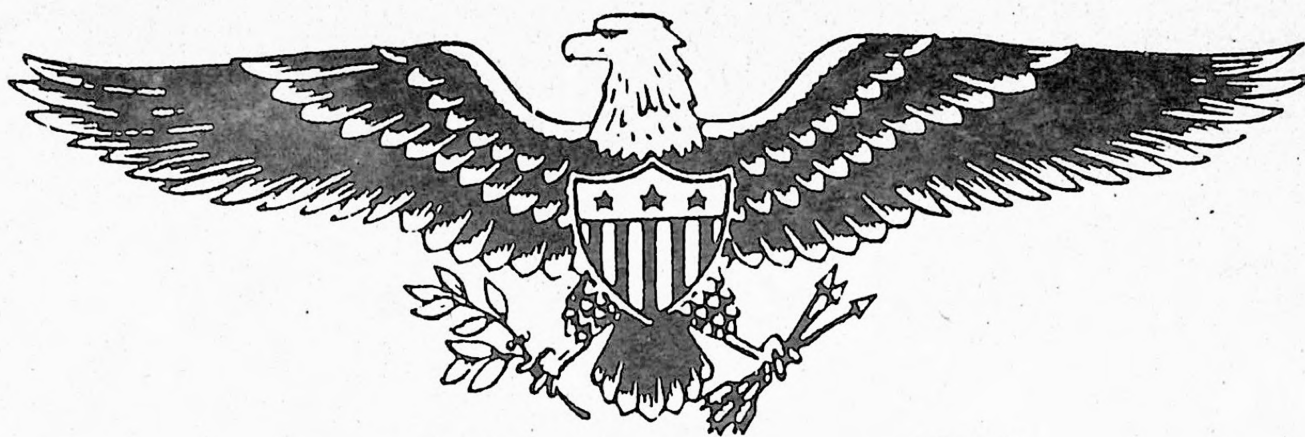




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Color Micro Journal

The Color Computer Monthly Magazine

\$1.95 per issue Vol. 1, Issue 8 April, 1984

THIS 'N THAT

A "New CoCo" Rumor,
Radio Shack Disk Controller Swap
and C Compiler,
Microware OS-9 Manuals,
another "Glitch" Fix,
and a SPECIAL NOTICE for Modem Users;
but first --

As most of you know, TANO Microcomputer Products in New Orleans was going to produce the Dragon Computer (an English CoCo look-alike) in the US. We received a letter from them the end of Feb., part of which follows:

Dear Mr. Nay:

... TANO Corporation has made the decision to withdraw from the microcomputer home/business market. We will continue to honor any and all warranties through our industrial products group.

...
Ben Albert
VP

TANO Microcomputer Products

Evidently, for the time being anyway, we can forget about the Dragon appearing in the US. I, for one, had hoped the Dragon would make it in the States, and had looked forward to some of the other products that Dragon Data is supposed to be working on (re. "This 'N That", Sept. '83, Color Micro Journal). ANYTHING to get more 6809 Machines in the General Marketplace here in the States is highly desirable for ALL CoCo Users; and a CoCo look-alike would be especially appealing.

It seems that the "Overseas Folks" think and do things a little differently

Continued on page 4

WORD-PAK 80 Column Display on the CoCo

pbj inc.
P.O. Box 813
N. Bergen, NJ 07047
(201) 330-1898

Cartridge - \$139.95
FLEX Patch - \$19.95
OS-9 Patch - \$19.95
Bare PC Board w/ Doc - \$19.95

One of the first limitations that the Serious Color Computer User encounters is the standard 32x16 Video Display. While the 51x24 Displays are a major improvement, they eat up a lot of valuable memory, ESPECIALLY with the OS-9 System, which is already extremely memory-sensitive. It was with great anticipation, then, that we awaited the arrival of a solution to this problem.

Enter the pbj inc. WORD-PAK Video Board. We have seldom seen such a COMPLETE elimination of a problem as the WORD-PAK installed on the Color Computer has provided. It is also good to see Software Producers such as Cer-Comp, with their TEXTPRO III, and Great Plains, with STYLOGRAPH, providing support for the WORD-PAK by providing versions of their Software which utilize it. It is also compatible with the Wayne Technology CP/M Board for the CoCo.

Functionally, the WORD-PAK System consists of a "ROM Cartridge" with the appropriate Software and Manuals. It will operate on any CoCo from 16K up, and can be used with the Disk Controller through the use of the pbj C-C BUS, the Radio Shack Multi-Pak, or a "Y-connector" which allows both the

Disk Controller AND the WORD-PAK to be plugged in at the same time. Additionally, you will need a Standard NTSC Input Video Monitor that is capable of displaying 80 Columns of characters, such as the Zenith VZM-121 or 122, the BMC BM-12EUN, etc. I would recommend that the Monitor have at least a 15-MHz Bandpass. These are available from different sources in the \$120 to \$150 price range (pbj sells the BMC Monitors for \$139 for the Green Screen or \$149 for the Amber Screen).

The Software for the WORD-PAK Driver for Radio Shack BASIC is supplied on Tape, with instructions for moving it to Disk. Two versions of the Video Driver Software are supplied, one for the 16/32K CoCo, and one for a 64K

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CoCo. Additionally, the Drivers on one side of the Tape execute automatically, while the Drivers on the other side of the Tape are LOADED and then EXECuted. The ONLY snag I ran into in getting the System up and running was that the Programs would not work with the Radio Shack Multi-Pak; but I found an "undocumented" file on the Tape that did the trick (I'm sure that has been taken care of by now). Once the proper "Driver" Program is executed (such as **CLOADM"VIDEO64**), the Video Display is on your 80 Column Monitor. Simple! (One NOTE; check the Brightness and Contrast settings on the Monitor - some of them display "garbaged characters" if contrast is set too high. This is a characteristic of the Monitor, NOT the **WORD-PAK**! -- Of course, if you are using a \$5,000 Monitor, you should not have this problem.)

The FLEX Driver Option comes on a standard FLEX Disk, and, at least for the Data Comp F-MATE FLEX Conversion, consists simply of copying "V80.COM" to your System Disk. Any time you want to use the 80 Col. Monitor, just enter the Command **V80**; to get back to the normal Display, enter **V51** or **V32**, and you are back. A "Patch" is also supplied so that you can modify "FLEX.SYS" to come up on the 80 Column Monitor when it is originally booted. This allows you to use the 80 Column Monitor WITHOUT a TV; you must enter **RUN" FLEX** in the blind, but from there on you are on the Monitor. I would assume, from the overall quality of the **pbj** Package, that the FHL FLEX Conversion Driver Routines are similar to the Data-Comp option.

The OS-9 Driver Option is supplied on a CoCo OS-9 Disk. The **WORD-PAK**

System is integrated into the OS-9 Operating System by REPLACING the "CCIO" and "TERM" Modules with new ones. This requires making up a new System Disk; DON'T PANIC, they make it easy. If you have a at least two Drives (if you have used OS-9 much, you already HAVE two Drives), you simply format a new disk in /d1 to backup the supplied disk, then run the supplied procedure by entering "/d1/install.2", and it's done. For those with a little experience, it is easy to edit the procedure file to customize your System Disk (if you are not sure of yourself, use their procedure first to be sure the Video System is working before you start playing with different configurations). They also provide a procedure for Single Drive Systems; obviously, it requires some Disk Swapping, etc. Now, when you boot OS-9, the logo and everything else comes up on the 80 Column Monitor. The FIRST thing I did, after getting **WORD-PAK** operational with OS-9, was copy my Gimix DIR Command to the CoCo; at last, a READABLE Directory! This system provides a major improvement in the use of OS-9; Basic09's indented listings and lower-case letters do not garbage up the Display, the Editor is easier to use, etc., and you have most of your original memory back (over the 51 Column Graphics package).

The **WORD-PAK** Video Board utilizes the "Industry Standard" (it is used in the majority of the Terminals, etc.) 6845 CRT Controller, along with a Character Generator ROM, a 6116 RAM Chip, and various buffers and gates (a full schematic and parts list is included in the Manual). A RCA Jack is installed for the Output, so you can use the Radio Shack supplied Video

Cable with the System. Since it has its own output jack, you can leave the TV/Color Monitor (the Color Monitors normally used with the CoCo will not work with the **WORD-PAK**; if you get one good enough to work with as an 80 Column Monitor, the normal CoCo Display is close to unreadable, and if you have one like the Amdek Color 1 that works so well with the CoCo, the Display is not good enough for the 80 Column Board) AND the **WORD-PAK** Video Board connected at the same time.

The supplied Software (the Driver Routines) are EXTREMELY well-done and complete. Bill Vergona, of Cer-Comp, wrote the Radio Shack Driver, and has done an outstanding job of integrating it into BASIC so that it can be used with standard BASIC Programs as well as other programs. The supplied Documentation is exceptionally complete, with full information on the use of the BASIC "CHR\$(n)" statements for controlling the Display. The Control Codes documented are:

Hex	Dec	Ctrl	Function
7	7	G	sound bell tone
8	8	H	Backspace Cursor one character position
9	9	I	Advance Cursor one character position
A	10	J	Move Cursor down one line (scroll if at bottom)
B	11	K	Initiate x-y Cursor positioning
C	12	L	Clear Screen
D	13	M	Move Cursor to the start of the next line
10	16	P	Home Cursor (top left of screen)
11	17	Q	Turn destructive cursor ON

Continued on page 4

CoCo GOES TO WORK

THE CoCo HAS GROWN UP. TODAY YOU'LL FIND IT IN OFFICES AND BUSINESSES ACROSS THE COUNTRY... IT'S NOT JUST FOR GAMES ANYMORE. WITH SEVERAL POWERFUL OPERATING SYSTEMS TO CHOOSE FROM, INCLUDING FLEX, OS-9, AND CP/M, THE APPLICATIONS ARE NUMEROUS—WITH OUR PERIPHERALS, THE POTENTIAL IS UNLIMITED.

WORD-PAK

The **WORD-PAK** is a video board in a cartridge form which plugs into the ROM/expansion port and produces a high quality, video display comparable to that found on high priced terminals. The board is fully compatible with any size system and can be implemented on cassette or disk based systems (disk systems require the use of a Y-connector or expansion bus). Included with the cartridge is a "Video Driver" software package which integrates the **WORD-PAK** into the system and adds a set of powerful screen commands including: Home Cursor, Erase to End of Line, Erase to End of Screen, Destructive Cursor (on/off), X-Y Cursor Positioning, Double Size Characters (on/off), plus others. The Video Driver also provides two new keyboard features, one is 'Auto Key Repeat' and a programmable 'Clear/Control Key'.

The following software patches are available for the **WORD-PAK**:

FLEX PATCH (specify version)	\$19.95
OS-9 PATCH	\$19.95
TEXPROIII (powerful text editor/processor)	\$49.95

P-C PAK

The **P-C PAK** is a parallel printer interface and real time clock/calendar cartridge for use with the Radio Shack Color Computer. The board features a fully buffered Centronics compatible parallel port and a four year clock/calendar that keeps track of time from 1/10,000 of a second to months.

PRICES

	ASSEMBLED & TESTED	BARE BOARD W/DOC
WORD-PAC	\$139.95	\$19.95
C-C BUS	\$149.95	\$22.95
P-C PAK (printer port)	\$69.95	\$17.95
P-C PAK (real time clock)	\$62.75	
Battery back-up	\$12.45	

MEM-PAK (with 16K RAM)	\$110	\$17.95
PROTO CoCo	\$10.95 (3/\$20)	

BMC #BM-12EUN	
18MHz Monitor (green)	\$139 (list \$189)
(amber)	\$149 (list \$199)

BMC # BM-AU9191U	
Color Monitor	\$249 (list \$299)
with audio input	
BMC #BX-80 Dot matrix printer	\$289 (list \$379)
parallel interface	

C-C BUS

The C-C BUS is an expansion bus which connects to the ROM/expansion port of the Radio Shack Color Computer. The bus provides six software selectable slots which can be populated with any combination of accessory boards/cartridges. A typical system might contain a disk controller, parallel printer interface card, **WORK-PAK** video board, and a real time clock board, all installed and accessible by the CPU. The C-C BUS accommodates two different types of boards: slot dependent (those which are addressed at C000-FEFF, i.e. ROM packs) and slot independent cartridges (those which are addressed at FF60-FFBF).

C-C BUS features:

- *All address and data lines fully buffered.
- *Gold plated cartridges connectors.
- *Low profile, compact design.
- *Power supply built-in.
- *Compatible with existing hardware and any size system.
- *Supported with a full line of accessories (more to come).

The C-C BUS is supplied complete with an attractive molded cover, power supply, and connection cable.

MEM-PAK

The **MEM-PAK** is a memory expansion board that can be populated with 24 pin compatible memory devices (ROM, EPROM, RAM, etc.)

PROTO CoCo

Prototyping board designed to fit in a disk controller case.

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BUB-PAK 1 Megabit bubble memory cartridge.
2SP-PAK Dual RS-232 cartridge.
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There are two basic versions of OS-9. Both have the same basic features and capabilities. OS-9 Level One runs on small to medium sized systems having up to 64K memory. The Level Two version runs on medium to large size systems having memory management hardware and up to 1 megabyte of memory, and includes record and file locking for multiuser database applications.

Here are just a few reasons why you should insist on OS-9 for your microcomputer system.

- Over 40 utility commands
- Friendly "Shell" command interpreter
- Tree-structured multilevel file directories

- Full timesharing support with log-in and file security
- Fast, secure random and sequential access files
- Comprehensive English language error messages
- Compact real-time multitasking executive
- Hardware or software memory management
- Device independent interrupt-driven I/O
- Fully ROMable for small control systems
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OS-9 PASCAL Language Compiler

- most complete and versatile PASCAL available for the 6809
- capable of generating P-code for interpretive execution while debugging OR
- highly optimized 6809 assembly language source code output for maximum speed
- "virtual memory" P-code interpreter lets you run large PASCAL programs

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- ideal for most demanding business applications
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- retains full compatibility with CP/M software
- meets ANSI 1974 Level One COBOL standard and is GSA certified
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BASIC09[™] Structured Basic Interactive Compiler

- fastest and most comprehensive full Basic language available for the 6809
- combines standard Basic with the best features of PASCAL
- features compiler speed, interpreter friendliness and superlative debugging facilities
- option available: Run B...a ROMable run-time system for compiled Basic 09

C Language Compiler

- complete implementation of the UNIX version 7 C language
- includes INT, CHAR, SIGNED, UNSIGNED, FLOAT AND LONG data types, structures, unions, standard C library and a full preprocessor with macro definitions
- generates fully reentrant 6809 assembly language source code output

For more information contact your computer supplier or



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910-520-2535

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12 18 R Turn destructive cursor
OFF
15 21 U Erase from cursor to end
of the line
16 22 V Erase from cursor to end
of the screen
*17 23 W Turn reverse character
mode OFF
*18 24 X Turn reverse character
mode ON
1B 27 ; Change number of
characters per line
that is displayed
1D 29 = Enable/Disable normal
screen output
1E 30 > Turn double size
characters OFF
1F 31 ? Turn double size
characters ON
* - These two were backwards in the
Manual.

The new Display Driver also adds two features to the Keyboard; a "Control" Key and Automatic Key Repeat. If the BREAK and CLEAR Keys are depressed at the same time, the CLEAR Key is switched to a "Control" Key, and the cursor flash-rate increases as a reminder. If a Key is held down for a couple of seconds, it begins to repeat (at a user controllable rate). Finally, the normal BASIC maximum "PRINT @" position of 511 is changed, and is adjusted automatically for the current screen format (which can be set at 80, 72, 64, 51, 42, 40, 36, or 32 chars/line with the "Ctrl ;" command in the table above).

There is a fairly complete discussion of the 6845 CRTC's Register Set-Up and Parameter Values, along with a sample Assembly Language "Initialization" Routine, but some Users may want to obtain the Data Sheet from Motorola for complete information. The Manual also provides a discussion and a

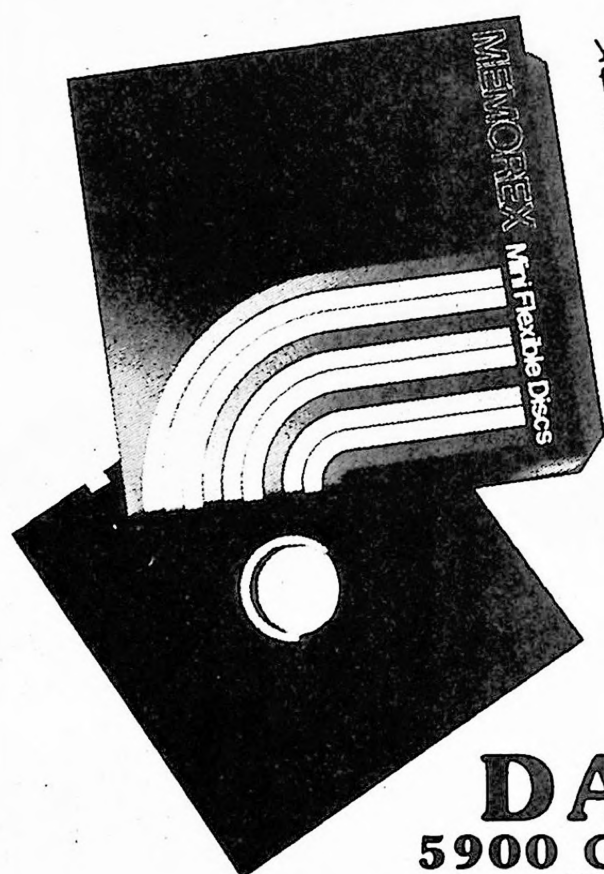
BASIC Program which allows you to create your own custom characters in the RS High Res Graphics Mode and save them to Tape for later use in burning a new character ROM, along with examples using the "CHR\$(n)" functions for controlling the Video System.

The FLEX and OS-9 Option Manuals, besides providing the installation information, also provide any "System Specific" Information that is applicable. For example, the OS-9 Manual discusses the Control Codes for that system, as well as the location in the "TERM" Device Descriptor module for the parameter table, should you want to change the provided values. The FLEX Manual (ours is for the Data Comp F-MATE Version), provides the User Routines and Data Areas information for customization (the full Source Listing is provided on the FLEX Disk for this Version).

In summary, if I were to use Carl Mann's rating system, I would have to give this one a 120 rating; 100 plus a 20 point bonus for usefulness. The supplied Documentation is well done and COMPLETE, the WORD-PAK Video Board works like a champ, the supplied Software is excellent, and pbj is quick to answer questions (please send a letter if possible, living on the phone cuts into the work on new products). Any one needing (or just WANTING) an 80 Column capability for the Color Computer would do well to invest in this little jewel.

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THIS 'N THAT

than us "Stateside" Computer Users. While the IBM PC is romping up a storm here (even though experienced Micro Users, that OWN PC's, say it is "overpriced for what you get"), it appears to be running into a little resistance in Europe (re. Mar. 12, 1984 **Computer System News**, p. 59, where the Headline states "IBM Cuts PC Tags In Europe; Some Observers Hint Weak Demand"). They are not "hooked" on the IBM "name" over there, nor are they as deeply committed to the Intel 8080 CPU and CP/M Operating System, as we are, so they are taking a realistic look at

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If articles are submitted on paper, they should be either Typed or Printed Single Spaced with a MAXIMUM Line Length of 4" on normal 8 1/2" x 11" bond or better paper. A good BLACK Ribbon must be used because all paper submitted articles will be photo reproduced. NO hand written articles will be accepted (except required art work which goes with an article). Again, PLEASE use a DARK Ribbon.

All letters to the editor should also comply with the above and MUST bear a signature. Letters of 'gripes' as well as 'praise' are solicited. We attempt to publish all letters to the editor verbatim; however, we reserve the right to reject any submission for lack of 'good taste'. We also reserve the right to define what constitutes 'good taste'.

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what THEY purchase. The 6809 and 68000 CPU's are developing a lot of activity overseas, especially since they are not tied to a 20-year old architecture, with more and more reasonably-priced Computers showing up almost daily (for example, the **Sinclair QL** is a 68008-based Computer that is just now hitting the Market over there at around \$500; INCLUDING a bit-mapped Color Display capability, BOTH R-G-B and TV Outputs, Word Processor, Electronic Spreadsheet, Data Base Management, and Graphics Programs, dual "Micro-Tape" Drives, and a Single-User Multi-Tasking Operating System with a BASIC Language similar to the OS-9 Basic09 Language - to be available in the US late this Summer).

I have stated several times that there is some excellent Hardware and Software coming out of England, and some indications that more will be coming from other areas over there. It appears that they are still in the "experimental stage"; they have not developed into the "mature complacency" of the US where most Microcomputer Users want to go out and buy a Program that will do everything they want by just entering "RUN Program". The "Europeans" are still searching; investigating; trying to find a better way! They are just beginning to recover from an economic situation where they can not afford to lay down \$3000 to \$5000 for a "Personal" Computer; they are willing to spend a LOT less for a Computer that has a high POTENTIAL and develop there OWN methods of using it.

That is one of the things that has impressed me about the Color Computer Users. Many of you knew up front that there was not a LOT of GOOD Software available when you bought your CoCo, but you WERE aware of the tremendous POTENTIAL in that little case. Scan through the CoCo Magazines and see how much of the material is oriented towards finding out how the ROMs work; or discuss better ways of doing something; or point out improvements to the basic Computer; etc. There is a feeling of "hunger", of "questing", or "searching" for more information, that MAINTAINS interest in USING a Computer, in the CoCo Community. OS-9 is the "new kid on the block", and has received a lot of coverage, especially in **Color Micro Journal**, but there is still a lot of information needed on using the normal Radio Shack Operating System, FLEX, BASIC, etc.; there is still a lot to learn. Like the old Model I, the CoCo will be around for a WHILE!

RUMORS - RUMORS

This month's "Super Rumor" gets back to a "Super CoCo" again. I have heard of everything from a 128K "fully compatible" CoCo that could only access the second 64K with programs like a "Virtual Disk" (i.e., the extra memory can not be used for actual Computer Operations such as running Programs, etc., but CAN be used like extra high speed disk storage, or for Printer Spooling, etc.), to a 64K - expandable to 256K - System with OS-9 Lvl II capability, more Display Colors with better resolution, etc. I have had reports from three different parts of the country of people that "have seen the new PC Board", but did not know the full details of the unit. The

System is to be available around May/June??? The OBVIOUS next step in the series would be towards a System that could use Extended Memory and OS-9 Lvl II (which is so MUCH easier to use than Lvl I because of the lack of Memory Problems), with a slightly improved Display System and, HOPEFULLY, and ACIA or so (and maybe a decoded Keyboard). IF there is ANY truth to be had, it should be interesting!

the Latest from Radio Shack

We understand that Radio Shack will swap Disk Controllers for \$25 if you have bought a CoCo 2 and have one of the old Disk Controllers that needs the 12 Volts (and could not be used on the CoCo 2 without a Multi-Pak). Hows that for SUPPORT?

We have also received a "Review" Copy of the Radio Shack OS-9 C Compiler (Cat. No. 26-3038; price is \$159.95). The physical package comes in the now-familiar 9 1/2" x 7 1/2" x approx. 1/2" thick gray package, with a spiral-bound 9 x 7 x 1/2" Manual with two Disks in a packet inside the back cover. We will go into a lot more detail at a later date, but the first impressions are sort of mixed. First, it comes on 2 Disks, a C Compiler Disk and a C Library Disk. It appears to be the standard Microware OS-9 C Compiler, and the Manual looks like an exact copy of Microwares Manual (you do NOT receive a copy of "K&R" with the RS Version, so must strike that line out of the Manual). You DO get a fairly COMPLETE C implementation, including "floats" and "doubles", AND a full Relocating Macro Assembler/Linking Loader with the package -- ALL for \$159.95. Microware has added the "Direct" Storage Class as an extension to K&R, which allows you to specify "Direct Page" data access to speed up certain sections of code. The Compiler supports the "#asm" - "#endasm" directives for including Assembly Language Source Code in the C Program, and a "Profiler" option is also provided which allows the user to determine the frequency of execution of each function in the C Program.

The first "stump" we ran into is that there are NO instructions on how to set the Compiler up on your Disk System (the "standard" procedure in the OS-9 World is to have a ReadMe File on one of the Disks that explains any special set-up; some even include "install" Files that do all of the work for you); you can figure some of it out from comments throughout the Manual. From past experience, you are going to need EVERY BIT of Memory you can squeeze out of the System to run the Compiler. In most cases, you will need to make up a special Systems Disk with a bare minimum of the OS-9 System in Memory (FORGET O-Pak and the 51 Column Display, but the **pbj 80 Column Word Pak** - see review this issue - will probably be OK). The second thing you need to be aware of is that you MUST have TWO Disk Drives to run this package; not because of Disk Storage, although that would be a problem, but because some of the Files the Compiler uses MUST be on /dl, and you have no way to change it. Again, this is a "Full-Blown" C Package, and is not SMALL. Microware has needed to change the OS-9 Level I C Compiler to a 3-pass Compiler for some time; even the "big boys" have trouble finding enough room to run it (the CoCo actually has more free memory

than an SS-50 Machine with Level I OS-9).

The Manual covers the Compiler and its operation, discusses the characteristics of Compiled Programs, the System Calls and Standard Library. Also provided is an Appendix on "Interfacing to Basic09".

The supplied documentation (as is the case with most C Compiler packages) is NOT a C "Tutorial"; if you are not a C expert, you will need some other means to learn the language. The 'bible' is "The C Programming Language" by Kernighan and Ritchie (Prentice-Hall) - it is available at most B. Dalton Book Stores - but, again, it is NOT the book to use in LEARNING the Language unless you have a lot of experience with several other structured high-level languages; especially Pascal (and then, the "Pointers" may still require further study). It SHOULD be part of your reference library as it provides the specification of what IS or is NOT "Standard". I would highly recommend "Programming in C" by Stephen G. Kochan (Hayden); again, you can get it through B. Dalton Stores. This book is about 370 pages for around \$20 that is well organized, is easy to read, and E-X-P-L-A-I-N-S things, along with numerous example programs. I have 6 or 7 of the "C Books", but this is the best by far (it also covers "enums", which is not in K&R, or most of the Microcomputer C Compilers yet).

Microware Manuals

The normal Documentation that is supplied with the C Compiler only provides a SUMMARY of the operation of the "Relocating Macro Assembler" (RMA), since it is controlled by the Compiler itself and requires little User operation. The Assembler is exactly the same system you would receive if you had purchased the Microware RMA itself, and the full RMA Manual is available from Microware for \$25.00.

Many CoCo Users have asked where they could obtain more information about the I/O and Disk Modules for the standard OS-9 System. Normally, when you purchase an OS-9 Operating System, it is obtained from the specific Computer Manufacturer, who has already set the System up for that Computer.

COLOR COMPUTER SOFTWARE

SUPER SLEUTH DISASSEMBLER EACH \$99-FLEX, \$101-OS/9
Interactively generates source on disk with labels, includes xref
specify 680x/6502 version or Z-80/8080/85 version
(OBJECT ONLY) EACH \$50-FLEX&OS/9, \$49-COCO DOS
COCO DOS available in 680x/6502 version only

CROSS-ASSEMBLERS EACH \$50-FLEX, \$55-OS/9, ALL \$100
specify for 6800/1, 6502, 6805, Z-80, or 8080/48/85
OS/9 version requires Microware RMA or FHL OSM macro assembler
FLEX version requires TSC ASMB or FHL ASM or OSM macro assembler

DEBUGGING SIMULATORS EACH \$75-FLEX, \$100-OS/9
specify for 6800/1, 6805/146805, or 6502

6502 to 6809 ASSEMBLER TRANSLATOR \$75-FLEX, \$85-OS/9
translates 6502 programs to 6809, noting inexact conversions

6800 to 6809 & 6809 PIC XLATORS \$50-FLEX, \$75-OS/9
translates 6800 programs to 6809, 6809 programs to PIC

FULL-SCREEN FLEX TSC XBASIC PROGRAMS
(with complete cursor control)

DISPLAY GENERATOR/DOCUMENTOR \$50

MAILING LIST \$100

INVENTORY WITH MRP \$100

TABULA RASA SPREADSHEET \$100

DISK UTILITY PROGRAM LIBRARY \$50-FLEX
fix disk errors, sort directory, maintain master catalog, etc.

5.25" SOFT-SECTORED DISKETTES EACH SET OF 50 \$75
DSDD, with Tyvek jackets, hub rings, labels, write-protect tabs

Computer Systems Consultants, Inc.
1454 Latta Lane, Conyers, GA 30207
Telephone Numbers 404-483-1717/4570

Specify Color Computer or other version of programs.
Programs provided in source form on diskette: specify O.S.
Call or write for full catalog and dealer info.
VISA and MASTER CARD accepted; US funds only.
Add 5% for shipping software, but not for diskettes.

FLEX is a trademark of Technical Systems Consultants.
OS/9 is a trademark of Microware

Much of the general information on how to write the Drivers is left out of the Manuals because it is not needed by the User. However, you can purchase a "System Programmers Guide" from Microware that INCLUDES this information; again, the price is \$25.00.

As some of you may be aware, Dale Puckett has written a book on Basic09, called "Basic09 Tour Guide", which will sell for \$18.95. The latest estimate is that it will be available around the middle of April. These will be available from Microware, or from Southeast Media (see Ads this Issue; call 800-338-6800 to reserve one NOW), and should be a big help in learning how to really USE Basic09.

another "Glitch" FIX

Last month we mentioned the problem of the CoCo intermittently "going south", which requires a RESET to get it back up and running again. To quote a letter from Howell Dennis in Fayetteville, NC, "... I have been having fits with System crashes while using OS-9. ...". We mentioned that Motorola was working on a "glitch" in the 6883/6847 Refresh timing and that they should have a new set of Chips available by this time. Ray Goff called when he saw those comments and pointed out another possibility for this problem, along with a solution (thanks, Ray). It seems they were working on a 6845 CRT Controller Interface for the CoCo and ran into this type of problem. They traced it to the fact that when the CPU is in the HALT State, as it is during Disk Accesses, the Address and Data Lines are tri-stated to a High-Z and the WRITE Line is brought LOW (which enables the system to write to any Memory that is selected). Now, since the Address and Data Lines are "floating" (not being forced high or low by the CPU), suppose there is some combination of Chips on the Bus that create a drain on random lines; they can sink below threshold and actually provide some Address selection, which would then cause the System to write RANDOM Data to RANDOM Memory locations. Blooey goes the System.

Their solution was to install 4.7K pull-up resistors on each Address AND Data Line from the CPU. Now, when these line go to a High-Z, they are pulled up to an address selection of \$FFFF, which is actually the second byte of the Reset Vector (which is in ROM), so it doesn't matter if something is written into memory there or not. All of his problems disappeared!

I think this is the situation that MOST CoCo Users have encountered. Remember, the Color Computer has NO buffers on these lines, so they are already loaded close to capacity when a Disk Controller is installed. If you then use something like a "Y" Connector to hook up ANOTHER Cartridge, you are adding yet more loading to the lines, even if the other Cartridge IS Buffered. Most Computer Systems buffer these Lines to prevent this problem; most ALSO use the pull-up resistors in addition to the buffering as a safety feature (which is fairly standard practice for ANY system which uses tri-state components). So, spend a couple of bucks and install 24 4.7K Resistors from the +5 Volt DC Line to each of the 16 Address and 8 Data Lines from the CPU, and see if your problems

disappear.

SUPER SPECIAL for Modem Users;
remember, you saw it HERE F-I-R-S-T

We just received the first Issue (Vol. 1, No. 1) of "COMPUTER DATA REPORT" from

Information USA
12400 Beall Mt. Road
Potomac, MD 20854
(301) 983-8220

This is a "quarterly newsletter which identifies free and low cost data for use in computerized decision making". Contact them for more information.

There really is a lot of good info in the publication, such as where to get a Govt. Pub. which shows the average amount for various tax deductions within various income levels (build it right into your Tax Return Program), where to look for a winner in the fifth race, and a LOT of info on accessing Data Bases, but one, especially, caught our eye. We quote it here VERBATIM:

A MOURNING DOVE DATA BASE????

That's right. There is a special data base of some 15,000

records which is used to monitor the size of the mourning dove population in the United States. If you are serious about mourning doves you may be able to access it for free. Contact: Chief, Bird Banding Laboratory, U.S. Dept. of Interior, Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, MD 20708, 301-498-0205.

Until next month ---

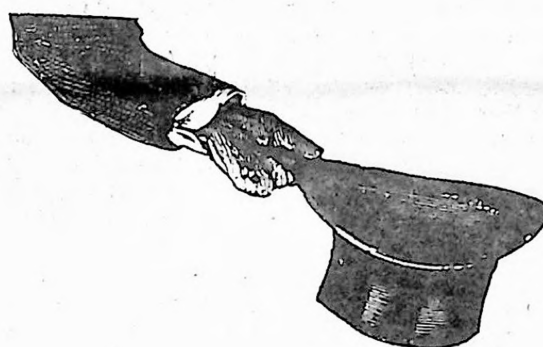
--- RLN ---

FREE ???

CHECK THIS OUT

FREE!

SPELL 'N FIX II



Hat ↗

Nowadays, when you go to the theatre, you first pay your money and then go to the show ... and hope you enjoy it. But it wasn't always like that. Centuries ago it was the other way around. First you saw the show. Then the performers passed their hats around. If you enjoyed the show, you put money in the hat. The more you enjoyed it, the more you put in.

We're going to try the same approach with software.

INTRODUCING PASS-THE-HAT SOFTWARE

It works like this. Send us a formatted disk along with a stamped, self-addressed mailer. We will use it to send you a copy of SPELL 'N FIX II. We also give you permission to copy the disk as much as you want and give copies to all your friends.

After you've had a chance to use it, that's where the hat comes in. We want you to decide for yourself what the program is worth to you, and send us a contribution. (Hint: send a LOT if you really like it!)

WOW! WHAT A PROGRAM!

SPELL 'N FIX II is not just for spelling mistakes — it catches typos too. It really makes sure that your word processing output is perfect. Easy to use too. Reads your text, fixes your mistakes, lets you look up the spelling of bad words in its dictionary file, even lets you add words to the dictionary. Color Computer Magazine called the original SPELL 'N FIX "a top-drawer piece of software" ... and SPELL 'N FIX II is even better! Originally advertised for \$69.29, it beats the \$200—\$300 dictionary programs for other computers — hands down!

COMPARISON CHART

	Radio Shack Color Dictionary 26-3265	Original SPELL 'N FIX	New SPELL 'N FIX II
Checks SCRIPSIT (R) files	YES	YES	YES
Checks other text processor files	NO	YES	YES
Checks Basic data files	NO	YES	YES
Checks files larger than memory	NO	YES	YES
Full upper and lower case display	NO	NO	YES
Add words from dictionary	NO	YES	YES
Delete words from dictionary	NO	YES	YES
Custom dictionaries possible	NO	YES	YES
Comes with error-free dictionary	NO	YES	YES
Usable for foreign languages	NO	YES	YES
Checks and fixed in one pass	NO	NO	YES
Shows suspect words in context	YES	YES	YES
Usable with just one diskette	NO	YES	YES
Looks up words in dictionary	YES	NO	YES
Looks up words while correcting	NO	NO	YES
DIR command allowed during run	NO	YES	YES
Uses standard Basic file format	NO	YES	YES
Price	\$59.95	\$49.39	FREE

(Note: SCRIPSIT is a trademark of Tandy Corporation)

STAR-KITS
SOFTWARE SYSTEMS CORPORATION

PO. BOX 209 J MT. KISCO, NY 10549 (914) 241-0287

Color Micro Journal

USING THE COLOR COMPUTER

By Carl W. Mann and the Neighbors

COMPUTER SURPLUS AND THE COCO

-- or --

Tandy, PLEASE! I'd Rather Do It Myself!

Well, here goes. A column devoted to surplus? Sure -- after all, the stuff's all over the place these days, and a buck's still a buck for a' that. Sure, lots of us would LOVE to buy out the entire line of Tandy CoCo products, but it's tough starting out with only a few extra pennies to spare, once the "mainframe" has come to roost on top of the handiest piece of furniture available. So, for all we do ... this column's for you. (No apologies to the brewers.)

There had been a massive giveaway at Sam Berry's place just a month before I bought my CoCo. His late wife (God rest her soul) had been an avid flea-marketeer to the last, and had amassed what may truly have been the most

amazing assortment of just plain stuff this side of my friend Bill's barn. There were Navy surplus generators, pieces of fabric, lots of china and tableware, an adding machine that really worked well once you figured out how it worked (not a standard operating system), an ancient cassette recorder (sans batteries), bits and scraps of hydraulic and pneumatic gear, an old boat, you name it - it was there. Old Sam (I use the term "old" as do the Chinese, as a term of high respect) had decided not to burden himself with all the stuff, having determined to sell the place and move up the road a few miles. He called upon Bill to lend a hand in the clearing out and moving. Bill took one look, and called Joe and me for help. The job was massive. Old Sam only packed off a couple or five favorite volt-ohmmeters, tube testers, and the like to keep himself occupied through the dark New Hampshire winters, and consigned the rest of the stuff to the three of us. Bill took a shine to a pile of picture frames. (Must have been two hundred or so.) Joe got the hydraulics, the pneumatics, and some furniture. I got the rest of the furniture, and the rest of the

electronics. All three of our houses looked as though hit by the proverbial tornado for at least a month after. (Mine took much longer to recover.) But buried deep in a little-visited corner of the kitchen, lying in wait for its destiny to appear, that old Zenith cassette machine bided its time.

That time finally appeared, as one might have guessed, when I bought my CoCo. Here was a fine little toy that conveniently forgot what it was supposed to do as soon as it was turned off. Practically useless. What was to be done? I knew nothing about computers, but decided to try the old Zenith cassette machine as a temporary mass-storage unit until the pain in my budget eased.

Maybe it was a miracle. It couldn't have been anything good about the Zenith. (Nah.) I had no batteries for the thing (remember when those machines took "D" batteries?) and was determined to make use of the "electrojunk" that filled most of my largest bedroom. I rummaged around 'till I found a few old "plug 'em into the wall and save on batteries" power supplies and took the one that most closely matched the voltage of the battery stack in the cassette machine. (If enough readers express an interest, I'll gladly explain the practical principles of basic electricity and electrical "troubleshooting" in this column. Just write and ask. Fact is, all the fancy computer logic in the world won't get you anywhere 'till you've got your series and parallel circuits, Ohm's Law and such, down.)

Anyway, I had to switch the polarity of the power supply around backwards from what it had been at first so as to have it right from the cassette machine's point of view. Took about two minutes, a sharp knife, and a little Scotch tape. (I was out of electrical tape, and really felt stingy that day.) I plugged everything into everything else (the Radio Shack CoCo cassette cable made things easy - yeah, I bought one of those) and turned on the power. Nothing smoked, so I proceeded to type in a short BASIC program, RUN it, and then put the rig to the test with a daring CSAVE"TEST" to the Zenith. I did it twice, just in case. Then off/on with the computer's power, a fast rewind to the beginning of the tape, and then the ultimate test. CLOAD"TEST" and press ENTER. The monitor screen (an ancient Motorola black-and-white portable with a surplus computer-video-rated picture tube) went blank, the tape machine sort of groaned, and then some sound from the TV speaker. Then a message: "I/O ERROR". Why? Because I had unwittingly violated the First Law of Tape I/O: The one that goes, "Thou shalt not attempt to record on that which is not brown or black!". Yep, I'd tried to CSAVE my program on the cassette's leader. I tried again, after repositioning the tape to the spot just before the start of the next series of indescribable sounds. This time things went much better. The monitor went blank, and right away displayed the cryptic message, "F TEST", then "OK". I typed RUN. The newly loaded program ran. I was convinced, and used that old cassette drive for nearly six months without any trouble.

Since that time, I've added a disc system (totally from third-party

STAR - KIBBITS

This month I have some good news and some not-so-good news. First the not-so-good news.

This is my last Star - Kibbits column. I have really enjoyed the chance to sound off on my favorite little computer each month, but the pressures of meeting a monthly deadline are getting to me (as you've probably noticed from my missing last month's.) I've gotten some very encouraging comments from some of you readers about this column, but I am afraid that the time has come to say goodbye.

Now for the good news.

PASS-THE-HAT SOFTWARE

A few months ago I tried an experiment. Instead of selling our Commterm communications program for the CoCo and MC-10, I decided to give it away free, but ask users to send us some money if they liked the program and used it. In reviewing the program for HOT CoCo Magazine, Douglas Swank called that the "Pass-the-Hat" sales method. I hope he doesn't mind if I borrow the name and extend the idea to SPELL 'N FIX II as well.

It's too early to tell whether we're going to lose our shirts on this idea, but my hope is that enough people will send us a contribution to make it possible for us to continue. It is a gamble and only time will tell whether we are making the right decision or not, but with today's high cost of doing business it is clear that we must change our marketing methods if Star-Kits is to survive.

If you would like to get your free copy of SPELL 'N FIX II, send us a disk with a stamped mailer. (Send a cassette for Commterm). We will return the disk with the program. The operations manual is also on the disk, and you can print it out yourself. We also give you permission to make copies and pass them out to your friends.

In return, we ask that each user decide what the program is worth and send us a contribution. Hopefully, you'll think it's worth a lot, but even a small contribution is better than nothing.

WHAT DO YOU THINK?

What's your opinion of this hare-brained scheme? Do you think we're ready for the loony bin? Should we do it for our other software as well? I'd love to hear from you!

DOUBLE - SIDED DISKS

We are selling a complete disk system with a disk controller, a double-sided 40-track drive, cabinet, power supply and all cables, all for \$400. The advantage, of course, is that the double-sided drive gives you the capacity of two regular drives for just slightly more than only one.

If you currently have a double-sided drive, send us a large self-addressed stamped envelope and we will send you free details on how to use it with your CoCo. That's it for this month - see you next time.

SPELL 'N FIX II

Regardless of whose text processor you use, let SPELL 'N FIX find and fix your spelling and typing mistakes. It reads text faster than you can, and spots and corrects errors even experienced proofreaders miss. It is compatible with all Color Computer text processors. Part of our Pass-the-Hat program. Send a disk and stamped mailer for your free copy. Older SPELL 'N FIX I is now priced at \$49.99 tape or disk. Both include a 20,000 word dictionary.

HUMBUG® - THE SUPER MONITOR

A complete monitor and debugging system which lets you input programs and data into memory, list memory contents, insert multiple breakpoints, single-step, test, checksum, and compare memory contents, find data in memory, start and stop programs, upload and download, save to tape, connect the Color Computer to a terminal, printer, or remote computer, and more. HUMBUG on disk or cassette costs just \$39.95, special 64K version for FLEX or STAR-DOS 64 costs \$59.95, MC-10 version \$29.95.

STAR-DOS

A Disk Operating System specially designed for the Color Computer, STAR-DOS is fully compatible with your present Color Computer disk format - it reads disks written by Extended Disk Basic and vice versa. STAR-DOS for 16K through 64K systems costs \$49.90.

DBLS for Data Bases

DBLS stands for Data Base Lookup System. A super-fast system for searching for a selected record in a sequential disk file. Supplied with SPELL 'N FIX's 20,000 word dictionary as a sample data file - lets you look up the spelling of any word in under FOUR seconds. Priced at \$29.95. Requires STAR-DOS.

CHECK 'N TAX

Home accounting package combines checkbook maintenance and income tax data collection. Written in Basic for either RS Disk or Flex, \$50.

REMOTERM

REMOTERM - makes your CoCo into a host computer, operated from a remote terminal. \$19.95, disk or cassette.

COMMTERM

A terminal program for your CoCo or MC-10. Part of our Pass-the-Hat software program. Send a cassette and stamped envelope for your free copy.

NEWTALK

NEWTALK - a memory examine utility for machine language programmers which reads out memory contents through the TV set speaker. \$20, disk or cassette.

SHRINK

SHRINK - our version of Eliza, in machine language and extremely fast. \$15, disk or cassette.

EDUCATIONAL SOFTWARE

Introduction to Numerical Methods - college level course on computer math, \$75.00, disk or cassette.

We accept cash, check, COD, Visa, or Master Card. NY State residents please add appropriate sales tax. Add \$3 to above price for AMDEK 3" disk versions.

(FLEX is a trademark of Technical Systems Consultants, Inc. Everything else in this ad is a trademark of Star-Kits.)



Color Micro Journal

PO BOX 209 J MT KISCO NY 10549 (914) 241-0287

DYNAMIC ELECTRONICS

96K EXPANDERS

Operating in the upper 8K of the ROM memory area, these hardware cartridges and modules allow you to use both 32K memory banks in 64K computers. There is nothing to load and the software is obtained by EXEC 57701. Easily transfer information from one bank to another without using any of your computer's RAM.

96KX-C . . Cartridge for cassettes or disk drive systems with cartridge selectors \$49.95

96KX-M . . Module that mounts inside the computer becoming a permanent part of your system. \$59.95

Solderless reversible memory upgrades.

1.1 ROM required for 64K upgrades. EXEC 41175 for ROM type. One year warranty.

ME-3 . . . D, E, & 285	16K-32K	\$36.95
ME-4F. . . 285 & CC-2 to 64K		\$79.95
ME-4 . . . D & E to 64K		\$89.95
ME-128-64 64K to 128K		\$199.00

Sam Buffer - Integrated circuit that mounts on the SAM chip & protects it against shorts from memory upgrading. \$8.95

We will loan you a computer while we upgrade yours. Write or call for details.

Video Reverser - Solderless assembly with 3 position switch for (1) reversed, (2) reversed all capitals, (3) normal display. \$19.9

DYNAMIC COLOR NEWS Monthly Engineering Newsletter

Learn how your computer works, basic programming techniques, machine language programming, operating hints, expansion techniques, etc. Receive discounts on our products. \$15 a year, sample \$1.

CC Software on tape. Extended Basic in not required. Disk compatible.

DISASM - Decimal Disassembler & Assembler. Uses English mnemonics & decimal arithmetic. \$19.95

DYTERM - Terminal program with expensive features such as baud rate of 300 to 2400, 7 or 8 bits, plus user definable buffer for composing messages or storing received messages. \$14.95

MPM - A multiprogram manager that allows up to 5 programs to be stacked in a 32K computer. Select the one you want to run from the menu. \$14.95

Computers for sale with extended basic and 90 day warranty.

64K Color Computer 2 with 96KX-M & Video Reverser installed. \$325

Used 128K TDP-100 with 96KX-M & Video Reverser installed. \$395

MC-10 Computer \$60.00
WE REPAIR COMPUTERS
FREE CATALOG

Checks, Visa & MC Cards,
24hr phone call at nights & on weekends & save

DYNAMIC ELECTRONICS INC.
P. O. Box 896 (205) 773-2758
Hartselle, AL 35640

sources), a printer (surplus) a modem (ditto) and another surplus tape drive. (The old Zenith is still kicking around. Joe is using it to listen to music in his car.) In the course of events, I've gleaned some hard-earned gems of experience which I'd like to pass on. Here they are.

First, as one might suspect, almost any old tape machine is good enough. Cassette, reel-to-reel, anything. (I've got an old Akai seven-incher I use for massive backup purposes.) The only important thing is that the machine in question have reasonably good high-frequency response. In fact, the tinnier it sounds, the better CoCo likes it. CoCo would just as soon send everything from about 1000 hertz (that's "cycles per second" to lots of us, yet!) on down to zero cycles right out the window. The only thing CoCo really wants for tape input is a signal that is relatively noise-free, and does not go away at unexpected moments. This means that the quality of the tape one uses is much more important than who made the machine that the tape is stuck into. Radio Shack leaderless computer cassettes are nice. They cost a lot, too. Lots of department stores sell perfectly good, low noise cassettes in their audio departments. They work very well indeed, and one can get lots more tape for the same money. Just don't trust the "bargain brand, three for a buck" cassettes that you often find in poly bags at the checkout counter (usually without any sort of protective box) if you value your data and time spent as a typist.

That "lots more tape" can be either a help or a kicker. It's nice to have a copy of everything in one place. On the other hand, it's a pain in the I/O port to have to find a particularly useful program that just happens to be buried under twenty-three minutes of nonstop "computrivia" somewhere on one side of a C-90 tape. When you get to that point, there are only two ways out. One is to buy a disc drive. (Expensive and not without risks of its own.) Then again, you can buy a couple dozen or so six- or twelve-minute tapes from a mail-order supplier (PCLEAR 80 in Mansfield, Ohio and Spectrum Projects in Woodhaven, New York are notably good ones in my experience) for about seventy-five or eighty-five cents (tops) apiece, and label each one as to its contents as you use them. Me, I keep a logbook. It's up to you and your needs. There's no shortage of options.

A printer is probably the next most useful thing, besides a pocketfull of hundred-dollar greenbacks, that a computerist could hope to own. I didn't buy a new one. In fact, I got something better, and learned a couple of hard lessons about CoCo's serial port (and Cartridge Scripsit) in the process.

I was poking about on the second floor of "Uncle" Mel's electronistuff store one day when a flash of beige caught my eye against the dingy grey of a huge pile of power supplies and nameless cardboard boxes. Upon closer inspection, the object of my attention turned out to be an Anderson Jacobson model 860 keyboard terminal, in sort of operating condition. My interest was immediately sparked. (I'm an inveterate scrounge, and I saw an opportunity to not have to throw away the printer as soon as I had "graduated" to a more sophisticated computer. I also liked the idea of being able to send data as

well as just printing it. Visions of local data networks danced in my head. I talked over the price with Uncle Mel. (He's not really my uncle, but that's his handle.) We settled on a price (about \$250) and I took Baby home. The adventure had just begun.

First thing Baby got was a thorough cleaning. Several pigeons had taken up residence in the warehouse, and their droppings peppered the innards of the printer and keyboard. I spent about three hours cleaning the guano off of the circuit boards, and burnishing the four hundred or so gold-plated circuit card connections inside the unit with a soft paper towel and rubbing alcohol. Finally, things settled down to the point that the printer would sit and idle for several hours at a stretch without spontaneously triggering one or more of its functions. The bird droppings, you see, had been good enough conductors of electricity to allow some of the logic circuits in the unit to be triggered in an unpredictable fashion. What the droppings hadn't done, the dirty card-fingers had. Finally, though, it worked well enough as a typewriter to make me think that it would also do well as a printer. I determined to try.

The first thing I did (which turned out to be the right thing) was to contact the company that built the thing. They proved to be very helpful. I bought a set of manuals (another fifty bucks) and set to work as soon as they arrived. A number of things immediately became clear. First: there was a BIG difference between CoCo's RS-232 port and the industry standard RS-232 protocol that Anderson Jacobson had built their Model 860 to conform to. And second, the Color Computer Technical Manual was more than ambiguous as to what the RS-232 connections and their functions really were. (Does Tandy Corporation somehow think that the "RS" in RS-232 really means "Radio Shack"? Joe and I finally figured out (after a LOT of head-scratching) that the first RS-232 port configuration illustrated in the Technical Manual (on page 33, figure 13) was actually a "supposed to be" drawing, which could be implemented IF one were good with software. As it turned out, the SECOND illustration (or non-illustration, really) on page 38 is correct for CoCo "as she sets". That is, Pin One (labeled CD) is not used. Pin 2 (labeled RS-232 IN) is really only a status line, taking on the "PRINTER BUSY" or "CD" function which could reasonably be expected of Pin One. Tie this line to +5 volts or so, and the data intended for the printer comes spewing out of Pin 4 as it should. Let Pin 2 go "low", though, (that is, to or nearly to zero volts) and data stops coming out. Very handy, once one catches on. Pin Three is (thankfully) still Ground in both versions of the story. Pin Four is, likewise, still the place to go for data FROM CoCo TO the printer. (Joe still doesn't believe the insane configuration of that port, and swears that the only reason it was ever done that way was to enable Tandy to sell a non-standard proprietary printer to an unsuspecting public. I must agree that it was a lowdown, sneaky, despicable piece of electronic trickery, which could well discourage all but the most determined hacker. Was that the intent? I don't know.) At any rate, things worked MUCH better

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after we caught on. The 860 turned out to be a dandy device for LISTING BASIC programs, once the following conditions were met:

1) CoCo's RS-232 Pin 2 was connected to a handy source of +12 volts which was available at the 860's standard RS-232 "D" connector.

2) The 860's "Carrier Detect" line (Pin 7 of its "D" connector) was connected to "D" connector Pin Three and thence to CoCo's Pin 4 in order to receive the data from CoCo.

3) The "Ground" connections of the two machines were likewise connected together. The connections were made through a little adaptor I soldered together using half of a CoCo printer cable and a mating "D" connector I had lying around the place. (Most Radio Shack stores sell these "D" connectors for a couple of bucks or so.) One word of caution is in order here, though.

That word of caution is with regard to word processing. If you have a surplus printer and expect to do word processing on your Color Computer, DO NOT BUY RADIO SHACK SCRIPSIT UNLESS YOU ALSO WANT TO BUY A TANDY PRINTER! Why? Because there's a "bug" in the program's printer driver routine - just the teensiest little ole bit of a bug - that sends nearly any printer that conforms to standard RS-232 data communications protocol off the deep end. That's right. You see, they don't time the "stop bit" (the electronic impulse that tells the printer "That's all of this character!" properly, and the baud rate (the speed at which the computer sends data to the printer) isn't really accurate, either. This doesn't faze a Tandy printer - oh, not at all! It's a different story, though, in the case of a piece of terminal equipment that was built to meet the exacting standards of the mainframe computer industry. Send a stop bit to an "industry standard" printer at an "unexpected" (to the printer) time, and the electronic logjam that is created can be devastating. There is a solution, though. Buy a better word processor program, and leave the "house brand" on the shelf until it is properly upgraded by the manufacturer. I have tested Pyramid's MASTERWRITER and Cognitec's TELEWRITER. Both do a superior job in the all-important function of driving the printer. Both are excellent buys, at their respective prices.

Before you buy a surplus printer, be sure you know the unit's "line feed delay". Line feed delay is the time that the printer needs to have to itself while it scrolls its (your) paper forward one line, in order to continue printing without stomping all over the line that it just printed. Many of the older printers (for example, the General Electric "TERMINET" series of letter-quality printers) absolutely demand a 250 millisecond (yep, that's a whole quarter of a second!) delay in the computer's output at the end of the printed line while the darn paper feed r-o-l-l-s up to the next line. This doesn't matter much at low baud rates, especially when long lines are to be printed. Unfortunately, "low" speed in the case of the Terminet is 150 or 300 baud. It WILL receive data at 1200 baud, too, but watch out! If the job you're trying to do is something that has a lot of short lines (such as a typical BASIC program), all you'll get is a lot of VERY black

paper. The line feed delay and baud rate variables in CoCo's printer driver software (located at decimal memory locations 149 through 152 in CoCo's RAM) can be changed via POKES, as explained on pages 209 and 210 of "Going Ahead With Extended Color BASIC". As an example, say you've bought one of those \$150 Terminets. (They ARE good machines.) First thing you'll learn is that the darn thing never heard of 600 baud. It only knows 150, 300, and 1200 baud, and couldn't care less about the fact that CoCo speaks 600 baud ASCII.. (That is to say, CoCo's "natural" printer data speed is about 600 electrical pulses, or "bits" per second.) It's not easy to teach an old printer new tricks, so it's off into CoCo's memory banks to fix things. You'll have to select the most reasonable speed for the job. Say 1200 baud is called for. POKE 149,0:POKE 150,57 (ENTER). This resets CoCo's baud rate to 1200 baud. Next the line delay. POKE 151,64:POKE 152,0 (ENTER). (Up to 1.15 seconds of linefeed delay may be selected by POKEing both 151 and 152 to 255. Try it and see.)

The only other thing that may need to be dealt with is the presence (or absence of) a "PRINTER BUSY" signal at the printer's cable connector with which to signal CoCo to alternately stop and resume sending data to the printer. Some older terminals' printing speed is MUCH slower than the speed at which they are capable of receiving their data. Many of these terminals were built to transmit a series of ASCII characters back to their mainframes when they got "full" of things to print, and then again when they became ready for another "mouthfull" of data. This is wonderful for the mainframe - but not for CoCo. As we saw earlier, CoCo needs a DC signal to tell it when the printer is full up to its eyeballs. Otherwise, CoCo just ploughs ahead, while the poor printer can only sound its bell (and dump its buffer) in desperation. The solution (which is essential at baud rates of 1200 and above) is to provide such a signal by any means possible. (I know of one old boy who uses a little pushbutton switch, connected from a 9-volt battery to his computers' serial port "Printer Busy" pin to do the job. He just holds the button down until he figures his clunker printer has gotten a bellyfull, then lets up on it 'till the printing stops, then repeats' till done.) Usually, though, the signal can be gotten from the printer itself, if it isn't already available from the printer's input/output connector. One possible source is the printer's bell signal. The idea is to grab ANY electrical signal that changes state (from positive to zero, preferably) at some point just before the printer's buffer (its own miniscule memory) becomes overfilled. Quite often, the manufacturer provided that the printer should sound an alarm of some kind in response to a number of abnormal conditions, of which "buffer overflow" is one. In such a case, of course, a certain amount of technical "sawvy" (or a good friend who possesses it) is required in order to make the printer do something it wasn't really ever expected to do. Isn't it wonderful to be capable of learning?

I hope the idea comes across.

Owners of Color Computers are blessed with a machine that is, by its design, inherently capable of "talking" to practically ANY industry standard peripheral device on the market, be it old or new. It may take some playing with the software or hardware (or both) to make things run right, but it CAN be done. Of course, lots of folks appreciate the convenience of being able to plug in an array of "canned" peripherals "right out of the box", and being able to run a complete system without really thinking about what must be done to the machine in order to do the work. CoCo and Tandy peripherals sure do the job for a lot of folks. But for those of us with special needs (such as poverty, the intention to move up to a mainframe someday, or just a hankerin' for tinkerin'), it's good to know that we can hook up "non-standard" (read, "non-Tandy") peripherals to our CoCos and make 'em work. Maybe that's what I like about freedom, and about CoCo.

WORKING IN 64K

Arnold H. Kahn

Many newcomers to the 64K Color Computer will begin to wonder what's up when they try PRINT MEM and find only 32K in BASIC (actually a bit less because of overhead). A return trip to the dealer will yield the answer that one must spend an additional \$70.00 or so for OS-9 in order to access the full 64K. And another \$100.00 is needed for BASIC09, or there'll be no high level language.

This all sounds dreadful, but there is no cause for despair. For two years or more, CoCo owners have been accessing the full 64K with excellent results. Numerous Articles have discussed the procedure; one of first was published in '68' **Micro Journal** (Feb. '82) by Frank Hogg, which presented the 64K Mod originally developed by Steve Odneal in the summer of 1981 in the process of developing the Data-Comp F-MATE FLEX Conversion for the CoCo, along with a BASIC Program to test the RAM which put the CoCo in the 64K Mode. In brief, the computer has two modes of operation called MAP 0 and MAP 1. In MAP 0, RAM occupies the low 32K of the address space, and ROMs (containing COLOR, EXTENDED, and DISK BASIC) answer to the next 24K. In MAP 1, the entire 64K address space is directed to the 64K of RAM; the ROMs are disabled. In order that this 64K of RAM not be empty and useless, the Radio Shack ROMs' Operating System is copied into RAM in the same address range that it would occupy in MAP 0. Now we're back where we started, but we can modify the copied operating system and store programs in the empty 8K of space above DISK BASIC (if you have one or more drives). If you don't have disks there is no problem; you can access 64K by loading the same program from tape and you can use the greater 16K of free memory above COLOR BASIC. Actually, I have fibbed a little, since the top 1/4K is reserved for control and I/O.

In the program presented in this article, called XFER64 (pronounced transfer sixty-four), I offer a machine language routine which effects the change to MAP 1 with the ROMs copied into RAM. The program executes in less than a second, which is an

improvement over an equivalent BASIC program which inserts the code by POKEing.

It has a few niceties. First of all, there would be no direct way to tell that you are in 64K, except for the increased hash on the TV screen. To cure that (the uncertainty, not the hash), I've changed the BASIC "OK" prompt to ">>". If "OK" comes up you know you have made a blunder and have been dumped back to 32K. Another issue is RESET protection. If you push the RESET button, you'd like to remain in 64K. That is included. Another bell/whistle is setting the printer baud rate. My Epson works fastest at 2400 baud, so I've included this instruction. You can change or remove those two lines. And the program is relocatable; store it anywhere. Run it by the commands

LOADM "XFER64" : EXEC

or

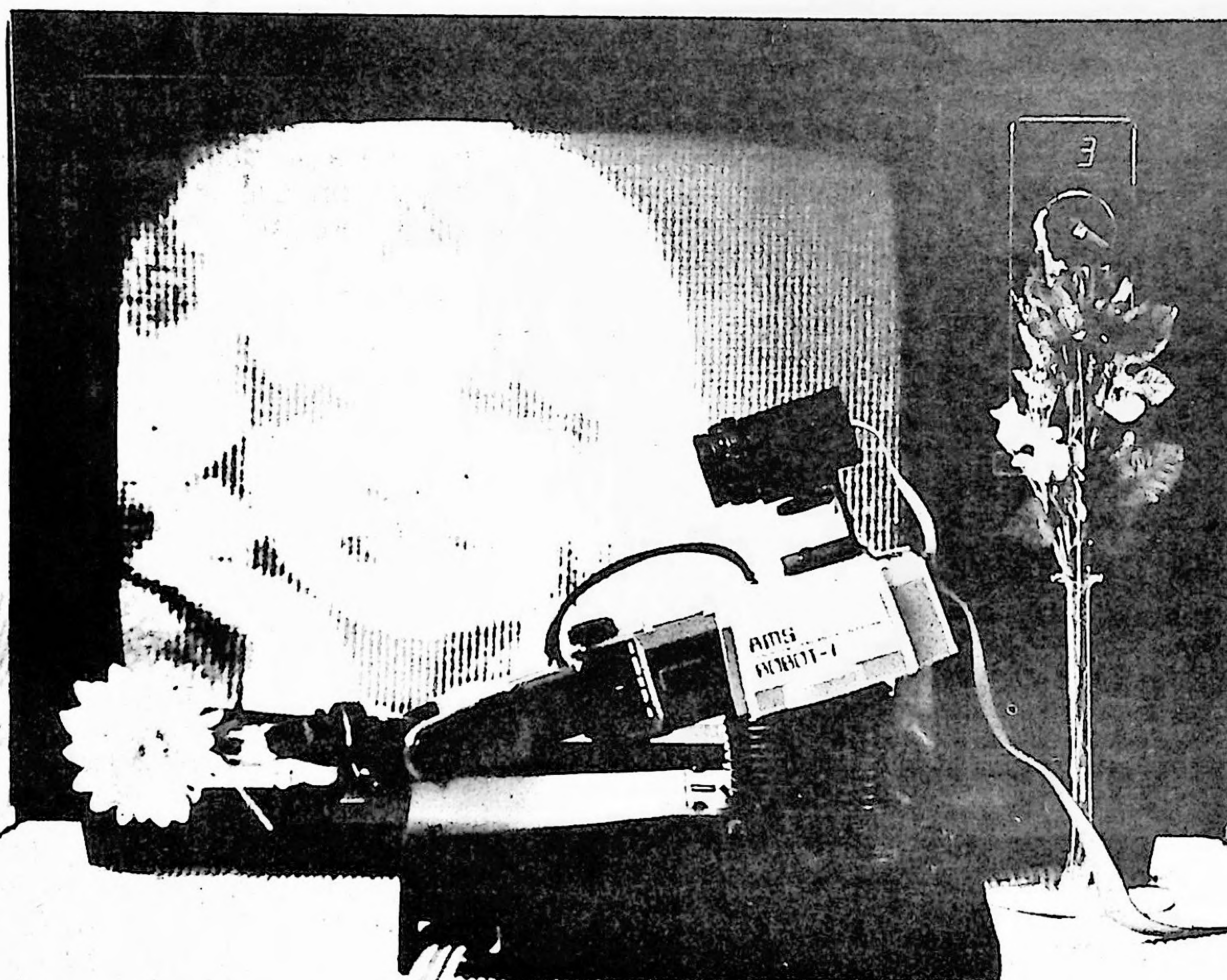
CLOADM "XFER64"
EXEC

as is appropriate for your configuration.

We assume that you know how to enter machine code with a monitor program; it can be copied from the listed assembly. The more advanced ML programmers will want to reproduce and possibly modify the source code. If you can't do either, drop us a line, and if there is enough interest we'll try publishing a BASIC program for systematically POKEing any assembled code directly into memory and verifying the result.

Here is a short description of the code. It is set to reside at \$7000 (the \$-sign now indicates hexadecimal, Continued on page 19

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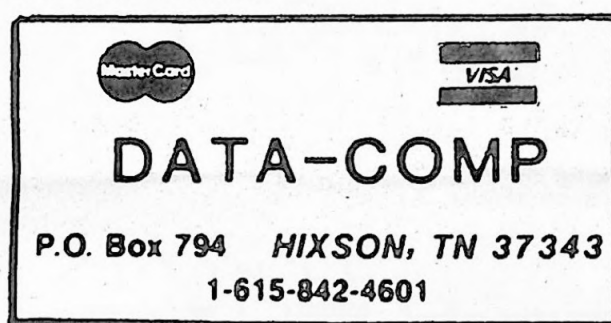
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WHIMSICAL in the Sept. '83 Issue of '68' Micro Journal
that, except for the lack of floats, "... I have to
give this one VERY high rating, ...". It is a FAST
Compiler which produces FAST Code (his "Primes"
Benchmark ran at 9 secs. on a 2 MHz System).

F and CCF - \$195.00

Introl

C Compiler

A full-featured C, streamlined for the 6809.
Generates very efficient object code. Output
"benchmarks" close to 10MHz 68000 in 8 Bit
Operations; 1.5 times faster than a 4 MHz Z80 when
using a 2MHz 6809 System (Re. p 43, "68" Micro
Journal, May '83). Floats, etc.

F, CCF, and O - \$375.00

U - \$425.00

One Year Maint. - \$100.00

TOLL FREE
1-800-338-6800
For Ordering

PASCAL Compilers

TSC

PASCAL Compiler

Native Code Compiler (UCSD Oriented).

F and CCF - \$200.00

Lucidata

PASCAL Compiler

P-Code Compiler (ISO Standard). Designed especially
for Microcomputer Systems; Run-time System checks
available resources for each task, allowing operation
on even minimal computer systems. Allows linkage to
Assembler Code for maximum flexibility.

F and CCF 5' - \$190.00

F 8' - \$205.00

OmegaSoft

PASCAL Compiler

For the PROFESSIONAL; ISO Based, Native Code
Compiler. Primarily for Real-Time and Process Control
applications. Use custom I/O devices in place of the
Pascal INPUT and OUTPUT; Long Int. (32 Bit); Dynamic
length strings; Interrupt processing, ROM-able, PIC,
Re-Entrant Code, etc. POWERFUL! Includes Source for
the Symbolic Debugger, Runtime, and several Utilities.
Requires a "Motorola Compatible" Relocating Assembler
and Linking Loader.

F and CCF - \$425.00

One Year Maint. - \$100.00

DECOMPILERS

Southeast Media

DUB (A UniFLEX "basic" De-Compiler)

Re-Create a Source Listing from UniFLEX Compiled
basic Programs. Easy to Use; works w/ ALL Versions
of UniFLEX basic; Output to Disk or Terminal. Time
TESTED and PROVEN; SOLID!

U - \$219.95

UTILITIES

Southeast Media

Basic09 XRef

This Basic09 Cross Reference Utility is a Basic09
Program which will produce a "pretty printed" listing
with each line numbered, followed by a complete cross
referenced listing of all variables, external
procedures, and line numbers called. Also included
is a Program List Utility which outputs the listing
without the overhead of building the cross reference
table, which allows it to run considerably faster when
only a "pretty printed" listing with line numbers is
desired. Requires Basic09 or RunB for operation.

```

72 EXITIF EOF(BinPath) THEN found=FALSE \ ENDEXIT
73 GET BInPath.Mhead
74 GET BInPath.Mhead \ GET BInPath.More
75 SEEK BInPath.Index.More
76 Mhead=" "
77 REPEAT
78 GET BInPath.Char
79 Mhead=Mhead+CHR(LAND(char,97F))
80 UNTIL char=127
81 RETURN Mhead=Mhead
82

```

More	3	26	60	70	7A										
Mhead	3	19	20	81											
OutPath	4	51	54	56											
Char	4	20	29	30	32	40	41	42	44	45	46				
found	70	79	80												
	4	22	60	72											
	9	11													
	11	13													

O and CCO - Obj. Only - \$39.95

O and CCO - w/ Source - \$79.95

Southeast Media

O-F

OS/9 to FLEX - FLEX to OS/9

Finally; the barrier has been removed between OS/9
and FLEX formatted disks! Now you can READ from, and
WRITE to, a Single Sided 5" or 8" FLEX diskette from
OS-9 with O-F. O-F is a new and unique program,
written in BASIC09 (with Source), that performs the
following functions;

REFORMAT: A BASIC09 Program that reformats a chosen
amount of an OS-9 disk to FLEX Format so it can be
used normally by FLEX.

FLEX: A BASIC09 Program that does the actual read
or write function to the special O-F Transfer Disk,
all selected from a user-friendly menu. Functions
provided include reading the FLEX Directory,
Deleting FLEX Files, Copying both directions, etc.
All selections are interactive and complete,
including all necessary prompts to the operator.

FLEX users can read, write and use the special disk
as any other FLEX disk, provided the FLEX directory
is not allowed to continue beyond track zero (too
many files).

F and CCF - \$79.95

Southeast Media

COPYMULT

Copy LARGE Disks to several smaller disks

The following FLEX utilities allow the backup of ANY
size disk to any SMALLER size diskettes (Winchester
to 8's or 5's, 8" to 5's, etc.). By simply inserting
diskettes as requested by COPYMULT, a large disk
system may be downloaded to your present floppy disk
system, any size. No need to fiddle with directory
deletions or any of the other tedious operations that
must be done using the normal copy routines.

COPYMULT.CMD understands normal "copy" syntax and
always keeps up with files already copied by
maintaining directories for both host and receiving
disk system, eliminating hours of tedious keyboard
entries and other time consuming cleanup chores.

BACKUP.CMD is a special program that downloads
"random" type files, any size.

RESTORE.CMD a special program to restructure copied
"random" files for copying, or recopying back to the
host system.

FREELINK.CMD a "bonus" utility that "relinks" the free
chain of floppy or hard disk thereby eliminating
fragmentation.

Completely documented source files included.

ALL 4 Programs (8" or 5") \$99.50

Southeast Media

CHESS 6809

Requires FLEX and DISPLAYS On Any Type Terminal
Features:

*Four levels of play.

*Swap side. *Point scoring system.

*Two display boards. *Change skill level.

*Solve Checkmate problems in 1-2-3-4 moves.

*Make move and swap sides. *Play white or black.

This is one of the strongest CHESS programs running
on any microcomputer, estimated USCF Rating 1600+
(better than most 'club' players at higher levels).

F and CCF - \$79.95

Availability Legends -

F = FLEX, CCF = Color Computer FLEX

O = OS-9, CCO = Color Computer OS-9

U = UniFLEX

CCD = Color Computer Disk

CCT = Color Computer Tape



*FLEX is a trademark of Technical Systems Consultants
*OS9 is a trademark of Microware

Color Micro Journal

COLOR COMPUTER FLEX™ OS9™ Software

UTILITIES

Southeast Media

DIET-TRAC Forecaster

DIET-TRAC Forecaster is an XBASIC program that plans a diet in terms of either calories and percentage of carbohydrates, proteins and fats (C P G%) or grams of Carbohydrate. Protein and Fat food exchanges of each of the six basic food groups (vegetable, bread, meat, skim milk, fruit and fat) for a specific individual.

Sex, Age, Height, Present Weight, Frame Size, Activity Level and Basal Metabolic Rate for normal individual are taken into account. Ideal weight and sustaining calories for any weight of the above individual are calculated. When a weight goal is given (either gain or loss), and a calorie plan is agreed upon between the computer and the individual, the number of days to reach the weight goal is projected. The starting and ending rate of weight loss is calculated, and a daily calendar with each day's weight for a 30-day period is printed.

F - \$59.95
U - \$89.95

Southeast Media

XDATA

A COMMUNICATION Package for the UniFLEX Operating System

Allows UniFLEX Based Systems to Transmit and Receive files to and from other Computer Systems via Modem. Use with CP/M, Main Frames, other UniFLEX Systems, etc.

- Verifies Transmission integrity using checksum or CRC
- Automatically Re-Transmits bad blocks
- Transmits data in 128 byte blocks

U - \$299.99

Southeast Media

JUST

Text Formatter

JUST, a Text Formatter developed by Ron Anderson, provides numerous features which make it a valuable addition to any FLEX Users Software Library. JUST is designed for formatting Text Output for Dot Matrix Printers and provides many unique features:

- Output the "Formatted" Text to the Display for format analysis and change.
- Output the "Formatted" Text to a Text File for use with the supplied FPRINT.COM for producing multiple copies of the Text on the Printer INCLUDING IMBEDDED PRINTER COMMANDS (this Utility is very useful at other times also, and worth the price of the program by itself).
- "User Configurable" for adapting to other Printers (comes set up for Epson MX-80 with Graftax); provides for up to ten (10) imbedded "Printer Control Commands", such as Italics on and off, boldface on and off, etc.
- Automatic compensation for a "Double Width" printed line.
- Includes the normal line width, margin, indent, paragraph, space, vertical skip lines, page length, page numbering, centering, fill, justification, etc.
- Use with ANY Editor.
- Supplied with "Structured Source" (Windrush PL/9); easy to see the flow of the program.

F and CCF - \$49.95

Lucidata

PASCAL UTILITIES

Requires LUCIDATA Pascal ver 3.

XREF -- produce a Cross Reference Listing of any text; oriented to Pascal Source.

F and CCF - \$25.00

INCLUDE -- allows the inclusion of other Files in a Source Text; has unlimited nesting capabilities. Also allows Binary File inclusions.

F and CCF - \$25.00

PROFILER -- produces an Indented, Numbered, "Structogram" of a Pascal Source Text File. Allows viewing the overall structure of large programs, and provides clues as to the integrity of the program. Supplied as Source Code; requires compilation.

F and CCF - \$25.00

Lucidata

COPYCAT

Pascal NOT required

Allows reading TSC Mini-FLEX, SSB DOS68, and Digital Research CP/M Disks while operating under FLEX 1.0, FLEX 2.0, or FLEX 9.0 with 6800 or 6809 Systems. COPYCAT will not perform Miracles, but, between the program and the manual, you stand a good chance of accomplishing a transfer. Includes Utilities to List Directories, Copy Files, and convert Text Files when required. Also includes a Utility for investigating Physical Compatibility problems. Programs supplied in Modular Source Code (Assembly Language) to make it easier to solve unusual problems.

F and CCF 5" - \$50.00
F 8" - \$65.00

Computer Systems Consultants

FLEX DISK UTILITIES

Eighteen (18) different FLEX Utilities that should be a part of every FLEX Users Toolbox. Ten BASIC Programs to:

Compare, Merge, or Generate Updates between two BASIC Programs, check BASIC Sequence Numbers, compare two unsequenced files, and 5 Programs for establishing a Master Directory of several Disks, and sorting, selecting, updating, and printing paginated listings of these files.

The other 8 Programs provide .CMD Files which allow: Copy a File with CRC Errors, so it can possibly be salvaged; Test Disk for errors; Compare two Disks; a fast Disk Backup Program; Edit Disk Sectors; Linearize Free-Chain on the Disk; print Disk Identification; and Sort and Replace the Disk Directory (in sorted order).

ALL Utilities include Source (either BASIC or Source Code). An EXCELLENT Value!

F and CCF - \$50.00

Southeast Media

SPELLB "Computer Dictionary"

OVER 120,000 words!

No more "Let your fingers do the walking through the Dictionary" while you are entering Text with your favorite Editor or Word Processor. SPELLB is more than just "another Spelling Checker"; it allows you to look up a word from within your Editor or Word Processor so that you KNOW it is right WHEN YOU TYPE IT IN with the SPH.COM Utility (which operates in the FLEX Utility Space). Yes, it ALSO allows you to check and update the Text after you are finished; along with allowing you to ADD WORDS to the Dictionary, "Flag" questionable words in the Text for evaluation later, "View a word in context" before changing or ignoring, etc. SPELLB first checks a "Common Word Dictionary", then the normal Dictionary, then a "Personal Word List", and finally, any "Special Word List" you may have specified. SPELLB also allows the use of Small Disk Storage systems.

F and CCF - \$129.95

Great Plains Computer Co.

SPELL

Fast Computer Dictionary -- allows directly changing the Text File, adding words to the dictionary, etc. 75,000 words in less than 400 sectors.

F, CCF, OS/9 - \$125.00
U - \$175.00

TOLL FREE

1-800-338-6800

For Ordering

WORD PROCESSORS

Alford and Associates

SCREATOR III

EXTREMELY Powerful Screen-Oriented Editor/Word Processor. Almost 50 different commands; EXCELLENT Documentation (over 300 pages), including a full Tutorial Section to help you learn how to use the system. Features Cursor-based editing, dynamic Screen Formatting (what you see is what you get), Multi-Column display and editing, "decimal align" columns (AND add them up automatically, if wanted), define multiple keystroke macros, even and odd page number headers and footers, imbed printer control codes in text, full justification series of commands, full "help" support, store common command series on disk for future use, etc. Easy "Set-Up" (for example, you just hit the key you want to use for a specific function, such as "cursor up", and the System reads an stores that key - no digging into tech manuals for codes, etc.); use supplied "set-ups", or remap the keyboard to what you are used too. Except for proportional printing, this package will DO IT ALL!

6800 or 6809 FLEX or SSB DOS, OS-9 - \$175.00

Great Plains Computer Co.

STYLOGRAPH

A full-screen oriented WORD PROCESSOR -- (now runs on the Data-Comp and FHL Color FLEX Systems; uses the 51 x 24 Display Screens). Full screen display and editing (i.e., what you see is what you get); supports the Daisy Wheel proportional printers.

SPECIAL CCF - \$195.00
F and O - \$295.00
U - \$395.00

Great Plains Computer Co.

MAIL MERGE

Greatly extends the power and flexibility of STYLOGRAPH. Allows Multiple Text files to be printed out as one large document. Provides for merging information into the Text File during printing (such as different names and addresses), etc.

F, CCF, O - \$145.00
U - \$195.00

DATA BASE MANAGEMENT SYSTEMS

Westchester Applied Business Systems

XIMS

Possibly one of the most powerful Database Management Systems available, this machine language program is small enough to operate on a single sided 5" disk, yet provides the speed of M.L. and power limited only by the user's imagination. This Relational DMS supports Sequential, Hierarchical, and Random Access File Structures, and has Virtual Memory capabilities for those Giant Data Bases. Easy-to-use English Language Command Structure.

XIMS - F and CCF - \$179.95
XIMS+ (w/ utils) - F and CCF - \$249.95
Manual only - \$19.95

Westchester Applied Business Systems

XIMS Utilities

These are part of XIMS+, includes SET which provides TTYSET Type of controls within the DMS, PLOT produces horizontal graphs of data, COPYDEF defines new files with existing formats, REVISE allows modification of field definitions, OUTPUT provides an ASCII output of a DMS File, INPUT loads a File from user generated text, PURGE erases all Data from a File, FORM displays the print format, SIZE provides no. of records and sectors info, and FILES outputs a file name matrix of a given file extent.

XIMS Utils. (requires XIMS V1.1) \$79.95

Great Plains Computer Co.

INFOMAG DBMS

An XBASIC, Menu Driven, DBMS with "Built-In" Audit Tracking, Extremely Powerful Report & Format Capabilities, etc. This Time Proven DBMS will become the "Work Horse" of your Software Stable.

F and CCF \$295.00
U \$395.00

ACCOUNTING PACKAGES

Great Plains Computer Co.

Accounting Packages

Accts Rec., Accts Payable & Gen Ledger -- A FULL Accounting Package that can be used together, or as separate packages; provides the IRS required Audit Tracking. (XBASIC, based on the "Osborne Business Programs.")

F and CCF - ea. Program \$295.00
U - ea. Program \$395.00

Universal Data Research, Inc.

Accounting and Database Manag. Sys.

Note: ALL UDRI Accounting and DBM Progs. Require FLEX and XBASIC. These are Time Tested programs from an old, established, software house.

Color Computer FLEX Systems

DEM Part 1 - \$49.95 DEM Part 2 - \$49.95
Church Contributions - \$49.95
Single Entry Gen Ledger - \$49.95
Balanced Billing System - \$49.95
A/R \$99.95 A/P \$99.95 Gen Ledger \$189.00
Inventory 2 \$69.00 Payroll \$99.95

FLEX and UniFLEX -- Note: Requires XBASIC or basic

A/P F - \$295, U - \$395
A/R F - \$295, U - \$395
Gen Ledger F - \$295, U - \$395
Inventory 2 F - \$295, U - \$395
Payroll F - \$295, U - \$395
DEM F - \$350, U - \$450

Computer Systems Consultants

FULL SCREEN INVENTORY/MRP

The Full Screen Inventory System provides a means of maintaining small inventories. Using a linked, keyed random file structure based upon the item field, it keeps the file in alphabetical order for easier inquiry. With the FIND command, the user may locate and/or print all records matching on partial or complete item, description, vendor, or attributes. Items in backorder or below minimum stock levels may be located and/or printed thru the same process. Printed output may be produced in item or vendor order. A materials requirement planning (MRP) capability for manufacturing environments is included to allow the maintenance and analysis of Hierarchical assemblies of items in the inventory file. It requires TSC's Extended BASIC.

F and CCF - \$100.00, U - \$150.00



"FLEX is a trademark of Technical Systems Consultants
"OS9 is a trademark of Microware

FREE DISKETTE With Each \$50 Purchase
SOUTH EAST MEDIA
5900 Cassandra Smith Rd., Hixson, TN 37343
(615) 842-4601

Availability Legends --
F = FLEX, CCF = Color Computer FLEX
O = OS-9, CCO = Color Computer OS-9
U = UniFLEX
CCD = Color Computer Disk
CCT = Color Computer Tape

COLOR COMPUTER FLEX™ OS9™ Software

BUSINESS FORECASTING

The Virginia Company **Bizpack**

Bizpack is a DESKTOP/PLAN type of Program which is oriented towards **Time Series Analysis** of Business Situations in providing information on which to base common business decisions. This program is used for storing accounting, numeric, and financial data, which can then be used for analyzing, planning, budgeting, forecasting, etc. While "Electronic Spreadsheets" are extremely useful in many situations, **Bizpack** excels in businesses when there are numerous expense columns, revenue sources, significant business indicators, large numbers, erratic week-to-week and month-to-month fluctuations, etc. **Bizpack** helps determine statistical relationships, establish trend lines, "smooth" data via moving averages, analyze seasonal data, adjust for inflation, lag data one or more periods in Statistics or Column functions, plot data, etc. The Program displays information on the screen as Columns of Information with each Row conforming to a defined Period of Time (weeks, months, years, etc.), and is very easy to use (data is easy to enter, change, and modify; commands can be renamed to suit the users requirements; unlimited ability to create specialized commands using common BASIC Statements; etc.). Requires **TSC's Extended BASIC**.

F and CCF - \$135.00
with Source - \$250.00

*** SPECIAL ***

Purchase **XBASIC** and **Bizpack** together for \$221.50
-- a Savings of \$13.50 --

Computer Systems Consultants

TABULA RASA SPREADSHEET

TABULA RASA is similar to DESKTOP/PLAN and provides for the generation and maintenance of tabular computation schemes often used for analysis of business, sales, and economic scenarios. Its menu-driven user interface provides these capabilities even to those users with no programming experience. Its extensive report-generation capabilities allow the user to generate professional results with minimum effort. It requires **TSC's Extended BASIC**.

F and CCF - \$100.00, U - \$200.00

Computer Systems Center

DYNACALC

THE Electronic Spread Sheet for 6809 Computer Systems. An extremely **POWERFUL** Business Tool, this Program will find an unlimited number of "non-business" applications, also (for example, a Full Junior College Electronics Curriculum was set up using **DYNACALC**). Advanced features like "Table Lookup" make Income Tax work easy; Column or Row Sorting for numerous applications; etc. Completely "Memory Resident", Machine Language, this Program is **FAST**. Provides **STANDARD FLEX** Text File output for use with **BASIC**, Word Processors, Pascal, "C", etc. Also available for Data-Comp and FHL **FLEX** systems using the 50 x 24 Displays.

F and SPECIAL CCF - \$200.00
U - \$395.00

ODDS AND ENDS

Computer Systems Consultants

FULL SCREEN FORMS DISPLAY

This package supports any Serial Terminal with cursor control of Memory-Mapped Video Displays. The package substantially extends the screen Input/Output capabilities of **TSC's Extended BASIC** programs by providing a simple, table-driven method of describing and using full screen displays. These table entries are easy to set up and maintain, and are normally stored on disk and read as required. A simple, interactive means of generating the forms and the data field definitions is provided.

F and CCF - \$50.00, U - \$75.00

Computer Systems Consultants

FULL SCREEN MAILING LIST

The Full Screen Mailing List System provides a means of maintaining simple mailing lists. Using a random fill structure based on the first character of the name field, it maintains the file in alphabetical order for easier inquiry. With the **FIND** command, the user may locate all records matching on partial or complete name, city, state, zip, or attributes. Printed listings and output to labels may also be produced on the same selective basis. It requires **TSC's Extended BASIC**.

F and CCF - \$100.00, U - \$110.00

COLOR COMPUTER SOFTWARE

Stearns Electronics

FORTH

Intrigued by **Forth**??? Here is a **FORTH** package tailored to the **Color Computer**! This package is supplied on Tape, with instructions for transferring it to disk if you wish. Written primarily in machine language, it's speed is unparalleled. A full Semigraphic-8 Editor is provided, along with "goodies" like Graphics and Sound Commands, Printer Commands, Auto-Repeat and Control Keys, etc. If you are interested in Learning **FORTH**, a **Trace Feature** is provided which is invaluable. If you are a **FORTH** Pro, this package provides CPU carry Flag accessibility, Fast Task Multiplexing, Clean Interrupt Handling, etc. (Or; you won't "out grow" the Basic capabilities of this Implementation). Combine this package with **Leo Brodie's EXCELLENT Book "Starting FORTH"**, and you will be a **FORTH** Expert before you know it (and have a lot of fun doing it!).

Color Computer TAPE - \$58.95

Custom Software Engineering, Inc.

Color Computer **GRAPHIC SCREEN PRINT** Programs Dumps any "PMODE" Screen to the Printer with the **BASIC** **USR** Function. Shift the Printout Left or Right or Reverse Print (Dark for Light Screen and Vice Versa). All Programs on Tape.

GSPP for R.S. LP-VII/VIII & DMP 100/200/400 \$7.95
GSPRE for Epson w/ Grafrax and Grafrax + \$9.95
GSPRG for Gemini 10 and 15 \$9.95
GSPRP for the Prowriter Printers \$9.95

Custom Software Engineering, Inc.

DATE-O-BASE CALENDAR Program

A Menu Driven **EXTENDED BASIC** Program which allows the entry of up to 12 Memos per Day, each of which may contain up to 28 Characters, for any day of the Month between the years 1700 and 2099. A **Graphic Calendar** shows which days contain Memos, and a "Key Word" Search is provided which can be output to the Screen or Printer.

TAPE DATE-O-BASE CALENDAR
(Each Tape File will hold up to 400 Memos) \$16.95
DISK DATE-O-BASE CALENDAR
(4,000 Memos at 300/Month per Disk) \$19.95

TOLL FREE
1-800-338-6800
For Ordering

Custom Software Engineering, Inc.

That's INTEREST-ing

Interested in **INTEREST** (the Money Kind)? An **EXTENDED BASIC** Program that will help you deal with numerous problems requiring interest calculations. Present Value, Rate of Return, Current Bond Yield and Rate of Return to maturity, Loan Repayment Amortization Schedules, etc.

TAPE - \$29.95

Custom Software Engineering, Inc.

DISK DATA HANDLER 64K

Custom Software Engineering, Inc.

DISK DOUBLE ENTRY

DISK EXTENDED BASIC Accounting Program w/ Mach. Lang. Routines. A "Traditional" Accounting Package for Small Business, Clubs, Churches, Personal Use, etc. Up to four levels of subtotals with Trial Balance, Income Statement, and Balance Sheet Reports. DDE allows up to 300 accounts and a Trial Balance of \$9,999,999.99. Transactions may be up to 14 lines long, and comments and explanations may be freely used. Accounts are traceable to the journal transaction, which may include comments. Screen reports allow review of past transactions and current balances.

DISK - \$44.95

Computer Systems Center

DYNASHARE

-- Multi-User, Multi-Tasking with **FLEX** --

Southeast Media is now shipping **DYNASHARE FROM STOCK** - the multi-user, multi-tasking capability of **DYNASHARE** allows **FLEX** users the advantages of more sophisticated and time saving computer usage without having to buy or learn a new Language or Operating System syntax. **DYNASHARE**, as its name implies, allows true "time-sharing" operation under the popular **FLEX** operating system, and also allows each user to run two simultaneous jobs (multi-tasking); even on single-user systems. For example, while in **EDIT**, you can

list another file or examine a directory. Or, you might look up an item in a Data Base while a Sort is in progress! **DYNASHARE** also provides some fringe benefits that will be greatly appreciated by **FLEX** users, including type-ahead, command line editing, and instant response to "escape".

DYNASHARE is the painless method! Use your existing **Flex** computer by simply adding 64K of RAM for each user and/or task. Fact is, you still use **FLEX** just like you always have! **DYNASHARE** is not intended as competition to **UnifLEX**. It does not improve on the speed of **FLEX**, and does not offer password protection or other niceties of a full-blown multi-user system. What **DYNASHARE** does do is give **FLEX** users a low-cost way to use existing software in a multi-user, multi-tasking environment, so your existing **FLEX** versions of **BASIC**, **XBASIC**, editors, assemblers, disassemblers, sort/merge packages, word processors, compilers, **DYNACALC** spread-sheet package, and so on are still good.

NOTE -- The initial release of **DYNASHARE** is for **SWTPC S/09** Computers, but versions will also be available for other popular extended-memory (up to 1024K) systems, such as **HELIX** and **GIMIX**. A minimum of 128K of RAM will be required with ALL versions. **DYNASHARE** requires 64k of RAM for each active task; thus a 256k system could allow foreground-background operation on two terminals, or foreground-only operation on four terminals.

AVAILABLE NOW from Southeast Media - \$200.00

AUTHORS - PROGRAMMERS

QUALITY SOFTWARE NEEDED

FLEX - **UnifLEX** - **OS/9** - **Color Computer**

For the past several months, we at the **Southeast Media Division of Computer Publishing, Inc. (CPI)**, the parent company of '68' **MICRO JOURNAL** and **COLOR MICRO JOURNAL**, have debated expanding our software distribution business. Many other magazines have been doing so for years (in fact, MOST were in the Software Distribution Business BEFORE they began to publish a Magazine). Presently there are many fine examples of software that has been developed by YOU, our readers, that will never see the "light of day" due to the Cost of Advertising and TIME and Cost involved in the production, distribution, and Customer SUPPORT of that software unless SOMEONE, with enough exposure and the willingness to continually advertise, runs with the ball.

Software is the "backbone" for the **REAL** utilization of any Computer System, and ours are no exception! This has been no simple decision. While we realize that there could be some conflict with some of our advertisers, we ALSO hear a LOUD and CONTINUOUS cry for **HELP** from our Readers. From day one, the foremost concern of '68' **MICRO JOURNAL** has been it's READERS! Therefore, our **Southeast Media Division** will accept, for appraisal for possible Distribution, 6809 software; Games, Utilities, Software Development, Business Application Programs, etc.

In the past there has been too much software offered that was not quite ready. We will strive to eliminate that element. But, right up front, we tell you only that we will do our very best; nothing more. Also, we will strive to keep cost to a bare minimum, while securing for the author a fair return in royalty payments, promptly paid, and in customer support for his product.

Of course, we will expect, no -- **DEMAND**, that the author keep the product free of errors (bugs), and maintain it in a prompt and business like manner. Also we shall require that authors be willing to furnish 'source' for those programs that justify, by price and utility, inclusion of same. The lack of source code, properly commented, is a continual complaint we hear. Not all programs will be sold with source, but where necessary, we will insist that it be included.

In some instances the program may be small or short and not justify itself as a "single" sale product. In this event it will be combined with other like programs, and offered as a package. In that event, the royalties will be split between the various authors.

If you have software that you feel will qualify under this program, please contact one of the people below. Remember, if your software has any problems or "funnies" -- **GET IT STRAIGHT BEFORE YOU CONTACT US!!** Also get your source code in proper shape and well commented; there is too much 99% code already drifting around.

If your software is **READY** contact:
Bob May, **Don Williams**, or **Tom Williams**

Southeast Media is a division
of **Computer Publishing, Inc. (CPI)**,
a family of 100% 68XX support facilities.

Availability Legends

F = **FLEX**, CCF = **Color Computer FLEX**
O = **OS-9**, CCO = **Color Computer OS-9**
U = **UnifLEX**
CCD = **Color Computer Disk**
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***FLEX** is a trademark of Technical Systems Consultants
***OS9** is a trademark of Microware

FREE DISKETTE With Each \$50 Purchase
SOUTH EAST MEDIA
5900 Cassandra Smith Rd., Hixson, TN 37343
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MINER BY LARRY LANDWEHR

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HOME INVENTORY BY JEFF PYNE

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CAT# DM013 16K \$12.95 (CAN) \$10.95 (US)

which is the accepted notation for referring to ADDRESSES). Interrupts are masked (shut off) while the ROMs are being copied to avoid the embarrassment of having an incomplete operating system when an interrupt request comes down and wants servicing. Next is the LOOP which copies the ROMs into RAM, two bytes at a time. We could quit after line 11, and you should try it that way. Just put an RTS (\$39) after line 11. EXEC &H7000 and you'll be in 64K with your usual BASIC. Try POKE &HABEF,&H4F and you'll see how the prompt has been transmogrified. You can't do that in a ROM-based system. Push the RESET button and see what happened to your change.

RESET protection is achieved by making certain changes in the COLOR BASIC routines and by a little rerouting. When the RESET button is pushed, the SAM is cleared, undoing our work, and the program counter (PC) is set to \$A027 for the next instruction. There is no changing this, since it is wired in copper and etched in silicon. But we can reroute the warmstart routine to \$7050, where we have prepared the instruction to set the SAM back to MAP 1 (64K). After the restoration, control is passed back to the "house" version of the reset, except for where we modified it to avoid further possibilities of return from MAP 1.

The code between \$A01F and \$A026 relates to setting up for 4K, 16K, and 32K. We NOP it out, to coin a phrase. (No-Op = \$12.) This code would never be reached anyway if you're wired for 64K. The NOPs could be used for your own purposes, such as a installing a LBSR to an external routine.

The warmstart flag is at \$0071. If the byte there is set to \$55, a reset will not wipe out programs, nor will it re-initialize the machine. The warmstart vector is the two-byte address at \$0072 and \$0073, to which the program jumps if the flag is set, and its value depends on your version and level of BASIC. We replace it with our own HOOK address, but save the old value at JMP OFF in order to put the reset back on track after we have brought about the restoration of MAP 1. Note that this address was squirreled away by STY JMP OFF,PCR and that the final jump was indirect, off the index register which pointed to the location of the address. This is a neat trick for making the program position independent. It is a remarkably simple way to write relocatable code, and in the world of 8-bit processors the 6809 alone has this feature. On other machines the only way I could imagine accomplishing this is by writing self-modifying code; i.e., by writing a program which would alter its own instructions as it executes.

Now that we have XFER64, what can we do with it? One use is already present: modifying BASIC by changing the prompt. In a future article I'll show how to run the new ROMs in your old CoCo, or the old ROMs in your new CoCo. Another application is saving ROMPAKs to tape. Since you bought the PAK there's no reason why you may not use CSAVEM to transfer it to tape. Then, after a power-down remove the PAK, go into 64K and CLOADM. This will work satisfactorily **provided** there is no special protection in the program.

Also, it is possible to put XFER64 at the beginning of any program of your own that requires 64K, so that only one LOADM and EXEC is necessary.

The application I use most frequently is the installation of a monitor program above \$E000. I use CBUG, HUMBUG, and COLORKIT; I put the one I'm using in high memory so that it will be out of the way and safe from collisions with BASIC programs or operations. For example, HUMBUG loads at \$3000 (as purchased). After going into 64K, I install it from disk by the command

LOADM "HUMBUG", &HE000-&H3000

and let the CoCo do the computation of the offset. I do a similar operation with CBUG. There is no need for a CLEAR command when using the monitors this way. COLORKIT is a little more complicated because it uses some 250 odd locations below \$8000 for its programmable keys; a CLEAR 200,&H7F00 will take care of it. Reset protection is not certain when a monitor is installed, for the Monitor may set its own reset vector.

The principal use for the full 64K memory is, of course, to provide residence for the major disk operating systems, FLEX and OS-9. These are whole new environments and they are very powerful. Yet we should not neglect experimenting with some of the very interesting possibilities available in the more familiar Radio Shack system. Many of the new commercially offered programs for modem communications, text processing, and spreadsheet use, or the like, automatically take advantage of this extra memory when it is available in the customer's machine. Likewise, we

users should not neglect this opportunity for enhancing our own programs.

```
*****
* PROGRAM XFER64
* COPIES ROMS TO UPPER HALF OF 64K RAM
* MODIFIES BASIC'S RESET TO INDICATE MODE AND
* TO STAY IN 64K.
*****
```

```
7000          ORG $7000  RELOCATABLE
7000 1A 50      START ORCC 0450  NO INTERRUPTIONS, PLEASE.

7002 0E 0000    LDI 000000  EXT BASIC HERE
7005 EC 04      LOOP LDI 000000  GET 2 BYTES FROM ROM
7007 07 FFDF    STA 000000  GO TO MAP 1
700A ED 01      STB 000000  MOVE 2 BYTES, AUTO INCR
700C 07 FFDF    STA 000000  GO MAP 0
700F 0C E000    CHPI 000000  TOP OF DISK ROM?
7012 25 F1      BLO LOOP

7014 07 FFDF    STA 000000  GO MAP 1 TO STAY

* NOW IN 64K; MODIFY RESET TO STAY THERE.
7017 04 00      LDA 0000  MODIFY RESET
7019 07 0053    STA 000053
701C CC 1212    LDB 001212  KILL CODE W/NOPI'S
701F FD A068    STB 00A068  UNNECESSARY
7022 FD A06A    STB 00A06A  CODE, FOR
7025 FD A06C    STB 00A06C  4K AND 16K
7028 FD A06E    STB 00A06E  DON'T CHANGE SAM NEW SIZE
702B FD A070    STB 00A070

702E 04 12      LDA 0112  SET PRINTER FOR
7030 97 96      STA 150  2400 BAUD (8000 FOR EPSON)

7032 04 50      LDA 0050  WARMSTART FLAG
7034 07 0071    STA 0071  ON POLE.

7037 CC 3E3E    LDB 003E3E  CHANGE BASIC'S "OK"
703A FD ABEE    STB 00ABEE  TO ">>>SO YOU CAN TELL 64K

703D 10DE 0072  LDI 0072  GET WARMSTART VECTOR
7041 10AF 00 0000  STY JMP OFF,PCR PUT VECTOR IN HOOK
7046 30 00 0000  LEAX HOOK,PCR GET ADDR
704A BF 0072    STX 0072  NEW WARMSTART VECTOR

704D 1C AF      ANDCC 00AF  OK INTERRUPTS
704F 39         RTB      ALL DONE!

* THE FOLLOWING CODE REMAINS AS A HOOK:
* IT RESTORES MAP 1 AFTER RESET BUTTON IS PUSHED.
*
7050 12         HOOK  NOP      DON'T DO COLOR BASIC
7051 07 FFDF    STA 00FFDF  BACK TO MAP 1 IF BUTTON IS PUSHED!
7054          JMP OFF  RMB 2  ADDR TO CONTINUE
7056 30 DC FB  LEAX JMP OFF,PCR GET SET
7059 6E 94      JRP 1,11  CONTINUE WARMSTART
                          ENB  START
```

0 ERROR(S) DETECTED

SYMBOL TABLE:

HOOK 7050 JMP OFF 7054 LOOP 7005 START 7000

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OS9 USER NOTES

by Peter Dibble
("OS-9 Users Notes" Columnist;
'68' Micro Journal)

Big System Hardware

Gimix has offered CoCo owners an attractive deal. Gimix will accept a CoCo in trade for a Gimix system at 110% of its value. Even with this roughly thousand dollar break in the price of a Gimix the upgrade is expensive, but, speaking as a person who has used a Gimix for many many hours, if you can find the money, take this opportunity. What makes it worth thousands of dollars to move from a CoCo to a SS50 system? The most important difference is that everything works right on the larger systems. Another is that the more expensive systems are faster. A two megahertz 6809 runs more than twice as fast as a CoCo in its normal mode. The DMA disk controller and other powerful I/O devices also make a noticeable difference.

The upgrade from a CoCo to a SS50 system isn't the end of the line. All the major SS50 systems that support OS-9 support both OS-9 Level One and Level Two. The move to Level Two involves a new version of the OS-9 operating system, but no change in applications programs. All the modern SS50 systems I know of can be upgraded with little or no change to the hardware (the main requirement is memory management hardware). I imagine that OS-9 Level Two might run with the 56K of memory that Level One uses, but

just barely. Level Two begins to come into its own at 128K. At 344K, I have never run out of memory.

Big System Software

There is a bit of controversy arising in the OS-9 world. Smoke Signal Broadcasting has been responsible for a lot of 6809 software over the years. There is even an operating system which they are responsible for. Now they are contributing to OS-9 software. My understanding is that Smoke commissioned someone to work on the version of OS-9 licensed to them. Their consultant made OS-9 less modular in order to improve its performance. The Smoke users I know confirm that the revisions make the Smoke version of OS-9 run faster than it used to. Running faster would seem to be an advantage, but the changes Smoke has made turn out to be a mixed blessing. There appear to be subtle incompatibilities between OS-9 as it comes from Microware and OS-9 from Smoke Signal Broadcasting. I have spoken to Microware and they say that they can't support Smoke's version of OS-9 (that may have changed by the time you read this). I have had trouble exchanging software with Smoke users.

The Smoke users are amazingly tolerant. I have read exchanges on the Compuserve OS-9 SIG in which Smoke users exchange tips on ways to prevent the DIR command from intermittently producing junk.

I certainly approve of improving OS-9's performance, but it is very important that an operating system be as standard as possible. If I were

buying a system from Smoke Signal Broadcasting, I would want strong assurances that their version of OS-9 was compatible with Microware's on every level. A good test would be that all applications programs and system modules that run under standard OS-9 should run under the modified one, and vice versa.

The Compuserve OS-9 SIG

The OS-9 Special Interest Group on Compuserve is booming. Messages flow through the bulletin board so fast I am beginning to question my ability to read them all. Many experienced OS-9 users regularly check in, but it is a particularly good resource for newcomers. I strongly suggest that you join Compuserve if there is an access point close to you. It is worth it even if you only use it to access the OS-9 SIG.

OS-9 on the Color Computer

I have been saying nasty things about Tandy which aren't true. I blamed the sloppy programming in the CCDISK device driver on Tandy when it seems the blame should fall on Microware and Microsoft. The bootstrap for the CoCo is in ROM. There is only one bootstrap ROM, designed by Microsoft for use with Color Disk Basic (I guess). Microware had to design the CoCo implementation of OS-9 so it could be loaded with that Bootstrap. The CoCo boot ROM reads 15 sectors off track 35 into a fixed location in memory. The OS9Boot file had to fit into those 15 sectors. This memory constraint forced Microware to pay even more attention to writing compact code than they usually do. Since 6809 instructions that do direct memory references take less memory than indexed instructions, Microware used them whenever they could. Since versatile device drivers take more memory than limited drivers, they wrote limited drivers. Tandy, I apologize for the nasty thoughts I sent your way.

I decided to write this month's project for the CoCo. I noticed that Color Basic has a number of commands which make assorted honks and beeps emerge from my TV. Basic09 has no way to make those noises. I checked the "Color Computer Technical Reference Manual" for information about the sound generator, and found that the Color Computer generates sound with a Digital to Analog converter. The output from the D/A converter is routed through an analog multiplexer to the modulator, and hence to the TV. It looked like OS-9 could learn to make noise.

I expect that the reason Microware didn't include sound generation in their OS-9 for the Color Computer is that sound generation with an D/A converter is a very time dependent operation. A note is played by gradually (in computer terms) raising and lowering the voltage generated by the D/A converter. This has to be done with a timing loop in a program. The timing loop must have exclusive use of the computer, or the rate at which the voltage rises and falls will vary causing the note being generated to rise and fall. Some people might find the resulting yodel surprising. A program can give itself exclusive use of the computer by masking out



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now boots OS9
EXTENDED BASIC not required

Add \$3 s/h OH res add 5%



interrupts, but locking out interrupts for more than a few millionths of a second is antisocial behavior for any program -- even a part of the operating system.

Still, the ability to at least be able to generate a beep seems important to me. I started by writing a program called Sound to investigate sound production. The program generates a saw-tooth wave that sounds rather like a saber saw cutting thin plywood, but it works. The most important discoveries I made while writing Sound were how to initialize the multiplexer so the D/A converter's output would be routed to the TV. The control registers at \$FF03 and \$FF23 both need to be modified. The fact that they could be modified was another interesting discovery. I am used to control registers being either readable or writeable. These registers are to some extent read/write. CoCo programmers may take this for granted, but I was pleasantly surprised.

Once the control registers are set, sound can be generated by simply writing different values into the most significant 6 bits of the byte at \$FF20. The faster the value is changed the higher the pitch. I wrote the program to send 1000 waves, then stop.

There is lots of room for improvement in Sound. The quality of the note created by the program could be improved, and the program might even be made to play a song. I decided to drop Sound and work on building a Device Driver for the D/A converter.

The Device descriptor I wrote for the D/A converter, Beep, is almost as small as a Device Descriptor can be. The D/A converter is not a random access device so I decided to use the SCF file manager to drive it. There are no options except the one byte which indicates that it is a SCF device. There are three addresses in the descriptor. Normally a descriptor only needs one port address, but in this case, since the three addresses used in making the D/A converter make sound aren't related, I included all the addresses explicitly.

The Device Driver, called Beeper, is not interrupt driven. Most OS-9 device drivers use interrupts to give them a way to avoid wait loops, but I couldn't find a way to get the D/A converter to generate interrupts. In this case interrupts weren't necessary; the device responds as fast as data can be pumped into it.

The initialization entry puts some values that will be needed in the termination routine into device static storage, and sets the two PIA registers that need to be adjusted to permit sound to be made. The termination entry sets the two control registers back the way they were before Beeper started, and the GetStat and PutStat entries don't do anything at all. The read and write entries deal with the fact that the D/A converter only uses the high-order six bits of the register it is accessed through.

Installation of Beep/Beeper

Beep and Beeper have to be typed in and assembled. As usual, the USE statements between the IFP1 and ENDC don't come out in the assembly listing. You will have to include use statements

for both OS9DEFS and SCFDEFS for these programs. When you assemble the Beeper file it will generate a file in the execution directory called Beeper with both Beep and Beeper in it.

To use beeper first load it with the OS-9 command line:

OS9: load beeper

then link beeper with the command line:

OS9: link beeper

Since beeper is the second module in the file it will have a tendency to disappear if you don't link it.

As a first try you can get a low growl out of your computer by listing a file to /Beep. I used

OS9: list beeper >/beep

To get a more interesting sound out of the device you will need to feed it meaningful data. The Basic09 program called TestBeep generates a thousand bytes of sin wave. TestBeep is intended to be packed and run out of the execution directory. If it is run from source the BYE should be removed. It takes a long time to initialize the array, so be patient. The wave can be sent one byte at a time with a loop like:

```
for I=1 to 1000
  put #sound,note(I)
next I
```

But OS-9 doesn't do very well at outputting a single character at a time. This program segment demonstrates that by generating a low, raspy note. To get a higher, smoother note I sent the entire thousand-byte array with one write. The quality of the tone still leaves a lot to be desired, but it's the best I could do quickly.

Applications for /Beep

I imagine that the timbre of the tone generated by TestBeep could be improved by spending more time with the wave form: the rough sin wave I use is pretty crude. Certainly the pitch can be varied by changing the frequency of the wave. I discovered that TestBeep just as it stands is a useful demonstration of OS-9's multitasking behavior. I started TestBeep with the command line:

OS9: BASIC09 TestBeep &

(or, with RUNB, use)

OS9: TestBeep &

will work fine. This runs the program as a background task. When the noise started, I ran a variety of different programs and noticed the effect on the sound.

If you want to generate a higher pitch than you can get out of Beeper, I suggest doing more work in the device driver. The approach I have in mind is to add a buffer in the device static storage for Beeper. When Beeper receives a request to write a zero value it will load the next 256 bytes written into the buffer. When the buffer isn't being loaded, each value written to Beep will indicate a number of times to send the buffer out the D/A. I believe that this approach will prove to be really useful, especially if there is a default wave loaded into the buffer by the INIT code.

The Users Group

I hope all the members of the OS-9 Users group will have their disks by the time you read this. I am afraid that some of you will have received the wrong type of disk. I am responsible for this. We don't have any record of

the type of disk (size and format) any of our early members use. Some of the people who have joined recently have included information about their disk, but in most cases I have had to guess. If you get a disk you can't deal with, write to the Users Group address, and we will try to get you a disk you can read.

Sound - Sound generator for CoCo

```
00001      nam      Sound
00002      tti      Sound generator for CoCo
00003      IFP1
          ( Insert your "USE Defs" Files here -- EDITORS NOTE )
00005      ENDC
00006      0011      TYPE      SET      PRGRM+OBJECT
00007      0000      87C00065      MOD      ENDSMD,NAM,TYPE,REENT+1,ENTRY,DSIZE
00008      D 0000      CMTL      RMB      2      Address of D/A control registe
00009      D 0002      CMTL2     RMB      2      Address of another D/A control
00010      D 0004      PORT      RMB      2      Address of D/A input
00011      D 0006      CMTL      RMB      2      Number of waves to send
00012      D 0008      CMTLV     RMB      1      Initial value of first Control
00013      D 0009      CMTLV2    RMB      1      Initial value of other control
00014      D 000A      RMB      200      STACK
00015      D 0002      DSIZE     EQU      .
00016      000D      534F554E      NAM      FCS      /SOUND/
00017      0012      ENTRY      EQU      .
00018      *****
00019      # Initialize addresses in local storage
00020      #
00021      0012      CCF23          LOD      #FF23
00022      0015      DD00          STD      CMTL
00023      0017      CCF20          LOD      #FF20
00024      001A      DD04          STD      PORT
00025      001C      CCF03          LOD      #FF03
00026      001F      DD02          STD      CMTL2
00027      *****
00028      # Save initial values of control registers
00029      # and set them to route D/A output to sound
00030      #
00031      0021      A504          LDA      [CMTL,U]
00032      0023      9708          STA      CMTLV
00033      0025      BA08          ORA      #08
00034      0027      A704          STA      [CMTL,U]
00035      0029      A5D802         LDA      [CMTLV,U]
00036      002C      9709          STA      CMTLV2
00037      002E      B4F7          ANDA      #FFF-10B
00038      0030      A7D802         STA      [CMTLV2,U]
00039      *****
00040      # Initialize the counter
00041      #
00042      0033      CC03EB          LOD      #1000
00043      0036      DD06          STD      CMTL
00044      *****
00045      # Send waves
00046      #
```

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```

00047 0038      LOOP2
00048 0038 B600      LDA #0
00049          *****
00050          * Send each wave
00051          *
00052 003A      LOOP1
00053 003A A7B04      STA (PORT,U)
00054 003D B804      ADDA #4
00055 003F 12      NOP
00056 0040 12      NOP
00057 0041 12      NOP
00058 0042 12      NOP
00059 0043 12      NOP
00060 0044 12      NOP
00061 0045 12      NOP
00062 0046 12      NOP
00063 0047 12      NOP
00064 004B B100      CMPA #0
00065 004A 26EE      BNE LOOP1
00066          *****
00067          * End of sending one wave.
00068          * See if we still need to send more
00069          *
00070 004C DC06      LDD CNTR
00071 004E B30001     SUBD #1
00072 0051 DD06      STD CNTR
00073 0053 26E3      BNE LOOP2
00074          *****
00075          * Restore initial values to control registers
00076          *
00077 0055 9608      LDA CNTRLV
00078 0057 A7D4      STA (CNTRL,U)
00079 0059 9609      LDA CNTRL2V
00080 005B A7DB02     STA (CNTRL2,U)
00081 005E 5F      CLRB      clear carry
00082 005F 103F06     OS9 F#EXIT return to OS-9
00083 0062 52B069     ENDD
00084 0065      ENDSMD EQU *

00000 error(s)
00000 warning(s)
$0065 00101 program bytes generated
$00D2 00210 data bytes allocated
$0EFB 03B32 bytes used for symbols

```

```

PROCEDURE TESTBEEP
0000      DIM NOTE(1000):BYTE
000C      DIM I:INTEGER
0013      DIM SOUND:INTEGER
001A      OPEN #SOUND,"/BEEP":WRITE
002A      FOR I=1 TO 1000
003B          NOTE(I)=32*(1+SIN(I))
0052      NEXT I
005D      FOR I=1 TO 100
006D          PUT #SOUND,NOTE
0077      NEXT I
0082      BYE

```

```

TTL DEVICE DESCRIPTOR
NAM BEEP
TYPE SET DEVIC+OBJCT
MOD BPEND,BPNAM,TYPE,REENT+1,FNNAME,DRVNAME
FCB READ,+WRITE. MODES
FCB $FF,$FF,$20 PORT ADDRESS

```

```

FCB OPTL Length of options section
OPTIONS EQU *
FCB DT,SCF
OPTL EQU *-OPTIONS

```

```

CNTL1 FDB $FF23 address of control byte 1
CNTL2 FDB $FF03 address of control byte 2
BPNAM FCS /BEEP/ name of this module
FNNAME FCS /SCF/ File Manager name
DRVNAM FCS /BEEPER/ Device driver name
EMOD
BPEND EQU *

```

```

NAM BEEPER
IFP1
USE /HO/DEFS/OS9DEFS.1
USE /HO/DEFS/os9iodefs.1
USE /HO/DEFS/os9SCFDEFS.1
ENDC
USE BEEP Device Descriptor
TTL DEVICE DRIVER FOR D/A
PAG
TYPE SET DRVR+OBJCT
REVS SET REENT+1
MOD BPEND,BPNAM,TYPE,REVS,ENTER,MEMSIZE
FCB READ,+WRITE. DRIVER MODE
BPNAM FCS /BEEPER/
FCB 1 EDITION
*****
* Device Static storage
*
ORG V.SCF System part of Static Storage
*****
* Local part of static storage
*
PORTA RMB 2 PORT ADDRESS
CTL1V RMB 1 HOLD CNTL1 VAL
CTL2V RMB 1 HOLD CNTL2 VALUE

```

```

CTL1A RMB 2 HOLD CNTL1 ADDR
CTL2A RMB 2 HOLD CNTL2 ADDR
MEMSIZE EQU .

```

```

*****
* Entry vectors
*

```

```

ENTER
LBRA INIT
LBRA READ
LBRA WRITE
LBRA GETSTAT
LBRA PUTSTAT
LBRA TERM
spc 1
INIT

```

```

*****
* U ADDRESS OF DEVICE STATIC STORAGE
* Y ADDRESS OF DEVICE DESCRIPTOR MODULE
*

```

```

LDX CNTL1,Y Get control address 1 out of Descriptor
STX CTL1A,U Save the address
LDA ,X Get the present value of cntl1
STA CTL1V,U save it for later restore
ORA #08 set it for sound
STA ,X

```

```

LDX CNTL2,Y do the same stuff for cntl2
STX CTL2A,U
LDA ,X
STA CTL2V,U
ANDA #$FF-$08
STA ,X

```

```

CLRB CLEAR CARRY
RTS RETURN
spc 1
READ

```

```

*****
* U ADDRESS OF DEVICE STATIC STORAGE
* Y ADDRESS OF PATH DESCRIPTOR
* RETURN CHARACTER READ IN A
*

```

```

LDX V.PORT,U port address from device descriptor
LDA ,X D/A value
LSRA
LSRA Shift out low order bits
CLRB Clear carry
RTS
spc 1
WRITE

```

```

*****
* U DEVICE STATIC STORAGE
* Y PATH DESCRIPTOR
* A VALUE TO WRITE
*

```

```

LDX V.PORT,U
LSLA Shift out high order bits
LSLA
PSHS A save value to write
LDA ,X Get current value at Port
ANDA #200000011 clear D/A value
ORA ,S+ put value to write in
STA ,X send it
CLRB
RTS RETURN
spc 1
GETSTAT
PUTSTAT
CLRB
RTS
TERM

```

```

*****
* U DEVICE STATIC STORAGE
*

```

```

LDX CTL1A,U restore original Cntl1 value
LDA CTL1V,U
STA ,X
LDX CTL2A,U restore original Cntl2 value
LDA CTL2V,U
STA ,X
CLRB clear carry
RTS
EMOD
BPEND EQU *

```

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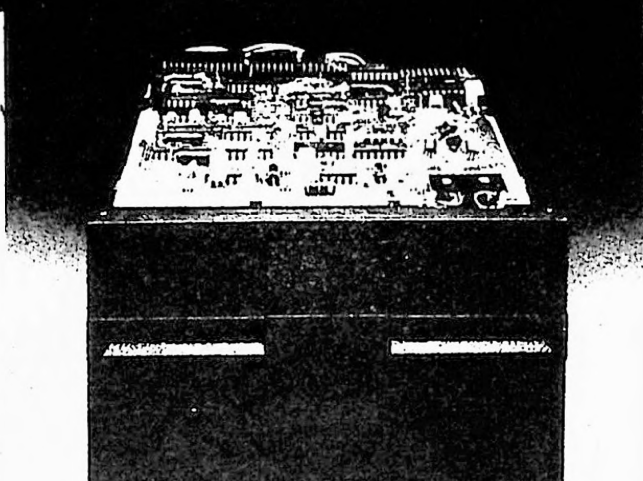
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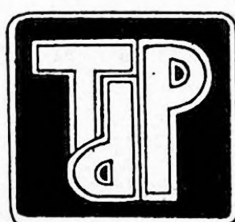
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INTRODUCTION

The MACRO-80C package consists of a text editor, debugger, assembler, and utility programs for the TRS-80 Color Computer. This article describes the contents of this package and presents a review of its use for training and for code generation.

Following is a list of the current directory of the diskette, for reference. Several of the files on the diskette are described later in this review.

DIRECTORY OF RADIO-SHACK DISK			
FILENAME/EXT	D	TYPE	A GN BYTE
ED	/BAS:1	BASPRG	20 003C
ED%	/BIN:1	MCHPRG	21 009A
AS	/BAS:1	BASPRG	23 0013
AS%	/BIN:1	MCHPRG	1E 006E
DCBUG	/BIN:1	MCHPRG	24 0019
XFER	/BAS:1	BASPRG	25 00C9
FILELIST	/BAS:1	BASPRG	26 0008
HLP%	/	:1 BASDAT A	27 00C0
DISPLAY	/TXT:1	BASDAT A	1A 00F3
EXSQR	/TXT:1	BASDAT A	1B 0049
BLKWHT	/TXT:1	BASDAT A	18 00D9
EXSCROLL	/TXT:1	BASDAT A	19 0016
TOWERS	/TXT:1	BASDAT A	2B 0063
TEXTOUT	/TXT:1	BASDAT A	16 003A
DRAWLINE	/TXT:1	BASDAT A	17 00F4
ASP	/BAS:1	BASPRG	2C 0017

END-OF-DIRECTORY

TEXT EDITOR

The text editor is disk-based and screen-oriented. As with the assembler, a small BASIC program is provided to simplify its invocation; rather than entering 'LOADM"ED%":EXEC', the user can enter 'RUN"ED'. One of the utility programs, XFER, may be used to transfer files to be edited from cassette tape to diskette; ED edits files on diskette, not on tape.

The user is prompted for the name of the file to be edited. Once this has been established, the screen display is set to command mode. At this point, the user may enter one of several commands, which change the command mode to edit mode, hit BREAK, which terminates the edit session, or hit CLEAR, which displays a HELP screen.

The editor may be used to edit assembler programs, BASIC programs, text files, etc. However, it is oriented toward editing assembler language programs, in that several of the features of the editor, such as the tab key and some options of the search commands, are structured for the assembler format.

When the editor is first invoked, the screen is in command mode. From command mode, the user may enter commands to change the status to other modes, such as insert mode, exchange mode, search mode, etc., as described below. The manual provides a short tutorial to illustrate the use of the

editor, and the diskette provides many example files which may be used to learn to use the editor.

The HELP screen may be requested at any point within the editor, and its contents will always reflect the commands which may be entered at that point. In order to conserve memory, the contents of the HELP screens are maintained on disk and are read as required. An edited copy of the HELP file appears below to provide a summary of the operations of the editor.

YOU ARE IN COMMAND MODE.

THIS IS THE MODE FROM WHICH YOU CAN GET INTO ALL OF THE OTHER MODES. USE THE ARROW KEYS, SHIFT ARROW KEYS, AND ENTER AND SPACE BAR TO MOVE THE CURSOR AROUND IN THE FILE. USE "O" & "P" TO MOVE BACKWARD AND FORWARD BY PAGES. HIT "I" TO INSERT TEXT, "D" TO DELETE IT, AND "X" TO ALTER IT.

IF YOU HIT BREAK, YOU WILL EXIT THE EDITOR. AT THAT POINT YOU MAY HIT ENTER, AND YOUR TEXT WILL BE WRITTEN OUT TO DISK. TYPE A "W" AND ENTER (WITHOUT THE QUOTES, OF COURSE) TO WRITE THE TEXT OUT TO A NEW FILE WITHOUT ALTERING THE OLD FILE. TYPE "NO" IF YOU HIT BREAK BY MISTAKE. TYPING "A" WILL ALLOW YOU TO APPEND ANOTHER TEXT FILE ONTO THE ONE YOU'RE ENTERING AND THEN RETURN TO THE EDITOR.

OTHER KEYS YOU CAN HIT:

F: FIND STRING (FORWARD)
B: FIND STRING (BACKWARD)
S: SEARCH FOR SYMBOL DEF.
C: CHANGE STRING
A: REPEAT LAST FIND OR CHANGE
JB: JUMP TO BEGINNING
JE: JUMP TO END
REMEMBER THAT ALL KEYS WILL REPEAT WHEN HELD DOWN. THIS IS ESPECIALLY USEFUL WITH THE "A" COMMAND, AND WITH ARROW KEYS. *

THIS IS LINE INSERT MODE.

IT IS THE MODE USED FOR ENTERING THE BULK OF YOUR TEXT.
BREAK: EXIT FROM THIS MODE
ENTER: START NEXT LINE
RIGHT ARROW: TAB TO COLS 7, 13
LEFT ARROW: BACKSPACE
SHIFT LEFT ARROW: RESTART
LINE TEXT KEYS: INSERT TEXT TO FILE. REMEMBER THAT SHIFT ZERO IS THE LOWERCASE CONTROL AS USUAL.

THIS IS EXCHANGE MODE.

IT IS USED TO ALTER EXISTING LINES.
BREAK: ABORT MODE AND FORGET ANY CHANGES MADE
ENTER: LEAVE THIS MODE
LEFT ARROW: BACKSPACE
RIGHT ARROW: FORWARD SPACE
SHIFT L. ARROW: DELETE SPACE
SHIFT R. ARROW: INSERT SPACE
TEXT KEYS: WRITE TEXT ON TOP OF OLD TEXT

TWO COPY MODE.

THIS IS USED TO DUPLICATE A SECTION OF THE TEXT. BEFORE ENTERING THIS MODE, POSITION THE TEXT SO THAT THE FIRST LINE TO BE DUPLICATED IS THE TOP LINE ON THE SCREEN. USE THE DOWN ARROW KEY TO PUSH THE TEXT TO BE COPIED OFF THE TOP OF THE

SCREEN, WHERE IT WILL BE
DUPLICATED. HIT ENTER WHEN
DONE.

MOVE TEXT MODE.

BEFORE ENTERING THIS MODE,
POSITION THE TEXT WITH THE
FIRST LINE TO BE MOVED ON THE
FIRST LINE OF THE SCREEN. UP
AND DOWN ARROWS MOVE THE TEXT
UP AND DOWN WITHIN THE FILE.
SHIFT DOWN ARROW EXPANDS THE
BLOCK TO BE MOVED. HIT ENTER
WHEN DONE.

DELETE LINES MODE.

POSITION THE CURSOR ON THE
FIRST CHARACTER TO BE DELETED
BEFORE ENTERING THIS MODE.
DOWN ARROW WILL DELETE ONE LINE
(32 COLUMNS). RIGHT ARROW WILL
DELETE THE NEXT 32 CHARACTERS.
HIT ENTER WHEN DONE. HIT BREAK
TO RESTORE LINES WHICH WERE
ACCIDENTALLY DELETED.

JUMP:

B - JUMP TO BEGINNING
E - JUMP TO END
F - JUMP TO BEGINNING AND GO
TO FIND MODE
C - JUMP TO BEGINNING AND GO
TO CHANGE MODE

FIND FORWARD.

YOU ARE NOW ENTERING A STRING
TO BE SEARCHED FOR IN THE FILE.
IF YOU PUT A QUOTE (") IN THE
FIRST CHARACTER, YOU CAN FIND A
STRING EVEN IF IT IS NEXT TO
OTHER LETTERS OR NUMBERS.
RIGHT ARROW IS THE "WILD CARD"
CHARACTER. LEFT ARROW IS THE
BACKSPACE, AND SHIFT LEFT ARROW
WILL RESTART THE STRING.

FIND BACKWARD.

YOU ARE NOW ENTERING A STRING
TO BE SEARCHED BACKWARD FOR.
IF YOU PUT A QUOTE (") IN THE
FIRST COLUMN, YOU CAN FIND A
STRING EVEN THOUGH IT IS NEXT
TO OTHER LETTERS OR NUMBERS.
RIGHT ARROW IS THE "WILD CARD"
CHARACTER. LEFT ARROW IS THE
BACKSPACE. SHIFT LEFT ARROW
WILL RESTART THE STRING.

SEARCH SYMBOL MODE.

THIS WILL FIND THE FIRST
OCCURANCE OF A SYMBOL NAME
WHICH STARTS IN THE FIRST
COLUMN. YOU ARE NOW ENTERING
THE NAME. RIGHT ARROW IS THE
"WILD CARD" CHARACTER. LEFT
ARROW IS THE BACKSPACE, AND
SHIFT LEFT ARROW WILL RESTART
THE LINE. AFTER THE SYMBOL IS
FOUND, HIT "A" TO FIND MULTIPLE
DEFINITIONS OF THAT SYMBOL.

CHANGE MODE.

THIS IS USED FOR MULTIPLE AND
"GLOBAL" CHANGES. YOU ARE NOW
ENTERING THE STRING TO BE
SEARCHED FOR. THE SAME RULES
APPLY AS WITH FIND MODE. AFTER
YOU HIT ENTER, YOU WILL BE
ASKED FOR A NEW STRING TO BE
USED TO REPLACE THE ONE WHICH
WAS FOUND. AFTER THE CHANGE IS
MADE, HIT OR HOLD "A" KEY FOR
MULTIPLE CHANGES.

YOU ARE NOW BEING ASKED FOR A
NEW STRING TO REPLACE THE OLD
ONE ONCE IT IS FOUND. THE SAME
KEY DEFINITIONS APPLY AS WITH
THE FIND COMMAND. CARE SHOULD

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BE USED, HOWEVER, IF YOU ENTER
THE WILD CARD IN THIS STRING IF
THIS STRING IS A DIFFERENT
LENGTH FROM THE ONE BEING
REPLACED. HIT ENTER WHEN READY
TO DO THE CHANGE, OR BREAK TO
ABORT.

YOU ARE IN HELP MODE.

YOU HAVE BEEN VIEWING DATA
DESCRIBING THE PARTICULAR MODE
YOU ARE IN. IF YOU HIT ENTER,
YOU WILL GET BACK TO EXACTLY
WHERE YOU WERE, UNLESS THERE IS
ANOTHER PAGE OF DATA FOR YOU TO
VIEW. THE BREAK KEY WILL
RETURN TO THE EDITOR
UNCONDITIONALLY. UP AND DOWN
ARROWS CAN BE USED TO SEE PAGES
PERTAINING TO OTHER MODES.

In summary, the editor provides a
considerable amount of power and
convenience for creating and modifying
text files, whether they contain
assembler-language programs, BASIC
programs, or other simple documents.
While it is not as powerful as word
processor-type editors for editing
documents, it is considerably more than
adequate for editing programs.
Although its section in the manual is
brief, it seemed to be quite adequate.

DEBUGGER

The debugger, called DCBUG, provides
a low-level debugging facility for 6809
assembler-language programs. With it,
a user is provided a means of changing
memory contents, setting breakpoints in
RAM, etc., to assist in the
determination of how an assembler

program is running. Debugging output
may be sent to the screen or to the
printer port.

Following is a summary of the DCBUG
commands:

B addr -- set breakpoint at "addr"
C reg -- change register "reg"
G -- go to address in PC register
I from thru chr -- insert byte "chr"
into all addresses "from"-
"thru"
J addr -- jump to subroutine at
"addr"
M addr -- examine or change memory
locations starting at "addr"
R -- display 6809 registers
T from thru to -- transfer bytes at
addresses "from"- "thru" to "to"
U unit -- set output unit to "unit"
\$ hexdata -- display "hexdata" in
decimal
. decdata -- display "decdata" in
hex
* -- reset computer

The M command is used to initiate
the inspection and potential
modification of the contents of memory
locations. These memory locations may
be associated with RAM, ROM, I/O, SAM,
etc. The contents of memory starting
with the specified address are
displayed in eight columns of data,
with the starting address of each row
displayed in the left column, one row
at a time initially. The left, right,
up, and down arrow keys are then used
to position the cursor to the
addresses to be modified, and the new
data for those addresses may be
entered in hexadecimal. After
modification, the memory location at a

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printer) the contents of the 6809's registers and stack, showing changes as they
are happening. In the slowest speed mode, Peeper provides continuous single-
stepping; faster modes give a coarser trace. Or, halt the action and single-step by
repeatedly pressing the space bar. Peeper supports breakpoints, memory
examine/change, and more. Think how much easier it would be to modify someone
else's ML software if you could determine what routines were being executed at
any given point!

For fun, (and this requires no ML experience), use Peeper with arcade games,
watching the fine details of the animation effects in slow motion. See how the game
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given address is read back and compared to the desired contents; if they do not match, the display is inverted at that address location.

The B command is used to set breakpoints. They may be set only in RAM, not in ROM or other special-purpose memory locations. After a B command has been issued for a given location in RAM and an SWI has been inserted in place of the old instruction, the user may use the G or J command to start execution of the program. Since only one breakpoint may be set at one time, and it is automatically removed whenever the SWI at that location has been encountered, the user must be very careful not to lose control of the program. However, the user may use the M command to manually insert as many additional SWI instructions as required (remembering the old contents separately) to prevent such situations.

The description of DCBUG in the manual is far briefer than that of the editor or of the assembler. It is also potentially the most complex to use. A tutorial on the debugging of machine language programs would definitely be appropriate, considering the level of detail in the remainder of the manual. A small glitch in the manual concerns the fact that the B command is not included in the summary of commands, and several commands are mentioned only in the summary of commands, with no indication as to their use.

In summary, DCBUG functions as a low-level debugger. It does not disassemble the instruction pointed to by the PC. It cannot single-step programs, displaying the registers after each instruction. It cannot set breakpoints in ROM locations. It has no access to the symbolic variable names associated with program

locations it is displaying, as do symbolic debuggers, and with which high-level language programmers are familiar. It provides approximately the level of debugging capabilities as the older 6809 SBUG and 6800 SWTBUG and MIKBUG monitors. It apparently functions properly and is usable for its stated purpose of assisting in the debugging of assembler-language programs.

ASSEMBLER

The assembler is **surprisingly sophisticated** for such a small machine. It implements segmented-source files, conditional assembly, local labels, macros, and several convenience instructions and directives. In comparison to some of the other assemblers which run under COCO DOS, such as EDTASM+, it is far superior. Even in comparison to some of the assemblers which run under other operating systems, such as OS/9 ASM, it is still **superior** in features.

As with the text editor, a small BASIC program is provided to simplify its invocation; rather than entering 'LOADM"AS":EXEC', the user can enter 'RUN"AS'. One of the utility programs, XFER, may be used to transfer files to be assembled from cassette tape to diskette; AS assembles files on diskette, not on tape.

The options supported by AS are as follows:

- D - slow speed of output to screen or not
- E - assemble the program one step at a time when an error has occurred or not
- L - list program or error lines only
- M - list macro expansions or not

- S - generate sorted symbol table listing or not
- W - provide warning on long branch when short branch would have sufficed or not
- X - generate sorted symbol cross-reference listing or not
- Z - generate error on production of zero byte instruction or not

In order to send the output of the assembler to the printer, rather than to the screen, the BASIC program ASP may be used, rather than AS. By modifying ASP, as described in the manual, ASP may be made to generate its output to a disk file, rather than to the printer. In addition to the options supported by AS, ASP supports the following options:

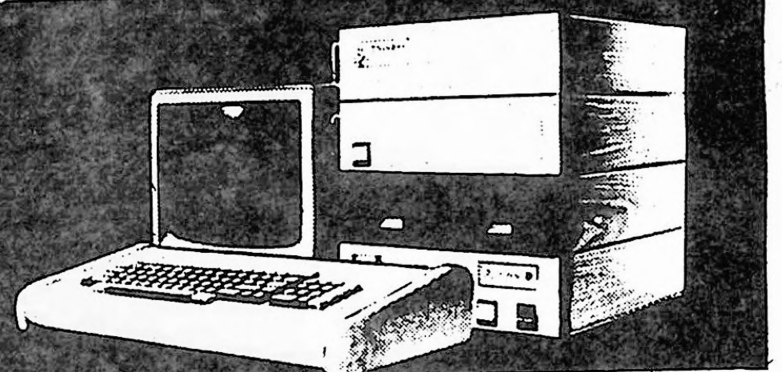
- 8 - use 80 column format for printed output
- C - tab to the comment field on printer
- F - use FF rather than LF's for printer heading
- L - send LF after each CR sent to printer
- N - suppress pagination of listing on printer
- R - suppress CR on last column of printer
- T - truncate listing at last column on printer

The manual explains in great detail how to generate assembler-language programs which may be loaded concurrently with BASIC programs. There are several methods in which to accomplish this, some of which are covered in the text, and some of which are not. The manual suggests placing the assembler-language program in unused graphics pages, above the stack, over the BASIC RAM areas (but

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only if return to BASIC is not necessary), or into the BASIC program area. Another technique, not covered in the manual, is to place short assembler-language programs into strings. Of these techniques, the placing of assembler-language programs into unused graphics pages is probably the simplest to implement. Since most of these techniques require the program to be placed at arbitrary locations, the manual recommends the use of position-independent code techniques and provides a tutorial on writing such code.

The assembler requires its input lines to either follow the **Standard Motorola Format**, as follows:

[label] [operator] [operand] [comment]

(in which the label field, if present, must start in the first position of the record), or they must be comment lines (designated by an asterisk in the first position of the record).

The assembler implements the standard Motorola 6809 instruction set. However, it also allows the 6800 mnemonics to be used, and generates the appropriate 6809 code for each. It also interprets a limited number of convenience mnemonics, as follows:

BRA # generates absolute branch
CLF generates ANDCC #SDF
CLIF generates ANDCC #SAF
CLRD generates CLRA & CLRB
EXG # generates specified EXG instruction
NEGD generates COMA & COMB & SUBD #-1
PSHS # generates specified PSHS instruction
PSHU # generates specified PSHU instruction
PULS # generates specified PULS instruction
PULU # generates specified PULU instruction
RESET generates \$3E to cause system reset
RHF generates \$14 to test system
SEF generates ORCC #\$40
SEIF generates ORCC #\$50
TFR # generates specified TFR instruction
TSID generates STD -2,S

Following is a list of the assembler directives implemented by **AS**. It is a more complete set than that implemented by many other 6809 assemblers.

APOP pop values from assembler stack
APSH push values into assembler stack
ASK input value of symbol
BSZ generate zero bytes
CLRC zero check word
CWORD generate check word
EQU set value of symbol
ELSE reverse conditional assembly
END terminate input file, provide xfer addr
ENDC terminate conditional assembly
ENDM terminate macro definition
FAIL generate error message
FCB generate hex constants
FOC generate ASCII string
FOCS generate screen-code string
FDB generate address constants
IFxx start conditional assembly
INCL insert source file segment
LIST resume assembler listing
LONGVR use symbols longer than six

characters
MACR introduce macro definition
MSG generate message during pass 1
NAM change program name for page headers
NLST suppress assembler listing
NOZER generate error if zero byte produced
ORG change program counter
PAGE place next line of listing on new page
PEEK set symbol value from memory in pass 1
POKE change memory location in pass 1
REORG reset program counter to previous value
RMB advance program counter
SET change value of symbol
SETDP change direct page (default zero)
SPC insert blank lines into listing

A macro is introduced with the **MACR** directive and terminated with the **ENDM** directive. The lines within a macro have the same format and rules as lines outside of macros, with the addition of symbolic parameters. A macro parameter is represented by a reverse slash and a digit, and may appear wherever a symbol may normally appear. The sequence "\0" designates the first symbolic parameter and "\9" designates the tenth symbolic parameter. Macro parameters may be provided values upon the invocation of the macro. A macro is called by placing its name in the operator field and its parameters in the operand field. Any parameters not assigned values in a given call are

assumed to have a value of null.

The **Assembler Manual** provides one of the best tutorials on the use of its features I have ever seen in an assembler manual, especially for a 6809 assembler. It even provides a short tutorial on the programming of a 6809 in assembler language, including such techniques as position-independent code. Many of the example programs in the manual are also available in source format on the diskette, providing an excellent learning facility for the assembler.

In summary, the assembler is an excellent part of the package and provides a powerful facility for learning and using assembler-language programming for the 6809 on the COCO.

SUMMARY

This article has reviewed the **Micro Works MACRO-80C** assembler package from the points of view of its use for training and for actual use. The package is composed of several programs, primarily a full-screen Editor, a Debugger, and an Assembler. The editor is quite sufficient for the task of editing 6809 assembler-language programs, although it is not specifically suited for general text editing. The assembler is quite complete for a 6809 assembler. The manuals and tutorials on the editor and assembler are very well done. The debugger is reasonably simple to use, but is quite limited, and its portion of the manual is very short. Example programs are provided on diskette to assist in learning and using the package.



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5. AMORTIZE: amortization schedule.
6. GRNSCRN: allows entry of lower case commands.
7. WIDTH: set width of your printer output.

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9. ROMMER: flip between BASIC, EXT BASIC, or DISK BASIC without removing DISK CONTROLLER (64K required).
10. DICKSCAN: gives START, END, and TRANSFER addresses of DISK ML programs.
11. SORT.DIR: sorts disk directory and writes to disk.
12. ZAPPED: check tracks, sectors, edit and fix directories.

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Motorola Announces the Raster Memory System (RMS) Graphics Chip Set

Austin, Texas, January 26, 1984... Motorola Microprocessor Division announces a new concept for graphics/text generation and display. A 2-chip set, the Raster Memory System (RMS) is composed of the MC68487 Raster Memory Controller (RMC) fabricated in HCMOS, and the MC68486 Raster Memory Interface (RMI), implemented in Motorola Oxide-Isolated Self-Aligned Implanted Circuit (MOSAIC) bipolar technology. This low-cost, high-resolution chip set contains a myriad of features to provide the

control for high-quality CRT graphics. Its capabilities are so pervasive that the graphics quality is primarily dependent on the power of the MPU, the amount of memory available, and the sophistication of the software, not by any limitations within the RMS system itself.

The RMS has been designed for personal computer, videotex, games, workstation, computer animated graphics and word processing markets.

"We feel that the RMS, with its many capabilities and low price tag, will revolutionize the market and set a new industry standard for intermediate graphics applications," states Steve Marsh, Marketing Manager for Motorola's Microcomputer Group.

The RMS operates with most popular CRT's. It will drive monitors with a 50 Hz field refresh rate used in Europe, or with a 60 Hz rate popular in the U.S. There is a choice of resolutions up to 640 pixels per line, and up to 500 lines per screen. For text reproduction, screen resolutions of either 32, 40, 64, or 80 characters per line are available in full color. For graphics interpretation, choices of 256, 320, 512, or 640 pixels per line provide the needed definition to fit a variety of applications. These choices

are software selectable from internal horizontal and vertical resolution registers.

The RMS chip set has been designed to operate with Motorola's M6809 and M68000 class of microprocessors. Flexibility is inherent in the RMS due to the variety of operating modes available. The RMS is backward compatible with Motorola's popular MC6847/MC6883 existing graphics solution. However, the use of high-performance CMOS technology in the RMC permits many new enhancements. The Raster Memory System can operate in either a bit-plane mode, where each pixel of display is governed by a unique location of RAM, or in one of six character-oriented modes called list modes. If one of the list modes is selected, the user can choose from 96 alphanumeric characters and 64 MOSAIC characters stored in the RMC's internal ROM. In addition to these, up to 32K dynamically redefinable characters can be supported. All of these character types can have attributes applied to them, such as color, underline, flash, invert, double high, and/or double wide.

The RMS chip set can simultaneously display up to 32 colors from its palette of 4096 colors. Color data

Continued on page 30

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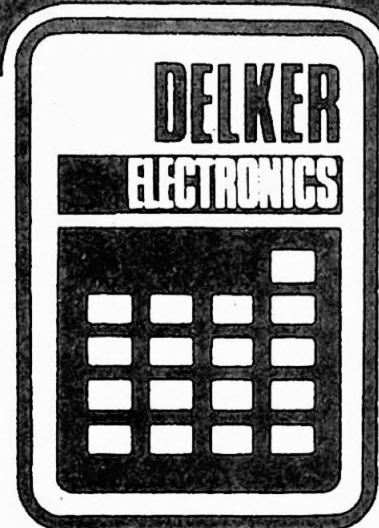
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selected is stored in a Color Mapping RAM which is addressed at the pixel rate as the video picture is generated. This extremely color selective system permits the programmer to use adjacent pixels which are only slightly different in shade, as in flesh tones, or completely different in color, as in the reproduction of company logos.

The RMS has two screen definitions; the virtual screen and the actual (display) screen. The virtual screen is usually much larger so that the actual screen can be positioned anywhere within the virtual screen. The effect is to be able to smoothly scroll in any direction without continuously changing memory. Up to 1 megabyte of DRAM memory can be accommodated. It is possible to sync the RMS to an external source to allow overlay of RMS data onto an existing VCR or broadcast TV picture. Fixed are redefinable characters with unique attributes. Such object attributes as color, priority, shading and collision detection make them especially useful in game applications.

The RMI is a bipolar chip that provides high-speed interfaces between the external DRAM, MPU, RMC. The RMI provides red, green, blue for the MPU, DRAM, and RMC and synchronization signals to the monitor, and provides interface signals.

The price of the RMC and RMI is expected to be in the \$20 range in high volume within a year from full production. Samples will be available in the 4th quarter of 1984 and production is slated for the 1st quarter of 1985.

Contact Literature Distribution Center in Phoenix, 616 W. 24th St., Tempe, AZ 85282 for brochures, or your local Motorola Sales Office for further information.

REPEAT KEY

Elite Software
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C. W. Mann

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First time I saw REPEAT KEY, I sort of wondered, "What the heck could this thing do that I can't do myself?" Then I started playing with it. I soon learned.

The first thing I noticed was that it was totally relocatable. Totally. REPEAT KEY didn't care whether my disc system was plugged in or not. It didn't care whether it had to live alongside another machine-language

program or two, either. For example, I first LOADED a 64K enabler into my creaky, home-modified E board. I followed with REPEAT KEY, CLOADM'd with a substantial offset calculated to keep it out of the way of what I (heh-heh-heh) planned next. (Provided, of course, that CoCo cooperated.) Next came the coup de grace: my prize 32k "Alice" adventure, complete with Cheshire Cat and snark. I held my breath as I typed EXEC (ENTER) for the third time. Everything seemed normal-but when I held down the "A" key, a line of "A"s appeared as pretty as you please. Holding down the left arrow key gobbled up the garbage as fast as I might ever have wanted. It was RESET-proof, too.

This experience opened up a whole range of possibilities that had only been faint glimmers in my little mind up to then. REPEAT KEY is only 202 bytes long, you see, so it can be slipped into any little cranny that might exist in user memory. REPEAT KEY meshes neatly with 64K memory-enablers such as the famous Hogg Labs program and Double Density's ROM MOVE, which gives the user total flexibility. REPEAT KEY produces the next-best thing to a full-screen editor for the adventurer (a welcome thing when the fingers start to slip after long and valiant play). It may, for all I know, even interface with some of the arcade-style "Alien Agony"-type games that use the keyboard for directional control. (I don't own any of those, so please don't take my speculations for gospel.) The BASIC programmer will surely find REPEAT KEY to be handy as an enhancement to the Extended BASIC line editor. (Imagine holding down the spacebar 'till the desired position is reached, with no more counting of characters on the monitor screen!)

With regard to packaging, REPEAT KEY is done up quite adequately. The directions for use with various size machines, transfer to disc, etc., are printed on reasonably durable card stock. The cassette appears to be of the highest quality. The tape itself is virtually noise-free.

REPEAT KEY doesn't seem to interface with my TELEWRITER, but that's the only incompatibility I could come up with. REPEAT KEY could have scored nearly 100% if the cassette write-protect tabs had been broken out, or if a generous number of backups were to be had from the cassette. Unfortunately, there are only two copies of REPEAT KEY on the front side of the cassette, and none on the back. Two hundred bytes isn't much tape, and one false move in a fuzzy moment could easily wipe out the whole thing. Let the buyer be warned! DON'T CLOADM IT until you break out those little tabs on the spine of the cassette! Then back REPEAT KEY up about ten times or more on EACH end of a blank cassette, (as clearly explained in the instructions) and run the backup.

All in all, though, I have to rate this little program rather highly. At \$14.95, it may at first look like a moderately costly frill, of limited usefulness. However, it is really a remarkably versatile utility. I award REPEAT KEY a healthy 86 points out of a possible hundred. With only minor improvements, a near-perfect score could be achieved. Properly handled, I think REPEAT KEY is worth the money.

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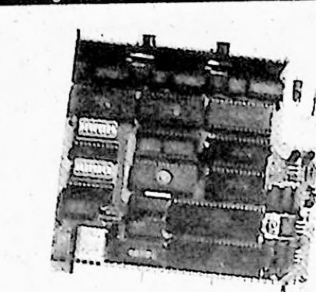
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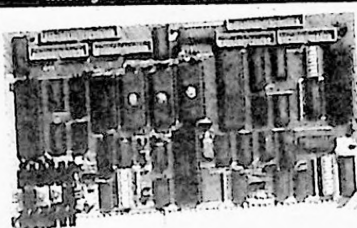


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- Each port has five "handshake" lines for modern control applications
- The on-board 6809 can be used by the host processor
- Compatible with memory-to-memory DMA transfers from the GIMIX 6809 CPU III
- Serial interface and status LEDs that can be used to select software options and indicate board status
- Separate 25-pin cable connectors for each port
- Approaches on-board firmware and operating system
- Drivers are included. Up to 20K of on-board RAM (10-255 bytes)

Also available - Intelligent Five-port serial interface #13 version for the 50 pin bus

Intelligent Parallel I/O Processor Board #12



The Intelligent Four-port Parallel Interface can be used to improve system performance by buffering data transfer to peripheral peripherals such as printers and by buffering and preprocessing parallel data from keyboards, sensors, etc.

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- Up to 20K of on-board memory (EPROM and RAM)
- Buffered data transfer between host and on-board CPU using a 2400 baud 128 byte bidirectional FIFO buffer and a 2400 baud 128 byte bidirectional FIFO buffer
- Four 16-bit parallel ports with handshaking and interrupt capability (two 6821 VIA) Each 6821 also has two 16-bit counters and a 16-bit register for serial data transfer
- Software programmable direction for each bit on two of the four ports (1 per VIA) the other 2 ports can be individually programmed as 8 in or 8 out. The 16-bit extended handshake lines can be programmed as inputs or outputs
- The on-board 6809 can be used by the host processor
- Full 20-bit address decoding. It can be addressed on any 4 byte boundary in 1M byte of address space
- Compatible with memory-to-memory DMA transfers from the GIMIX 6809 CPU III
- Sense switch and status LEDs that can be used to select software options and indicate board status
- Separate 25-pin cable connectors for each port plus two 36-pin connector used to allow full implementation of the GIMIX 6809 CPU III
- Approaches on-board firmware and operating system
- Drivers are included. Up to 20K of on-board RAM (10-255 bytes) or two 36-pin cable sets with GIMIX compatible back panel connector plate for the Classy Chassis back panel to printer cables are also available

OS-9 Firmware and Drivers for the Intelligent 3-port Serial Interface

The OS-9 firmware and drivers enhance the performance of multi-user systems, while providing functions (including single character I/O) equivalent to the standard ASCII type drivers normally used for terminals and serial printers. Input and output functions (handshake, echo, flow control and repeat, etc.) are handled by the I/O board, rather than the host, allowing the host more time for other processing tasks. The host is only interrupted when a complete input line (terminated by a "CR") is received, or when a complete output line (terminated by a "LF") is sent. When used with the GIMIX CPU III, block data transfer between the I/O board and the host via the CPU is memory-to-memory DMA to further enhance throughput. In addition to performance enhancements, features such as software selectable baud rates and transmission characteristics (number of data bits, stop bits, parity, etc.) are provided. The board also contains "handshake" to any or all I/O ports to indicate that the I/O interface is ready and "waiting for the host" and that the host is "on-line" and has opened a path to the port. Messages to individual ports can be disabled.

Also available - Intelligent Five-port serial interface #13 version for the 50 pin bus

The GIMIX 6809 CPU III

The GIMIX 6809 CPU III board is an advanced design specifically intended for use with multi-user tasking operating systems. Built on a multi-layer circuit board with high-speed, high-density logic, the GIMIX CPU III enhances the performance of the 2MHz 6809 by providing such features as: 1. 20K on-board memory (EPROM and RAM) 2. 2400 baud 128 byte bidirectional FIFO buffer and a 2400 baud 128 byte bidirectional FIFO buffer 3. 2400 baud 128 byte bidirectional FIFO buffer and a 2400 baud 128 byte bidirectional FIFO buffer 4. 2400 baud 128 byte bidirectional FIFO buffer and a 2400 baud 128 byte bidirectional FIFO buffer

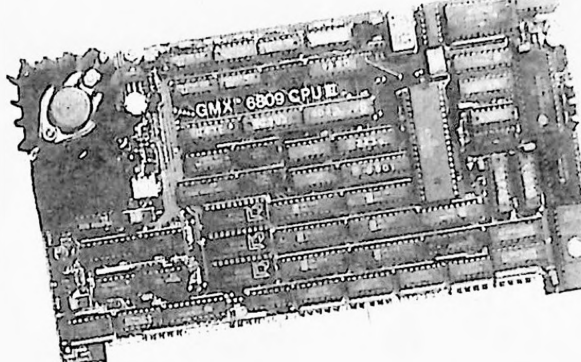
The board prevents the execution of certain illegal instructions from crashing the system by monitoring interrupts to the 6809 and in response to them, the processor does not respond to an interrupt within 128 clock cycles. The board resets the 6809 and starts a special reset vector. The system can then close down the offending task and resume normal operation. This also limits the length of time that interrupts can remain masked by a user, preventing users from keeping the system from task switching and servicing other users.

The GIMIX CPU III also includes a full hardware timer/counter, clock with year and date/time keep year daylight savings time correction, and a 2K on-board RAM. Both with battery back-up. To provide precision timing functions, a 6809 PPI with a separate 20K RAM (20K x 8) time base oscillator is included. The oscillator is easily user replaceable to provide other time base frequencies (150 KHz, maximum). The single EPROM socket will accept 1K, 4K, or 8K EPROMs with a maximum of 4K mapped into the system address space at 010000h. One time software switching is implemented by selecting the upper or lower half of an 8K EPROM under hardware or software control.

OS-9 GIMIX III Operating System

OS-9 GIMIX III is an enhanced OS-9 Level II that takes full advantage of the features of the GIMIX CPU III. As a result, the system is faster, more efficient, and more secure. The system is a better multi-tasking operating system than the original OS-9 GIMIX II, while retaining complete software compatibility. Throughput is enhanced by the memory-to-memory DMA and the automatic task switching while the memory-to-memory DMA and logical instruction trapping protect the system and individual users from each other. Shared system resources in RAM are write protected to prevent tampering. Memory mapping in 4K segments and the ability to load modules in non-contiguous RAM provide more efficient memory utilization. Each task can be allocated a full 64K of RAM with no operating system overhead in the task address space.

UNIFLEX for the GIMIX 6809 CPU III and Intelligent I/O boards is in development.



Non-Volatile 64KB CMOS STATIC RAM Boards with Battery Back-up #64

All GIMIX boards have Gold Bus Connectors and are fully soldered, assembled, burned in, and tested.

- Write Protect Switch permits the entire board to be write protected for PROM/DMA emulation and software debugging
- Addressable in two 32K sections with separate regular and extended address decoding for each section. Each section can be addressed to any 32K boundary in the address range (1M byte with extended addressing). Each 32K section is divided into four 8K blocks that can be individually enabled or disabled. Disabled sections do not occupy address space.
- Fully static. Memory does not require complicated refresh timing or clocks for data retention. Compatible with any of the 6809/6809 RAM techniques.
- Guaranteed 2Mbit Operation. Operation uses high speed (150 ns) memory with no wait states or clock stretching required.
- Non-Volatile Memory with built-in battery back-up. Battery data even with system power removed. With the battery fully charged, data remains intact for a minimum of 21 days.
- Ultra Low Power CMOS RAM requires less than 1uA (typical) at 0V.
- Low Bias Voltage Protection inhibits memory access during power up and power down to prevent data writes to the memory.

ALSO AVAILABLE NMOS Version Without Battery Back-up #67

- Low Power NMOS RAM requires less than 1uA (typical) at 0V.
- Write Protect Switch permits the entire board to be write protected for PROM/DMA emulation and software debugging

16 Socket EPROM/ROM/RAM Board #32

Features: Up to 128K on a single board (using 8K devices). Can be used with 2, 4, and 8K 24 pin, 2716/2732 16 pin, single supply voltage EPROMs and most non-compatible ROMs and static RAMs.

Wintrush EPROM Programmer

- Probably the most versatile EPROM programmer available. Interface to software to EXOCODE - II (fully addressable) and 510 bit systems.
- Program and verify 2708, 2716, 2732, 2764, 2716 (single and dual in-line), 2732, 2732, 2732A, 2764, 2764 - without additional personality modules.
- Programmer extends out to your work area no 5' or 6' long cable.
- Extensive commands menu, move data read program, verify EPROMs, erase/change buffer formatted dump of buffer, 4K buffer.
- Fully documented user's manual with schematics & theory of operation. Professionally finished PCB w/ solder mask & component overlay.
- Software available for FLEX 2.0, OS-9 (LVL 1), now LVL 2 (lower) and MDS. All software is supplied. One version is supplied FREE. Specify disk or tape.

Features: Up to 128K on a single board (using 8K devices). Can be used with 2, 4, and 8K 24 pin, 2716/2732 16 pin, single supply voltage EPROMs and most non-compatible ROMs and static RAMs.

256K Byte STATIC RAM Board #63

- Addressable in configurations to suit a variety of applications. Full 20 bit address decoding for 1M byte systems.
- Addressable compatible with OS-9 GIMIX II and III, UNIFLEX and FLEX with GIMIX VDSX.
- Fully static. Memory does not require complicated refresh timing or clocks for data retention. Compatible with any DMA technique.
- Guaranteed 2Mbit Operation. Operation uses high speed (150 ns) static RAMs with no wait states or clock stretching required.
- Low Power RAM requires less than 350 mW typical at 0V for 256K Bytes. A Megabyte (4 boards) requires less than 1.5 Amps.



256K Byte Non-Volatile, Battery Back-up Version (as pictured) #72

- With the same features as the above PLUS:
- In-Circuit Battery Back-up for power of data retention up to 300 days with a fully charged battery.
- Low Bias Voltage Protection inhibits memory access during power up and power-down to prevent data writes to the memory.
- Write Protectable for PROM/DMA emulation and software debugging.

GIMIX 2MHz Input/Output Boards

Serial Interface Boards

SERIAL INTERFACE boards use the versatile 6809 program-mable ASCII type processors which control number of data bits, parity, stop bits, and interrupts. They all feature 25-pin serial ports with RS-232C, CTS, and DCD hand shake signals.

All serial boards have gold plated header pin connectors for common resistance and reliable operation.

2 Port Serial Interface #43

Software drivers provide easy selection and changing of options.

(for the 30 pin bus)



- 2 separate RS-232C ports (with handshaking) on a single board
- Jumper programmable connector pins for easier connection to external devices. (Connector can be programmed as CTS or DTT)
- Provides cable pins for standard RS-232C connection when used with optional GIMIX cable sets
- Individual board rate and interrupt select jumpers for each port
- Selectable for use with 4, 8 or 16 addresses per port. Uses 1 or 2 #95 cable sets

8 Port Serial Board #46

The GIMIX 8 PORT SERIAL INTERFACE has 8 header type connectors for external connectors. The carrier connector pins have 25-pin serial ports with RS-232C, CTS, and DCD hand shake signals. The carrier connector pins have 25-pin serial ports with RS-232C, CTS, and DCD hand shake signals.

(for the 30 pin bus)



- 8 separate RS-232C ports (with handshaking) on a single 50 pin board
- Extended address decoding for the 2500C bus
- Occupies only 16 bytes of address space
- DIP switch addressable to any 16 byte boundary
- Individual DIP switch selectable board rates and interrupts for each port
- On board board rate generator for board rates from 75 to 38.4K baud
- Uses 1 or 2 #95 cable sets

Parallel Interface Boards

Parallel boards use the 6821 PPI for compatibility and versatility. Each 6821 provides two 8 bit ports with a variety of handshake and interrupt generation modes.

Two Port Parallel Interface Card #42

(for the 30 pin bus)



- Logic data I/O lines - fully buffered, with Schmitt trigger inputs for high noise immunity
- DIP switch selection of either input or output
- One buffered input handshaking line
- One buffered output handshaking line that is tri-stateable for input
- DIP switches for connecting to the interrupt request or the Non-Maskable Interrupt lines
- A gold plated header connector - Gold Bus Connectors
- DIP switch for connecting to boards that need an external 8 bit or output port such as the GIMIX CPU board
- On-board regulator for +5 and +12 volts provide power to the connectors for keyboards, tape readers, etc.
- Uses 1 or 2 #95 cable sets

Single Port Serial Interface #41

(for the 30 pin bus)



- DIP switches provide full control over I/O and handshaking configuration - easily accessible, no soldering necessary for RS-232C or 30 Ma Current Loop select
- One of the board rates or an external clock
- Optional connection to the interrupt request line
- On-board the DCD and CTS modernized signals
- On-board regulator for +5 and +12 volts provide power to the connectors for keyboards, cassette interfaces, etc.
- Uses 1 or 2 #95 cable sets

8 Port Parallel Interface Board #45

(for the 30 pin bus)



- Eight 8 bit parallel ports on a single board
- Four 6821 PPIs
- 3 ports buffered for output
- 5 ports bi-directional (not buffered)
- Built in interrupt generator outputs 1 second or 1 min. time intervals
- Occupies 16 bytes of address space
- DIP switch addressable to any 16 byte boundary
- Does NOT have extended address decoding
- Uses 1 or 2 #95 cable sets

GIMIX 6809 CPU PLUS Board #05 for use with FLEX, OS-9 GIMIX I, UNIFLEX, and OS-9 GIMIX II

The GIMIX 6809 CPU PLUS is an extremely versatile board that gives the user a great many features and options which make it an ideal choice for a variety of systems and applications.

- Any one of 3 memory management techniques can be used: Single Bank Select, GIMIX Extended DAT w/ software write protect (optional), SWTPC compatible DAT (required for 2500C) (optional).
- Software write protect in 4K blocks of the entire address space (when GIMIX extended DAT is selected).
- Jumper selectable processor clock speeds (1, 1.5, 2 MHz).
- Separate buffers for the 6809 and the on-board devices.
- 4 PROM/DMA RAM sockets for memory and user software (up to 32K).
- PROM/DMA RAM sockets individually jumper selectable for single or multiple supply voltage and 1, 2, 4 or 8K byte devices (Some EPROMs do not support 8K devices).
- 1K bytes of scratchpad RAM.
- 6840 programmable timer with provisions for external clock, gate and output connections.
- Time of Day Clock (2416) w/ battery backup.
- 9511A or 9512 Arithmetic Processor w/ jumper selectable 2, 3 or 4 MHz clock speeds (optional).
- FTLA address decoders for the 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288, 1048576, 2097152, 4194304, 8388608, 16777216, 33554432, 67108864, 134217728, 268435456, 536870912, 1073741824, 2147483648, 4294967296, 8589934592, 17179869184, 34359738368, 68719476736, 137438953472, 274877906944, 549755813888, 1099511627776, 2199023255552, 4398046511104, 8796093022208, 17592186044416, 35184372088832, 70368744177664, 140737488355328, 281474976710656, 562949953421312, 1125899906842624, 2251799813685248, 4503599627370496, 9007199254740992, 18014398509481984, 36028797018963968, 72057594037927936, 144115188075855872, 288230376151711744, 576460752303423488, 1152921504606846976, 2305843009213693952, 4611686018427387904, 9223372036854775808, 18446744073709551616, 36893488147419103232, 73786976294838206464, 147573952589676412928, 295147905179352825856, 590295810358705651712, 1180591620717411303424, 2361183241434822606848, 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