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VOLUME IV ISSUE IV • Devoted to the 68XX User • April 1982

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Pascal for 6809

Pascal for the 6809 is a true native code compiler. Unlike the usual P-code Pascals which run in an interpretive manner, ours produces efficient assembly language mnemonics which can be assembled and run directly. This compiler is available for both 6809 FLEX™ and UniFLEX™. Many features not found in other Pascal systems were implemented while avoiding those features completely non-standard. Features of the Pascal system include:

- Supports most of Jensen and Wirth specification
- Produces fast and efficient 6809, native code
- FLEX run-time package may be trimmed
- Double precision real numbers (16.8 digits)
- Implements scalar, subrange and structured data types
- Standard I/O using file buffer pointers
- Dynamic storage allocation
- Ability to call other Pascal programs
- FLEX version may call assembly language programs
- Buffered or single character terminal input
- Standard math functions: SIN, COS, ARCTAN, EXP, LN, SQR, SQRT
- Random number generator function
- Many usable, sample programs included
- UniFLEX version supports:
  - Random file positioning
  - Ability to call various UniFLEX system routines
  - Ability to execute UniFLEX utility commands

Pascal on diskette for 5" and 8" 6809 FLEX is available for $200.00 The 5" version requires two disk drives. The UniFLEX version is $300.00 and includes one year of maintenance. All orders should include 3 percent for postage and handling (10 percent on foreign orders).

™FLEX and UniFLEX are trademarks of Technical Systems Consultants, Inc.

technical systems consultants, inc.
111 Providence Rd., Chapel Hill, N.C. 27514
(919) 493-1451

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Portions of text prepared using the following.

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Southwest Technical Products
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San Antonio, Texas 78216

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FLEX is TM of TSC

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GIMIX Inc.
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Chicago, Il 60609

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MICRO JOURNAL

Send All Correspondence To:

Computer Publishing Center
68 MICRO JOURNAL
5900 Cassandra Smith
PO Box 849
Hixson, TN 37343
615 842-4600

Copyrighted 1982 by Computer Publishing, Inc. (CPI)

68 Micro Journal is published 12 times a year by Computer Publishing, Inc. Second class postage paid at Hixson, Tennessee and additional entries. Postmaster: send Form 3579 to 68 Micro Journal, PO Box 849, Hixson, Tennessee.

Subscription Rates

1-Year $24.50 2-Years $42.50 3-Years $64.50 USA

Items Submitted for Publication

Articles submitted for publication should be accompanied by the authors **full name, addr ss, date** and **telephone number.** It is preferred that articles be submitted on either 5 or 8 inch diskette in TSC Editor format or STYLO format. All diskettes will be returned.

The following TSC Text Processor commands **ONLY** should be used (due to our proportional processor): **.sp** space, **.pp** paragraph, **.fi** fill and **.nf** no fill. Also please do not format within the text with multiple spaces. The rest we will enter at time of editing.

STYLO commands are all acceptable except the **.pg** page command, we print edited text files in continous text.

All articles submitted on diskettes should be in TSC FLEX™ format, either FLEX2 6800, or FLEX9 6809 any version.

If articles are submitted on paper they should be on white 8X11 bond or better grade paper. No hand written articles (hand written or drawn art accepted). All paper submitted articles will be photo reproduced. This requires that they be typed or produced with a dark ribbon (no blue), single spaced and type font no smaller than 'elite' or 12 pitch. Typed text should be approximately 7 inches wide (will be reduced to column width of 3 1/2 inches). **Please use a dark ribbon!**

All letters to the editor should also comply with the above and 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 reserve the right to define what constitutes 'good taste'.

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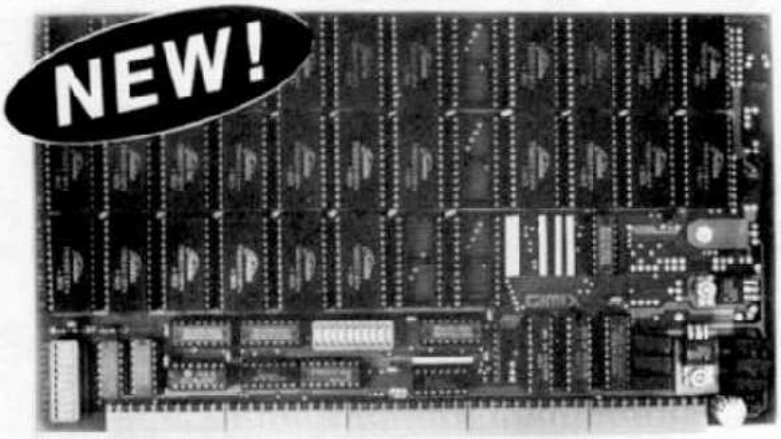
for 6800 and 6809 systems using the SS-50/SS-50C bus



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All versions have gold bus connectors and are fully socketed, assembled, burned in, and tested. Versions with less than 64K can be expanded at any time by adding additional RAM chips.

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64K.....$798.64 **56K.....$728.56** **32K.....$518.36**

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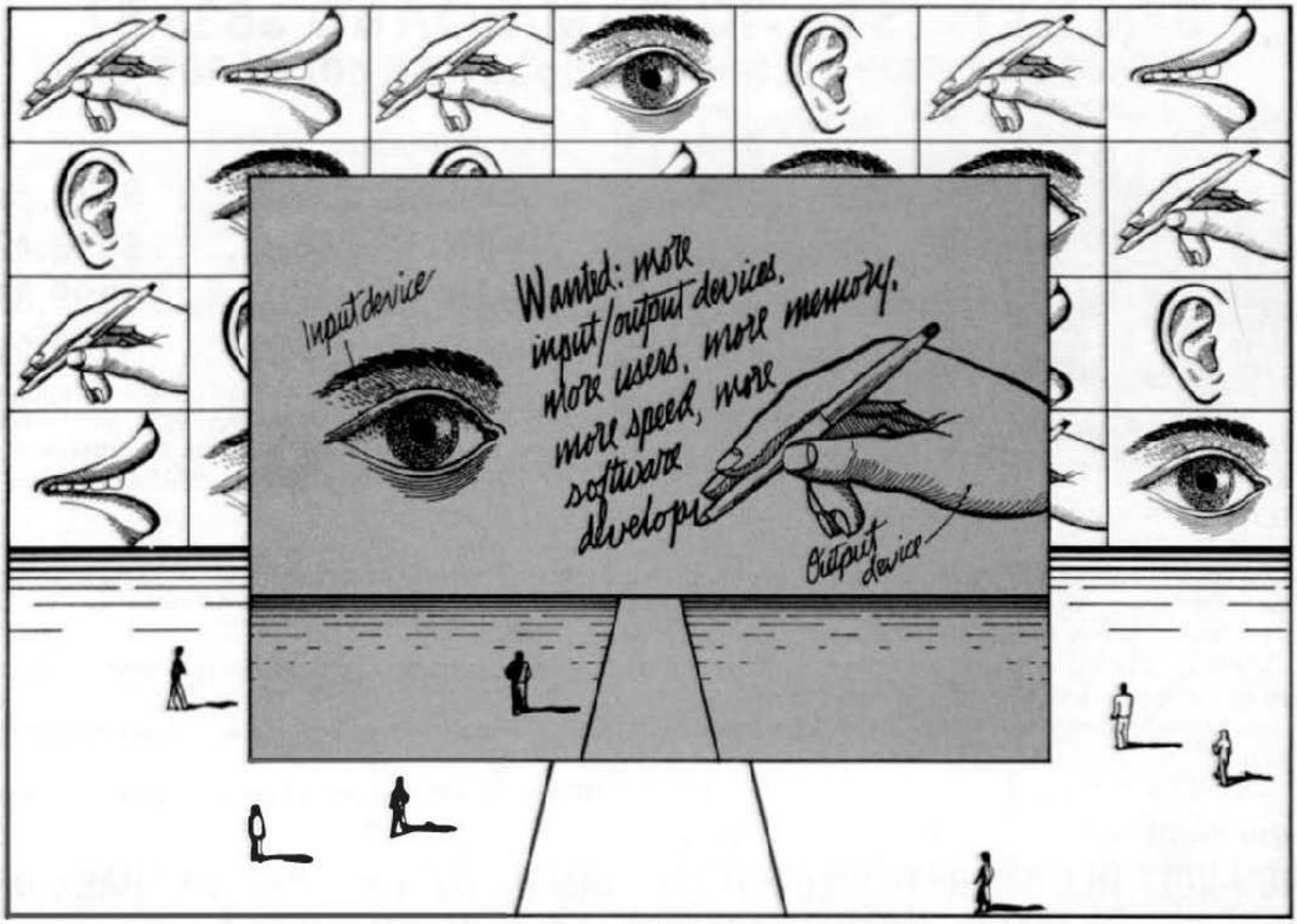

Expand your horizons with OS-9™ Level Two

Expand your 6809 computer to a fast, efficient multi-user system utilizing up to one megabyte of memory, almost any I/O device, and comprehensive implementations of the most-wanted programming languages: Basic, C, Pascal, Cobol, and Assembler.

With OS-9 Level Two, your computer is transformed into the ultimate software development system with performance and features found only on large and costly computing systems. It brings to your fingertips the friendliness and power of a Unix*-based environment. You can even run most Unix* software tools using OS-9's Unix Version 7 compatible C Compiler.

As a multiuser system, OS-9 Level Two excels with a multi-level directory system, a fast random access file system with record lockout, user name/password log-on protection, "pipes" for interprogram communication, and full file security. The versatile "Shell" command interpreter makes it easy for each user to run interactive or multiple background programs with I/O redirection to or from any file or I/O device.

As a real-time system, your OS-9-based computer can sense, monitor, control, and communicate with the real world thanks to OS-9's highly modular and user expandable structure. Adding customized I/O to OS-9 is almost too easy: software interfaces are simple, modular, and well documented. That is why OS-9 users routinely interface it to almost every kind of peripheral device and instrumentation.

For large systems, OS-9 Level Two can handle over one megabyte of RAM and ROM memory with extraordinary efficiency. When, as is often the case, two or more tasks run the same program (such as Basic09) they automatically "share" just one copy in memory. Also, OS-9 Level Two typically resides in less than 24K memory. Savings like these give OS-9 based systems large capacity without having to resort to performance-robbing techniques such as disk swapping.

OS-9 Level Two is available exclusively from manufacturers of most popular 6809 computers equipped with memory management hardware. They offer versions specifically tailored to their computers for use with both new and existing systems.

For more information about OS-9 Level Two contact your computer supplier, or

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Build performance into your system using the OS-9™ toolbox!

Microware's OS-9 Toolbox holds the finest 6809 programming languages and software tools in the industry. Microware languages are complete language implementations that meet or exceed applicable industry standards, and have unmatched speed, efficiency, and ease of use that Microware software is famous for. *All Microware languages run on OS-9 Levels One or Two.*

OS-9 PASCAL™ LANGUAGE COMPILER

The OS-9 Pascal language compiler is the most complete and versatile Pascal available for the 6809. OS-9 Pascal has the unusual capability of generating P-code for interpretive execution while debugging OR highly optimized 6809 assembly language source code output for maximum speed. Another feature of OS-9 Pascal is its "virtual memory" P-code interpreter that lets you run incredibly large Pascal programs. OS-9 Pascal meets the ISO 7185.1 Standard and the complete Wirth/Jensen specification.

CIS COBOL™ COMPILER

6809 CIS Cobol is a compact, interactive and standard Cobol language compiler which is ideal for the most demanding business applications. Standard features are: ISAM, Debug, ACCEPT/DISPLAY, and Interprogram Communications modules. CIS Cobol is *the* preeminent microcomputer Cobol in the industry, and the OS-9 version retains full compatibility with CP/M applications software. CIS Cobol meets the ANSI 1974 Level One COBOL standard and is GSA certified. Also available is Micro Focus' FORMS 2, an optional automatic program generator that lets you interactively design screen-oriented applications with ease.

BASIC09™ STRUCTURED BASIC INTERACTIVE COMPILER

Basic09 is the fastest and most comprehensive full Basic language available for the 6809. It combines standard Basic with the best features of Pascal. It is a unique interactive compiler that combines compiler speed, interpreter friendliness, and superlative debugging facilities. RunB, a ROMable run-time system for compiled Basic09 programs is now available as an option.

C LANGUAGE COMPILER

C—the systems language of the future—is here today on OS-9. This is a complete implementation of the Unix Version 7 C language including 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 information contact your computer supplier, or

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CIS COBOL™:

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COBOL has been the universal business programming standard for nearly two decades. COBOL is rich in commercially-oriented facilities. It has powerful file handling, formatted printing, and data structure capabilities. It is English-like, so that programs are easy to read and maintain. By far, most organizations use COBOL as their main business programming language. One effect of this is that more professional business programmers know and use COBOL and the best business application software is written in COBOL.

Microware has developed the 6809 version of Micro Focus's proven CIS COBOL compiler to allow you to run ANSI 1974 standard COBOL on your OS-9 based computer system. It's been certified as such by the U.S. General Services Administration, following stringent testing. This assures that CIS COBOL is compatable with standard minicomputer or mainframe COBOLs. And CIS COBOL has been proven on thousands of micro and mini systems all over the world.

Stability is an important advantage of COBOL. Unlike some other languages, a firm standard has been established. Because of this, COBOL programs can be transferred from one machine to another with a minimum of modifications. COBOL users can take advantage of the mass of existing programs written in COBOL.

CIS stands for Compact, Interactive, and Standard—the most desirable qualities for microcomputer COBOL. And CIS COBOL offers you much more! It has been specially designed for interactive operation and efficient use on small computers. CIS COBOL has multi-user capability that allows more than one COBOL program to be run simultaneously. CIS COBOL extensions for conversational applications, screen control, interactive debugging, and OS-9's device-independent I/O system.

CIS COBOL's optional FORMS 2 program generator eliminates the need to write simple data entry and inquiry programs. It lets you build a screen layout on line at the CRT, then automatically generates COBOL source code programs from your screen definitions. Or you can use it to create the interactive screen handling portions of more complex programs.

CIS COBOL and FORMS 2 can be used with any disk-based 6809 computer system having at least 48K of user RAM running Microware's OS-9 Level One or OS-9 Level Two operating systems.

If you need to create business applications, COBOL is your natural choice. And if you want to run COBOL on your 6809 system—or want easy to use interactive business programming facilities—that means 6809 CIS COBOL.

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EXCITING NEWS FOR COLOR COMPUTER USERS

FLEX, OS-9 and the Radio Shack Disk System ALL on the SAME Color Computer

Would you believe that you can run FLEX, OS-9 and Radio Shack disk software on the same Color Computer, and all you have to do is change the disk? That's right, just change the disk. If you have a 32K Color Computer with the Radio Shack disk system, all you need to do is make a trivial modification to access the hidden 32K, as described in the Feb. issue of COLOR COMPUTER NEWS and the March issue of '68' Micro. You can get FLEX from us right now. OS-9 will be ready by summer. Please note that this will only work with the Radio Shack disk system and 32K/64K memory chips that RS calls 32K. Maybe they put 64K's in yours, too. If you don't have a copy of the article, send a SASE and we'll send it to you.

Using this system to run FLEX and OS-9 has many advantages. First, it gives you 48K from zero right up to FLEX. This means that *ALL* FLEX compatible software will run with *NO MODIFICATIONS* and *NO PATCHES!* There are no memory conflicts because we moved the screen up above FLEX which leaves the lower 48K free for user programs.

What you end up with is 48K for user programs, 8K for FLEX and another 8K above FLEX for the screens and stuff. We are working on a multi screen format so you can page backward to see what scrolled by and a Hi-Res screen that will enable us to have 24 lines by 42 character display. That's better than an Apple!

We also implemented a full function keyboard, with a control key and escape key. All ASCII codes can now be generated from the Color Computer keyboard!

We also added some bells and whistles to Radio Shack's Disk system when you're running FLEX or OS-9. We are supporting single or double sided, single or double density, 35, 40 and 80 track drives. If you use double sided drives, the maximum is three drives because we use the drive 3 select for side select. When you are running the Radio Shack disk, it will work with the double sided drives but it will only use one side and only 35 tracks. Using 80 track drives is okay, but will not be compatible with standard Radio Shack software. You can also set each drive's stepping rate and drive type. (SS or DS - SD or DD)

In case you don't understand how this works, I'll give you a brief explanation. The Color Computer was designed so that the roms in the system could be turned off under software control. In a normal Color Computer this would only make it go away. However, if you put a program in memory to do something first (like boot in FLEX or OS-9), when you turn off the roms, you will have a full *64K RAM* System with which to run your program (FLEX or OS-9). When the roms are turned off, it is as if you had removed them from the computer. They are gone!

Now, we need the other half of the 64K ram chips to work, and this seems to be the case most of the time, as the article states. Of course, you could also put 64K chips in.

We decided that this was the best way to run FLEX and OS-9 on the Color Computer because it does remove the roms from the memory map and leaves the full 48K for user programs. If you just put in memory for FLEX and use the Basic hooks for I/O, all you have is a little over 30K for user programs. In addition, very few FLEX programs will run without being modified and some won't run very well, if at all (our DATAMAN + for example). Let me state it again. ALL FLEX COMPATIBLE PROGRAMS WILL RUN WITHOUT MODIFICATION!!! and the same goes for OS-9!

It is also the ONLY way OS-9 will run because 30K is just not enough.

Some neat utilities are included.

MOVEROM moves Color Basic from ROM to RAM. Because it's moved to RAM you can not only access it from FLEX, you can run it and even change it!! You can load Color Comuter cassette software and save it to FLEX disk. Single Drive Copy, Format and Setup commands are also included.

If you don't have a Color Computer, we can sell you one complete with 64K ram, 24K rom, Single RS disk drive and FLEX for only $1,490, set up and ready to go.

FLEX with Edit, Asmb and installation disk is $199.

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WORD PROCESSING SYSTEM FOR OS-9

DynaStar
Full Screen Editor
for OS-9 Systems

This is the HOT one everyone is talking about. Easy as pie to learn and use. People call and rave about how easy it is to use, and how quickly they got it running. DynaStar is the screen editor we've all been waiting for and now it's here. DynaStar has sold more copies in the first month than any other program we have. Here are some of it features.

Full Screen Editor with a Rich selection of Single Keystroke commands!

MOVE CURSOR Left, Left word, Right, Right word, Right Tab, Up, Down.

SCROLL Up, Down, Up Screen, Down screen

DELETE Character, Word, Line, Block.

PLUS Find string, Substitute string, Move block, Word wrap, Right Justify, Center. Also read and write side files, Execute Shell commands, Optional help menu

User c figurable to virtually any terminal.
Available soon for FLEX 9.

INTRODUCTORY PRICE $89.95

DynaStar
Word Processing System

Coming soon!! Full word processing for the DynaStar screen editor. The package will be ready in May. It will include all the capabilities found in other word processors plus many unique to DynaStar. Some of those features are, Mail Merge, Form Letter support, Macro capability, conditional IF, Pagin, and much more...

Spelltest

From Dale Puckett

FAST 6809 MACHINE CODE

SPELLTEST is the most versatile 68XX spelling checker available.
MENU'S MAKE OPERATION EASY. From the menu you may: Print a list of suspect words; Print a list of valid words; Check each suspect word one by one; Read your text, stopping to check suspect words; Use additional dictionaries for more thorough checking or special applications; Build an additional dictionary of newly accepted words; Write correct text file to disk.
While checking you may: Accept the suspect word; Accept and save in the dictionary; Replace with correct spelling.
Designed to be used by the layman, SPELLTEST is right at home in the office. Ease of use and speed will recover the cost in days.
22,000 word dictionary covers the first 25,000 entries in the American vintage listing of the most common English words.
500 built in common words (and, or, the, etc.) and 300 specific to your field, filter the text and allows a large file to processed even in small computers.

PRICE $199.00

CRASMB

MULTI CPU CROSS ASSEMBLER FOR 6809 FLEX
by Frank Hoffman

CRASMB is a conditio al macro assembler with the capability to use different CPU overlays in order to cross assemble. These CPU overlays called *"CPU PERSONALITY MODULES" (CPM's)* can be called from a source file, thereby making it easy to create object code for a variety of CPU's. It is also possible to create new *CPM's* yourself for any 8 or 16 bit CPU. The information needed is included in the manual. If you decide to do this, it would be advisable to purchase the source for one of the *CPM's* and modify it rather than starting from scratch. *CPM's* are currently available for the following CPU's: 6809, 6800, 6805, 6502, 280/8080, 1802, and others coming.

PRICE $139.95

Includes one 8 bit *CPM* of your choice (not source)
Additional *CPM's*
8 Bit $25.00 *Source $25.00 extra*

6502 TRANSLATOR
Translator 6502 code to 6809
$75.00

INVENTORY with MATERIAL REQUISITION PLANNING
$100.00

SUPER SLEUTH
Disassembler for 6800/6809 or Z80
$99.00

TABULA RASA
Electronic Spreadsheet
$100.00

AUTOTASK

for 6809 FLEX

Just what does a program with the name AUTOTASK do? That is the question, and I will try to answer it. AUTOTASK can be thought of as an addition to FLEX, in that it resides in the background and adds several capabilities to FLEX. For instance, you can run a series of programs or tasks automatically with it, hence the name AUTOTASK. But it's more than that, and its power is not going to come through in this small ad. The tasks are put into a buffer that's similar to a stack. You can add or remove things from the buffer at any time from any program. This means that a running program can change the flow of the procedure that AUTOTASK is running. This may sound familiar to users of the Job Control Program that we also sell, and it is similar in that many of the same things can be done, but different in the way it works. AUTOTASK runs a procedure like JCP but when that is over with, AUTOTASK goes to sleep until it is called to do something else. JCP runs a procedure and then ends, removing itself from memory.
AUTOTASK is small (less than 1 K) and can be configured to be even smaller at assembly time. AUTOTASK can be changed on the fly. It also has conditional features and can call procedures from the disk. It is also simple to use and can be used interactively. To really get the feel of it you have to try it or buy the manual (can be applied to future purchase).

PRICE $129.95 with source on disk.
Manual $10.00

Dynasoft PASCAL 1.4 for OS-9

Dynasoft Pascal 1.4 includes all the features of the FLEX version 1.3 with the following ehhancements. Chain, Fread, Fwrite, Seek, Open, Create, Close, Delete, Fork, Send, Wait, Sleep, Settime, Time, Getstatus, Setstatus, SetPriority, GetProcID, and JSR. This is an excellent and fast program, small enough to write utilities but powerful enough for things like DynaStar.
Object only $69.95
Add for run-time source on disk $30.00
Add for source of Dynasoft Pascal itself! $125.00

Dataman+

DATA BASE MANAGEMENT
ONE PROGRAM THAT DOES IT ALL!

DATAMAN + is for BUSINESS systems with 56K user ram. You can use DATAMAN + for inventory control, work scheduling, mailing lists, sales reports and much more. The powerful report writer lets you create invoices, statements, form letters, and any other type of report your business needs. You can perform calculations with your data and print out the results. Special printer handling allows use of any size column output, not just 80 and 132.

DATAMAN + is password protected at the menu level so that redundent password prompts are eliminated. We've added the human touch with the use of the operator's name and calculator style input. DATAMAN + checks for valid data types on input thus eliminating erroneous data in your database.

DATAMAN + 's report writer has added intelligence so that separate select programs need not be run to create different reports from the same database. As a matter of fact, the report writer is so flexible that you can use it to create invoices, statements, even form letters using data from the database. You can even perform calculations with the data and put the results in the report.

Setting up your system to run DATAMAN + is very easy and automatic. The entire system has been designed with the inexperienced user in mind. The operation of the system is so easy that although a manual is provided none is required to run DATAMAN +.

It's easy to create databases and reports with DATAMAN +. Full editing capability has been added to make it a snap. DATAMAN + is the first truly RANDOM DBM system to allow any size record and any number of fields.

Modifying DATAMAN + is easy because DATAMAN + comes with every line of source on disk! and an easy to use manual with sections on each program for the programmer who wants to make modifications or customize it.

An upgrade will be available for users with DATAMAN.
FLEX version available now. $199.95
UniFLEX and OS-9 versions soon thereafter.

THE BILL PAYER SYSTEM™

THE BILL PAYER is a package of 10 menu driven programs in TSC Extended Basic. This powerful system helps you keep track of your bills. You can create a vendor list, enter invoices to be paid, generate reports about them, print your checks and much more. Uses random access files.

Explore Package now included at the same price.
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POLICY

Because of a few complaints received concerning our way of doing things I will repeat a policy we published some months ago. I have certain policy requirements that some other magazines do not have. I do not now and do **not intend in the future to attempt to emulate other magazines!** What we do we do because I feel that all things considered, cost, reader satisfaction, advertiser consideration, distribution and the size of our market place dictates some trade-offs and compromises. There are a lot of ifs, if there were more advertisers, if there were more 68XXs being used, if there were more manufacturers making 68XX devices, if the economy was better, if postage didn't keep continually increasing, on and on. But as we all know the ifs are a continual gotcha. So, I publish 68 Micro Journal in such a manner as to try to keep away from the gotchas and negate the ifs for the least impact. The results are compromises and are never optimal. But at least we do have a magazine, just for us and it keeps coming every month and is full of something that all of us can use and in many cases something that many of us need. To me that is the name of the game, being. Also there is one thing for sure, **there is more 68XX related material in 68 Micro Journal than all the other magazines combined!** Standard S50 Bus, Color Computer or you name it, 68 Micro Journal has much, much more.

Over the past four years, and we have been around all that time, five (5) other magazines have attempted to publish a 68XX magazine, before and since we started. To the best of my knowledge some failed, a couple are still around, and 68 Micro Journal still covers over 80% of the market. The reasons are fairly evident, first we do our own printing, binding, editorial work and in fact everything except our mailing. This makes us unique in the world of magazine publishers. Most others have to have it done by outside vendors. This increases cost. Also we do most of our typesetting **on our own 68XX, Standard S50 Bus computers!** We do this for more than one reason. We do it because we are proud of the quality of the hardware and software that allows us this option. Also we do it because the computer knows more about its own language than any human typesetter. That is why you will seldom see a long list each month of errors from previous issues, in 68 Micro Journal. Check some of the others! There is nothing more annoying than to type in a program and then spend two or three months going over, and over and over the program trying to find out why it 'bombs' and then be told (two or three issues later) that a human typesetter had transposed or unknowingly left out a 'couple of lines'! Also another complaint is that some of the letters and other info we publish is hard to read. Well, there is a good reason for this, it came to us that way and in hopes that you can use it we publish it just as we received it. At most other magazines it would have been dumped to 'file 13' and you would have never gotten the information. This way we think is better.

However, the major consideration also figures into all of the above. That is **COST!!** Our 'get ready' and 'make up' cost are the same as if we were going to print 250,000 copies, of course we don't, our group is nowhere near that size, so we have the same initial cost as the biggies. Believe it or not but the paper and press running time is a smaller factor. Our presses can run 150,000 sheets of paper about as fast as we run 15,000 sheets. But again the set up time is the same, and so is that cost. Also we could typeset more but by this time we are scratching our heads trying to figure out how to keep the final cost reasonable. We keep it down by photo-reducing as much as we can, using our computers to generate as much text as we can and most **important of all is you the ones who contribute your experience and skill to all of us by sending us your efforts, in the form of articles, hints and kinks and other valuable and much needed information.** For this I and thousands of our readers are grateful to you!!! We can never THANK you enough.

Our loyal advertisers are also to be thanked, for without them we could not continue. And then we would all be back where we were five years ago, a fine group with excellent soft/hardware but nothing in the other magazines for us! It is still that way.

I was lately told by one of our advertisers that 68 Micro Journal 'embarrassed' him in the eyes of one of his friends or a customer, I don't remember which. For this I am truly sorry, BUT I have no intention to change things much. If I did he would soon have no place to advertise his goods (and reach a significant part of the 68XX market, at a reasonable rate), the cost would become a certain gotcha. The 'numbers game' rules still demand our doing the best we can and exist. Exist we do and intend to continue, but there are bills to be paid and readers who want this information, so to stay in the 'black' end continue to bring you the very best I can, some corners will be 'cut'.

I have had less than bubbling reaction from some of our advertisers and manufacturers of Standard S50 Bus concerning the 68XX Convention, in Atlanta in June. Seems that these dates conflict with NCC. A pity as NCC has far less for us than a good assembly of our 68XX folks. It should be noted that some had committed to NCC before we could get this info out. I will still be there as well as some of our advertisers and for those that do make it, I feel sure that the effort will be well worth it. Also to dispell a possible rumor; I and the whole CPI family, 68 Micro Journal, Data-Comp/S.E. Media will be there. One other point needs to be made, I and CPI have no interest in this show other than to have a place to get together. We have NOTHING to do with the arrangments and will not receive even one penny for our efforts! In fact we will be paying the same price as every other exhibitor and even donating door prizes! We are supporting the 68XX Convention because hundreds of you ASKED for it. That is the only reason. I must admit that even the sponsors of this event have not indicated much enthusiasm either. All I can say is that for all the years we have exhibited in Atlanta this year seems to be the quietest. However, we and others will be there and look forward to seeing all of you!

Flex User Notes

BY: RONALD W. ANDERSON
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ANN ARBOR, MI 48105

MORE ON SPELLING CHECKERS

Peter Stark's Magic Spell has been enhanced by compressing the dictionary by a simple technique. The previous dictionary occupied about 420 sectors. The compressed version occupies 189, and it is processed in 45 seconds. Peter's dictionary is about 13,000 words in length. When you add words, the resulting file is automatically "uncompressed". You may, however, stop the output at a number of sectors specified by you, and change disks to save the remainder of the file. The expanded file with the added words may then be compressed again into a single file, using the COMPRESS utility supplied with the new version. I ran a test on a file of about 2000 words, and found Magic Spell to read the text file in 30 seconds, and process the dictionary in 45 more. Magic Spell now reads as much of the dictionary file as it can, finding suspect words, outputs those words for your consideration, and then

finishes reading the dictionary, outputting more words after it has finished. Peter indicates that this change was done so that if you are adding words to your dictionary, the drives won't select and deselect heads for every sector of old dictionary copied to new dictionary.

This dictionary compression feature makes a very large dictionary feasible even with a 5" disk system. The only juggling that has to be done, is limited to the process of adding new words. Operation is still simple and well prompted.

BOOK PROJECT DONE!

Yes, I've finished my book on Pascal Programming. It has been shipped to the publisher, and will hit the bookstores around early Summer, I'm told by TAB. I spent the entire four day Newyears weekend finishing up the text and printing it on a borrowed Centronics 737 printer. I was really impressed by the quality of the output of the 737 when in the high quality mode (proportional spacing). To take full advantage of this printer, you need text processing software that will justify text on a proportional spacing printer. The latest version of Stylograph will do that quite well. That 737 output looked for all the world to me like the output of a good electric typewriter. Characters are all well formed with no "Mickey Mouse" fake descenders on p, q, y, and g. All lower case letters are true lower case and not "miniature" upper case letters. I had only one problem using the TSC text processor. It doesn't support the proportional spacing table required to get true justification. I found, however, that the lines were quite uniform in length, and acceptable in a double spaced manuscript. The only large problem was that the proportional spacing fouled up all my tables. The columns were automatically "detabularized". Had I this job to do over again, I would use Stylograph, which would produce fully justified output, and aligned tables.

I've tried to include numerous examples of various kinds of programs in the book, and I will (pending approval by the publisher) include one or two in this column. I worked out a 5 page pascal program that is a simple text formatter that provides variable line length and margin, paragraphing, paging with page numbers, right justification of titles, centering of titles, and formatting of tables etc. without justification. All paragraphs are fully left and right justified.

NEW VERSIONS TO COME

Speaking of Pascal, OmegaSoft has just released version 2 for FLEX09. We received a copy yesterday, so I can't say a great deal about it yet. It has a number of new features including the implementation of RECORDS. I ran a quick compile of a program that I had done in version 1. (A Prime number program, of course.) It compiled in the same time, assembled in about 20% less, generated about 10% less code for the program, (more than offset by an increase in the size of the runtime code), and ran about 30% faster. I promised Bob Reimiller that I wouldn't review it yet, but let the dust settle a bit and see if the first field use uncovers a few bugs. I won't worry if I find a few, because OmegaSoft has been extremely responsive to bug reports, generally having a fix in a day or two! This compiler is very complete, a whole system in itself, well integrated into FLEX, and priced probably out of the range of most of the hobbyist market. I'll fill in more detail in a more complete review after I've had time to digest all the new features.

I suspect that many of the SS-50 users that read this column are more than hobbyists. That is, they thoroughly enjoy this hobby, and use the knowledge in software and hardware gained in the hobby activities directly in their profession as well. If you have a need for an excellent native code compiler that interfaces well with hardware and the outside world, look into this product.

Lucidata has announced the availability of their Pascal compiler in a UNIFLEX version, most likely before you read this. They have added some enhancements in their "revision 6 of the run-time system and level J of the compiler." These include the extensions necessary so that a program may prompt the user for a filename, and then open that file for use by the program. It will work something like this. If you have a logical filename DATA in your program, and want to associate it with a filename within the program, (a SCRATCH file, for example), you would use ASSIGN (DATA, 'SCRATCH.TXT.1');. If you had input a string into an array of character called FILENAME, I assume you could use ASSIGN (DATA, FILENAME);. Since Lucidata has an extension that allows you to read a string into an array of characters, you could prompt for the filename.

```
WRITELN ('DATA FILE NAME ? ');
READ (FILENAME);
ASSIGN (DATA,FILENAME);
RESET (DATA);
```

The file whose name you input in response to the prompt would at that point be opened for read, and associated with the internal program logical filename DATA. Some of this is conjecture, since I don't at this moment have the new version to try.

NEED HELP? BE SPECIFIC.

I received a half page letter from an SS-50 bus user a couple weeks ago. It essentially lists this user's hardware, (indicates non-FLEX system operation), and says that most or all of the software "doesn't work". The BASIC "always seems to give me error codes no matter what I try to do on it". Since I have never seen the operating system in question, and have not used any of the software, there is not much I can do to help. Any readers nearby who could give this reader some help? He is Harry Colborn, 1152 3450 Drive, Hotchkiss, Colorado 81419. Anyone in the area familiar with Percom hardware and software in a SWTPC 6800 system could be a great help in getting someone started in the right direction. With the limited information I've received, there is little I can do from here.

MORE ON 6809 ASSEMBLER CODE

In line with continuing my series on effective use of 6909 assembler, I've found some new users of the 6809 a bit bewildered by the concept of indirect addressing. It is really not terribly hard to understand when you use an analogy with indexed addressing.

LDA 0,X loads the accumulator with the contents of "the address contained in the X index register". That is, if X contains the value $14FE, the A accumulator is loaded with the contents of address $14FE. In a very similar manner, LDA [$1000] uses the contents of addresses $1000 and $1001 as a 16 bit register to point at an address whose contents are to be loaded into the A accumulator. If address $1000 contains $14 and address $1001 contains $FE, the result of LDA [$1000] would be to load A with the contents of memory address $14FE, the same result as the indexed instruction above.

Thus you can see that indirect addressing provides a virtually unlimited number of pointers in addition to the four hardware pointers (X, Y, U, and S) provided in the 6809. I don't mean to complicate things unduely here, but the instruction LDA [0,X] would load A with the contents of the address pointed at by the contents of the address pointed at by the X index register. No, I didn't accidentally repeat myself, and

there is no typographical error in the preceding sentence. The result of that instruction is to use two levels of pointers. X points at a pointer that points at the data.

Then we have what is known as "register offset indexed addressing". The instruction looks like LDA B,X or LDB A,Y or LDA D,X. The effect is to add the value in the register to the index register contents. For example, if B contains $10 and X contains $1000, LDA B,X would load A with the contents of address $1010. This sort of instruction is very useful in an application such as a look up table. Suppose you want to translate ASCII codes into some other code. You might use a table like this.

```
TABLE EQU * * COMMENTS SHOW VALUE IN B ON ENTRY.
FCB IS VALUE IN A ON EXIT
  FCB 'q  ASCII 0
  FCB 's  1
  FCB 'b  2
  FCB 'x  3
  .
  .
  FCB 'A  $23
```

Now suppose we write a subroutine that is entered with the ASCII value in A and returns the "looked up" substitute value in B.

```
LOOKUP LDX #TABLE
     LDB A,X
     RTS
```

Now, enter the subroutine with with the value $23 in A and you will get $41 returned (the value of ASCII A). You might use this sort of approach, for example, in driving an old IBM typewriter, whose character set is scrambled with respect to the ASCII codes. Your program would output the ASCII codes just as it would to your terminal, but the output routine would include that subroutine to translate the ASCII character to the required foreign code to print that character on the typewriter. The table uses only one byte per output code, the position in the table corresponding to the input code. Writers of compilers make use of the register offset instructions in array accessing. Suppose we have an array of double byte values such as 16 bit integers. We can load X with the "base address" (the address of the array value that corresponds to subscript 0). Now LDD INDEX (the array subscript corresponding to the value to be found). Since the array elements are double bytes, we have to multiply the value in D by two, perhaps by using ASLB followed by ROLA. Now, LDD D,X will get the "INDEX'th" value in the ARRAY in the D accumulator. (Just in case you need a reminder, the D accumulator consists of the A and B accumulators together.) D holds a 16 bit value, high order byte in A and low order in B.

The 6809 has what is called auto increment and decrement mode indexed addressing. LDA 0,X+ does the same thing as the two instructions LDA 0,X and INX did in 6800 code. You may use two pluses to increment twice. LDA 0,-X does the same thing as DEX followed by LDA 0,X in 6800 code. Here also, a double decrement is allowed. When the auto modes are used, no offset is allowed. This mode applies to Y, U, and S as well. The 6800 had two instructions TAB and TBA for transfer of contents between the two accumulators. The 6809 has extended that to the more general TFR instruction. TFR X,D copies the contents of X into D. TFR A,B copies the contents of A into B. Any pair of registers are valid as long as they are both the same length. That is, TFR X,A is not valid because X is 16 bits and A is only 8. EXG works the same way, except that it causes the values in the two specified registers to be swapped.

MORE ON USING LUCIDATA PASCAL

A time or two ago, I included a memory dump program. I thought it might be informative to show how to duplicate the output of that exactly, with a Pascal program. This program is only possible because Lucidata has implemented some extensions. The necessary one is the ability to declare a variable at an absolute address. Unfortunately, since Pascal doesn't allow unsigned arithmetic and doesn't have a TYPE HEX variable, there are still some limitations. Perhaps someone will see a way around this, but I don't think it is possible presently to access memory above $7FFF for a dump. The problem is that the limit of integer arithmetic is +32767 ($7FFF). In fact, I found I got an arithmetic overflow until I reduced that limit to 32766 or $7FFE. The thing that makes this dump program possible is the ability to declare a variable at an absolute memory address.

Lucidata has a means to do this. I found that their Pragmat feature, would work only with comment delimiters (* and *), though they will accept the "curly braces" elsewhere. (A pragmat is essentially an instruction passed to the compiler that is not part of the program itself, such as instructions to turn the listing on and off, analogous to LIS and NOL instructions in an assembler). Lucidata signals the compiler that an instruction is to come by placing a "$" immediately after the left comment delimiter. To start allocating variables at a particular memory location, (suppose $100 for example) you simply include the following comment before the variable declaration in the VAR section of the program. (*$ADDRESS=$100 followed by optional comment *). To go back to allocation of variables on the stack (the normal mode) you use (*$STACK*). ADDRESS may be abbreviated A, and STACK may be abbreviated S.

The listing is presented here and you may see that I declared a variable MEMORY : ARRAY [0..32766] of BYTE. Byte is an extension in Lucidata, and is a single byte integer type, that is it has the value range of 0 to 255. Since the array was declared starting at $0, the index value into the array is identical to the memory address being accessed! Now the only problem is to do the conversions to hexadecimal for input and output. You enter the starting page as a hex value such as 0F to dump memory from $0F00 to 0FFF, for example. The input value is treated as a character and converted by the procedure GETPAGE to an integer (which is represented as a 16 bit binary value in Pascal) so that it is in the proper form to access that memory area.

The function HEX takes one HEX digit, which can have the binary value 0000 through 1111, representing 0 - - F, and converts it to the proper ASCII character to represent the digit. A memory address is four hex digits. The value PAGE represents the two high order digits. LINE represents the next digit, and the index variable L represents the low order digit. The sum of PAGE times 256 + LINE times 16 + L is the address of the byte to be shown. PAGE DIV 16 yields the value of the highest order byte of the address, and PAGE MOD 16 yields the value of the next order byte. Line is the third and L is the last. Performing the HEX function on those four values and outputting them, produces the address at the start of each line. The DIV 16 and MOD 16 trick is again used to split the contents of each memory location into two hex digits for their output.

When a line of 16 bytes has been output as hex digits, that line is repeated with the ASCII representation. There are two problems here. First, the first 31 ASCII values represent control codes, and if they are output, the cursor may be redirected, the screen cleared, etc. Secondly, Pascal will generate an error for any ASCII value larger than $7F (decimal 127). That is, the 8th bit of the ASCII code must be zero. If M > 127 THEN M := M - 128 takes care of the 8th bit, and IF M < 31 THEN WRITE (CHR (M)) ELSE WRITE ('.'); takes

care of control characters. This is, by the way, exactly how the assembler version handles control characters and the 8th bit. OmegaSoft has an extension that allows in line assembler code that could be used to write a procedure to AND the value of M with $7F to do the same thing. The AND function in Pascal is only implemented for Boolean variables. That is, it is not a bitwise AND.

The program runs in a REPEAT UNTIL loop, and after output of each page of dump it asks for a command. Just as in the assembler version, I've implemented a command table. E will exit the program. N will result in a prompt for a new page. F will dump the next page and B the preceeding one. As I indicated above, I don't see a way of accessing all of memory with this program. Since HEX constants are allowed, I tried defining constants MIN = 0; MAX = $FFFF; and then declaring MEMORY : ARRAY [MIN..MAX] OF CHAR; I got an error message that indicates that MAX is a smaller number than MIN, so apparently it is not recognized as an unsigned number even if declared as a Hex constant. At any rate, the program might illustrate how it is possible to generate a system utility program in Pascal, and show how some Hexadecimal values can be handled.

See Page 36 Pascal Program P Dump Listing

COLOR User Notes

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Well, another month for the photo-oopy routine -- I have my Computer on line now, but the Disk Controller is still very ILL. (For those who missed last months' Column; the Primary windings of the Power Transformer in my computer opened, creating havoc with various and asundry parts internally - the new unit I obtained was also open. There was no sign of overheating, etc., it just died; or, more like it, had a stroke.) All systems should be up-and-running by next month - HOPEFULLY. Something like this makes you realize what a SUPER Operating System FLEX is, and how much power and flexibility you have with such a System.

While we are on the Power Supply subject, my problem was not unique. I have talked to SEVERAL other Color Computer owners who have had the same failure; must be a problem with the Transformer itself, although it normally does not cause any damage to other parts when it goes. These things show up sometimes; hopefully, Radio Shack will see the problem in Parts Flow and solve it. Another item; the Crystal Oscillator which generates the System timing appears to be extremely sensitive to +5VDC instability. Since the "TINT" and "COLOR" on the TV are controlled by this frequency, it is easy to determine when your +5VDC Regulator is not up to par. If you are getting different Color "Tints" with RESETS; or the Color is just not stable, then you might consider replacing the Regulator before it goes and really 'cleans house' with Memory Chips, etc.

I have a few FLEX Disks that I haven't been able to read in a while - one from Pete Stark of Starkits on his MAGIC SPELL Dictionary for the Color Computer FLEX Operating System with a "READ/ME" file on it that I'm dying to read. Any body know how to read magnetic filings; I may try it if my Controller doesn't show up soon. Also, I think I have a copy of TSC's XBASIC converted to run on the Color Computer FLEX System from DATA-COMP (615 842-4601) - that will sure open the use of this machine to a lot of GOOD Programs. We'll look at these and several other things next month.

CARTRIDGE TAKE-OVER DISABLE:

Evidently we a gaining some new Color Computer users AND readers: I have a couple letters wondering about the "Cartridge Disable" we mention in some of the 68 MICRO JOURNAL ads in other magazines. As a review for new readers, and a little more info on the Cartridge Slot, the following discussion is presented:

Slide the 'door' on the Cartridge back so you can look at the Printed Circuit Lands on the edge of the Board: notice that one of them on the TOP is shorter than the others, that is, it does not come all the way out to the edge of the Board. That is the +5 VDC Land (more about it later). It is Pin 9 on the Cartridge Connector; the Land right below it goes to Pin 10 on the Connector. To disable the "Cartridge Take Over" feature of the ROM-Packs, COVER PIN 8 (eight) WITH A PIECE OF SCOTCH TAPE. Pin 8 is the Land on the bottom of the Board just to the LEFT of Pin 10; so cover the BOTTOM Circuit Land just to the LEFT of the "shortened" +5 VDC Land on top (looking into the Cartridge with the edge that goes to the BACK of the Computer on your Left). If you cover the wrong one in that area of the Board, it won't hurt anything.

Pin 7, the one just above the "covered" PC Land, is the "Q" Clock Signal; normally it triggers the "CART" line and causes this "Take-Over". Since some Expansion Cartridges in the future MAY use this signal, covering Pin 8 will allow it to operate normally.

Once you cover that Land, the Cartridge will not "Take Over" the Computer when you turn it on. To use the Cartridge, ENTER 'EXEC &HC000' and hit '<ENTER>'. This causes the Computer to 'EXEC'ute the program at Hex Address 'C000'. There is no way to get back to 'BASIC' except with some of the non-Radio Shack Monitor Cartridges like The MICRO WORKS CBUG Monitor, which has the capability of "Jumping" to a program (or in their case, 'G'oing to BASIC).

The reason the +5 VDC Land is shortened on the Radio Shack Cartridges is so you will be LESS LIKELY to cause any damage to the Computer if you plug the Cartridge IN, or UNPLUG it, while Power is ON. That shortened Land helps insure that all other connections are made before POWER is applied to the Cartridge. It is RISKY to PLUG and UNPLUG Packs with the Power ON, but it usually doesn't cause any problems with THOSE Paks. NO NON-RADIO SHACK CARTRIDGE that 'I' know of has this protection; they will DEFINITELY blow parts in the Computer if inserted or removed with Power on

(AS WILL RADIO SHACKS new DISK CONTROLLER, which does NOT have this same protection ?????).

'COLOR COMPUTER USERS NOTES' INDEX:

Along the same reasoning, the following is an INDEX of the past COLOR COMPUTER Users Notes Columns, so you can specify which specific issue you need when requesting Back Issues of the 68 MICRO JOURNAL Magazine:

May 81: An article by Bob Margeson on C.C. fixes.

Sep 81:
REVIEW: CER-COMP COLOR COMPUTER EDITOR; An excellent Tape Based Line Editor.

Oct 81:
GENERAL: Introduction to the CCUN Column.
INFO: More 'fixes'; heat problems, sticky Keys, 32K Mod, inserting Cartridges.
REVIEW: DATASOFT S.E.C.S. Screen Editor (not impressed).
REVIEW: DATASOFT SIGMON - an EXCELLENT Tape Monitor (which I still use A LOT).

Nov 81:
REVIEW: EXATRON's "Expension Interfece" and Disk Controller which are now being used for the 'FLEX' Operating System on the Color Computer - Both Excellent!
REVIEWS: The MICRO WORKS CBUG Monitor (including wiring it into the RS Diagnostics Pak), 6809 DISASSEMBLER Source Generator; Both EXCELLENT, as are ALL of their products.
Also has another review of S.E.C.S. and SIGMON; and the initial letter from Steve Odneal on his "FLEX" Conversion to the Color Computer, which is the one now being sold by DATA-COMP.

Dec 81:
REVIEW: ARMADILLO SOFTWARE's ARMADILLO BUG - A monitor written in BASIC - Good.
QUICK LOOK: TALLGRASS TECHNOLOGIES DISK INTERFACE and FLEA Monitor - Both good but has limitations.
QUICK LOOK: CER-COMP Mdisk+9 - a very good Disk Operating System ROM for the TALLGRASS Controller.
QUICK LOOK: CER-COMP CO-RES9 Editor Assembler - Tape based, EXCELLENT. Full Assembler which provides Pagination on Listings.
QUICK LOOK: CER-COMP TRSMON - An excellent Tape based Monitor.
BOOK REVIEW: MICROCOMPUTER ARCHITECTURE AND PROGRAMMING by John Wakerly - An EXCELLENT Book which any one interested in this type of a Magazine should HAVE IN HIS LIBRARY.

Jan 82:
GENERAL: Discussion updating Col. Comp. info. and the first discussions of using FLEX on the Color Computer and its' configuration.
REVIEW: MARK DATA PRODUCTS BERSERK - an excellent Game which makes very good use of the C.C. Sound and Graphics capabilities.
PRODUCT REPORT: The MICRO WORKS MICROTEXT ROM Pack for use with Modems and Communications - provides a Printer Output at the ROM Pack. As usual; OUTSTANDING.
RUMORS: About R.S. Col. Comp. Products and the FIRST (to my knowledge) PUBLISHED hints about the new "introduced" 68000-based Model 16.

Feb 82:
INFORMATION: First discussion of the 6883 SAM and "REAL" capabilities of the Color Computer.
QUICK LOOK: ATOMTRONICS 64K Mod and WOLFBUG Monitor - it WORKS Great!!

Mar 82:
INFORMATION: Further discussion of the 6883 w/ use of 96K Memory, adjust Tape Player for 'hard to read' tapes.
REVIEW: The FLEX Conversion Package.
QUICK LOOK: Radio Shack DISK SYSTEM.
QUICK LOOK: NELSON SOFTWARE's SUPER "COLOR" TERMINAL - Looks GOOD for ANY type of Communications; Modem, to other Computers, etc.
REVIEW: COMPUTERWARE's COLOR PAC ATTACK - OUTSTANDING.

COLOR COMPUTER NOTES:

There seems to be a "BUG" in the BASIC V1.1 ROMs in the RESET/Clearing Pointers area. I haven't been able to nail it down to a specific area yet - thought I'd mention it and see what you have found. If we can get enough information, it will make it a lot easier for Radio Shack to find a "fix". I first ran into the problem when I tried running a Machine Language program I had Taped on a new Color Computer. The program was one of the 'load-and-go' Tapes, which I had stopped with RESET and then loaded with MY Tape deck (I was having trouble reading the original due to Head Alignment). It had played with no problems on my System, but when I went to show it to someone on a new unit, it WOULD NOT RUN. After some checking, we found that it was the Systems with the new Version 1.1 ROM that the Program would not play on. Since then, I have run into a few other things that I think are related.

With a new 32K unit with the Radio Shack Disk System, I have found that two different Machine Language programs will not run when loaded from Disk IF a BASIC Program has been "RUN" previously. Hitting <RESET> will not enable it on one of them; the Computer must be TURNED OFF and Back ON to get the program to run. The problems are probably tied in with the fact that Disk BASIC's Variable Storage area goes all the way up to $0988, which means that M. L. Programs will have to start ABOVE this area, and that it will NOT be CLEARED from a RESET. How about letting me know of any problems you have had along these lines; what problems, under what circumstances, etc., and maybe we can accumulate enough information to nail it down.

Next item: I am hearing RUMORS that there is a GOOD chance the 32K RAMs in the Radio Shack upgrade package are NOT 32K after all; but 64K units with ALL 64K OPERATIONAL. I know the price of the chips has been dropping drastically; it now seems that the FULL 64K chips are as inexpensive,

or maybe even less, than the original 32K units (which were 64K chips with a bad bank) were a few months ago. If this is true, whole new fields are opening up. I have been running the ATOMTRONICS 64K Mod for a while (at least when the Computer was working - they appear to have lived through the problems OK), and it is great. A little more work on WOLFBUG (which just doesn't seem to like the EXATRON Controller right now - and again, I haven't been "up" with the system enough to define the problem yet - I suspect some overlapping memory problems right now, though), and it WILL BE GREAT. I must mention, in complete fairness, that the problem with WOLFBUG is ONLY WITH THE EXATRON EXPANSION UNIT HOOKED UP; WOLFBUG works GREAT, otherwise.

I think you will see a lot of amazing, to some, anyway, things happening with this machine in the near future. We have a Radio Shack DISK CONTROLLER / FLEX marriage working right now; it still needs some smoothing out, but the idea is feasible. Also, I know of some more Disk Controllers on the way - I have already mentioned ATOMTRONICS Double-Density, multiple Side/Track system in previous months to name just one. Frank Hogg is advertising FORTH for the Color Computer; Microware is looking into OS-9 on the Color Computer; The Micro Works is working of a version of Ray Talbot's FORTH for this machine; I think you will see a lot more good programs from Computerware, both Tape and Disk; Nelson Software has their SUPER 'COLOR' WRITER Wordprocesser about ready on both Tape and R.S. Disk; etc., etc., etc.

COLOR SCRIPSIT -- Radio Shack

Cartridge --- $39.95

Well, I have finally obtained a copy of the long-awaited Word Processor for the Color Computer from Radio Shack. It is called COLOR SCRIPSIT; named after it's big brother, the SCRIPSIT Word Processor programs for the Model II and III. Being well acquainted with the excellent Model II version of this program, I may have been looking for too much, but I am a little disappointed with COLOR SCRIPSIT. To be honest, it IS one of the BETTER "SERIOUS" (not a Game) Programs they have produced for the Computer (along with "COLOR FILE" and "SPECTACULATOR"); and things seem to be looking up (-- RUMOR: -- They have been surprised that the COLOR COMPUTER is being taken SERIOUSLY by a lot of people - I hear they are considering producing some "REAL" Software in the near future.). Also, I'm sure that the use of the standard ROMPACK concept restricted the capabilities of the Program -- Oh, Oh: I see a hand in the back of the Room. Yeh, I know the Cartridge Slot can handle almost 16K of ROM - No; I don't know why it can't be used. Maybe just "We haven't done that before and just didn't think about it"??

So, just what do we have with COLOR SCRIPSIT? The best description is "a mini Word Processor". It is definitely beyond the normal "Line Editor" concept, although it CAN be used for BASIC Programming and Editing. It does not use the Line Number routine; the "Text" is displayed just exactly like it will be Printed on a Line Printer. You can manipulate Text at the Character, Word, or "Block" level; by Inserting, Deleting, Copying, Moving, Formating, etc. You can Left Justify (straight Left Column like normal typing), Center Justify, OR Right Justify (straight Right Column); but you can NOT justify BOTH Left AND Right. You can insert "soft" or "hidden" hyphens while typing the Text, or at a later time. You also have the capability of specifying Headers (the TOP of EACH page) and Footers (at the BOTTOM of EACH page); along with automatic Page Numbers. You can Print various portions of the Text, such as a single line, block, or the whole Text. Finally, you have the Find and/or Replace capabilities.

The Program is slightly "Menu Driven" in that it comes up with a Main Menu and has a few other Menus (for instance, the "STANDARDS" Menu). From the Main Menu the operator has the choice of:

1. CLEAR MEMORY
2. EDIT TEXT
3. SAVE ON TAPE
4. LOAD FROM TAPE
5. PRINT
6. CHANGE STANDARDS

Generally, the Program is "user friendly" and the Commands and Controls consistent. The <BREAK> Key is used exactly like a "CONTROL" Key, with the TOP row of keys defining the various functions (which is a weakness - you have to remember that "BREAK 5" is "TAB SET", for instance; "BREAK 'T'" would have been much better). BUT, <BREAK> is ONLY and ALWAYS a control key when Manipulating Text; it also Stops a Memory Clear, Searchs, etc., when not in Text Edit modes (which is a natural function of the Key for Color Computer users, so not a large deviation from the norm). The four Arrow Keys provide 'non-destructive' cursor control (Backspace is accomplished by "Left Arrow" back one char. and overtyping the mistake), while <SHIFT> Arrows provide jumps (i.e., <SHIFT> Up-Arrow jumps to the beginning of the Text; <SHIFT> Dn-Arrow to the End of Text; and Rt & Lft to the ends of the Line). "Tab" capability is provided, and Format changes are accomplished by Inserting a 'Control Character' in place of a SPACE on the Line of Text preceding the Format change (where Format refers to Line Justification ONLY). Hyphen possibilities can be located by the Computer; it looks for a place where at least 3 characters could fit on the end of the previous line, and you can determine where and when to insert one.

Since I haven't had a chance to use the Program much, I hope some of you readers will send in some reports on it. Generally, it sure beats not having anything, at the minimum, and does appear to be a fairly good program overall. I would prefer the "Control Keys" to be meaningful; ie., "Control I" for 'Insert', "Control C" for 'Center', etc., but use brings comfortable operation of a GOOD Program. Let's hope this IS one.

PROGRAMMING??

A lot of the people I have talked with the last several months are looking into Writing Programs for the Color Computer as a business venture. Of course, most of these people are "pushing the Technology of the Color Computer", so to speak; that is, they are the ones in the forefront of Color Computer Software and Hardware Development,

or are trying to get there. Since I have been shot down with a "busted" machine lately, I thought I would pass on some comments in the "food for thought" vein.

Lately, I have been working with a lot of different Programs; General Ledger, Accounts Receivable, Word Processors, etc. Some of the problems I have run into should help act as a guide for those investigating writing their own Software for the market place.

Many major Programs, especially those in the G.L., A.R., etc. lines which are intended for use by 'data entry' type personnel that are not technically inclined, are "Menu Driven" programs. This allows a Program Operator to start at the beginning of the program with a Main Menu, and select the operation required, such as "Daily Sales", for instance, and proceed to enter the data from Sales Slips, etc. When this is finished, you are brought back to the Main Menu, from which you select the next procedure; etc. This has become a fairly standard practice with Major Accounting type Programs as it DOES allow the use of the program by unskilled personnel; but it also creates some major problems.

The first one concerns the 'data entry'. If the person entering the data is going to be setting there day after day punching a numeric keypad, they are likely to get pretty good at it, right? Yet, I have seen Major Programs that set there PROCESSING THE ENTRY before giving control back to the operator for the next entry. Here an organization has purchased a Computer to speed things up, and an operator has to set there waiting two minuets for EACH data entry to be processed - that really speeds things up. These programs are normally written in Cobol, which is notorious for loading this module, run it, then load this module, run IT, etc., till it has found all the files and updated each one, then finally coming back to you again; IF THE PROGRAM IS NOT PROPERLY STRUCTURED.

The point of this discussion: if there is a lot of Data Entry required of the Program, set the Program up to start with so this data is stored in a file as fast as it can be entered by a SKILLFUL Keyboard Operator, and then can be processed at a later time (say at night, when the System is not needed for other things). Careful planning when the Program is initially developed will prevent this type of problem.

Another problem with the "Menu Driven" Programs shows up when something out of the ordinary comes up; either by accident (wrong entry, etc.), or from the users requirements. With most "Menu Driven" programs, the USER is LOCKED INTO A SPECIFIC PROCEDURE, whether he wants to go that way or not. Agreed, the Program must be 'SAFE' from unskilled operators; BUT PROVIDE A KNOWLEDGEABLE USER A METHOD TO BACK OUT OF A PROCEDURE WHEN THE REQUIREMENT EXISTS. Provide a way SOMEONE can salvage an error.

A couple of examples:

We have been running a small Accounting Package the last several days which FORCES you to make BACKUPS EVERY TIME YOU BRING UP THE SYSTEM. Normally, this would probably be a good idea; it makes sure you have saved the past 'data entry' session and in normal, routine use, IS a good procedure. BUT, this was an "initialization" period, where there is a lot of data to be entered to get things up to the present, and it is next to impossible to do this at one sitting. Well, WE SURE MADE A LOT OF BACKUPS, to the tune of several minutes each time. If there was a procedure provided to circumvent the "MAIN MENU" routine, for the knowledgeable user, it would sure have saved us a lot of time. The procedure does not need to be available to the "normal" user; BUT THERE SHOULD BE A WAY to 'dig your own grave'.

Next example:

We had a user setting up a Major Accounting Program; Accts. Rec., Gen. Ledger, Accts. Payable, Inventory Control, etc. Again, while initializing the system, they hit the wrong key and bad information was 'posted'. BIG TROUBLE!! There was NO WAY to either repair the mistake (yes, I know you have to have 'audit tracking'), or TO ENTER ANY MORE NEW "INITIALIZATION" INFORMATION: the system was set up so that the initial information was entered first, and then the "posting" would finalize things. WELL, IT SURE DID! Three weeks worth of work down the tubes.

By the way; NONE OF THESE PROGRAMS WERE ADVERTISED IN 68 MICRO JOURNAL.

All I'm saying is to put yourself in the OPERATORS position when you are designing a Program; consider how it will NORMALLY be run, and WHAT STUPID, DUMB, IDIOTIC THING could be done to "BREAK" it. If there is ANY POSSIBLE way, it will happen. The solution to the "posting" problem above would have been FULL WARNING that continuing this procedure meant that you were finished with "initialization" and ready to LOCK THE DOOR to any CHANGES, ADDITIONS, etc. This concept should be followed for any type of Program; remember Murphy's Law No. 1. Often, we are so involved with a Program, we forget that WE are not going to be using it, and that the "Operator" or "User" is not as familiar with it as we are.

Next month we will look at some ideas on "STANDARDIZATION" for the Color Computer so that a Program Writer will have SOME HOPE of his program running on the majority of it's Operating Systems.

32K RAM FOR FREE!!!

By Frank Hogg

"How to run Pascal, C, and Cobol, not to mention X-FORTH, and Spelltest, on the TRS-80 COLOR COMPUTER"

Someday, as the Honeywell advertisement would say, integrated circuit processing will become so inexpensive that computer memory will be available for FREE.

That day is today, for owners of the Radio Shack TRS-80 COLOR COMPUTER.

The story begins with my early production model (with a 3-digit serial number) of the 4k COLOR COMPUTER. Its logic board had some extra wires and things on it, indicating that the design was not quite perfected when it was produced. I heard that Radio Shack would

replace the board with a newer version if I purchased their 32k ram upgrade for $149.00, so I decided to give it a try.

When I took the computer to the local computer center, I was told that the upgrade would only cost $99.00. They did complete the upgrade, and indeed they did install a new logic board, containing eight memory chips with unrecognizable part numbers on them.

Various rumors have been circulating about how the 32k upgrade is accomplished. It is not done by piggybacking 16k rams! Neither is it done by installing 32k rams, as Radio Shack contends.

The 32k dynamic ram was only available for a short time. These parts were actually attempts at 64k parts that were only half-good, or they had some bad bits in one half or the other. The 32k upgrade was originally designed to take advantage of these parts - a jumper exists on revision E of the COLOR COMPUTER circuit board to select which half of the 64k dynamic ram is accessed.

Since then, memory manufacturers have learned how to produce 64k chips with sufficient yield to drive the cost lower than you or I, or Radio Shack, expected. These chips are available by mail order, in small quantities, for less than $12.00 each. Radio Shack can certainly buy them in quantity at a lower price.

The astute reader will have guessed the punch line by now. The 32k COLOR COMPUTER actually contains 64k rams! I am not in a position to guarantee this, of course, but so far it seems to be the case. I will now tell you how the "other 32K" might be useful to you.

USING THE FULL 64K RAM.

None of the versions of Radio Shack Color Basic know how to use the other 32k. As a matter of fact, this memory is not available to the cpu at all in an unmodified COLOR COMPUTER. This is due to an easily correctible omission in the design of the computer.

The dynamic memory in the COLOR COMPUTER is controlled by a chip known as the SAM, or synchronous address multiplexer. The SAM bears the Motorola part number 6883, or 74LS783. The SAM takes care of refreshing the rams and interlaces the access cycles of the cpu and the video display so that no "specks" occur on the screen. The SAM must be programmed differently for 4k, and 16k, and 64k rams. (this is why Color Basic 1.1 was written - version 1.0 didn't know about 64ks.) The SAM also provides address decoding for the three rams, as well as the I/O hardware.

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

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

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

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

THE MODIFICATION IS REVERSIBLE.

One of the extra NOR gates must be connected into the circuit as shown in figure 1. This modification disables the selection circuitry (G2B high) if a write is attempted (r/w low) and a rom is addressed (r/w low). If you have some experience with fine soldering, you can accomplish this modification in a reversible fashion, allowing you to run to Radio Shack if your COLOR COMPUTER breaks. Warning - you must remove that nasty sticker on the back, thus voiding your warranty (if you're still covered), to get inside.

The procedure is as follows. Remove the case and the top of the rf shield. On the right behind the keyboard, you should be able to find the IC's and TP1 as shown in figure 2. They are also marked on the board. U11 is a 74LS138, and U29 is a 74LS02.

You may wish to obtain a new 74LS138 and a 74LS02, so you can save the "originals" for a rainy day. In reality, Radio Sheck probably doesn't remember what brand of IC it put in your computer, but precautions are cheap. Anyway, carefully remove those two IC's. (they are not especially sensitive to static.) Bend pins 4, 5 and 6 of the 74LS02 up in the air, as shown in figure 3. They must be almost straight up so they don't touch the shield. Similarly disfigure pin 5 of the 74LS138. (be gentle!)

Next, using a short piece of 30-gauge wire, connect pin 6 of the 74LS02 to pin 8. Pin 8 must plug back in, so try not to get solder down on the pin. You should tack the wire on the very top of the pin, where it enters the package. If it doesn't come out right, buy another 74LS02 - it costs much less than a new computer.

You can do the rest of your soldering either before or after you plug the chips back in - use your own judgement. Pin 4 of the 74LS02 must be connected to pin 5 of the 74LS138, and pin 5 of the 74LS02 must be connected to TP1. I recommend that you do not solder to TP1. Just use a wire wrap tool to wrap the wire around the pin, so it can be pulled off.

After you have reinstalled the IC's, the wiring should appear as in figure 4. Check carefully for shorts!

At this point, you can turn on the computer and do a "PRINT MEM." If it says the usual number, all is probably well, so put it back together.

TESTING YOUR NEW FREE MEMORY.

The extended Color Basic program in listing 1 will test the ram which you have just made available. Save it before you try to run it, because if you mistype one of those data statements, anything can happen. The program will take about a minute to get set up, after which it will print "OK" if your memory is good. If you do have a problem, it will tell you the address and the date read from the ram, compared to what was expected. I would like to hear from you if you do find errors. If the errors occur in only one or two bit positions, they can be fixed with one or two 64k rams, for one or two ten-dollar bills. No big deal.

WHAT DO YOU DO WITH IT?

You now own a computer with almost 88k of memory, in a box no bigger than a typewriter. This fact alone may be enough for some of you. However, a large collection of software exists which can now be run on your computer.

The most important item in this collection is the popular FLEX operating system. (FLEX is a trademark of Technical Systems Consultants, Inc.) Frank Hogg Labs has developed a package which will allow FLEX to be run on the 32k COLOR COMPUTER, with the Radio Shack disc

system, and the modification described above. FLEX will reside in memory at addresses &HC000-&HDfff, as always. addresses 0-&HBFFf will be available for user programs. All FLEX compatible software will run as is without patches or modifications. Addresses &HE000-&HFFEF will be available for utility programs. (We are working on an enhanced display package, using hi-res graphics to simulate a 41-by-24 screen. That's better than an apple!)

With FLEX you have a whole cosmos of software available to you. Besides the items mentioned in the subtitle, there are Basic compilers, business programs, adventure games, assemblers and text editors, word processing software, machine-language debug programs, disc system diagnostic packages, and too much more to mention. FLEX is an excellent system which is widely supported.

If this isn't enough, we are planning to have the powerful OS-9 system on the Color Computer in the same way by early summer. Besides supporting several high level languages like Basic09, Pascal, C, and Cobol, OS-9 is Multi-User, Multi-Tasking, and Multi programming as well. The CC and OS-9 will be more powerful than all of the other TRS-80's put together!

SUMMARY

The 32k upgrade of the Radio Shack TRS-80 COLOR COMPUTER is accomplished by installing 64k dynamic ram chips. With a simple, reversible modification, nearly all 64k of this ram can be utilized. A package has been developed which will allow the FLEX operating system to be run on the modified 32k TRS-80CC with disc. You can do a lot of stuff with that.

In addition, the OS-9 operating system is being installed now and when finished (early summer '82') will allow the use of Radio Shack disk software, FLEX software, and OS-9 software on the same computer by merely changing Disks. No other computer made has those capabilities!

This article was prepared, using a preliminary version of the FLEX package, on a COLOR COMPUTER.

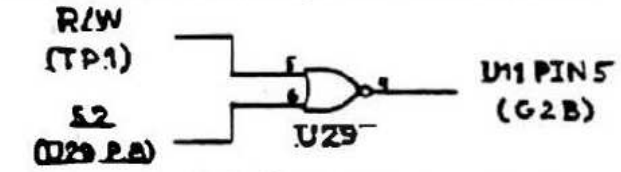

Figure 1: Modification to TRS80CC for 64K RAM.

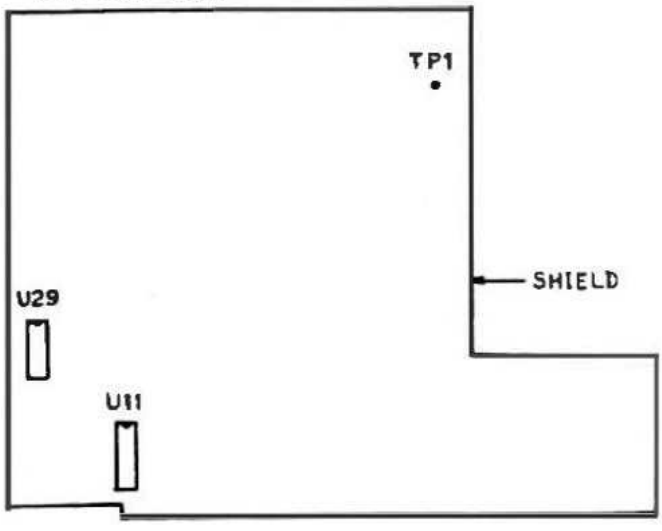

FIGURE 2. LOCATION OF COMPONENTS

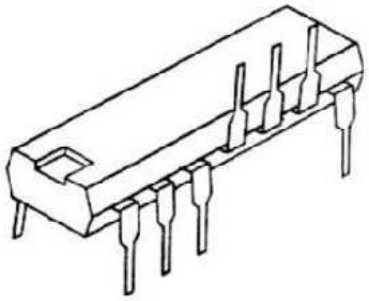

FIGURE 3. MODIFIED 74LS02 PACKAGE

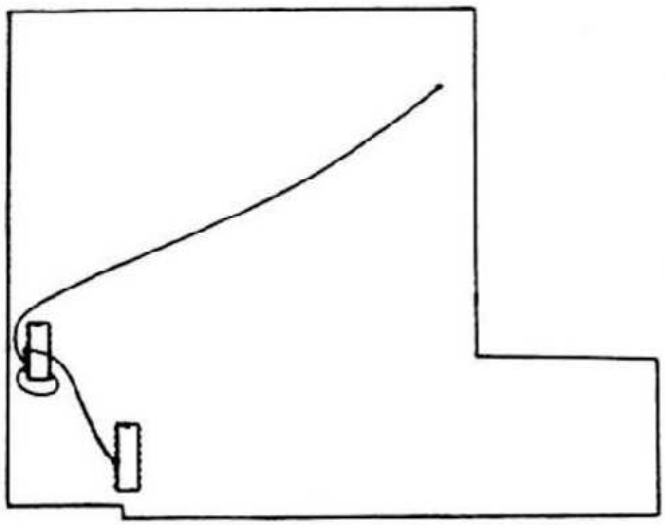

FIGURE 4. INSTALLED MODIFICATION

PACKETMAN
by Greg Zumwalt

Packetman resembles another arcade game of a fairly similar name. It consists of (yes, you guessed it) a maze with three munchkins and a man (creature?) which the player controls with the right joystick. The player makes little noises as he eats the dots throughout the maze. The three munchkins give you a few seconds, and then chase after you. They are fairly slow at first, and not too smart, but after half a minute or so they speed up and get smarter. It is very wise to get as many dots out of the way before they speed up!

This game is fantastic. My family have almost entirely taken over my computer in playing it! The game is more addictive than any I've played on the CC, and unlike the others I have tried, the excitement doesn't seem to wear out. The graphics are very clear and rapid, and all in all this is the best game I have seen yet for the CC.

First time Packetman users may be disappointed in one difference from the arcade - Packetman does not have little blue dots that enable one to reverse and eat the munchkins. The other unfortunate part of the game is that the subroutine for your man being slowly eaten and the pieces falling through the screen is missing. If you can live with these shortcomings, you will love Packetman. I recommend it very highly.

Packetman by Greg Zumwalt. $24.95.

Reviewed by Bill Bruck

Is there anyone out there who could answer a few questions about the Color computer?

1. How about a home mod for 64k? It's advertised from Spectral Assocites for $300, and others have ads for this, but can it be done at home for cheaper?

2. What is the radio shack mod for grounding the CC to prevent screen glitches when using the RS disk system?

3. Anyone in the Washington, D.C. area interested in a CC users group?

Bill Bruck (703) 734-9291

```
100 ' THIS PROGRAM TESTS THE
110 ' MEMORY CHIPS IN A MODIFIED
120 ' 32K TRS80 COLOR COMPUTER
130 ' FOR FUNCTIONALITY. THE
140 ' TEST DETERMINES WHETHER
150 ' FULL 64K RAM CHIPS WERE
160 ' USED IN THE RAM UPGRADE.
170 '
180 ' REQUIRES EXTENDED COLOR
190 ' BASIC.
200 '
210 ' REQUIRES ABOUT 65 SECONDS
220 ' TO SET UP THE MACHINE
230 ' LANGUAGE PROGRAM BEFORE
240 ' RUNNING.
250 '
260 ' RESERVE RAM
270 '
280 CLEAR 256,&HBFF8
290 '
300 ' SET UP MACHINE LANGUAGE
310 ' PROGRAM
320 '
330 GOSUB 1660 : SA=H
340 GOSUB 1660 : EA=H
350 GOSUB 1660 : E0=H
360 GOSUB 1660 : E1=H
370 '
380 ' SA=START ADDRESS
390 ' EA=END ADDRESS
400 ' E0=ENTRY POINT 0
410 ' E1=ENTRY POINT 1
420 '
430 FOR A=SA TO EA
440 GOSUB 1660
450 POKE A,H
460 NEXT A
470 '
480 DEFUSR0=E0
490 DEFUSR1=E1
500 '
510 ' TEST THE MEMORY
520 '
530 X=USR0(0)
540 '
550 ' CHECK FAILURE ADDRESS
560 '
570 FA=PEEK(&HBFFC)*256
    +PEEK(&HBFFD)
580 '
590 IF FA=0 THEN 760 :' END TEST
600 '
610 ' REPORT FAILURE
620 '
630 DW=PEEK(&HBFFE) :' DATA WRIT
640 DR=PEEK(&HBFFF) :' DATA READ
650 '
660 PRINT "AT ADDRESS ";HEX$(FA)
670 PRINT "WROTE ";HEX$(DW);
        "; READ ";HEX$(DR)
680 '
690 ' RESUME TEST
700 '
710 X=USR1(0)
720 '
730 GOTO 550
740 '
750 '
760 ' END OF TEST
770 '
780 END
790 '
800 ' MACHINE LANGUAGE PROGRAM
810 '
820 DATA 4000,4054
830 DATA 4000,4046
840 '
850 ' THE MACHINE LANGUAGE
860 ' MEMORY TEST PROGRAM IS AS
870 ' FOLLOWS:
880 '
890 ' E0   ORCC #$50 DIS. INTS.
900 '      STA $FFDF MAP TYPE 1
910 '      LDX #$4100
920 ' P1   CLR ,X+ CLEAR TO ZERO
930 '      CMPX #$FF00
940 '      BNE P1
950 '      CLR $3FFE DW
960 '      LDX #$4100
970 ' P2   LDA ,X
980 '      BNE RE REPORT ERROR
990 ' P2A  LDA #$FF
1000 '     STA ,X+
1010 '     CMPX #$FF00
1020 '     BNE P2
1030 '     COM $3FFE DW
1040 '     LDX #$4100
1050 'P3   LDA ,X
1060 '     CMPA #$FF
1070 '     BNE RE REPORT ERROR
1080 'P3A  LDA #$00
1090 '     STA ,X+
1100 '     CMPX #$FF00
1110 '     BNE P3
1120 '     LDX #$0000 END TEST
1130 'RE   STX $3FFC FA
1140 '     STA $3FFF DR
1150 '     STA $FFDE MAP TYPE 0
1160 '     ANDCC #$AF ENBL INTS.
1170 '     RTS
1180 '
1190 ' RESUME TESTING
1200 '
1210 'E1   ORCC #$50 DIS. INTS.
1220 '     STA $FFDF MAP TYPE 1
1230 '     LDX $3FFC FA
1240 '     TST $3FFE DW
1250 '     BEQ P2A
1260 '     BRA P3A
1270 '
1280 ' ACTUAL CODE
1290 '
1300 DATA 1A,50
1310 DATA B7,FF,DF
1320 DATA BE,41,00
1330 DATA 6F,80
1340 DATA 8C,FF,00
1350 DATA 26,F9
1360 DATA 7F,3F,FE
1370 DATA BE,41,00
1380 DATA A6,84
1390 DATA 26,21
1400 DATA 86,FF
1410 DATA A7,80
1420 DATA 8C,FF,00
1430 DATA 26,F3
1440 DATA 73,3F,FE
1450 DATA BE,41,00
1460 DATA A6,84
1470 DATA 81,FF
1480 DATA 26,0C
1490 DATA 86,00
1500 DATA A7,80
1510 DATA 8C,FF,00
1520 DATA 26,F1
1530 DATA BE,00,00
1540 DATA BF,3F,FC
1550 DATA B7,3F,FF
1560 DATA B7,FF,DE
1570 DATA 1C,AF
1580 DATA 39
1590 '
1600 DATA 1A,50
1610 DATA B7,FF,DF
1620 DATA BE,3F,FC
1630 DATA 7D,3F,FE
1640 DATA 27,C6
1650 DATA 20,D9
1660 '
1670 ' READ A HEX NUMBER TO H
1680 '
1690 READ A$
1700 LZ=LEN(A$)
1710 H=0
1720 IF LZ<=0 THEN RETURN
1730 C$=LEFT$(A$,1)
1740 FOR I=0 TO 15
1750 IF (I=0)AND(C$="0")
       THEN 1790
1760 IF C$=HEX$(I) THEN 1790
1770 NEXT I
1780 RETURN
1790 H=H*16+I:LZ=LZ-1
1800 A$=RIGHT$(A$,LZ)
1810 GOTO 1730
```

Editor's Note

It hes always been the policy of 68 Micro Journal and its sister organizations to follow a strict rule concerning advertising and articles. In light of the advertising carried in 68 Micro Journal by Data-Comp Division and S.E. Media Supply, who are associated with Computer Publishing Inc. (CPI), who also owns 68 Micro Journal, the following is offered.

It is a policy of CPI's 68 Micro Journal that the interest of the reader is the primary consideration. This means simply that we want our readers to know as much as there is to know about the Standard S50 Bus, the 6809, 6800 end any computer that use these devices, period!

As the above article indicates and also as indicated in the FRANK HOGG LABORATORY, INC advertising in this issue, there are now two ways to run FLEX™ and other 6809 software on the color computer. There is a difference in the approach addressed by these two, also there will be others later that will use even other approachs. It is our desire **that our readers know about everything available** and have enough knowledge to make a rational and wise choice for his or her particualar use.

Originally I allowed Data-Comp and S.E. Media to proceed with a FLEX™ program for the Color Computer as devised by Steve Odneal. I made this known to all major advertisers who had indicated, to me, an interest in the Color Computer. My desire was to expose to as many as I could the advantages of all the excellent software and disk systems we have for the 6809. This would bring in more 6809 users and hopefully more business for our advertisers, as well as helping 68 Micro Journal grow. So far this has been eccomplishing what we set out to do. Now that there is more than one way to do it, I feel that an attempt to explain the differences between them is in order, as best we know so far, and then you can decide which is best for YOU.

First, beceuse of my close associetion with Data-Comp and S.E. Media (I own stock) I know that it may seem thet I might want to 'hype' my product over the others, **well for the record I can assure you that my most pressing concern is for the well being of the 68XX community, our readers and advertisers as well as 68 Micro Journal.** As has been the policy in the pest I will not allow Dete-Comp or S.E. Medie to go head up against enother product already being advertised. But once we get into it, because someone else just was not prepered or did not let me know, there is not much I can do, efter all if no one else wants to do it for our readers, by golly we will try! To me our readers ere the most important aspect, ebove ell, including advertisers. And you advertisers should consider thet without readers, who will read your ads? Just remember back a few years!

The FRANK HOGG approach is a good one for the reader who has the skill to modify and maintain his own color computer. It has the advantage of running software that will not have to be patched. However, except for FLEX™ and a few other software products the Data-Comp/S.E. Media system does also. Both promise additional utilities and other software goodies.

There are several considerations beyond the above that need to be addressed. As Frank outlines above, one is the skill to accomplish the HOGG modification without damage to the computer or finding out at 'failure time' that you must repair your own. Radio Shack informs me that they will not repair a modified Color Computer. Of course you may be able to perform the modifications so neatly that they can be removed and not detected by the repair agency, if so you have removed one very important consideration. Also if your computer actually has the 64K RAM chips, end they ere all o.k., chelk up another plus. However should Radio Shack refuse to repair your computer because ofunauthorized modifications you could be faced with a costly disester. I do not doubt for one minute that many of our readers can utilize this method without any problems, I just feel that you should be eware.

The Data-Comp/S.E. Media scheme takes a somewhat different approach, although the end results are about the same, both from a cost and operetional view point. When we first looked into this we decided against a system similar to the HOGG approach, meinly due to the fact that many Color Computer users do not want to be patching their computer, both from a standpoint of warranty and 'maybe someday need a repair'. A call from Frank Hogg confirms that they are working on a board to be plugged into an IC socket and will require no cutting or soldering. For those who do not mind removing a few screws, this will be fine. We opted, as Steve Odneal has done to relocate some of the software to allow the color computer to operate in its normal manner. Use the Radio Shack tape, disk and game-pak as originally set up by RS and also the Exatron way, or a mix of them all. Once the software patches are done everthing works normal, and the computer has not been tampered with.

We have not had a chance to evaluate the Hogg system but if it is like their other software it will be another fine product. As for the Data-Comp/S.E. Media System we and others have been running it for some four months now and all seems well. So there you have it, a choice between what should be two good systems. Frankly, I really don't care which one you choose; **just get going and have FUN!**

DMW - - -

"C" User Notes

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Maybe someday, in the great beyond, I'll manage to elude Mr. Murphy. But until then let me apologize for a minor snafu with the first column. Seems that I inadvertently put my Pascal word counting program on the same disk as the column. At that time I didn't have my C library up to snuff and was using the Pascal version to keep tabs on the size of the article. Wouldn't you know that it would get printed along with the column.

I am going to change the game plan a bit. Initially I was planning to present a fairly complete tutorial on the C language. However, responses to the first column indicate that I should stop after this month's session and devote some time to giving hints and kinks for the compilers that are available today. So this month we will go over C's operators and control statements. With the conclusion of this installment we will have covered most of the C language that is available with today's compilers. Incidently, today means February. You will probably be reading this in April.

One of the nicer features of C is its set of operators. Few languages have as rich a set as C does. These incl de all sorts of unary, binary, bitwise, relational, and assignment operators. Let's take them one group at a time.

UNARY OPERATORS

The unary operators require only one operand, which could be an expression, variable or constant. Included in the group is

- two's compliment negation
~ one's compliment negation
! logical negation
++ incremenation (pre or post)
— decrementation (pre or post)
* indirection
& address of

Most of us have used "-" in other languages. It merely negates the operand in an arithmetic sense. So the statements

```
n = -5;
```

would leave the value of minus 5 in n. The "~" performs a one's, or bit ise, compliment of the number. The statements

```
n = ~0x55;
```

ould leave 0xAA in n, assuming n to be a char. If n was an int then 0xFFAA would be the result since 0x55 expands 0x0055.

The "!" is the logical negator. If the operand is zero then it becomes one; if it is nonzero, then it becomes zero. This operator is typically used in control or conditional statements like

```
while (!quit)
if (!cond)
```

which are completely equivalent to

```
while (quit == 0)
if (cond == 0)
```

Neither the logical nor bitwise negators may be used with floats or doubles.

The "++" and "—" operators increment or decrement a variable respectively. They may be applied before or after the variable so that

```
n = ++x;
```

increments x and then assigns n the value of x, whereas

```
n = x++;
```

assigns n the value of x and then increments x. These two operators are often combined with other operators. Some examples would be

```
n = *pointer++;
n = element[++i];
if (i++ == 5)
```

The last example needs some comment. Here, i is compared against 5 and the result is saved for use after i has been incremented. From experience I can tell you that you won't realize how handy these two operators are until you've used them for a while and then find yourself programming in another language that doesn't have them!

The "*" is the indirection operator. It causes an operand to be used as a pointer. We saw this last month in the discussion of pointer types. Some examples would be

```
n = *arg;
n = *(arg + 5);
n = **arg;
```

The last example is interesting. It says to take what arg points to and use it as a pointer. There is no limit to how many indirections can be applied, the statement

```
n = *****arg;
```

is totally valid as far as the compiler is concerned. It would crank out the appropriate code to execute a fifth order indirection.

In preparing for this installment I saw an example similar to

```
n = *++*arg;
```

If you start from right to left, then it means that what arg points to is incremented and then used as a pointer. I dare say the beginner will be hard put to get much beyond **arg. But when you're ready the power is there.

The "&" is the address operator and means "take the address of the variable". It usually crops up in pointer assignments, or passing an address to a function. Suppose that you wanted to scan the right side of a string. The call to the scanning function could look like

```
scan(&array[14]);
```

which would pass scan() the address of the fifteenth element of array[]. The address operator is not limited to arrays. Many times we have to write some type of sorting routine. The call to the swapping function would pass the addresses of the variables

```
if (a > b)
   swap(&a,&b);
```

and the parameters to swap() would be declared as pointers.

```
swap(n1, n2)
   int *n1, *n2;
   {
   int temp;

   temp = *n1;
   *n1 = *n2;
   *n2 = temp;
   }
```

BINARY OPERATORS

The binary operators take two operands and can be broken down into subgroups as shown

```
* / % + -          arithmetic
>> << & ^ |        bitwise
< > <= >= == !=    relation
&& ||              logical
= += -= /= %= *=   assignment
^= |= &= >>= <<=
```

The arithmetic operators are the same as they are for most other language with the possible exception of % which is the MODULO or remainder operator. 9 modulo 4 implies the remainder when 9 is divided by 4. In this case 1.

The bitwise operators consist of

```
&  and
|  or
^  exclusive or
>> shift right
<< shift left
```

and may be applied to most of the primary data types except floats and doubles.

The "&", "|", and "^" are typically used with some sort of

mask for manipulating bits.

```
data = *acia & 0x7F;    /* strip off parity */
data = data | 0x01;     /* turn on bit 0 */
data = data ^ 0x02;     /* flip bit 1 */
```

The shift operators shift the operand on the left by the amount of the operand on the right.

```
n = n >> 4;          /* shift right 4 bits */
if ((j << i) <= 0)   /* shift left and compare */
```

A left shift zero fills the operand. A right shift may zero fill or one fill depending on the host machine and the compiler. For 68xx users it will probably always be zero fill.

The relational operators work the same as they would in Basic or Pascal except that the symbol for not equal is "!=". The relational operators are used in conditional or control statements like

```
while ( i <= 5)
if (foo == 'a')
```

A warning to the neophyte C programmer. Many of your initial programs will run amuck because you used the equate symbol, "=", instead of the equality symbol, "==". When you do that, C executes the equate and uses the result for the compare so

```
if (ascii = NULL)
```

will always be FALSE since ascii is set to NULL.

The operators "&&" and "||" are the logical AND and the logical OR respectively. They are used with conditional and control statements such as

```
if (ch >= 'a'  &&  ch <= 'z')
```

which would evaluate to TRUE if ch was an ascii lower case alpha character. Here is where compilers modeled after "Small C" really fall down. They use the bit wise operators & and | as logical operators also. While, most of us will never have to worry about portability, I still feel this is a very serious shortcoming or oversight. At least Intersoft had the forsight to point this out. They recommend that the operands be parenthesised when using the bit wise operators logically. So the previous example would code as

```
if ((ch >= 'a') & (ch <= 'z'))
```

which should execute properly on most other compilers.

The assignment operators take two operands, with the left operand being the one that is modified. We are all acquainted with the statement

```
x = x + 5;
```

where x is assigned the value of x with 5 added to it. Of course, any valid expression could comprise the right operand. C departs from most other languages in that the previous statement could also have been written as

```
x += 5;
```

which says to add 5 to x. The other assigment operators allow the same sort of thing. Some examples would be

```
x -= y;    /* x = x - y */
x >>= 4;   /* x = x >> 4 */
```

So far I have avoided discussion of operator precedence. Like all languages there is a ranking of the operators, given in the following table, which is shown in decreasing order

```
expression operators group from left to right
() []

unary operators group from right to left
* & - ! ~ ++ --

binary operators have decreasing precedence
as shown and group from right to left
* / %
+ -
<< >>
< > <= >=
== !=
&
^
|
&&
||
 assigment operators have equal precedence and
 group from left to right
= += -= *= /= %= >>= <<= &= ^= |=
```

CONTROL STATEMENTS

The C language has two basic forms of control structures, the conditional and the loop statements. Oh yes, and there is the ubiquitous GOTO.

CONDITIONAL STATEMENTS

The primary conditional is the "IF-THEN" and the "IF-THEN-ELSE" structure. These have been used in a few of the examples already. The syntax is

```
if (condition)
   statement   /* the "then" action */
else
   statement   /* the optional "else" action */
```

When the condition evaluates to TRUE, which is any nonzero value, the "then" statement is executed. When the condition evalutes to FALSE, which is zero, either the "else" statement is executed, or control merely passes on to the next statement following the IF-THEN. Remember that if multiple statements are to be executed for either result of the test they must be surrounded by the {} braces.

Note that the condition could be an expression, a variable, a function call, or a comparison between operands using the relational operators. Or it could be some combination of any or all of these linked with the logical operators.

IF's may be nested but some care must be exercised in handling the ELSE. Consider the statement

```
if (condition 1)
   if (condition 2)
      statement;
else
   statement;
```

By the format it appears that the ELSE binds to the first IF. But that's not the case. The standard calls for the ELSE to be associated with the closest "non-nested" IF. To bind the else to the first IF, we must enclose the second IF and its statement with brackets

```
if (condition 1)
   {
   if (condition 2)
      statement;
   }
else
   statement;
```

We have now told the compiler in unambiguous terms what we really wanted.

To construct an n-way choice, we may string together IF's as follows

```
if (condition 1)
   statement;
else if (cond 2)
      statement;
else if (cond 3)
      statement;
else
   statement;
```

However, C has a much cleaner construct for multiple choice branching. It is called the SWITCH statement and has the following syntax

```
switch(expression)
   {
   case const_1 : statement;
                  break;
   case const_2 : statement;
                  break;
   case const_3 : statement;
                  break;
   default : statement;
   }
```

The expression is evaluted, just once, and then compared to the constants (const 1, const 2, etc) associated with each CASE. If the expression matches a CASE, the corresponding statement is executed. If there are no matches, then the optional DEFAULT statement will be executed. If there is no DEFAULT, control passes on to the next statement following the SWITCH. The constants may be any of the legal literal formats except a string.

The limitation of the SWITCH, as compared to the "IF-THEN-ELSE IF" construct is that the expression may be compared only against constants. With the IF's it may be compared against other expressions or variables. But the SWITCH is certainly adequate for a host of everyday problems and has the advantage of readability.

Notice the use of the BREAK following some of the statements. These are required if you do not want control to fall through to the rest of the switch. For certain CASE's you may execute a unique statement by using the BREAK. Or you could execute the statement for a CASE and execute the DEFAULT by leaving out the BREAK. You may also cause more than one CASE to execute the same statement. Consider

```
switch (expression)
   {
   case 1 :
   case 2 :
   case 3 : statement;
            break;
   case 4 : statement;
   default : statement;
   }
```

Here, CASE's 1, 2 and 3 will execute only one statement. CASE 4 will execute both its own statement and the DEFAULT. The BREAK will be discussed more fully later.

LOOPING STATEMENTS

C has three looping statements, the WHILE, the DO-WHILE and the FOR.

The WHILE statement is a loop construct where the condition is tested at the "top" of the loop.

```
while (condition)
   statement;
```

As long as condition evaluates TRUE, the statement gets executed. If it evaluates FALSE, then the loop is exited, or perhaps never even entered if the condition is FALSE the first time through. A WHILE might be used to print a string as in

```
puts(stg)
   char *stg;
   {
   while (*stg)
      putchar(*stg++);
   }
```

Each time through the loop, the character pointed to by *stg is tested. If it is not NULL then it is printed. Remember, FALSE is zero and TRUE is any nonzero value. We might also want to initialize an array to some value

```
init_array(numbs,size)
   int numbs[], size;
   {
   int i;

   i = 0;
   while (i < size)
      numbs[i++] = MAGIC_NUMBER;
   }
```

The DO-WHILE is a loop that tests for a condition at the "bottom". It is usually used where the loop must be executed at least once.

```
do
   {
   printf("\nEnter a number from 1 to 10");
   getchar(num);
   }
while (num < 1  &&  num > 10);
```

The prompt will get issued at least once since the test for a good entry is at the bottom of the loop. If the entry is valid, the loop is exited.

The FOR loop in C is really unique. It has the syntax

```
for (exp_1; exp_2; exp_3)
   statement;
```

which is equivalent to

```
exp_1;
while (exp_2);
   {
   statement;
   exp_3;
   }
```

What makes it special is that exp 1 is an initializer, exp 2 is a condition, exp 3 is some action that occurs at the bottom of the loop and they are totally independant of each other. Also, any given part or parts may be left out. In fact, in the "The C Programming Language", the statement

```
for (;;)
   statement;
```

is given as an example for doing something forever, since the lack exp 2 causes a TRUE to be assumed. Let's rewrite init_array() with the FOR loop.

```
init_array(numbs,size)
   int numbs[], size;
   {
   int i;
```

```
    for (i = 0; i < size; i++)
        numbs[i] = MAGIC_NUMBER;
    }
```

As another example, lets write a function to copy one string onto the tail of another

```
/*
 * s1 = s1 + s2
 */
strcat(s1, s2)
    char s1[], s2[];
    {
    int i, j;

    for (i = slen(s1), j = 0; s2[j]; i++, j++)
        s1[i] = s2[j];

    s1[i] = NULL;
    }
```

Here, i is initialized to the length of s1 by the call to slen(). This example shows that the exp 1 and exp 3 may each be a list of actions. The conditional may be any legal combination of relational and logical operators just like a WHILE or an IF statement.

There are times when it is necessary to break out of a loop, or go back to the beginning, without executing any more of the loop. C provides for this possibility with the BREAK and the CONTINUE statements. The BREAK will cause the program to exit the innermost loop. It can also be used to exit a SWITCH. The CONTINUE causes control to pass back to the beginning of the loop. In the case of a WHILE, it goes directly to the front. But in a F R loop, it branches to any statements connected with exp 3. Note that a CONTINUE is meaningless within a WITCH and using it there will pass control back to any loop that the switch was included within, or perhaps cause a syntax error during compilation.

The GOTO. I've never had to use one but there a few rare cases where it is useful, usually to recover from some catastrophic chain of events.

```
heading_towards_trouble()
    {
    while (getting_deep)
        {
        ...
        while (deeper_still)
            {
            ...
            if (total chaos)
                goto bailout;
            }
        }
    bailout : ...recover from chaos!!...
    }
```

GOTO labels have the same syntax as a variable name and are followed by the colon. They must appear in the same function as the call to them. The GOTO was needed here because a BREAK would have only exited from the innermost loop. At present, neither Dugger nor Intersoft implement the GOTO.

What we have covered so far should explain most of the C language that is available in today's compilers which were modeled after the "Small C Compiler" that was published in Dr. Dobb's Journal in 1980 by Ron Cain.

These Small C derivatives have their problems. By and large they make an effort to stick with the standard. But they fail here and there. The problem is that the "here and there" can really trip up the neophyte C programmer. Therefore, this column will explain C, and give examples in terms of the standard, pointing out variances where they occur. It is also the only fair thing to do for the compiler makers. If the column is not faithful to the standard, then whose compiler gets picked to replace the standard.

Speaking of "Small C' compilers, there is another one on the block. It is offered by Word's Worth of Dallas, in the mid $50 price class. The ad will probably have come out in the February issue. They have done something very interesting. The compiler was designed to work in conjunction with RLOAD. It gives you the ability to assembler source files into binary object modules and then link them with RLOAD. They have also included what is called a "peep-hole" optimizer with the compiler. This is a program that looks for, and eliminates, a lot of superfluous code from the output file created by the compiler.

Included in the package is the compiler, the optimizer and its source in C, RLOAD and its various source files, and a function library in both object and source form. I have run the compiler and the optimizer. The code looks like the tightest of any 6809 compilers I've seen so far. There's not very much fat. They claim that the optimizer will shave any where from 15% TO 35% from the code and that it removed 25% from the C compiler itself. A very nifty idea. I have not had a chance to assemble any of the compiler's output code yet. Maybe some more on this compiler next month.

Next month we will go over some of the "standard" functions that most compiler packages come with and how to make life easier when using compilers designed for absolute assemblers.

If there is still time, I found an error in a section of code for the March column. It is the function that does the translation of Spanish to English. The changes have to do with the indices of the array number in lines 10 and 11 of the function. Below is the corrected text.

```
translate(stg)
    char *stg;  /* pointer to the Spanish */
    {
    int i;
    static char number[2][5] =
      {"Uno", "Dos", "Tres", "Cuatro", "Cinco"},
      {"One", "Two", "Three", "Four", "Five"};

    for (i = 0; i < 5; i++)
        if (match(stg, number[0][i]))
            return(number[1][i]);

    return(0);  /* failed -- no match */
    }
```

Bob LaJeunesse buys his first assembled board. Bob is one of the founders of SEMCO in the Detroit Mich area and is chairman of the 6800 SIG. He has been a confirmed homebrewer. The new GIMIX disc controller card he is buying is a historic first for him. Bob has also written for 68 Micro. Bob Zeh witnesses the payment to Richard Don.

Flex Disk Format

by Leo Taylor

Leo Taylor is Editor of the Conneticuit Computer Club newsletter. He has written material which has recently appeared in the 11/81 68OX User Notes column. Leo has submitted the following article to '68 Micro Journal'. It was originally written in October 1980 and was updated in December 1981.

I would like to clear the air as to how Technical Systems Consultants formats a FLEX disk. I suspect few readers of '68 JOURNAL' know what order the sectors are in and how this affects the speed of the operating system. FLEX users have questioned why FLEX-1 with DMA isn't a lot faster than FLEX-2 with accumulator I/O. In the Sept 80 issue of '68 JOURNAL' Ray Talbot observes that speeding up the step rate did not speed up the loading of a program. Imagine my shock when I first initialized an 8 INCH drive with my F&D controller and found it was slower than the 5 inch drive I was using. This shock proved very enlightening since it prompted me to write my own initializing program, which in turn forced me to learn the answer to this speed paradox.

The File Management System in FLEX is very elegant, very versatile, and very SLOW. First I'll explain the advantages of the FMS, then I'll relate this to speed. TSC has provided FLEX with an FMS that is easy to use which has encouraged the many assembly language programmers that we find in '68 JOURNAL'. Other companies have written operating systems that are faster but harder for the programmer to access. For example, the RT-11 system used on the DEC LSI-11 requires much more user program to access a disk. To read through a file the user commands RT-11 to read a block into a buffer. The user is then responsible for maintaining a buffer pointer, checking for end of file, and testing for end of block. At the end of each block the user must request RT-11 to read another sector. FLEX reads through a file with only a JSR FMS which returns a character in the accumulator. The FMS maintains the pointer, checks for end of file, and automatically reads the next sector when the current sector is depleted.

All this elegance takes its price in speed. For each character in RT-11 the user loads from the buffer, stores where desired and checks a few conditions. This may take about 50 microseconds per character. FLEX requires less user code to call FMS but the subroutine being called takes a lot longer. FMS must check the type of command, legality of command, juggle some pointers, expand TABS, etc. A rough count of a typical call is 140 machine cycles. Add a dozen or so cycles for the user's program and multiply by 256 bytes per sector and add 10 msec for head load and you can see that it takes about 50 msec to read a sector using FLEX at 1MHZ. This is several times longer than it takes for a sector to pass under the head. Sectors go by in 18 msec for 5 inch and 9 msec for 8 inch single density. Thus FLEX skips over a number of sectors while processing the current sector. Since the processing time is constant, FLEX must skip twice as many sectors for 8 vs 5 inch. Thus the speed of reading a FLEX-1 disk on my system is only slightly greater than a FLEX-2 disk.

Now how does FLEX account for this skipping of sectors? Going back to RT-11 the processing time between sectors is less than one sector so RT-11 can read every other sector. The operating system handles this interleaving of sectors in software. In FLEX you may know that we usually read sectors in order. This is much simpler for the user to handle. Fortunately the physical order of the sectors on the disk is intentionally scrambled. Otherwise as we process a sector one sector two would pass by and we would have to wait for the disk to rotate all the way around before sector two is again available. We now wonder how many sectors will pass by before we read sector two. The FLEX manual did not elaborate on the interleaving other than acknowledging that it exists, so I set up a scope and test program to find out. I found a FLEX-2 disk to be sectored 135792468A. This was later confirmed by disassembling NEWDISK.CMD. You should notice that there are four physical sectors between any numerically adjacent sectors. This allows plenty of slack over the 50 msec we calculated. Testing an 8 inch disk initialized by the F&D INIT1.CMD revealed a surprise! It was formatted sequentially which is why it was slower than the 5 inch disk. Surely a new format was in order. I thought of creating my own sector order but decided to copy FLEX-1. I borrowed a disk that was formatted by a DMA controller and analyzed it with a scope. It was sectored 16B38D5AF27C49E. Notice it skips 8-9 physical sectors between numercally adjacent sectors. The fact that the controller used DMA made no difference which kills the claim that DMA is much faster than accumulator I/O. In some systems it would be but not with FLEX.

If FLEX seems slow in reading compared to RT-11 the write speed fares even worse. The LSI-11 writes about as fast as it reads. FLEX requires three passes over a sector when writing; this limits the write speed to 400-500 bytes per second. My digital cassette goes faster than that! Much to my amazement turning off verify (not recommended) makes only a small improvement. For FLEX to write a sector it first has to read it to find the link to the next sector. This link is merged in with the new data and the sector is written on the second pass. Usually there is a third pass for the verification of the data. This can not be improved with reformatting, faster processing, or DMA.

So what does all this mean? FLEX is not I/O bound when reading a disk so changes in hardware make only a minor change in speed. When Mr. Talbot changed the step speed it was a drop in the bucket compared to the processing time. Not that his change was not worthwhile, when a lot of seeks are involved (such as his EXEC) the seek speed is significant. Can you speed up FLEX? Only by increasing CPU speed. Since I'm using a 68B00 I can reorder the sectors to take advantage of my reduced processing time. But the disk would be very slow (but fully compatible) on a 6800 system. One can save 10 msec per sector by not loading the head when it is already down but this requires new disk drivers. I found a 'trick' to eliminate the head load delay that enabled me to speed up FLEX noticeably.

Anyone interested in the source of my disk formatting program can have a copy for free by sending me two initialized FLEX-2 disks or single sided 8 inch disk in a self address stamped container. The program is very fast (25 sec for 5 inch and 45 sec for 8 inch). The program demonstrates that the hardware can read and verify a disk far faster than TSC allows for. Currently the program supports SWTP MF-68, F&D MDI-1, and DMAF-1. The program is table driven so the sectors can be arranged in many ways. Included are tables for IBM disks and TRS-80 disks to mention a few.

My INIT.CMD is in use by several friends and I haven't had a bug report in a long time. A few users have asked "How do you do it so FAST"? All I can say is I do it with mirrors! I write the disk using a sector table at 2 revolutions per track (same as anyone else). I use this sector order 'image' to verify the tracks in one revolution. Also I use track-to-track skew and verify form the inside out to reduce the overhead from seek time resulting in a total format time of 3+ revolutions per track.

I hope I have cleared up some misconceptions about the speed vs. flexibility of the FLEX operating systems. Though FLEX may be a little slow reading from a disk I wouldn't trade it for any other DOS around!

```
NAM UNIVERSAL DISK FORMATTER
OPT PAG
PAG
* UNIVERSAL DISK FORMATTER BY LEO TAYLOR
*
* UTILITY FOR INITIALIZING 5 AND 8 INCH SOFT
* SECTOR DISKS WITH FD1771 TYPE CONTROLLERS.
* PROGRAM CAN FORMAT 6800 OR 6809 DISKS FOR
* DMAF-1 OR MF68 TYPE CONTROLLERS USING ANY
* OF THOSE FOUR SYSTEM COMBINATIONS.
*
* FORMATS DISKS USING TABLES FOR SECTOR SIZE,
* SECTORS PER TRACK, AND TRACKS PER SIDE. CAN
* BE USED WITH FLEX-1, FLEX-2, OR FLEX-9. ALSO
* CAN FORMAT AN IBM OR RADIO SHACK DISK. IF NO
* PARAMETERS ARE GIVEN ON THE COMMAND LINE THE
* PROGRAM WILL PROMPT FOR ALL DATA NEEDED. THE
* PROMPTING CAN BE REDUCED TO THE DISK NAME AND
* NUMBER IF THE DRIVE IS INCLUDED ON THE COMMAND
* LINE. THE PROGRAM WILL DEFAULT THE OPTION BY
* USING A DRIVE DEFAULT TABLE FOR EASE OF USE
* WITH A MIXED DRIVE SYSTEM. YOU CAN OVERRIDE
* THE DEFAULT BY ADDING AN OPTION ALONG WITH
* THE DRIVE ON THE COMMAND LINE. THIS PROGRAM
* CONFORMS TO SEVERAL FLEX SECTOR ORDERING
* PATTERNS OR ANY USER DESIRED SECTOR ORDER
* AND INITIALIZES VERY QUICKLY. REPORTS SOFT
* ERRORS WHICH MAY BE MORE FREQUENT THAN YOU
* EXPECT. MULTIPLE RETRIES AFTER SOFT ERRORS.
* REPORTS PROGRESS AFTER EACH PROGRAM MODULE.
* ALL NUMBERS ARE IN HEX EXCEPT VOLUME NUMBER
* (65535 MAX) AND TOTAL AVAILABLE SECTORS. IF
* THE USER DESIRES THERE ARE PROVISIONS FOR AN
* EXTENDED LENGTH FLEX CATALOG USING TRACK ONE.
* REQUIRES ABOUT 16K OF RAM STARTING AT $20 BUT
* MAY BE ASSEMBLED ELSEWHERE. SELECTING A DISK
* OPTION THAT DOESN'T MAKE SENSE (SUCH AS IBM
* FORMAT ON A 5 INCH DISK) IS ILL ADVISED. YOU
* SHOULD SET UP THE DRIVE OPTION DEFAULT TABLE
* (FOUR CHARACTERS AT ADDRESS $0105) TO MATCH
* YOUR SYSTEM BEFORE ASSEMBLING. THE NEXT FOUR
* BYTES AFTER THE DEFAULT TABLE ARE:
*
*   DMAFLG   USED FOR DMAF-1 CONTROLLER.
*   USEMFLG  USED IF DRIVES 0 AND 1 ARE DMAF-1 AND
*            DRIVES 2 AND 3 ARE MF68 AND USEMF.CMD
*            HAS BEEN LOADED.
*   EXTFLG   USED ONLY IF AN EXTENDED DIRECTORY IS
*            DESIRED MOST OF THE TIME.
*   FORTYF   USED FOR DRIVES SUCH AS MPI THAT ALLO
*            FORTY TRACK OPERATION.
*
* A FEW EXAMPLES OF DEFAULT TABLE SETUP:
*
*  FOR A FLEX-2 SYSTEM WITH MF68 CONTROLLER AND
*  1 MHZ CLOCK USE 'M,'M,'M,'M,00,00,00,00.
*
*  FOR A FLEX-9 SYSTEM WITH DOUBLE SIDED DMAF-1
*  AND MF68 AND 1 MHZ USE 'D,'D,'M,'M,01,01,00,00.
*
*  FOR A FLEX-2 SYSTEM WITH F40 5 AND 8 INCH AND
*  2 MHZ CLOCK USE 'G,'G,'O,'O,00,00,00,00.
*
* A BOOTSTRAP IS SELECTED FROM FOUR BOOTSTRAP
* PROGRAMS FOR EITHER PROCESSOR AND CONTROLLER.
* THE DEFAULT BOOT IS THE ONE FOR THE SYSTEM THE
* DISK IS BEING INITIALIZED ON.
*
*
* <EXAMPLE OF USE WITH USER INPUT BRACKETED>
*
* COMMAND LINE FORMAT:
*
*   (INIT)        PROMPTS FOR DRIVE AND OPTIONS
*   (INIT 0)      DRIVE 0       DEFAULT OPTION
*   (INIT 2 A)    DRIVE 2       A=8 IN SINGLE SIDE DMAF
*
*
* <OPTIONAL PROMPTS FOR PARAMETERS>
*
*  LEO'S UNIVERSAL DISK FORMATTER
*
*  DRIVE NUMBER TO INITIALIZE (0-3): [1]
*
*   8=8800    R=RADIO SHACK
*   9=6809    S=STANDARD IBM
*
*  DIR  TO BE USED WITH (0,9,A,B): [9]
*
*                          8 INCH        5 INCH
*                        DMAF  MF68   DMAF  MF68
*  SINGLE SIDED NORMAL     A     E      I     M
*  DOUBLE SIDED NORMAL     B     F      J     N
*  SINGLE SIDED FAST       C     G      K     O
*  DOUBLE SIDED FAST       D     H      L     P
*
*  ENTER DESIRED OPTION CHAR. (A-P): [M]
*
*  THIRTY FIVE OR FORTY TRACK (T,F): [T]
*
*  NORMAL OR OVERSIZE CATALOG (N,O): [N]
*
* <REQUIRED FROM TB FOR NAME>
*
*  NAME FOR DISK IN DRIVE 1
*  OR PRESS RETURN TO  ABORT! [MAXBCHAR]
*  VOLUME NUMBER: [17345]
*  TRACK ZERO VERIFIED
*  ALL TRACKS WRITTEN
*  FORMAT FINISHED
*  AVAILABLE SECTORS: 348
*
*
* ERROR MESSAGES:
*
*  DISK IS PROTECTED  (INSERT UNPROTECTED DISK)
*  SOFT ERROR AT TT SS (RETRIED IF FLEX FORMAT)
*  HARD ERROR AT TT SS   (FLEX SECTORS DELETED)
*  FORMAT ABORTED          (FATAL ERROR OCCURED)
PAG
* STANDARD FLEX ADDRESS ASSIGNMENTS
*
* ONLY THREE EQUATES NEED TO BE CHANGED FOR
* A6809 THE START OF FLEX AND TH  ADDRESSES
* OF THE DISK CONTROLLERS.
*
FLEX EQU $A800 USE $C000 FOR 6809
MF68 EQU $DD1B USE $E01B FOR 6809
DMAF EQU $9000 USE $F000 FOR 6809

FCB EQU FLEX+$0048 FLEX FILE CONTROL BLOCK
PAUSE EQU FLEX+$C09 TTYSET PAUSE
WRBN EQU FLEX+$C8C WORK DRIVE ASSIGNED
FLXDAT EQU FLEX+$C8E FLEX DATE REGISTERS
LIPNTR EQU FLEX+$C14 LINE BUFFER POINTER

WARMS EQU FLEX+$D03
GETCHR EQU FLEX+$D15
PUTCHR EQU FLEX+$D18
INBUFF EQU FLEX+$D1B
PSTRNG EQU FLEX+$D1E
RSTCH EQU FLEX+$D27
GETFIL EQU FLEX+$D2D
ADDBX EQU FLEX+$D36
OUTDEC EQU FLEX+$D39
OUTHEX EQU FLEX+$D3C
RPTERR EQU FLEX+$D3F
GETHEX EQU FLEX+$D42
INDEC EQU FLEX+$D4B
FMS EQU FLEX+$1406

OFSET EQU $C800-FLEX
OFFSET EQU OFSET/84 FIX FLEX INCONSISTANCY
READ EQU FLEX+$1E00+OFFSET $DE00 OR $DE00
RESTOR EQU READ+9
 PAG
 ORG $20 BASE PAGE

DRIVE RMB 1 DRIVE NUMBER
VOLUME RMB 2 VOLUME NUMBER
FATLFL RMB 1 MULTI-PURPOSE ERROR FLAG
DELFLG RMB 1 SECTOR DELETED
SIDNOW RMB 1 SIDE OF DISK
LSTSEC RMB 1 LAST GOOD DISK SEC
TYPNTR RMB 2 TYPE OF DISK POINTER
TBLPNT RMB 2 FORMAT TABLE IN USE

SPCFMT RMB 1 SPECIAL FORMAT
MAXTRK RMB 1 TRKS PER SIDE
MAXSEC RMB 1 SECS PER TRK
TOTALS RMB 2 MAXTRK * MAXSEC
BYTSEC RMB 1 BYTES PER SECTOR-1
GAPCHR RMB 1 GAP FILL CHAR
GAPSIZ RMB 1 SIZE OF LARGER GAPS
DBLFLG RMB 1 1 = DOUBLE SIDED

TK NOW RMB 1 CURRENT TRACK
SECNOW RMB 1 CURRENT SECTOR
WORKEN RMB 2 COMPUTED END OF WORKSPACE
ENDMOV RMB 2 END OF BLOCK MOVE
NAME RMB 8 VOLUME NAME
TEMP RMB 2 GENERAL PURPOSE
LETTER RMB 1 SAVE FORMAT LETTER
PAUSTM RMB 1 SAVE FLEX PAUSE
NXTLNK RMB 2 NEXT GOOD LINK
SOURCE RMB 2 POINTER FOR BLOCK MOVE
SECCNT RMB 1 SECTOR COUNTER
DMADRV RMB 1 DMA DRIVE (1,2,4,8)
BOOTNU RMB 1 BOOT NUMBER (0-3)
FLX2FL RMB 1 1 = FLEX-2 (6800)
FLX9FL RMB 1 1 = FLEX-9 (6809)
EXTEND RMB 1 1 = OVERSIZE FLEX CATALOG
T48FLG RMB 1 1 = FORTY TRACK
BIBFLG RMB 1 1 = DMA SYSTEM CONTROLLER

WORKBP EQU $2000 TRACK  ONE SPACE
 PAG
 ORG $0100
START BRA INIT
VN FCB 3 VERSION NUMBER
 BRA INIT ALLOW WARMSTART AT $103
 SPC 3
* DEFAULT DRIVE FORMAT TABLE USES SAME
* LETTER AS CALLING FORMAT. THE DMAFLG
* MUST BE SET TO 1 FOR DMAF CONTROLLER.
* IF THE USEMFLG IS ALSO SET THEN DMA
* WILL BE USED FOR DRIVES 0 OR 1 AND
* MF68 USED FOR DRIVES 2 OR 3. EXTFLG
* WOULD ONLY BE SET IF YOU ALWAYS WANT
* AN EXTENDED DIRECTORY. FORTYF SHOULD
* BE SET TO 1 BY USERS OF DRIVES SUCH
* AS MPI THAT ALLOW FIVE EXTRA TRACKS
* PER SIDE.
*
DEFTBL FCB 'D DRIVE 0 DBLE SIDE 5 FAST
 FCB 'D DRIVE 1 DBLE SIDE 5 FAST
 FCB 'G DRIVE 2 SINGLE SIDE 8 FAST
 FCB 'G DRIVE 3 SINGLE SIDE 8 FAST

DMAFLG FCB 0 0=USE MF68  1=USE DMAF
USEMFLG FCB 0 0=ALL DMAF1 1=USEMF 2/3
EXTFLG FCB 0 0=NORMAL     1=EXTEND DIR
FORTYF FCB 0 0=35 TRACK   1=40 TRACK
 SPC 3
* MAIN PROGRAM CALLS ALL SUBPROGRAMS
*
INIT LDAA EXTFLG GET DEFAULT
 STAA EXTEND
 LDAA FORTYF GET DEFAULT
 STAA T48FLG
 LDAA PAUSE
 STAA PAUSTMP
 CLR PAUSE NO PAUSE DURING PROMPTS
 JSR PARSE PARSE PARAMETER LIST
 JSR PROMPT GET DISK NAME AND NUMBER
 TST SPCFMT RADIO SHACK OR IBM
 BNE ALLSAME NO SPECIAL TRACK
TRYAGA JSR WRITE0 WRITE TRK 0
 JSR VERIF0 TEST TRACK ZERO
 BEQ NOFATAL
 CLR TRKNOW
 STAB BECNOW
 JSR RPTSEC DISPLAY BAD SECTOR
 DEC FATLFLG COUNT RETRIES
 BNE TRYAGAIN
FATAL LDX #FATALMSG
 JSR PSTRNG
 BRA EXIT2 FIVE FATAL ERRORS

NOFATAL LDX #VERBMSG
 JSR PSTRNG
ALLSAM JSR WRTALL WRITE REMAINING TRACKS
 LDX #ALWRTMSG
 JSR PSTRNG
 JSR VERIFALL
 TST SPCFMT
 BNE NOUPDATE
 JSR UPDATE FIX TRK 0 SEC 3
 BNE FATAL
NOUPDA JSR REPORT DISPLAY RESULTS
EXIT2 JMP EXIT
 SPC 3
* PARSE INPUT LINE FOR DRIVE AND FORMAT
* IF NONE REQUEST PARAMETERS FROM USER
*
PARSE JSR GETHEX GET DRIVE NUMBER
 BCS BADRIVE
 TSTB
 BEQ NDRIVE
 JMP DRIVEFOUND

BADRIV LDAA #15 ILLEGAL DRIVE NUMBER
 JMP ERROR2

NDRIVE LDX #DRIVMSG TITLE AND PROMPT
 LDAA #'0 MIN
 LDAB #'3 MAX
 JSR REPLY
 SUBA #'0 REDUCE '0 TO 00
 STAA DRIVE
 JSR SETUP CONFIGURE HARDWARE
MENU LDX #SYSTMSG 0,9,R,S
 LDAA #'0 MIN
 LDAB #'S MAX
 BSR REPLY
 LDAB #1
 CMPA #'0 6800
 BNE NOT0
 STAB FLX2FLG SET 6800
 CLR FLX9FLG CLR 6809
 BRA GETLETR

NOT0 CMPA #'9 6809
 BNE NOT9
 CLR FLX2FLG CLR 6800
 STAB FLX9FLG SET 6809
 BRA GETLETR

NOT9 CM A #'R RADIO SHACK
 BEQ GOTCM2
 CMPA #'S STANDARD IBM
 BNE MENU
GOTCM2 JMP GOTCHR SKIP REMAINING QUESTIONS

GETLETR LDX #LETRMSG
 LDAA #'A MAX
 LDAB #'F MIN
 BSR REPLY
 TAB
 STAA LETTER SAVE FOR TABLE
 SUBB #'A REDUCE A TO 00
 BITB #04 DMAF OR MF68?
 BEQ SETDMA
 LDAB FLX9FLG 0 OR 1
 ASLB
 STAB BOOTNUM 0 OR 2
 BRA TRY40

SETDMA LDAB FLX9FLG 0 OR 1
 ASLB
 ORAB #1
 STAB BOOTNUM 1 OR 3
 CLR FLX2FLG
TRY40 CLR T48FLG
 CMPA #'I FIVE OR EIGHT?
 BLO GETCAT NO PROMPT NEEDED
 LDX #FORTYMSG
 LDAA #'F FORTY TRACK
 LDAB #'T THIRTY FIVE
 BSR REPLY
 CMPA #'F
 BNE GETCAT
 INC T48FLG
GETCAT CLR EXTEND
 LDX #CATMSG
 LDAA #'N NORMAL CATALOG
 LDAB #'O OVERSIZE
 BSR REPLY
 CMPA #'N
 BEQ NOEXT
 INC EXTEND DO EXTENDED CATALOG
NOEXT LDAA LETTER
 BRA GOTCHR
 SPC 3
* PRINT MESSAGE AND WAIT FOR USER REPLY.
* CHECKS RANGE OF REPLY AND RECYCLES IF
*  NEEDED.
*  ENTER WITH X=MESSAGE, A=MINIMUM,
*        B=MAXIMUM
RNGERR LDX #OUTMSG OUT OF RANGE
 JSR PSTRNG
 LDX TEMP ORIGINAL MESSAGE
 BRA REPLY2

REPLY STX TEMP
 STAA SOURCE
 STAB SOURCE+1
```

```
REPLY2 JSR PSTRNG
 JSR GETCHR
 CMPA #$49 LETTER?
 BLO NOTLTR
 ANDA #$5F UPPER CASE NO PARITY
NOTLTR CMPA #$0D RETURN=ABORT
 BNE NOABORT
 JMP FATAL

NOABORT CMPA SOURCE MIN
 BLO RNGERR
 CMPA SOURCE+1 MAX
 BHI RNGERR
 RTS
 SPC 3
* SAVE DRIVE AND FIND FORMAT TABLE
*
DRIVEF STX TEMP
 LDAA TEMP+1 GET DRIVE BYTE
 CMPA #3  AX DRIVE
 BLS NOTBAD
 JMP BADRIVE

NOTBAD STAA DRIVE SAVE FOR LATER
 JSR SETUP CONFIGURE HARDWARE
 JSR MATCH GET DISK TYPE
 BCC GOTCHR
 LDAB DRIVE
 LDX #DEFTBL
 JSR ADDBX COMPUTE DEFAULT FORMAT
 LDAA 0,X GET DEFAULT
GOTCHR ANDA #$5F UPPER CASE NO PARITY
 CMPA #'A MINIMUM LETTER
 BLT SYNTAX
 CMPA #'D MAXIMUM LETTER
 BHI SYNTAX
 LDX #FTABLE TABLE OF FORMATS
 SUBA #'A REDUCE LETTER A TO ZERO
 STAA LETTER SAVE FOR FAST FLAG
 TAB
 ASLB FOR AT LETTER*2
 JSR ADDBX INDEX INTO TABLE
 LDX 0,X GET TABLE ADDRESS
 STX TYPNTR START OF TABLE
 LDAB #9 SIZE OF PARAMETER TABLE
 JSR ADDBX
 STX TBLPNTR SECTOR TABLE POINTER
 STX ENDMOVE SETUP BLOCK MOVE
 LDX #BPCFMT FIRST PARAMETER
 STX TEMP
 LDX TYPNTR TABLE START
 JSR MOVE TABLE TO TEMP AREA
 TST T40FLG FORTY TRACKS?
 BEQ NOT40
 LDAA #39 USER TRACKS
 STAA MAXTRK
 LDAA #5 ADDITIONAL TRKS
 LDX TOTALSEC
ADDTRK LDAB MAXSEC
 JSR AD #X TOTAL+MAXSEC
 DECA
 BNE ADDTRK
 STX TOTALSEC
NOT40 LDAA #5
 STAA FATLFLG MAXIMUM FATAL ERRORS
 LDAA MAXSEC
 STAA LSTSEC LAST GOOD SEC
 RTS

SYNTAX LDAA #26
ERROR2 LDX #FCB
 STAA 1,X
ERROR JSR  PTERR
EXIT NOP
 CLI ALLOW B BOLER
 LDAA PAUBTMP
 STAA PAUSE RESTORE ORIG PAUSE
 JMP WARMS

NODRIV LDAA #16 DRIVE NOT READY
 BRA ERROR2
 SPC 3
* PROMPT FOR NAME OF DISK
*
PROMPT JSR CLRFCB PUT DRIVE IN FCB
 JSR RESTORE SEEK TRACK ZERO
 BCS NODRIVE NO SUCH DRIVE
 BEQ PROMP2 PROTECTED DISK?
 LDX #PROTMSG
 JSR PSTRNG CONTINUE ON ANYWAY

PROMP2 LDX #NAMEMSG
 TST SPCFMT
 BEQ ASKNAME
 LDX #SPCMSG
ASKNAM JSR PSTRNG
 LDAA DRIVE
 ORAA #'0 DRIVE IN ASCII
 JSR PUTCHR
 LDX #NAM2MSG
 JSR PSTRNG
 TST SPCFMT
 BEQ GETNAME
 JSR GETCHR
 CMPA #'Y YES OK?
 BEQ JOG
FATAL2 JMP FATAL
 SPC 2
GETNAM JSR INBUFF GET DISK NAME
 LDX LIPNTR POINT AT FLEX BUFFER
 LDAA 0,X GET FIRST CHAR
 CMPA #$0D RETURN?
 BEQ FATAL2
 LDX #FCB
 JSR GETFILE FLEX PARSES NAME
 BCS ERROR
 LDX #NAME SET UP MOVE
 STX TEMP
 LDX #FCB+12
 STX ENDMOVE
 LDX #FCB+4
 JSR MOVE FROM FCB TO NAME
GETVOL LDX #VOLMSG
 JSR PSTRNG
 JSR INBUFF GET VOLUME NUMBER
 JSR INDEC
 BCS GETVOLUME
 TSTB NUMBER FOUND?
 BEQ FATAL2
 STX VOLUME

JOG LDAA #2 TRK 2
 JSR SEEK JOG HEAD OUT
 JSR CLRFCB
 JSR RESTORE BRING HEAD BACK
 BNE FATAL2 STILL PROTECTED?
 SPC 3
* WRITE TRACK ZERO
*
WRITE0 CLR SIDNOW
 CLR TRKNOW TRK ZERO FIRST SIDE
 JSR SETRAM
 CLRA
 JSR WRITRK WRITE EMPTY TRACK ZERO
 TST  LFLG
 BEQ NOTDB1
 INC SIDNOW
 CLR TRKNOW TRK ZERO SECOND SIDE
 JSR SETRAM
 CLRA
 JSR WRITRK
NOTDB1 JSR CLRFCB
 LDAA #3 TRK 0 SEC 3
 STAA #1F,X
 LDAA #1 PREPARE SYS INFO RECORD
 STAA #50,X FIRST TRK
 STAA #5E,X FIRST SEC
 LDAA MAXTRK
 STAA #5F,X LAST TRK
 STAA #66,X MAX TRK
 LDAA MAXSEC
 STAA #68,X LAST SEC
 STAA #67,X MAX SEC
 CLR #61,X SET TOTAL SECTORS TO
 CLR #62,X ZERO FOR NOW
 LDAA FLXDATE MONTH DAY YEAR
 STAA #63,X
 LDAA FLXDATE+1
 STAA #64,X
 LDAA FLXDATE+2
 STAA #65,X
 LDAA VOLUME NUMBER
 STAA #5B,X
 LDAA VOLUME+1
 STAA #5C,X FAST FORMAT FLAG
 LDAA LETTER
 BITA #2 FAST FORMAT?
 BEQ NOTFST
 LDAA #$FF
 STAA FCB+319
NOTFST LDX #FCB+#50 SET UP MOVE
 STX TEMP
 LDX #NAME+8
 STX ENDMOVE
 LDX #NAME
 BSR MOVE FROM NAME TO FCB
 BSR WRITSECT WRITE SIR
 BRA CLRFCB TRK 0 SEC 0
 TST FLX2FLG
 BNE I8FLX2
 INC #1F,X TRK 0 SEC 1
I8FLX2 LDX #FCB+#40
 STX TEMP FCB DATA POINTER
 LDAA #BOOTNUM SELECT BOOT@TRAP
 BEQ USE@0
 CMPA #2
 BLO USE@1
 BEQ USE@2
 BHI USE@3

USE@0 LDX #@0END
 STX ENDMOVE
 LDX #BOOT0
 BRA MOVEBT

USE@1 LDX #@1END
 STX ENDMOVE
 LDX #BOOT1
 BRA MOVEBT

USE@2 LDX #@2END
 STX ENDMOVE
 LDX #BOOT2
 BRA MOVEBT

USE@3 LDX #@3END
 STX ENDMOVE
 LDX #BOOT3
MOVEBT BSR MOVE FROM BOOT TO FCB
 BRA WRITSECTOR
 SPC 3
* BLOCK MOVE SUBROUTINE
*
MOVE STX SOURCE SOURCE POINTER
 LDAA 0,X
 LDX TEMP DESTINATION POINTER
 STAA 0,X
 INX
 STX TEMP
 LDX SOURCE GET SOURCE
 INX
 CPX ENDMOVE END OF SOURCE+1
 BNE MOVE
 RTS
 SPC 3
* CLEAR FILE CONTROL BLOCK
*
CLRFCB LDX #FCB
CLRFC2 CLR 0,X
 INX
 CPX #FCB+#40+256
 BNE CLRFC2
 LDX #FCB POINT X AT START
 LDAA DRIVE
 STAA 3,X RESTORE DRIVE
 RTS
 SPC 3
* READ OR WRITE SECTOR USING FNB
* FLEX  AKES SEVERAL RETRIES
*
WRITSE LDAA #$0A WRITE MODE
READSE LDX #FCB
 STAA 0,X
 JMP FMS WRITE SEC
 SPC 3
* SETUP TRACK IN RAM
*
SETRAM CLR SECNOW
 CLR SECCNT
 TST D@LFLG
 BEQ SETRA2
 TST SIDNOW SECOND SIDE?
 BEQ SETRA2
 LDAA MAXSEC
 LSRA 1/2 MAXSEC
 STAA SECCNT
 LDX TBLPNTR
LOOKU2 INX
 DECA
 BNE LOOKU2
 LDAA 0,X FIRST SEC SECOND SIDE
 STAA SECNOW
 LDX #WORKSPACE
 BRA SECZER DON'T BUMP SE NOW

SETRA2 LDX #WORKSPACE
 TST SPCFMT NO SEC 0 FOR IBM
 BMI SECZERO ALWAYS SEC 0 FOR RS
 BNE BUMPSEC
 TST FLX2FLG
 BEQ BUMPSEC
 TST TRKNOW FLEX-2 HAS TRK 0 SEC 0
 BEQ SECZERO
BUMPSE INC SECNOW FIRST SEC NORMALLY ONE
SECZER LDAA CAPCNR
 LDAB #40 LEADER SIZE
GAP1 STAA 0,X 4D GAPCNR BYTES
 INX
 DECB
 BNE GAP1
 LDAB #6
GAP2 CLR 0,X 6 ZERO BYTES
 INX
 DECB
 BNE GAP2
 LDAB #$FC
 STAB 0,X INDEX MARK
 INX
 LDAB GAPSIZE
GAP3 STAA 0,X GAPSIZE GAPCNR BYTES
 INX
 DECB
 BNE GAP3
 SPC 3
* SETUP SECTORS
*
SECLOOP LDAB #6
GAP4 CLR 0,X 6 ZERO BYTES
 INX
 DECB
 BNE GAP4
 LDAB #$FE
 STAB 0,X ID ADDRESS MARK
 INX
 LDAB TRKNOW
 STAB 0,X TRACK
 INX
 CLR 0,X SEPARATOR
 INX
 LDAB SECNOW
 NOP SPACE FOR TEST TRAP
 NOP
 NOP
 STAB 0,X SECTOR
 INX
 CLRB CODE #0 FOR 128 BYTES
 TST BYTSEC
 BPL SEC128
 INCB CODE #1 FOR 256 BYTES
SEC128 STAB 0,X SECTOR SIZE CODE
 INX
 LDAB #$F7
 STAB 0,X CRC FOR ADDRESS MARK
 INX
 LDAB #11
GAP5 STAA 0,X 11 GAPCNR BYTES
 INX
 DECB
 BNE GAP5
 LDAB #6
GAP6 CLR 0,X 6 ZERO BYTES
 INX
 DECB
 BNE GAP6
 LDAB #$FB
 STAB 0,X DATA ADDRESS MARK
 INX
 CLRA RS FILL CHAR
 TST SPCFMT
 BEQ FLXFMT
 BMI RADBNK
 LDAA #$E5 IBM FILL CHAR
RADBNK LDAB BYTSEC SECTOR SIZE
SPCFIL STAA 0,X SECTOR FILLED WITH SES
 INX
 DECB
 BNE SPCFILL
 STAA 0,X ONE MORE
 INX
 BRA SECFULL
```

```
 SPC 2
FLXFMT LDAA SECNOW
 LDAB TRKNOW
 CMPA MAXSEC
 BLT SECOK NOT LAST SEC
 CLRA
 TSTB
 BEQ DIRECTORY
 INCB
SECOK INCA LINK NEXT SECTOR
DIRECT STAB 0,X LINK TRK
 INX
 STAA 0,X LINK SECTOR
 INX
 LDAB BYTSEC SIZE OF SECTOR
 DECB ADJUST FOR LINK
FLXFIL CLR 0,X FILL WITH ZEROS
 INX
 DECB
 BNE FLXFILL

SECFUL LDAB #$F7
 STAB 0,X CRC
 INX
 LDAB CAPSIZE
 LDAA CAPCHR
CAP7 STAA 0,X CAPSIZE CAPCHR BYTES
 INX
 DECB
 BNE CAP7
 SPC 2
* SECTOR COMPLETE. COMPUTE NEXT SECTOR
*
 TST SPCFMT
 BEQ FLEXFMT
 INC SECNOW NUMERICAL ORDER
 LDAB SECNOW
 CMPB MAXSEC DONE?
 BLE SECLO2 LOOP FOR ANOTHER SEC
 BRA TRKDONE

FLEXFM INC SECCNT BUMP COUNTER
 LDAB MAXSEC
 TST DBLFLG
 BEQ NOTDB3
 TST SIDNOW 0 COMP SIDE?
 BNE NOTDB3
 LSRB 1/2 MAXSEC
NOTDB3 CMPB SECCNT DONE?
 BLE TRKDONE
 STX TEMP SAVE WORKSPACE POSITION
 LDX TBLPNTR
 LDAB SECCNT
LOOKUP INX NEXT SEC FROM TABLE
 DECB
 BNE LOOKUP
 LDAB 0,X
 STAB SECNOW NEXT PHYSICAL SECTOR
 LDX TEMP
SECLO2 JMP SECLOOP
 SPC 2
TRKDONE STX WORKEND SAVE END OF WORKSPACE
 RTS
 SPC 3
* VERIFY TRACK ZERO USING  FLEX READ
*
VERIF0 CLRB
 TST FLEXFLG FLEX-2 HAS SEC 0
 BNE VBLOOP
 INCB
VBLOOP LDX #FCB+$09
 CLRA TRACK
 PSHB SAVE SECTOR
 JSR READ
 PULB
 BNE 0 DTRB
 TSTA
 BNE INCSEC
 INCB FLEX-2 SKIP SEC 1
INCSEC INCB
 CMPB MAXSEC
 BLE VBLOOP
 CLRB FLX  INX 0 OK
BADTR0 RTS
 SPC 3
* WRITE ALL REMAINING TRACKS
*
WRTALL CLRA
 TST SPCFMT
 BNE WRLOOP IBM STARTS WITH TRK 0
 INCA FLX STARTS WITH TRK 1
WRLOOP STAA TRKNOW
 CLR SIDNOW
 JSR SETRAN
 LDAA TRKNOW
 JSR WRITRK FIRST SIDE
 TST DBLFLG
 BEQ NOTDB4
 INC SIDNOW SECOND SIDE
 JSR SETRAN SETUP TRACK
 LDAA TRKNOW
 JSR WRITRK
NOTDB4 LDAA TRKNOW
 INCA
 CMPA MAXTRK DONE?
 BLE WRLOOP
 JSR CLRFCB
 LDX MAXTRK REWRITE LAST SECTOR
 STX FCB+$1E
 JMP WRITSECTOR
 SPC 3
* VERIFY ALL TRACKS QUICKLY BY USING
* FAST READ AND TRACK SKEWIN
*
VERIFA LDAA MAXTRK
 STAA TRKNOW
 LDAB #2 DUMMY SEC
 LDX #FCB+$09
 JSR READ DROP HEAD ON INSIDE TRK
 LDAA MAXSEC
 STAA SECCNT
 LDX TBLPNT
 STX TEMP
 CLR FATLFLG
 CLR DELFLG
VESEEK LDAA TRKNOW
 JSR SEEK
VELOOP LDX TEMP POINTS TO TABLE
 LDAB 0,X SECTOR
 BNE NOTEND
 LDX TBLPNT RESET POINTER
 LDAB 0,X
NOTEND INX
 STX TEMP
 STAB SECNOW SAVE FOR ERROR
 JSR FSTREQ HIGH SPEED READ
 BEQ  GOOSE2
 JSR RPTSECT 'SOFT' ERROR
 TST SPCFMT
 BEQ VESLOW
 LDAB #2 DUMMY SEC
 LDX #FCB+$09
 JSR READ INSURE HEAD STILL DOWN
GOOSE2 JMP GOOSEC ONLY FLEX CAN DELETE
 SPC 3
* IF SOFT ERROR IS FOUND ENTIRE TRACK MUST BE
* VERIFIED WITH FLEX AND BAD SECTORS DELETED.
*
VESLOW JSR CLRFCB
 LDAA TRKNOW
 STAA #1E,X
 LDAA MAXSEC LOGICAL END OF TRK
 STAA SECNOW
VLOOP2 STAA #1F,X
 LDAA #9
 JSR READSEC
 BEQ VEROK THIS SECTOR OK?
 LDX #HARDMSG
 JSR RPTSECT+3
 TST DELFLG FIRST CONSECUTIVE DELETE
 BNE NOTLAST
 INC DELFLG
 LDAA TRKNOW SAME TRACK
 STAA NXTLNK
 LDAA SECNOW
 INCA NEXT HIGHER SECTOR
 STAA NXTLNK+1
 CMPA MAXSEC LAST IN TRACK?
 BLE NOTLAST
 LDaa #1 FIRST SEC NEXT TRK
 STAA NXTLNK+1
 LDAA TRKNOW
 INCA NEXT TRK
 STAA NXTLNK
 CMPA MAXTRK LAST SEC ON DISK?
 BLT NOTLAST
 COM DELFLG FLAG LAST SECTOR
 CLR NXTLNK END DISK LINKS ZERO
 CLR NXTLNK+1
NOTLAST LDAB #1
 STAB FATLFLG
 LDX TOTALSECTORS
 DEX
 STX TOTALSECTORS
 LDX #FCB
 BRA MOVEON

VEROK TST DELFLG ANY DELETIONS PENDING?
 BEQ MOVEON
 BPL FLGNORMAL
 LDAA SECNOW LAST GOOD SEC
 STAA LSTSEC
FLGNORM LDAA NXTLNK NEXT GOOD LINK
 STAA #0,X LINK IN SECTOR
 LDAA NXTLNK+1
 STAA #1,X
 JSR WRITSEC
 CLR DELFLG NO  ELETIONS PENDING
MOVEON LDAA SECNOW
 DECA
 STAA SECNOW BACK UP ONE
 BNE VLOOP2
 TST DELFLG
 BEQ NXTTRK HIGH SPEED NEXT TRACK
 DEC TRKNOW
 BNE VESLOW CONTINUE SLOW VERIFY
 JMP FATAL RAN INTO TRK 0
 SPC 3
* SKEW OUT SIX SECTORS PER TRACK
*
GOOSBE DEC BE  NT
 BEQ NXTTRK
 JMP VELOOP

NXTTRK L AB MAXSEC RESET COUNTER
 STAB SECCNT
 LDAB #6 TRK TO TRK SKEW
 LDX TEMP
SKEWLO TST 0,X
 BNE NOTEN2
 LDX TBLPNT RESET POINTER
 DEX
NOTEN2 INX ADD SKEW TO TEMP
 DECB
 BNE SKEWLOOP
 STX TEMP
 DEC TRKNOW
 BEQ ENDVERIFY
 BLT RETRN3
ONERR JMP VESEEK STEP OUT TOWARD ZERO

ENDVER TST SPCFMT IF SPECIAL THEN
 BNE ONEMORE VERIFY TRK 0
RETRN3 RTS
 SPC 3
* UPDATE DIR FOR TOTAL SECTORS
*
UPDATE JSR CLRFCB
 LDAA #3 DIR
 STAA #1F,X
 LDAA #9 READ MODE
 JSR READSEC
 BNE RETRN3
 TST EXTEND
 BEQ DIROK NORMAL DIRECTORY
 LDAA MAXSEC
 LDX TOTALSECTORS
DOEXTE DEX REDUCE BY ONE TRACK
 DECA
 BNE DOEXTEND
 STX TOTALSECTORS
 INC FCB+$30 FIRST USER TRACK
 BSR DIROK UPDATE DIR
 BNE RETRN3
 JSR CLRFCB
 LDAA #1
 STAA #1E,X TRK 1 SEC MAX
 LDAA MAXSEC
 STAA #1F,X SEC
 BSR WRITS2 END OF DIRECTORY
 BNE RETRN3
 CLR #1E,X TRK 0 SEC MAX
 LDAA #1
 STAA $48,X LINK EXTENDED DIRECTORY
 STAA #$1,X
 BRA WRITS2
 SPC 2
DIROK LDX TOTALSECTORS
 STX FCB+$61
 LDAA LSTSEC NORMALLY=MAXSEC
 STAA FCB+$60 NEW LAST SECTOR
WRITS2 JMP WRITSECTOR
 SPC 3
* REPORT PROGRAM FINISHED
*
REPORT LDX #FINISMSG
 JSR PSTRNG
 LDX #TOTALSECTORS
 CLRB
 JMP OUTDEC
 SPC 3
* REPORT BAD SECTOR
*
RPTSEC LDX #BADFMSG
 LDAB TRKNOW
 BSR PNTNUM BAD TRK
 LDAA #$20 SPACE
 JSR PUTCHR
 LDAB SECNOW
 BRA PNTNU2 BAD SEC

PNTNUM JSR PSTRNG PRINT MESSAGE
PNTNU2 STAB ENDMOVE USE AS TEMP
 LDX #ENDMOVE
 JMP OUTHEX
 SPC 3
* INDEX TABLE FOR FORMAT TABLES
*
FTABLE FDB TABLEA
 FDB TABLEC
 FDB TABLED
 FDB TABLEA
 FDB TABLEB
 FDB TABLEC
 FDB TABLED
 FDB TABLEI
 FDB TABLEJ
 FDB TABLEK
 FDB TABLEL
 FDB TABLEI
 FDB TABLEJ
 FDB TABLEK
 FDB TABLEL
 FDB TABLEQ
 FDB TABLER
 FDB TABLES
 SPC 3
* FORMAT TABLES FOR SEVERAL DISKS
*
* BYTE  1     SPECIAL FORMAT FLA
        (1=IBM #FF=RS)
* BYTES 2-3  MAXIMUM TRACKS AND SECTORS
* BYTES 4-5  TOTAL USER SECTORS PER DISK
* BYTE  6    BYTES PER SECTOR-1
* BYTES 7-8  CAP CHARACTER AND SIZE
* BYTE  9    DOUBLE SIDED=1
* BYTES A-N  PHYSICAL ORDER OF SECTORS
* BYTE  N+1  NULL MARKS END OF TABLE
*
TABLEA FCB 0 NORMAL 8 INCH SINGLE
 FCB 76,15 TRACKS,SECTORS
 FDB 76*15 TOTAL USABLE SECTORS
 FCB 255 SEC SIZE-1
 FCB $FF,27 CAP CHARACTER AND LENGTH
 FCB 0 SINGLE SIDED
 FCB 1,6,$B,3,8,$D,5,$A,$F,2
 FCB 7,$C,4,9,$E,0
 SPC 2
TABLEB FCB 0 NORMAL 8 INCH DOUBLE
 FCB 76,30
 FDB 76*30
 FCB 255
 FCB $FF,27
 FCB 1
 FCB 1,6,$B,2,8,$D,5,$A,$F,2
 FCB 7,$C,4,9,$E
 FCB $10,$15,$1A,$12,$17,$1C
 FCB $14,$19,$1E,$11,$16,$1D
 FCB $13,$18,$1D,0
 SPC 3
TABLEC FCB 0 FAST   8 INCH SINGLE
 FCB 76,15
 FDB 76*15
 FCB 255
 FCB $FF,27
 FCB 0
 FCB 1,A,$B,4,9,$E,2,7,$C
 FCB 5,$A,$F,3,8,$D
 SPC 2
```

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TABLED FCB 0 FAST   8 INCH DOUBLE
 FCB 76,30
 FDB 74*30
 FCB 255
 FCB $FF,27
 FCB 1
 FCB 1,6,$B,9,9,$E,2,7,$C
 FCB 5,$A,$F,3,8,$D
 FCB $17,$1C,$10,$15,$1A,$13
 FCB $18,$1D,$11,$16,$1B,$14
 FCB $19,$1E,$12,8
 SPC 3
TABLEI FCB 0 NORMAL 5 INCH SINGLE
 FCB 34,10
 FDB 34*10
 FCB 255
 FCB 0,13
 FCB 0
 FCB 1,3,5,7,9,2,4,6,8,$A,0
 SPC 2
TABLEJ FCB 0 NORMAL 5 INCH DOUBLE
 FCB 34,20
 FDB 34*20
 FCB 255
 FCB 0,13
 FCB 1
 FCB 1,3,5,7,9,2,4,6,8,$A
 FCB $B,$D,$F,$11,$13,$C
 FCB $E,$18,$12,$14,0
 SPC 2
TABLEK FCB 0 FAST   5 INCH SINGLE
 FCB 34,18
 FDB 34*18
 FCB 255
 FCB 0,13
 FCB 0
 FCB 1,6,4,9,2,7,5,$A,3,8,0
 SPC 2
TABLEL FCB 0 FAST   5 INCH  OUBLE
 FCB 34,20
 FDB 34*20
 FCB 255
 FCB 0,13
 FCB 1
 FCB 1,6,4,9,2,7,5,$A,3,8,0
 FCB $12,$B,$10,$F,$13,$C
 FCB $11,$F,$14,$D,0
 SPC 2
TABLEQ FCB 8 QUICK  8 INCH SINGLE
 FCB 76,15
 FDB 76*15
 FCB 255
 FCB $FF,27
 FCB 0
 FCB 1,4,7,$A,$D,$F,2,5,8,$B
 FCB $E,3,6,9,$C,0
 SPC 2
TABLER FCB $FF RADIO SHACK
 FCB 34,9
 FDB 34*18
 FCB 255
 FCB 0,13
 FCB 0
 FCB 0,5,1,6,2,7,3,8,4,9,0
 SPC 2
TABLES FCB 1 STANDARD IBM
 FCB 76,26
 FDB 76*26
 FCB 127
 FCB $FF,27
 FCB 0
 FCB 1,2,3,4,5,6,7,8,9,10
 FCB 11,12,13,14,15,16,17,18,19,20
 FCB 21,22,23,24,25,26,0
 SPC 2
* MESSAGES
*
FATALM FCC /FORMAT ABORTED!!/
 FCB 7,4
VERDMS FCC /TRACK ZERO VERIFIED/
 FCB 4
ALWRTM FCC /ALL TRACKS WRITTEN/
 FCB 4
PROTMS FCC "DISK IS PROTECTED!"
 FCB 7,4
SPCMSG FCC /ENTER Y FOR SPECIAL FORMAT /
 FCC /OR DRIVE /
 FCB 4
NAMEMS FCC /NAME FOR DISK IN DRIVE /
 FCB 4
WAMZMS FCC /OR PRESS RETURN TO ABORT!/
 FCB 4
VOLMSG FCC /VOLUME NUMBER! /
 FCB 4
FINIMS FCC /FORMAT FINISHED/
 FCB $D,$A,0
 FCC /AVAILABLE SECTORS! /
 FCB 7,4
SOFTMS FCC /SOFT ERROR AT /
 FCB 4
HARDMS FCC /HARD ERROR AT /
 FCB 4
DRIVMS FCB $A,$A
 FCC /LEO'S UNIVERSAL DISK FORMATTER/
 FCB $D,$A,$A
 FCC /DRIVE NUMBER TO INITIALIZE (0-3)!/
 FCB 4
SYSTMS FCB 0 ,$A
 FCC /S=$B8$   R=RADIO SHACK/
 FCB $D,$A
 FCC /T=$B89   S=STANDARD IBM/
 FCB $D,$A,$A
 FCC /DISK TO BE USED WITH   (S,T,R,S)!/
 FCB 4
LETRMS FCB $D,$A
 FCC /                  /
 FCC /    8 INCH       5 INCH/
 FCB $D,$A
 FCC /                  /
 FCC /  DMAF   MF68  DMAF   MF68/
 FCB $D,$A
 FCC /SINGLE SIDED NORMAL /
 FCC /   A      E      I      M/
 FCB $D,$A
 FCC /DOUBLE SIDED NORMAL /
 FCC /   B      F      J      N/
 FCB $D,$A
 FCC /SINGLE SIDED FAST   /
 FCC /   C      G      K      O/
 FCB $D,$A
 FCC /DOUBLE SIDED FAST   /
 FCC /   D      H      L      P/
 FCB $D,$A,$A
 FCC /ENTER DESIRED OPTION (HAR. (A-P)!/
 FCB 4
FORTYM FCB $D,$A
 FCC /THIRTY FIVE OR FORTY TRACK (T,F)!/
 FCB 4
CATMSG FCB $D,$A
 FCC /NORMAL OR OVERSIZE CATALOG (N,O)!/
 FCB 4
OUTMSG FCB $D,$A
 FCC /OUT OF RANGE/
 FCB $D,$A,7,4
 PAG
* DISK DRIVERS FOR BOTH MF68 AND DMAF
* DRIVER IS SELECTED BY VALUE OF SYSFLG
*
SETUP TST  MAFLG WHICH SYSTEM?
 BEQ MSETUP
 JMP  SETUP

WRITRK TST SYSFLG DMA OR MF68?
 BEQ MWRTRK
 JMP DWRTRK

SEEK TST SYSFLG DMA OR MF68?
 BEQ MSEEK
 JMP DSEEK

FS RED TST SYSFLG DMA OR MF68?
 BEQ MFSTRD
 JMP DFSTRD
 SPC 3
* DRIVER FOR SWTP MF-68 OR FAO MDI-1
*
* LOCAL ADDRESS EQUATES
*
MCOMRG EQU MF68 1771 COMMAND REGISTER
MTRKRG EQU MCOMRG+1 TRACK
MSECRG EQU MCOMRG+2 SECTOR
MDATRG EQU MCOMRG+3 DATA
 SPC 3
* SET CONTROLLER TYPE
*
MSETUP LDAB #2 BOOT $B89 MF68
 CLR FLX2FLG
 LDAA TESTBYT
 CMPA #$CE $B88 IN USE?
 BNE IS6889
 CLRB
 INC FLX2FLG
IS6889 STAB  BOOTNUM 0 OR 2
 CLR SYS LG NO DMA
 RTS
  PC 3
* WRITE TRACK FROM RAM TO DISK
*
MWRTRK BSR MSETSID
 BSR MSEEK FIND TRACK
TESTBY LDX #WORKSPACE
 NOP
 SEI STOP SPOOLER
 LDAB #$F4 WRITE TRACK COMMAND
 STAB MCOMRG
 BSR DELAY
 LDAB #2 DATA REQUEST BIT
WRITR1 LDAA 0,X GET BYTE IN ADVANCE
WRITR2 BITB MCOMRG
 BEQ WRITR2
 STAA MDATRG WRITE BYTE
 INX
 CPX WORKEND OUT OF DATA?
 BNE WRITR1
 DECB BUSY BIT
 LDAA CAPCHR TRAILER BYTE
TRAIL CMPB MCOMRG
 BGT RETRN2 END OF TRACK
 BEQ TRAIL NO DATA REQUEST
 STAA MDATRG TRAILER OF CAPCHR
 BRA TRAIL

MSEEK CMPA MTRKRG ALREADY THERE?
 BEQ RETRN2
SEEK2 STAA MDATRG
 BSR DELAY
 LDAA #$1B SEEK
 STAA MCOMRG
 BSR DELAY
MREADY LDAA MCOMRG
 BITA #1 BUSY BIT
 BNE MREADY
RETRN2 RTS

MSETSI TST DBLFLG NEEDED?
 BEQ NOTDB6
 NOP ADD SIDE HERE
NOTDB6 RTS

MFSTRD STAB MSECRG
 CLR SIDWON ASSUME FIRST SIDE
 TST DBLFLG
 BEQ NOTDB7
 LDAB MAXSEC
 LSRB MAXSEC/2
 CMPB SECWON
 BGE NOTDB7
 INC SIDWON SECOND SIDE
NOTDB7 BSR MSETSID
 NOP
 SEI STOP SPOOLER
 LDAA #$88 READ WITHOUT DELAY
 STAA MCOMRG
NODATA LDAB MCOMRG
 CMPB #1
 BNE NODATA
 BSR MREADY
 BITA #$18 ERRDA MASK
 RTS

DELAY BSR *+2 WASTE TIME
 BSR *+2
 BSR *+2
 BSR *+2
 RTS
 SPC 3
* DRIVER FOR DMAF1
*
* LOCAL ADDRESS EQUATES
*
ADDREG EQU DMAF+$00 FIRST ADDRESS FOR DMA
CNTREG EQU DMAF+$02 BYTES TO BE TRANSFERED
CCREG EQU DMAF+$10
PRIREG EQU DMAF+$14
DCOMRG EQU DMAF+$20 1771 COMMAND AND STATUS
DTRKRG EQU DMAF+$21 1771 TRACK
DSECRG EQU DMAF+$22 1771 SECTOR
DDATRG EQU DMAF+$23 1771 DATA
DRVREG EQU DMAF+$24
 SPC 3
* SET CONTOLLER TYPE AND DRIVE
*
DSETUP LDAB #1 BOOT $B88 DMA
 STAB SYSFLG ASSUME DMA
 CLR FLX2FLG
 LDAA TSTBYT
 CMPA #$CE $B88 IN USE?
 BEQ IS6888
 LDAB #3 BOOT $B89 DMA
IS6888 STAB BOOTNUM 1 OR 3
 LDAA DRIVE 0-3
 TST USEMFLG USE MF.CMD IN USE?
 BEQ KEEPDMA
 CMPA #2
 BLO KEEPDMA
 CLR SYSFLG USE MF68
 ANDB #2 STRIP DMA BIT
 STAB BOOTNUM 0 OR 2
 BNE KEEPDM
 INC FLX2FLG $B88 MF68=FLEX-2
KEEPDM LDAB #1
 LDAA DRIVE
 BEQ DMADOK
DRLOOP ASLB SHIFT DRIVE BIT
 DECA
 BNE DRLOOP
DMADOK STAB DMADRV 1 2 4 OR 8
 RTS
 SPC 3
* WRITE TRACK FROM RAM TO DISK
*
DWRTRK BSR SETDRV
 BSR DSEEK
 NOP
 SEI STOP SPOOLER
TSTBYT LDX #$FFFF-WORKSPACE
 STX ADDREG
 LDX #WORKSPACE
 STX TEMP MOVE TO MEMORY
 LDAA WORKEND+1
 SUBA TEMP+1
 LDAB WORKEND
 SBCB TEMP
 COMA
 COMB
 STAB CNTREG -(WORKEND-WORKSPACE)
 STAA CNTREG+1
 LDX CNTREG GET COMPLIMENT
 LDAB #$FC
 STAB CCREG
 LDAB #$FE
 STAB PRIREG
 LDAA #$F4 TRACK WRITE
 STAA DCOMRG
BLOOP1 TST CCREG STARTED COUNTING?
 BMI BLOOP1
 LDX #$FFFF
 STX PRIREG
 BRA DREADY

* SEEK TRACK
*
DSEEK CMPA DTRKRG ALREADY THERE
 BEQ DRETRN
 STAA DDATRG
 LDAA #$1B SEEK SPEED
 STAA DCOMRG
 BSR DELAY1 USE MF68 DELAY
DREADY LDAA DCOMRG
 BITA #1
 BNE DREADY
DRETRN RTS
 SPC 3
* SET DRIVE NUMBER
*
SETDRV LDAB DMADRV
 ORAB #$80
 TST SIDWON SECOND SIDE?
 BEQ SETDR2
 ORAB #$08
SETDR2 COMB
 STAB DRVREG
DELAY1 JMP DELAY
 SPC 3
* FAST READ CHECKS WITHOUT HEA LOAD DELAY
*
DFSTRD STAB DSECRG
 CLR SIDWON ASSUME FIRST SIDE
 TST DBLFLG
 BEQ NOTDB5
 LDAB MAXSEC
```

```
 LSRB MAXSEC/2
 CMPB SECNOW
 BCE NOTOS5
 INC SIDNOW SECOND SIDE
NOT 05 BSR SETDRV
 LDX #$FFFF-FCB-$48 LOAD DATA HERE
 STX ADDREG
 LDX #$FFFF-256 BYTES TO TRANSFER
 TST BYTSEC SECTOR SIZE
 BMI NOT128
 LDX #$FFFF-128
NOT128 STX CNTREG
 LDAB #$FD
 SIA  CCREG
 INCB
 STAB PRIREG
 NOP
 SEI STOP SPOOLER
 LDAA #$08 READ WITHOUT DELAY
 STAA DCOMAG
 LDX #$F888 TIME OUT LIMIT
FSTREZ TST CCREG
 BPL FSTRE3
 DEX
 BNE FSTREZ
FSTPE3 LDX #$FFFF
 STX PRIREG
 BSR DREADY
 BITA #$1B
 RTS
 SPC 3
* BOOTSTRAP LOADER FOR TRK 0 SEC 8/1
*
* THIS SECTOR IS READ BY ROM BOOTSTRAP
* AND IN TURN READS ALL OF THE FLEX.SYS
* FILE STARTING AT THE SECTOR STORED IN
* THE FIFTH AND SIXTH BYTES BY 'LINK.CMD'.
*
* THERE ARE FOUR VERSIONS OF THE BOOTSTRAP.
* THE VALUE OF BOOTMUM DETERMINES WHICH ONE
* WILL BE USED. THESE BOOTS ARE RELOCATABLE
* AND WILL ASSEMBLE CORRECTLY REGARDLESS OF
* WHICH PROCESSOR ASSEMBLES THIS PROGRAM.
*
* BOOT0 = 6800 MF68
* BOOT1 = 6800 DMAF
* BOOT2 = 6809 MF68
* BOOT3 = 6809 DMAF
*
* LOCAL ADDRESS EQUATES FOR 6800 AND 6809
*
BPNTR8 EQU $A87C POINTER AND BUFFER8
BPNTR9 E   $C1FC
BTEMP8 EQU BPNTR8+2
BTEMP9 EQU BPNTR9+2
BFCB8 EQU $A200
BFCB9 EQU $C200

MCOMR8 EQU $8018 6800 MF68
MTRKR8 EQU MCOMR8+1
MSECR8 EQU MCOMR8+2
MDATR8 EQU MCOMR8+3

ADDRE8 EQU $9800 6800 DMAF
CNTRE8 EQU ADDRE8+$02
CCREG8 EQU ADDRE8+$10
PRIRE8 EQU ADDRE8+$14
DCOMR8 EQU ADDRE8+$20
DTRKR8 EQU ADDRE8+$21
DSECR8 EQU ADDRE8+$22
DDATR8 EQU ADDRE8+$23
DRVRE8 EQU ADDRE8+$24

MCOMR9 EQU $E81B 6809 M 6B
MTRKR9 EQU MCOMR9+1
MSECR9 EQU MCOMR9+2
MDATR9 EQU MCOMR9+3

ADDRE9 EQU $F800 6809 DMAF
CNTRE9 EQU ADDRE9+$02
CCREG9 EQU ADDRE9+$10
PRIRE9 EQU ADDRE9+$14
DCOMR9 EQU ADDRE9+$20
DTRKR9 EQU ADDRE9+$21
DSECR9 EQU ADDRE9+$22
DDATR9 EQU ADDRE9+$23
DRVRE9 EQU ADDRE9+$24
 SPC 3
* BOOT0
*
BOOT0 FCB $8E LDS #
 FDB BPNTR8-2 LEAVE ROOM FOR TEMPS
 FCB 1 NOP TO ADJUST POSITION
 FCB 0 $,0,0 LDX #LINK ADDR.
 BNE GOTLN8
 FCB $FE,$FF,$FE GET VECTOR
 FCB $6E,0 JMP 0,X RESET

GOTLN8 FCB $FF STX
 F B BPNTR8 SAVE LINK SECTOR
 BRA BRSTR8 RESTORE HEAD

FRST88 LDAA BPNTR8 FIRST TRK AND SEC
 LDAB BPNTR8+1
BPEAD8 BSR BSEEK8
 LDAA #$8C READ COMMAND
 STAA MCOMR8
 BSR BDEL8
 CLRB COUNT 256 BYTES
 FCB $CE LDX #
 FDB BFCB8 READ DATA INTO HERE
MORED8 LDAA MCOMR8
 BITA #2 DATA AVAILABLE BIT
 BNE GBYTE8 DATA IS READY
 BITA #1 READY BIT
 BNE MORED8
 BRA BOOT8 ENDED TOO SOON

GBYTE8 LDAA MDATR8 GET A BYTE
 FCB $A7,$00 STORE IN MEMORY
 FCB 0 INX
 DECB COUNT BYTES
 BNE MORED8

 BSR BRDY8 WAIT FOR CRC CHECK
 BITB #$1C READ ERROR?
 BNE BOOT8 YES, TRY AGAIN
 FCB $CE LDX #
 F B BFCB8+4
SAVPT8 FCB $FF STX
 FDB BPNTR8 BOOTFCB POINTER
 RTS

BSEEK8 CMPA MTRKR8 ALREADY THERE?
 BEQ GOTRK8
 STAA MDATR8
 BSR BDEL8
 LDAA #$1B SEEK COMMAND
 STAA MCOMR8
 BSR BDEL8
 FCB $37 PSH B
 BSR BRDY8
 FCB $33 PUL B
GOTRK8 STAB MSECR8
BDEL8 BSR *+2 WASTE TIME
 BSR *+2
 BSR *+2
 RTS

BRDY8 LDAB MCOMR8
 BITB #1 RE DY?
 BNE BRDY8 NO
 RTS

RDBYT8 FCB $FE LDX
 FDB BPNTR8
 CPX #BFCB8+256
 BEQ GETLN8 END OF CURRENT SECTOR
 FCB $A6,0  DAA BYTE FROM SECTOR
 FCB 0 INX
 BRA SAVPT8

GETLN8 LDAA BFCB8 LINK TO NEXT SECTOR
 LDAB  FCB8+1
 BSR BREAD8
 BRA R BYT8

BRSTR8 LDAA #$8 RESTORE COMMAND
 STAA MCOMR8
 BSR BDEL8
 BSR BRDY8
 BSR FRST88 GET FLEX SEC
GETYP8 BSR RDBYT8
 CMPA #2 BINARY BLOCK?
 BEQ GETAD8
 CMPA #$16 START ADR BLOCK?
 BNE GETYP8
 BSR RDBYT8
 STAA BTEMP8 STARTING ADDRESS
 BSR RDBYT8
 STAA BTEMP8+1
 FCB $FE LDX
 FDB BTEMP8
 FCB $6E,$0 JUMP TO FLEX

GETAD8 BSR RDBYT8
 STAA BTEMP8
 BSR RDBYT8
 STAA BTEMP8+1
 BSR RDBYT8
 FCB $16 TAB BYTE COUNT
 BEQ GETYP8 EMPTY BLOCK
MOVBE8 FCB $37 PSH B
 BSR RDBYT8 GET BYTE FROM BOOTFCB
 FCB $33 PUL B
 FCB $FE LDX
 FDB BTEMP8
 FCB $A7,0 STAA IN MEMORY
 FCB 0 INX
 FCB $FF STX
 FDB BTEMP8
 DECB
 BNE MOVBE8
 BRA GETYP8 LOOK FOR NEXT BLOCK

B8END EQU * END OF BOOT8
 SPC 3
* BOOT1
*
BOOT1 FCB $8E LDS #
 FDB BPNTR8-2 LEAVE ROOM FOR TEMPS
 FCB 1 NOP TO ADJUST POSITION
 FCB $CE,0,0 LDX #LINK ADDR.
 BNE GOTLN1
 FCB $FE,$FF,$FE GET VECTOR
 FCB $6E,0 JMP 0,X RESET

GOTLN1 FCB $FF STX
 FDB BPNTR8 SAVE START SE TOR
 BRA BRSTR1

FRST1A LDAA BPNTR8 FIRST TRK AND SEC
 LDAB BPNTR8+1
BREAD1 BSR BSEEK1
 LDAB #$FD
 FCB $CE LDX #
 FDB $FFFF-BFCB8 LOAD DATA HERE
 FCB $FF STX
 FDB ADDRE8
 FCB $CE LDX #
 FDB $FFFF-256 BYTES TO TRANSFER
 FCB $FF STX
 FDB CNTRE8
 STAB CCREG8
 INCB
 LDAA #$8C READ COMMAND
 STAB PRIRE8
 STAA DCOMR8
 FCB $CE LDX #
 FDB $F888 TIME OUT

TIME1 TST CCREG8
 BPL OK1
 FCB 9 DEX
 BNE TIME1

OK1 FCB $CE LDX #
 FDB $FFFF
 FCB $FF STX
 FDB PRIRE8
 BSR BRDY1 WAIT FOR CRC CHECK
 BITB #$1C READ ERROR?
 BNE BOOT1 YES, TRY AGAIN
 FCB $CE LDX #
 FDB BFCB8+4
SAVPT1 FCB $FF STX
 FDB BPNTR8 BOOTFCB POINTER
 RTS

BRSTR1 BRA BRST1A ISLAND8
FRST81 BRA FRST1A
BREA1A BRA BREAD1

BSEEK1 STAB BSECR8
 CMPB #$F B IHEH FIRST SIDE
 BNI FLIP1
 LDAB #$7E DRV 8 FIRST SIDE
 BRA DOSID1

FLIP1 LDAB #$6E DRV 8 SECOND SIDE
DOSID1 STAB DRVRE8
 CMPA DTRKR8 ALREADY THERE?
 BEQ BDEL1
 STAA DDATR8
 BSR BDEL1
 LDAA #$19 SEEK SPEED
 STAA DCOMR8
 BSR BDEL1
 BRA BRDY1

BDEL1 BSR *+2 WASTE TIME
 BSR *+2
 BSR *+2
 RTS

BRDY1 LDAB DCOMR8
 BITB #1 RE DY?
 BNE BRDY1 NO
 RTS

RDBYT1 FCB $FE LDX
 F B BPNTR8
 CPX #BFCB8+256
 BEQ GETLN1 END OF CURRENT SECTOR
 FCB $A6,0 LDAA BYTE FROM SECTOR
 FCB 0 INX
 BRA SAVPT1

GETLN1 LDAA BFCB8 LINK TO NEXT SECTOR
 LDAB BFCB8+1
 BSR BREA1A
 BRA RDBYT1

BRSTA1 LDAA #$9 RESTORE SPEED
 STAA DCOMR8
 BSR BDEL1
 BSR BRDY1
 BSR FRST81 GET FLEX SEC
GETYP1 BSR RDBYT1
 CMPA #2 BINARY BLOCK?
 BEQ GETAD1
 CMPA #$16 START ADR BLOCK?
 BNE GETYP1
 BSR RDBYT1
 STAA BTEMP8 STARTING ADDRESS
 BSR RDBYT1
 STAA BTEMP8+1
 FCB $FE LDX
 FDB BTEMP8
 FCB $6E,$0 JUMP TO FLEX

GETAD1 BSR RDBYT1
 STAA BTEMP8
 BSR RDBYT1
 STAA BTEMP8+1
 BSR RDBYT1
 FCB $16 TAB BYTE COUNT
 BEQ GETYP1 EMPTY BLOCK
MOVBE1 FCB $37 PSH B
 BSR RDBYT1 GET BYTE F ON BOOTFCB
 FCB $33 PUL B
 FCB $FE LDX
 FDB BTEMP8
 FCB $A7,0 STAA IN MEMORY
 FCB 0 INX
 FCB $FF STX
 FDB BTEMP8
 DECB
 BNE MOVBE1
 BRA GETYP1 LOOK FOR NEXT BLOCK

B1END EQU * END OF BOOT1
 SPC 3
* BOOT 2
*
BOOT2 FDB $18CE LDS #
 FDB BPNTR9-2 LEAVE ROOM FOR TEMPS
 FCB $8E,0,0 LDX #LINK ADDR.
 BNE GOTLN2
 FCB $BE,$FF,$FE GET VECTOR
 FCB $6E,0 JMP 0,X RESET

GOTLN2 FCB $BF STX
 FDB BPNTR9 SAVE START SECTOR
 BRA BRSTR2

FRST2A LDAA BPNTR9 FIRST TRK AND SEC
 LDAB BPNTR9+1
BREAD2 BSR BSEEK2
 LDAA #$BC READ COMMAND
```

```
 STAA MCOMR9
 BSR BOEL2
 CLRB COUNT 256 BYTES
 FCB $8E LDX #
 FDB $FCB9 READ DATA INTO HERE
MORED2 LDAA MCOMR9
 BITA #2 DATA AVAILABLE BIT
 BNE GBYTE2 DATA IS READY
 BITA #1 READY BIT
 BNE MORED2
 BRA BOOT2 ENDED TOO SOON

GBYTE2 LDAA MDATR9 GET A BYTE
 FCB $A7,$88 STORE IN MEMORY
 FDB $3081 INX
 DECB COUNT BYTES
 BNE MORED2

 BSR BRDY2 WAIT FOR CRC CHECK
 BITB #$1C READ ERROR?
 BNE BOOT2 YES, TRY AGAIN
 FCB $8E LDX #
 FDB $FCB9+4
SAVPT2 FCB $8F STX
 FDB BPNTR9 BOOTFCB POINTER
 RTS

FRST02 BRA FRST2A ISLAND8

BSEEK2 CMPA MTRKR9 ALREADY THERE?
 BEQ GOTRK2
 STAA MDATR9
 BSR BOEL2
 LDAA #$18 SEEK COMMAND
 STAA MCOMR9
 BSR BOEL2
 FDB $3404 PSH B
 BSR BRDY2
 FDB $3584 PUL B
GOTRK2 STAB MSECR9
BOEL2 BSR *+2 WASTE TIME
 BSR *+2
 BSR *+2
 RTS

BRDY2 LOAB MCOMR9
 BITB #1 REA Y?
 BNE BRDY2 NO
 RTS

RDBYT2 FCB $8E LDX
 FDB BPNTR9
 CPX #$FCB9+256
 BEQ GETLN2 END OF CURRENT SECTOR
 FCB $A6,0 LDAA BYTE FROM SECTOR
 FDB $3081 INX
 BRA SAVPT2

GETLN2 LDAA BFCB9 LINK TO NEXT SECTOR
 LOAB BFCB9+1
 BSR BREAD2
 BRA RDBYT2

BRSTR2 LDAA #$8 RESTORE TRK #
 BTAA MCOMR9
 BSR BOEL2
 BSR BRDY2
 BSR FRST02 GET FLEX SEC
GETYP2 BSR RDBYT2
 CMPA #2 BINARY BLOCK?
 BEQ GETAD2
 CMPA #$16 START ADR BLOCK?
 BNE GETYP2
 BSR RDBYT2
 BTAA BTEMP9 STARTING ADDRESS
 BSR RDBYT2
 BTAA BTEMP9+1
 FCB $8E LDX
 FDB BTEMP9
 FCB $6E,$8 JUMP TO FLEX

GETAD2 BSR RDBYT2
 BTAA BTEMP9
 BSR RDBYT2
 STAA BTEMP9+1
 BSR RDBYT2
 FDB #$1F89 TAB BYTE COUNT
 BEQ GETYP2 EMPTY BLOCK
MOVSE2 FDB $3404 PSH B
 BSR RDBYT2 GT BYTE FROM BOOTFCB
 FDB $3584 PUL B
 FCB $8E LDX
 FDB BTEMP9
 FCB $A7,$ BTAA IN MEMORY
 FDB $3081 INX
 FCB $8F STX
 FDB BTEMP9
 DECB
 BNE MOVSE2
 BRA GETYP2 LOOK FOR NEXT BLOCK

BZERO EQU * END OF BOOT2
 SPC 3
* BOOT3
*
BOOT3 FDB $19CE LOS #
 FDB BPNTR9-2 LEAVE ROOM FOR TEMPS
 FCB $8E,0,0 LDX #LINK ADDR.
 BNE GOTLN3
 FCB   .$FF,$FE GET VECTOR
 FCB $6E,$ JMP 0,X RESET

GOTLN3 FCB $8F STX
 FDB BPNTR9 SAVE START SECTOR
 BRA BRSTR3

FRST3A LDAA BPNTR9 FIRST TRK AND SEC
 LDAB BPNTR9+1
BREAD3 BSR BSEEK3
 LOAB #$FD
 FCB $8E LDX #
 FDB $FFFF-BFCB9 LOAD DATA HERE
 FCB $8F STX
 FDB ADDRE9
 FCB $8E LDX #
 FDB $FFFF-256 BYTES TO TRANSFER
 FCB $8F STX
 FDB CNTRE9
 STAB CCREG9
 INCB
 LOAA #$8C READ COMMAND
 STAB PRIRE9
 STAA DCOMR9
 FCB $8E LDX #
 FDB $FD80 TIME OUT
TIME3 TST CCREG9
 BPL OK3
 FDB $3A1F DEX
 BNE TIME3

OK3 FCB $8E LDX #
 FDB $FFFF
 FCB $8F STX
 FDB PRIRE9
 BSR BRDY3 WAIT FOR CRC CHECK
 BITB #$1C READ ERROR?
 BNE BOOT3 YES, TRY AGAIN
 FCB $8E LDX #
 FDB BFCB9+4
SAVPT3 FCB $8F STX
 FDB BPNTR9 BOOTFCB POINTER
 RTS

BRSTR3 BRA BRST3A ISLAND8
FRST03 BRA FRST3A
BREA3A BRA BREAD3

BSEEK3 STAB BSECR9
 CMPB #$F B INCH END FIRST SIDE
 BHI FLIP3
 LDAB #$7E DRV 0 FIRST SIDE
 BRA DOSID3

FLIP3 LDAB #$4E DRV 0 SECOND SIDE
DOSID3 STA  DRVRE9
 CMPA DTRKR9 ALREADY THERE?
 BEQ BOEL3
 STAA DDATR9
 BSR BOEL3
 LDAA #$19 SEEK SPEED
 STAA DCOMR9
 BSR BOEL3
  RA BRDY3

BOEL3 BSR *+2 WASTE TIME
 BSR *+2
 BSR *+2
 RTS

BRDY3 LDAB DCOMR9
 BITB #1 R ADY?
 BNE BR Y3 NO
 RTS

RDBYT3 FCB $8E LDX
 FDB BPNTR9
 CPX #BFCB9+256
 BEQ GETLN3 END OF CURRENT SECTOR
 FCB $A6,0 LDAA BYTE FROM SECTOR
 FDB $3081 INX
 BRA SAVPT3

GETLN3 LDAA BF B9 LINK TO NEXT
SECTOR
 LOAB BFCB9+1
 BSR BREA3A
 BRA RDBYT3

BRST3A LDAA #$9 RESTORE SPEED
 STAA DCOMR9
 BSR BOEL3
 BSR BRDY3
 BSR FRST03 GET FLEX SEC
GETYP3 BSR RDBYT3
 CMPA #2 BINARY BLOCK?
 BEQ GETAD3
 CMPA #$16 START ADR BLOCK?
 BNE GETYP3
 BSR RDBYT3
 STAA BTEMP9 STARTING ADDRESS
 BSR RDBYT3
 BTAA BTEMP9+1
 FCB $8E LDX
 FDB BTEMP9
 FCB $6E,$8 JUMP TO FLEX

GETAD3 BSR RDBYT3
 BTAA BTEMP9
 BSR RDBYT3
 BTAA BTEMP9+1
 BSR RDBYT3
 FDB #$1F89 TAB BYTE COUNT
 BEQ GETYP3 EMPTY BLOCK
MOVSE3 FDB $3404 PSH B
 BSR RDBYT3 GET BYTE FROM BOOTFCB
 FDB $3584 PUL B
 FCB $8E LDX
 FDB BTEMP9
 FCB $A7,$ BTAA IN MEMORY
 FDB $3081 INX
 FCB $8F STX
 FDB BTEMP9
 DECB
 BNE MOVSE3
 BRA GETYP3 LOOK FOR NEXT BLOCK

BZEND EQU * END OF BOOT 3
```

BIT Bucket

Mr. Don Williams
68 Micro Journal
Hixson, Tennessee 37343

Vail Electronics, Inc.
P.O. Box 1136
Palm Bay, Fl. 32905
February 9, 1982

Dear Mr. Williams,

We thought your readers would be interested in our experiences with two relatively new products recently appearing on the market relating to the 6809 microprocessor : the Hazelwood Computer Systems' HELIX computer and Microware's PASCAL for the OS-9 operating system.

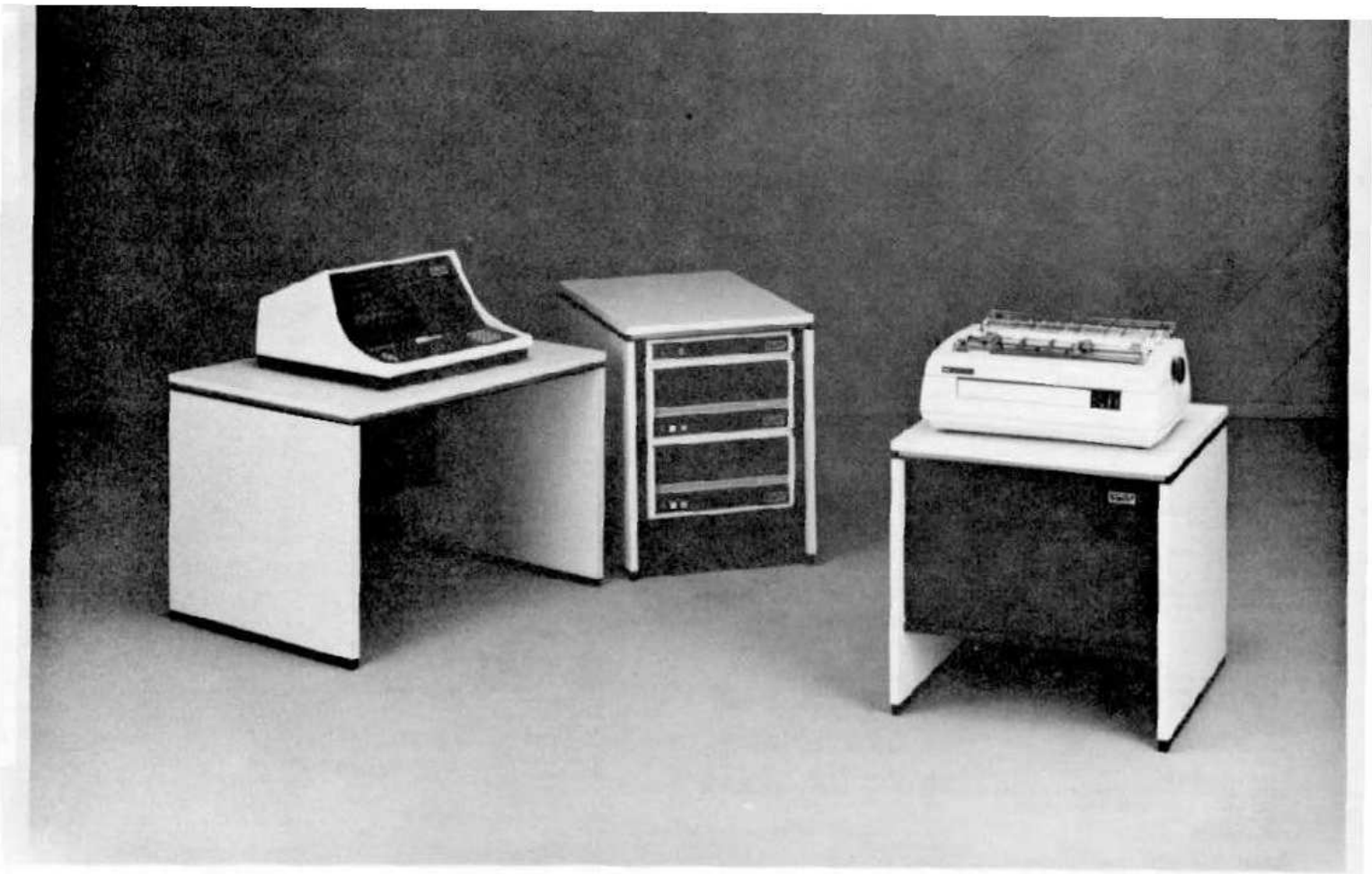
The HELIX computer:

We purchased one of the first HELIX computers to be built, in November 1981, after seeing it advertised in 68 Micro Journal. Even though our unit is really a "preproduction" model, it has performed flawlessly from the start. It seems to be mechanically well constructed, housed in an Optima commercial grade cabinet. Our unit uses a Hazelwood 2 MHz 6809 CPU board, a 64K dynamic memory board, and has an upwards-compatible SS-64 main bus to allow future expansion to a 68000 system. The main features that attracted us to the HELIX were:

- Low price ($1995 list, including 2 parallel and 2 serial I/O ports, chassis, CPU card and 64K RAM)
- SS-50, OS-9 and FLEX compatibility
- 68000 compatibility with a full 16 bit data bus and 24 bit address bus
- Sturdy professional chassis, oversize power supply, "better" real time clock circuit (It knows the year as well as date and time, even after power has been off.)
- Use of only 2 MHz rated B series 68XX chips
- Hi-resolution, low cost color graphics card coming during the second quarter of 1982
- SS-64 bus allows physically large cards, such as special breadboard circuits

Of course, a new system, especially an early model like ours, will have some imperfections and design tradeoffs evident. Our list of "minuses" for the HELIX include:

- Relatively high cooling fan noise (At least in our early model.)
- Detailed hardware documentation just now becoming available
- Production schedule slips of about 6 months, to the second quarter of 1982, for the 68000 CPU card, disk controller card, 512K memory card, and hi-resolution color graphics card.



THE COMPLETE BUSINESS SYSTEM

+Multiuser+Highly Expandable+Cost Effective

S+ THE CONCEPT

The S+ system is a modular computer system in which all portions of the hardware and software are designed to work together in the most efficient way possible. An S+ single user system with floppy disk storage is a competitive and cost effective entry level system. Unlike most other small computers being sold as "personal", or "small business" machines, the S+ system may be expanded to maximum capabilities using this same hardware and software. You cannot end up with a DEAD END system that cannot be expanded and whose software is not compatible with larger machines. A basic S+ system may be expanded to thirty-two users, a megabyte of main memory and hundreds of megabytes of hard disk storage by simply plugging in, or connecting the desired upgrade equipment.

TOTAL DESIGN—Hardware and Software

The S+ system is an integrated hardware and software design. The two complement and enhance each other in this system. The UniFLEX® operating system used in the S+ systems is patterned after the Bell Laboratories UNIX® operating system, one of the most admired and widely used operating systems in the world. Instead of being an afterthought, the software is part of the design of the S+ system. You can be sure that with this approach that all parts of the computer operate with maximum efficiency and cost effectiveness.

THE CENTRAL PROCESSOR

The basic S+ system is configured with 256K bytes of memory and can be expanded to more than 1 million bytes. An efficient and fast hardware memory management system is used to allocate the available memory among the users on a dynamic basis. As little as 8K bytes, or the entire memory—if needed—can be used by any individual user. This makes it possible to run very large programs on the system, but it also uses no more memory than necessary for a particular job. The increase in cost effectiveness of this system over crude and outdated bank switching arrangements is dramatic.

The central processor runs in both user and supervisor states. It can detect and reject a defective user program. It is impossible for a user program to go bad and stop the entire system, as can happen quite easily in less sophisticated systems.

Task switching is accomplished by use of a multiple map RAM memory, with sixty-four individual task maps. Each task can access from 4 to 64 K-bytes of memory. Multiple tasks may be used in programs that require more than 64K bytes of memory for execution. When a task is completed the memory is automatically released for other use.

SOFTWARE

The S+ operating system, UniFLEX® is a multiuser, multitasking operating system based on the UNIX® operating system that has been used for many years on Digital Equipment Corp. PDP-11 series minicomputers. It is considered one of the most sophisticated and "user friendly" operating systems available. Variations of UNIX® are rapidly becoming standard on mini and larger microcomputers.

A large variety of languages are available for use with the system. These include FORTRAN, COBOL, BASIC, and Pascal. Word processing packages are also available to give you full text processing capability on the system.

Applications programs are available in large quantities in many fields. This includes general business, medical, dental, veterinary, library and real estate management; plus others. Since the system is multiuser it can also be connected to cash registers to produce a point-ofsale terminal system combined with the computer. The possibilities for application of this system are endless.

THE I/O SYSTEM

The S+ system is totally interrupt driven. All terminal and printer I/O devices connect to an I/O bus separate from the main bus. Up to thirty-two separate devices may be connected to the I/O bus at any one time. If I/O activity is great enough to cause an unacceptable slowdown in system operation, a separate I/O processor can be installed in the system. This plug-in option removes all I/O handling overhead from the main processor and allows operation of up to thirty-two external devices at 9,600 baud. Without an integrated total design, as in the S+ system, it would become impractical to use a UNIX®type operating system in a situation with heavy terminal I/O activity.

DISK STORAGE

A wide range of disk storage capacity is available for the S+ system, from 2.5 M-byte floppy disks to an 80 M-byte Winchester and many sizes between. All disk controllers use direct memory access (DMA) type operations to maximize data transfer and to minimize overhead on the main processor. The Winchester disks also use intelligent controllers along with DMA transfers to preserve the performance that these type devices are capable of giving. Without this distributed intelligence the system performance would be greatly degraded. The UniFLEX® operating system is designed to work at maximum efficiency with this type disk system. The data transfer rates achieved by this combination rival those of large minicomputers.

COMMUNICATIONS

A high speed local network communications system is available to interconnect S+ systems. The VIABUS® network will allow communication between systems at data rates of over 400K baud. Such a system makes it possible to share data between local systems in an efficient and low-cost manner.

AVAILABLE SOON

Tape backup—20M-Byte in less than 15 minutes on a standard ¼ inch cartridge.

Mini-Wini—5 and 10 M-Byte Winchesters—5¼ inch package. Winchester performance, for smaller systems in a small package. UniFLEX® compatible design.

Large Capacity—190 and 340 M-Byte Winchesters, plus SMD cartridge drives.

UniFLEX is a registered trademark of Technical Systems Consultants, Inc.

UNIX is a registered trademark of Bell Labs.

VIABUS is a registered trademark of Southwest Technical Products Corporation.

SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RHAPSODY
SAN ANTONIO, TEXAS 78216 (512) 344-0241

. Neither the 64K nor the 512K memory card uses parity.

In summary, we found the HELIX to be a well built, reliable machine, answering our need for an SS-50 6809 computer that would be easily upgradable to the 68000. We have used it a total of approximately 200 hours with no problems. In fact, we became such enthusiastic supporters of the HELIX that we are now authorized HELIX dealers!

OS-9 PASCAL:

Our selection of an operating system and high level language for the HELIX was based on our long term goal of developing software for an ultra-low cost computer-aided printed circuit design system. Execution speed is a primary concern, followed by compatibility with a multitasking operating system, good memory efficiency and future portability to compilers for the 68000.

We selected Microware's OS-9 operating system and their new OS-9 Pascal product. For the Pascal list price of $400 the user receives six major pieces of software:

- Compiler - for compiling Pascal source code to pcode
- Interpreter - for executing pcode programs small enough to reside in memory
- Virtual code swapping interpreter - for executing very large pcode programs
- Optimizing translator - for converting pcode programs or individual procedures into 6809 assembly source code. (An assembler, not included, but available from Microware is required to convert the translator output to native code.)
- Linkage editor utility - for integrating native code "external" routines such as separately translated or assembled routines into Pascal programs
- Support packages - for support of the runtime execution of pcode or Pascal produced native code programs (Three separate support packages of varying size and complexity are provided.)

The OS-9 Pascal seems to meet all of our requirements. Under the most important criterion, speed, the OS-9 Pascal appears to be more than twice the speed of its nearest competitor when running the prime number benchmark program listed in the July 1981, issue of 68 Micro Journal.

The November 1981, 68 Micro Journal compared the results of running that program using several Pascal compilers. That data is repeated below with the addition of the OS-9 Pascal results:

PASCAL	TIME (SEC)	USER BYTES	TOTAL BYTES
OS-9 native code	27	919	6113
OS-9 pcode	56	427	10241
Lucidata	158	598	3929
Dynasoft	143	301	1490
Omegasoft	66	940	2465
TSC	57	721	14334

The OS-9 Pascal version 1.0.0 is a nearly full implementation of the ISO standard. Exceptions are that conformant arrays are not supported; procedures and functions can be passed as formal parameters only by value, not by name; and goto statements cannot branch out of their enclosing procedure or function. Many enhancements are are provided including several recommended by the ANSII-IEEE Joint Pascal Committee (See Electronic Design, January 7, 1982, page 42-46). These include:

- Slicing as a method of substring manipulation, for example:
  S[2..4] := 'ABC';
- Subranges as case constants, and an otherwise option for the case statement

Additional enhancements include:

- Additional standard functions and procedures, many of which allow convenient I/O file handling for both sequential and random access files
- 5 byte format for floating point numbers, allowing over 9 digits of precision

The OS-9 Pascal documentation is excellent, with a 120 page user's manual that is concise and readable. The manual assumes that the user is familiar with the Pascal language and therefore concentrates on how to install and use the OS-9 Pascal products. The manual is very tutorial in nature, with many specific examples demonstrating the use of the language enhancements provided and the manipulation of OS-9 I/O files from Pascal. The section on error messages also provides clues as to the most likely cause of the error and/or how to correct it. The lack of an index makes the manual's use as a reference document more difficult, but the table of contents and list of figures are usually sufficient to locate needed information.

We hope the this information will be of help to any readers who may have an interest in the above products.

David and Barbara Vail
Vail Electronics, Inc.
(305) 729-6363

P.S. As mentioned above, we have recently become authorized dealers for both HELIX computers and Microware Systems Corporation software. As a "Going Into Business" sale we are currently offering both product lines at 10% below the current list prices.

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MIDDLESEX, EN3 4SF
ENGLAND

Telephone 01 804 8131

A CONVERSION TO GIVE 16 ADDRESSES PER PORT WITH SOUTHWEST TECHNICAL 6800's.

BACKGROUND.

Some time ago the Psychology Labs of Middlesex Polytechnic were faced with the problem of re-equiping. To fit the budget we decided to opt for a distributed cluster system based on the S.W.T. 6800 microcomputer, running FLEX.

A central machine runs a dual 8 inch floppy disc unit. The outlying computers are directly connected, via parallel ports, to the central machine. This enables us to run real time experiments on each outlying computer and give these computers access to the disc unit, while only having to buy one such item. The time taken to load , save and run programs is practically the same as if each outlying computer had its own disc drives.

Having started using S.W.T. 6800's we then replaced the central machine with a GIMIX 68 chassis, fitted with a 6809 CPU, to give greater capacity for plug in boards. We then purchased four S.W.T. S/09 computers as the old 6800's were no longer available.

Finding such a mixture to much of a headache we converted everthing to 6809's. This left us with 4 addresses per port on the 6800's and 16 addresses per port on the S.W.T. S/09's. Two sets of software were needed to run this setup so we went for 16 addresses per port all round.

CONVERSION

These notes apply to S.W.T. MPB and MPB2 motherboards only.

Convert these motherboards to 6809 standard using the instructions supplied by S.W.T. with the replacement 6809 CPU card.

Remove the wire link between pins 1 and 30 on port 5 (board select and UD4).

Cut the track from address line A5 to pin 4 of IC 6 and join pin 4 (IC 6) to address line A7.

Cut the tracks from A2, A3 and A4 to pins 1, 2 and 3 of IC 3, close to the molex pins.

Reconnect these three tracks as follows:-

IC 3 pin 1 to A4
IC 3 pin 2 to A5
IC 3 pin 3 to A6

Finally connect A2 to UD3 and A3 to UD4.

UD3 and UD4 have now become register select lines 2 and 3. This gives 16 addresses per port, in conjunction with RS0 and RS1. These new register select lines do not affect the working of single port boards, but are needed if double port boards are installed.

As the original port numbers have divided by 4 the VDU serial port card should now be installed in port 0 and the minifloppy disc controller in port 1. The S.W.T. minifloppy disc controller board needs modifying to work with 16 addresses per port. S.W.T. issues a modification sheet for this.

The disc controller board for 8" drives should work in in a converted chassis but we have not tried this as our controller card is installed in the Gimix chassis which converts to 16 addresses per port by altering a switch bank and moving a socketed IC.

Yours Sincerely,

Brian Roberts

BRIAN ROBERTS

STAR-KITS

P. O. Box 209
Mt. Kisco, New York 10549
February 16, 1982

Don Williams, Sr.
'68' Micro Journal
5930 Cassandra Smith
Hixson TN 37343

Dear Don:

I recently received a phone call from John Tucker, a long time 68xx user, reporting a problem he encountered while running my Spell 'n Fix spelling correction program (formerly called Magic Spell). Under certain conditions, the program would write in the wrong place on a disk, clobber

files, or give the wrong number of free sectors.

On closer examination, it turns out to be a problem in TSC's Flex. Given just the right combination of events, Flex will clobber a disk in a way which makes it difficult to assign the blame.

Each time Flex writes on a disk, it needs to know where to find the next free sector to use. This information is kept in sector 3 of track 0, which is the System Information Record (also called the SIR), and Flex usually reads this sector before opening a new file for write. Once the file is open, however, Flex maintains the data in memory, and does not update the SIR itself until the file is closed. Keeping the data in memory saves much time by avoiding frequent disk accesses.

A special situation occurs when we write to two files on the same disk at the same time. Flex uses the free sector data in memory to assign sectors to the two files, alternating between the two files and assigning space to them as needed. If you close one of the two files, Flex updates the SIR on the disk, but continues to use the data in memory to assign space to the remaining file. In other words, it assumes that the data in memory is more up-to-date than the data in the SIR on the disk. If you then open and write into a new file on the same drive, space will be assigned according to the data in memory, since that is assumed to be more current than the free sector data written in the SIR.

Note the difference: when opening a new file for write, Flex usually reads the SIR to determine where to put it. But when another file is already open, Flex uses the free sector data in memory to assign space for the new file, and does not read the SIR. This is essential when writing two or more files on the same disk, since the actual free sector data in memory may be different from that last written on the disk's SIR.

But a problem arises when two different drives are involved. Flex does not check drive numbers. Whenever you open a file for write while another file is open on any drive, Flex always assumes that the data in memory (if available) is correct. That is indeed the case ... but only if you haven't switched disks!

Now, switching disks is obviously a bad idea while you're writing on them. But it is perfectly reasonable to take the disk out of a drive which is not being used, and substitute a different disk. The problem is that if a file is open on another drive, Flex will continue using the old disk data to write on the new disk, thereby putting the new file in the wrong place (perhaps clobbering existing files, and getting the number of free sectors wrong in the process).

Here is how to demonstrate the existence of the bug:

1. NEWDISK a diskette.
2. Load TSC Basic and enter the following program.

```
 10 REM OPEN A FILE ON DRIVE 0
 20 OPEN NEW "0.FILE0" AS 1
 30 FOR I=1 TO 10 : PRINT #1, "HUMBUG" : NEXT I
 40 REM NOW LEAVE FILE0 OPEN AND START FILE1 ON DRIVE 1
 50 OPEN NEW "1.FILE1" AS 2
 60 FOR I=1 TO 1000 : PRINT #2, "HUMBUG" : NEXT I
 70 CLOSE 2
 80 REM FILE0 ON DRIVE 0 IS STILL OPEN, BUT FILE1 ON
 90 REM DRIVE 1 IS NOW CLOSED AND IT SHOULD BE SAFE
100 REM TO SWITCH DISKS ON DRIVE 1.
110 PRINT "NOW PUT A FRESH DISK INTO DRIVE 1."
120 PRINT "TYPE 'OK' WHEN READY TO CONTINUE."
130 INPUT A$                    : REM WAIT FOR ANSWER
140 OPEN NEW "1.FILE2" AS 3
150 FOR I=1 TO 1000 : PRINT #3, "HUMBUG" : NEXT I
160 CLOSE 1 : CLOSE 3
```

3. Put diskettes into drive 0 and drive 1. They will both be written on, so make sure they have some room and are not write protected. Now run the program.
4. When the message in lines 110-120 is printed, a file is left open on drive 0, but the file on drive 1 is properly closed so it should be safe to take the disk out. So take the disk out of drive 1, and put in your NEWDISKed disk. (Don't put in a valuable disk, because it will get clobbered!).
5. Now type 'OK' to continue the program.
6. When the program is done, get a CATalog of the disk in drive 1. You will note that the number of free sectors is incorrect. If you have a utility (such as DIR) which allows you to examine where FILE2 is on the disk, you will also see that it is in the wrong place. Specifically, you will see that the file location and number of sectors are what they would have been if you hadn't switched to a new disk.

The particular combination of events which leads to the problem is clearly somewhat unusual (fortunately), but it is nevertheless one that can and does occur in many situations, especially when programs update or copy several disk files at the same time. It's quite possible that you have clobbered a disk in the past in just this way without knowing just why.

The solution to the problem is obviously to have TSC fix Flex so that it checks drive numbers, and always reads the SIR whenever you open a file on a drive which does not currently have an open file on it. Until such time as they do so, however, here is an alternate solution which works. Its only disadvantage is that it must be incorporated into any program which requires you to switch disks.

Flex maintains an internal drive data table which consists of 24 bytes. In MiniFlex, this table starts at $7615; in 6800 Flex it starts at $8A1D; in 6809 Flex it begins at $D41D. This table contains six bytes for each of four drives - two bytes contain the track and sector numbers for the first free sector on the disk, two bytes contain similar data for the last free sector, and two bytes contain the number of free sectors. If the very first of these six bytes is 0, Flex will assume that the drive data is missing, and will therefore be forced to read the SIR for that drive. Hence the solution is to clear that first byte prior to opening the new file. In the above Basic program, this can be done by inserting the following line:

```
135 DR=1 : POKE HEX("D41D")+DR*6, 0
```

This line multiplies the drive number DR by 6, adds the result to the address of the table to point to the data for that drive, and pokes a 0 into that location. Multiplication by 6 is required since there are six bytes per drive - address $D41D is used for drive 0, $D423 is used for drive 1, and so on (assuming Flex 9 addresses are used.)

You must obviously be careful to use the right drive number, and to avoid doing this if there is an open file on that drive (when you oughtn't switch disks anyway!)

A similar procedure can be used in machine language programs. The patch we are using in Spell 'n Fix is as follows:

```
      LDX   #FCB    POINT TO FILE CONTROL BLOCK
      LDA B 3,X     GET DRIVE NUMBER
      ASL B
      ADD B 3,X     MULTIPLY BY 6
      ASL B
      LDX   #$D41D  POINT TO DRIVE DATA TABLE
      TST B         CHECK FOR 0
      BEQ   ABX1
ABX   INX
      DEC B         ADD B TO X
      BNE   ABX
ABX1  CLR   0,X     ERASE TABLE ENTRY FOR THIS DRIVE
```

In 6809 systems, the loop at ABX can be replaced by the ABX (add B to X) instruction or by a JSR to Flex's ADDBX routine.

Hope that the foregoing explains the problem and a temporary solution. Obviously the only real solution is to have TSC fix Flex, but due to the large number of copies affected (dating all the way from the first MiniFlex versions to the latest 6809 Flex), it is quite possible that their solution will be to add a sentence to the manual instructing us never to switch disks while executing a program.

Sincerely yours,

Peter A. Stark

technical systems consultants, inc.

Mr. Don Williams
68 Micro Journal
P.O. Box 849
Nixson, TN 37343

February 17, 1982

Dear Don,

We recently received a few letters regarding problems in the FLEX Disk Operating System when changing diskettes. I would like to clarify this situation for all your readers.

In general a user should not change diskettes in a drive while FLEX is executing a program. The only safe time to change diskettes is when all files on the system are closed (not just the drive on which the diskette is being changed). This is the case when FLEX's three plus sign prompt is issued. If a user wishes to develop a program which allows the changing of diskettes during execution, he should close all files on the system before asking the operator to change diskettes. One simple way to ensure all files are closed is to execute an "FMS Close" function (at $0403 in 6809 FLEX).

Thanks, Don, for the opportunity to spread this word. 68 Micro Journal is quite an asset to the 68XX industry.

Sincerely yours,

Daniel E. Vanada

DEV/pr

```
PROGRAM DUMP (INPUT,OUTPUT);

{ HEX ASCII DUMP OF MEMORY }

VAR
   ($A+$0000 $)  ( ASSIGN WHAT FOLLOWS STARTING AT $0 ABSOLUTE ADDRESS )
   MEMORY : ARRAY [0,.32766] OF BYTE;
   ($S $)  ( RESUME ASSIGNING VARIABLES ON STACK )

   K,L,M,N,
   LINE,PAGE : INTEGER;
   CH : CHAR;
```

```
FUNCTION GETPAGE : INTEGER;

{ CONVERTS TWO ASCII HEX DIGITS TO THE EQUIVALENT INTEGER VALUE.
  COULD BE EXTENDED TO FOUR DIGITS BY CHANGING ARRAY DIMENSION
  AND LOOP COUNT. }

VAR
  CH : ARRAY [1..2] OF CHAR;
  K,N : INTEGER;

BEGIN
  WRITE (' STARTING PAGE (TWO HEX DIGITS)? ');

  N := 0;
  FOR K := 1 TO 2 DO
  BEGIN
    N := N * 16;
    READ (CH [K]);
    IF CH [K] IN ['0'..'9'] THEN N := N + (ORD (CH [K]) - 48);
              { ALTERNATELY ORD (CH [K]) - ORD ('0') }

    IF CH [K] IN ['A'..'F'] THEN N := N + (ORD (CH [K]) - 55);
              { ALTERNATELY ORD (CH [K] - ORD ('A') + 10) }
  END;
  GETPAGE := N;
END;
FUNCTION HEX (NUMBER : INTEGER) : CHAR;

{ CONVERTS 4 BITS BINARY TO ONE HEX DIGIT ASCII REPRESENTATION }

BEGIN
  IF NUMBER IN [0..9] THEN HEX := CHR (NUMBER + 48);
      { ALTERNATELY, CHR (NUMBER + ORD ('0')); }

  IF NUMBER IN [10..15] THEN HEX := CHR (NUMBER + 55);
      { ALTERNATELY, CHR (NUMBER + ORD ('A')); }

END;
{ START OF MAIN PROGRAM }

BEGIN
  PAGE := GETPAGE;
  REPEAT
    WRITELN;
    N := PAGE * 256;

    FOR LINE := 0 TO 15 DO
    BEGIN
      K := 16 * LINE;
      WRITE (HEX(PAGE DIV 16):1,HEX(PAGE MOD 16):1,HEX(LINE):1,'0  ');

      FOR L := 0 TO 15 DO
        WRITE (HEX (MEMORY [N+K+L] DIV 16):1,
               HEX (MEMORY [N+K+L] MOD 16):1,' ');

      WRITE (' ');

      FOR L := 0 TO 15 DO
      BEGIN
        M := MEMORY [N+K+L];
        IF M > 127 THEN M := M - 128;
        IF M > 31 THEN WRITE (CHR (M))
          ELSE WRITE ('.');
      END;

      WRITELN;
    END;

    WRITELN;
    WRITE ('COMMAND? ');
    READ (CH);

    CASE CH OF
      'E' : BEGIN { DON'T DO ANYTHING } END;
      'F' : PAGE := PAGE + 1;
      'B' : PAGE := PAGE - 1;
      'N' : PAGE := GETPAGE  { NO SEMICOLON HERE }
    END;
  UNTIL CH = 'E';  { CASE OF 'E' TAKEN CARE OF HERE }
END.
```

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NEW SS50 PRODUCTS

META LAB announces two new products for the SS50 Bus Computer ... the DAC 1220 and the ADA 800.

The DAC 1220 is a High Speed Dual Channel Digital to Analog Converter Board compatible with the SS50C Bus. This card utilizes state of the art dual buffered monolithic semiconductors. The dual channel allows many ' 2 Axis ' control problems to be handled with this single 30 pin board. Blanking outputs are available so that external circuits can update or generate blanking during settling time. Output update of both channels can be done synchronously. This feature is very useful in such applications as XY displays.

The ADA 800 is an Eight Channel 8 Bit Analog to Digital Converter Board with a Single Channel 8 Bit Digital to Analog Converter. The A/D converter uses a standard 0 to 5V input range with the 5V reference available for easy and accurate ratiometric measurements. The 6821 Peripheral Interface Adapter (PIA) provides simple and familiar programming of inputs, outputs, and interrupts. The typical A/D conversion time is 128 uSec (7800 samples per second). The ADA 800 can be jumpered to convert at twice this speed with reduced accuracy. A buffered continuous conversion mode is available where a single channel can be monitored with minimum software and runtime overhead. The D/A channel can be set up for standard 0 to 5V or ±5V operation with zero and full scale adjustments. The settling time of 2 uSec for the D/A converter is fast enough for almost all applications.

These products are part of a series of high quality SS50 based products manufactured by Meta Lab. Watch for the upcoming release of our Z80 Soft Board Package which will allow you to run CP/M* based software on your SS50 computer.

*CP/M is a registered trademark of Digital Research Corp.

CSC

COMPUTER SYSTEMS CENTER
OF ST. LOUIS, INC.
13461 OLIVE BLVD.
CHESTERFIELD, MO. 63017
(314) 576-6020

February 10, 1982

Mr. Don Williams, Publisher
68 Micro Journal
5900 Cassandra Smith Road
Hixson, TN 37343

Dear Don,

Enclosed is a copy of the latest version of DYNAMITE, which was last updated over a year ago (version 1.3:8 is still current). No bugs have been reported since then, which is quite amazing when you consider the size and complexity of DYNAMITE and the large number of copies in use. We must have done something right.

The four new files, COLOSLSL.TXT, COLOSLSL.BIN, RELOCATE.CMD, and READ-ME.TXT are for the convenience of FLEX-Color Computer users. The new label files describe legal entry points, and should be valid for all versions of Color BASIC. RELOCATE is used to move DYNAMITE (or any other position-independent-code programs) to higher memory to avoid screen memory conflict problems. READ-ME describes how to do the move.

These new files will be furnished with all copies of DYNAMITE shipped beginning today. Anyone wanting an update should return his old diskette along with a check for $10.00 to cover handling and postage.

Thanks for your continued interest in DYNAMITE. Please let me know if I can be of further assistance.

Sincerely,

H. Joseph Turner, Jr.
President

technical systems consultants, inc.

PRESS RELEASE

Release Date: Immediately
Contact: Dan Vanada
Phone: before March 6, 1982: (317) 463-2502
after March 6, 1982: (919) 493-1451

Technical Systems Consultants Relocates

Technical Systems Consultants, Inc., the world's leading independent supplier of systems software for the Motorola 6800 and 6809, is relocating to North Carolina. The firm is moving its entire operati into a new 8000 square foot office facility in early March. Effecti March 15, 1982, the new address and telephone number for all correspondence will be:

Technical Systems Consultants, Inc.
111 Providence Road
Chapel Hill, NC 27514

(919) 493-1451

The firm will expand its staff and expects improved service for its customers.

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COMPUWORLD Inc.

Don Williams, Sr.
68 Micro Journal
5900 Cassandra Smith
Computer Publishing Center
P.O. box 849
Hixson Tn. 37343

Dear Mr. Williams:

We at Compuworld, Inc. would like to thank Jim Walker at Mid West Pharmaceutical Inc. for his gracious and thorough review of our new UniComp Payroll.

Mr. Walker made some very good suggestions which have since acted upon:

1) Under employee maintenance, specifically the auto insertion of the new employee, information is now entered automatically with the carriage return, eliminating the need to specify "U" for update mode.

2) A new employee's name is now printed out on the payroll register along with employee number, check number, social security number, gross wages, various deductions and net amount.

In addition to these, Compuworld Inc. has added the following features to Payroll to further enhance the power of the package:

Payroll now supports multiple companies on the same diskette.

The number of employees per company is now user definable.

Taxes may be compiled through the tax tables or by a user defined percentage on the same diskette.

We certainly appreciate Mr. Walker's kind words and are doing our best to continue to make our package the best payroll package anywhere.

Sincerely,
Marian Chapman
Marian K. Chapman
Vice President
Sales and Marketing

125 WHITE SPRUCE BLVD. • ROCHESTER, NY 14623 • (716) 424-6200

Don Williams, Sr., Publisher
68 MICRO JOURNAL
5900 Cassandra Smith Rd.
Hixson, TN 37343

Dear Don,

In recent correspondence with Dan Vanada of TSC, I learned that there's an error in the listing of my Global Sunrise/Sunset Calculator Program, published in last November's issue. The program still works, otherwise I may have caught the boo-boo earlier.

Anyway, the error is on page 34, at line number 1730. It was originally:

1730 ND=INT((YC-150)/100):REM ND IS NO. OF CENT.LEAP YRS.

and it should have been:

1730 ND=INT((YC-120)/400):REM ND IS NO. OF CENT.LEAP YRS.

The error is an obvious one if you look at line 1720. I ran the program both ways (with and without the correction), and the corrected version is about a minute and a half different for the sunrise time calculation.

Hope I haven't inconvenienced any readers with this error. Thanks for publishing the correction, Don.

Sincerely,
Keith Alexander

611 Whitmore Rd., #207
Detroit, MI 48203
February 21, 1982

PRODUCT ANNOUNCEMENT

VDISK

VDISK (tm) allows FLEX(tm) users to treat extended memory as a super-fast disk drive. This "virtual" disk drive has its own directory and may contain program and data files. Files may be copied to it and from it. All FLEX(tm) utilities and user programs may read from and write to this drive, just as with any other drive.

The virtual disk operates much faster than a physical disk, however. The speed advantage apparent to the user will depend on the amount and nature of disk operations being carried out. The time required to load a binary file is negligible. For example, loading BASIC from the virtual disk takes 180 milliseconds, as opposed to 5.07 seconds with a physical disk. With operations that are less disk-intensive, the speed advantage of the virtual disk is not so dramatic, though still substantial. For example, assembling a 74 line program takes 2.17 seconds with the virtual disk, as opposed to 14.8 seconds with a physical disk. The timing comparisons presented here are for a processor speed of 1MHZ with single sided, double density minifloppies. For a 2MHZ processor, the virtual disk times will be halved, whereas the physical disk times would be roughly the same.

VDISK is supplied with utilities for dumping the contents of the virtual disk to a physical disk at high speed, and for reloading the virtual disk, also at high speed.

VDISK requires the FLEX(tm) operating system. The current release of VDISK requires an SWTPc(tm) compatible dynamic address translator. A future release to accomodate other extended memory addressing schemes is anticipated.

VDISK is priced at $99 for the object version. The source for VDISK is available for an additional $99. Further information and a list of dealers may be obtained from James Arbuckle, P.O. Box 328, Ambler, Pa. 19002 (215:643-0788).

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Don and Larry,

Here's something for a new (?) "Uniflex User Notes" column in the Journal.

We were running version 1.05 Uniflex on our S/09, using the CDS-1 harddisk as the root device, when in December we began having a lot(!) of Swap Errors. I tried every known fix (at that time), swapping memory boards, swapping interface boards, updating the processor board, and updating the MP-ID board to revision D. After all this, I still had the problem.

After talking to Dwayne and Pat at SWTPC service, I took another look at the MP-ID. I ended up replacing the 74367's (IC 9 and IC 15) on it. They are hex buffer chips that mess with the address lines when they die.

This solved the problem until the harddisk power supply lost a diode. I think it died from heat/overload but needless to say, the ripple killed everything.

I think the diodes are too light on the ARK-P1 board, in the harddisk, because after only six months of operation, the board is black from heat. Again I called Dwayne, and after discussing the problem with him, I decided to go back with heavier diodes (D1 thru D12). The ones that came in the machine were 1N5402's, rated at 3 amps, so I used MR824's, rated at 6 amps, as the replacements. (That was the only thing available at noon on Friday.)

Well, that brought everything up, and we have been on line since before Christmas. My software is almost completely debugged, it is in daily use by the other people in our office.

I'll try to let you know how the Service school goes when I get back from San Antonio later this month.

Jim Carter
3 Feb 82

CLASSIFIED

Midwest Scientific MSI, 120K, 2 MHZ, 6800, Dual FD-8 8" Disk System, Multi User SDOS Files, Multi Disk Flex, SDOS Sysgen Files, TSC 6800 to 6809 Cross Assembler, Flex Sort/Merge, TSC 6800 Debug Package, TSC 6800 Basic, Hemenway Associates Programs, TSC Business Basic, TSC Text Processor, Sort/Merge Programs, Software Library Programs, Flex Utility Program, and Manuals, with much more. New - Never been used. Please make me an offer.
Contact LEW 1-615-842-4601 10am-5pm.

***

Tano 56K Dual Serial Ports, Dual 5" Disk Drives, complete software package. Like New, Wholesale $5300 will take $2995. Three SWTPC 8K memory boards $95.00 ea. PR-40 Printer, Extra Paper, And Ribbons, $95.
LEW 10am-5pm 1-615-842-4601

***

For Sale: Tano 48K 6800 With Dual Serial Ports, Dual 5" Drives, Electric Word Processor, TSC Editor and XBasic, Flex Dos $2395.00
Charles Skelton (805) 484-3162.

***

SWTP 6800, MPA-2, Smartbug, 32K, 2 Drives, 2 MPS, Music Software. Looks like Chieftian. $1500.
(214) 352-9568.

***

SWTPC, 20K, MPC, MPS, AC30, Smoke BFD-2, 20 Disks, CT64 w Hitachi TV-Monitor, Teletype-Perfect-$1380.
Dick Hack, Annapolis,MD w(301)841-6688 h(301)757-2164.

***

SWTP MP-8M Kit. New $125 CT-1024 Terminal $75. MP-A CPU $50 Panasonic TR 930 Monitors $90.
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***

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***

HELP

5905 Pratt St.
Alexandria, VA 22310
Feb. 9,1982

Dear Don,

I have an Altair 680b which I haven't used in several years. I intend to adapt it to a SS-50 bus and do whatever it takes to interface it to a disk

system. I would like to know if anybody out there has done it before, and if it worked.

Yours truly,

Daniel J. Horowitz
(703) 971-6285

***

Joseph G. Gay
2102 Liberty Rd.
Chelsea, AL 35043
Jan. 27, 1982

Dear Don, I have enjoyed our phone conversation today- your comments were helpful.

I would appreciate any information you may have about expansion of the Heath Kit Microprocessor Trainer Model ET-3400. This is a 6800 based system with fully buffered address and data register and fully accessible plug-in connector for all microprocessor functions.

I would like to know if there is a good Basic interperter program available (preferable in ROM) that could interface with this system. Also would like about 32K of memory-preferably from supplier of readily available boards.

A 40 Pin Connector is on board-maybe this could easily adapt to a SS-50 bus?

Joseph Gay

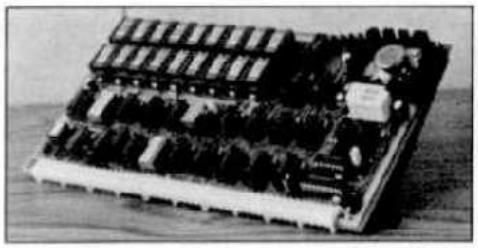
***

HELP! Please could you explain what changes must be made to a model I,III,II program to run on a color computer w/ext. color basic (16K) 6809(E) CPV. Model I,III, Z-80 (or convert 6502 language (Atari/Apple) to 6809(E).

Thank you very much,
Peter J. Ardita
60 Farmington Lane
Melville, NY 11747

QMM1

Quarter Megabyte Memory



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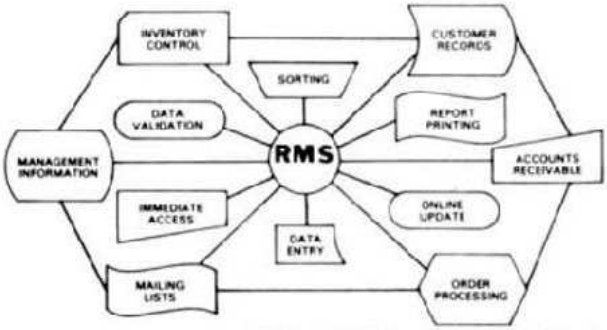

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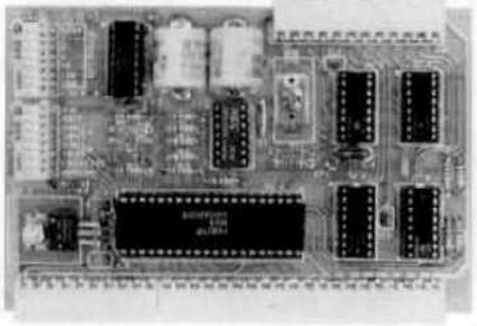

Calendar - Clock CLK68-1

- Sings date and time whether or not the computer is on
- All clock functions software controlled
- On card battery (included) can charge circuit runs for months
- Day of week, month/day/year, hour:min:sec 12/24 hrs

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- For printer spooling, multi-tasking, etc.
- Compatible with OS-9 and Flex 2/9*
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- Compatible with parallel printer drivers in most workspaces of BASIC

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Manual -- Well documented - 36 pages

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Assembled and tested	$119.95	Kit	$89.95
Goldplated bus conn	7.50	2 MHz option	2.50
Disk 5 or 8 in. SSB or Flex* OS-9 Available, NOW			14.95

** OS-9 is a trademark of Microsoft Systems Corporation
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COLOR COMPUTER SYSTEMS SOFTWARE

EDITOR/ABBEMBLER

The Micro Works Sottware Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for your program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor I tures finds, changes, moves, copysand much more. All keys have convenient auto repe t (typamatic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features all of the following: complete 6809 instruction set; complete 6800 set supported for cross-assembly; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; nd mnemonic error codes instead of numbers.

The versatile ABUG monitor is a compact version of CBUG, tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, br kpoints and more. **SOS80C Price: $89.95**

MODEM COMMUNICATIONS

M ke your Color Computer an intelligent printing terminal with off-line storage! The Microtext module is j st what you'll need for:

- —Talking to a timeshare system or information service
- —Printing out what is received as it is received
- —S ving received text to cassette tape
- —Re-displaying the received text even while on-line
- —Communications with other computers
- —Using yo r computer as a general-purpose 300-baud terminal
- —Downloading programs from other computers

The Microtext mod le is a program pack containing not only firmw re but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to c ssette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' PI80C parallel interface.

For those of you with special terminal applications, Microtext has selectable parity; it sends odd, even, mark or space. With mark parity (which is default) you can send to computers requiring either seven or eight bits. All 128 ASCII codes can be sent. Exchange programs with other Color Computer users! Basic programs may be downloaded from other computers or timesharing systems.

You'll find many uses for this versatile module! Available in ROMPACK, ready-to-use, for $59.95.

MACHINE LANGUAGE

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG Tape Price: $29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The E M plugs into the Extended Basic ROM Socket or the Romless Pak I. **CBUG ROM Price: $39.95**

SOURCE GENERATOR: This package is a disassembler which runs on the color computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler Price: $ 9.95**

LEARN 6809!

6809 ASSEMBLY LANGUAGE PROGRAMMING, by Lance Leventhal, contains the most comprehensive reference material available for programming your Color Computer. **Price: $16.95**

HARDWARE

PARALLEL O!

USE A PARALLEL PRINTER with your Color Computer! Adaptor box plugs into the serial port and allows use of Centronics/Radio Shack-compatible printers with parallel interface. Assembled nd tested. PI80C Price: **$69.96**

ROMLESS PAK I — is an empty program pack capable of holding two 2716 or 2732 EPROMS, allowing you up to 8K of program! The PC board inside comes with sockets installed, ready to go with the addition of your custom EPROMs. **Price: $24.95**

32K RAM!

MEMORY UPGRADE KITS: Consisting of 4116 200ns. integrated circuits, with instructions for installation. **4K-16K Kit Price: $39.95. 16K-32K Kit** (requires soldering experience) **Price: $39.95**

SPARE PARTS — SAMs, 6809Es, RAMs, PIAs. Call for prices.

GAMES

Pak Attack — Try your hand at this challenging game by omputerware, with lantastic graphics, sound and action! Cassette requires 16K. **Price: $24.95**

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Adventure — *Black Sanctum* and *Caloxo Island* by Mark Data Products. Each cassette requires 16K. **Price: $19.95 each.**

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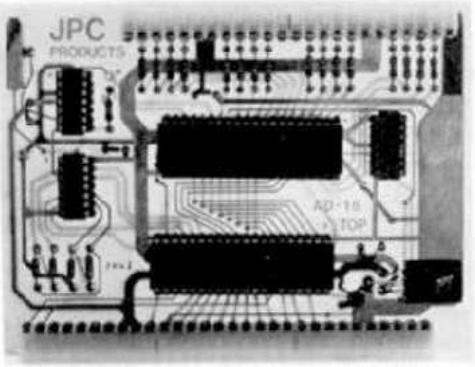

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In terms of size, our little HUMBUG is probably one of the smallest things you can add to your system. But in terms of utility, power, and convenience it may well be THE GREATEST!

HUMBUG is a monitor ROM which plugs into your CPU board instead of your present monitor and is a totally compatible replacement. All the standard monitor commands and routines are there, and it will run the same software. But there is more.

HUMBUG is not just a monitor—it is also a complete debugging system. It has additional commands for displaying memory contents in various formats (including ASCII); filling, moving, searching, and checking memory contents; doing memory tests; inserting multiple breakpoints, even single-stepping through programs one instruction at a time. HUMBUG lets you start and stop programs from the keyboard—without pushing RESET. And when a program goes into 'never-never-land', HUMBUG can stop it and tell you where it was when stopped. But there is more.

HUMBUG provides full I/O control from the keyboard. Turn a printer port on and off; enable a user-written port; pause when the screen is full; even turn off your main terminal output and let the program run without being slowed down by output. A printer spooling feature provides a 1K RAM buffer for your printer, and overlaps printing with processing for greater speed. But there is more.

HUMBUG can support your video board. That and a keyboard can replace an expensive terminal, and provide greater speed and versatility as well. Allows simple cursor control, cursor read, and screen read too. But there is more.

HUMBUG is available for 6800, 6802, and 6809 CPU boards made by SWTP, Gimix, Percom, and Star-Kits. It supports a serial terminal, or video boards made by Percom, Thomas, or F&D. It comes in either 2708 or 2716 EPROMs, and in either 2K, 3K or 4K versions, at prices ranging from $40 to $75 which include a full manual and full source code. There are several versions, depending on your hardware configuration, and it's a good idea to get our catalog and HUMBUG spec sheet first.

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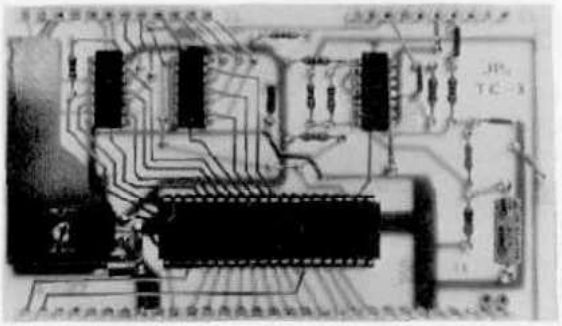
JPC PRODUCTS FOR 6800 COMPUTERS



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- **OPTIONAL** - CFM/3 File Manager
  Manual & Listing $19.95
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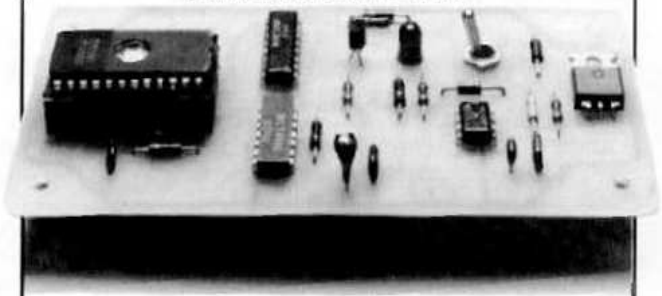
EPROM PROGRAMMER

Shown assembled. EPROM not included.



For single supply 2516, 2716 & 2758 EPROMs. Connects through a user supplied interface to any computer system. Interfacing requires two 8-bit ports plus hand-shake lines. One of the ports must be software controllable for input or output. Timing is done via hardware, thus is independent of MPU clock rate. Verify erased. Program — entire or partial. Auto verify after programming. Transfer contents to RAM for modifying or duplicating.

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ALFORD'S GOOD NEWS!

UNLIMITED COMPUTER SPEECH...

Our speech synthesizers allow your computer to talk, LITERALLY! Using our VS-1 (for the SS-50 bus) or the SP-1 (for the COLOR COMPUTER), your programs can now communicate with speech! You can add a new dimension to almost any application with our synthesizers. Business programs, computer assisted instruction, industrial control, alarm systems, most anything can benefit from the power of speech.

We don't just sell you a hunk of hardware, either. Our synthesizers come with well-documented manuals detailing speech theory, programming examples, sample dictionaries, coding tables and more. We even include software to help to integrate these products into your system! Our unique "VOX-EDITOR" speech editing program, for instance, allows you to create and edit speech messages simply and easily. You can save the speeches created into files which can be directly read by Basic or other programs.

Both units come completely assembled and tested. No electronics knowledge or assembly is required. The SP-1 plugs directly into the ROM-PACK slot on the COLOR COMPUTER. Audio is fed back into the computer and routed to your television monitor. The VS-1 occupies one slot on the 50-pin I/O bus, and only requires the attachment of an external speaker (not supplied) for operation.

The VS-1 software is available for SSB DOS68 and all versions of 6800 FLEX (except mini-FLEX), and for SSB DOS69, FLEX-09 and OS-9, and may be ordered on 5- or 8-inch disk. The SP-1 software comes on a single cassette (disk versions not available at this time).

TEXT TO SPEECH TRANSLATOR...

We are now offering a speech translator for the VS-1 and SP-1 synthesizers.

The SC-1/VS-1 translator allows you to generate speech files from the keyboard, or from standard disk text files. The resulting file may be "fine-tuned" with the VOX-EDITOR, thus greatly reducing the amount of time needed to generate custom messages. Also, the SC-1/VS-1 translator allows you to simply speak your text files, allowing you to listen to your work while you do something else, eliminating the need to keep your eyes "glued" to the screen. You may also type from the keyboard directly to the translator.

The SC-1/SP-1 translator allows you to operate directly from Color Basic by adding a new port to Basic. Now, by typing "PRINT #1, "THIS IS A TEST"", your computer will say "THIS IS A TEST"! By using control codes (PRINT #1,CHR$(xx)), you can make the translator pronounce everything which goes to the screen!

Flags are included in both versions which will cause the translator to pronounce punctuations, in this way, you can listen to every "jot and tittle" as it is read!

We plan to offer regular updates at a reduced price, so that as we continue to improve the translational accuracy of this product, you can take advantage of the updates without having to pay the full price!

The SC-1/VS-1 version is available for 6800 SSB DOS68, versions 5.1 and 6.0, and for all versions of FLEX (except mini-FLEX), 6809 versions are available for DOS69, FLEX-09 and OS-9. All may be ordered on 5-inch or 8-inch disk. The Color Computer version requires 16k or 32k memory (Extended Color Basic not required), and is supplied on cassette only.

The disk versions of the SC-1 translator include the source files, so you can make custom modifications to allow you to use it with other speech boards (we admit they exist!), or to change I/O addresses, etc... The 6809 disk version is self-relocating to place it at the top of available memory and out of the way of your other programs!

PUBLIC NOTICE...

FLEX is a trademark of Technical Systems Consultants, Inc. OS-9 is a trademark of Microware Systems Corporation. Radio Shack and TRS-80 Color Computer are trademarks of the Tandy Corporation. SSB ain't so picky! (love you, Rick, Larry, Jim, Debbie, Ken, etc...!). SCREDITOR III (no, Ed, we aren't gonna change it!) is a trademark of Alford & Associates, but then who else would use the name? For that matter, who can pronounce it?

TREK...

Some of you might not know it, but many of the games which you have seen written in Basic are emulations of games which were developed with compilers or assemblers for large machines. Some are pretty engrossing games, but all share two very bad problems ... question-and-answer play, and low speed. We went in the other direction. We took one of the most popular Basic games of all time, re-wrote it completely in assembly language, using full interrupt-driven, multi-tasking structure, and came up with what we feel is one of the best games around today!

Although our TREK uses alphanumerics exclusively in its display (thus making it compatible with most every memory-mapped display around), the lack of hi-res graphics is not missed due to the edge-of-the-seat action! The enemy space destroyers use multiple battle plans as they pursue you around the quadrants. Torpedoes destroy anything in their paths, forcing you to take continual evasive action. Damage control reports flash on and off as you take hits and repairs are made. Energy runs down continuously, making it impossible to sit back and relax. The only way to believe that so much action could be fitted on one screen is to play it!

TREK-68/6800 is available for 6800 processors running SSB DOS68 or any version of FLEX (except mini-Flex), and may be obtained on 5- or 8-inch disk. TREK-68/6809 is available for 6809 processors running SSB DOS69 or FLEX-09, and can be shipped on 5- or 8-inch disk.

COLOR-TREK is available on cassette for the TRS-80 COLOR COMPUTER, and requires 16K or more memory (Extended Color Basic NOT required). COLOR-TREK+ is identical to COLOR-TREK, except that it requires our SP-1 Speaker Pack voice synthesizer for operation, as the computer uses english speech messages continuously throughout program play.

TREK-68 requires a MEMORY-MAPPED display for operation as well as a source of interrupts (such as the MP-T timer) programmed for 50-120 interrupts per second. Also, a serial or parallel keyboard port is required (will not run with the MP-C interface).

FANTASTIC PROOFREADER...

We are now offering Peter Stark's SPELL'N FIX proofreading program for both FLEX and SSB! We think that this program is the best spelling checker/corrector available today, and is definitely the fastest and most flexible such program that we have used.

SPELL'N FIX provides a number of features that we have not seen on any other such program ... features such as multiple dictionaries, compressed dictionaries (25000 words on a single 5-inch diskette!), automatic dictionary updates, the option of simply printing errors, marking them in the file being proofread, or correcting them! Sector limits may be set to limit the length of file on each disk, text files may be split up, the dictionary split, and best of all, SPELL'N FIX doesn't let you down with DISK FULL errors! When the disk fills up, SPELL'N FIX automatically closes the output file and asks for another disk on which to continue!

In addition, you can perform most FLEX commands directly from SPELL'N FIX. The SSB version includes a directory list command which allows you to list disk files directly from SPELL'N FIX. This means that you don't have to stop and restart simply because you have forgotten a file name in the course of proofreading!

SPELL'N FIX is available for SSB DOS68 versions 5.1 and 6.0, and DOS69 (all versions). FLEX-9, 6800 FLEX (all versions except mini-FLEX), and can be ordered on 5- or 8-inch disk. Versions for mini-FLEX and PERCOM available directly from STAR-KITS. OS-9 versions will be available soon.

ALFORD & ASSOCIATES
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SSB UTILITIES...

We are now shipping our UTILITIES #1 disk for DOS68 and DOS69 users. If your disk library is getting out of hand, or if you are going bonkers trying to make sense out of fifty, one hundred, or more files on a disk, this set of programs is for you!

We have developed a method to write a unique I.D. sector on SSB disks. In this sector, we include an 8-character disk access code, a 16-character disk name, an 8-character disk I.D., an 8-character disk creation date, an 8-character disk update date, and a 64-character comment field. Our NAME utility prompts you for the information and builds the information sector.

UPDATE then allows you to change the I.D. sector selectively. You can, without the access code, change only the update date and comments field, allowing you to make a quick change to reflect, say, the most recent change to the files on the disk. Using the ACCESS code, you can change everything except the disk creation date.

LOCK allows you to list- delete- and write-protect your files. With list protection, the list-locked files only list when you supply the disk access code!

LIST is a multi-option program, allowing you to list transients, non-transients, locked files (if you supply the disk access code), free space, disk information, or any combination of these.

PURGE is a quick and easy mass file deletion program. Each file on the disk is presented for your inspection. Multiple prompts then determine whether or not to delete each file.

TITLE generates BIG LETTER banner pages for your printed listings. You supply a name for the banner page of up to twelve characters, and TITLE generates the banner page with the current date and time (as contained in YDATE and YTIME).

DUMP is a formatted hexidecimal and ASCII memory dump. When directed to a hard copy device, page boundaries are honored to make dumps more readable.

COUNT allows you to quickly determine file sizes in lines and characters. Multiple files may be specified to allow you to count in a single pass those jobs which you have spread over several files.

UTILITIES #1 is available for DOS68, versions 5.1 and 6.0, and for DOS69 (all versions), and may be ordered on 5- or 8-inch disk. The manual also includes some very good information on the chained sector technique which SSB uses on their disks.

PRICES...

TREK-68/6800 disk, manual	$ 29.95
TREK-68/6809 disk, manual	$ 29.95
TREK-68 manual only	$ 12.95
COLOR-TREK cassette, manual	$ 17.95
COLOR-TREK+ cassette, manual	$ 24.95
COLOR-TREK manual only	$ 9.95
SPELL'N FIX disk, manual	$ 89.29
UTILITIES #1 disk, manual	$ 29.95
UTILITIES #1 manual only	$ 12.95
VS-1 complete, disk, manual	$194.95
VS-1 complete, disk, manual (less SC-01A)	$134.95
VS-1 disk, manual (see VOX-EDIT with brand X)	$ 39.95
VS-1 manual only	$ 19.95
SC-01A synthesizer chip	$ 65.00
SP-1 pack, cassette, manual	$179.95
SP-1 manual only	$ 14.95
SC-1/6800 disk, manual	$ 29.95
SC-1/6809 disk, manual	$ 39.95
SC-1/COLOR cassette, manual	$ 29.95
SCREDITOR III disk, manual, tutorial cassette	$190.00
SCREDITOR III manual and cassette only	$ 39.95

THE BEST NEWS...

God is truly a God of miracles. We could not begin to enumerate the miracles which He has performed for us, and wish to give thanks for His love and care in our lives. Without Him, we would not be in business. We hope that our concern and devotion to our customers reflects our love for Him. We do make mistakes, and occasionally an order is loused up or lost, but we'll do everything we can to correct any mistakes that we make. Thank you for your patronage.

SCREDITOR III DOES IT ALL...

This ad is being prepared using the SCREDITOR III word processor. Unlike any other editing package available for 6800/6809 machines, SCREDITOR III supports true multiple column editing capability. This ad was typed a column at a time. No cut and paste was used to prepare it (well, one, actually... our printer only prints 132 columns wide!).

SCREDITOR III is a true screen editor. What you are reading now is what we saw as we were entering the text! With full cursor movement capability, automatic justification, true multi-column insert, delete, paragraph splitting and welding, and edit capability of up to 251 character positions per line, SCREDITOR III makes document preparation a breeze! Also, you can define page footers and headers, automatically, delete and then re-insert them, or change them at any time.

You can merge multiple files with SCREDITOR III. You can even specify where to insert a file, what line in the file to start from, and how many lines of the file to use! You can extract or copy lines from the current file into another file. You can even do form letter printing with automatic line item merging for custom mailings.

Automatic justification (left, center, right, or full line) can be turned on or off at any time. Margins can be moved at any time. Just about any job can be done better with SCREDITOR III.

You can define "symbols" with SCREDITOR III. Up to 251 keystrokes may be included in a single symbol, including all edit and line commands, and later recalled with a single keystroke. Up to 26 symbols may be defined, and the symbols may be saved to a disk file for later recall.

Unlimited tabs may be set with SCREDITOR III, and may be changed at any time as you desire. Margins and tabs are continuously displayed for quick reference, along with all major edit modes, current column, current line, total lines, current display columns, etc...

SCREDITOR III runs with practically any SERIAL TERMINAL or with most any MEMORY MAPPED DISPLAY. If you change from a serial terminal to a memory-mapped display, or if you simply change display or terminal types, you don't have to buy a new copy of SCREDITOR III. Just run SYSGEN and define your new hardware! Even key definitions may be changed by SYSGEN! Terminals with special function keys may also be accommodated. Simply run SYSGEN, and hit each key as it asks you to, and SCREDITOR III will use that key in your system!

SCREDITOR III is designed to provide capabilities for any office, personal, programming, or other editing and formatting job that you might have. The applications are essentially unlimited.

The manual provides extremely detailed information about every mode, feature and function of SCREDITOR III, and was written with office personnel and the unsophisticated user in mind. A unique feature of SCREDITOR III is a tutorial cassette which makes learning to use SCREDITOR III simpler than any other such program on the market. The cassette takes you step-by-step, through every function of SCREDITOR III, giving you practical examples and learning sessions with test files. No more reading for three weeks to learn how to do it!

SCREDITOR III is available to run under DOS68 versions 5.1 and 6.0 and all versions of 6800 FLEX (except mini-FLEX), and for DOS69, FLEX-9 and OS-9. SCREDITOR III may be ordered on 5- or 8- inch disk.

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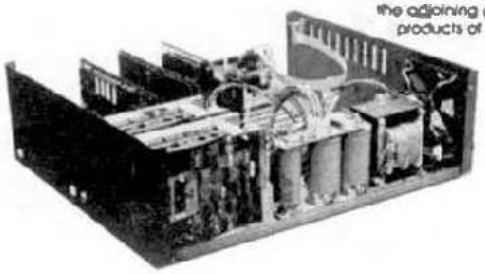

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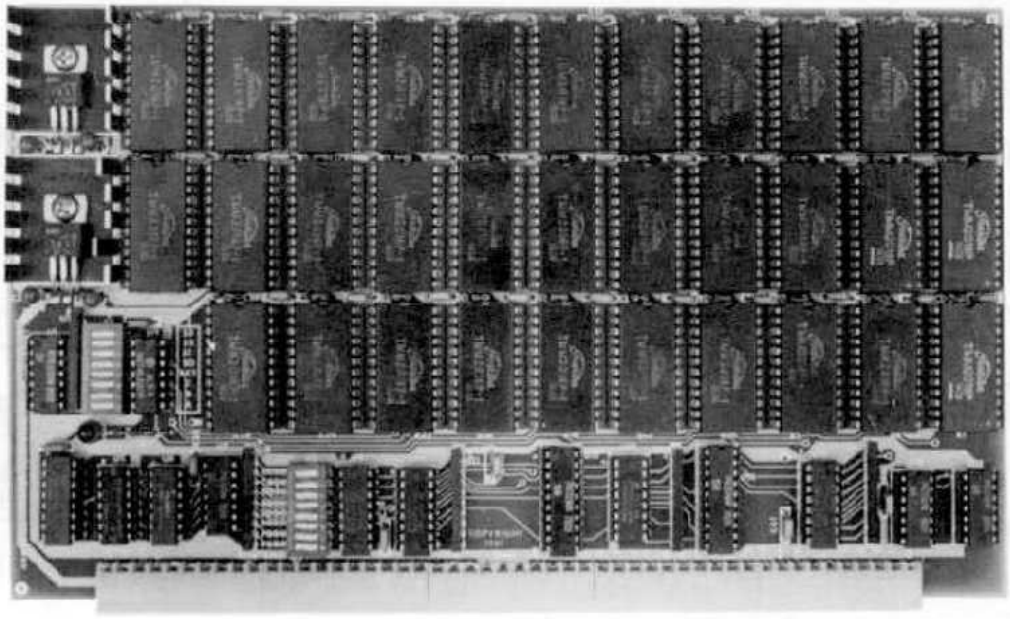

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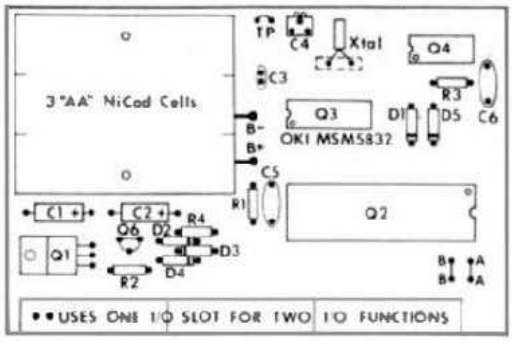

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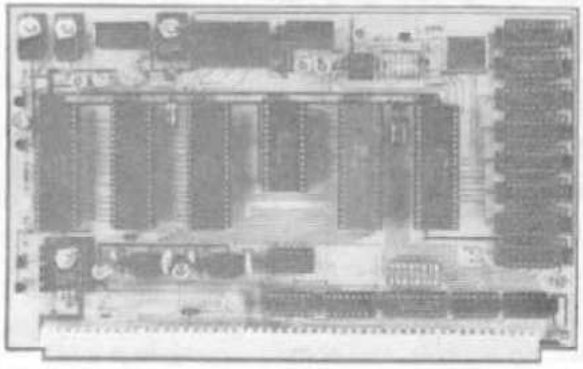

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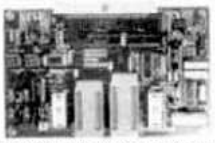

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Mailing Lists and Labels. Use the same mailing list disk file (with protected areas) for both mailing labels and repeat letters. Repeat letters are personally addressed to each person or selected persons on the mailing list.

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Editor allows exiting to either the monitor or DOS and then reentry (Warm Start) without destroying previously prepared text in the buffer. The Restart command erases contents in the buffer without the user having to reload the Editor.

The Editor allows the user to toggle between full duplex (no echo) and half duplex (echo) as needed. It responds to commands in both upper and lower case and can be used to create assembler source code and Basic programs as well as text.

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Allows user definition of region size for up to eight terminal/tasks and emulates FLEX O/S for simultaneous execution of each task. Allows cross scheduling (eg printer regions) and inter-task communications.

UTILITIES "A LA CARTE" - $5.00 EACH
DUMP - Output any section of memory in hex and ASCII. DDSK - Output any disk sector in dump format. DMAP - Output track & sector chain of any file. PMAP - Output load map of command files. LISTD - Output all directory info on files. LISTDS - Output selected directory info in three columns. LISTF - List file with disk id & date heading. KILL - delete files without "are you sure" prompt. FIND - Output all file records containing a given string. MCOPY - Copy files between disks using one drive. All load at $C100 and output may be directed to CRT, printer or disk. MINIMUM ORDER - $25.00. All 10 for $40.00.

All software is written in modular assembler and runs on SWTPc 6809 with FLEX O/S and 8" disk. DMS2/VM Ver 1.3 requires 56K or more RAM. Ver 2.0, available soon, runs in 16K or more and is MFT1 compatible. Manuals available, DMS2/VM $10., Accounting $15., deduct from order. Add P&H $2.50, Foreign $5.00, N.Y. State add sales tax. No C.O.D. Send Purchase Orders on letterhead or Check orders to:

WESTCHESTER Applied Business Systems
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Briarcliff Manor, N.Y. 10510

Consultation: 914-941-3352 (6-10 P.M. EST)
Sales Dept 212-899-1416 (Visa,M.C. orders,Catalog requests)

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6809 **DUB**

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DUB WILL CREATE SOURCE STATEMENTS FROM PROGRAMS COMPILED WITH TSC BASIC AND RUNS UNDER TSC UNIFLEX.

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- *use on SS-50 and SS-50C buss
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- *5 volts only
- *low power consumption (typ. ½ amp with 48K RAM)
- *gold connectors

Bare Board $49.00 2716 1MHZ $9.95 2016 P-2 2MHZ $16.50

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SS-50/SS-50C EXTENDER CARD	$35.00
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*Both cards assembled with a built in logic aid & gold edge connectors	
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*Pad spacing permits most standard sockets from 8 to 64 pins	
*Provision has been made for voltage regulators	

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*A super prototype board *Card design includes

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(4) 6850 4 serial ports
(1) 6840 3 16 bit counter/timers

which are fully buffered and decoded

*Accomodates a mix of 38, 14 & 16 pin wire wrap sockets

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*TRANSITION CARD bare		$ 49.00

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You can order a system to meet your needs, or select from the 6809 Systems featured below.

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GIMIX® CLASSY CHASSIS™ is a heavyweight aluminum mainframe cabinet with back panel cutouts to conveniently connect your terminals, printers, drives, monitors, etc. A 3 position keyswitch lets you lock out the reset switch. The power supply features a ferro-resonant constant voltage transformer that supplies 8V at 30 amps, + 15V at 5 amps, and – 15V at 5 amps to insure against problems caused by adverse power input conditions. It supplies power for all the boards in a fully loaded system plus two 5 ¼" drives (yes! even a Winchester) that can be installed in the cabinet. The Mother board has fifteen 50 pin and eight 30 pin slots to give you the most room for expansion of any SS50 system available. 11 standard baud rates from 75 to 38.4K are provided and the I/O section has its own extended addressing to permit the maximum memory address space to be used. The 2 Mhz 6809 CPU card has both a time of day clock with battery back-up and a 6840 programmable timer. It also contains 1K RAM, 4 PROM/ROM/RAM sockets, and provides for an optional 9511A or 9512 Arithmetic Processor. The RAM boards use high speed, low power STATIC memory that is fully compatible with any DMA technique. STATIC RAM requires no refresh timing, no wait states or clock stretching, and allows fast, reliable operation. The system includes a 2 port RS232 serial interface and cables. All GIMIX boards use gold plated bus connectors and are fully socketed. GIMIX designs, manufactures, and tests in-house its complete line of products. All boards are twice tested, and burned in electrically to insure reliability and freedom from infant mortality of component parts. All systems are assembled and then retested as a system after being configured to your specific order.

56KB 2MHZ 6809 SYSTEMS WITH GMXBUX/FLEX/OS-9 SOFTWARE SELECTABLE

With #58 single density disk controller	**$2988.59**
With #68 DMA double density disk controller	**$3248.49**
to substitute Non-volatile CMOS RAM with battery back-up, add	150.00
for 50 Hz export power supply models, add	30.00

Either controller can be used with any combination of 5" and/or 8" drives, up to 4 drives total, have data recovery circuits (data separators), and are designed to fully meet the timing requirements of the controller I.C.s.

5 ¼" DRIVES INSTALLED IN THE ABOVE with all necessary cables

	SINGLE DENSITY		DOUBLE DENSITY		
	Formatted	**Unformatted**	**Formatted**	**Unformatted**	
40 track (48TPI) single sided	199,680	250,000	341,424	500,000	2 for **$700.00**
40 track (48TPI) double sided	399,360	500,000	718,848	1,000,000	2 for **900.00**
80 track (96TPI) single	404,480	500,000	728,064	1,000,000	2 for **900.00**
80 track (96TPI) double	808,960	1,000,000	1,456,128	2,000,000	2 for **1300.00**

Chart shows total capacity in Bytes for 2 drives.

Contact GIMIX for price and availability of 8" floppy disk drives and cabinets; and 5" and 8" Winchester hard disk system.

128KB 2Mhz 6809 DMA Systems for use with TSC's UNIFLEX or MICROWARES's OS-9 Level 2

(Software and drives not included)	**$3798.39**
to substitute 128KB CMOS RAM with battery back-up, add	300.00
for each additional 64KB NMOS STATIC RAM board, add	638.67
for each additional 64KB CMOS STATIC RAM board, add	798.64
for 50 Hz export power supply, add	30.00

NOTE: UNIFLEX can not be used with 5" minifloppy drives.

GIMIX has a wide variety of RAM, ROM, Serial and Parallel I/O, Video, Graphics, and other SS50 bus cards that can be added now or in the future. Phone or write for more complete information and brochure.

THE SUN NEVER SETS ON GIMIX USERS

GIMIX Systems are found on every continent, except Antarctica. (Any users there? If so, please contact GIMIX so we can change this.) A representative group of GIMIX users includes: **Government Research and Scientific Organizations** in Australia, Canada, U.K., and in the U.S.: NASA, Oak Ridge, White Plains, Fermilab, Argonne, Scripps, Sloan Kettering, Los Alamos National Labs, AURA. **Universities:** Carleton, Waterloo, Royal Military College, in Canada; Trier in Germany; and in the U.S.: Stanford, SUNY, Harvard, UCSD, Mississippi, Georgia Tech. **Industrial users** in Hong Kong, Malaysia, South Africa, Germany, Sweden, and in the U.S.: GTE, Becton Dickinson, American Hoechst, Monsanto, Allied, Honeywell, Perkin Elmer, Johnson Controls, Associated Press, Aydin, Newkirk Electric, Revere Sugar, HI-G/AMS Controls, Chevron. **Computer mainframe and peripheral manufacturers,** IBM, OKI, Computer Peripherals Inc., Qume, Floating Point Systems. **Software houses:** Microware, T.S.C., Lucidata, Norpak, Talbot, Stylo Systems, AAA, HHH, Frank Hogg Labs, Epstein Associates, Softwest, Dynasoft, Research Resources U.K., Microworks, Analog Systems, Computerized Business Systems.

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The system can be ordered in parts as needed.OR AS A COMPLETE RUNNING SYSTEM, all you furnish is a color or B&W TV or monitor, and a desire to learn and use the powerful **FLEX™** disk system and the Motorola 6809 microprocessor. The necessary software includes the special Technical System Consultants's 6809 General FLEX™ ($150 including the Editor and Assembler). Note that the Editor and Assembler normally sell for $50 each, which means that FLEX™ (special) is only $50 as packaged. Also to mate up the system we offer the following software and hardware packages.

F-MATE™: (For Radio Shack system and Exatron) a set of software supplied on 5 inch diskettes. F-mate generates the interface between the disk controller*, FLEX™, editor, assembler, word processor** and the color computer. Simple step-by-step instructions detail the creation of a 'Sysgen' disk and then a final 'bootable' FLEX™ disk for the Color Computer. Included is: EXBOOT which is the power-up boot on disk, EXLOADER is used to load a virgin FLEX.COR when performing a Sysgen operation (the supplied assembler is required). The disk controller ROM is the interface at this stage of the operation. Also included is GETOFF which unloads and offsets needed programs to avoid conflicts in memory utilization. GETOFF can be used as a normal FLEX™ program once the bootable disk is finished. PATCHES is furnished to complete the interface between the new FLEX™ system and the Color Computer.

PATCHES: patch and make functional various standard TSC utilities and programs including APPEND ASMB COPY EDIT PUTLDR SAVE and others. A special NEWDISK (single side, single density, 35 track) routine allows disks made on the Color Computer to be read or written on other FLEX™ systems, insuring complete transfer of disks from Standard $50 Bus computers.

Additional new software patches are being developed for existing Standard $50 Bus FLEX™ software. They will be advertised as soon as reasonable debugging sessions indicate they function as expected.

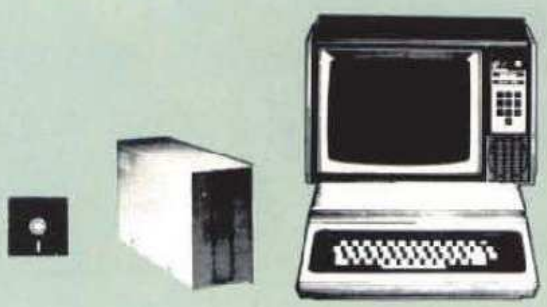
*** TSC's Extended BASIC (XBASIC) patches are now running. Others to follow; call for current information.

COLOR BASIC SAVE & LOAD

A set of utilities will be announced soon. Included in this package will be utilities to LOAD and SAVE the Microsoft BASIC programs you write for the Color Computers ROM BASIC. Fact is that this FLEX™ system does not in any way change the normal Radio Shack BASIC operation. All Radio Shack game-paks and other hardware and software can be used when desired. Also you have the powerful and very useful Radio Shack BASIC™,TSC XBASIC, Radio Shack Color Disk System and/or the Exatron disk system, you end up with three systems, FLEX™, Exatron™ or the Radio Shack system!!

******NEW******

NOTE: Also ready by the time this is published will be the F-Mate™ version for the Radio Shack Color Computer Disk System!!



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FLEX special general version Includes Editor and Assembler	$150.00
F-mate™ as described above but not including coming utilities	
** Specify RS Disk System or Exatron Disk System	**
When ordered with FLEX	$ 49.95
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NOTE: This unit required for the above system.	
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With the above as a package you have a FULL 48K RAM plus ROM computer with FLEX™ and disk(s) for LESS THAN $1500 and with C O L O R!!!

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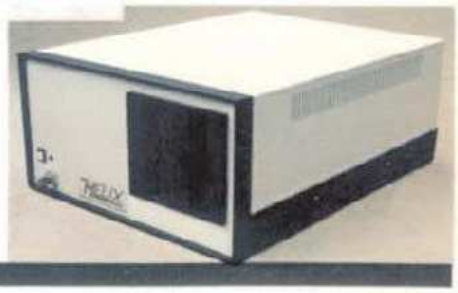

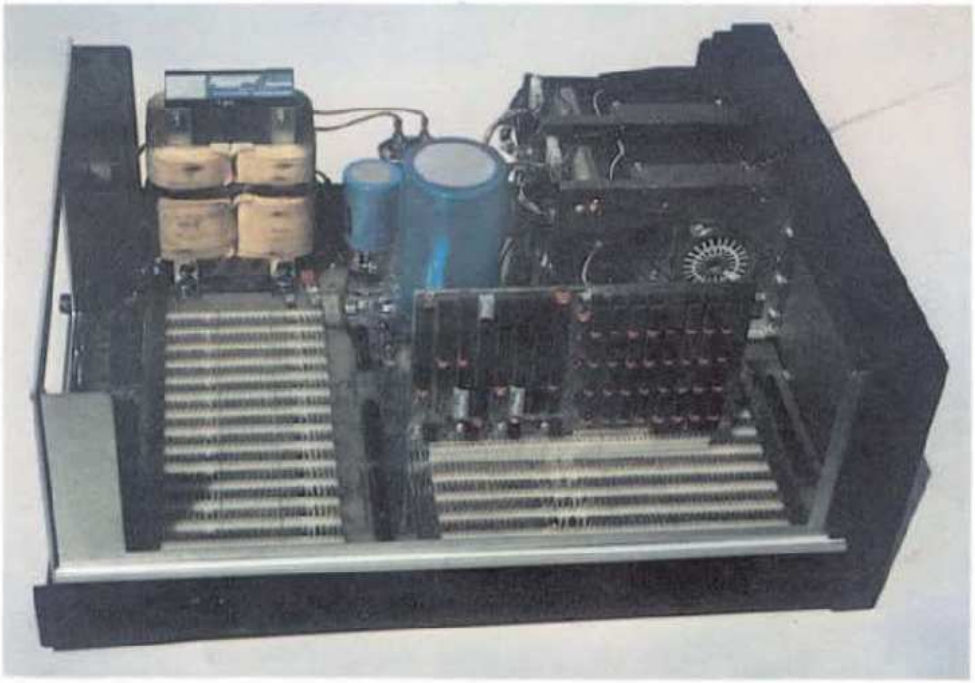

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6809

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- Standard DAT Compatible with GIMIX and SWTPC
- Standard 6840 Interval Timer
- Standard 1K Scratchpad RAM
- Standard Clock/Calendar with Battery
- Provision for Programmers Console

68000

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- 64K 6809 HELIX $1995
- 64K 68000 HELIX $2595
- 512K 6809 HELIX $4450
- 512K 68000 HELIX $4995

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