

68

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MICRO JOURNAL

VOLUME II ISSUE 2 • Devoted to the 68XX User • February 1980
"Small Computers Doing Big Things."

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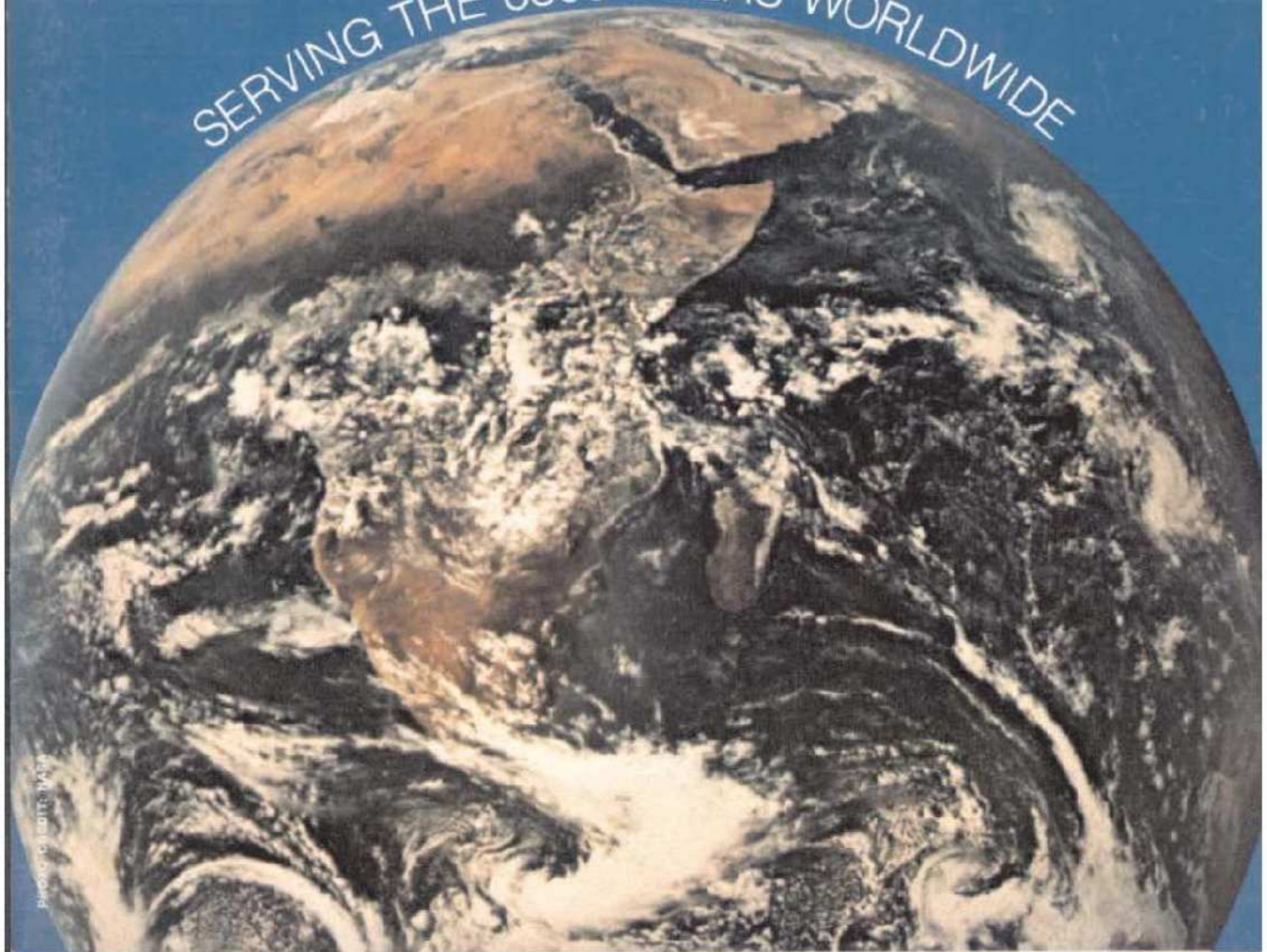


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Program Name	6800	6809
FLEX for SWTPc	\$90	\$90
FLEX for SSB	90	90
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Extended BASIC Precompiler	50	50
BASIC	65	65
BASIC Precompiler	40	40
FLEX Sort/Merge	75	75
Text Editing System	40	35
Assembler	40	40
Text Processing System	60	N/A
Debug Package	55	75
FLEX Utilities	100	60

These packages are available on either 8" or 5" soft-sectored FLEX diskettes (5" 6800 is FLEX 2.0). Price includes user's manual and object code diskette. Certain programs are available on cassette. Contact Technical Systems Consultants for pricing. All orders should include 3 percent for postage and handling (8 percent on foreign orders). Master Charge and Visa are welcome.

*FLEX is a trademark of Technical Systems Consultants, Inc.

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'68'

MICRO JOURNAL

Portions of the text of '68' Micro Journal set using the following
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Technical Systems Consultants, Inc.
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W. LaFayette, IN 47906 *MINIFLEX & FLEX REG. *
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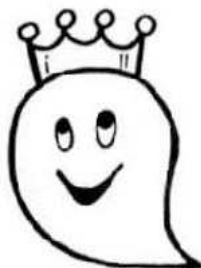
—ITEMS SUBMITTED FOR PUBLICATION—

(Letters to the Editor for Publication) All 'letters to the Editor' should be substantiated by facts. Opinions should be indicated as such. All letters must be signed. We are interested in receiving letters that will benefit or alert our readers. Praise as well as gripes is always good subject matter. Your name may be withheld upon request. If you have had a good experience with a 6800 vendor please put it in a letter. If the experience was bad put that in a letter also. Remember, if you tell us who they are then it is only fair that your name 'not' be withheld. This means that all letters published, of a critical nature, cannot have a name withheld. We will attempt to publish 'verbatim' letters that are composed using 'good taste.' We reserve the right to define (for '68' Micro) what constitutes 'good taste.'

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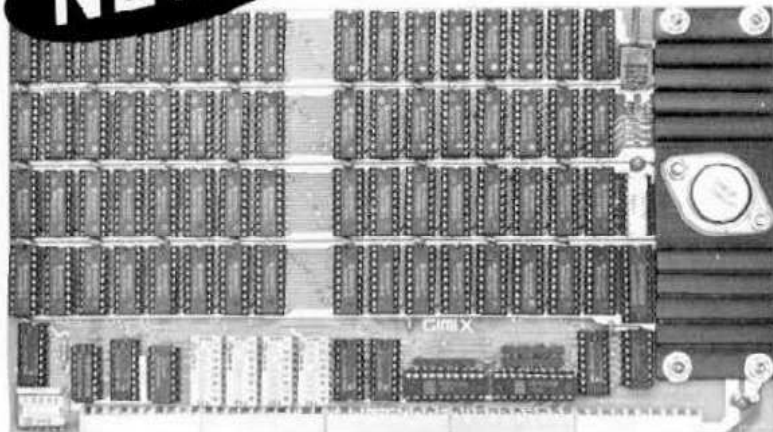
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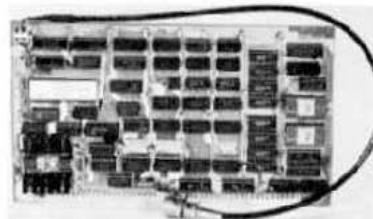
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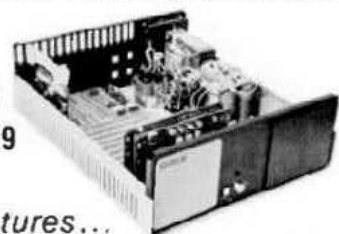
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SOFTRAN™ for Percom's 77-track LFD-800™ mini-disk system; SOFTRAN/9™ for 6809 FLEX[†] files and programs.

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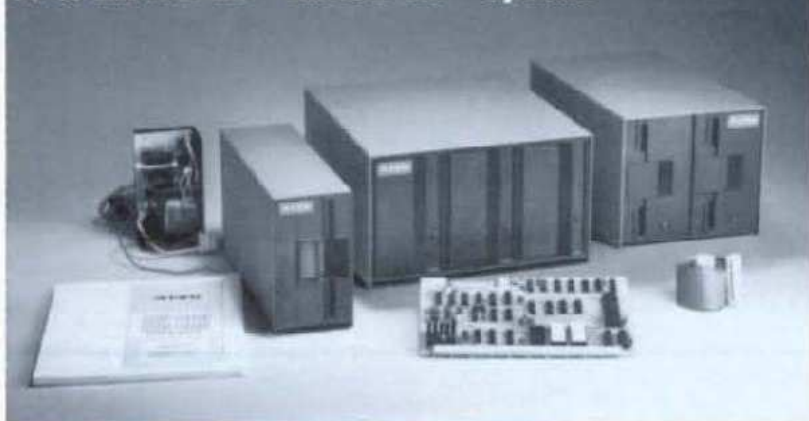
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Each LFD mini-disk storage system includes:

- drives with integral power supplies in an enamel-finished enclosure
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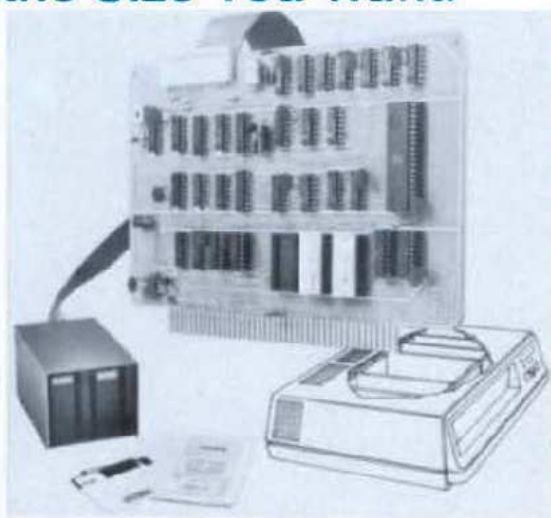
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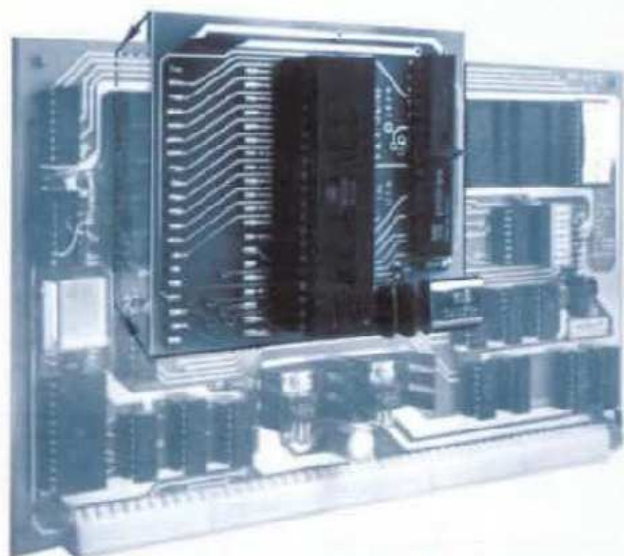
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EXORciser® Bus LFD-400EX™ -800EX™ Systems



Upgrade to 6809 Computing Power. Only \$69.95

Although designed with the SWTP 6800 owner in mind, this upgrade adapter may also be used with most other 6800 and 6802 MPUs. The adapter is supplied assembled and tested, and includes the 6809 IC, a crystal, other essential components and user instructions. Restore your original system by merely unplugging the adapter and a wire-jumpered

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of 6800 Microcomputing.

6800/6809 SOFTWARE

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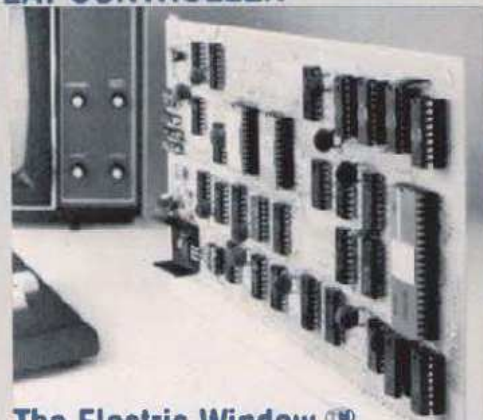
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- Resides entirely in 2K on-board RAM mapped into main memory.



The Electric Window.™ Worth Looking Into. \$249.95

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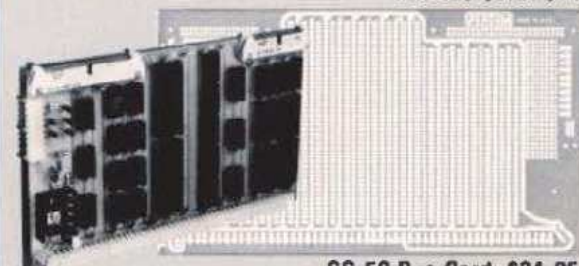
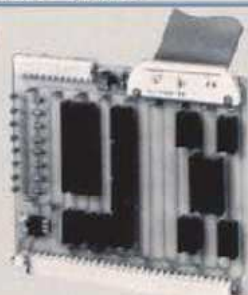
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68 MICRO JOURNAL SOFTWARE CONTEST

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FIRST - Life Subscription 68 Micro Journal™

SECOND - 6 year extension 68 Micro Journal™

THIRD - 3 year extension 68 Micro Journal™

4th-10th 1 year extension 68 Micro Journal™

The software must be applications, utilities or serious software, of original design, to operate with the following CATEGORIES:

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TSC FLEX 6800 Disk System FLEX Ver. 2.0 5"
TSC FLEX 6800 Disk System Ver. 1.0 8"
TSC FLEX 6809 Disk System Ver. 09 5" or 8"
SSB Dos Version 5
SSB Dos Version 4 or earlier
SSB TSC FLEX Version
PERCOM INDEX
PERCOM MinIDos+
HEMENWAY CP/68 Disk System
MSI Disk Operating Systems
SOFTWARE DYNAMICS SDOS
JPC TC-3 Cassette System
ANY KC Standard Tape System
BASIC Any 6800 Version
BASIC Any 6809 Version

There are sixteen (16) categories, as indicated above. In addition we have other prizes donated by various vendors of 6800/09 products. As of the 15th of November 1979 over \$13,000.00 in prizes has been pledged.

GIMIX - Mainframe, value \$829.00. ** A GRAND PRIZE **

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JPC PRODUCTS, TC-3 kit w/CFM-3 package; AD-16 kit; CK7 kit, total value \$190.00.

STAR-KITS, Set checkbook balancing software : MINIFLEX™ or PERCOM Super BASIC on disk, value \$40.00.

MICROWARE Systems Corp, Package 1 each: ABASIC Compiler, ABASIC Source Gen., ABASIC Interpreter, LISP Interpreter; also 6 each RT/68 ROM OS and 6 each 6800 Chess programs. Total value \$1,005.00.

SMOKE SIGNAL BROADCASTING, two \$500.00 gift certificates for any SSB product. Categories eligible SSB DOS Ver. 4 or earlier and Ver. 5 or later; total value \$1,000.00.

LUCIDATA, 5 each PASCAL Ver. 2, 1 to each FLEX™ category. Total value \$750.00.

COMPUTERWARE, 2 each \$200.00 gift certificates for any Computerware software product. 1 gift certificate for best of SSB disk BASIC and 1 gift certificate for best of Computerware's Random BASIC. Total value, \$400.00.

SSI, Schreier Software Index, choice of \$100.00 of SSI software.

SOFTWARE DYNAMICS; 6800 BASIC Compiler, value \$350.00.

The MICRO WORKS, choice of any one item, value up to \$179.95.

HEMENWAY ASSOCIATES, INC., Books, 3 each CP/68, 3 each XA6809 Macro Cross Assembler, 3 each STRUBAL+ Compiler, total value \$329.55.

CER-COMP Microcomputers, MiniDisk+ Disk system (EPROM) and software on disk. Total value \$89.00.

TECHNICAL SYSTEMS CONSULTANTS (TSC), \$250.00 choice of any TSC software, for best of FLEX™ entries.

MM Enterprises and Springbok Digiltronics, SPIRIT (disk SSB) and a copy of STD-1, these will be awarded for 'best of SSB DOS. Value \$110.00.

ED SMITH'S SOFTWARE WORKS, RRMAC Recursive Macroassembler and Linking Loader, \$150.00, for best recursive macro program.

PERCOM, Assorted hardware and software, items to be listed next month

Final decision shall be delegated to a panel of judges selected by the staff of 68 Micro Journal™. All judges decisions are final and each person submitting, shall by his or her submitting material for evaluation, acknowledge that they agree to abide by any and all rules of this contest, as published within the pages of 68 Micro Journal™

Programs and material submitted shall be judged on the basis of good and workable software. By this we mean, it should do something useful and be needed by the average 6800/09 user in the particular category. Size is of little importance, the most important consideration will be how useful it is.

All material submitted shall remain the property of the original owner (who should be the author). Each submission shall contain a paragraph that states the material submitted is of original design and the property of the person in whose name it is submitted.

It shall be understood that regardless of who wins or does not win a prize, all material submitted shall be authorized and eligible, to be published by 68 Micro Journal™. Material published, which was not a winning entry, shall gain the author an extension to his or her subscription. Anyone may enter and it is not a requirement that the person submitting material be a subscriber to 68 Micro Journal™. Prizes will be awarded on the quality of the material submitted and being or not being a subscriber, will have no bearing.

Full details may be secured from previous issues of 68 Micro Journal™.

AN I N D E X
to the
"68" MICRO JOURNAL
Compiled by Jim Schreier

Preface

Few Microcomputer publications can match the variety of the 1979 issues of the "68" MICRO JOURNAL. The 200 plus entries of this Index will be proof enough. My 6800 interest was created a few years ago when when it was discovered the 6800 systems were the only ones to make sense. And they worked. And worked. In almost three years my SWTPC 6800 went down once. It blew a fuse. So you see, the "68" MICRO JOURNAL has a good act to follow: It makes sense and provides excellent information.

The thousands of MICRO JOURNAL readers probably keep back issues under protective custody. And, based on the assumption that the average reader's ability to find a specific article, news release, product announcement, review or letter is no better than mine, an Index is a must. Some microcomputer magazines are made to look nice, some aim at the hippie market (yet!); but the MICRO JOURNAL is, like a three course meal, made to be enjoyed and digested.

This Index covers everything but ads. Some of the page layouts in early issues are not clear, however any Index errors are my responsibility. The Index was prepared using the TSC FLEX2 Text Editor, Text Processor and Sort/Merge Package. Five fields were established after examining the various type source entries. Since the sources contain two type of entries the fields had to have certain common elements for proper layout. Normally the "no entry" character ("-") would be edited out prior to the final Text Processor pass. In order for MICRO JOURNAL users unfamiliar with Text Processing to observe these items, "no entry" characters have been retained. The FLEX2 DOS TTYSET WD command was set at 42.

It is my hope that the labor represented in this Index may be of current and future value to that special group of people, the "68" MICRO JOURNAL readers.

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Your Computer and the Real World Crunchers Corner By Jack Bryant February 1979 p 9

Micro-time 6800 Review

The Micro-time 6800 is a stand alone real-time clock and calendar. This means that no system overhead or interrupts are required for time keeping as in some other system clocks. The clock is timed by a quartz oscillator with a trimmer capacitor for fine tuning. This allows operation without need for timing from the sixty Hertz power source and steering diodes are provided to allow operation from separate dc power sources or for battery backup to keep the clock running during power blinks.

The clock board plugs into a standard 30 pin I/O port and has a connector on top where manual time and date set switches may be attached.

The software provided with the board is in three sections. The first section when called as a subroutine, updates the time and date in a scratch area in ram. The second routine prints the time and date on the I/O device in the form: "12/17/79 10:35:22 PM EST". The last routine is used to set the clock and calendar.

The clock board is offered just as a bare board with connectors and documentation or factory assembled and tested. The assembled unit is available in either a switch settable version or software settable. The version which was sent for evaluation was the software settable version and seems to be well worth the few extra bucks that it costs.

The software was provided with a commented source listing, which was fortunate since I had to reassemble for my 09 system. Incidentally, when reassembled for the 09, the code was about 101 longer; however, when optimized for the 09, the needed code required approximately 151 fewer bytes than the 6800 version.

The documentation supplied is complete and explains operation adequately. The quality of the board and components used is good and the advantage of not having to worry about loosing the time every time the reset button is pressed, as happens with the clock I have been using, makes this device a worthwhile addition to any 68XX system. Other accessories include an A/C adapter for powering the clock while the computer is turned off and a Kansas City cassette with the previously described software. The Micro-time 6800 is available from :

THE DATA MART
914 E. WAVERLY DRIVE
ARLINGTON HEIGHTS, IL 60004

A 68 Micro Journal™ lab rating of: AAA

Rating Scale:

- AAA - Excellent
- AA - Good
- A - Fair (could be better but works)
- P - Poor (may not always work properly)
- X - Not recommended for children (or anything else!)

PERCOM PROTOTYPING BOARDS REVIEW

Percom Data Company has recently announced two new 68XX prototyping circuit cards. One card fits the standard SS-50 bus and has enough room to accomodate up to 70 14-pin DIP sockets or less 16,24, or 40-pin sockets. The top of the board has pads for insertion of a 34-pin and a 50-pin ribbon cable connector. One side of the board provides an area for miscellaneous circuitry or test points. DC power for the board is fed from the 8-volt bulk supply and goes to circuit pads for a 5-volt regulator. From the regulator a plus supply buss feeds between alternate rows of pads so that it is close to all circuits. A ground buss passes between opposite alternate rows also in close proximity to all circuits.

The second board is a SS-30 bus board. It has room for up to 34 14-pin DIP sockets or less larger sockets. The top edge provides pads for one 12-pin Molex connector and a 34-pin ribbon cable connector. A small area is also provided at the top for other miscellaneous circuits, indicators, or test points. The SS-30 board also has pads for a 5-volt regulator and positive supply and ground busses close to all socket locations. Both boards are single sided, solder plated, and up to Percoms usual high quality.

One thing that I watch closely on 68XX boards is how well the mother board molex connectors fit. There is nothing that bothers me more than boards that fit onto the mother board at a 30-degree angle. The Percom boards passed this test well. The quality of the boards is excellent and allow for optimum placement of IC's and components. The only complaint that I have is the fact that there is no identification of any of the mother board signals on the board. This would have made use of the boards somewhat easier. The boards are available from:

PERCOM DATA COMPANY, INC.
211 N. KIRBY
GARLAND, Texas 75042

A 68 Micro Journal™ lab rating of: AAA

Rating Scale:

- AAA - Excellent
- AA - Good
- A - Fair (could be better but works)
- P - Poor (may not always work properly)
- X - Not recommended for children (or anything else!)

J.B.I. CT1024-64 High Speed Conversion

If you are like a lot of the rest of us 68XX users, you still use one of the SWTPC earlier terminals. The SWTPC CT-1024 and CT64 were two of the most popular video display units for 68XX users. They were low in cost and worked reasonably well. The keys were sometimes balky or at other times self striking. This was annoying but not fatal to the operation. The screen when refreshed looked like a midwest blizzard and occasionally the cursor developed a mind of it's own,

wandering here and there at will. One of the most annoying drawbacks was the slow write speed of either. Three hundred baud was the normal and twelve hundred baud was the upper limit, and still is until you install the J.B.I. conversion kit. Despite these and other occasional quirks; the CT-1024 and CT-64 were and still are in use by thousands of micro users worldwide today.

The J.B.I. conversion kit eliminates many of the major drawbacks of the CT series of video displays. It can be adapted to those units that have been field-updated with 64 character mod (CT-1024) and other popular changes. It uses a DMA method of screen memory, essentially causing the terminal memory to become computer memory. By this scheme the screen can be written to at near computer speed. Screen writes can range from one character per second to 4,000 characters per second (40K baud). All of the memory management (terminal) is still accomplished by the terminal and leaves the CPU unburdened for these chores. BASIC can 'POKE' directly any character position (limited graphics) and 'PEEK' any character position.

Terminal memory can be relocated to any 1K block in computer memory range that is available. This requires a software change of three standard Mikbug™ routines. These are the ones used in screen write, e.g. \$E1D1 OUTE, \$E1AC INEE and \$E07E PDATA. Patches are furnished for practically all popular software.

The board has been run on 2 meg machines and requires no delay. Included with the kit is a source listing of all changes or patches. The supplied software is RDMable. The converted terminal allows software control over scrolling or paging. One foil cut on the terminal eliminates the 'snow' problem when using the conversion kit. Baud rates are controlled from the keyboard or from software. It honors the tape 'SAVE and LOAD' thru BASIC at 300 baud. Existing software requires only a change of the three routine references to run in the converted mode.

COMPUTER MODS

If you are still using the MP-C I/O board in slot 1 you will be required to lift one IC pin on the board, this eliminates 'echo' to the terminal. No changes are

required to the computer if you are using a serial 'MP-S' I/O board.

MODS FOR CT-64

One trace cut and two IC pin cuts (or lift out if you are using sockets) also one wire jumper added.

MODS FOR CT-1024

One IC pin lift or cut and two grounds extended. One or possibly two wire extensions.

The conversion comes with two boards connected by two ribbon cables. The boards are factory built and require only memory chip installing if you use your own. One board fits on the computer S50 bus and the other replaces the memory board in the terminal. The kit comes with or without out memory IC's. This way you can use your old 2102 memory chips (if they are in sockets) or can be ordered with all new memory chips (2 Mhz). The prices advertised are \$169.00 with you supplying the memory chips. If you order with new memory chips the price is \$179.00. We recommend that you order with new chips as most all older chips are slow and end up looking like worms are eating portions of some characters, interesting but annoying!

One note of caution if you are going to update a CT-1024 you need to let them know if it has been modified for 64 characters per line or is original.

The documentation seems very complete and should be useable by anyone who original constructed his terminal. It comes with 12 pages of instructions, diagrams, board layouts, software patches and assembled source code.

Additional information can be secured from:

JOHNSON MICRO COMPUTER
2607 E Charleston
Las Vegas, Nevada 89104
1-702-384-3354

A 68 Micro Journal™ lab rating of: AAA

Rating Scale:
AAA - Excellent
AA - Good
A - Fair (could be better but works)

P - Poor (may not always work properly)
 X - Not recommended for children
 (or anything else!)

CORESIDING JBUG AND MINIBUG II
 MONITOR ROM FOR MEK6800S2
 MICROPROCESSING SYSTEM

K. Russell Peterman Staff Scientist
 Radlan Corp. 8500 Shoal Creek, Austin, TX
 78766

The Motorola MEK6800D2 microprocessor system features a hexadecimal keypad for data/address entry and a 7-segment LED array for data/address display. The system also utilizes one ACIA as a Kansas City Standard audio cassette interface. The JBUG ROM monitor supplied with the system will support the functions outlined in Table 1, including audio cassette read/write capabilities. However, during applications program development it is much more productive to use an external crossassembler such as M68SAM (Ref.1) for building object files. When the crossassembler is resident in a larger computer or development system, this almost always implies an RS-232 serial interface standard for data communications between the data terminal and the resident crossassembler. Thus, for prototyping purposes, it would be ideal in a system such as the MEK6800D2 to provide coresiding ROM monitors to format I/O data for either the hex keypad/audio cassette (JBUG) or an RS-232 serial data communications port (MINIBUG II) (Ref.2) as shown in Fig. 1. Although Motorola has released an excellent applications note (Ref.3) outlining the modifications required to allow coresiding ROM monitors in the MEK6800D2, their scheme is somewhat complex, so that it can provide program control of which ROM monitor is addressed. However, in many applications the monitor need simply be selected manually using a front panel control switch. In this manner applications program development could proceed from a source file in the development system machine to an ASCII coded object file on a digital cassette tape. The object file may then be transferred from cassette tape, via RS-232 serial interface, to the RAM resident in the MEK6800D2 system using the MINIBUG II monitor. The ROM control may then be switched to JBUG to allow complete system control of the MEK6800D2 from front panel keypads.

To implement this scheme, only one control signal need be switched between the two ROMs as shown in Fig. 2. The signal designated as ROM is output to the selected ROM by the JBUG/MBUG switch, shown in the figure. The upper portion of the switch also parallels the Tx clock and the Rx clock of the ACIA (U23), as shown in Fig. 1, when the MBUG ROM monitor is selected. Adequate space is provided on the MEK6800D2 board to add the second MC6830 ROM as shown in Fig. 1 as well as the RS-232 driver-receiver shown

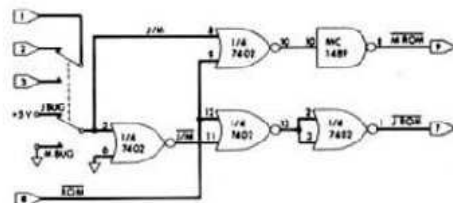
In Fig. 2. Note also that in order to ensure that no data are lost during monitor switching the MC6800 microprocessing unit should be held in the reset condition while the JBUG/MBUG switch is changed. The MEK6800D2 system provides baud rate logic for standard rates up to 9600 baud which may be selected at the output taps of counter U17. The JBUG ROM is normally supplied with the MEK6800D2 system; however the MINIBUG II ROM may be specified separately by asking for an MEX68MIN II preprogrammed MC6830 read only memory.

REFERENCES

1. M68SAM is the property of Motorola SPD, Inc. Copyright 1974 to 1978 by Motorola, Inc.
2. Motorola Semiconductor Products, Inc., Applications Note AN-771, "MEK6800D2 Microcomputer Kit System Expansion Techniques", Motorola Semiconductor Products, Inc., Phoenix, Arizona, 1977.
3. Motorola Semiconductor Products, Inc., "Evaluation Module II User's Guide", Motorola Semiconductor Products, Inc., Phoenix, Arizona, 1976.

TABLE 1

Monitor Function	JBUG	MINIBUG II
Display Registers	R	R
Load From Tape	L	L
Dump to Tape	P	P
Memory Examine/Change	M	M
Execute from Entered Address	G	G
Set Terminal Baud Rate	-	S
Test Memory	-	W
Punch Binary Tape	-	Y
Load Binary Tape	-	Z
Abort Program Execution	E	-
Trace (Single Step)	N	-
Set Breakpoint	V	-
Reset Breakpoint	V	-
Continue Execute from Breakpoint	E,G	-
Delete All Breakpoints	V	-



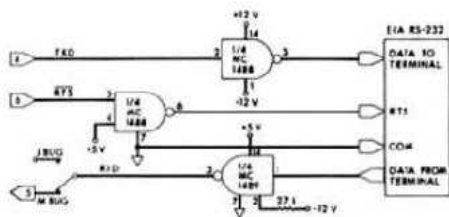


FIGURE 2
M800 D II
DUAL MONITOR LOGIC
CIRCUIT DIAGRAM

USING THE 6801/6803 AND 6809 IN THE MP-A2 BOARD

Dr. J L Pentecost
3605 Clubwood Trail
Marietta, GA 30067

Both the 6801 (or 6803) and the 6809 MPU chips can be used with the SWTP MP-A2 board with simple adapters. This article describes this approach to use both the 6801/6803 and 6809, in adapters, with TSC software.

First examination of the 6801/6803 specifications reveals a faster processor with equivalent 6800 instructions, plus some added instructions (Table I). Tests show that the 6801/03 runs typically 17.51 faster than the 6800 at the same clock frequency. The only disadvantage of the 6801/03 is the inability to use the first 20 Hex addresses in memory. These addresses have the special purpose registers and ports and are not available for memory use on the direct page. The pin-out of the 6801 and 6803 is not equivalent to the 6800 and an adapter is required. A circuit of an effective adapter is shown in Figure 1. With this adapter, and a jumper header substituted for the 6875 (as for the 6809, 68MJ6P6) on the MP-A2 board, the 6801 or 6803 runs most programs without any modification of the monitor or software. The only notable exception is disk versions of SWTPC BASIC (and possibly other versions). The TSC Editor, Assembler, BASIC, etc., operate properly.

Some additional advantages of the 6801/6803 include the availability of a programmable timer and a direct page ACIA port, the availability of 16 bit arithmetic shift instructions, PSHX, PULX and 8 bit multiply. The only disadvantages are the loss of 20 Hex bytes of memory on the direct page, and the inability to use DMA readily. Since most software for the 6800 also runs on the 6801/03 little difficulty should be experienced with this modification.

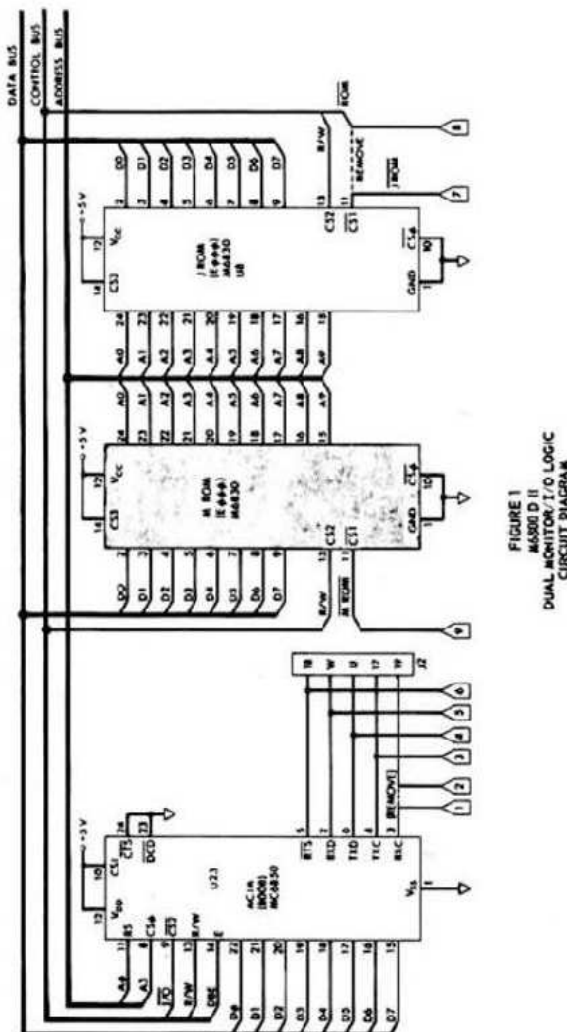


FIGURE 1
M800 D II
ADAPTER LOGIC
CIRCUIT DIAGRAM

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THE 6809

The 6809 may be used with the SWTPC MP-A2 board with simple adapters like the PERCOM. Some difficulty was experienced with this adapter on my system since a PIA port would not operate properly. The solution was found in pulling VMA high with a 1K resistor rather than by using E

AND Q. The 6809 in a simple adapter requires a new monitor. The easy approach is to modify the SWTPC S-BUG monitor for the standard 8000 Hex I/O normally used with the MP-A2 board. This is simpler than modifying the MP-A2 board to allow the EOXX addresses to be put on the main buss. These addresses are only used with the on-board EPROM or monitor. The contents of the monitor addresses in Table II should be changed from EO to 80 to modify the ACIA location for the control port (only a MPS card!) and the 5 addresses for the mini-disk boot. This can be done by reading the standard S-BUG monitor into the EPROM programmer routine, modifying the addresses in memory, and programming a 2716 with the new code.

To modify TSC software to run on this system, it is only necessary to change the EOXX addresses in NEWDISK.COMD and FLEX.SYS. Once these addresses are changed, a new disk is formatted, these two programs copied onto the new disk and the modified FLEX.SYS LINKed, the new disk will boot and operate properly with the utilities. These changes may not be simple to make with only a 6809 disk and a single system. Here are two approaches.

First, if FLEX 2 is available (FLEX at 7000 will not work) it can be brought up and with memory from A000 to DFFF, GET,FLEX.SYS from the 6809 disk to place FLEX.SYS into memory. Change all EO addresses (Table III) to 80 and SAVE,FLEX.NEW,C700,DF4D,CA00 on the 6809 disk. NEWDISK.COMD can be modified and saved similarly (see Table IV). This still does not allow the disk to boot even when linked, however, because the track 00 boot sector still contains EO addresses. Only disks formatted with the modified NEWDISK command will boot with 8000 I/O.

If battery back-up for C000-DFFF is available to maintain FLEX 9 in memory, the system can be shut down, converted to a 6809 system and reset. Upon jumping to C000 or CA00, FLEX 9 works properly. From here, NEWDISK a blank disk with the modified utility, copy FLEX.NEW to it and LINK,FLEX.NEW on the new disk.

This new disk will now boot properly and the system is up. The next approach can be used if FLEX 2 is not available and will work if no battery back-up is available for the RAM memory.

1. Boot the 6809 disk using the modified S-BUG and memory at C000-DFFF, reset, one sector will have loaded at C000.

2. Change all EO addresses in this sector (Table V).

3. Set X to C000, jump to C000. This will cause the disk to load FLEX.SYS, but hang up, so reset again. Change all EOXX addresses (Table III) and jump to C000.FLEX 9 will be operating.

4. SAVE,FLEX.NEW,C700,DF4D,CA00. Modify and save NEWDISK as above.

5. Format a new disk with the modified utility, copy FLEX.NEW and NEWDISK to this disk and LINK. The new disk will boot and all utilities will work properly.

Advantages:

1. No buss modifications or motherboard changes.

2. Low cost modifications allow use of both 6800 and 6809

3. All TSC software for 6809 can be used.

4. Up to 40K of memory is accomodated exactly as with the SWTPC board.

5. With the MOVE9 utility (by James Hughes), MINI-FLEX files are easily transferred to FLEX 9 disks.

Disadvantages:

1. Only 32K of useful memory is available vs 48K for I/O at EOXX.

2. Some initial software modification is required.

For those with Thomas Instrumentation video boards, a version of JOEBUG monitor (68MJ2) for the 6809 is also available to operate the video board, printer, keyboard and terminal ports simultaneously. FLEX 9 I/O must be modified for the video drivers however. It was noted in performing this modification that the jump table (D3E7-D3FC) is not normally used for CHAR in and CHAR out routines at D370 and D38B respectively and that jumps (7E XXXX) must be placed at D37D, INCH; D388, OUTCH; and D39C, STATUS to accomplish this modification.

TABLE I. NEW INSTRUCTIONS IN THE 6801/6803

ABX	B+X -> X
ADDD	M, (M+1) + D -> D
ASLD	C <- D <- 0
LDD	M, (M+1) -> D
LSRD	0 -> D -> C
MUL	A x 8 -> 0

PSHX X -> Stack
 PULX Stack -> X
 STD D -> M, (M+1)
 SUBD D - M, (M-1) -> D

TABLE II. S-BUG MONITOR I/O ADDRESSES

F825 (ACIA)	FBC8	FBDD
FBB1	FBCD	FBE8
FBB4	FBD6	FBF0

TABLE III. FLEX 9 FLEX.SYS I/O ADDRESSES

D3E1(Timer)	DE79	DEB9
D3E3(ACIA)	DE88	DECB
D3E5(ACIA)	DE8B	DEE6
DE40	DE90	DEFC
DE48	DE98	DF23
DE58	DEB1	DF28
DE71		DF32

SAVE ,FLEX.NEW,C700,DF4D,CA00

TABLE IV. FLEX 9 NEWDISK.COM I/O ADDRESSES

C479	C4BE	C626
C47F	C5ED	C627
C48E	C5F6	C633
C499	C603	C63F
C49E	C618	C65E
C4A4	C624	

SAVE ,NEWDISK8.COM,C100,C6A7,CA00

TABLE V. I/O ADDRESSES IN BOOT SECTOR

C015	C04C	C067
C01E	C04F	C086
C02B	C054	
C040	C05B	

REFERENCE 'BOOKEEPING' NEXT COLUMN

NOTE: Due to the volume of data in the BASIC programs we will furnish copies of the entire disk programs (.BIN and .BAS) for \$6.50 (minIFLEX format) including postage and handling. The BASIC programs will be run next month in source format.

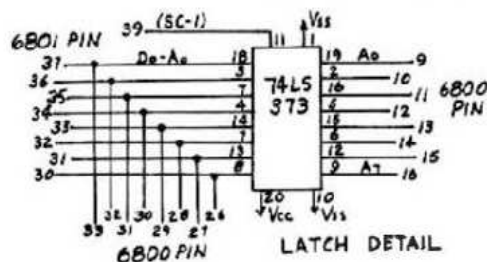
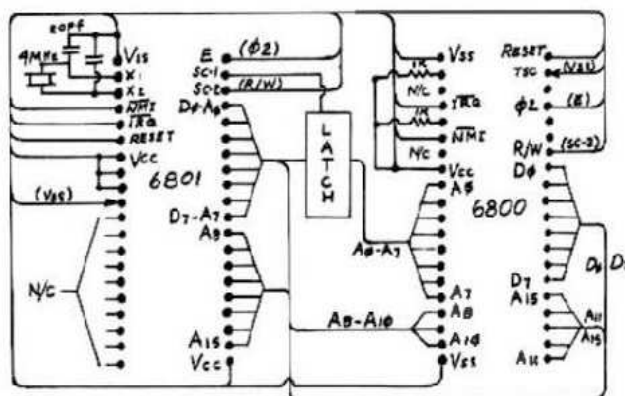


FIGURE 1 ADAPTER FOR USING 6801/03

BOOKEEPING (Disk & Tape)
 minIFLEX William R. Stock
 1125 Lois Dr
 Cincinnati, OH 45237

Totally ignoring the fact that my father kept adequate financial records with nothing more than a check register and 395 worth of index cards, I have convinced all concerned that my SWTPC 6800 is useful because it keeps my books. Assuming you have similar problems, this bookkeeping system may be for you.

It is written in SWTPC BASIC 3.0, intended to be used with the Southwest minidisk under minIFLEX 1.0. If you have another system you may have to modify the programs a little.

HOUSEHOLD NEEDS

The primary purpose of a household bookkeeping system is to keep a record of all income and expenses; the former for your friend and mine, the IRS, and the latter for you. However, if we're going to do this on a computer we may as well go ahead and list our assets and liabilities (debts). This gives a general ledger, and a much more comprehensive picture of our financial status.

To this base I have added a rudimentary Accounts Payable, to assist in projecting cash requirements.

Notice that this system is designed for households. Businesses will still have to look elsewhere.

DESIGN PHILOSOPHY

In any monetary record keeping system, accuracy is of paramount importance. As a result, this system uses a double entry ledger. A double entry system can get unwieldy, however, if you have to keep track of assets, liabilities, debits

and credits, and how they interact. This leads to the second design consideration: simplicity, be used if it is too complicated to operate. Consequently, this system was designed so that once it is booted up, all instructions are displayed on the CRT. The only debit/credit decisions you have to make are on the first entry of each transaction, and they are further simplified, as we shall show. Moreover, the programs call each other from disk, eliminating the need to remember what comes next.

SYSTEM REQUIREMENTS

This system was designed to run on (a) SWTPC 6800 with 20K RAM, a SWTPC 1824 terminal, SWTPC mini-floppies running TPC's minIFLEX 1.0 and BASIC 3.0 (the additional 4K required for minIFLEX is not included in the 20K), and the SWTPC AC-30 cassette interface + SWTBUC for tape backup of the data files.

The only programs unique to the SWTPC system are those dealing with the cassette. These programs are written in assembler, and interface with minIFLEX 1.0.

PROGRAM DESCRIPTIONS

POSTING: Transactions are entered into the books by the posting routine. The APIN program validates the transactions, makes the debit/credit decisions, and writes the transactions to the TRAN file. If any entries affect Accounts Payable, they are also written to the PTRAN file.

If any transactions were written to the PTRAN file, they are now sorted and the APMASST is updated. If there are any rejected entries, they are displayed and the program aborted.

The Journal Append program is called APPEND, and it simply appends the transactions to those already present in the Journal. This was done in BASIC to keep things simple.

Next, the TRAN file is sorted, and the CLMASTER is updated. At the same time, the sorted TRAN file is merged with GLLIST01, to produce an updated file of G/L transactions. Rejected entries are displayed on the CRT.

JOURNAL PRINT: Occasionally you will want to look at some transactions. This program lists them as they were input, within either a date or a sequence number range.

TRIAL BALANCE: This program lists the asset and liability accounts, with or without a listing of the transactions on file. It reads, but does not display, the income and expense accounts to arrive at the surplus, which is needed to make the debits equal the credits. These two figures will always match (unless you have posted to an account not on file.)

PROFIT & LOSS: You are sometimes interested

in either how you made so much money, or where it all went. This program tells you. It reads the income and expense accounts, displays them, and by a clever algorithm (subtraction), gives you the amount of either profit or loss.

CASH REQUIRED: This is the only function of Accounts Payable at this time. The program tells you how much you need to meet the bills that will come due between the date of last update and the date you enter.

END OF PERIOD: Although the diskettes will probably hold a year's transactions, the update time can get rather long, so this program allows you to scratch the JOURNAL and the GLLIST01, with the option of saving the data on tape. Should you need to refer back to the saved data, the RECOVERY program will put the data back to disk, from which you can run the usual trial balance and Journal print.

END OF YEAR: To set up your books for a new year, this program performs the end of period function, then zeros out the income and expense accounts and updates the net worth.

MAINTENANCE: You will have occasion to add and delete accounts. This routine performs the task. It also allows you to change an account name, and, on the accounts payable file, change the date and amount due.

BUDGET: Since everybody talks about budgets, I have included a budget program. It will tell you how much you've budgeted for each expense account so far this year, how much you've actually spent, and what percentage you've spent.

PART II: OPERATION

Once you have created all the disks, bringing up the system is a snap. Power up your computer, put the SYSTEM disk in drive #0, and enter D (SWTBUC). The computer will eventually respond with:

READY
#

to which you respond: CHAIN @.START.

This routine gets today's date and saves it for all subsequent processing. You now select a job from the CRT menu.

1 - TRANSACTION POST. There are two rules to remember when posting transactions. First, ALL ACCOUNTS MUST BE ON FILE. Second, THE FIRST ENTRY DETERMINES DEBIT/CREDIT FOR THE ENTIRE TRANSACTION. We will now look at each of these in detail.

Since a typical household chart of accounts will contain between 75 and 100 entries, it is not feasible to verify account numbers on the input run. It is possible, but response

(the aullors terribly.) Consequently, it is imperative that you make sure each account number is correct. If a transaction contains items on file and items not on file, then some accounts get updated and some don't (because they're not there!), leading to an out of balance condition. (In which case you start over.)

My approach to the second rule might drive professional bookkeepers crazy, but it makes things simple. The computer knows, because you told it, which accounts are income, asset, liability, etc. It also knows, because the programs tell it, that increases to income are debits, and so forth. Furthermore, it can figure out, based on the first entry, the debit/credit status of each item. Consequently, to make things as simple as possible, I have adopted this rule: IF IT ADDS TO THE ACCOUNT BALANCE, ENTER IT POSITIVE. Consider the following transaction:

ACCT	AMOUNT	COMMENT
? 111	298.8	10/20
? 711	40.94	
? 712	16.92	
? 713	2.32	
? 714	5.52	
? 583	1.6	
? 322	20	
? 324	211.7	

You will notice that the first entry is positive. It adds to 'Dad's income'. The computer knows that 111 is an income account, and makes a positive entry a debit. It also knows that accounts 711 through 583 (in the example) are expenses, and makes these entries credits. 322 and 324 are assets, and these will be debits. The important fact is that YOU don't have to worry about anything but the FIRST ENTRY. The rest is taken care of for you.

Less obvious, but equally important, the second through last entries add up to the amount of the first entry. This is the basis of the double entry system. You cannot post a transaction unless this condition is met, which means you cannot get out of balance unless you post to an account that doesn't exist, as we've already mentioned.)

When you have made the last entry of a transaction, the in balance condition triggers a neat, columnar display of the transaction. The program asks if everything is ok. At this point you should double check the account numbers, and then answer yes or no.

If you have entered the last line of a transaction and the program doesn't list it out, then the transaction obviously is not in balance. Figure out why, press return, and re-enter it.

When you are finished posting all your transactions, press return without entering anything. The program asks if you are REALLY finished. Answer yes (or no, if you're not!).

There is one last remark about the input program. If you look at the example, you will notice that it looks sloppy. This is not because I am a poor typist, but because I am lazy.

It is far easier to hit the space bar than the comma, so the entire line is one INPUT AS command. The program picks AS apart, retrieving the account number, amount, and comment (if any). While this makes input easy, it does place one restriction on you: the fields must be separated by one, and only one, space.

2 - JOURNAL PRINT. The operator input to this program is minimal. It asks if you want the entire journal printed. If you answer 'no', it asks if you want the range based on date or sequence number. Depending on your answer, it asks for the beginning and ending dates or sequence numbers.

3 - TRIAL BALANCE. Trial balance asks only one question: do you want details to print. A 'yes' will display every transaction to every account that is on file. A 'no' will cause only the account number, description, and balance to print.

4 - END OF PERIOD. The only question is whether or not you want to save the date to tape. Answer yes or no.

5 - END OF YEAR. The same question for end of period is asked here.

6 - PROFIT & LOSS. There is no input to P&L. It runs all by itself.

7 - CASH REQUIRED. The cash required program must know the cutoff date you are interested in. It will add up the amounts due from the date of last update to the date you enter. Additionally, it asks whether or not you want it to display a list of which accounts and amounts are due.

The routine is limited by the fact that the amounts are added only once. Consequently, the date range should not encompass two payroll periods.

8 - MAINTENANCE. Before we start talking about the input, let me remind you that all accounts must be accessed in ascending account number sequence. After you have all additions, deletions, and changes in sequence, you may start.

Enter the account number. If this is an old account you can 'return' through the description and it will stay the same. If it is a new account, enter the description. If it is an A/P account, enter the date due and amount due.

To delete an account, enter 'DELETE' for description. An account must have a zero balance to be deleted. Balance cannot be changed by maintenance.

To exit maintenance, hit 'return' without entering an account number.

10 - BUDGET. Printing a budget has no input and is no fun. Building a budget, however, is as close to a game as we will get with this pedestrian system.

First, let me warn you that the budget build program was designed to work off the previous year's actual expenses. As a result, it won't work until there is at least something in the general ledger balances.

The program starts out by asking you to select a budget period. Since we all pay as we go, we tend to think in weekly, monthly, etc., terms. And since our computer can multiply and divide, we will let it annualize our input.

Next, the program needs to know our best guess at our annual income. Guess too high and you'll be within budget, but show a loss. Guess too low and you'll have a rough time budgeting. I usually guess high, go over budget, and make New Year's resolutions.

The program now reads the general ledger expense accounts, computes what percentage of the total expense was spent on each account, computes what should be spent, and you're off to the races!

The repetitive display consists of the account name, the amount you have previously input, and the suggested amount. You now enter:

The item-by-item input is very flexible. It is so flexible, in fact, that it is simple to use and impossible to explain. Here are the possibilities:

(amount)(return): the amount entered replaces the previous amount. It is for the period chosen at the beginning of the program.

(amount),F(return): the amount entered replaces the previous amount as in the above example, and the account is then removed from further consideration (frozen).

(return): everything for this account remains the same.

F(return): Everything for this account remains the same and it is removed from consideration.

(amount),(period)(return): the amount entered is multiplied by the period entered, and the product divided by the initial period to arrive at the amount to be displayed. This is handy for things like insurance premiums.

(sect #),? (return): this places the entered account back into the matrix (shows it). The disadvantage is that you have

When you have journeyed through all your expenses, the program will display how much you are over your income. It will then re-compute suggestions for all non-frozen accounts, and you play it again. See.

When you have finally figured out how to live within your income, the final budget will print, and you will be asked if you want to revise it. If you say 'no', the general ledger is updated with the new budget. (OBVIOUSLY you run the budget build before the end-of-year program!!!)

In closing, let me point out that you can't freeze nothing (zero amount). You can, however, freeze a penny, which will have minimal impact on the results.

PART III: CONVERSION

Building all the disks required is the most difficult aspect of the whole operation. Not only is everything unfamiliar, but you are dealing with a great volume of data, all of which must be entered correctly. Take heart; you have to do it only once.

Since miniFLEX file organization precludes a destructive update (overwrite), *edit* or *gen* is the only technique available. This means the master file must be in ascending account number sequence.

Since the programs assume the lowest account numbers are income accounts, followed by receivables, assets, expenses, payables and net worth, your chart better follow this scheme. The available numbers are 1 through 99999999. Since the 1024 screen is 32 characters wide, I used 3 digit numbers.

With these restrictions in mind, we are ready to get started.

First, *NEWDISK* a box of diskettes. You will need at least seven, and ten is better. (One SYSTEM, and two or three each GENERAL LEDGER, JOURNAL, and ACCOUNTS PAYABLE.)

Next, write labels for each diskette, so when things start to move you know what's what.

Place your miniFLEX disk in #0. This is the disk you got when you bought your computer. Place the newly *NEWDISKed* disk marked SYSTEM in #1. Enter:

```
COPY,0,1, .CMD, .OV, .LOW, .SYS  
LINK,1, .DOS
```

Then build your *STARTUP* file. The instructions came with your *SWTPC* disk system, and you're interested mostly in *TVSRT*. The *STARTUP* file, or the file it calls in, must end with *EXEC,0,BOOKS.DI*. This loads the end-of-period/end-of-year binary program, the BASIC interpreter, and a housekeeping binary program when the system is booted up.

Now remove the SYSTEM disk from #1 and replace it with the *BASE* disk (which has *all* the programs on it).

```
Enter: COPY,0,EXEC.CMD  
COPY,0,COPY.CMD
```

Take your miniFLEX disk out of #0 and store it away. Take the *BASE* disk out of #1 and place it in #0. Place your newly made SYSTEM disk back in #1 and enter:

```
EXEC,0,BOOKS.ICL
```


The system takes over from this point, and puts the system programs on the system disk. It then requests you to put a JOURNAL, GENERAL LEDGER (G/L), and ACCOUNTS PAYABLE (A/P) disk on #1. Do what it says, and then enter Y. NOTE: The programs at this point aren't sophisticated. They wait to fetch a character, ANY CHARACTER, from the keyboard, (to give you time to change disks), and then they take off again. So change disks BEFORE hitting anything!

Since you will need at least two of each data disk, your first answer to the 'another set' question should be 'Y' (no 'return'; just Y). After you have made as many sets as you need for con afford, enter N. The system will respond with the familiar +++.

At this point, all the disks have their minimum contents. You will now need your own particular data to flesh out the skeletons. After reading the rest of the instructions, get some paper and write down your chart of accounts and their balances. Don't waste your time trying to calculate your net worth. The computer will do that for you.

Power up your computer and put the SYSTEM disk in #0. Enter 'D'. When the system responds READY #, enter: CHAIN 0,INSTALL.

The first file you will build is the parameter file. We need the highest possible account numbers for each of the six categories: income, receivables, assets, expenses, payables, and net worth. (See the sample chart for an example.)

The next file will be the accounts payables. Before putting on A/P disk in the drive, get a label and write today's date on it. Stick it on the disk. The last thing you want is to get the disks mixed up.

The information requested for A/P is:

ACCT #
DESCRIPTION
BALANCE
AYMENT
DATE DUE.

The first three are self-explanatory. The payment entry is used by the cash required program, and should be the amount you expect to pay on the date due. If the payment field is zero, the program assumes the entire balance is due (not so cool in the case of the mortgage). The date due can be either an MMDD format (325 = March 25th) or a DD format (10 = 10th of every month). If the date due is zero, then the program assumes you don't have to pay this one until you want to, and it knows the account.

The last two entries (payment and date due) can be null entered (return), in which case they default to zero.

When all the accounts payable have been entered, you exit the routine by pressing 'return' without an account number.

Did you get the date on the A/P disk? Good.

Now put one on a general ledger disk. The G/L files are identical to the A/P files, except there aren't any payments or dates due.

When you are finished with the general ledger entries, you exit the routine the same as accounts payable. Since the A/P file is already built, there is no reason to enter the data twice. The program will build the A/P section of the G/L, compute the net worth, and call in the START program. Enter today's date and you're finished.

PLEASE, PLEASE, PLEASE, keep track of which disks are current. The small Avery labels are inexpensive, and worth their weight in gold. I have seen a couple sites update from an old disk to their current disk, (rooting a colossal mess. Some never recover.

BOOKS.S C

10		NAM	BOOKS	
20		OPT	0,S,NOP,NOG	
30		START	EQU \$2442	SWTPC BASIC 3.0 END
40		PDATA	EQU \$207E	SWTBUG
50		INECE	BOU \$E1AC	SWTBUG
60		FLXFCB	BOU \$7809	FLEX 1.0 FCB POINTER
70		PREG	BOU \$A044	SWTBUG
80		PEND	BOU \$A004	SWTBUG
90		PCHON	DOU \$E14D	SWTBUG
100		PUNCH	DOU \$E37E	SWTBUG
110		PCROFF	DOU \$E353	SWTBUG
120		DELAY	DOU \$E2C2	SWTBUG
130		FMS	DOU \$7806	FLEX 1.0 FMS ENTRY
140		BUF	DOU \$7884	FLEX 1.0 DISC BUFR
150		USER	EQU \$5D	BASIC 3.0 USER/D0
160		BASIC	EQU \$100	BASIC 3.0 COLD ENTRY
170		BASPGM	DOU \$14E	BASIC 3.0 START OF PGMS
180		DOSENT	DOU \$32A	BASIC 3.0 JUMP TO DCS
190		FLXWRM	DOU \$7103	FLEX 1.0 WARM START
200		FLXCLD	DOU \$7100	FLEX 1.0 COLD START
210		R N	DOU \$E234	SWTBUG
220		JNCH	EQU \$2078	SWTBUG
230		CKSM	EQU \$A007	SWTBUG
240		BYTE	BOU \$8055	SWTBUG
250		BYTDCI	BOU \$A047	SWTBUG
260		BADDR	BOU \$E047	SWTBUG
270		CUTCH	BOU \$E075	SWTBUG
280		RDOFF	DOU \$E247	SWTBUG
290		ORG	START	
295	2442	JMP	BOOT	CNTL STNG ENTRY
300	2445	JMP	ZOJNL	JOURNAL PUNCH
310	2446	JMP	ZOGL	GL PUNCH
320	2448	JMP	ZJNL	JOURNAL READ
330	244E	JMP	ZIHST	HIST READ
340	2451	IMP	ZIGL	GL READ
350		ZOJNL	LDX #MSG01	INITIAL M SAGES
360		JSR	PDATA	
370		LDX	#MSG03	
380		BRA	OMCS1	
390		ZOGL	LDX #MSG01	
400		JSR	PDATA	
410		LDX	#MSG02	
420		OMCS1	JSR PDATA	
430		LDX	#MSG04	
440		JSR	PDATA	
450		LDX	#MSG07	
460		JSR	PDATA	
470		OMCS2	LDX #MSG08	
480		JSR	PDATA	
490		JSR	JNECE	
500		CMFA	#SD	
510		ONE	CMES2	
520		IDAA	FLXFCB+1	GET ADDRESS OF FILE
530		IDAI	FLXFCB	
540		SUBA	#51C	
550		SBCB	#0	
560		STAA	FCB+1	
570		STAB	FCB	
580		LDX	#BUF	
590		STX	CURPOS	
600		STX	PBDG	
610		LDAB	#11	GET LABEL READY FOR UNCH
620		LDX	FCB	
630		OLABEL	LDAA 4,X	
640		INX		
650		STX	TEMP	
660		LDX	CURPOS	
670		STAA	0,X	
680		INX		
690		STX	CU POS	
700		LDX	TEMP	

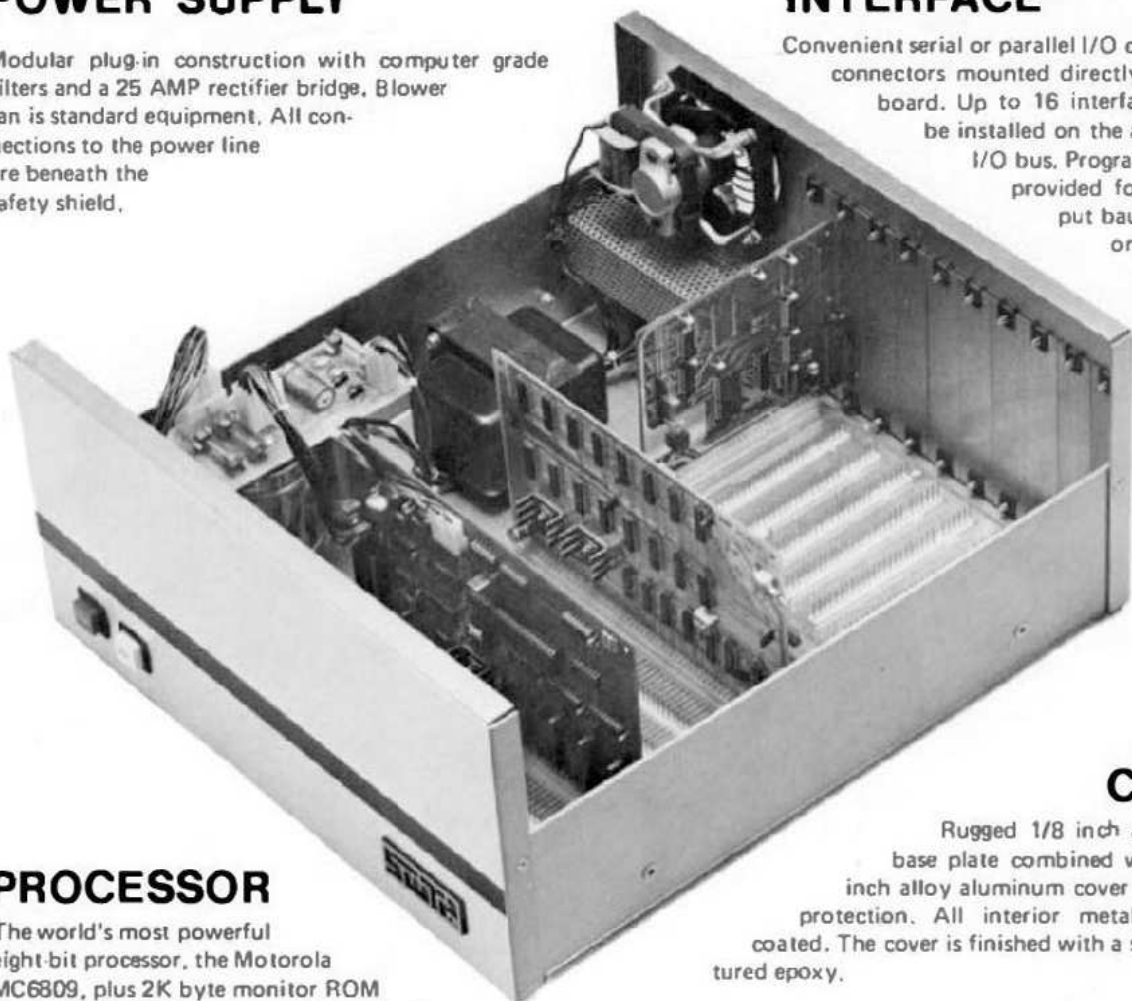
WE HAVE A 6809 FOR YOU

POWER SUPPLY

Modular plug-in construction with computer grade filters and a 25 AMP rectifier bridge. Blower fan is standard equipment. All connections to the power line are beneath the safety shield.

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Convenient serial or parallel I/O cards have DB-25 connectors mounted directly on the circuit board. Up to 16 interface devices may be installed on the address decoded I/O bus. Programming strips are provided for input and output baud rate selection on each port. All outputs are fully buffered.



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The world's most powerful eight-bit processor, the Motorola MC6809, plus 2K byte monitor ROM that is 2716 EPROM compatible and full buffering on all output lines. Built-in multiuser capability, just add I/O cards to operate a multi-terminal system.

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Rugged 1/8 inch alloy aluminum base plate combined with a solid 1/8 inch alloy aluminum cover for unsurpassed protection. All interior metal is conversion coated. The cover is finished with a super tough textured epoxy.

MEMORY— You can purchase the computer with either 8K bytes of RAM memory (expandable to 56K), or with the full 56K. The efficient, cool running dynamic memory used in this system is designed and manufactured for us by "Motorola Memory Systems Inc."

PERIPHERALS—The wide range of peripheral hardware that is supported by the 6809 includes: dot matrix printers (both 80 and 132 column), IBM Electronic 50 typewriter, daisy wheel printers, 5-inch floppy disk system, 8-inch floppy disk systems and a 16 megabyte hard disk.

SOFTWARE—The amount of software support available for the 6809 is incredible when you consider that it was first introduced in June, 1979. In addition to the FLEX9 operating system, we have a Text Editor, Mnemonic Assembler, Debug, Sort-Merge, BASIC, Extended BASIC, MultiUser BASIC, FORTRAN, PASCAL and PILOT.

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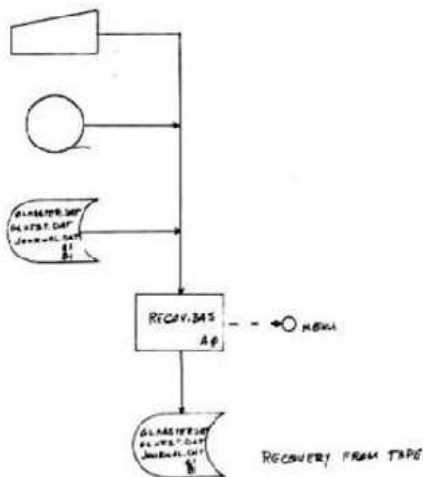
710		DOCB		1750		LDX	#MSG03	
720		BNE	OLABEL	1760		BRA	IMES1	
730		LDX	CURPOS	1770	ZIHS1	LDX	#MSG01	
740		DIX		1780		JSR	FDATA	
750		STX	PEND	1790		LDX	#MSG02	
760		JSR	PCHON	1800	IMES1	JSR	FDATA	
770		JSR	DELAY			LDX	#MSG04	
780		JSR	DELAY	1810		JSR	PDATA	
790		JSR	DELAY	1820		LDX	#MSG05	
800		JSR	PUNCH	1830		JSR	FDATA	
810		LDX	#B1	1840		LDX	#MSG08	
820		JSR	PDATA	1850	IMES2	JSR	FDATA	
830		JSR	PCHOFF	1860		JSR	INILE	
840		LDX	FCB	1870		CMPA	#D	
850		LDAA	#5	1880		BNE	IMES2	
860		STAA	0,X	1890	ZIGL	LDAA	FLX/FCB+1	ENTRY FOR NO MESSAG
870		JSR	FMS	1900		LDAB	FLX/FCB	GET ADDRESS OF FILE
880	PREC1	LDX	#BUF	1910		SUBA	#51G	
890		STX	CURPOS	1920		SBCB	#0	
900	PCHR1	LDX	FCB	1930		STAA	FCB+1	
910		JSR	FMS	1940		STAB	FCB	
920		TST	1,X	1950		JSR	LOAD	1ST RECORD OF TAPE
930		BNE	OERR	1960		LDX	FCB	
940		LDX	CURPOS	1970		STX	TEMP	
950		STAA	0,X	1980		LDX	#BUF	
960		INX		1990		STX	CURPOS	
970		STX	CURPOS	2000		LDAB	#11	VERIFY LABEL
980		CPI	#BUF*125	2010	LAB1	LDX	TEMP	
990		BNE	PCHR1	2020		LDAA	4,X	
1000	PCHR2	LDX	#BUF	2030		INX		
1010		STX	PRDG	2040		STX	TEMP	
1020		LDX	CURPOS	2050		LDX	CURPOS	
1030		DIX		2060		CMPA	0,X	
1040		STX	PEND	2070		BNE	BADLAB	WRONG TAPE
1050		JSR	PCHON	2080		INX		
1060		JSR	DELAY	2090		STX	CURPOS	
1070		JSR	DELAY	2100		DOCB		
1080		JSR	DELAY	2110		BNE	LAB1	
1090		JSR	PUNCH	2120		LDX	FCB	LAB LOCK
1100		LDX	#B1	2130		LDAA	#4	
1110		JSR	PDATA	2140		STAA	522,X	RESET DATA INDEX
1120		JSR	PCHOFF	2150				
1130		LDX	FCB					
1140		TST	1,X	2230				
1150		BDQ	PREC1	2240	IREC	LDX	#BUF	FILL BUFFER FOR END DETECT
1160		BRA	ONODR	2250		LDAA	#5FF	
1170	OERR	LDAB	1,X	2260		LDAB	#124	
1180		CMPB	#8	2270	IFILL	STAA	0,X	
1190		BZQ	PCHR2	2280		INX		
1200	ONODR	LDX	FCB	2290		DECB		
1210		LDAA	1,X	2300		BNE	IFILL	READ TAPE RECORD
1220		LDX	USER	2310		JSR	LOAD	
				2320		LDX	#BUF	
1240		CLR		2330	ICHR	LDAA	0,X	END OF BLOCK
1250		TSTA		2340		CMPA	#5FF	
1260		BDQ	0USER4	2350		BDQ	IREC	END OF FILE
1270		CMPA	#8	2360		CMPA	#4	
1280		BNE	0USER2	2370		BDQ	IDONE	
1290		CLRA		2380		INX		
1300	0USER2	DDA	#0	2390		STX	CURPOS	
1310		DAA		2400		LDX	FCB	
1320		BITA	#5F0	2410		JSR	FMS	WRITE CHARACTER
1330		BDQ	0USER4	2420		LDAA	1,X	
1340		TAB		2430		BNE	IBR	WRITE ERROR: ABORT
1350		LSRA		2440		LDX	CURPOS	
1360		LSRA		2450		CPI	#BUF*125	
1370		LSRA		2460		BNE	ICHR	GET NEXT CH R
1380		LSRA		2470	BADLAB	BRA	IBR	GET NEXT RECORD
1390		ASLB		2480		LDAA	#0	5 = BAD LABEL
1400		ASLB		2490	IERR	BRA	ICLO1	
1410		ASLB		2500		LDX	FCB	
1420		ASLB		2510		LDAA	1,X	
				2520	IDONE	BRA	ICLO1	
1440	0USER4	CLR	5,X	2530		CLR	USER	SET UP USER0
1450		STAA	0,X					
1460		BDQ	0USER5	2550		CLR		
1470		INC	6,X			ADDA	#0	HEX TO BCD
1480	0USER5	STAB	1,X	2580		DNA		
1490		BDQ	0USER6	2590		BITA	#5F0	
1500		INC	6,X	2600		BDQ	ICLO3	
1510	0USER6	INX		2610		TAB		
1520		LDAB	#4	2620		LSRA		
1530	0USER1	CLR	1,X	2630		LSRA		
1540		INX		2640		LSRA		
1550		DOCB		2650		LSRA		
1560		BNE	0USER1	2660		LSRA		
1570		LDX	#BUF	2670		AS #		
1580		LDAA	#4	2680		ASLB		
1590		STAA	0,X	2690		ASLB		
1600		STAA	1,X	2700		ASLB		
1610		STX	PRDG					
1620		INX		2720	ICLO3	CLR	6,X	EXPONENT
1630		STX	PEND	2730		STAA	0,X	SGN + 1ST DIGIT
1640		JSR	PCHON	2740		BDQ	ICLO4	
1650		JSR	DELAY	2750		INC	6,X	EXPONENT
1660		JSR	DELAY	2760	ICLO4	STAB	1,X	2ND & 3RD DIGITS
1670		JSR	DELAY	2770		BDQ	ICLO5	
1680		JSR	PUNCH	2780		INC	6,X	EXPONENT
1690		LDX	#B1	2790	ICLO5	INX		
1700		JSR	PDATA	2800		LDAB	#4	CLEAR REST OF USER0
1710		JSR	PCHOFF	2810	TCLO1	CLR	1,X	
1720		RTS		2820		INX		
1730	ZUNL	LDX	#MSG01	2830		DOCB		
1740		JSR	FDATA	2840		BNE		
				2850		RTS		

```

2860 MSG01 FDB $1016.0.0
2870 FCC /THE /
2880 FCB 4
2890 MSG02 FCC /GENERAL LEDGER/
2900 FCB 4
2910 MSG03 FCC //JOURNAL/
2920 FCB 4
2930 MSG04 FDB $D&A
2940 FCC /IS READY FOR TAPE./
2950 FCB $D, $A, $A
2960 FCC /SET BAUD AT 300 FOR K. C. STD./
2970 FDB $D&A
2980 FCC /TAPE./
2990 FCB $D, $A, $A
3000 FCC /PUT TAPE IN RECORDER AND/
3010 FDB $D&A
3020 FCC /PREPARE TO /
3030 FCB 4
3040 MSG05 FCC /READ./
3050 FCB 4
3060 MSG07 FCC /RECORD./
3070 FCB 4
3080 MSG08 FCC $D, $A, $A
3090 FCC /RETURN WHEN READY. ? /
3100 FCB 4
3110 89 FCC /89/
3120 FCB 4
3130 TEMP RMB 2
3140 CURPOS RMB 2
3150 FCB RMB 2
3160 LOAD JSR RDOX SWTBUG READ MODIFIED
3170 LOAD3 JSR INCH AS SUBROUTINE
3180 CMPS #5
3190 BNE LOAD3
3200 JSR INCH
3210 CMPS #9
3220 BDC LOAD21
3230 CMPS #1
3240 BNE LOAD3
3250 CLR CKSM
3260 JSR BYTE
3270 SUBA #2
3280 STAA BYTDC
3290 JSR BADDR
3300 LOAD11 JSR BYTE
3310 DDC BYTDC
3320 BBO LOAD15
3330 STAA 0,X
3340 CMPS 0,X
3350 BNE LOAD19
3360 INX
3370 BRA LOAD11
3380 INC CKSM
3390 BDC LOAD3
3400 LOAD19 LDAA #7
3410 JSR OUTCH
3420 ICAD21 JSR RDOFF
3430 RTS
3440 DOS LDX #FLXWRM FIRST FLEX ENTR MUST
3450 STX DOSENT BE COLD
3460 JMP FLXCLD
3470 BOUT LDX #DOS INITIALIZE BASIC
3480 STX DOSENT
3490 LDX #BOOT
3500 STX BASPGM
3510 JMP
3520 2780 DONE FDB * FIND END OF PGM FROM
3530 END SYMBOL TABLE

```

NOTE: Object file = BOOKS.BIN,2442,277F,2442



SAMPLE CHART OF ACCOUNTS

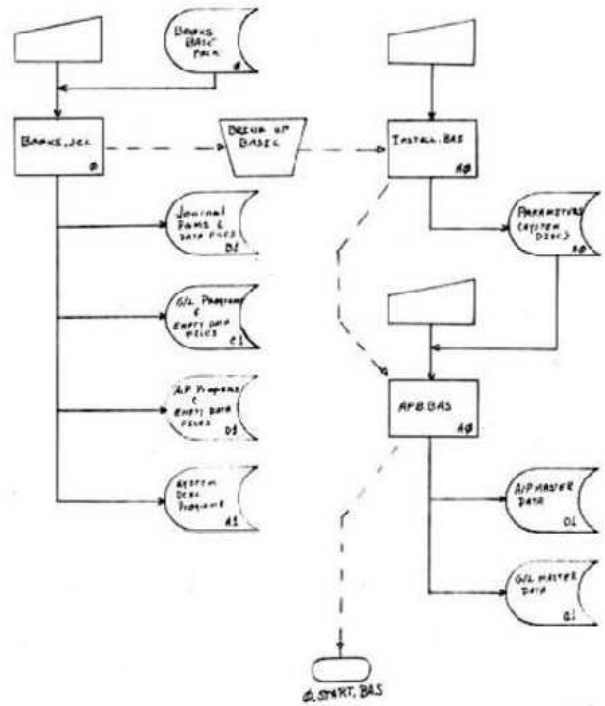
111	Dad's income	431	furnishings under \$100
121	Mom's income	432	furnishings over \$100
		431	books, magazines...
131	XYZ capital gains	511	Dad's allowance
132	ABQ capital gains	512	Mom's allowance
141	golden savings interest	520	food
142	roy savings interest	530	babysitters
		540	tuition
151	XYZ dividends	550	medical
152	ABQ dividends	550	personal insurance
200 - 299	acct's receivable (bal)	571	Dad's clothing
		572	Mom's clothing
311	XYZ stock	573	kid #1 clothing
312	ABQ stock	574	kid #2 clothing
		575	kid #3 clothing
321	golden savings	581	Christmas gifts
322	roy savings	582	other gifts
323	wife's savings (double ha)	583	united appeal 6c.
324	checking	584	Cr card interest \$\$\$
		585	church donations
331	house	586	Merrill Lynch donations
332	cars	589	misc. misc.
333	furniture 6c.		
334	appliances	611	Dad's gas and oil
335	other (computer)	612	maintenance
		613	insurance
412	interest on house note	614	company reimbursed
413	house insurance	621	wife's gas & oil
414	house taxes	622	wife's car maint
		623	wife car ins
421	gas & elect		
422	water	711	dad fed withhold
423	phone	712	dad fica
424	elect maint	713	dad state donations
425	plumbing maint	721	wife fed withhold
426	heating maint	722	wife fica
427	general repairs	723	wife state tax
429	other		

SAMPLE CHART OF ACCOUNTS (cont)

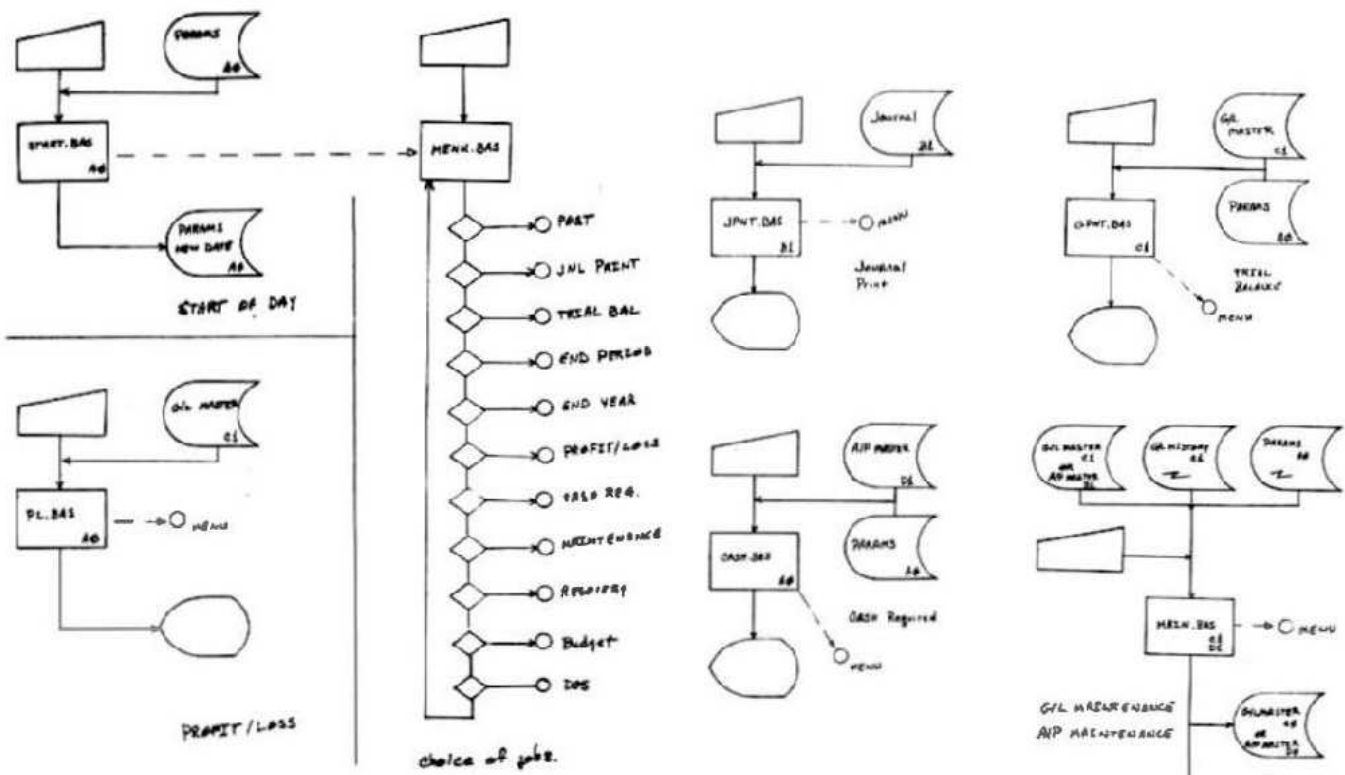
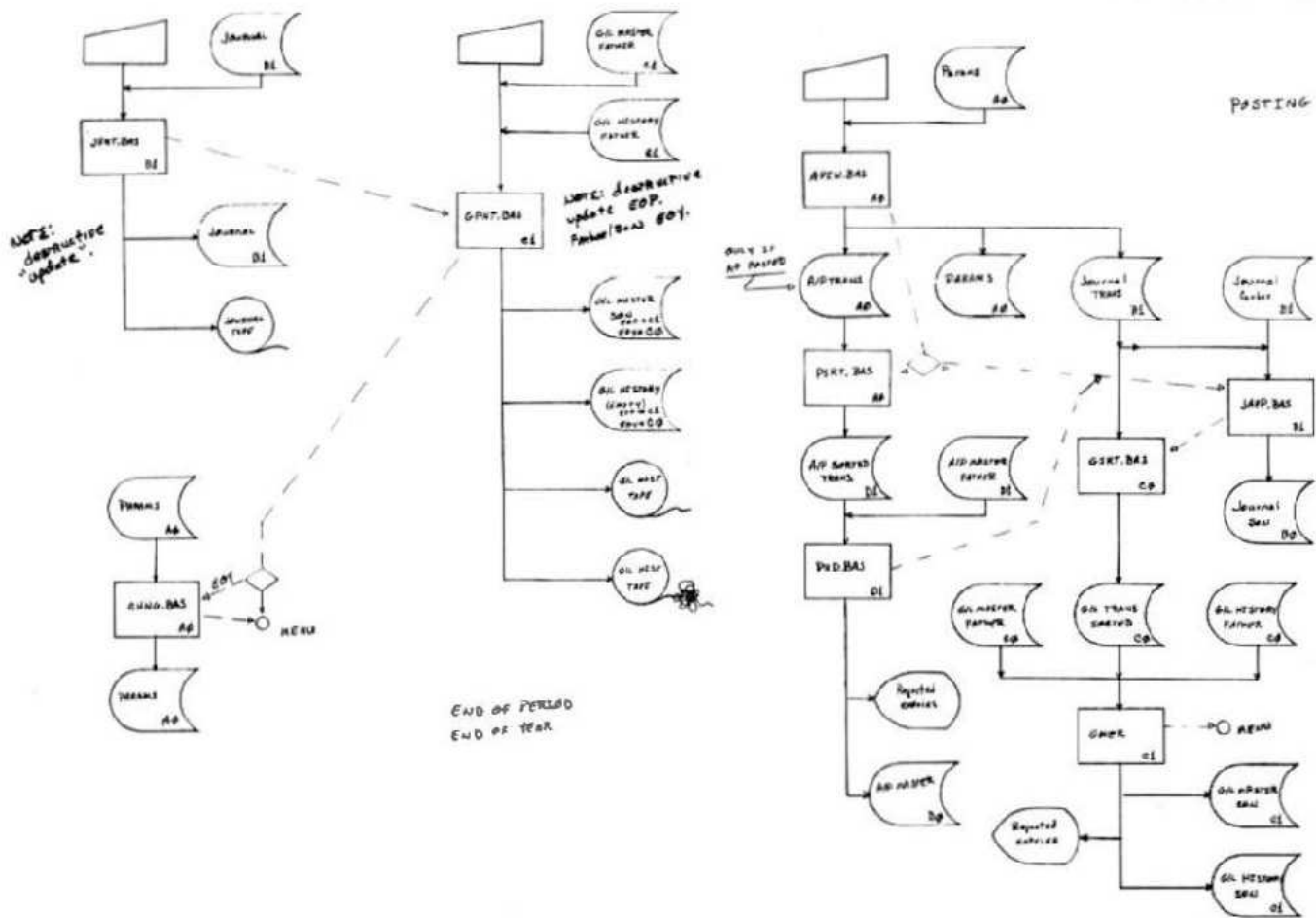
Sample entries for parameter build, using the above chart:

811	DEF insurance		
812	credit card #1	INCOME	199
813	mortgage	RECEIVABLES	299
814	dept store #1	ASSETS	399
815	dept store #2	EXPENSES	799
816	credit card #2	PAYABLES	899
817	credit card #3	NET WORTH	900
...			

900 Net Worth



CONVERSION



A SOFTWARE DATA ENCRYPTON STANDARD
IMPLEMENTATION FOR THE 6800

S. J. Lacour and T. F. Elbart
The University of West Florida
Pensacola, FL 32504

The security of digital communications is becoming of great importance as the use of distributed systems becomes commonplace. Several systems for encrypting sensitive data have recently appeared in the literature, and some controversy has arisen over the relative security of these systems. The purpose of this article is to describe a 6800 software implementation of one of these systems, the National Bureau of Standards Data Encryption Standard (DES). This particular standard was developed by NBS in response to the requirement for a single certifiable standard to be used for all federal government unclassified data stored and transmitted by computer.

The contract to develop the standard was issued to IBM in 1974. During the development phase of the program, the National Security Agency was consulted regarding certain aspects of the standard, one of which was the key length. This fact led to speculation that perhaps the NSA had "tampered" with the encryption algorithm, creating a weakness which only they could exploit. The NBS Data Encryption standard was adopted on November 23, 1976, with an effective date of July 15, 1977. After this date, all federal agencies were required to comply with the standard. On April 13, 1978, the United States Senate Select Committee on Intelligence issued a report which, among other things, concluded that NSA did not tamper with the design of the DES algorithm in any way. And so, the DES exists today as the single method by which encryption of nonclassified data within all federal agencies is accomplished.

The Data Encryption Standard is thoroughly described in Federal Information Processing Standards (FIPS) Publication 46, U.S. Department of Commerce, National Bureau of Standards, issued on January 15, 1979. It is described as "an algorithm to be implemented in electronic hardware devices" and not by software. The 6800 user who can utilize the Motorola Exorcisor bus configuration can purchase a data security module which will encrypt a 64-bit block of data in less than 200 microseconds, and which has been

certified by the NBS. The cost is around \$500. Those computer users with a requirement for data encryption not involving any federal agency, or those merely wishing to experiment with data encryption, can use a software implementation of the algorithm. Such software implementations offer the same immunity to cryptanalysis as the hardware versions, in that the best machines available for the next few years would take some 200 years to break the code.

Since the DES algorithm is fully explained in FIPS Publication 46, only the rudiments will be discussed here. The algorithm utilizes a 64 bit input block, a 64 bit output block, and a 64 bit key of which 56 bits are actually used as the key, with the remaining eight bits being reserved for parity checks on the key itself. The 64 bit input block is first passed through an initial permutation (IP) which shuffles the input bits in accordance with a specified permutation table. The resulting 64 bit permuted input is then split into two 32 bit blocks, L and R, such that the permuted input block is LR. The L and R blocks are then passed through 16 iterations of a calculation described below in terms of a cipher function f . Successive functions L_m and R_m are determined by the recursive equations

$$\begin{aligned}L_m &= R_{m-1} \\R_m &= L_{m-1} \oplus f(R_{m-1}, K_m)\end{aligned}$$

where initial values L_0 and R_0 are those resulting from initial division of the permuted input block, and where \oplus represents the bit-by-bit exclusive OR operation. The subkey K_m is a block of 48 bits chosen from the 64 bit key in accordance with the expression

$$K_m = KS(M, KEY)$$

where KEY is the 64 bit input key, KS is a function called the key schedule, and K_m is determined by the bits in 48 distinct bit positions within KEY, as specified by the key schedule. The KS function consists of putting the 64 bit key through a specified permutation and bit selection process (PC-1), resulting in two 28 bit blocks termed C_0 and D_0 . These blocks are then left shifted in accordance with a specified schedule to generate C_m and D_m for each of the sixteen iterations. The block $C_m D_m$ is then passed through a second permutation and bit selection process (PC-2) to produce K_m , a 48 bit block used as the subkey for iteration M .

Finally, the cipher function $f(R_{m-1}, K_m)$ is determined by first forming a 48 bit function $E(R_{m-1})$ from the 32 bit R_{m-1} block by means of a specified bit selection table, exclusive OR-ing this block with the 48 bit subkey K_m , and then passing each six bit block of the result through a specified selection function, S_1, S_2, \dots, S_8 . These so called "S-boxes" generate eight four bit blocks, one from each of the six bit blocks, which combine to form a 32 bit result. This result then undergoes a final permutation P to produce the 32 bit cipher function $f(R_{m-1}, K_m)$. The 32 bit R_m is then determined from f and L_{m-1} as described above.

When L_{16} and R_{16} are finally determined, the 64 bit block $L_{16}R_{16}$ is passed through the inverse of the initial permutation (IP^{-1}) to yield the 64 bit output ciphertext. To decrypt a ciphertext encoded by the DES algorithm, it is necessary only to process the encrypted block through the same algorithm, only now the subkeys K_n are generated in reverse order.

The algorithm itself is fairly complex but the procedures, including the permutations, bit selections, shift schedules, and the S-boxes themselves, are public knowledge and are fully described in FIPS Publication 46. The only thing which needs to be kept secret is the key. The reasons behind the particular selection of these various functions by NBS is not obvious to those unfamiliar with cryptographic techniques, but it must be assumed that the selections and procedures were chosen to enhance the security of the algorithm against cryptanalysis. In fact, it is the design of the S-boxes themselves, which has never been explained by IBM, NBS, or NSA, which has led to the speculation of tampering.

The particular software version of the DES described below was written for a SWTP 6800 microcomputer using the FLEX operating system, and requires approximately 1100 bytes of memory. The permutation routine PERM is used most often and with various inputs, outputs, and permutation tables. A parameter table is used to indicate to the permutation routine the number of bits in the output byte, the number of output bytes, the location of input and output blocks, and the desired permutation table. All permutation tables are stored in the format mmmmbbbb as described in the program listing. The mask number mmmmm gives the location of the source bit

within the source byte. The bbbb gives the location within the input of the byte which contains the desired bit. The desired bit is masked out and shifted into a holding byte which, when full, is stored in the output block.

Routine SHIFT generates the shifting operation necessary for generation of the subkeys. Since each subkey corresponds to a specific iteration of L and R, it is used only once in the encryption of a given 64 bit input block. This makes it possible for the subkeys to be generated as they are needed, rather than having them stored in memory. This requires a shift routine which will handle both left and right shifting of 28 bit blocks of data.

The routine which requires the most memory and table searching is PERMS, which performs the S-box mapping. Since each element of an S-box can fit into a half byte, a compacted table is used so that two elements are contained in a single byte. To access an S-box entry, the row and column numbers are specified. The column number is then divided by two and added to the row number, which in turn is adjusted to the left half byte of the table pointer. This provides the table offset, which is added to the table address to get the byte containing the desired half-byte. The particular half-byte of interest is then determined, together with the specification of the half of the output byte into which it is to be stored.

The routine which actually performs the iterative procedures of the DES algorithm is ITER. It calls the various subroutines, and directs the logic flow for both encryption and decryption. It follows the iterative procedures described above for generating L_m, R_m , and K_m for each of the 16 iterative steps.

The main routine converts the DES program into a FLEX utility responding to the entry DES from a FLEX prompt. It responds with a user prompt for the DES parameters, and calls ITER to initiate the encryption or decryption. The DES parameters are:

- (1) MODE (00 = encrypt, 01 = decrypt)
- (2) KEY (16 hexadecimal digits)
- (3) INPUT (16 hexadecimal digits)

After the input data is entered, the system responds with the output of 16 hexadecimal

digits. A sample encryption followed by a decryption is shown following the program listing.

It will be noted that the main routine utilizes certain FLEX and MIKBUG (in this case) routines. These are not necessary unless something like the main routine is used to interface the program with FLEX. Also, the FLEX routine ADDBX is used by two of the subroutines. This merely adds the B accumulator to the index register, and could be replaced by a user provided subroutine. It is used to provide a variable offset to the index register, permitting easier table access.

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```

1      ORG     ORG
2      *-----*
3      *   SAMPD DATA (ENCRYPT) ON ALGORITHM   *
4      *-----*
5      *   AUTHOR: Sam J. La Cour Jr.         *
6      *-----*
7      ORG     ORG
8      ORG    20  (1)  ORG     ORG
9      ORG    01  ORG     ORG
10     ORG    7E  (3)  ORG     ORG
11     ORG    45  ORG     ORG
12     ORG    84  ORG     ORG
13     ORG    00  ORG     ORG
14     ORG    04  ORG     ORG
15     ORG    45  ORG     ORG
16     ORG    04  ORG     ORG
17     ORG    04  ORG     ORG
18     ORG    04  ORG     ORG
19     ORG    04  ORG     ORG
20     ORG    04  ORG     ORG
21     ORG    04  ORG     ORG
22     ORG    04  ORG     ORG
23     ORG    04  ORG     ORG
24     ORG    04  ORG     ORG
25     ORG    04  ORG     ORG
26     ORG    04  ORG     ORG
27     ORG    04  ORG     ORG
28     ORG    04  ORG     ORG

```

```

29 007A K R00 8
30 0082 K1 R00 8
31 0084 INPUT R00 8
32 008E C R00 4
33 0092 D R00 4
34 0094 DD16 R00 1
35 0097 3F ORG0 F00 63F,47E
36 0099 00 7A KADR F00 8
37 009B 00 82 H1ADR F00 00
38 009D 01 8F SAMR F00 0
39 009F KEY R00 8
40 00A7 APNR0 R00 2
41 00A9 08 FADR0 F00 001,010
42 00AB 00 84 FDR INPUT,L,INITAB
43 00AD 08 FCB 000,004
44 00B3 00 7F FDB KE1,C,PDCHA
45 00B9 08 FCB 000,004
46 00BB 00 7F FDB KEY,D,PCDR0
47 00C1 04 KPR0 FCB 004,008
48 00C3 00 8E FCB C,H,PCD2
49 00C9 04 FCB 004,008
50 00CB 00 76 FDB 0,INPUT,I
51 00D1 08 FCB 000,004
52 00D3 00 82 FDB H1,INPUT,F
53 00D9 08 FCB 000,008
54 00DB 00 72 FDB L,INPUT,INITAB
55 00E1 27 INITAB FCB 027,036,025,024,023,022,021,020
56 00E9 47 FCB 047,046,045,044,043,042,041,040
57 00EF 67 FCB 067,066,065,064,063,062,061,060
58 00F5 87 FCB 087,086,085,084,083,082,081,080
59 00FB A7 FCB 107,014,015,014,013,012,011,010
60 0101 C7 FCB 127,034,035,034,033,032,031,030
61 0109 E7 FCB 157,054,055,054,053,052,051,050
62 0117 07 FCB 177,074,073,074,073,072,071,070
63 0125 27 PCN1A FCB 117,016,015,014,013,012,011
64 0133 47 FCB 010,027,024,025,024,023,022
65 0141 67 FCB 021,020,017,030,035,034,033
66 0149 87 PCN1B FCB 032,031,032,047,046,045,044
67 0157 A7 FCB 077,074,075,074,073,072,071
68 0165 C7 FCB 176,047,046,045,044,043,042
69 0173 E7 FCB 061,060,057,056,055,054,053
70 0181 07 PCN2 FCB 152,051,050,043,042,041,040
71 0189 27 FCB 061,012,031,002,010,009
72 0197 47 FCB 036,043,071,040,052,021
73 01A5 67 FCB 072,032,041,040,023,008
74 01AB 81 FCB 101,070,033,042,051,020
75 01B1 05 FCB 155,004,034,015,034,037
76 01B9 24 FCB 124,042,074,014,054,044
77 01C7 44 FCB 003,050,031,047,004,017
78 01CD 64 FCB 124,045,044,044,014,044
79 01D3 84 E FCB 003,010,030,030,040,050
80 01DB 04 FCB 040,050,060,070,080,011
81 01E1 24 FCB 090,011,021,031,041,051
82 01E9 44 FCB 041,051,061,071,081,012
83 01F7 64 FCB 001,012,022,032,042,052
84 0205 84 FCB 042,052,062,072,082,013
85 0213 04 FCB 002,013,023,033,043,053
86 0221 24 FCB 043,053,063,073,083,014
87 0229 44 F FCB 001,070,042,052
88 0237 64 FCB 053,041,043,012
89 0245 84 FCB 114,071,072,023
90 0253 04 FCB 050,022,073,021
91 0261 24 FCB 024,080,080,041
92 0269 44 FCB 003,013,030,011
93 0277 64 FCB 032,051,043,060
94 0285 84 FCB 042,031,040,013
95 0293 04 S FCB 004,011,027,080,030,040,050,060
96 0301 24 FCB 107,074,072,001,000,100,090,070
97 0309 44 FCB 041,000,001,020,070,070,030,050
98 0317 64 FCB 070,002,049,017,050,130,040,060
99 0325 84 FCB 071,000,040,034,017,020,000,050
100 0333 04 FCB 030,047,007,000,000,010,010,000
101 0341 24 FCB 100,070,000,001,050,100,010,020
102 0349 44 FCB 000,001,030,042,000,070,005,010
103 0357 64 FCB 040,070,061,005,010,017,034,020
104 0365 84 FCB 107,019,034,000,020,150,000,011
105 0373 04 FCB 004,049,000,030,001,020,050,007
106 0381 24 FCB 010,000,007,007,040,003,005,020
107 0389 44 FCB 070,003,000,000,012,005,000,040
108 0397 64 FCB 000,005,040,003,047,020,010,000
109 0405 84 FCB 000,000,000,070,071,030,052,000
110 0413 04 FCB 030,000,001,000,000,000,007,020
111 0421 24 FCB 020,041,070,000,005,030,000,010
112 0429 44 FCB 000,020,047,020,010,030,000,000
113 0437 64 FCB 042,010,040,070,000,005,040,000
114 0445 84 FCB 000,007,010,020,040,000,044,053
115 0453 04 FCB 001,047,072,060,000,034,007,050
116 0461 24 FCB 040,042,070,005,061,000,040,030
117 0469 44 FCB 070,073,020,003,070,040,010,000
118 0477 64 FCB 043,020,070,000,000,017,010,010
119 0485 84 FCB 040,020,070,000,030,070,000,041
120 0493 04 FCB 000,007,041,010,003,030,020,000
121 0501 24 FCB 010,000,003,070,040,040,005,017
122 0509 44 FCB 060,020,014,047,015,000,002,030
123 0517 64 FCB 007,004,040,001,040,030,000,007
124 0525 84 FCB 010,000,043,074,000,061,000,007
125 0533 04 FCB 070,041,070,002,010,040,073,000
126 0541 24 FCB 021,007,044,000,070,001,030,000
127 0549 44 FCB 004,000,005,001,010,002,007,003
128 0557 64 FCB 071,070,075,071,074,072,077,073
129 0565 84 FCB 064,040,065,041,060,042,067,041
130 0573 04 FCB 034,050,050,041,050,051,057,053
131 0581 24 FCB 044,040,045,041,046,042,047,043
132 0589 44 FCB 034,050,035,031,034,033,037,033
133 0597 64 FCB 024,020,025,021,024,022,027,023
134 0605 84 FCB 014,010,015,011,016,012,017,013
135 0613 04 INVTAB FCB
136 0621 24 FCB
137 0629 44 FCB
138 0637 64 FCB
139 0645 84 FCB
140 0653 04 FCB
141 0661 24 FCB
142 0669 44 FCB
143 0677 64 FCB
144 0685 84 FCB
145 0693 04 FCB
146 0701 24 FCB
147 0709 44 FCB
148 0717 64 FCB
149 0725 84 FCB
150 0733 04 FCB
151 0741 24 FCB
152 0749 44 FCB
153 0757 64 FCB
154 0765 84 FCB
155 0773 04 FCB
156 0781 24 FCB
157 0789 44 FCB
158 0797 64 FCB
159 0805 84 FCB
160 0813 04 FCB
161 0821 24 FCB
162 0829 44 FCB
163 0837 64 FCB
164 0845 84 FCB
165 0853 04 FCB
166 0861 24 FCB
167 0869 44 FCB
168 0877 64 FCB
169 0885 84 FCB
170 0893 04 FCB
171 0901 24 FCB
172 0909 44 FCB
173 0917 64 FCB
174 0925 84 FCB
175 0933 04 FCB
176 0941 24 FCB
177 0949 44 FCB
178 0957 64 FCB
179 0965 84 FCB
180 0973 04 FCB
181 0981 24 FCB
182 0989 44 FCB
183 0997 64 FCB
184 1005 84 FCB
185 1013 04 FCB
186 1021 24 FCB
187 1029 44 FCB
188 1037 64 FCB
189 1045 84 FCB
190 1053 04 FCB
191 1061 24 FCB
192 1069 44 FCB
193 1077 64 FCB
194 1085 84 FCB
195 1093 04 FCB
196 1101 24 FCB
197 1109 44 FCB
198 1117 64 FCB
199 1125 84 FCB
200 1133 04 FCB

```

```

151 8013  BENCH EQU 8AD55
152 8014  PCRLF EQU 8AD24
153 8015  PUTCW EQU 8AD18
154 *****
155 * MAIN ROUTINE: *
156 * *
157 * *
158 * FUNCTION: Prompts user for DES parameters and *
159 * * invokes ITER to do the encryption or *
160 * * decryption. The DES parameters *
161 * * consist of: *
162 * * (1) MODE (00=encrypt,01=decrypt) *
163 * * (2) KEY (8 new bytes) *
164 * * (3) INPUT DATA (8 new bytes) *
165 * *
166 * *
167 * *
168 * *
169 * *
170 * *
171 *****
172 0310 00 00 24  RSHN JSH PCRLF
173 0311 CE 00 06  LSH RNDM80
174 0312 00 10 7E  JSH PDATA1
175 0322 00 10 24  JSH PCRLF
176 0325 00 10 55  JSH BYTE
177 0326 07 0A  STA B
178 0328 00 10 24  JSH PCRLF
179 0329 CE 10 2E  LSH RNDM80
180 0330 00 10 7E  JSH PDATA1
181 0331 00 10 24  JSH PCRLF
182 0332 CE 00 1A  LSH B
183 0333 CE 00 0F  LSH INCT
184 0334 37  PSH B
185 0335 00 10 35  JSH BYTE
186 0336 A7 10  STA A,0,X
187 0341 08  INC
188 0342 33  PUL B
189 0343 34  DEC B
190 0344 2E 75  NOT INCT
191 0345 00 10 24  JSH PCRLF
192 0346 CE 10 42  LSH RNDM80
193 0347 00 10 7E  JSH PDATA1
194 0348 00 10 24  JSH PCRLF
195 0352 CE 00 06  LSH B
196 0353 CE 00 04  LSH RNDM80
197 0357 37  IAPL PSH B
198 0358 10 00 55  JSH BYTE
199 0359 07 00  STA A,0,I
200 0359 08  INX
201 035F 33  PUL B
202 035F 34  DEC B
203 0360 2E 75  NOT INPLH
204 0361 00 10 24  JSH PCRLF
205 0365 00 10 83  JSH INCR
206 0366 CE 00 08  LSH B
207 036A 00 10 06  JSH RNDM80
208 0370 5A  PSH B
209 0371 2E 7A  DEC B
210 0372 2E 60  JSH PDATA1
211 0373 2E 60  JSH RNDM80
212 *****
213 * SUBROUTINE SHIF1: *
214 * *
215 * *
216 * *
217 * *
218 * *
219 * *
220 * *
221 * *
222 * *
223 * *
224 *****
225 0374 36  SHIF1 PSH A Save accumulators A and B.
226 0377 37  PSH B
227 0378 36  PSH A Clear out right side of low
228 0379 A6 03  LSH A 3,X of C or B.
229 037A 84 00  AND A 06FO
230 037B 07 03  STA A 3,I
231 037F 12  PUL A
232 0380 84 01  CMP A 0601 Encrypt or decrypt
233 0382 77 15  BSH RSHIF1 decrypt -- right rotate.
234 0384 08 03  LSH A 3,X encrypt -- left rotate.
235 0386 A6 03  PUL A
236 0388 07 02  ROL 3,X
237 038A 07 01  ROL 4,X
238 038C 09 00  ROL 0,X
239 038E 09 0F  AND A 060F Force carry into bit 4 of I
240 0390 84 00  AND A 06FO byte and reset bits 3 - B.
241 0392 07 03  STA A 3,I
242 0394 5A  DEC B
243 0395 2E 60  BSH LSHIF1 Yes -- do it again.
244 0397 20 17  BSH BSH OUTSHF Exit.
245 0399 07 00  BSHIF1 LSH 0,X decrypt -- right rotate.
246 039B 08 01  RSH 1,X
247 039D 06 02  RSH 2,X
248 039F 06 03  RSH 3,X
249 03A1 A6 03  LSH A 3,X
250 03A3 49  AND A 1900 Force plaintext bit 4 of last byte
251 03A4 48  AND A 1900 to position 1 as it can be placed
252 03A5 48  AND A 1900 in bit 4 of the first byte which
253 03A6 48  AND A 1900 has been cleared by the LSH 0,X.
254 03A7 84 00  AND A 1900 Set this bit.
255 03A9 A6 00  OR A 0,X OR it into byte 1.
256 03AB 07 00  STA A 0,I Reserve byte 1.
257 03AD 5A  DEC B
258 03AE 2E 60  BSH BSH RSHIF1 Yes -- do it again.
259 03B0 33  PSH B Restore accumulators A and B.
260 03B1 27  PUL A
261 03B2 37  PSH B
262 *****
263 * SUBROUTINE ITER: *
264 * *
265 * *
266 * *
267 * *
268 * *
269 * *
270 * *
271 * *
272 * *
273 *****
274 03B3 CE 00 0F  ITER LSH SPARM Initialize parameter pointer to
275 03B4 0F 65  STLOC first group of parameters.
276 03B5 CE 1F 7E  LSH 0327E Initialize shift schedule register.
277 03B6 0F 77  STA SHUN
278 03B8 00 00 6F  JSH PCWU Perform initial permutation.
279 03C0 00 04 6F  JSH PERM Perform permuted choice 1a.
280 03C1 00 04 6F  JSH PERM Perform permuted choice 1b.
281 03C2 01 10  LSH A 004 Initialize iteration counter.
282 03C3 01 24  PSH A Save current iteration counter.
283 03C4 00 00 C1  LSH 03C4H Force parameter pointer to start
284 03C5 0F 65  STLOC of parameters used in iterations.
285 03C6 0F 76  LSH A 030H Set encrypt, decrypt mode.
286 03D0 24 18  AND DECE If 1 then decrypt mode.
287 03D2 78 00 90  AND SHUN+1 Rotate wheel shift schedule bit into
288 03D3 7F 00 97  LSH B 001 carry then add the carry to 1,
289 03D4 01 01  LSH B 001 giving the number of shifts.
290 03D6 C1 00  AND B 0100
291 03D7 CE 00 8E  LSH 0C Prepare to shift C to the left.
292 03D8 00 01 7A  JSH SHIF1 Shift C left.
293 03D9 CE 00 92  LSH 0B Prepare to shift D to the left.
294 03DA 00 01 7A  JSH SHIF1 Shift D left.
295 03DB 00 04 6F  JSH PERM Perform permuted choice 2.
296 03DC 20 1A  AND 0000H Continue.
297 03DE 00 04 6F  JSH PERM Perform permuted choice 3 first.
298 03DF 78 00 90  LSH A 001H Set encrypt, decrypt code.
299 03E1 78 00 17  AND 13F1 78 00 17 Rotate wheel shift schedule bit into
300 03E2 78 00 49  AND 03F4 78 00 49 carry 1 from carry for decryption.
301 03E3 78 00 17  AND 13F1 78 00 17 Now add the carry to 1 giving the
302 03E4 78 00 01  AND 03F4 78 00 01 number of shifts.
303 03E5 78 00 8E  LSH 0C Prepare to shift C to the right.
304 03E6 00 03 7A  JSH SHIF1 Shift C to the right.
305 03E7 CE 00 92  LSH 0D Prepare to shift D to the right.
306 03E8 00 01 7A  JSH SHIF1 Shift D to the right.
307 0407 80 44  JSH PERM Perform E permutation on R.
308 0409 CE 01 7A  LSH 0E Prepare to XOR subkey K with
309 040C 0A 08  AND 040C result of E permutation, result in K.
310 040E 36  PSH A
311 040F A6 00  AND 040F A6 00
312 0411 A9 0C  AND 0411 A9 0C
313 0413 87 00  STA 0,I
314 0415 08  INX
315 0416 32  PUL A
316 0417 08  DEC I
317 0418 02 04 81  AND I NSTA
318 0419 02 04 81  AND I NSTA
319 041D 00 30  JSH PCWU Perform F permutation giving FIR,K1.
320 041F CE 00 72  LSH 0L Prepare to swap and XOR L and R.
321 0420 84 04  LSH A 004 Four bytes is each.
322 0424 34  PSH A
323 0425 A6 00  AND 0425 A6 00
324 0427 A8 14  AND 0427 A8 14
325 0429 E6 04  LSH A 4,I
326 042B 82 04  STA A 4,I Put new L where R was.
327 042D E7 00  STA B 0,I Put R where L was.
328 042F 08  INX
329 0430 32  PUL A
330 0431 44  DEC A
331 0432 2E 7F  NOT NSTA
332 0434 32  PUL A
333 0435 44  DEC A
334 0436 2E 70  NOT ITER1
335 0438 CE 00 72  LSH 0L Prepare to perform final swap.
336 0439 84 04  LSH A 004
337 043B 36  PSH A
338 043E A6 00  AND 043E A6 00
339 0440 E6 04  LSH A 4,I
340 0442 E7 00  STA B 0,I
341 0444 A7 00  STA A 4,X Put L in L.
342 0446 08  INX
343 0447 32  PUL A
344 0448 1A  DEC A
345 0449 0A 72  AND 0449 0A 72
346 044B 00 04 6F  JSH PERM Perform inverse initial permutation
347 044E 37  INX finished.
348 *****
349 * SUBROUTINE PDATA: *
350 * *
351 * *
352 * *
353 * *
354 * *
355 * *
356 * *
357 * *
358 * *
359 * *
360 * *
361 * *
362 * *
363 * *
364 * *
365 * *
366 * *
367 * *
368 * *
369 * *
370 * *
371 * *
372 * *
373 *****
374 044F 04 48  PSH B
375 0451 CE 00 47  STA 0,I
376 0453 0F 67  STA SPARM
377 0454 0E 65  PSH B
378 0456 0E 65  STA P
379 0458 0E 00  LSH B 0,I
380 045A 00 00  INX
381 045B 0F 45  AND 045B 0F 45
382 045D 0E 67  AND 045D 0E 67
383 045F 0E 00  AND 045F 0E 00
384 0461 0E 67  AND 0461 0E 67
385 0463 0F 47  AND 0463 0F 47
386 0465 44  AND 0465 44
387 0467 2E 6F  AND 0467 2E 6F
388 0469 0E 65  AND 0469 0E 65
389 046B 0E 67  AND 046B 0E 67
390 046D 0F 47  AND 046D 0F 47
391 046F 7F 00 70  AND 046F 7F 00 70
392 0470 0E 65  AND 0470 0E 65
393 0472 17  AND 0472 17

```

174	0472 00 78	AND A 00F0	Extract mask for source byte.
175	0475 44	LSR A	Right justify mask number.
176	0474 44	LSR A	
177	0477 44	LSR A	
178	0478 44	LSR A	
179	0479 0E 4F	LDX AINPUT	Get input address from parameters.
180	0479 C4 0F	AND B 040F	Extract source byte number.
181	0475 03 00 14	JBR 00000	
182	0480 E6 00	LDA B 0,X	Get source byte.
183	0482 03 00 71	CLR THASH	Prepare mask area.
184	0480 39	SEC	Not carry to be rotated into mask.
185	0484 76 00 71	BLOP 000	Location of mask bit is 16 1.
186	0489 44	DEC I	
187	048A 2E FA	DDT BLOP	Continue shifting mask bit in.
188	048C 04 71	AND B THASH	Use mask to get bit from source byte.
189	048E CF FF	AND B 0FFF	Any one bit will be forced into the carry.
190	0490 79 00 79	ROL R0	Move the carry into R0.
191	0493 0E 4B	INX TABADR	Move pointer to next table entry.
192	0495 00	INX	
193	0496 0F 00	STX TABADR	
194	0497 7A 00 4F	SEC RO	Increment bit counter.
195	0497 2E 33	DDT SHFIN	Continue until finished with current byte.
196	0499 0A 70	LDA B 00	Get completed work byte.
197	049F 0E 4B	LDX 0490D	Get result address.
198	04A1 E7 00	STA B 0,X	Store work byte.
199	04A1 0B	INX	Point to next result byte.
200	04A1 0F 4B	STX 04 00	
201	04A1 7F 00 79	CLR R0	Clear out work byte for next iteration.
202	04A7 0E 4B	LDX TABADR	Get current table location.
203	04A3 7A 00 4B	SEC R0RO	Increment byte counter.
204	04A6 2E 0F	DDT PI00P	Continue till finished.
205	04B0 39	RTS	Return to caller.
207		*****	
208		> SUBROUTINE PERMS:	
209		>	
210		> FUNCTIONS: Performs B mapping from E to X1	
211		> using S tables which are computed	
212		> so that odd bytes elements are in	
213		> the odd byte.	
214		>	
215		> INTERNAL ROUTINES:	
216		> FLEX: 00000	
217		>	
218		*****	
219	0481 C4 00	PERMS L0A B 00B	Initialize select B iteration counter.
220	0483 37	PERMS PAX P	
221	0484 3E FF	LDX XABR	Get current address of X.
222	0486 16 00	LDA B 0,X	Get a byte of X.
223	0488 17	TBA	Put a copy in k.
224	0489 C4 1E	AND B 001E	Mask bits 4 - 7 to get column no.
225	0488 54	LSR B	Right justify column number.
226	048C 37 70	STA B 0B	Save column number for use.
227	048E 54	AND B 0021	Integer divide col. no. by 2.
228	048F 04 21	AND A 000F	Get row number.
229	04C1 00 0F	AND A 00FF	Force bit 1 next to bit 7.
230	04C3 04 F0	AND A 01F0	Clear right part of byte.
231	04C5 04	LSR A	Integer divide row number by 2.
232	04C6 0E 0B	LDI XABR	Get base/initial address of current B table.
233	04C8 19	XBA	Per a byte number within table.
234	04C9 14	TAB	
235	04CA 00 00 3A	JBR 00000	
236	04C2 C4 00	LDA B 0,X	Get table entry.
237	04C2 7A 00 70	ORR RB	Restore original col. no. to see if the
238	04C3 24 07	SEC RETL	edge is on the left or right side.
239	04C4 7F 00 71	CLR TABADR	Clear flag byte.
240	04C7 C4 0F	AND B 040F	Get the right value from the table entry.
241	04C9 20 04	ORA P00P	Do see which side to put it in.
242	04B8 C4 F0	AND B 01F0	Get the left value from the table entry.
243	04B8 06 01	LDA A 001	Get left side flag.
244	04B8 97 71	STA A TABADR	Save it.
245	04E1 32	PUL A	Get copy of iteration counter.
246	04E2 34	POP A	Restore it to stack.
247	04E3 44	ROL A	Rotate rightmost bit into carry.
248	04E4 24 13	SEC STL	If 0 then even numbered iteration.
249	04E4 7A 71	LDA A THASH	Get number - if the entry is already
250	04E8 27 04	DDT XNWR	in the right side then no shift needed.
251	04E4 54	LSR B	
252	04E5 54	LSR B	
253	04E6 54	LSR B	
254	04E7 54	LSR B	
255	04E8 54	LSR B	
256	04E9 0E 0B	DDT XNWR	Get current byte address.
257	04F0 CA 00	ORA B 0,X	Place right side of byte in.
258	04F2 E7 00	STA B 0,X	
259	04F4 00	INX	Since the byte is now completed,
260	04F5 0F 00	STI 01ABP	increase the result byte pointer.
261	04F7 20 0C	ORA STD	
262	04F9 04 71	STL LDA A THASH	Get flag.
263	04F8 24 04	AND XNWR	If flag is 0 then need to left
264	04F9 50	AND B	justify th table entry to fit
265	04FE 50	AND B	the output.
266	04FF 50	AND B	
267	0500 50	AND B	
268	0501 0E 0B	DDT XNWR	Get current result byte address.
269	0503 E7 00	STA B 0,X	Left side - just store it.
270	0505 0E 0B	STI 01ABP	Increment source data addr pointer.
271	0507 00	INX	
272	0508 0F 00	STX XABR	
273	050A 0E 0B	LDX XABR	Increment table pointer to next table.
274	050C C4 20	LDA B 032	
275	050E 00 A3 24	JBR 00000	
276	0511 0F 03	STI 0ABR	
277	0513 33	PUL B	Get iteration counter.
278	0514 54	DEC B	
279	0515 2E 0C	DDT PERMS	Keep going.
280	0517 0E 00 7A	LDI 00	
281	0518 0F 00 71	STI XABR	Reset source data pointer.
282	051C 0E 00 02	LDI 001	
283	051F 0F 00 71	STI TABADR	Reset result data pointer.
284	0521 0E 01 0F	LDI 00	
285	0524 0F 00 71	STI XABR	Reset table pointer.
286	0526 39	RTS	
287	0528 39	END	

NO EXHIBITS DETECTED

SYMBOL TABLE

ADDER	AD36	AINPUT	006F	APARE	0067	ARESD	0068	BAUER	E147
BITE	E033	C	008E	B	0072	DICR	032D	E	0184
ERT	0003	BETCHR	A015	BETFIL	A020	GITL	0409	DOMH	0407
IMKEE	E1AC	IMKEY	033B	IMPLA	0357	IMPMS	0C42	IMPUV	0066
INTAB	00E1	INTAB	0209	ITER	0303	ITEI1	03CB	E	007A
KI	0082	KIADR	0078	KADR	0079	KET	00FF	KETMS	082E
KPAR8	00C1	L	0472	LSHIFT	030A	MAM	0311	MOMSG	0004
MYI1	040C	MYI2	0424	MYI3	006F	MYI4	0C4B	MYI5	0067
MYIPL	0501	MYIPL	04EE	MYIPL	040F	MYIPL	0C4A	MYIPL	0009
MYIPL	0101	OUTS	03CC	OUTSNF	0300	P	0100	P1	0456
PARE	00AF	PCH'A	0121	PCH'1	0138	PDG	0109	PDLF	0224
PATAI	037E	PERM	044F	PERM	0401	PCH001	0433	PLOP	044F
PERM	04E1	PTERR	031E	PTRCHR	0310	FX	0240	E	007E
PERM	0479	PTERR	033F	RSRIFT	0309	B	0109	SAMB	0090
SHR	0094	SETEXT	0333	SH'1H	0470	SH'1T	037A	SLOP	0406
SMBR	0097	SHL	04FF	SHLD	0045	SHD	0201	SHI	0431
TABADR	4419	TABADR	0071	VH	00C2	0000	AD01		

=====
ENTER 4 09 FOR ENCRYPT, 01 FOR DECRYPT!
00
INPUT KEY (8 BYTES)
01010101010101010101010101010101
ENTER DATA TO BE ENCODED (8 BYTES)
00 00 00 00 00 00 00 00 00
=====
ENTER 4 00 FOR ENCRYPT, 01 FOR DECRYPT
01
INPUT KEY (8 BYTES)
01010101010101010101010101010101
ENTER DATA TO BE ENCODED (8 BYTES)
00000000000000000000000000000000
01 00 00 00 00 00 01 39 00
====

Letters—New Products—Etc.

Alford and Associates

P.O. Box 6712 Richmond, Virginia 23238

Phone 804 370 3906

28 December 1979

NEW PRODUCT ANNOUNCEMENT FOR THE SCREEN / SS-50 USE

Alford and Associates is pleased to announce the availability of their new SREDITOR Screen Editing System for operation with Sigma Signal Broadcasting SOB version 5.1X.

The SREDITOR provides the most flexible and convenient combination of capabilities available in any editing utility today. Dual mode operation is provided, allowing the editing of SOURCE files whose lines must be exactly defined as well as TEXT-typed material, where the need to constantly watch for margin overrun makes line-editors clumsy. In 'TEXT-MODE', pre-words are AUTOMATICALLY SHIFTS to the next line, making margin-watch unnecessary. In 'SOURCE-MODE', the SREDITOR sets a fixed right margin.

The SREDITOR provides FOURTEEN major edit commands, giving it all the power of the best of line-editors. In addition, in the screen editing mode, TWENTY-TWO screen operators (cursor operations, insertions, deletions, movements, case-changes, etc...) provide a level of control over the edit process that is not matched by any other system in the industry to our knowledge. With editing being done ON-SCREEN, the operator controls the edit process, eliminating costly errors common to line-editors.

The SREDITOR is designed to operate with either 16 x 64 or the now available 24 x 80 character memory-mapped displays for the SS-50 bus. Necessary modifications to support a particular memory-mapped display board are minimal, if any.

The manual provided with the software provides a tutorial section to familiarize the operator with the unique features of the SREDITOR. Complete information to allow the user to modify the package for individual tastes and system considerations is provided. Keyword definition, system I/O, etc..., are user alterable to meet special requirements.

When compared to other screen-editing software available to the users of microcomputers, the SREDITOR, priced at \$99.95, is one of the best buys available to the 168000 user today. The SREDITOR may be ordered by phone or mail, and payment may be made by VISA, MASTERCARD or by personal check. Check payments will delay the normal three-day shipment by about two weeks on the average. Dealer and OEM inquiries are invited.

A version for the 6400 will be available in the first quarter of 1980.

11/26/79

Mr. Don Williams
 '68' Micro Journal
 3018 Hamill Road
 Hixson, TN 37343

Dear Mr. Williams:
 You did not print the truth table of AND, NAND, OR, NOR, Ex. OR
 in the article, "Logic Gate Tester", in Nov./Dec. 1979 issue
 on page 33.

Enclosed please find the truth table for your correction.

Sincerely,

S. J. Young
 S. J. Young
 E. 36 Salmon Street
 Spokane, WA 99218

Test Pattern	AND	NAND	OR	NOR	Ex. OR
0 0	0	1	0	1	0
0 1	0	1	1	0	1
1 0	0	1	1	0	1
1 1	1	0	1	0	0
Hex. Value	1	E	7	8	6
Displayed Character	A	n	O	Q	E

Test Pattern	Buffer	Inverter	Hex. Value	Displayed Character
0	0	1	5	U
1	1	0	A	I
0 0	0	1		
0 1	0	0		
1 0	1	1		
1 1	1	0		

Clock	D-Input	U-Type Flip-Flop		J-K Flip-Flop J=K=1	
		Q	Q̄	Q	Q̄
0	0	1	0	0	1
1	0	0	1	0	1
0	1	0	1	1	0
1	1	1	0	1	0
Hex. Value		9	6	3	C
Displayed Character		Γ	E	F	F

November 27, 1979

'68 Micro Journal
 3018 Hamill Road
 Hixson, Tennessee 37343

Dear Mr. Williams:

While loading and debugging the Christmas File Program submitted by Mr. Paul Phelps in the Nov/Dec issue of '68 Micro Journal, I discovered a small error in the listing. On line 2200; FOR I = 1 to Y + 1 should be FOR I = 1 to Y. After I made this correction the program ran perfectly.

I would also like to take this opportunity to plug what I think is one of the best Floppy Disk Systems available for 5550 buss computers, and this, of course, is Percom's LFD-400 Floppy Disk System. It comes from Percom with "Windows-Plus X" Percom's named file DOS in ROM.

Sincerely,

D. B. Taylor
 D. B. Taylor
 Route # 4 - Box 196
 Seneca, S.C.

DBT/PC

6800/6809 SOFTWARE

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Tracer: A 6800 Debugging Program is for the programmer looking for good debugging software. Tracer features single step execution using dynamic break points, register examination and modification, and memory examination and modification. This book includes detailed Tracer program notes and a reprint of "Jack and the Machine Debug" (from the December 1977 issue of BYTE magazine).
ISBN 0-931718-02-3 Pages: 24 Price: \$6
Authors: Robert D. Grappel & Jack E. Hemenway

MONDEB: An Advanced M6800 Monitor-Debugger has all the general features of Motorola's MIKBUG monitor as well as numerous other capabilities. Some of the command capabilities of MONDEB include displaying and setting the contents of registers, setting interrupts for debugging, testing a programmable memory range for bad memory locations, changing the display and input base of numbers, displaying the contents of memory, searching for a specified string, copying a range of bytes from one location in memory to another, and defining the location to which control will transfer upon receipt of an interrupt.
ISBN 0-931718-06-6 Author: Don Peters Pages: 88 Price: \$5

RA6800ML: An M6800 Relocatable Macro Assembler is a two pass assembler for the Motorola 6800 microprocessor. The Assembler can produce a program listing, a sorted Symbol Table listing and relocatable object code. The object code is loaded and linked with other assembled modules using the Linking Loader LINK68. There is a complete description of the 6800 Assembly language and its components. Each major routine of the Assembler is described in detail, complete with flow charts and a cross reference showing all calling and called-by routines, pointers, flags, and temporary variables. In addition, details on interfacing and using the Assembler and error messages generated by the Assembler are included. This book provides the necessary background for coding programs in the 6800 assembly language, and for understanding innermost operations of the Assembler.
ISBN 0-931718-10-4
Author: Jack E. Hemenway
Pages: 184 Price: \$25

LINK68: An M6800 Linking Loader is a one pass linking loader which allows separately translated relocatable object modules to be loaded and linked together to form a single executable load module, and to relocate modules in memory. It produces a load map and a load module in Motorola MIKBUG loader format. This book provides everything necessary for the user to easily learn about the system, including a detailed description of the major routines of the Linking Loader, including flow charts. While implementing the system, the user has an opportunity to learn about the nature of linking loader design as well as simply acquiring a useful software tool.
ISBN 0-931718-09-0
Authors: Robert D. Grappel & Jack E. Hemenway
Pages: 72 Price: \$8

Tiny Assembler 6800, Version 3.1 is a small (4 K) but sophisticated and useful assembler for a large subset of the Motorola 6800 assembly language. The book includes detailed notes on the design and implementation of Version 3.0 of the assembler, a complete description of the enhancements upgrading the Tiny Assembler to Version 3.1, an updated user's guide, and complete listings for both versions, making this book the most complete documentation possible for Jack Emmerich's Tiny Assembler.
ISBN 0-931718-08-2 Pages: 80 Price: \$9
Author: Jack Emmerichs

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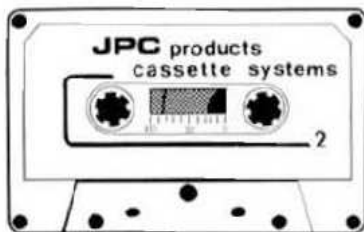
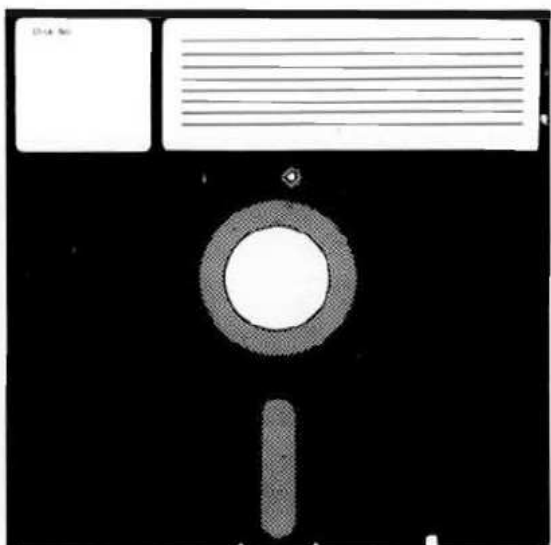
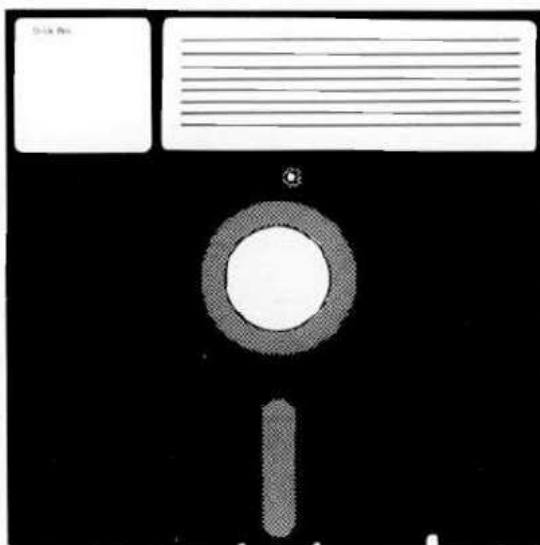
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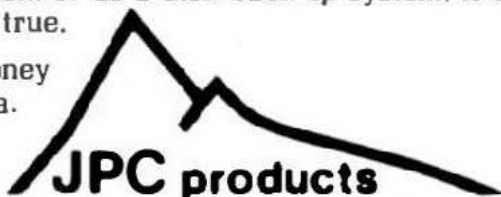
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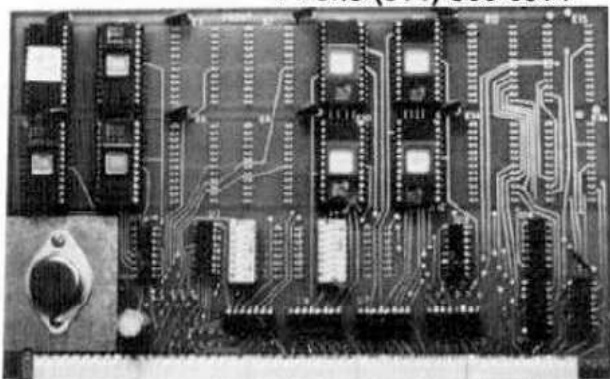


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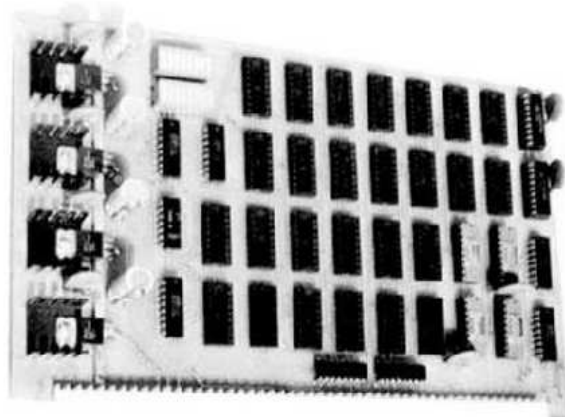


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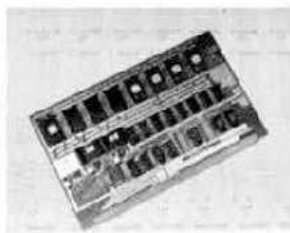


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See Gimix Ad on page 3



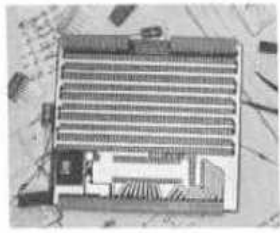
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PSB-08 PROM SYSTEM BOARD



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DM-85 DISK MIXER is an add-on board for the Smoke Signal Broadcasting BFD-68A Disk Controller which allows operation of both 8" and 5" drives. Controller mode (8" or 5") is selected on a drive-by-drive basis, so any mix of 5" and 8" drives is allowable. The 2" x 3" PC board mounts inconspicuously on the back of the BFD-68A. Its operation is completely transparent to software. An oscilloscope is required for the setup procedure. Kit Price: \$39.95

B-08 2708 EPROM PROGRAMMER is a compact unit that fits in the 6800's I/O slot. A safety switch and LED indicator provide control over the high programming voltage generated on board. An industrial quality Textool socket and extended board height allow effortless PROM insertion and retrieval. Fully commented source listings of U2708 is included in the Owner's Manual. \$99.95

M6809 EMULATOR is a machine language program that will emulate all of the functions of the Motorola 6809 third generation microprocessor. Developed for use on any 6800 system, the program allows software development and debugging. The 3K byte program is complete with a 6809 mini-monitor and single-step trace routines. Fully commented source listing included. Specify Smoke Signal Broadcasting or FLEX™ disk, or KCS cassette. \$49.95

U2708 utility for testing, burning, verifying and copying 2708s in EPROM. \$29.95

PSB-08 PROM SYSTEM BOARD features 1K of high speed, low-power RAM and space for up to 8 2708 EPROMs, both DIP-switch addressable to start on any 8K boundary in memory. The exclusive I/O select feature allows you to move I/O locations up to any unused 1K block in the EPROM memory space. This permits memory expansion to a full 56K of contiguous user RAM. \$119.95

UIO UNIVERSAL I/O BOARD helps you with your custom interfaces. It has space for a 40-pin wire wrap socket into which you may plug any of Motorola's 40 or 24-pin interface chips. All data and control lines are connected to the appropriate edge connector pins. All other bus connections are brought out to a 16-pin socket pad. +5 volt regulator and all Molex connectors are provided; regulated +5 and ground are bused among the locations for up to 35 14-pin ICs. \$24.95

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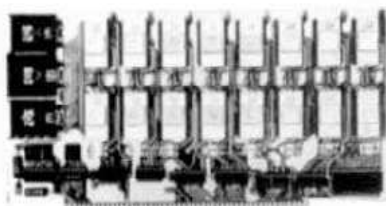
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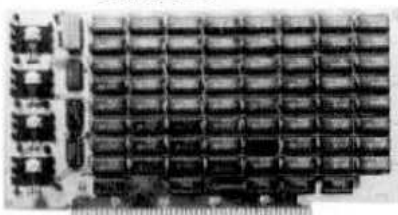
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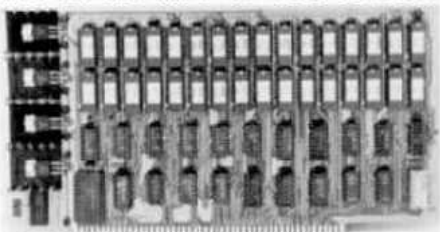
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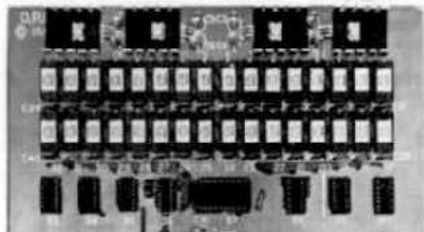
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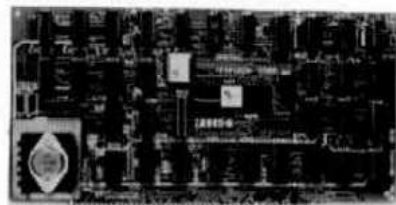
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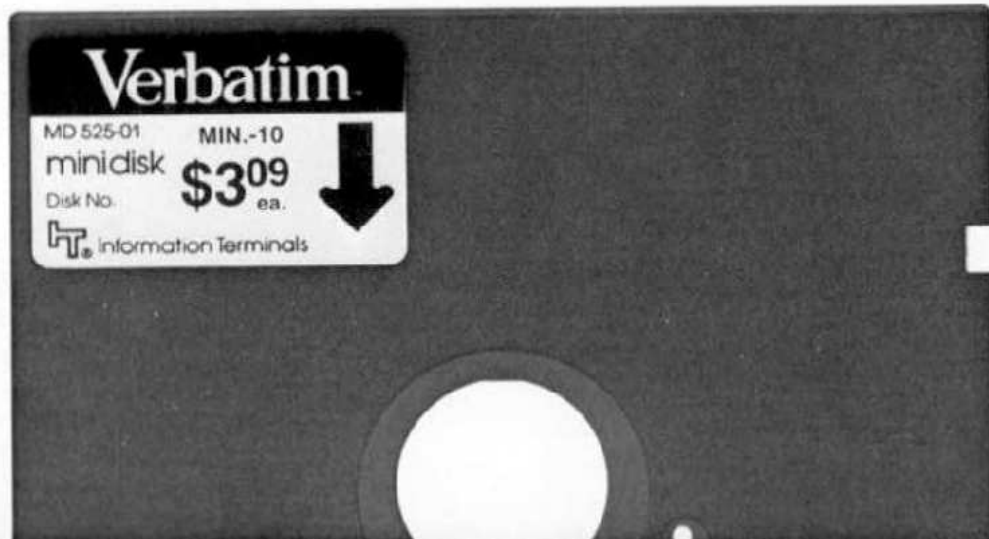
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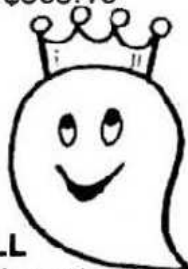
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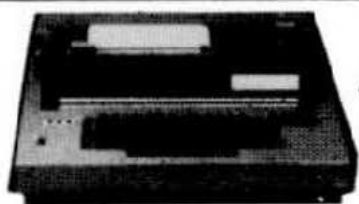
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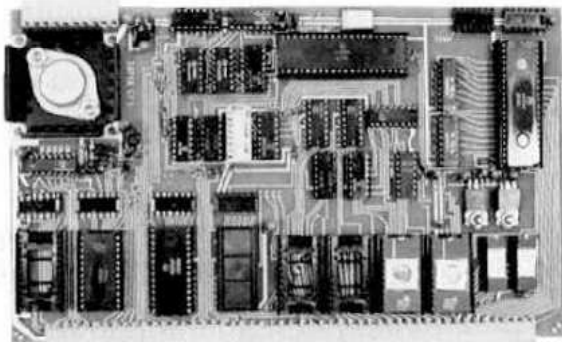
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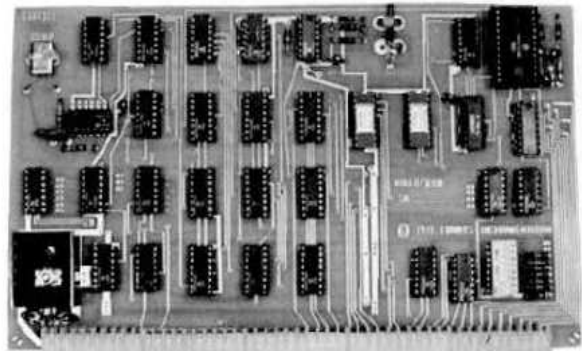
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NOTE: DOS 69 is supported on Smoke Signal Broadcasting's Chieftain systems with Smoke Signal Broadcasting's 6809 CPU board; and on SWTPC systems with Smoke Signal's BFD or LFD disc system and SWTPC 6809 CPU board (I/O moved to \$E000 in accordance with SWTPC instructions). Support for other hardware configurations including consultation on operation with other CPU boards cannot be provided.

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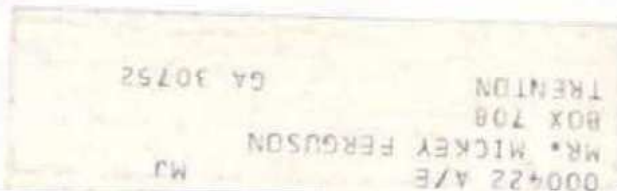
- Direct updating of employee information, hours worked, wages, deduction, etc., means that any inquiry for a selected employee will provide up to the minute status on that employee.
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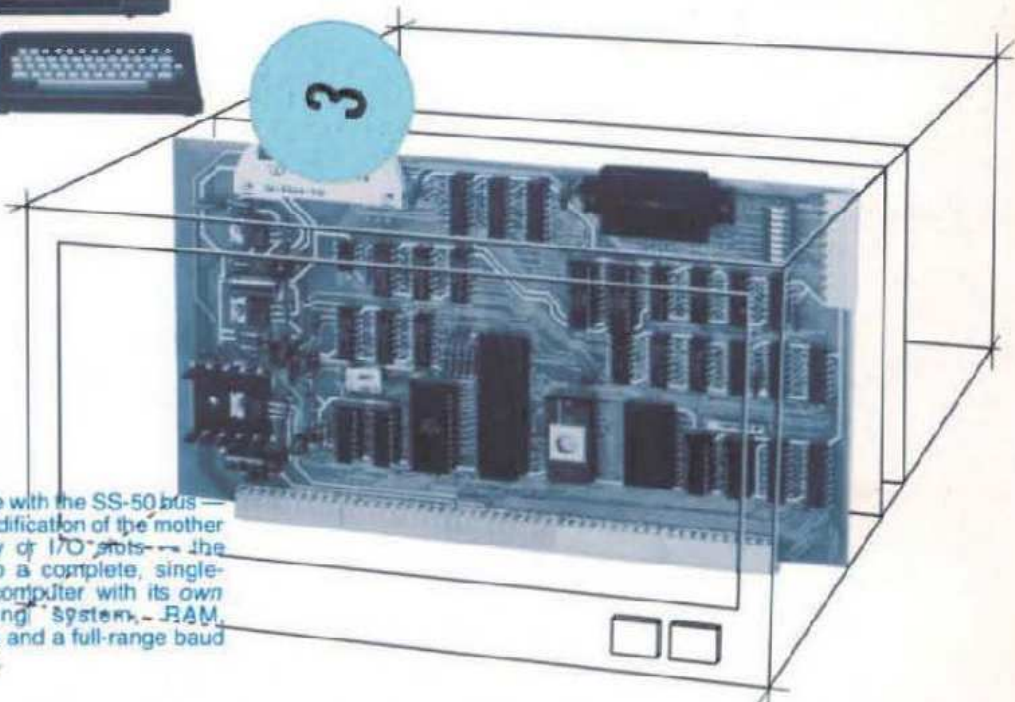
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