NO. 63 AUGUST 1983 U.S. Edition: $2.50 International Edition: $3.00

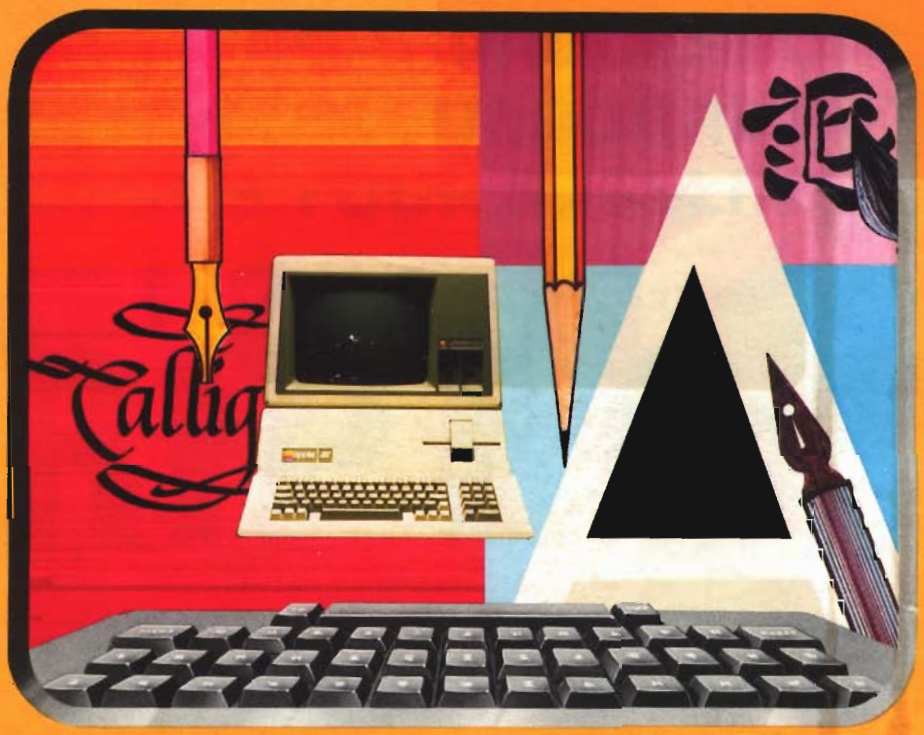
Choose The Right Word Processor See Page 22

MICRO

Advancing Computer Knowledge

Word Processing

- A Word Processing Primer : What to Look for, What to Avoid
- Fourteen Popular Apple Word Processors Reviewed
- Word Processing in Pascal: Add Sophisticated Printout Controls
- Use a Selectric Terminal as a Letter Quality Printer



Compute the Net Present Value of Your Investment

Peripherals Catalog for Commodore, Color Computer, Texas Instruments

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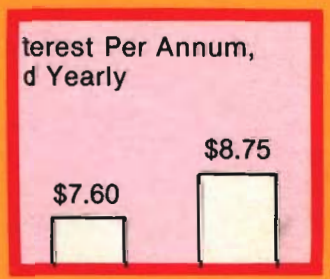

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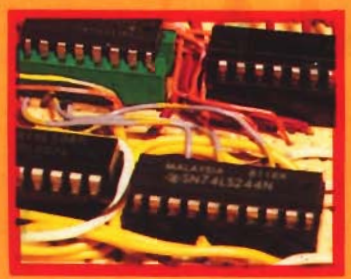

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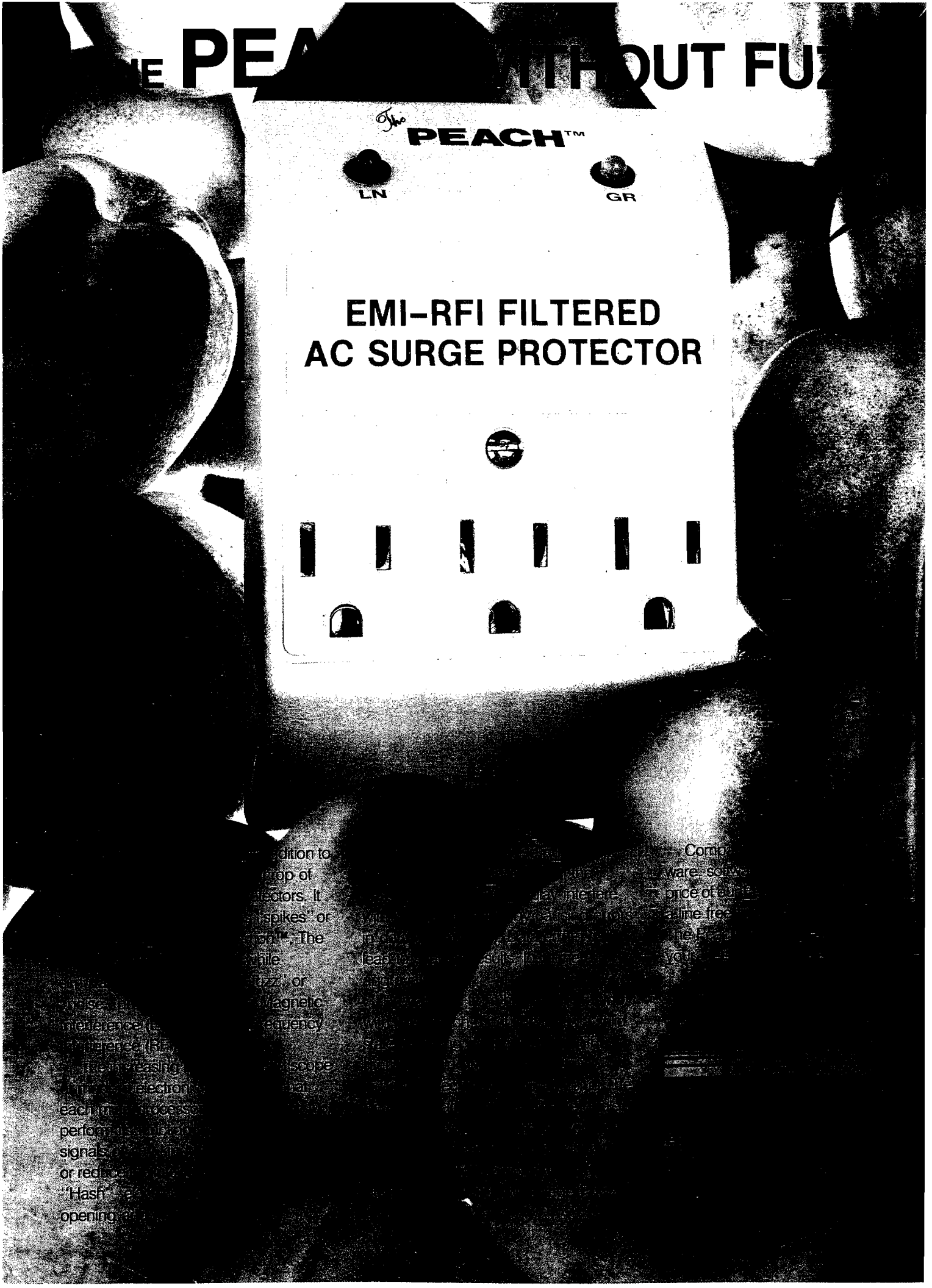
In this month's Learning Center:

Atari Nine-Color Painting Program, Part 2

Color Computer Text Editing Routines

Address Filer for the Apple

0 74470 11690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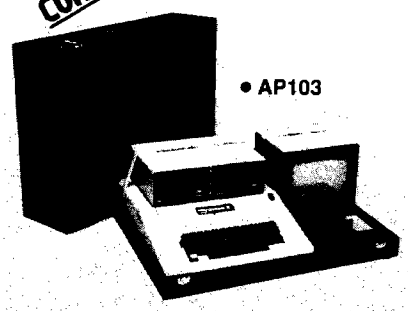

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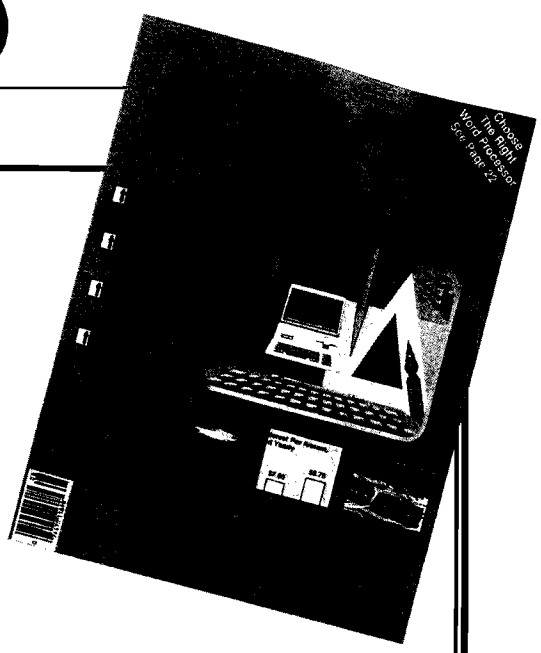
Highlights



ABOUT THE COVER

The colorful graphic on MICRO's cover is an interpretive representation of this month's feature — word processing — as conceived by artist Curt Witt.

The magic wand currently being brandished is the *word processor*, an automated unit that combines hardware and software to create, store, retrieve, and print out text. There are many factors to consider when buying a word processor, first and foremost being your needs. You will also have to make decisions regarding hardware (the computer, a mass storage device, and printer), word-processing software, documentation, equipment compatibility, and available additional features. Cost will be related to the power of your total system.

To help you put together your own magic wand, this month MICRO features word processing. In "A Word Processing Primer" (pg. 22) Phil Daley and Loren Wright provide some guide lines for buying a word-processing system. If you own an Apple, you will want to read "Apple Word Processors" (pg. 26) in which Phil Daley reviews word processors currently available for use with the Apple. Richard and Donna Marmon have written a program that adds the features missing in the Apple Pascal Language System Editor. "Word Processing with Apple Pascal" (pg. 30) shows you how to add full word-processing capabilities to your Pascal Editor. John R. Raines explains why the Dvorak Simplified Keyboard is faster and more efficient for touch typists than the "qwerty" keyboard. See "Dvorak Keyboard for Your Computer" (pg. 38). And finally, "The Selectric Word Processor" by Louis F. Sander (pg. 44) is a conversion program that uses an IBM Selectric terminal to provide low-cost letter-quality printing.

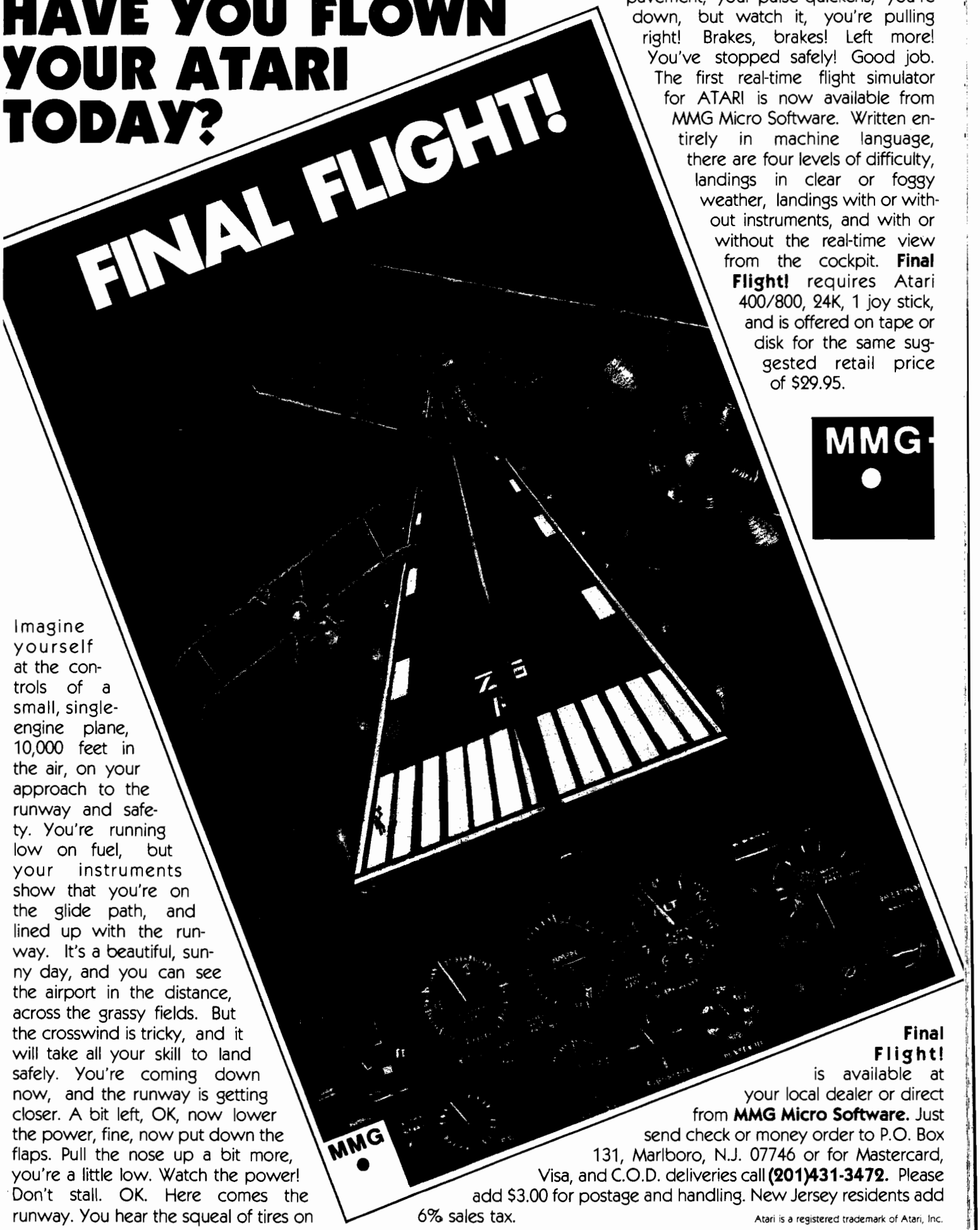
When you have finished with the feature section, turn to John Steiner's monthly "CoCo Bits" column (pg. 115) for information on the Color Computer as a word processor. Also this month, MICRO introduces a new "Apple Slices" (pg. 118) columnist. Jules Gilder is editor of *Microcomputer Software Newsletter* and has been vice president in charge of computer software at Children's Television Workshop. You will find that the content of the column is now featuring news rather than programs and programming techniques, which are already covered in the magazine.

Loren Wright's "PET Vet" column (pg. 12) provides you with information about KMMM Pascal for the C64, Paul Swanson discusses new products for the Atari in "From Here to Atari" (pg. 16), and Ralph Tenny, in "Interface Clinic" (pg. 122), continues his discussion of BASIC programming.

Be sure to visit The Learning Center (pg. 65) where you can study graphics, text editing routines, and an address file manager. It may be summer, but that does not mean school is out at MICRO!

MICRO

HAVE YOU FLOWN YOUR ATARI TODAY?



Imagine yourself at the controls of a small, single-engine plane, 10,000 feet in the air, on your approach to the runway and safety. You're running low on fuel, but your instruments show that you're on the glide path, and lined up with the runway. It's a beautiful, sunny day, and you can see the airport in the distance, across the grassy fields. But the crosswind is tricky, and it will take all your skill to land safely. You're coming down now, and the runway is getting closer. A bit left, OK, now lower the power, fine, now put down the flaps. Pull the nose up a bit more, you're a little low. Watch the power! Don't stall. OK. Here comes the runway. You hear the squeal of tires on pavement, your pulse quickens, you're down, but watch it, you're pulling right! Brakes, brakes! Left more! You've stopped safely! Good job. The first real-time flight simulator for ATARI is now available from MMG Micro Software. Written entirely in machine language, there are four levels of difficulty, landings in clear or foggy weather, landings with or without instruments, and with or without the real-time view from the cockpit. **Final Flight!** requires Atari 400/800, 24K, 1 joy stick, and is offered on tape or disk for the same suggested retail price of $29.95.

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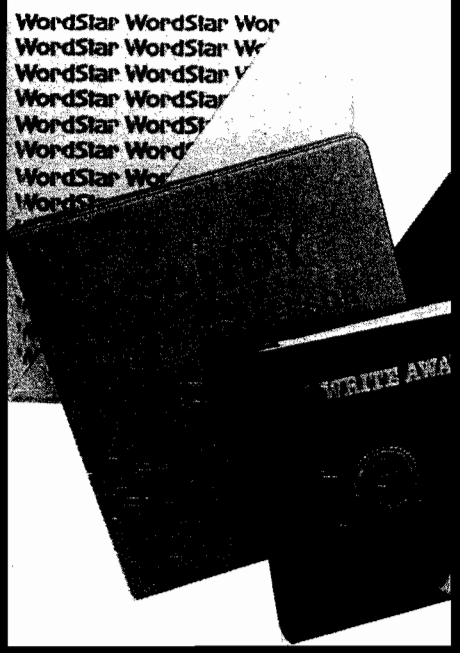

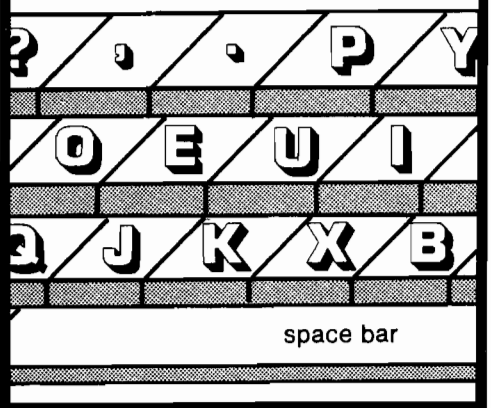

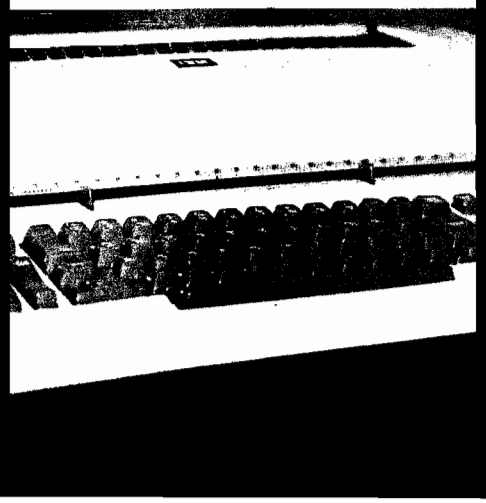

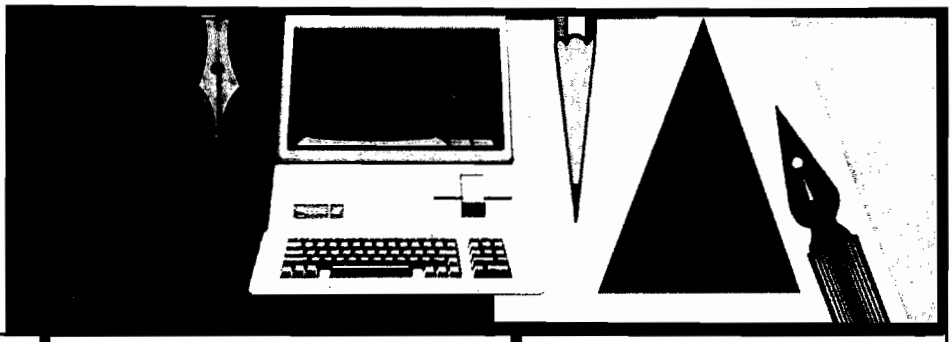

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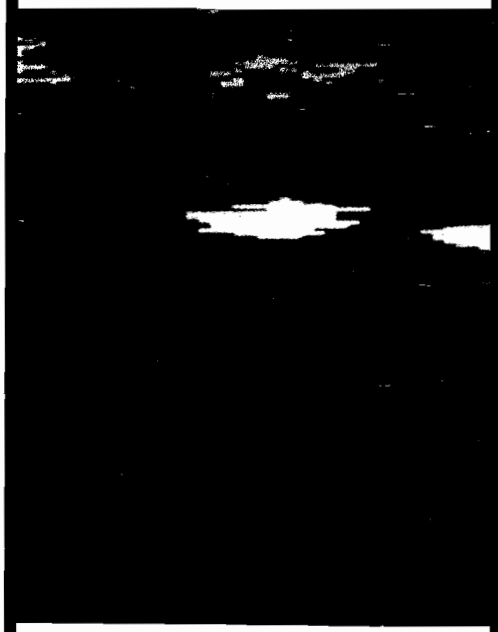

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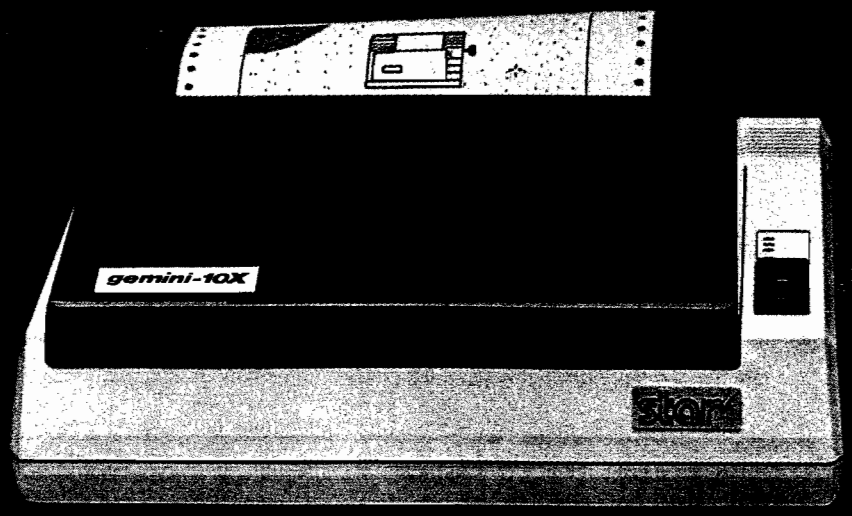

Editorial

OSI Update R.I.P.

In March 1982, we ran an editorial entitled "Hello, OSI?", which was intended to be a service to our readers. We tried to find out what OSI (M/A COM) had planned for its line of OSI microcomputers. Details were sketchy and complete explanations non-existent. Since then a lot has happened to the microcomputer market and to MICRO magazine. Now it is time for us to close our OSI chapter.

You've probably noticed that MICRO is changing; so is our audience. Our editorial space is limited and it is obvious to us that we must devote that space to users of Ataris, Commodores, Apples, Color Computers, and the machines of the future. These systems have lots of support and many owners. The low-cost OSI, as a strong contender in the home microcomputer market, has died.

We called Kendata, recent purchaser of OSI, to find out what they have planned for the microcomputer market. The staff in their Connecticut offices said that at present they are working on a portable, low-end workstation for the 300. But the 300 is aimed at the professional business market, not MICRO's "programmer" audience. According to the Kendata staff, the OSI market is being redefined as the professional business market and they do not intend to compete with Apple, IBM, or Commodore for the "personal" market.

Consequently, we've decided that, after this August issue, MICRO will no longer offer articles on OSI systems. We do realize that a certain percentage of our readers own OSIs, but we hope they will understand our position. MICRO has covered the OSI more thoroughly than any other magazine, for the last six years. But it is time for us to move on. There are still several newsletters covering OSI specifically. For instance, the OSIO Newsletter out of Virginia offers news on OSI, articles, and a program exchange. You may contact William Callaghan at 6605 Fisher Ave., Fall Church, VA 22046 for more information. We suggest that OSI owners use OSIO and other newsletters as their resource.

AIM, SYM, KIM

We've also decided to discontinue coverage of the AIM, SYM, and KIM computers. Over the last several months the number of articles in each issue on these single boards has dwindled to almost nothing. As with OSI, the market for these systems is dying. Not only is our readership limited in this area, but we receive a negligible number of ASK-related articles. These computers essentially began the microcomputer industry and were important in their time; but their time has come and gone. Users of these systems will continue to write for MICRO, but the programs and ideas will be of general interest or converted to other machines.

MICRO on the OSI

Although we have decided to discontinue OSI coverage in MICRO, we have not completely discontinued support. MICRO recently published a volume specifically for OSI users. *MICRO on the OSI*, for $19.95, offers 24 programs/articles to help you enhance your programming capabilities. This book is full of essential material (including an OSI memory map!) for OSI users.

Marjorie Morse
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Updates and Microbes

Many Missing Lines

Our June issue carried an article by Bob Sullivan entitled "HEXPAD: Utility for Machine Language Key-Ins." Unfortunately, the listing shown here, was not included.

```
                0110 ; PET HEXPAD
                0120 ;
                0130 ;CREATE A HEX-PAD FOR MACHINE LANGUAGE KEY-INS
                0140 ;
                0150 ;  BY BOB SULLIVAN
                0160 ;     BOX 2247
                0170 ;     OAK PARK, ILL. 60301
                0180 ;
                0190 ; AS OF AUGUST 1982
                0200 ;
                0210            .BA $1000
                0220            .OS
                0230 ;
                0240 ;DEFINITIONS
                0250 ;
                0260 IRQ        .DE $E455           ;4032 INTERRUPT ADDRESS
                0265 ;                               ;** CAUTION: CHECK IRQ
                0267 ;                               ;   ON YOUR MACHINE
                0268 ;
                0270 @WRT       .DE $FFD2           ;WRITE ASCII CHAR.
                0275 ;                              ;IN ACCUMULATOR
                0280 ;
                0290 ;
                0300 ;
                0310 START      ;
                0320            ;
                0330 ;
1000- AD C6 00  0340 CONDITIONS LDA $C6             ;GET CURSOR COLUMN POSIT.
1003- C9 0A     0350            CMP #$0A            ;CURSOR COLUMN = 10 YET?
1005- 90 0B     0360            BCC IRQ.JMP         ;IF NOT THEN GOTO IRQ
                0370 ;
1007- AD D9 00  0380            LDA $D9             ;GET LAST KEY ENTERED
100A- C9 30     0390            CMP #$30            ;LAST KEY < ASCII FOR 0?
100C- 90 07     0400            BCC KEYCHK          ;IF TRUE THEN GOTO KEYCHK
                0410 ;
100E- C9 39     0420            CMP #$39            ;LAST KEY > ASCII FOR 9?
1010- B0 03     0430            BCS KEYCHK          ;IF TRUE THEN GOTO KEYCHK
                0440 ;
1012- 4C 55 E4  0450 IRQ.JMP    JMP IRQ             ;ELSE GOTO NORMAL IRQ
                0460 ;
1015- 20 1B 10  0470 KEYCHK     JSR KEYCHK2
1018- 4C 12 10  0480            JMP IRQ.JMP
                0490 ;
                0500 ;
                0510 ;
101B- A0 07     0530 KEYCHK2    LDY #$07
                0535 ;
101D- D9 31 10  0540 LOOP.KC    CMP TABLE-1,Y       ;LAST KEY = TARGET?
1020- F0 04     0550            BEQ NEWKEY          ;IF TRUE THEN SWITCH KEYS
1022- 88        0560            DEY
1023- D0 F8     0570            BNE LOOP.KC
1025- 60        0580            RTS                 ;ELSE GOTO NORMAL IRQ
                0590 ;
                0600 ;
1026- A9 9D     0620 NEWKEY     LDA #$9D
                0625 ;
1028- 20 D2 FF  0630            JSR @WRT            ;PRINT CURSOR LEFT
                0640 ;
102B- 98        0650            TYA                 ;Y-INCREMENT INTO ACCUM
102C- 69 3F     0660            ADC #$3F            ;Y+$3F=NEW ASCII KEY VALUE
102E- 20 D2 FF  0670            JSR @WRT            ;PRINT DESIRED REPLACEMENT
                0680 ;
1031- 60        0690            RTS                 ;RETURN AND GOTO IRQ
                0700 ;
                0710 ;                               TARGET KEY  REPLACEMENT
                0720 ;                               ##########  ############
                0730 ;
1032- 2E        0740 TABLE      .BY $2E             ;     .           A
1033- 2D        0750            .BY $2D             ;     -           B
1034- 3D        0760            .BY $3D             ;     =           C
1035- 2B        0770            .BY $2B             ;     +           D
1036- 2A        0780            .BY $2A             ;     *           E
1037- 2F        0790            .BY $2F             ;     /           F
                0800            .EN
```

Conservation of Momentum Correction

The Commodore 64 version of "Conversion of Momentum" (59:85) contained errors in two lines of the listing. The lines should read:

```
1370 IF(PA<24) or (PA>323) THEN
     1500
1380IF(PA<24) or (PB>323) THEN
     1500
```

Mutual Fund Change

Roger Green sent in this change to his program, "Mutual Fund Charting" (59:100): Line 1430 should read "...:GOTO 1450" instead of GOTO 450.

(Continued on next page)

Letterbox

OSI Memory Test

Dear Editor:

This letter is in answer to Jeff Guernsey's letter in the April issue (#59). *(Editor's note: Mr. Guernsey owns an OSI C4P and was looking for a memory program to check his computer's memory.)*

Here is a memory test I've found useful:

```
10 INPUT "FROM";T:U=T+1024
20 PRINT "TO";U:PRINT:FORW=1 to
   500:NEXT
30 IF T U THEN END
40 POKE T,66:R=PEEK(T):PRINT
   CHR$(R);T
50 IF CHR$(R)="B" THEN 70
60 INPUT "ENTER SPACE TO CON-
   TINUE";Q$
70 T=T+1:GOTO 30
```

Above, T is the starting RAM address in decimal. You will have to know the first vacant address above the program. On my C1, the program occupies 768 to 957. Locations 0-767 are used by the system overhead. So, in line 10, I enter 958.

The program tests 1K of memory at a time. Line 20 has a pause loop to allow you to note the end of the test range. Line 30 checks to see if the end has been reached. In line 40, the memory location is POKEd with ASCII 66, which is the letter B. The location

(continued on page 11)

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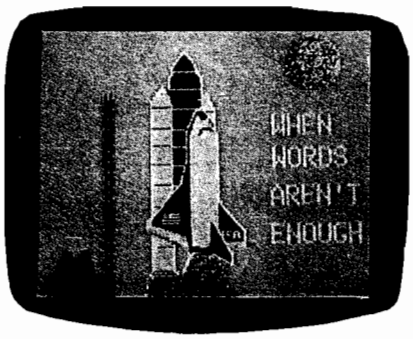

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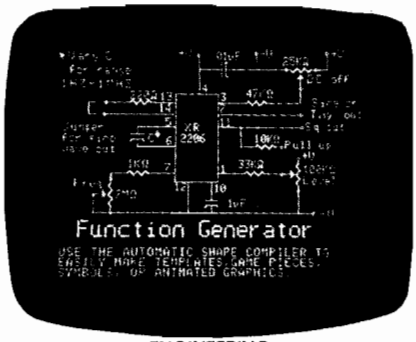

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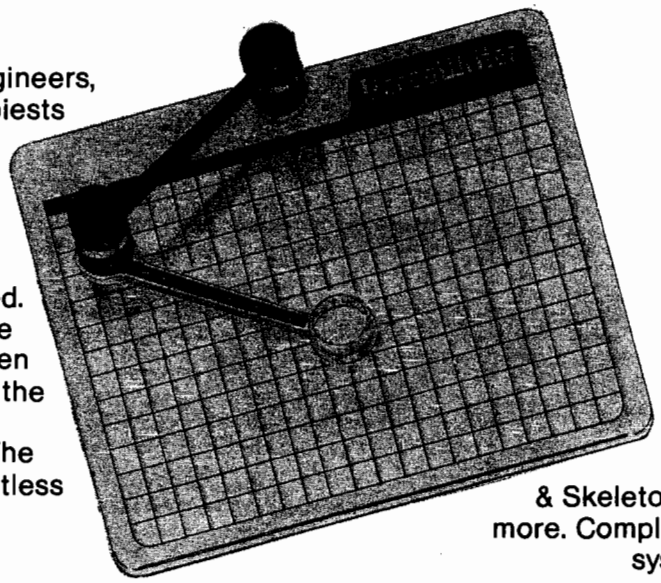

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Updates and Microbes *(continued)*

U.C.S.D. Update The following listing was omitted from Steven Lesh's article "U.C.S.D. Pascal Directory" in MICRO (61:26).

```
{ WRITESYSDATE SHOULD BE CALLED PRIOR TO CREATING OR UPDATING A DISK FILE }
PROCEDURE WRITESYSDATE;
CONST
   BLOCKSIZE=512;
TYPE
   { THESE SUBRANGES MUST BE ALLOWED TO ACCEPT 'Ø' FOR }
   { INTERMEDIATE AND EXCEPTION PROCESSING            }
   DAYS=Ø..31;
   MONTHNMRS=Ø..12;
   YEARS=Ø..99;
VAR
   DAYNUM:DAYS;
   MONTHNUM:MONTHNMRS;
   YEARNUM:YEARS;
   MOREDATE:BOOLEAN;
   INDEX,DAYMONMR,YEARNMR,WORKAREA:INTEGER;
   OLDDAY,WORKDAY,OLDMONTH,WORKMONTH,OLDYEAR,WORKYEAR:STRING[3];
   MONTHSTR:STRING[36];
   BLOCKTEXT:PACKED ARRAY[Ø..BLOCKSIZE] OF CHAR;
BEGIN
   UNITREAD(4,BLOCKTEXT,BLOCKSIZE,2);
   READDATE(BLOCKTEXT[20],BLOCKTEXT[21],DAY,MONTH,YEAR);
   PAGE(INPUT);
   WRITELN('ENTER DATE USING "DATE SET" FORMAT..');
   WRITELN;
   WRITELN('DATE SET: <1..31>-<JAN..DEC>-<ØØ..99>');
   WRITELN('TODAY IS ',DAY,'-',MONTH,'-',YEAR);
   WRITE('NEW DATE ? ');
   READLN(MONTHSTR);
   IF LENGTH(MONTHSTR) = Ø THEN
   BEGIN
      WRITELN('THE DATE IS ',DAY,'-',MONTH,'-',YEAR);
      HALTDISPLAY;
      EXIT(WRITESYSDATE);
   END;
   { SAVE CURRENT DATE VALUES }
   OLDDAY:=DAY; DAY:='';
   OLDMONTH:=MONTH; MONTH:='';
   OLDYEAR:=YEAR; YEAR:='';
   { GET DAY PART OF THE STRING }
   MOREDATE:=TRUE;
   INDEX:=POS('-',MONTHSTR);
   IF (INDEX = Ø) AND (LENGTH(MONTHSTR) > Ø) THEN
      BEGIN
         DAY:=MONTHSTR;
         DELETE(MONTHSTR,1,LENGTH(MONTHSTR));
         MOREDATE:=FALSE;
         MONTH:=OLDMONTH; YEAR:=OLDYEAR;
      END;
   IF (INDEX > Ø) AND (INDEX < 4) THEN
   BEGIN
      DAY:=COPY(MONTHSTR,1,INDEX-1);
      DELETE(MONTHSTR,1,INDEX);
   END;
   IF LENGTH(DAY) = Ø THEN DAY:=OLDDAY
      ELSE IF LENGTH(DAY) > 2 THEN DATEERROR('DATESTRING');
   { GET MONTH PART OF THE STRING }
   IF MOREDATE=TRUE THEN
   BEGIN
      INDEX:=POS('-',MONTHSTR);
      IF (INDEX = Ø) AND (LENGTH(MONTHSTR) > Ø) THEN
         BEGIN
            MONTH:=MONTHSTR;
            DELETE(MONTHSTR,1,LENGTH(MONTHSTR));
            MOREDATE:=FALSE;
            YEAR:=OLDYEAR;
         END;
      IF (INDEX > Ø) AND (INDEX < 5) THEN
      BEGIN
         MONTH:=COPY(MONTHSTR,1,INDEX-1);
         DELETE(MONTHSTR,1,INDEX);
         IF LENGTH(MONTH) = Ø THEN MONTH:=OLDMONTH;
      END;
   END;
   IF LENGTH(MONTHSTR) > Ø THEN YEAR:=MONTHSTR
      ELSE YEAR:=OLDYEAR;
IF LENGTH(DAY) > Ø THEN
   BEGIN
      DAYNUM:=Ø;
      REPEAT
         DAYNUM:=DAYNUM+1;
         STR(DAYNUM,WORKDAY);
      UNTIL (WORKDAY=DAY) OR
            (DAYNUM = 31);
```

(continued)

```
      IF WORKDAY <> DAY THEN
         DATEERROR('DAY');
   END;
IF LENGTH(MONTH) > Ø THEN
   BEGIN
      MONTHSTR:='JANFEBMARAPRMAYJUNJULAUGSEP
         OCTNOVDEC';
      INDEX:=POS(MONTH,MONTHSTR);
      IF INDEX MOD 3 <> 1 THEN
         DATEERROR('MONTH');
      MONTHNUM:=(INDEX DIV 3)+1;
   END;
IF LENGTH(YEAR) > Ø THEN
BEGIN
   INDEX:=1ØØ;
   REPEAT
      INDEX:=INDEX-1;
      STR(INDEX,WORKYEAR);
   UNTIL (WORKYEAR=YEAR) OR (INDEX=-1);
   IF INDEX = -1 THEN DATEERROR('YEAR');
   YEARNUM:=INDEX;
END;
{ FIND THE VALUES TO BE USED WITH THE 'ORD'
    FUNCTION TO FIND THE TWO 'CHAR'S TO BE USED
    TO REPRESENT THE SYSTEM DATE }
 IF (DAY <> OLDDAY) OR
    (MONTH <> OLDMONTH) OR
    (YEAR <> OLDYEAR) THEN
    BEGIN
       IF DAYNUM > 15 THEN
       BEGIN
          YEARNMR:=1;
          DAYNUM:=DAYNUM-16;
       END
          ELSE YEARNMR:=Ø;
       DAYMONMR:=(16*DAYNUM) + MONTHNUM;
       YEARNMR:=YEARNMR + (2*YEARNUM);
       BLOCKTEXT[2Ø]:=CHR(DAYMONMR);
       BLOCKTEXT[21]:=CHR(YEARNMR);
       UNITWRITE(4,BLOCKTEXT,BLOCKSIZE,2);
    END;
 WRITELN('THE DATE IS ',DAY,'-',MONTH,'-',YEAR);
 HALTDISPLAY;
END;
{$P}
```

Letterbox *(continued)*

is then PEEKed, and the contents stored as variable R. Next, the character string of R is printed, along with the memory location. If the character is the letter B, line 50 will send program flow to line 70. There, the memory index T will be incremented and the process will repeat from line 30.

To check the next 1K of RAM, type RUN, then enter the starting address from where the last run ended. If the value found in memory is not 66, then CHR$(R) will not = B. At that point, the program will execute line 60. You can then see which byte contains the problem. To continue the test run, type SPACE (or any character) and hit RETURN.

To check your ROMs, find another C4 owner who will allow you to switch ROMs temporarily. Be sure to check power supply voltages before this step.

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PET Vet

Loren Wright

Pascal for the Commodore 64

A couple of months ago I mentioned the availability of KMMM Pascal for the Commodore 64. Since then, author Willi Kusche has been hard at work removing the remaining bugs and producing a new manual. He gave me copies of the latest versions of the Pascal disk and manual while we were both participating in the recent Toronto PET Users Group conference (see below). The package now warrants a more thorough look.

Pascal is a language for the devotee of structured programming. It provides a lot of powerful structures including REPEAT...UNTIL, WHILE...DO, CASE, and others. Procedures, functions, and variables may be given long, descriptive names instead of the cryptic double-letter names or line numbers of BASIC. Variables may be local or global, and parameters can be passed to a procedure or function. The result is a source listing that is readable and understandable, even months later. There is no penalty for space occupied by comments and indentation since the source is compiled.

Most microcomputer Pascals are compiled to P-code (Pseudo-code), which is then interpreted by a P-code interpreter. A typical Pascal, such as the popular Apple Pascal, includes several programs: an editor to put the source file together; a compiler to convert the source file to P-code; and an interpreter, which executes the P-code by interpreting each code in sequence. KMMM Pascal does it a little differently, substituting a translator for the interpreter. The translator converts the P-code into machine code, which can be SAVEd along with 8K of support routines to disk. This module will LOAD and RUN on its own, without the presence of any interpreter or translator.

The KMMM editor could stand some improvement. In the command mode, commands must be separated by user-specified escape characters. Two escape characters in sequence cause the command string to be processed. Changes, insertions, deletions, etc., can be done but in a tedious manner that involves moving the character pointer. In short, this editor is not powerful enough to justify its confusing complexity. Fortunately, there is a window mode that allows full-screen editing, and this is adequate for routine editing of source files. Tabs and more convenient search and search-and-replace functions would be a real plus. Also, the way source files are handled seems cumbersome.

There are actually two versions of the editor. One allows editing of the largest possible source file; the other has a built-in syntax checker. One of my biggest frustrations with the Apple Pascal package was debugging. Something as simple as omitting a semicolon would cause the compiler to abort. This means you have to reload the editor, reload the source file, reload the compiler, and recompile the file (only to find another error!). I can't

overemphasize the value of having a syntax checker available in the editor!

The KMMM implementation of Pascal is not a complete Pascal. For instance, arrays may have only one dimension and only value parameters may be passed to procedures. These deficiencies can usually be made up with some extra programming. There are also some convenient, non-standard additions, such as ANDB, ORB, NOTB, SHL, and SHR for bit-level operations on integers. Also, a non-standard MEM function allows the equivalent of BASIC PEEK and POKE instructions. The latest version adds UCSD-style string functions.

I tried most of the sample programs on the disk. They demonstrate the power of the language and the speed. Two programs were provided in both BASIC and Pascal versions. Needless to say, there was a considerable difference in speed. There were no Commodore 64 graphics demonstrations, so I tried a few simple programs. On a quick run through all the possible screen and border colors, KMMM Pascal was so fast that it changed the colors several times before the TV's beam reached the bottom of the screen! However, in plotting a simple sine curve, the speed was about the same as with BASIC.

The manual is considerably better than before, but it could still use some work (perhaps by a third party?). It is well organized and most things are explained a lot better. More examples should have been included. There is no index or table of contents, but there is a handy table of editor commands on the last page. It is assumed that the user already knows Pascal, and there is no material covering standard Pascal.

Like the C64 FORTH I reviewed last month, KMMM Pascal exploits one of the features of the C64. The memory occupied by the BASIC ROMs has been made available for Pascal. By adding the unused RAM block at $C000 and subtracting the floating-point routines you can have a total of 10K extra available for programs. As a result, this causes a conflict with cartridges, such as the CIE and C64 Link. Willi has provided for the CIE, and I found that the new relocator routines for the C64 Link offer a compatible option for smaller files.

I don't recommend KMMM Pascal (or any microcomputer Pascal) for trivial programs. It just isn't worth the trouble of loading and reloading all the programs, particularly at the slow rate of the 1541 disk drive. However, a larger project can realize the benefits of this essentially self-documenting language, and KMMM Pascal is one of the best implementations available. Registered owners receive a newsletter, are entitled to a limited amount of telephone consultation, and may purchase a user library for $2.00. At $85 it is a real bargain.

KMMM Pascal is available for Commodore 64 and 2.0 or 4.0 PET from Wilserv Industries (P.O. Box 456, Bellmawr, NJ 08031 (609) 227-8696).

(Continued on next page)

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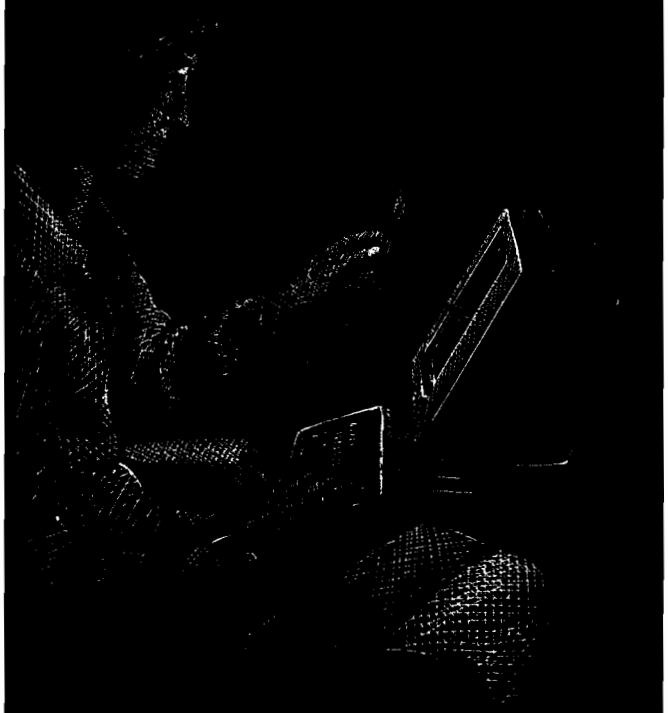

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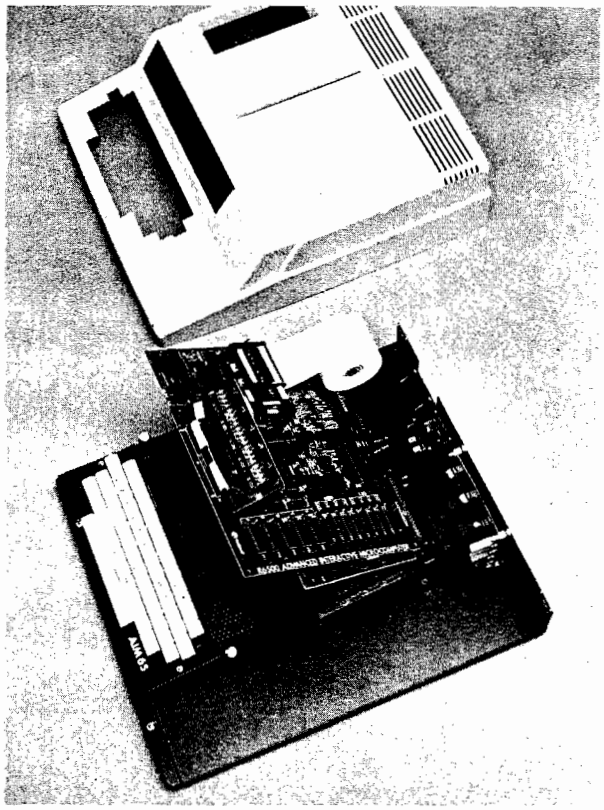

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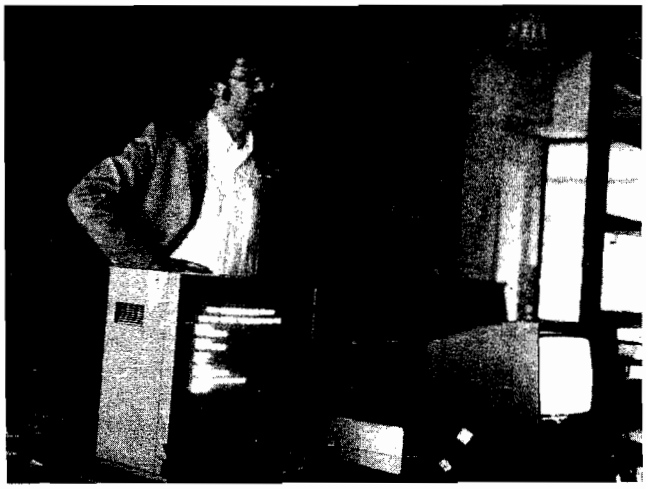
PET VET *(continued)*

Report on TPUG Conference

On May 14-15 I participated in the Toronto PET Users Group conference. I must say I was not prepared for the enormity of this event. Programs included a day-long copy session on Saturday and presentations by such people as Willi Kusche (see above), Steve Punter (the author of WordPro), Brad Templeton (the author of POWER and PAL), Jim Strasma (Midnight Gazette editor and MICRO contributing editor), Greg Yob (Creative Computing columnist), and MICRO authors Frank Covitz, Peter Hiscocks, and Chris Bennett. Jim Butterfield, recognized as the world's expert on Commodore computers, lives in Toronto and was one of the founders of TPUG. He gave an all-day workshop on Saturday for beginners in machine language and two question-and-answer sessions on Sunday. My presentation was on programmable characters and, particularly, character sets on the VIC and C64. The conference was not without problems (from equipment shortages and imbalances on Saturday to a campus-wide power outage just before my presentation on Sunday), but conference coordinators Gord Campbell and Jim Carswell and other TPUG staffers managed to cover all the bases to make it a very successful conference.

Loren Wright



(Photo by John Easton)

Users' Groups

With VIC-20s and Commodore 64s now sold in department and toy stores and through the mail, the user is left to his own initiative. The user group will become more and more important. In addition to regular meetings, where information and opinions can be shared with fellow Commodore computer owners, most groups have club libraries, newsletters, and many other benefits. To connect with a PET users group in your area, check with a local computer store that carries CBM equipment.

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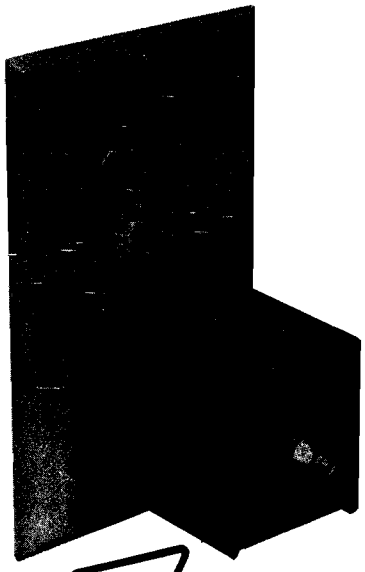

In a few millionths of a second, common electrical surges and spikes can enter your data processing equipment and cause memory loss, false logic and misregistration. Surges very often do permanent damage to microcircuitry.

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MICRO™

From Here To Atari

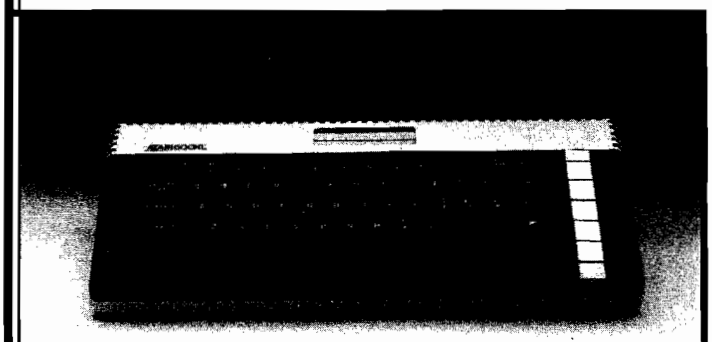
by Paul Swanson

The Atari product line is undergoing several changes. It looks like there was truth to the rumor about cancelling the 400 and 800 computers. They are not on the most current price lists.

New Products

Through the end of 1983, many new products will become available from Atari. They include four new computers and many new peripherals.

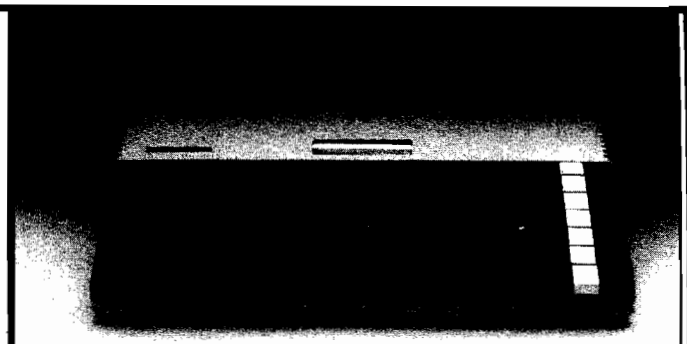
The new computers are the Atari 600XL, 800XL, 1400XL, and 1450XLD. The 600XL will list at about $199. The prices on the other computers are "to be announced." All of these new computers, supporting the fact that Atari does listen, have slots in the back exposing the system bus. The 600XL has 16K, expandable to 64K, and the others have 64K built in. Atari BASIC is a built-in feature of all of these systems — no cartridge required. They also



support the international character set available on the 1200XL and are similarly styled. The 600XL and 800XL systems will be available in the third quarter of this year and the 1400XL and 1450XLD will be available in the last quarter of this year.

The 800XL looks like it is a 600XL with the extra memory included, but the 1400XL and 1450XLD have some interesting new features. Both have built-in modems and speech synthesizer. The 1450XLD also has a built-in 254 KB double-density, dual-sided disk drive.

New peripherals include the 1027 printer, which is a 5×7 dot matrix printer that prints at 20 cps and is designated letter quality. It will take single sheet or roll paper and features bi-directional printing and underlining. I haven't seen the output yet, but Atari's description is "prestige elite" fully formed characters, printed at 12 cpi, 80 characters per line, and I have heard comments indicating that the output really does look typed. The retail price is listed at $349.95.

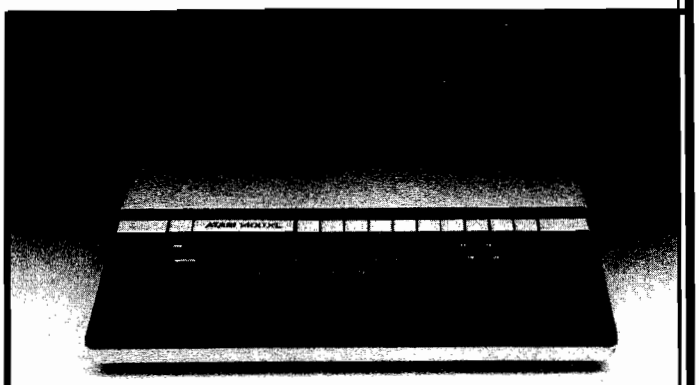


The Atari 1050 disk drive is a 127 KB dual-density disk that is available now. It will retail at $449.95. However, you will require DOS 3.0 to enable the dual-density feature, and that will not be available until the third quarter.

A direct connect modem, cased in the "new look," will also be available in the fourth quarter. This is the Atari 1030 and specs look very similar to the Atari 835 direct connect modem. It is still only 300 baud, but does not require the 850 interface.

Other new hardware items are a touch tablet (digitizer) for $79.95 (4th quarter), a 10-key numeric pad for $124.95 (available now), remote control joysticks that include two joystick transmitter units and one receive unit for $74.95 (4th quarter), the "Ultimate joystick" (no idea what this will be) available in the 4th quarter, and a Track Ball for $59.95 (also 4th quarter). The Track Ball is read like a joystick and programs set up for joystick input can use this with no changes. It looks like next Christmas will see an entirely reworked product line from Atari.

Atari is also working on a CP/M board for these new computers. That should be available in the fourth quarter at a price "to be announced."

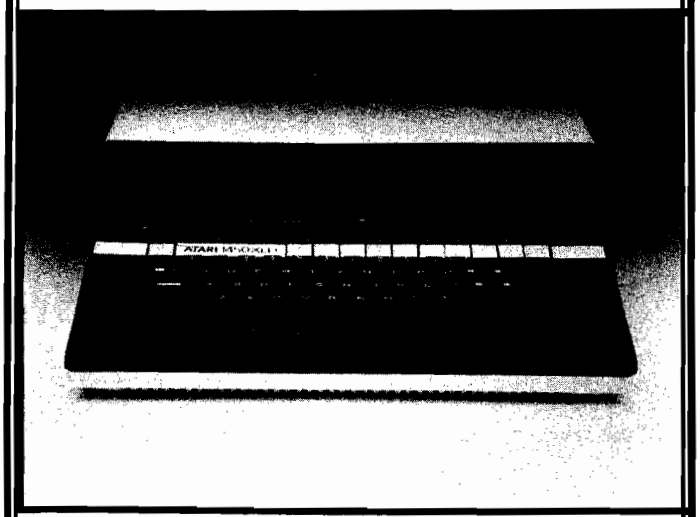


There is not too much available in terms of technical data beyond what I have mentioned, at least not at this writing. I will have more information on at least some of these products by next month.

80-Column Board

Austin Franklin Associates (43 Grove St. Ayer, Massachusetts) has a new 80-column monitor interface for Atari 800 computers. At this writing the board is not yet on the market. I have an early prototype here to examine and the software on it is incomplete. Therefore, a complete review is not possible, but I have tested enough of the board to describe it.

The hardware consists of a four-layer PC board to install in the last memory slot of the 800. To run the system with this card and 48K, you must use either a 16K and 32K combination of memory boards or one 48K board.



To make this board work, a cartridge for the right cartridge slot is also supplied. However, no computer memory is used for the right slot cartridge. Normally, when a cartridge is inserted in the right slot, memory addressing between 32K and 40K is disabled so that the cartridge may be mapped in. In this particular cartridge, the program contained on the cartridge is relocated and, for all practical purposes from an application program's point of view, seems to disappear. It is therefore compatible with programs that require 40K to 48K of memory. This 80-column interface leaves the left cartridge slot open for BASIC, the Assembler/Editor, or any other Atari-compatible left cartridge.

The software on the right cartridge makes the board very easy to use. The board is enabled by opening the screen editor or declaring GRAPHICS 0. Selecting any other mode disables the board and switches to the normal monitor output from the computer so that the graphics

(Continued on next page)

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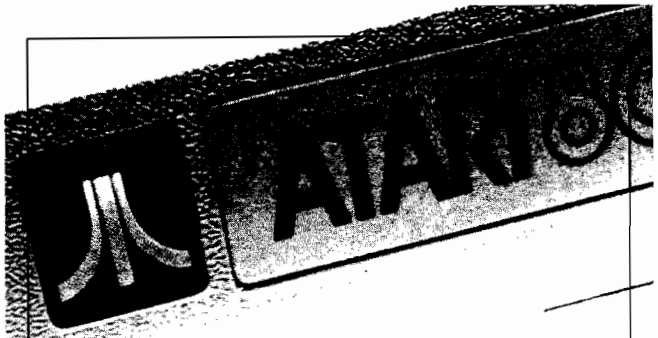

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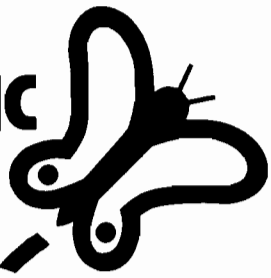

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From Here to Atari *(continued)*

will appear on the monitor. In your programs, PRINT to it as if it were the normal mode 0 screen, but with 80 columns instead of 40. Keyboard selectable options allow a few more options not available in normal 40-column mode 0 operation.

Output is in 16 colors, selectable for each character as it is written. There are also four attributes that can be applied to each character, which are underline, blink, half intensity, and inverse video. The full ATASCII 128-character set is available plus an extra 128 characters, accessible through a special function. These extra characters are the same as the VT-100 graphics characters at codes $80-$FF. These may also use the four attributes and 16 colors.

The hardware also includes a light pen input, which is a male connector functionally identical to the controller jacks on the front of the computer. A plug that fits the monitor output jack on the side of the Atari 800 is also supplied. This plug allows the use of the monitor when the 80-column mode is not in use.

The board is accessed by the computer directly through memory-mapped location. The effective transfer rate is well above 19,200 baud. The television goes blank during these transfers when the 80-column board takes over. This is because ANTIC must be shut off. If you store display lists and screens in memory, you can turn ANTIC back on and use the television for a second display. If you are not using the television, ANTIC and all of the DMA is disabled, so program will run 20-30% faster than when using the normal text screen.

The retail price for the 80-column board is $289.95. Some software support packages are being developed for it and I will mention them as they become available.

BASIC Compilers

A BASIC Compiler is a program that converts a BASIC program to a faster, machine-language version. There are three compilers available for Atari BASIC programs. None of them is completely compatible with all of the commands in Atari BASIC. I have two of the three — the DataSoft compiler and the Monarch Data Systems compiler (the ABC compiler). They are two very different compilers.

The DataSoft compiler requires much rearranging of the program before compilation. For example, all DATA statements must be listed as the last statements in the program, variables and expressions are not allowed in DIM, GOTO, GOSUB, and RESTORE statements, and there are different rules for FOR/NEXT statements (there may be only one NEXT statement for each FOR statement). The substring assignment is also not compatible with Atari BASIC.

The DataSoft compiler does give the choice of compiling for fixed or floating-point arithmetic and supports the appropriate functions in the floating-point mode (SIN, LOG, etc). It also prints out an assembly-language listing of the compiled program during the four-pass compilation. I saw no way to alter and reassemble from this listing. In fact, the only uses I found for it are optimizing the BASIC code for shorter object files and decoding the run-time error messages (the compiler lists the error number and memory location instead of program line).

The Monarch compiler was much easier to use because almost all of the functions are implemented identically and no rearranging of statements was required. Just about the only thing required was to adjust the program to use integer arithmetic instead of floating point. The Monarch compiler uses 3-byte integer values (the DataSoft integer compile, for comparison, uses only 2-byte integers) for the variables and calculations. The RND function is not supported, so a PEEK(53770) to get a random number in the 0-255 range is needed in place of any RND functions in the program.

The Monarch compiler supports expressions in DIM, GOTO, GOSUB, and RESTORE statements; DATA statements follow the same rules as they do in Atari BASIC. Error messages at run time state the error number and BASIC program line number.

Speed is an important factor with compilers and the DataSoft compiler does produce slightly faster programs. I have not run any speed tests, but the manufacturer's claims of 5-20 times for DataSoft and 4-12 times for Monarch (times meaning number of times faster than the original BASIC program) seem to be true. However, in compilation, the one-pass process used in the Monarch compiler is much faster than the four-pass process used by DataSoft.

I compiled my word processor on the Monarch compiler and am very happy with the results. The word processor is written almost entirely in Atari BASIC (there is one small machine-language subroutine it puts in page 6). It required very little alteration for the compilation. Because of the difference in substring use, I couldn't compile it with DataSoft's compiler. I may rewrite parts of it later so that I can, just to compare the results.

In short, I found the Monarch compiler much more compatible with Atari BASIC and therefore much easier to use. The DataSoft compiler would be useful for BASIC programs written specifically with compilation in mind. The DataSoft compiler also has an advantage with programs that require the floating-point arithmetic, although much of it could be simulated in fixed-point on the Monarch compiler because of the large number of significant digits it supports.

I also compared the space required to store the results on diskette. The Monarch compiler produces longer files on very short programs, but on longer programs, the compiled version is usually smaller. The DataSoft compiler restricts the program size to 100 sectors and uses two intermediate files in the compilation. DataSoft claims that the finished object program requires about the same disk space as the original BASIC program, but I have found that it requires more. The Monarch compiler requires only the BASIC source program and a file for the completed object code.

The DataSoft compiler retails at $99.95 (9421 Winnetka Ave., Chatsworth, CA 91311; 800-423-5916) and the Monarch compiler retails at $69.95 (P.O. Box 207, Cochituate, MA 01778; 617-877-3457). The third compiler — not reviewed — is BASIC from Computer Alliance.

(Continued on next page)

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Missing: June Listings!

Editor's note: The following listings were omitted from Paul's June column. We apologize for the inconvenience.

Listing 1

```
10 GRAPHICS 8
30 DL=PEEK(560)+PEEK(561)*256
40 FOR I=DL TO DL+200
50 IF PEEK(I)=79 THEN POKE I,78:
   GOTO 70
60 IF PEEK(I)=15 THEN POKE I,14
70 NEXT I
80 FOR J=0 TO 95
110 POSITION J*2,J+50
120 ? #6;"0101010101010101010101
    0101010101010101010";
130 ? #6;"1010101010101010101010
    1010101010101010101";
140 ? #6;"1111111111111111111111
    1111111111111111"
150 NEXT J:STOP
```

Listing 2

```
10 GRAPHICS 15
20 FOR J=1 TO 79
30 POSITION J,J+40
40 ? #6;"11111111111111111111";
50 ? #6;"22222222222222222222";
60 ? #6;"33333333333333333333"
70 NEXT J
```

Listing 3

```
10 GRAPHICS 7
20 FOR J=1 TO 79
30 POSITION J,J
40 ? #6;"11111111111111111111";
50 ? #6;"22222222222222222222";
60 ? #6;"33333333333333333333"
70 NEXT J
80 DIM X$(1)
90 ? "PRESS RETURN";
100 INPUT X$
110 DL=PEEK(560)+PEEK(561)*256
120 FOR J=DL+6 TO DL+84
130 POKE J,14
140 NEXT J
```

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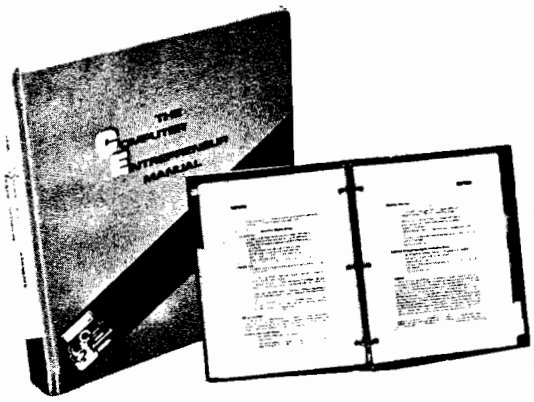

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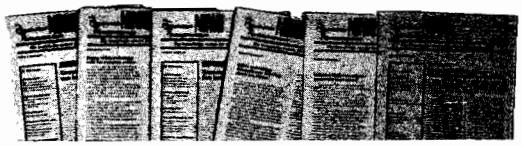

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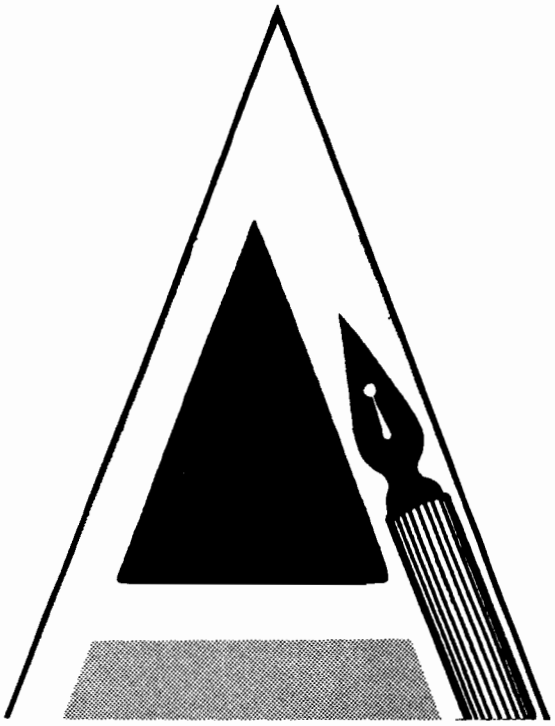


A Word Processing Primer

Select the right system to meet your requirements

by Loren Wright and Phil Daley

Word processing is a term used to describe a machine or a program (or both) that allows the user to manipulate, store, retrieve, and print out text. The price for a word processor ranges from many thousands of dollars for a dedicated unit, such as those manufactured by DEC, Wang, Lanier, and Xerox, to nothing for a short BASIC program you can write yourself. Of course the power of the word processor is closely related to what you pay for it, but if you recognize your needs before you buy, you can be sure that you get everything you need and that you don't pay for things you don't need.

Establishing Your Needs

The first decision to make is whether you are buying a word processing package for one reason exclusively, or you want to buy a computer that will entertain, provide learning experiences through programming capabilities, and run other home or business applications. If you want to do professional word processing only and can afford it, a dedicated system will provide the best possible environment for word processing. However, if you are like most of us, with limited resources and a multiplicity of needs, compromises will have to be made. The remainder of this article will assume that you have decided to use a microcomputer to meet your word processing needs.

System Decisions

There are certain basic hardware factors that will affect the overall performance of the system, no matter which software package you purchase. If you don't have a computer system yet and you expect word processing to be one of its primary uses, then the hardware purchase decision is as important as the software purchase decision. You may even find it necessary to have one computer for your word processing and other business needs and another for your recreational and educational needs.

The main components of any word processing system include the computer, a mass storage device, and a printer. The computer has a number of components that determine its effectiveness for word processing: the display, the keyboard, the amount of memory, and the operating system. Since the computer is at the center of the whole system we will discuss it first, followed by the other two components.

The screen display is probably the most critical component. Most of the less expensive computers hook up, more or less directly, to a color TV. This is convenient and inexpensive, since most people already have color TVs. However, for word processing, the picture quality may not be good enough. Furthermore, it is dangerous to sit close to a color TV for any length of time. A black-and-white monitor, preferably with green or amber phosphor for greater readability, is essential if you expect to spend any significant amount of time word processing. (A black-and-white TV will minimize the radiation danger but it won't help the readability problem.)

The size of the display is of some importance. Generally, the more text you can get on the screen at once, the better. Twenty-four or 25 lines of 80 characters is ideal. Computers with such displays are the Apple //e, IBM PC, and Commodore CBM 8032 and new B-series machines. The standard display is 24 or 25 lines of 40 characters, and this is not a bad compromise to make if you expect to be able to use games and educational software on the same computer. Although there are several good word processing programs available for the VIC-20, we cannot recommend it for any significant amount of word processing because of its tiny 23 × 22-character display. Be sure the computer can display upper- and lower-case letters on the screen. Ideally, the tails (called *descenders*) of the lower-case letters q, y, p, g, and j should extend fully below the line. On most of the 40-column-display computers they do not. This may or may not bother you.

The keyboard is also an important factor, and some of the decisions depend on individual taste. In general, the more keys on the keyboard, the better.

Since a multi-purpose computer can't have specially labeled keys for every function (as on dedicated word processing units), it helps to have more keys. Programmable function keys are especially useful. The mechanical action of the keyboard is also important. Membrane keyboards are inexpensive and milk-proof, but they do not provide the positive feedback (even with the audio feedback) that most typists need. Full-stroke keyboards are much preferred. A good keyboard should echo every character you type to the screen. It should not miss some characters and repeat others. The rest can only be determined by what is comfortable to you.

The amount of memory in the computer is important in two ways. The more memory, the larger and more sophisticated the word processing program can be. Also, more memory means you can process more text without storing or retrieving it. In general, you should purchase a computer with the maximum available RAM; barring that, be sure that expansion memory is available and affordable.

There are three main modes of text storage: hard disk, floppy disk, and cassette. Hard disk units are faster, hold more, and are usually more reliable. They are also very expensive. Cassettes are least expensive, but they are also slowest and least reliable. Floppy disk drive units are the most cost-effective compromise. Depending on the word processing program you buy, you will need one or two such units.

The choice of printer depends mostly on the amount of its usage. For business-quality correspondence you need a formed-character printer (most are now of the daisy wheel type); for graphics output you need a dot-matrix printer. Dot-matrix printers are generally less expensive, and the print quality is generally acceptable for most applications. On the other hand, daisy-wheel printers have decreased in price to the point where some are less expensive than some dot-matrix printers. Daisy-wheel printers are also usually slower than dot-matrix printers. You may very well start with a dot-matrix printer and later add a daisy-wheel printer when you can afford it. Whatever printer you buy, be sure it is compatible with the word processor programs you are considering. Printers that use aluminized or thermal paper may be less expensive than plain paper printers, but the cost and availability of these special papers may prove to be a serious problem. Also, the print may not be legible, particularly after a lot of handling.

Word Processing Software

The functions of a word processor fall into a few general categories. We will discuss what to look for in each of these categories.

General Design

There are different ways to organize and handle text. One method treats your document as if it were a continuous scroll. The user includes special codes that determine such things as the length of the page, size of margins, single- or double-spacing, and underlining. Other word processors actually reflect the format on the screen. With these, the text is often organized in pages or chapters. Still others treat the text in *screen* units. With the continuous-scroll style, words may split at the end of a line, making the text hard to read. With other types it can be a little complicated to move from one part of the text to another.

Nearly every word processor has some sort of *status line* — a block of information at the top of the screen. The minimum information shown here should be row and column position of the cursor, indication of special modes (such as file, insert, delete, etc.), and amount of memory remaining. Other information that may be included is the file name, date, and tab and margin positions. The status line should be clearly set off from the text so you don't get confused between the two. Some word processors use an alternate screen for status information. This makes the screen appear less cluttered, but it destroys the continuity of your session.

Entry of Text

Most of the time spent with a word processor is in entering text. It follows, therefore, that this is one of the most important parts of the word processor's design. Yet sometimes this is the most neglected. Every character you type should appear immediately on the screen. If the program can't keep up, then it should have a buffer that captures every keystroke, no matter how fast you type. No characters should be lost, even when the program is scrolling or changing pages. The cursor should move quickly to any position on the screen and to any point elsewhere in the text without much trouble. Moving the cursor to the beginning or end of your text should be a simple matter. The cursor-positioning and space keys should repeat if held down, and it's useful if all other keys repeat too. While you are entering text, the delete key should remove characters from the end, allowing you to back up.

The program should give a warning if it is about to run out of space. This allows you to break your text at a convenient point before you save it. If you have to enter a command mode, such as to save your text, the program should return to the text with the cursor where you left it.

Often, part of entering the text is providing the proper format codes so the word processor knows how to prepare your printed document. Ideally, these codes should make enough sense to be easily remembered, but that goal is seldom achieved. Help screens and reference cards can be useful if they are well done. The same goes for commands. One feature that helps here is a branching command structure, where you have to remember only one key to start the sequence. After that, you're offered choices. The disadvantage is that a simple, frequently used command can take four keystrokes to complete.

Editing Text

Much of your routine editing can be handled with the features mentioned above. You can position the cursor where you want and delete or type over to make changes. In addition, most word processors offer convenient and powerful editing features.

When you are entering text, it is convenient to be able to delete characters from the end of the text. However, if you are trying to delete in the middle of text you have already entered, it is more useful to be able to position the cursor at the beginning of what you want to delete and have characters disappear from the right. The latter type of delete is called an *editing* delete, and it is available on some word processors as a separate key and on others as a switchable option replacing the typing delete.

Most word processors have some kind of *insert mode*. This allows you to continuously insert text at any point. The commands for entering and exiting insert mode should be both easy to remember and easy to execute. There

should also be some indication, such as a different cursor or a lighted letter in the status line.

A word processor should be able to operate on large blocks of text as well as on smaller blocks, such as words, sentences, and screen lines. Block operations include delete, transfer, and copy. Ideally, these should all operate in a similar fashion by marking the beginning and end of the block followed by the new position (if applicable). For word-delete you should be able to position the cursor anywhere within the word, and for sentence-delete the program should delete from the cursor position to the next period.

Search and Search-and-Replace

If these features work properly and easily, they can be the most powerful parts of a word processor. Since these are similar functions, the commands should be nearly identical. A *search* command can help you to find a particular place in your document by specifying a group of characters (usually a word, but not necessarily) called the *search pattern*. With *search-and-replace* you specify an additional *replace pattern*, which is substituted for the search pattern. It is useful if you have consistently misspelled a word or if you want to change a title. Search-and-replace should have a selective option so you can (if you want) change only certain occurrences of your search pattern. When your document is too large to be held in memory at one time, there should be some way to make the search-and-replace operate on the whole document (called *global* operation), rather than just what is in memory (called *local* operation). For both commands it should be convenient to repeat the search from a new point.

Additional useful options are *ignore-case* and *wild-card* characters. Ignore-case will find every occurrence of a pattern, regardless of which letters in it are capitalized. Wild-card characters (usually a '?' or a '*') are ones you include in the search pattern that will match *any* character in that position. Some word processors allow more than one search or search-and-replace to take place on a pass through the text; others allow you to search backwards, as well as forwards.

Printouts

This is the moment of truth — the true test of your word processor. If it falls short here, all the other fancy features aren't worth much. If your word processor is the type that doesn't automatically format the text on the screen, then it should have some sort of *output-to-video* function. This will save you a lot of paper. If the 'printout' doesn't look right, you can just make the appropriate changes in the format specifications and try again. In addition, you should be able to interrupt the hard-copy output without turning off the computer or losing the text, and you should be able to resume the output where you left off. If the document you are printing occupies more than one file on the disk, you should be able to print it all at once, using the same output parameters, with a single *global* print command. Additional useful options are multiple copies, page numbering, headings, footers, single/double spacing, and pauses for feeding single sheets.

Manual

Without good documentation, a program's value is diminished considerably. A manual for a complicated program like a word processor should serve two important functions. It should teach you the essentials of operating it and it should serve as a reference. A tutorial or series of lessons is valuable, but this should be a separate section. The reference part should give all the facts, clearly and concisely, with examples. There should be an index as well as reference tables and a table of contents.

Form Letters and Variable Data

Many word processors allow you to define a number of frequently used words or phrases and enter them at any place in your text with only a few keystrokes. It is also useful to be able to append or insert whole paragraphs directly from disk.

Form letters are another feature of many word processors. Using the word processor you construct your letter leaving markers at the points where you want to insert variable phrases. Using a list you construct either with the word processor or with an additional program, the program fills in the data at the marker positions and prints out each letter with a different set of data. Some word processors have the ability to construct the list built in while others require the use of a separate program included on the master disk, and still others require you to purchase an additional program. Some word processors can use files created by particular commercial database management programs. Also, you can usually construct your own list with a simple BASIC program. Some word processors allow distinction among the fill points. With this feature you could, for instance, use the last name from the address block in the salutation without repeating it in your list. If you anticipate using your word processor to do form letters, see if it can do what you want it to do in this area.

Equipment Compatibility

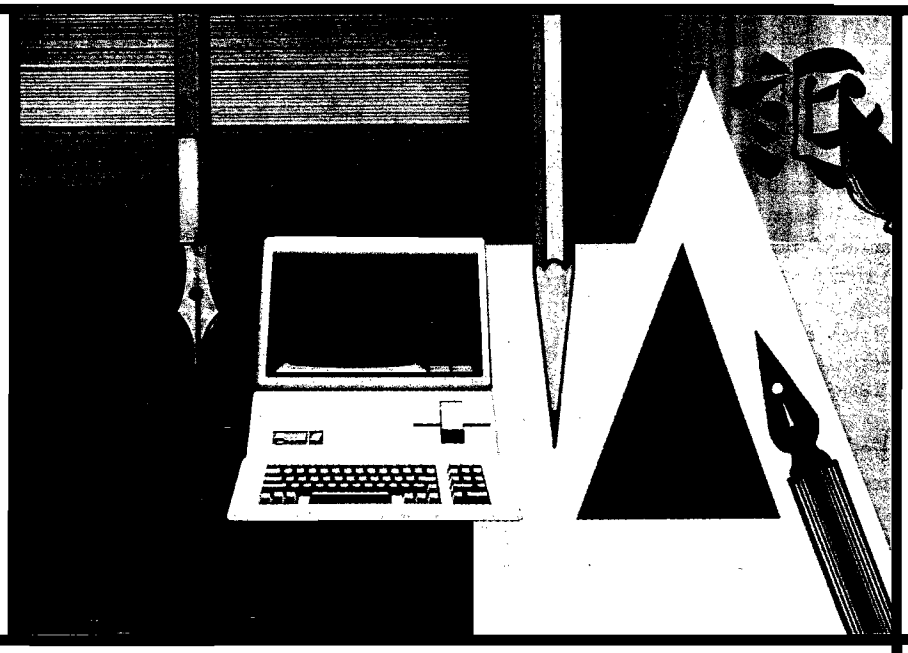
Does the word processor work with your equipment, particularly your printer? If you are anticipating buying an additional or replacement printer, does it work with that? If your printer can do fancy things like elongated type, compressed type, subscripts, superscripts, italics, bold face, overstriking, underlining, special characters, etc., does the word processor you're considering support these features? Many word processors support only a few of these features directly, but they have a user-definable character feature that will allow you to use them — with a bit more trouble.

Additional Features

A dictionary program can process your text, pointing out potential spelling errors. Most allow you to add new words to the dictionary as you go along. This is not an essential feature, but if you do a lot of word processing and you aren't a former 6th grade spelling bee champion, then you might find a dictionary program handy. A few word processors have such a program built in or on the master disk. Most require an additional purchase, either from the word processor manufacturer or from a separate company.

If your computer has a color display, then there should be some means of changing the colors of the characters and background. Certain color combinations are better for readability, for minimizing interference effects, or for use with a black-and-white monitor.

MICRO



Word Processing on Your Apple

by Phil Daley

Can the standard Apple be used as a reasonable word processing station? Since there are so many different word processing programs on the market, how can you decide which software to buy? Do you need special hardware to run certain programs? This article will help to answer these questions.

In any review of a lot of different products, remember that it would be impossible to cover every possible software package, trying every possible combination of commands, especially for the Apple. I used during the normal day-to-day routine several of the most popular and some of the newer word processors for the Apple currently available.

I wrote a letter to most of the currently advertising word processing manufacturers requesting a demo program. Those who responded are included in this article.

(Continued on next page)

I concentrated on the following points: how easy were they to set up from scratch; what, if any, hardware did they require or recognize; how well written was the documentation (including whether the index could be used to find the answer to a particular question); did the documentation include a 'quick-reference' chart or page; were the commands logical and easy to use; and, were the commands easily remembered.

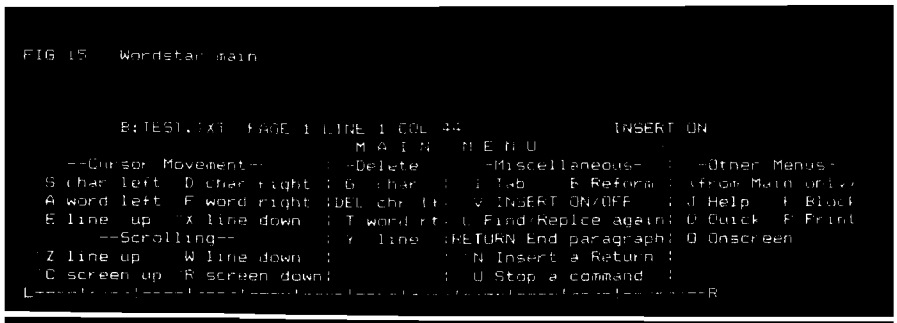
Recognizing that all reviewers are predisposed more or less to some particular mind set, I will give you mine so that you can add this coloration to the following report. I liked the programs that use the hardware I have available. I liked programs that utilized more than one drive while not requiring it. I liked programs that didn't particularly care what kind of printer/interface combination I was using. I appreciate the programs that allow you to make back-up copies, and preferred programs that made standard DOS text-type files.

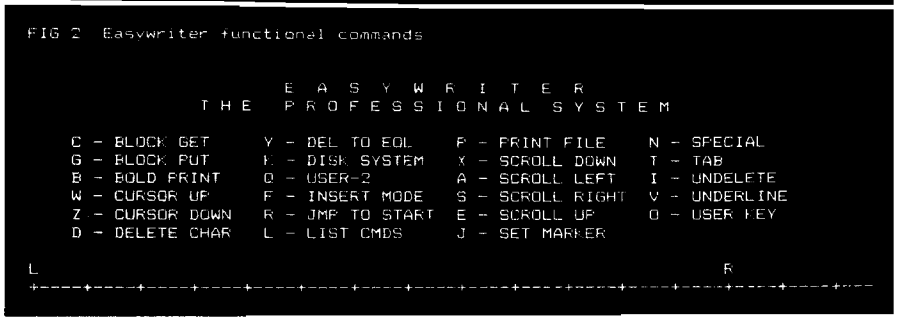
Since the average end-user probably has a fixed set of hardware, and since programs that load specific drivers for specific hardware utilize the capablities of that hardware more fully, I tried to take this into account when describing the usefulness of the software package. With this information and caveats in mind, here are the programs I tested.

Easy Writer — The Professional Word Processing System
Information Unlimited Software, Inc.; 281 Arlington Ave.; Berkeley, CA 94707

Easy Writer is one of the oldest word processors still on the market, a testament to its quality. The version I have requires an 80-column card, but they have a 40-column version available. Easy Writer is copy-protected, simple and straight-forward to configure, and is easily reconfigured should the need arise. The documentation (77 pages), while brief, is complete and well organized.

I like a menu driven approach, and Easy Writer has three menus: a command mode menu for disk accesses, an edit mode menu (optionally on screen) for edit commands and an additional command mode menu. This program is easy to use and has many features that I personally like. The insert mode appears to be difficult to program since many of the word processors have ungainly methods of inserting letters. I like a program that inserts letters one at a time on screen and pushes everything else to the right, wrapping when necessary. This gives a visual flow to the program and enables each change to be instantly observed. While not the fastest program in the test group, Easy Writer does implement this style of insert, and includes a type-ahead buffer for people typing faster than the program can insert.





Easy Writer displays carriage returns on-screen, a feature I find especially useful when making charts. Once you boot the system disk, it can be removed and is not necessary for any operation except reconfigure. The reset key is approporiately handled, reinitializing the 80-column card and returning you to the main menu, text file intact. Each file can be about 12K in length and several files may be linked for printing.

My major complaint with Easy Writer is its slowness of operation, especially when the file size is large. The jump from top to bottom, or vice versa, can take 5 to 10 seconds, while you sit and wonder if the computer accepted your command or has gone off the deep end. The other factor that I consider unnecessary is the non-standard format of the text disks. The disks are DOS 3.2 format with the directory on Track 8.

FORMAT-][— Word Processing System
Kensington Microware Ltd.; 300 East 54 Street,Suite 3L; New York, NY 10022

This new entry into the word processing field is easy to use. The documentation is very complete, including a 60-page 'Quick Guide' and a more in-depth 170-page reference manual. In addition to the unprotected system disk (two copies), you receive a reference card. The guides are very well written, although it is a little difficult to find the appropriate information for a particular problem.

The program requires an 80-column card in slot 3, and determines on its own what type you have. The Videx requires an additional IC, supplied. Also supplied is a two-wire shift-modification to allow the use of the CTRL-SHIFT as a shift lock. The program uses a text paging system that stores pages of up to 80 lines as separate files. Several of the commands that operate on a whole document require a RAM card in slot 0.

The program has self-explanatory main and print menus but will require the reference card 'at the ready' during actual keyboarding due to the lack of an edit/format menu and the multiplicity of the possible commands. The 'escape' key serves as the switch between 'edit' and 'format' routines. It also serves as the 'abort' key for almost any process in any mode. The reset key returns you to the main menu, everything intact. Each of the format command letters prints a mini-menu at the bottom of the screen to explain your options while in each of the 26 format modes. Most of the modes are memorable by the beginning letter,

although you may think 'K' for 'klose up text to the cursor position' stretching the point a little.

The program has automatic page naming and numbering to help eliminate the problems associated with having the text split into individual blocks, and simplifying the operations of editing and printing several pages at once. In addition to all the standard editing commands, Format includes several useful commands such as: Align numbers — left, decimal point, right; Horizontal slide; On screen justification; Make or remove paragraphs automatically; User definable option — enter any (0-254) ASCII characters into the file; automatic hyphenation; automatic removing of multiple spaces and soft hyphens; headings and footnotes; and a mailing list program.

The program is designed to work with hard disks, including volume specification, and makes standard text files. If you have a proportional spacing, daisy wheel printer, there are several options available to alter the amount of proportional spacing for each letter, set the justification priority, offset and aggressiveness, and to define an alternate character table for special print wheels.

This was my favorite program because it recognized the hardware I have and it didn't do anything I find really objectionable. No program is perfect (at least I haven't found one yet), and the main problem with this one is the breaking of documents into individual pages. Overall, it is a fast, easy and convenient program and has more options than I'll ever use.

SANDY WORD PROCESSOR — designed for APPLE COMPUTERS
VIP Software Inc.; 951 West Pipeline Rd., Suite 415; Hurst, TX 76503

This primarily BASIC program is a new entry from Australia. It is quite a bit different from most American software and takes some acclimatization. The documentation (130 pages) assumes you just brought your Apple home from the dealer showroom, and does appropriate hand-holding through boot-up. Sandy requires a Vision 80 board for 80 columns and therefore I had to use it in 40-column mode. I do have the lower case and shift key modifications, which it accepted after answering the appropriate prompts.

The Sandy system disk is copy-protected (you get a backup when sending in the registration) but it makes standard DOS 3.3 textfiles. The program does a very primitive word wrap, leaving '-'s in the spaces where the word would have been if it hadn't been wrapped. This leaves a messy looking screen, although, since it is only displaying 40 columns and is going to print 80 columns, the screen display has little to do with reality anyway. It is always necessary to have the cursor at the top of file when saving or printing or else it won't operate on the entire file. Sandy allows most normal DOS commands when in the file command mode.

Additional features include a mailing list program including a sorting and mailing label provision, outdenting as well as indenting of paragraphs, and handling of very large files by saving temporary portions of the file on a scratch disk. Unfortunately, this slows down already slow execution speed. The search and replace has to be the slowest operation I have ever seen. The carriage returns are displayed as ':'s and there are large block bars at the beginning and ending of the file. Reset returns you to edit mode, file intact.

APPLE WRITER][— Apple's own Word Processor
Apple Computer Company, Inc.; 10260 Bandley Drive; Cupertino, CA 95014

More people probably own some version of Apple Writer than any other word processor for the Apple. While it is well written, fast, and makes standard text files, it is not my favorite for several reasons. The first is that the program only recognizes the 80-column card "Sup'R'Terminal", which I don't have. Therefore, I am forced to use 40-column mode with shift and lower-case modifications.

The documentation is excellent (106 pages and reference card) and it is easy to locate questionable items. Booting the copy-protected disk (you receive a backup in the package) and pressing return puts you into edit mode. Apple Writer changes modes by use of control keys, which are easily remembered by the first letters in most instances. The screen display of 40 columns is disconcerting, because the word wrap in the middle of every second line seems unusual. People who use Apple Writer all the time seem to have no trouble doing complicated charts, even though the columns don't seem to line up correctly on the screen. The other complaint with Apple Writer is the "bubble" cursor. The cursor actually occupies a position in the current line causing the rest of the line to push one character to the right. When scrolling by lines, the text appears to bubble around the cursor, including wrapping words back and forth from the end of the line.

In addition to all the standard word processing commands, Apple Writer includes automatic case change, an excellent search and replace including control codes, a glossary function for

(Continued on next page)

FIG 19 Wordstar onscreen

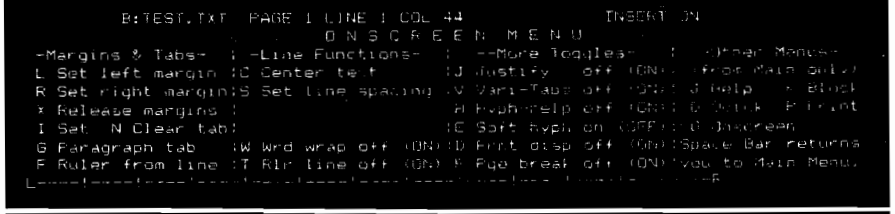
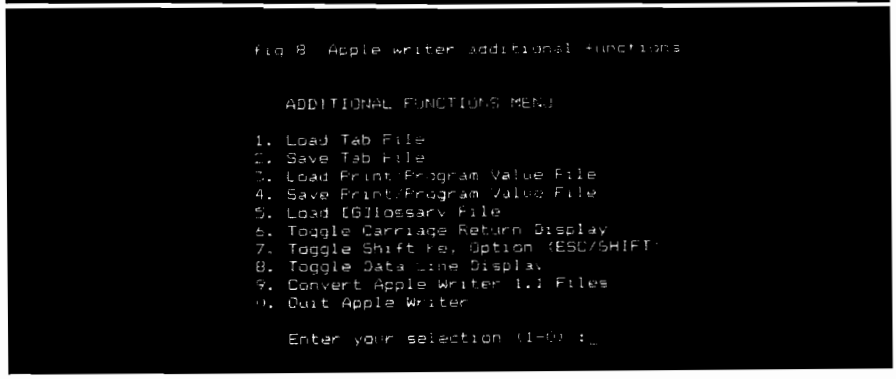
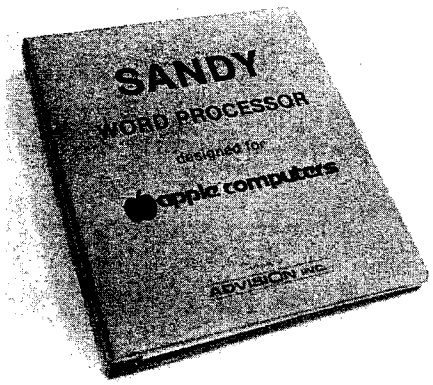


Fig 8 Apple writer additional functions





defining frequently used sets of characters such as printer codes, and a very powerful word processing language. This is probably the least understood part of Apple Writer and its best feature. Unfortunately, it requires learning what is esentially a mini-language to get the most benefit from it. It can do form letters with a mailing list, report creation, automatic replacement over several files, and automatic print of several documents.

In spite of its faults, Apple Writer is a very good, uncrashable word processing program, which is inexpensive and powerful. If you can put up with the screen display limitations, it is the best buy.

Write Away — An Advanced Word Processor
Midwest Software Associates; P.O. Box 301; St. Ann, MO 63074

Formerly Word Processor II, this new release has a full free replacement warranty and is on an unprotected disk so that you can make your own backups. The program is recorded on both sides of the disk in case of a blemished disk. It also includes "The DOS Enhancer" for extra fast loading. In addition to creating standard text files, Write Away can read random access files and has conversion utilities for several of the most popular data base programs so that they can be used for mailing lists.

Write Away is an extremely versatile, very powerful word processor with a wide range of applications. It automatically recognizes which 80-column card you have, if you have one, and properly configures itself. In addition to all the standard commands, it includes a logical operator/conditional text feature for advanced form letter structuring. The screen display is good with a minimum of status line distraction. The cursor jumps from the command line to the text and back, depending on the current mode. I found the reference card to be too terse and needed the full documentation to explain several features. The 175-page book is well written and logically indexed for reference.

Unfortunately, with this much complexity comes a drawback. The command line entries are usually several characters in length and would require a lot of use to become familiar enough to do without looking each one up. I could not get the program to rejustify the screen for reset margins. The program has a screen dump to preview a printout, and this is only marginally better than seeing the printout on paper.

The Word Handler II — A Simple Text Editor
Silicon Valley Systems, Inc.; 1625 El Camino Real, Suite 4; Belmont, CA 94002

Here is an easy-to-use, simplified word processor that comes on a copy-protected disk and creates non-standard text files. The 66-page documentation is somewhat brief, but since the commands are not too complicated, it is probably sufficient. There is a postcard-size reference sheet with most commands summarized. It also tells how to reset the printer parameters, something I couldn't find in the book.

Word Handler uses the high-resolution graphics screen for display eliminating the need for an 80-column card or lower-case adapter. Unfortunately, the 66-column mode is fairly illegible and the 40-column mode, while excellent in legibility, is no better than the Apple Writer display, and a good deal slower. In addition to not seeing what will be printed, the display includes paragraph numbering and end-of-file markers that clutter up the display. The status line is quite uninformative except for the prompting for different modes.

The display does have one nice feature: underlining, bold-face, sub-and super-scripting are done on-screen and make a nice looking display. In addition to normal word processing commands, Word Handler has a keyboard fill letter capability. It can be combined with List Handler for a mailing list.

Pie Writer — Word Processing System
Hayden Software; 50 Essex St.; Rochelle Park, NJ 07662

This is a reincarnation of Apple Pie 2.0 with all of the bugs removed. The 164 pages of documentation are well written and clearly explain all functions. There is a sparse index and a complete reference card (so complete that the only time you need the book is if you don't understand how a command works). The reference card is necessary since there is very little information displayed on the screen. The program is unprotected and can work with standard text files.

The edit display includes an annoying outline of the displayed page using dashes and exclamation points, with pluses for tab stops. This is the only word processor besides Word Star that allows typing beyond the 80th column. The editor is very line-oriented — the screen display, even though I have an 80-column version, does not wrap unless a special command is given. There is no provision for setting the left and right margins on the screen. The text can't be rejustified on the screen to see what the document looks like.

There is a noticible delay while changing from "Edit" to "Format" (the formatting program which actually does the printing, to either screen or printer, using embedded printer commands). Also, the system disk must be in the default drive in order to switch programs. Either every text disk must have a copy of Pie on it, or you need two drives.

The 80-column version used the Smarterm and worked quickly with scrolling and cursor movement. The 40-column version allows lower-case adapters and shift key modifications. In the 40-column mode, the word wrap is not too useful as the printout will exceed that length in most cases.

The keyboard function keys are designed in logical groupings of cursor and scroll movements, character and word movement, find and replace, etc. Unfortunately, this means that the key letters have nothing to do with the function and are therefore hard to learn. Also, the forward key doesn't move the cursor forward, and the backward key, while it does move the cursor backwards, deletes letters as it goes.

While Pie is a good line-oriented word processor and is copyable, it is hard to learn, and does not display what will be printed.

ScreenWriter][— A Professional Word Processing System
On-Line Systems; 36575 Mudge Ranch Road; Coarsegold, CA 93614

This is a full-featured word processor that doesn't recognize any hardware modifications to the Apple, except the shift key mod. It prints upper/lower case letters on the hi-res screen. In 40-column mode it is the best implementation of this that I have seen. The letters are clear and the scrolling/line movement smooth and fast. In 70-column mode, while the scrolling is still fast, if you have any dexterity at all, you will type quite a distance ahead of the program. It appears to have about a 120-character type-ahead buffer, but you don't have to be very fast to overflow it. The letters are fairly illegible on the 70-column screen, and I wouldn't want to have to work with it for very long.The program prints carriage returns on the screen, the tab stops work similarly to Apple Writer, and it is difficult to view columnar material.

The documentation is well written, including a 187-page reference manual with complete index and two quick reference cards, one for the most generally used functions and the other very complete. You also receive two protected master diskettes.

The program is in two pieces, which requires on-line master disk unless you have a RAM card. In this case the printer program is loaded there so that you can call it without disk access. The printer program uses imbedded printer commands for margins, justification, etc., so that on-screen display is not indicative of the final result.

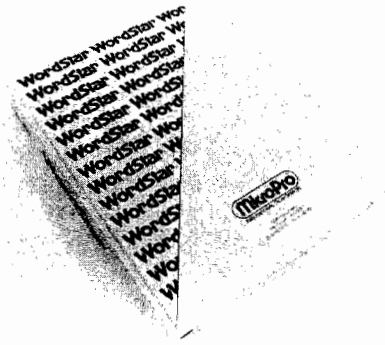
In addition to all the standard functions, Screen Writer will do print spooling with certain interface/printer combinations, indexing, headers and footers, macros, form letters, and memory extension with your disk drive for super-large documents — up to 65,000 characters.

On-Line Systems also sells a data base, The General Manager, and a spelling checker, The Dic-tionary separately.

Zardax — Word Processor
Computer Solutions; P.O. Box 397; Mt. Gravatt, Q4122; Australia

This sophisticated word processor is versatile and adapts to most hardware configurations. If you don't have any lower-case modification, it uses a clear, fast high-resolution, 40-column mode. It recognizes most 80-column cards and utilizes a RAM card if one is available. Maximum file size increases proportionately with this additional hardware.

Zardax comes with two copy-protected disks, a 194-page user manual and a double-size complete reference card which must be removed from the manual. The documentation is excellent and clearly written for a novice user. A shift key modification is included that uses a DIP socket for an IC so that the game port can still be used for paddles. The SETUP configuration program cleverly determines what type of shift modification you have, allowing great flexibility in this area.



The 40-column mode, of course, doesn't display the final output: however, neither does the 80-column mode. In fact, Zardax doesn't do word wrap, its major flaw from my view. It does have the easiest document preview of the group. By typing "ESCape V", the document is scrolled on the screen with the printers parameters in force, where possible.

In addition to all the standard word processing functions, which use common names for easy remembering, Zardax will do headers and footers, conditional pages, single, double, and one and one-half spacing, sub- and superscripts, underlining (on-screen for 40-mode), and multiple document printing, either on-screen or on the printer. Zardax is very good except for the lack of on-screen formatting.

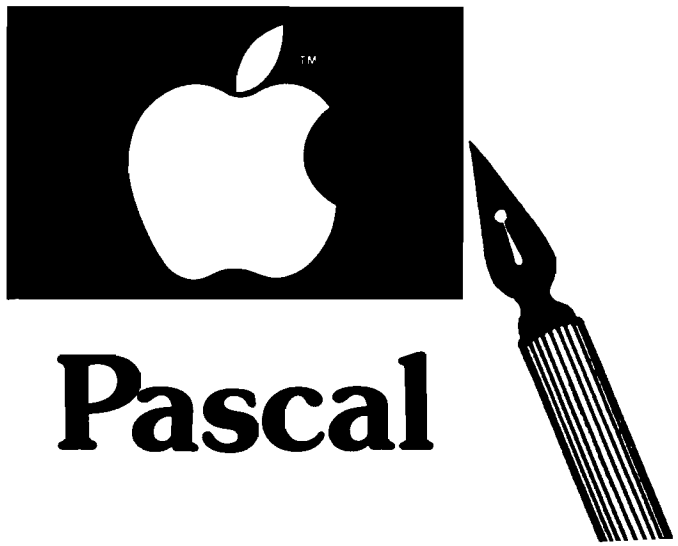
WordStar — Version 3.01P
MicroPro International Corp.; 1299 4th Street; San Rafael, CA 94901

WordStar is the Mercedes of the word processing industry. If you do a lot of word processing, you can't afford not to have it. If you only do a little word processing, you probably can't justify its price. At the Applefest in Boston, WordStar was being bundled with a free PCPI Appli-Card, a Z-80 board with 64K on-board RAM, making it a much better buy. It recognizes most 80-columns cards and a 16K RAM card is advised with a regular Z-80 card.

In addition to the mammoth reference manual, over 200 8 1/2 x 11 pages, you receive a Training Guide of 75 pages, a complete command card, and a copyable program disk. The documentation is the most complete I

(Continued on page 119)

Word Processing with Apple Pascal



by Richard Marmon and Donna Marmon

The Apple Pascal Language System Editor, while very powerful, falls short of providing full word-processing capabilities. This article describes a program you can add to your system to supply the missing features.

The Apple Pascal Editor, Version 1.1, provides many features normally associated with word processing. In addition to being a powerful text editor with many text modification commands available, it provides several formatting features like upper/lower-case capability, line centering, margins, paragraph indentation, and word wrap.

If you have tried to use the Editor for word processing, however, you've probably been frustrated by its limitations. Unfortunately, the Editor cannot provide a number of the capabilities that are absolutely essential for letter and document production. It cannot do paging, page numbering, or titling, for example. Also it cannot do right justification of text for that neat professional look or underlining for emphasis. Even something as simple as double-spaced printing is impossible.

But the most serious limitation of the Pascal Editor is its refusal to allow you to embed control characters and escape-character sequences in your text. This completely prohibits you from utilizing the power and flexibility of today's modern printers. The Epson MX-80 with Graftrax, for instance, has a total of 24 different typestyles. But the Editor doesn't allow you to change typestyles in the middle of a document, so the full power of this printer is lost. About the best you can do with the Editor alone is to set your printer to the single typeface in which you want your whole document printed, and use the Transfer command of the Filer to print your Editor file. Still, the Editor is useful for text editing. It seems a shame to spend nearly $100 to buy a word processor that overcomes the Editor's limitations but also provides all of the same features your Editor already has.

Word Processing requires:

Apple II with Pascal Language System

With PFORM, you can produce attractive documents using the Apple Pascal System. PFORM overcomes the Editor's limitations mentioned earlier and gives you full access to the flexibility of your printer. Combined with the Pascal Editor, PFORM gives you a word processor that is suitable for many document-production applications. The program operates with simple commands you insert in your Editor file. Then, instead of using the Filer to print your file, you use PFORM to print it. As an example, figure 1 is a sample of normal Editor text printed with the Filer. Figure 2 shows what can be done with PFORM. The printer we used is the Epson MX-80 with Graftrax, but any printer may be used with the program.

Preparing Your Text File

PFORM recognizes various command sequences embedded in your Editor file. To prepare a file for PFORM, simply enter your text as usual using the Editor. In addition, enter the command sequences described below into your file to obtain the formatting features you want. When you're done, save this file using any name you want; this is the file PFORM will use to print your document.

PFORM Command Sequences

Unless otherwise noted, these command sequences may be entered anywhere in a line or on a line by themselves. Figure 3 is a Filer print of the Editor text, which PFORM used to print the text shown in figure 2. Use it as a guide to preparing text for PFORM.

%P — Page Eject: The printer goes to top of form after the line in which the %P appears is printed.

(Continued on page 33)

PASCAL DISK QTILITY

PDQ is a Pascal Disk utility that allows you to do almost anything to any Pascal program—examine, change, modify, assemble and disassemble.

The PDQ Editor will let you read and change any information on a disk, or in memory, byte by byte. Its Mapper is an extraordinary tool, as it will show you in detail all the information in the codefile... yours or in other Pascal programs. The Disassembler lets you see how the compiler implements Pascal statements. It does this by taking the p-code produced by the compiler (or our assembler) and produces a mnemonic source listing of the code. In addition, if it encounters 6502 code it will automatically start disassembling 6502 machine language. PDQ's P-code Assembler converts those p-code mnemonics and pseudo-ops into p-code...and makes it easy for you to start writing your own p-code programs.

If you're into Pascal, PDQ lets you really get into Pascal ... in ways you never dreamed of. **$49.95.**

B-FAST

B-FAST (short for Btree File Accessing and Sorting Technique) is a file indexing utility designed in Pascal, for Pascal. Which means it is compact and extremely fast.

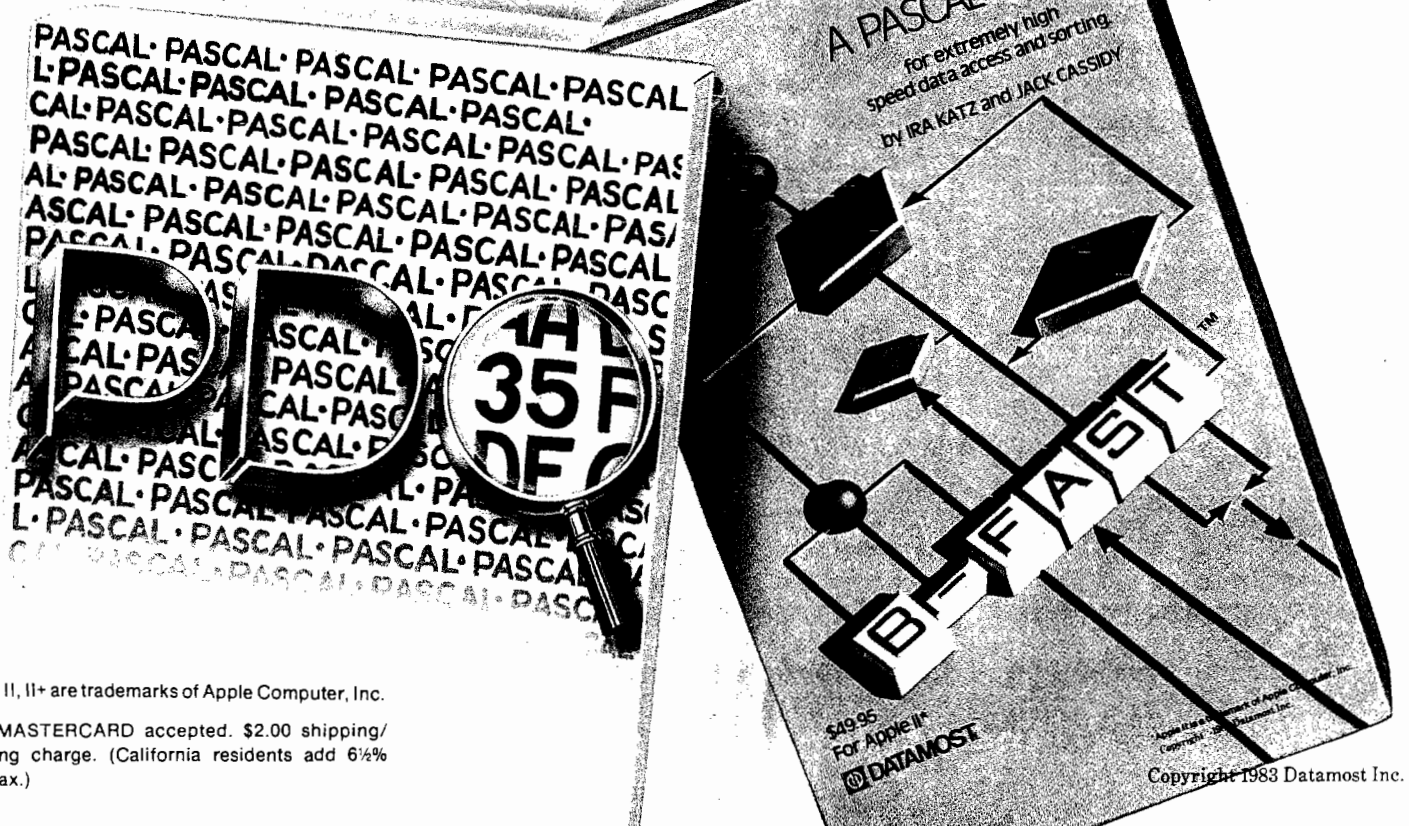
B-FAST provides up to 10 active Btrees, with up to 32,000 items per Btree! Yet, it can retrieve any record in under one second. And whenever required, it will automatically do a generic search to locate the equal or next higher record. To make it even more useful B-FAST allows you to go forward or backward through a Btree, or to its start or end. And if you "overstuff" a particular Btree and it explodes, there's no need to worry, we've included a special Recover program that saves the day and the data! There's a lot more utility to B-FAST, and it's all explained in the comprehensive and conversational documentation. **$49.95.**

DATAMOST
8943 Fullbright Ave., Chatsworth, CA 91311
(213) 709-1202

The very fact that you're into Pascal puts you a step ahead of the regular Apple II or II+* user. Now ... here are 2 software utilities to put you many steps ahead in Pascal programming.

These are our Quick 'n Change artists—one to tremendously enhance the speed of file accessing and sorting, and the other to let you get inside and change or modify Pascal programs byte by byte.

2 New Pascal Performers



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VISA/MASTERCARD accepted. $2.00 shipping/handling charge. (California residents add 6½% sales tax.)

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TAC

Tactical Armor Combat

One last tug to the helmet strap—a reassuring glance at the line of powerful steel monsters and you know all is ready. From your command hatch you raise your hand and order "forward"! The air suddenly fills with the roar of engines and the rumble of treads, as the mighty dreadnaughts of the land start forward. You command a team of your country's finest armored vehicles in a mission to search and destroy the enemy.

T.A.C. is a game of World War II tactical armored combat. **You** pick a nation (from among the four major combatants—Britain, U.S.A., Germany and Russia). **You** build a combat team from their most powerful tanks, assault guns and tank destroyers. **You** command the team you've created in major operations against like forces of the enemy.

All the famous vehicles of the second world war are here—Tigers, Panthers, Shermans and JS II's; Jagdpanthers, SU 152's, Fireflies and T 34's, just to name a few. They have all been thoroughly researched and their important features programmed into the game. Each vehicle is distinguished by such elements as armor thickness (rear and flanks as well as front), fire power, speed, acceleration and gun traverse. Even minor points like fuel tank location can be critical.

The computer handles all the technical details. This lets you concentrate on making the same kinds of decisions the real-life tank commanders made. You search for the enemy, set your speed, aim your gun and knock out the enemy. The computer will handle all the rest.

Here are [illegible]

- **T.A.C.** [illegible] a two-player [illegible] mediator.
- The most important armored vehicles of Britain, Russia, U.S. and Germany are available to command—40 in all.
- Choose from five different scenarios to play. Actions range from open meeting engagements to assaults against prepared positions.
- You pick the sides. You choose the weapons. A simple purchasing system has been provided to let you "buy" what you want in balance with your opponent.
- The results of combat are determined by the computer. It factors such critical elements as range, armor thickness (front, rear and flanks), tracking time, the speed and maneuvers of both the firing and target units, visibility and weapon adjustment to determine weapon accuracy.
- Special options include hidden movement, improved positions, smoke mortars, minefields, close assaults, overruns and indirect fire.

T.A.C. on diskette retails for $40.00 and can be played on the following computers: Apple® II's with 48K (Mockingboard™ Sound Enhanced!), Atari's® with 48K. Commodore® & IBM® versions coming this fall.

BY RALPH BOSSON

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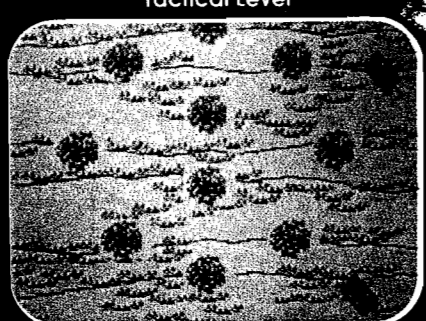
Tactical Level



Strategic Level

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%Tcharacter string — Title Set: The character string following the %T will be used as a title on all page headers or footers following the command. A title is never printed on page 1. If the page number is printed on the bottom of the page, then the title is printed on the top and *vice versa*. More than one %T command can be used in a document to produce section headings. This command must appear on a line by itself.

%R — Right Justification On: All subsequent text is space-filled to the right margin.

%N — Right Justification Off: Space-filling to the right margin is turned off for all subsequent text.

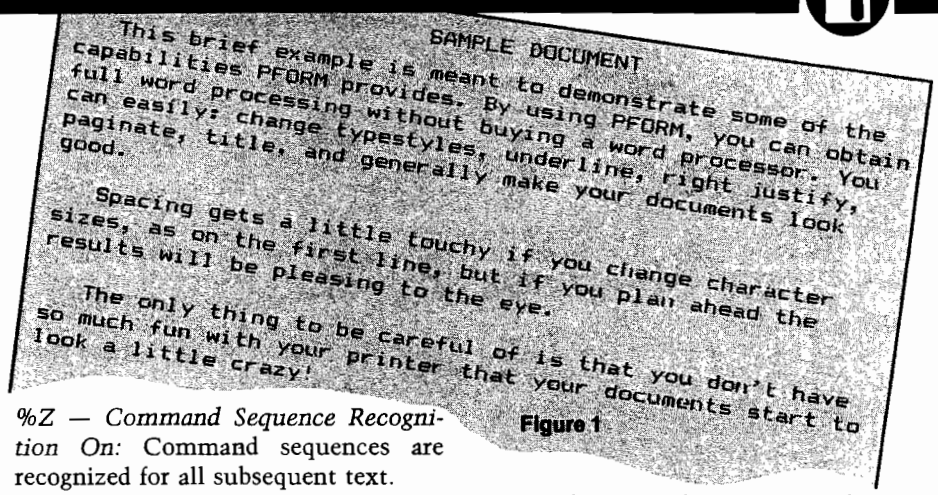
%U — Underlining On: All subsequent text is underlined.

%V — Underlining Off: Underlining for all subsequent text is turned off. If this command is not given by the end of line, it will be terminated then.

!character string! — Escape Sequence: An escape character is sent to the printer, followed by the characters in the character string up to the next ! character. If there is not another ! by the end of line, the command is terminated then. The action of this command varies according to the printer, but typically it is used to change typestyles.

?character string? — Control Sequence: All characters in the character string are turned into control characters and sent to the printer. The action of a control character on the printer varies according to the printer, but generally it is used to change type size or style. The command is terminated by a ? or end of line.

%X — Command Sequence Recognition Off: All subsequent command sequences are not recognized as such, except the %Z command, which is always recognized. This command is used for special-purpose documents, such as program listings or this article, where the command sequences are part of the text to be printed.


SAMPLE DOCUMENT

This brief example is meant to demonstrate some of the capabilities PFORM provides. By using PFORM, you can obtain full word processing without buying a word processor. You can easily: change typestyles, underline, right justify, paginate, title, and generally make your documents look good.

Spacing gets a little touchy if you change character sizes, as on the first line, but if you plan ahead the results will be pleasing to the eye.

The only thing to be careful of is that you don't have so much fun with your printer that your documents start to look a little crazy!

Figure 1

%Z — Command Sequence Recognition On: Command sequences are recognized for all subsequent text.

If the command characters (percent, question mark, and exclamation point) are followed by a space in the text, they will not be recognized as commands. In addition, if the percent symbol is followed by anything except P, T, R, N, U, V, X, or Z, those characters will not be recognized as commands. This facilitates normal text use of these symbols. The default conditions at the beginning of any new document are as follows: no title, right justification off, underlining off, and command sequence recognition on.

Executing the Program

After you've entered and compiled PFORM, Xecute it; the program will be read from disk and executed. You will be asked the following questions. (Before answering any of them, make sure the disk containing the text file you want to print is inserted in any disk drive.)

FILE NAME TO PRINT? — Type the full file name including the volume name and extension. If you make a mistake, a beep will sound and you will be asked the question again.

SPACING (S OR D)? — Type S for single spacing or D for double spacing.

RIGHT MARGIN? — Type the column number you wish to be your right margin. Normally, this will be the same one you used to create your document using the Editor. This is used for right justification.

LINES PER PAGE? — type the number of lines you wish to see printed per page.

PAGE NUMBERS (T, B, OR N)? — Type T for top page numbers, B for bottom page numbers, or N for no page numbers.

STARTING PAGE NUMBER? — You will see this question only if you answered T or B to the previous question. Type the beginning number you want in your page-numbering scheme. If you type anything other than 1, that number will appear on the very first page printed. If you type 1, the first page will not be numbered but all other pages will be, starting with 2. This capability enables you to print documents longer than the Editor capacity.

NUMBER OF COPIES? — Type the number of copies of this document you wish printed.

Program Operation

Following the question/answer sequence, your text file will be read from disk and printed according to the answers you gave to the questions and the PFORM commands embedded in your text. The printing is somewhat slow due to the processing involved, but the results are worth the wait. After all copies have been printed you are asked PRINT ANOTHER FILE? Type Y to start the question sequence again; type N to end the program.

PFORM Logic Description

The main program consists of five embedded repeat loops — one executing for each document, copy, page, line, and character of your text. The document loop is controlled by the variable TURNOFF. It starts by opening the printer, setting the page number to the default of 1, and executing the question/answer sequence. The copies loop then begins, controlled by the variable NCOPY. This loop sets the default conditions for the document and then falls into the page loop. The

(Continued on next page)

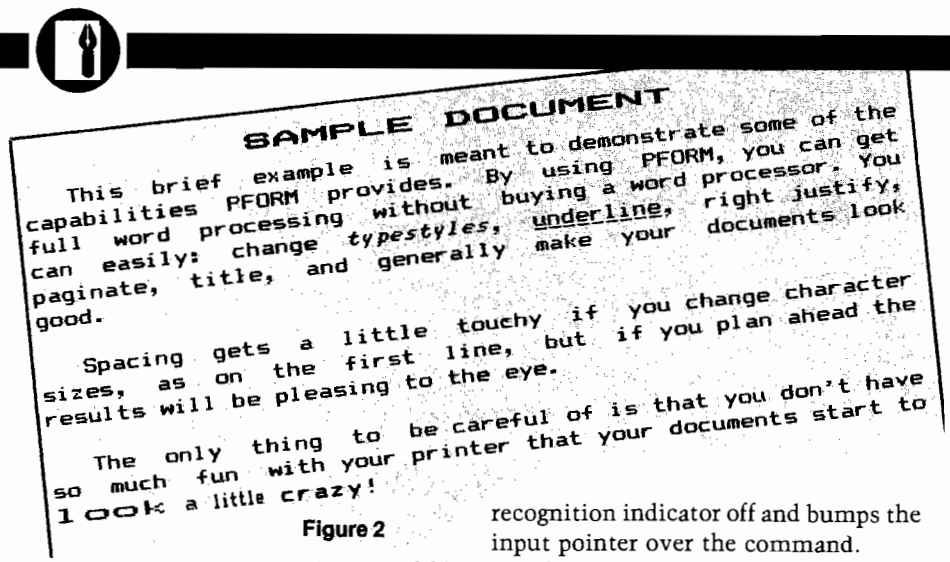


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Figure 2

page loop, controlled by the end-of-file condition, sets the line count to zero, prints the page number or title if necessary, and falls into the line loop. Controlled by the variable LINCNT, the line loop initializes some variables and reads a line of text.

The character loop, controlled by I (the index of the character being looked at), then begins. Each character is examined. If the character is not the beginning of a PFORM command, it is put into the output string; otherwise the appropriate procedure handling the command is executed. When a text character is placed into the output buffer, underlining characters follow it if appropriate. When all characters of the line have been looked at, the character loop ends. Right justification of the output line is performed if necessary and the line is printed. Then the line count is incremented. If the eject command appeared in the line, the printer spaces to the bottom of the page. When all lines of the page have been printed, the line loop ends. The page number or title is printed if necessary, and a form feed is sent to the printer.

When the whole file has been printed, the page loop ends. The printer is sent a form feed, the screen is cleared, NCOPY is decremented, and the text file is closed. It is reopened if another copy is to be printed. When all copies have been printed, you are asked PRINT ANOTHER FILE? Y continues the document loop, N ends it. When the document loop ends, the printer is closed, the screen is cleared, and the program ends.

The INITSEQ procedure conducts the initial question/answer sequence and sets variables based on the answers. The RECON procedure sets the command sequence recognition indicator on and bumps the input pointer over the command. The RECOFF command sets the command sequence recognition indicator off and bumps the input pointer over the command.

The SEJECT procedure sets the page eject indicator on and bumps the input pointer over the command. The RJON procedure sets the right justification indicator on and bumps the input pointer over the command. The RJOFF procedure sets the right justification indicator off and bumps the input pointer over the command. The SUON procedure sets the underlining indicator on and bumps the input pointer over the command. The SUOFF procedure sets the underlining indicator off and bumps the input pointer over the command.

The SESC procedure puts an escape character into the output buffer followed by all characters in the input buffer up to the next ! or end of line. The input and output pointers are bumped appropriately. The SCONTR procedure turns all characters between the first question mark delimiter and the next one (or end of line) into control characters by subtracting 64 from the ASCII value of each and puts them in the output buffer. The input and output pointers are bumped appropriately. The USEQ procedure puts a backspace character followed by an underline character into the output buffer. The output pointer is then bumped by two. The ESEQ procedure skips to the bottom of a page by printing the correct number of blank lines. The STITLE procedure puts all characters after the command sequence and up to the end of the line into TSTRING, which is then used as the title for all subsequent headers or footers.

The PPRINT procedure prints the page number either preceded or followed by two blank lines, depending on whether the number is printed at the bottom or top of the page. The line count is then bumped by three. The TPRINT procedure prints the characters in TSTRING either preceded or followed by two blank lines, depending on whether a footer or a header is being printed. The line count is then bumped by three. The RJUST procedure right fills the output line before it is printed. As characters are put in the output buffer in the main program, COUNT accumulates how many have gone in exclusive of control, escape, and underlining sequences. The number of spaces needed to fill to the right margin is computed and the spaces are then inserted evenly between the words in the line. The last line of a paragraph is sensed by a period at the end of the line and at least nine spaces needed to be inserted. Such a line is not right justified.

Summary

You'll need some practice in order to familiarize yourself with all the features the program provides and to get used to inserting the proper command sequences in your Editor text. However, in no time at all you will have professional looking documents that use all the features your printer has to offer. We've found that PFORM provides all the features we need in our work; we hope you'll have the same experience. And you can't beat the price!

You may contact the authors at
1118 Michelle Pkwy., Papillion, NE 68046

(Listings begin on page 36)

```
!E!!G!?N?SAMPLE DOCUMENT?T?!H!

%RThis brief example is meant to demonstrate some of the
capabilities PFORM provides. By using PFORM, you can get
full word processing without buying a word processor. You
can easily: change !4!typestyles!5!, %Uunderline%V, right
justify, paginate, title, and generally make your documents
look good.

   Spacing gets a little touchy if you change character
sizes, as on the first line, but if you plan ahead the
results will be pleasing to the eye.

   The only thing to be careful of is that you don't have
so much fun with your printer that your documents start to
%N!F!!G!!S!look!T! a !P!little!Q! ?ON?crazy! ?RT?!H!!E!
```

Figure 3

ADVENTURE.
THE KEY IS YOUR COMPUTER

KONGO KONG

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PFORM Program Listing

```
{$I-}
{$R-}
PROGRAM PFORM;
{This program performs print formatting of}
{a PASCAL Editor File. This program along}
{with the editor provides the features}
{of a full Word Processor. It does not}
{duplicate features already available in}
{the PASCAL text editor.}

VAR FNAME,PG:STRING;
    FBUF,PBUF,TSTRING:STRING[255];
    DFILE:TEXT;
    SPACE,PTYPE,ANSWER:CHAR;
    TNUM,COUNT,PLIN,LINES,PNUM,NCOPY,LINCNT,I,J,K,LCHARS:INTEGER;
    RECOG,EX,TURNOFF,TITLE,EJECT,ULIN,RJ:BOOLEAN;
    PRTR:INTERACTIVE;

PROCEDURE INITSEQ;
{THIS ROUTINE CONDUCTS THE INITIAL QUESTION-ANSWER SEQUENCE}
  BEGIN
    PAGE(OUTPUT);
    WRITE('FILE NAME TO PRINT? ');
    READLN(FNAME);
    RESET(DFILE,FNAME);
    WHILE IORESULT>Ø DO
      BEGIN
        WRITE(CHR(7),'FILE NAME TO PRINT? ');
        READLN(FNAME);
        RESET(DFILE,FNAME);
      END;
    WRITE('SPACING (S OR D)? ');
    READLN(SPACE);
    WRITE('RIGHT MARGIN? ');
    READLN(LCHARS);
    WRITE('LINES PER PAGE? ');
    READLN(LINES);
    WRITE('PAGE NUMBERS (T,B, OR N)? ');
    READLN(PTYPE);
    IF PTYPE <> 'N' THEN
      BEGIN
        WRITE('STARTING PAGE NUMBER? ');
        READLN(TNUM);
        LINES:=LINES-3;
      END;
    WRITE('NUMBER OF COPIES? ');
    READLN(NCOPY);
  END;

PROCEDURE RECON;
{THIS PROCEDURE SETS THE %?! RECOGNITION INDICATOR ON}
  BEGIN
    EX:=TRUE;
    RECOG:=TRUE;
    I:=I+2;
  END;

PROCEDURE RECOFF;
{THIS PROCEDURE SETS THE %?! RECOGNITION INDICATOR OFF}
  BEGIN
    EX:=TRUE;
    RECOG:=FALSE;
    I:=I+2;
  END;

PROCEDURE SEJECT;
{SETS THE PAGE EJECT INDICATOR TRUE}
  BEGIN
    EX:=TRUE;
    EJECT:=TRUE;
    I:=I+2;
  END;

PROCEDURE RJON;
{SETS THE RIGHT JUSTIFICATION INDICATOR ON}
  BEGIN
    EX:=TRUE;
    RJ:=TRUE;
    I:=I+2;
  END;

PROCEDURE RJOFF;
{SETS THE RIGHT JUSTIFICATION INDICATOR OFF}
  BEGIN
    EX:=TRUE;
    RJ:=FALSE;
```

(continued)

PFORM Program Listing *(continued)*

```
    I:=I+2;
  END;

PROCEDURE SUON;
{SETS THE UNDERLINING INDICATOR ON}
  BEGIN
    EX:=TRUE;
    ULIN:=TRUE;
    I:=I+2;
  END;

PROCEDURE SUOFF;
{SETS THE UNDERLINING INDICATOR OFF}
  BEGIN
    EX:=TRUE;
    ULIN:=FALSE;
    I:=I+2;
  END;

PROCEDURE SESC;
  {PUTS AN ESCAPE CHARACTER IN PBUF FOLLOWED BY ALL}
  {CHARACTERS UP TO THE NEXT ! OR END OF LINE}
  BEGIN
    EX:=TRUE;
    I:=I+1; PBUF:=CONCAT(PBUF,' '); PBUF[J]:=CHR(27); J:=J+1;
    REPEAT
      PBUF:=CONCAT(PBUF,' ');
      PBUF[J]:=FBUF[I];
      I:=I+1;
      J:=J+1;
    UNTIL (I>LENGTH(FBUF)) OR (FBUF[I]='!');
    I:=I+1;
  END;

PROCEDURE SCONTR;
  {TURNS ALL CHARACTERS UP TO THE NEXT ? OR END OF LINE}
  {INTO CONTROL CHARACTERS BY SUBTRACTING 64 , AND}
  {PUTS THEM IN PBUF}
  BEGIN
    EX:=TRUE;
    I:=I+1;
    REPEAT
      PBUF:=CONCAT(PBUF,' ');
      PBUF[J]:=CHR(ORD(FBUF[I])-64);
      I:=I+1;
      J:=J+1;
    UNTIL (I>LENGTH(FBUF)) OR (FBUF[I]='?');
    I:=I+1;
  END;

BEGIN {MAIN PROGRAM}
TURNOFF:=FALSE;
REPEAT {DOCUMENT LOOP}
  REWRITE(PRTR,'PRINTER:');
  TNUM:=1;
  INITSEQ;
  REPEAT {COPIES LOOP}
    RECOG:=TRUE;
    RJ:=FALSE; PNUM:=TNUM;
    TITLE:=FALSE; PLIN:=LINES;
    REPEAT {PAGE LOOP}
      LINCNT:=Ø;
      IF PNUM>1 THEN
        BEGIN
          IF PTYPE='T' THEN PPRINT
           ELSE IF TITLE THEN TPRINT;
        END;
      EJECT:=FALSE;
      REPEAT {LINE LOOP}
        COUNT:=Ø;
        FBUF:='';
        PBUF:='';
        ULIN:=FALSE;
        READLN(DFILE,FBUF);
        IF LENGTH(FBUF)=Ø THEN FBUF:=CONCAT(FBUF,' ');
        I:=1; J:=1;
        REPEAT {CHARACTER LOOP}
          EX:=FALSE;
          IF I<LENGTH(FBUF) THEN
            CASE FBUF[I] OF
              '%': CASE FBUF[I+1] OF
                     'P': IF RECOG THEN SEJECT;
                     'T': IF RECOG THEN STITLE;
                     'R': IF RECOG THEN RJON;
                     'N': IF RECOG THEN RJOFF;
                     'U': IF RECOG THEN SUON;
                     'V': IF RECOG THEN SUOFF;
```

(continued)

PFORM Program Listing *(continued)*

```
                    'X': IF RECOG THEN RECOFF;
                    'Z': RECON;
                  END;
              '!': IF (FBUF[I+1]<>' ') AND (RECOG) THEN SESC;
              '?': IF (FBUF[I+1]<>' ') AND (RECOG) THEN SCONTR;
            END;
          IF EX=FALSE THEN
            BEGIN
              PBUF:=CONCAT(PBUF,' ');
              PBUF[J]:=FBUF[I];
              COUNT:=COUNT+1;
              J:=J+1;
              I:=I+1;
              IF ULIN THEN USEQ;
            END;
        UNTIL I>LENGTH(FBUF);
        IF RJ THEN RJUST;
        WRITELN(PRTR,PBUF);
        LINCNT:=LINCNT+1;
        IF SPACE='D' THEN
          BEGIN
            WRITELN(PRTR,' ');
            LINCNT:=LINCNT+1;
          END;
        IF EJECT THEN ESEQ;
        IF EOF(DFILE) THEN ESEQ;
      UNTIL LINCNT=PLIN;
      IF (PTYPE='B') AND (PNUM>1) THEN PPRINT
       ELSE
        IF PNUM>1 THEN IF TITLE THEN TPRINT;
      PAGE(PRTR);
      IF PNUM=1 THEN PNUM:=2;
    UNTIL EOF(DFILE);
    PAGE(OUTPUT);
    PAGE(PRTR);
    NCOPY:=NCOPY-1;
    CLOSE(DFILE);
    IF NCOPY>Ø THEN RESET(DFILE,FNAME);
  UNTIL NCOPY=Ø;
  WRITE('PRINT ANOTHER FILE? ');
  READLN(ANSWER);
  IF ANSWER='N' THEN TURNOFF:=TRUE;
UNTIL TURNOFF=TRUE;
CLOSE(PRTR);
PAGE(OUTPUT);
END.

PROCEDURE USEQ;
{PUTS A BACKSPACE CHARACTER FOLLOWED BY AN UNDERLINE}
{CHARACTER INTO PBUF}
  BEGIN
    PBUF:=CONCAT(PBUF,'  ');
    PBUF[J]:=CHR(8);
    PBUF[J+1]:=CHR(95);
    J:=J+2;
  END;

PROCEDURE ESEQ;
{PRINTS BLANK LINES TO SPACE TO THE BOTTOM OF A PAGE}
{WHERE A PAGE NUMBER OR TITLE MAY BE PRINTED}
  BEGIN
    WHILE LINCNT<PLIN DO
      BEGIN
        WRITELN(PRTR,' ');
        LINCNT:=LINCNT+1;
      END;
  END;

PROCEDURE STITLE;
{PUTS CHARACTERS UP TO END OF LINE IN TSTRING AND}
{SETS TITLE INDICATOR ON}
  BEGIN
    TSTRING:='';
    EX:=TRUE;
    I:=I+2; K:=1;
    REPEAT
      TSTRING:=CONCAT(TSTRING,' ');
      TSTRING[K]:=FBUF[I];
      I:=I+1; K:=K+1;
    UNTIL I>LENGTH(FBUF);
    TITLE:=TRUE;
    PLIN:=PLIN-3;
  END;

PROCEDURE PPRINT;
{PRINTS PAGE NUMBER}
VAR SPC,I:INTEGER;
```

(continued)

PFORM Program Listing *(continued)*

```
      BEGIN
        IF PTYPE='B' THEN
      BEGIN
        WRITELN(PRTR,' ');
        WRITELN(PRTR,' ');
      END;
    IF PNUM<100 THEN SPC:=40
     ELSE SPC:=39;
    FOR I:=1 TO SPC DO
      WRITE(PRTR,' ');
    WRITELN(PRTR,PNUM);
    PNUM:=PNUM+1;
    IF PTYPE='T' THEN
      BEGIN
        WRITELN(PRTR,' ');
        WRITELN(PRTR,' ');
        LINCNT:=LINCNT+3;
      END;
  END;

PROCEDURE TPRINT;
{PRINTS TITLE}
VAR I,SPC:INTEGER;
  BEGIN
    IF PTYPE='T' THEN
      BEGIN
        WRITELN(PRTR,' ');
        WRITELN(PRTR,' ');
      END;
    SPC:=(80-LENGTH(TSTRING)) DIV 2;
    FOR I:=1 TO SPC DO
      WRITE(PRTR,' ');
    WRITELN(PRTR,TSTRING);
    IF PTYPE='B' THEN
      BEGIN
        WRITELN(PRTR,' ');
        WRITELN(PRTR,' ');
        LINCNT:=LINCNT+3;
      END;
  END;

PROCEDURE RJUST;
{PERFORMS RIGHT JUSTIFICATION OF PBUF}
VAR I,SPC,NEED,BIDX,FACT,REM,LOOP:INTEGER;
    JSTRING1,JSTRING:STRING;
  BEGIN
    JSTRING:=''; JSTRING1:=' ';
    IF COUNT=Ø THEN EXIT(RJUST);
    NEED:=LCHARS-COUNT; {CHAR. SPACES NEEDED}
    BIDX:=1; SPC:=Ø;
    WHILE (BIDX<LENGTH(FBUF)) AND (FBUF[BIDX]=' ') DO
      BIDX:=BIDX+1;
    IF BIDX=LENGTH(FBUF) THEN EXIT(RJUST);
    FOR I:=BIDX TO LENGTH(FBUF) DO
      IF FBUF[I]=' ' THEN SPC:=SPC+1;
    IF SPC=Ø THEN EXIT(RJUST)
     ELSE IF (FBUF[LENGTH(FBUF)]='.') AND (LENGTH(FBUF)<LCHARS-9)
            THEN EXIT(RJUST);
    FACT:=NEED DIV SPC;
    REM:=NEED MOD SPC;
    I:=Ø;
    LOOP:=FACT;
    WHILE LOOP>Ø DO
      BEGIN
        JSTRING:=CONCAT(JSTRING,' ');
        I:=I+1;
        LOOP:=LOOP-1;
      END;
    I:=LENGTH(PBUF);
    REPEAT
      WHILE PBUF[I]<>' ' DO
        I:=I-1;
      INSERT(JSTRING,PBUF,I);
      I:=I-1;
      SPC:=SPC-1;
    UNTIL SPC=Ø;
    IF REM=Ø THEN EXIT(RJUST);
    I:=BIDX;
    REPEAT
      WHILE PBUF[I]<>' ' DO
        I:=I+1;
      INSERT(JSTRING1,PBUF,I);
      I:=I+FACT+2;
      WHILE PBUF[I]=' ' DO
        I:=I+1;
      REM:=REM-1;
    UNTIL REM=Ø;
  END;
```

Dvorak Keyboard for Your Computer

by John R. Raines

The standard typewriter/computer keyboard layout is inefficient. This article presents a computer program that allows experimentation with the Dvorak Simplified Keyboard, which is much faster for touch typists.

Over 100 years ago, when typewriters were relatively new inventions and before the shift key had been invented, Christopher Sholes was faced with a problem: the keys, which returned sluggishly from hitting the paper, would often get jammed if the typist went too fast. Christopher's solution to the problem was the "qwerty" keyboard (named after the upper left-hand key arrangement), and is not a truly efficient keyboard.

In 1932 Dr. August Dvorak patented a keyboard that was human-engineered to speed up typists. Most typing speed records are held by typists who use the Dvorak Simplified Keyboard. Typing time may be reduced by up to 75%.

Everyone, myself included, is disinclined to change from the keyboard that he/she knows and owns. But consider how many hours are spent typing in the course of a year nationwide. How much would the conversion of all of the keyboards cost? How many hours would be lost in the course of retraining? Studies done 20 years ago suggested that the payoff comes long before one year is out.

While the cost of conversion of one privately owned keyboard used to be high, it has fallen drastically in some examples of modular keyboard design. In many cases only a single ROM needs replacing. Newer computers aimed at an international market are often designed with redefinition of the keyboard in mind.

Why is the Dvorak keyboard so much better than qwerty? (The analysis presumes you will be entering something like English text.) The most commonly used letters should be on the 'home' row of keys. Typing is faster if letters struck by the left hand alternate with letters struck by the right. The arrangement of keys should take into account the relative strengths and coordination of the fingers. The Dvorak keyboard systematically follows these tenets while the qwerty keyboard (rather haphazardly) does the contrary.

Basically the Dvorak layout puts vowels on the home row for the left hand. The most common punctuation marks (? , and .) are just above these keys and y is also in that row. Some of the less commonly used consonants fill out the left hand's duties. On the average the left hand does 45% of the total keystrokes, as opposed to 55% on

Modified Dvorak Keyboard as implemented by these programs
(Modified so that existing key caps can be used)

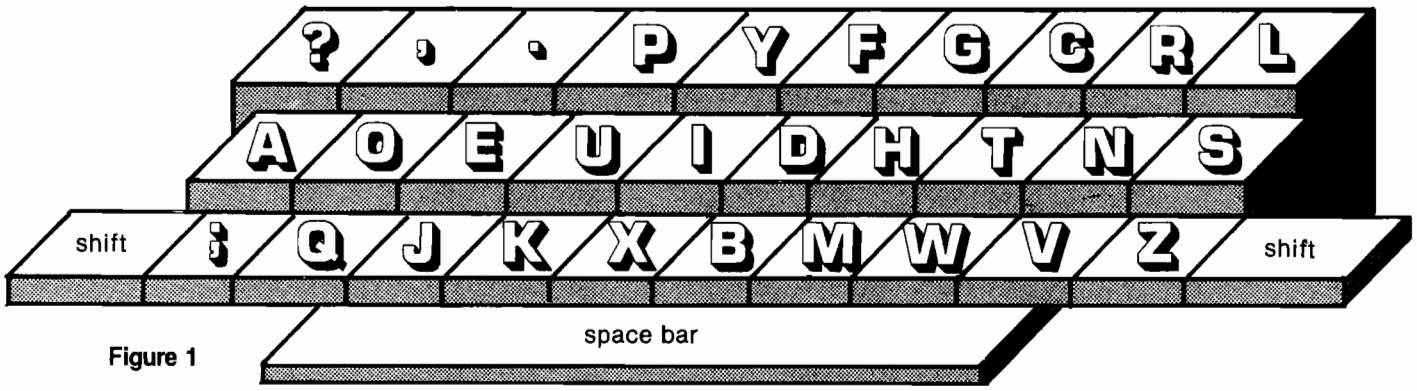


Figure 1

Dvorak Keyboard
requires: Apple II
could be modified to another 6502 machine

the qwerty keyboard. Since vowels and consonants tend to alternate, keystrokes will naturally alternate between the two hands. In the qwerty arrangement, 32% of the keystrokes are on the home row (50% are on the row above it!); in the Dvorak layout, 70% of the keystrokes fall on the home row.

In 1944 the U.S. Navy performed an experiment. For about 10 weeks 14 typists were retrained on the Dvorak keyboard and a control group was given some additional qwerty training. The Dvorak group improved their productivity by 74% and the total cost of their retraining was amortized 10 days after the test was finished. The control group improved by 28% but took twice as long to reach this level of improvement as the Dvorak group had taken. This seems to be a good measure of what the cost of retraining yourself will be.

Is the Dvorak Simplified Keyboard the best keyboard? Probably not. I've read of several ideas that may be better, none of which has been directly compared with Dvorak. However, not one of them can be implemented by rearranging the keys on a standard keyboard. Dvorak remains the best known of the improved keyboards and the documentation of its superiority is also better than the newer contenders.

A couple of years ago I read an article about a new keyboard. There was no close-up picture of the keyboard, but the basic idea was this: sit down, rest your hands in your lap, and cock your wrists up as in typing. Now draw a line through the fingertips of each hand. The lines will intersect at an angle since this is the position in which hands like to rest. The rectangular keyboard is more fatiguing than it needs to be, not only because the qwerty design puts more of the work on weaker and less dexterous fingers, but also simply because it *is* rectangular.

Michael Adler has designed a typing machine that allows comfortable use of the thumbs on the home row of keys and enlists the feet to operate the space, return, and shift. He argues that a pianist can hit keys at a rate that is equivalent to 300-400 words per minute.

Edward Montgomery has developed a more radical keyboard. Since fingers are better adapted to a wiping movement than poking at keys and then pulling the finger back again, it is feasible to design switches that are triggered by the capacitance of a finger (rather than depending on actual vertical movement or pressure). In addition, with a wiping movement it is possible to keep going and trigger a second or third key before stopping. By laying out the keys so that common words and two- and three-letter combinations occur adjacent to each other, the number of separate strokes can be cut by almost half.

I first read about keyboards better than qwerty 10 years ago. I was tempted to change keyboards at that time but I couldn't afford it, and it seemed impractical since I would certainly be typing on other people's computers in the future. Now it's less expensive to make the switch and I can probably count on being able to use the Dvorak keyboard exclusively for the foreseeable future.

As a result, I began to look at software solutions. These are necessarily less satisfactory than hardware solutions, at least on my BASIS 108 (an Apple-like machine with numerous improvements). The biggest problems are with the operation of the shift key and especially the effect of alpha shift lock (available on the BASIS). This is because certain punctuation marks (? , . ;) must be switched with letters when implementing the Dvorak keyboard. Alpha shift lock thus will capitalize the letters that fall where qwerty letters were, but it will capitalize some Dvorak punctuation keys and not capitalize a few letters (s, w, v, and z) that fall where the punctuation keys had been. Fortunately you don't need alpha shift lock often for word processing. The next problem is that if you are going to switch, you should switch completely. Every language, operating system, game, word processor, etc., should be affected.

My program can switch DOS, Integer, and Applesoft BASICs and the machine-code monitor. Any program that doesn't intefere with DOS's handling of the keyboard input will work. Unfortunately, PR#0 will undo the effect of this program (even if typed from the keyboard or sent to DOS *via* a PRINT with ctrl/D). Still more frustrating, editors and word processors necessarily disconnect DOS (so

(Continued on next page)

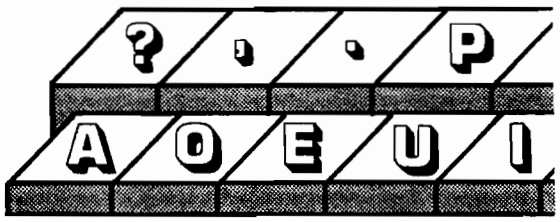
that typing "RUN DICK, RUN." doesn't make DOS load the BASIC program "DICK" over the word processor). Of course, the program is very simple and if you can find where your word processor calls the keyboard (check for references to $36 and to the hardware keyboard location, as well as the obvious monitor subroutines) and if your word processor's disk isn't locked and if you can find some free space, then you can probably convert it easily; and then you can convert your Pascal and CP/M systems, etc. CP/M-based word processors should be able to use CP/M for the keyboard input, but (at least on the Apple) WordStar patches CP/M to use a new keyboard routine of its own. My program is far from a panacea; however, it does let you try the Dvorak keyboard without spending any more money.

If you decide to switch to Dvorak, find out what is needed to put a new ROM in your keyboard. I haven't made a final decision, myself, and I don't yet have the expertise to tell you how to make the switch. There is some additional information on page 101 of the *Apple II Reference Manual*. I'm not familiar with the features of the Videx Keyboard and Display Enhancer, but it might be useful for the Apple owner to investigate these products before proceeding with a project like this.

This program is a half-measure. It does the most important part of the conversion to the Dvorak keyboard — the letters and the punctuation marks that have to be switched with letters. The full Dvorak keyboard also changes the location of the numbers (the top row reads: ! 7 5 3 1 9 0 2 4 6 8 =) and changes which punctuation marks go together (e.g., ? is a lower-case keystroke with : as its capitalized keystroke). The important benefits of the Dvorak keyboard should be apparent with this program.

The keys on the keyboard can be relabeled in one of two ways. You can rearrange the key caps (see figure 1). If you share your computer with others who are not interested in trying the Dvorak keyboard yet, then putting figure 1 near the keyboard may help. A better alternative might be to purchase (from a graphic arts supply store) a set of transfer lettering in either white or black and in a small size (e.g., 8-point)

Basically the Dvorak layout puts vowels on the home row for for the left hand. The most common punctuation marks are just above these keys. On the average the left hand does 45% of the total keystrokes.



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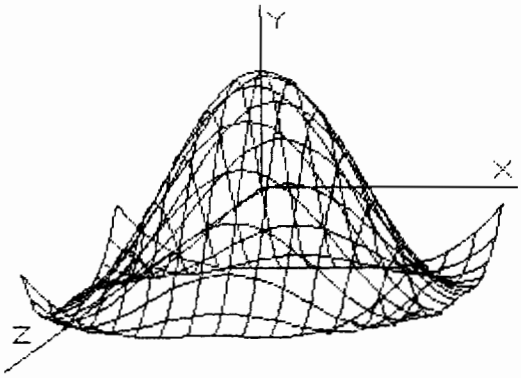

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Dvorak Keyboard Listing

```
*       APPLE ][ DVORAK KEYBOARD DEMO

                        START

                KEYIN   GEQU  $FD1B   MONITOR FINAL INPUT ROUTINE
                KSW     GEQU  $38     INPUT POINTER

                        ORG   $300

0014  0300 A90C INIT    LDA   #DVSTRT PATCH INPUT SUBROUTINE ADDRESS
0015  0302 8538         STA   KSW
0016  0304 A903         LDA   /DVSTRT
0017  0306 8539         STA   KSW+$1
0018  0308 20EA03       JSR   $3EA    CONNECT DOS
0019  030B 60           RTS

0021  030C 201BFD DVSTRT JSR   KEYIN
0022  030F C9AC         CMP   #$AC
0023  0311 300B         BMI   DONEIN  DON'T TRANSLATE
0024  0313 C9DB         CMP   #$DB     IF BELOW ',' IN ASCII
0025  0315 1007         BPL   DONEIN   OR ABOVE 'Z'
0026  0317 38       USETBL SEC         CHAR IS IN RANGE TO TRANSLATE
0027  0318 E9AC         SBC   #$AC
0028  031A A8           TAY
0029  031B B91F03       LDA   TABLE,Y GET DVORAK CHAR FROM TABLE
0030  031E 60       DONEIN RTS         ALL DONE, CHAR IN 'A' REG
0031  031F
0032  031F D7ADD6   TABLE  DC    H'D7ADD6DAB0B1B2B3B4B5B6B7B8B9BAD3'
      0322 DAB0B1
      0325 B2B3B4
      0328 B5B6B7
      032B B8B9BA
      032E D3
0033  032F BCBDBE         DC    H'BCBDBEBFC0C1D8CAC5AED5C9C4C3C8D4'
      0332 BFC0C1
      0335 D8CAC5
      0338 AED5C9
      033B C4C3C8
      033E D4
0034  033F CECDC2         DC    H'CECDC2D2CCAFD0CFD9C7CBACD1C6BBDB'
      0342 D2CCAF
      0345 D0CFD9
      0348 C7CBAC
      034B D1C6BB
      034E DB

                        END
```

and add extra labels to the keys in one corner. The adhesive on the transfer lettering is not permanent and the letters are so thin that they do not affect keyboard feel.

When the program is BRUN, it attaches itself to DOS as the input routine. The BASICs (and even the monitor) get input by first calling DOS (*via* the keyboard input pointer). DOS will then call my routine, which gets a single character *via* the usual monitor keyboard input routine. Then it translates the character to the character that would be at that location on the Dvorak keyboard. This is passed back to DOS and then to the higher-level monitor and BASIC code. The arrow keys still work because that happens after my translation.

The capital letter input is changed along with the (unshifted) punctuation marks that are interchanged with some of the letters. This is necessary because the effect of the shift key on most of the Apple II keys is undetectable. However, because the ctrl key can't be detected separately and because keys like the arrows and return can't be distinguished from ctrl plus various letters, I decided against translating the control keys. Basically you would have to change all the documentation of control keys if you wanted to use this as a permanent solution on the Apple II. A more permanent solution is to change the keyboard hardware.

Typing practice probably should not be haphazard. Exercises are usually devised for practicing a few new keystrokes at a time. Concentrate on developing a good rhythm, and remember that repetition is important. Although your old touch typing textbook isn't ideal (since it emphasizes the easy home row keys on the qwerty keyboard in the early lessons), it is probably superior to random exercises.

Letters to manufacturers of machines that concern you would help them to know of the interest in alternatives to the qwerty keyboard. It would be great if machines were available with either programmable or switch-selectable keyboard configurations! The manufacturers probably won't do it unless we urge them. Remember that the total time you save by reducing your manual input time may be greater than you could save by doubling the clock rate of your microprocessor. The value of a better keyboard layout will usually exceed that of a keyboard with a nicer feel. The expense of providing a second ROM and switch to choose between them is relatively small compared to the savings it could generate.

References

1. Parkinson, Robert, "The Dvorak Simplified Keyboard: Forty Years of Frustration," *Computers and Automation*, Nov. 1972, p. 18.
2. Montgomery, Edward, "Bringing Manual Input into the 20th Century: New Keyboard Concepts," *Computer* (IEEE), March, 1982, p. 11.
3. Lemmons, Phil, "A Short History of the Keyboard," *BYTE*, November, 1982, p. 386.

You may contact Mr. Raines at 2170 Wellesley, St. Paul, MN 55105.

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Typing practice probably should not be haphazard. Excerises are usually devised for practicing a few new keystrokes at a time. Concentrate on developing a good rhythm.

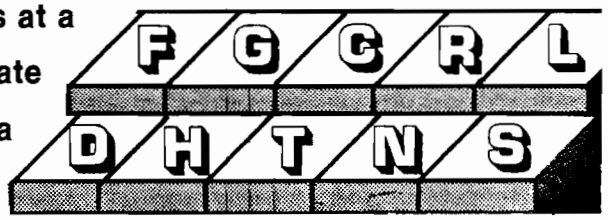

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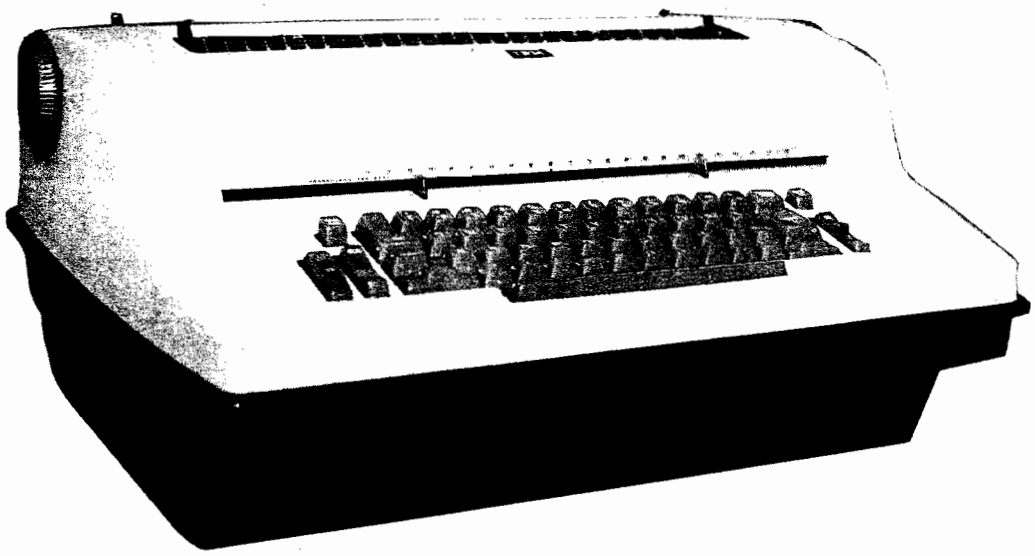
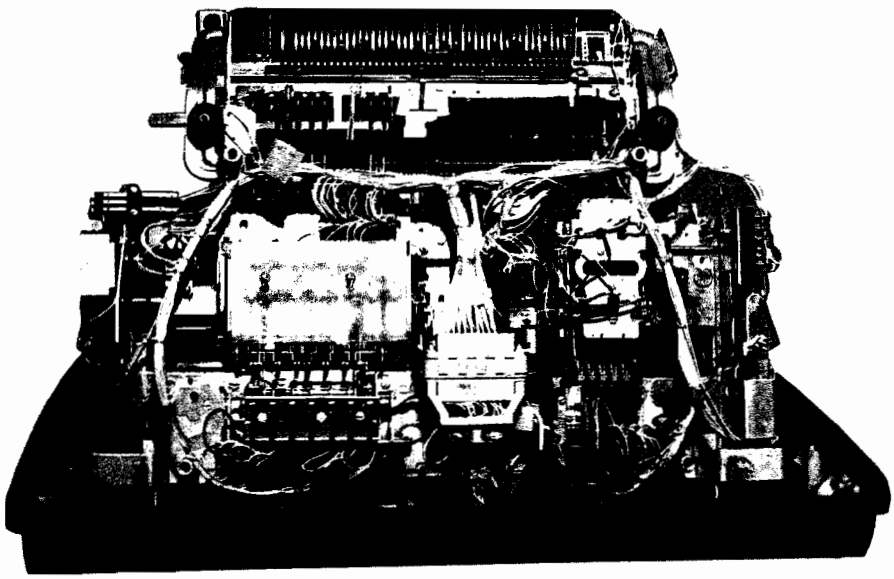
Figure 1: **The I/O Selectric Typewriter**



The Selectric Word Processor

by Louis F. Sander

This conversion program uses an IBM Selectric terminal to provide low-cost letter-quality printing to the home computerist.



The I/O Selectric, Interior View

In many ways, the IBM Selectric terminal makes an ideal letter-quality printer for the home computerist. It produces nice output at a modest price, and it serves double duty as an excellent electric typewriter for jobs not suited to computerization.

Adapting the Selectric to the computer is a rewarding task, made even more so by the challenge of making it work with the latest word processing software. Several articles on converting the hardware have appeared, but if they mention software at all, they provide only a rudimentary text processor. This article describes my personal adventures in finding a Selectric printer, converting it for computer use, interfacing it to my Commodore PET, and making it work with my full-featured commercial word processing software. With this article and those in the list of references as a guide, the reasonably skillful hardware/software hacker should be able to make a similarly successful conversion.

My project began in 1980 when I became obsessed with getting letter-quality output from my computer. At that time the least expensive letter-quality printers cost $2500, and it was rare to find them attached to $895 personal computers. I wanted to do the job for under $400 or so, so I began investigating. It didn't take long to find that thousands of IBM Selectric terminals were taken out of service in communications and word processing systems when the much faster daisy-

wheel printers came along. What did take long was to find such a printer that I could afford. One day my persistence paid off and I found *two* Selectric terminals plus a custom desk for $375 total. They seemed to be in good condition and the price was right, so I bought them. Within a week I had an offer for two more in even better condition for $200. I bought them, too!

Two articles in a computer magazine and an IBM service manual (see references) got me started on converting the Selectric terminals to microcomputer printers. If you want to make the conversion yourself, you can refer to the same sources for the details.

For many years IBM made several models of a typewriter called the I/O Selectric, the primary purpose of which was computer input and output. An I/O Selectric has additional mechanisms beneath the keyboard, which allow the keys to send electrical signals and allow other signals to control the typing machinery. The extra mechanisms make an I/O Selectric about 5'' higher than a standard machine, usually requiring it to be mounted in a cutout in its desk.

Selectric Driver Program
requires:
PET, IBM I/O Selectric modified and interfaced as described

A group of 24- or 48-volt solenoids drives the Selectric mechanisms when the machine is used as a printer. Seven solenoids are activated in various combinations to energize the 44 printed characters. Other functions, such as the space, backspace, shift, return, etc., are activated by additional single-purpose solenoids. In some models the space is treated as one of the printing keys. A surge-suppressing diode is connected across the coil of each solenoid.

Since I did not want to use my Selectric's keyboard as a computer device, I disconnected its special mechanisms and devoted all my attention to the solenoids. IBM used a lot of handshaking contacts for timing purposes. Since I planned to do all my timing in software, my approach was to remove the existing handshaking contact of wiring and to run my own leads to the solenoids of interest. The result was a machine with lots of space and visibility inside, where before there had been a rat's nest of yellow-colored wire.

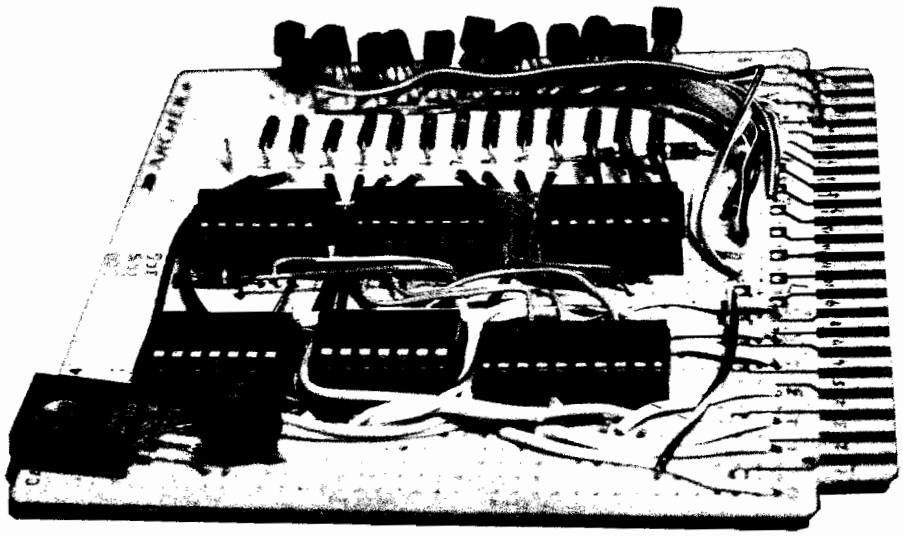
The next step was to design a computer-to-Selectric interface — a circuit to let a 5-volt computer port drive all the 48-volt solenoids. Here again a magazine article was helpful as it described someone else's solution to the same problem (see reference 4). I decided to use my PET's parallel user port as the source of the signals to the printer. Since my Selectric contained 13 solenoids, and the user port has only eight lines, I needed some decoding in my interface. A quirk in the Selectric allows six lines to control the seven print solenoids, so I used the six low-order bits from the user port for this purpose. The seventh bit was a control bit, which when high disabled the print solenoids and allowed the others to be controlled by the three low-order bits. I have reserved the eighth user port line for future use when I might decide to use the Selectric keyboard as an input device.

The logic chips in the interface ultimately activate a series of transistors that connect the cold ends of individual solenoids to ground. The hot ends are all connected to a 48-volt power supply, which came with my Selectric desk. Figure 2 is a photograph of the interface, which is built entirely of components available at Radio Shack. Figure 3 is its schematic diagram.

One perversity of I/O Selectrics merits special mention — many of

(Figure 3 appears on page 47)
(Text continues on page 48)

Figure 2: **Interface Board Construction**



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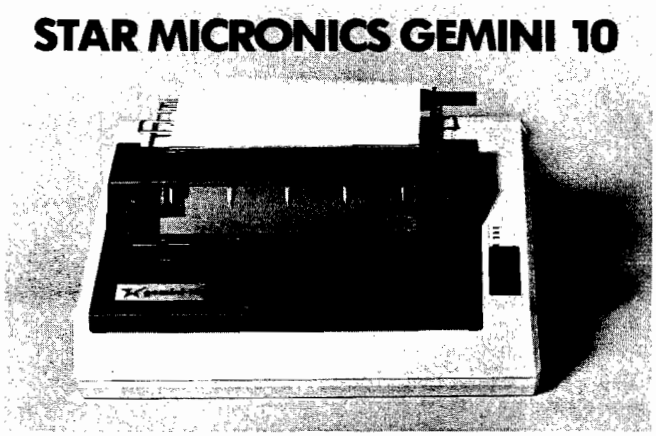

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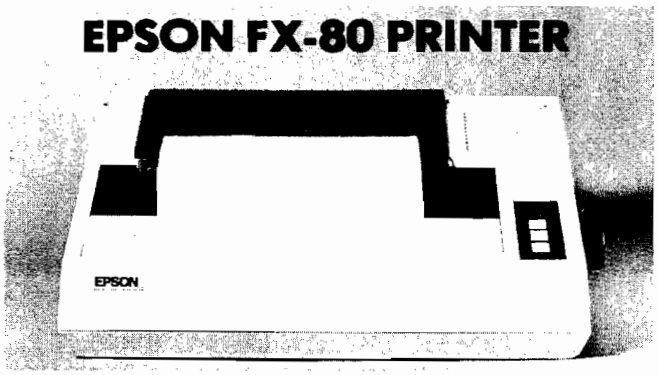

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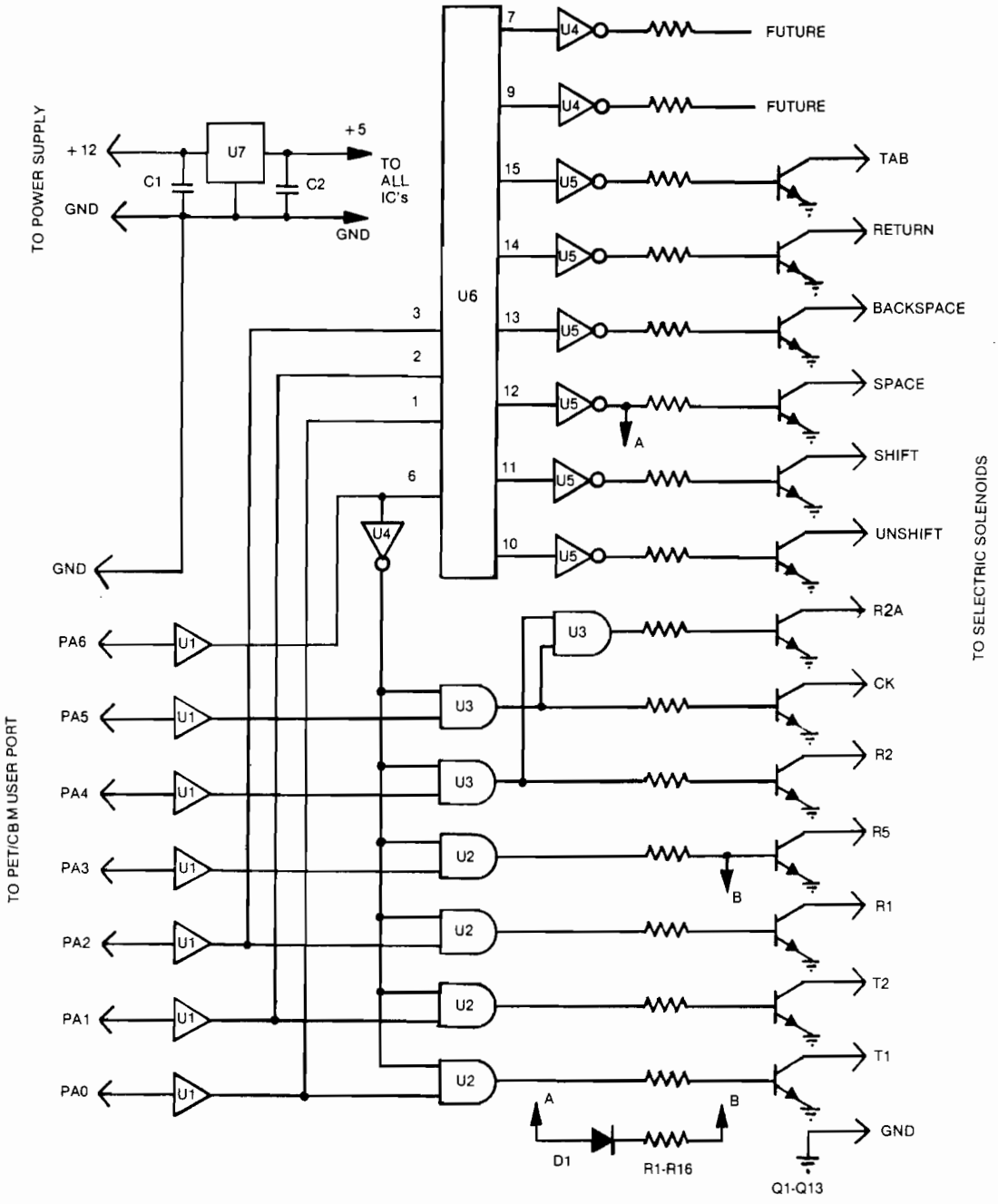
U4,U5	7404	276-1802
U6	74LS138	276-1939
U7	7805	276-1770
	Plug-in PC board	276-153
	Matching connector	276-1551

1. Some selectrics may have a different group of solenoids. Use circuit A-B *only* for Selectrics without a SPACE solenoid.
2. Inputs of all unused gates should be grounded.
3. Power supply voltage can be in 6-35 volt range.
4. Be sure to make +5 and GND connections to all IC's.

Figure 3: **Interface Schematic Diagram**



them must be modified before they can use the standard Selectric typing elements, or 'balls', in the standalone mode. Most of the I/O Selectrics had special typing elements, often with all capital letters, and the positions of the letters on the element were non-standard. The major exceptions to this rule were units used in the old MT/ST word processors, all of which used standard typing elements. The machines with special elements are called 'BCD coded' units, while the others are known as 'correspondence coded' units. The difference is unimportant when the computer is driving the printer because software can select the proper letter, no matter where it is positioned on the ball. But when you use the I/O Selectric as a typewriter, BCD-coded keyboards will only work with BCD typeballs. Converting a BCD unit requires you to alter these mechanical connections so the keys correspond to positions on standard correspondence elements. Although the conversion takes several hours of meticulous mechanical work (see reference 1), it is well worth the effort.

As with any computer application the key to powerful use of the Selectric printer is software.

As with any computer application, the key to powerful use of the Selectric printer is software. I wanted to use my word processor (Copy-Writer from CGRS Microtech) with the Selectric, taking advantage of the best features of both. Copy-Writer, like Word Pro and most other word processing programs, stores text in a certain area of memory as images of the characters actually appearing on the screen. I wrote a Selectric driver program that reads the text, converts it to the proper Selectric character codes, and sends them to the printer with the proper timing. Since the driver and the word processor won't fit in memory at the same time, I load Copy-Writer, use it to load the desired text, then replace Copy-Writer with the Selectric driver and start typing.

Because the Selectric has features that work differently than those on most computer printers (margins, tab stops, etc.), the driver program had to take them into account. The accompanying listing is the latest version of my driver program (see listing 1); it is the product of many months of evolution and revision, and I feel it is a good solution to the problem of optimizing the performance of a Selectric printer. The major functions of the various sections of the program are described below in the general sequence of their execution.

Line 0 is a dummy line containing a short ML program (shown in hex dump and disassembly in listing 2) to find the end of the word processor text, plus the table that relates the character codes in text to their Selectric equivalents; it also provides several temporary storage locations used later in the program. The 255-character length of this line was achieved by changing its link, as described in reference 5.

Line 110 is used to activate or 'pick' the print solenoids by POKEing the appropriate code to the user port for a time determined by the FOR...NEXT loop. This line is placed early in the program to reduce its execution time. Line 100 keeps it from interfering with the main loop of the program.

Lines 510-550 initializes the main program. The ML at 1190 finds the end of text, then BASIC initializes a series of variables and sets the top of memory to a point below the text area.

Lines 560-740 allow the operator to choose his starting point in text and the number of lines per printed page and to input the settings of the margins and tab stops. These stops are set mechanically on the Selectric then input to the program so it knows where the carriage is positioned.

Lines 120-270 work through the text in memory, printing the characters and returning the carriage at the proper points. When the end of text has been reached, line 270 reloads the main word processor program. (My PEDISK II uses the !RUN command for this purpose — other disk drives will use something else.)

Lines 280-330 bypass any word processor format control characters embedded in the text since the Selectric has no way to respond to them. They also activate the tab and backspace and return solenoids when called for. When entering text for Selectric typing, I use the 'less than' key to cause a backspace and the 'greater than' key to initiate a tab. Copy-Writer itself doesn't have characters for these functions because they aren't usually found on computer printers.

Lines 340-380 return the carriage on the first space at the end of a printed line.

Lines 390-440 pause for paper changing, lines 450-500 'pick' three special solenoids, and lines 750-810 allow the temporary suspension of printing for paper adjustment or any other reason.

If you have thought about converting an I/O Selectric for use with your PET, the system described here is proof that it can be done with powerful effect. The same interface and a modified driver should be able to be used with a VIC-20 or Commodore 64, or any Commodore machine having a parallel user port. If you would like more detailed information than is presented here, write to me at the address below.

References

1. Robert M. Weil, "Converting Selectric Keyboards from BCD to Correspondence Code, Part 1," *Microcomputing*, December 1979.
2. Robert M. Weil, "Converting Selectric Keyboards from BCD to Correspondence Code, Part 2, *Microcomputing*, January 1980.
3. IBM Corporation, *I/O Selectric Service Manual*, Part No. 241-5737-0.
4. William F. Pytlik, "An Inexpensive Word Processor," *MICRO #36*, May 1981.
5. Louis F. Sander, "A New Technique for Mixing BASIC and Machine Language," *COMPUTE! #24*, May 1982.

Louis F. Sander lectures on computer subjects for the Special Programs Division of Carlow College. He is the originator of COMPUTER KINDERGARTEN™, a computer familiarization course for adults, and has written articles for many computer-related publications. You may contact Mr. Sander at 153 Mayer Drive, Pittsburgh, PA 15237.

(Listings begin on page 50)

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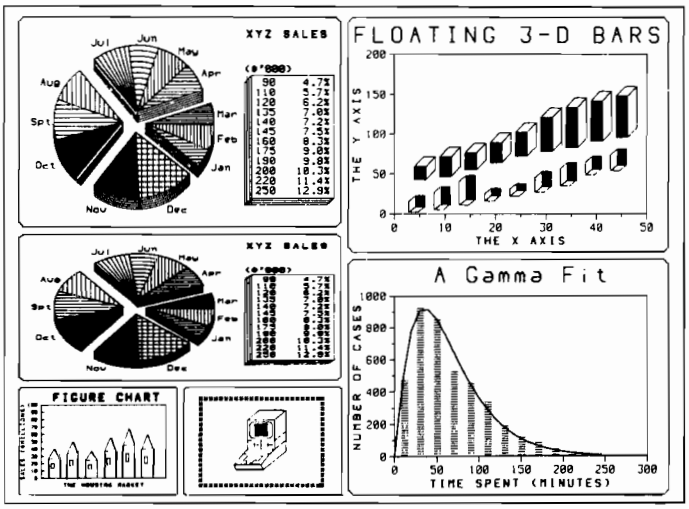

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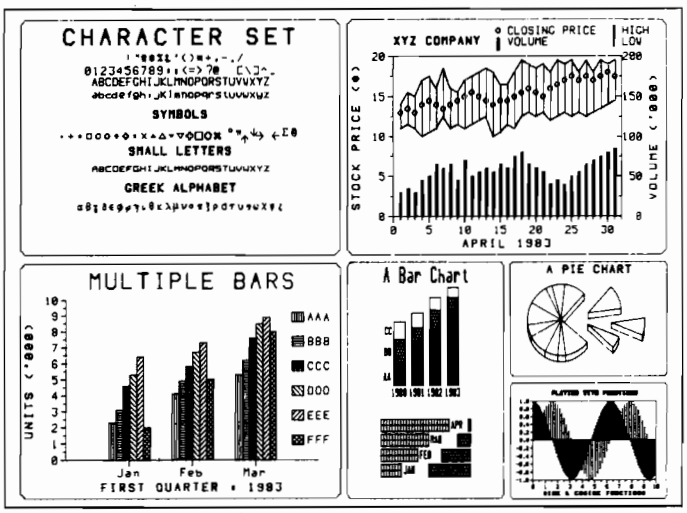

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***Listing 1:* Selectric Driver Program Listing**

```
 0 rem+1"■■■3<&■K■.=2-i■■■*:9!>$+"■C?ARc>u■_■■■■■■+r■ 1,'.3:/■■■■■■
```

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Listing 2: Driver Program Dummy Line

```
.:  0400 00 00 05 00 00 8F 73 19
.:  0408 22 1A 1E 16 38 3C 26 11
.:  0410 28 12 2E 3D 32 2D 14 10
.:  0418 1D 25 2A 3A 39 21 3E 24
.:  0420 2B 7F C3 3F C1 C1 43 29
.:  0428 55 7B 6F 57 5F 15 63 67
.:  0430 5B 70 18 20 31 2C 27 2E
.:  0438 33 3B 2F 17 13 1F 1B 23
.:  0440 5C 1C C2 30 C0 6C FF 59
.:  0448 62 5A 5E 56 78 7C 66 51
.:  0450 68 52 6E 7D 72 6D 54 50
.:  0458 5D 65 6A 7A 79 61 7E 64
.:  0460 6B 60 60 60 FF FF FF FF
.:  0468 FF FF FF FF FF FF FF FF
.:  0470 FF C4 FF FF FF FF FF FF
.:  0478 FF FF FF FF FF FF FF FF
.:  0480 C5 FF FF FF FF 32 2B
.:  0488 30 4E 72 9B 5A 64 6E 78
.:  0490 8C 9B 9B 9B 9B 72 EA EA
.:  0498 EA EA EA EA EA EA EA EA
.:  04A0 EA EA EA EA EA EA A0 01
.:  04A8 88 84 01 A9 77 85 02 A0
.:  04B0 F8 B1 01 C9 20 D0 0D 88
.:  04B8 C0 FF D0 F5 C6 02 A5 02
.:  04C0 C9 35 D0 ED 84 01 60 EA
.:  04C8 EA EA EA EA EA EA EA EA
.:  04D0 EA EA EA EA EA EA EA EA
.:  04D8 EA EA EA EA EA EA EA EA
.:  04E0 EA EA EA EA EA EA EA EA
.:  04E8 EA EA EA EA EA EA EA EA
.:  04F0 EA EA EA EA EA EA EA EA
.:  04F8 EA EA EA 92 09 0B 0E 00
```

Listing 3

```
B*
     PC   IRQ   SR AC XR YR SP
.;  1059 12E8 30 10 10 00 F6
.

.,  04A6 A0 01     LDY #$01
.,  04A8 88        DEY
.,  04A9 84 01     STY $01
.,  04AB A9 77     LDA #$77
.,  04AD 85 02     STA $02
.,  04AF A0 F8     LDY #$F8
.,  04B1 B1 01     LDA ($01),Y
.,  04B3 C9 20     CMP #$20
.,  04B5 D0 0D     BNE $04C4
.,  04B7 88        DEY
.,  04B8 C0 FF     CPY #$FF
.,  04BA D0 F5     BNE $04B1
.,  04BC C6 02     DEC $02
.,  04BE A5 02     LDA $02
.,  04C0 C9 35     CMP #$35
.,  04C2 D0 ED     BNE $04B1
.,  04C4 84 01     STY $01
.,  04C6 60        RTS
```

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RENAME	CHAIN
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ALT	COPY
NORM	PIC
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LPLOT	

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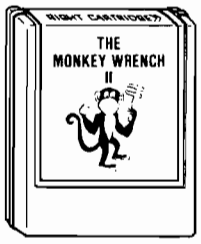

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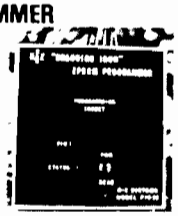

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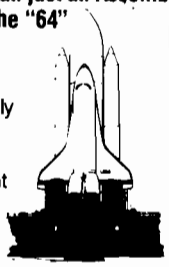

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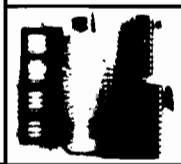

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How Much Is It Worth?

Computing the Net Present Value of an Investment

by Brian J. Flynn

Computation of net present value is an important consideration; costs and benefits occur in the future as well as the present because money has value over time.

Consumers, government managers, and corporate men and women often face the dilemma of how best to spend scarce resources. Resolution of this problem entails evaluating alternatives whose costs and benefits occur in the future as well as the present.

A consumer who wants to buy a new car, for example, may tally the costs of three models, each with a different sticker price and recurring cost of operation. Differences in recurring costs may be due to differences in fuel efficiency (miles per gallon), price of insurance, and frequency of repair. Since costs are partly incurred in the future and since money is valuable over time, computation of net present values is desirable. Net present value is the amount of money needed today to generate a future cash flow. This article explains net present value in more detail, and gives an example of its use, applying the BASIC program listed here.

Net Present Value

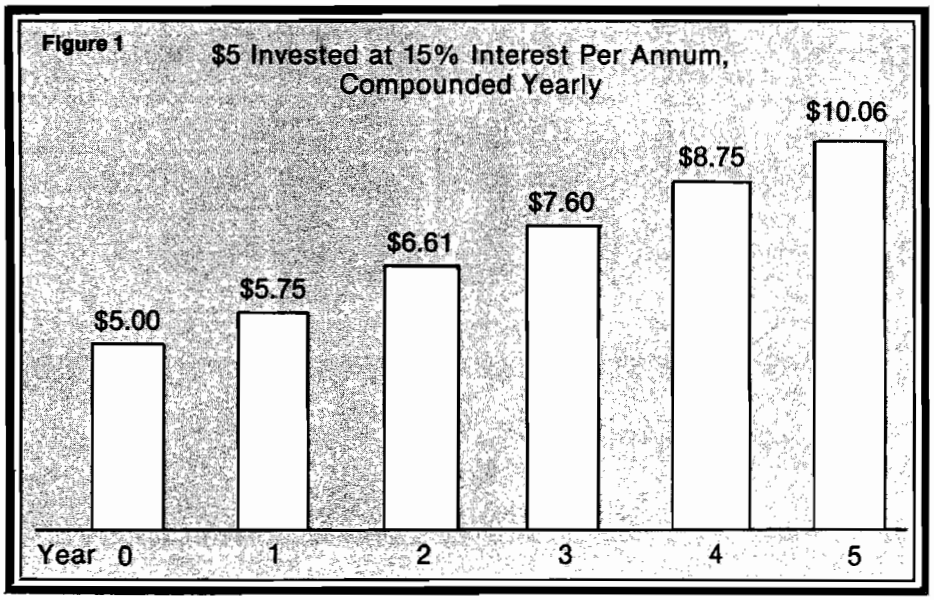
Almost no one in today's economy would willingly part with $1,000 in return for merely $1,000 a year hence. This is because inflation would diminish the purchasing power of the $1,000 and because this sum, properly invested, would likely produce a "real" return, or a yield above and beyond the rate of inflation. Hence, a person might lend $1,000 for one year only if promised $1,000 plus 15% interest at the end of the period. It is this rate of interest that links money today and tomorrow.

Today's dollars are translated into tomorrow's by compounding the rate of interest. Conversely, tomorrow's are converted into today's by discounting. Each operation is the inverse of the other. Let's first discuss compounding. Five dollars ($5.00) invested at 15% interest per annum, compounded once a year, yields $5.75 at the end of 12 months ($\$5+\$5\times0.15 = \$5\times1.15 = \$5.75$). And as figure 1 shows, the $5.00 investment doubles in value after about five years ($\$5\times1.15^5\approx\$10$). Interest need not be compounded just once a year, however. In fact, it may be compounded any number of times, as table 1 shows. But when interest is compounded more than once a year, nominal and effective interest rates differ. For example, $1.00 invested at 15% interest, compounded every six months, yields approximately $1.1556 at the end of one year [$\$1\times(1+0.15/2)^2\approx\$1.1556$]. While the nominal interest rate is 15.00%, the effective rate is about 15.56%.

Discounting is the antithesis of compounding. Hence, $5 invested today at 15% interest, compounded annually, yields $5.75 in one year, and $5.75 in one year is worth $5 today ($\$5.75/1.15=\$5$). The first process involves compounding and the second discounting, as figure 2 shows. Similarly, $50 two years from now is worth about $37.81 today ($\$50/1.15^2\approx\$37.81$). And the present value of $100 in "n" years is $\$100/1.15^n$. Following this logic, the formula for computing the net present value of an investment, with interest compounded annually and with dollars spent or received at the end of each period, is:

$$\text{Net Present Value} = R_0 + \frac{R_1}{(1+r)} + \frac{R_2}{(1+r)^2} + \ldots + \frac{R_n}{(1+r)^n}$$

Figure 1



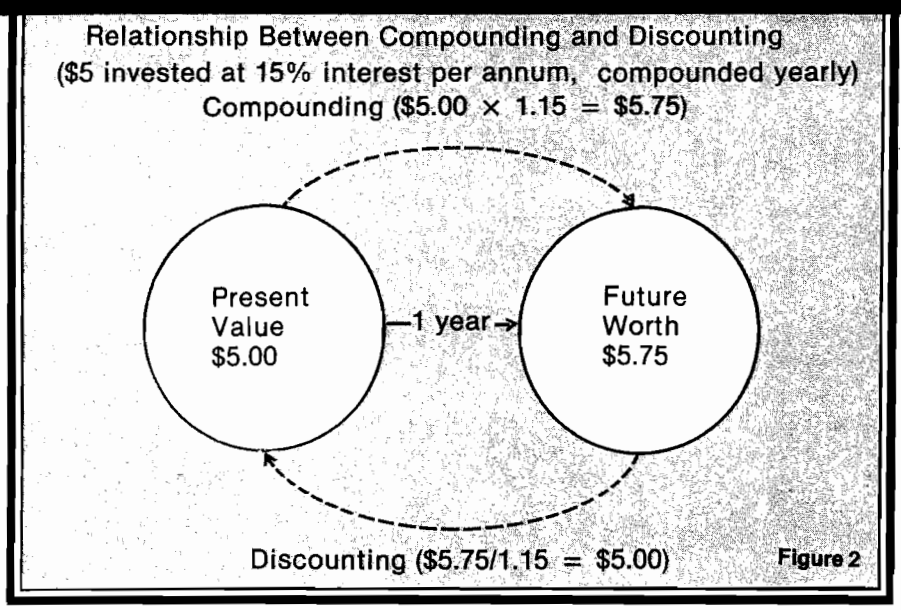


Figure 2

R_0 is initial net revenue (revenue minus cost) of the proposed project, and is always either zero or a negative number. This is because building a new factory, for example, involves an immediate expenditure (cost of construction) but yields no immediate return. Next, R_1 through R_n are the annual net revenues expected during the investment's life. Finally, r is the interest or discount rate, and n is the number of years in the cash flow.

If we decide to discount interest twice instead of once a year, the formula changes to:

$$\text{Net Present Value} = R_0 + \frac{R_1}{(1 + \frac{1}{2}r)^{2\times 1}} + \frac{R_2}{(1 + \frac{1}{2}r)^{2\times 2}} + \ldots + \frac{R_n}{(1 + \frac{1}{2}r)^{2\times n}}$$

Similarly, when quarterly discounting is desired, r is divided by 4 and the exponent becomes 4 multiplied by the appropriate year. The computer program lets you use any frequency of discounting that you want.

But what discount rate (r) is appropriate? Theoretically, the "correct" discount rate is the opportunity cost of the investment, or the next best available rate of return. But opportunity cost is difficult to measure, and varies from firm to firm and from private to public sector. In the private sector, a measure of a firm's cost of capital is probably a good approximation for r.

An Example

Let's say you want to buy a microcomputer system to reduce number crunching in your shoe store. Your estimates of costs and benefits of two alternative systems are:

Estimated Net Revenue

	System			System	
Year	A	B	Year	A	B
0	$1500	$2000	3	$ 500	$700
1	50	600	4	1000	750
2	150	650	5	1300	750

Each system, consisting of a CPU, video screen, disk drive, printer, and software, is expected to last five years, with no salvage value. System A costs $1500 but should save $3000 over its life (net saving = $1500). System B, on the other hand, costs $2000 but saves $3450 over five years (net saving = $1450). Since A saves more, do you purchase it instead of B?

Since money has value over time, you can always put your money into government bonds and earn about 15% per annum. Hence, you should decide which system to buy by comparing net present values. With r = 15%, and with interest compounded once a year, the net present value of system A is:

$$-\$1500 + \frac{\$50}{1.15} + \frac{\$150}{1.15^2} + \frac{\$500}{1.15^3} + \frac{\$1000}{1.15^4} + \frac{\$1300}{1.15^5} \approx \$204$$

Similarly, the net present value of B is approximately $275. Therefore computer B is the better buy.

(Continued on next page)

Table 1: **Future worth of $5 invested at 15% interest per annum, compounded with varying frequency**

End of Year	Future Worth of the Investment, Interest Compounded: Semi-annually	Quarterly	Monthly	Continuously
1	$ 5.78	$ 5.79	$ 5.80	$ 5.81
2	6.68	6.71	6.74	6.75
3	7.72	7.78	7.82	7.84
4	8.92	9.01	9.08	9.11
5	10.31	10.44	10.54	10.58

Notes: 1. Future worth of an investment = $\$P \times (1 + \frac{r}{f})^{t\times f}$, where

$P = the principal
r = rate of interest, in decimal form
f = frequency of compounding
t = year "t"

For example, with quarterly compounding of interest, $5 at the end of five years is worth:

$$\$5 \times (1 + \frac{0.15}{4})^{5\times 4} \approx \$10.44$$

2. When interest is compounded continuously, future worth equals

$$\lim_{f \to \infty} \$P \times (1 + \frac{r}{f})^{t\times f} = \$\,Pe^{r\times t}$$

Listing 1

```
10 REM Computing the Net Present Value of an investment.
20 REM Brian J. Flynn — 1 July 1981
30 REM Copyright (C) 1983 by MICRO Ink
40 REM P.O. Box 6502, Amherst, NH 03031
50 GOSUB 2000 : REM Print heading and enter parameters
60 GOSUB 3000 : REM Enter data
70 GOSUB 4000 : REM Compute Net Present Value
80 GOSUB 5000 : REM Print results
90 END
1000 REM CD$ = YES or NO for continuous discounting of interest
1010 REM DF = Discount factor
1020 REM DN = Denominator of the first period term in NPV formula
1030 REM E = 2.71828
1040 REM F = Frequency of discounting per period
1050 REM N = Number of periods in the cash flow
1060 REM NPV = Net Present Value
1070 REM R = Interest (Discount) rate
1080 REM R() = Vector of net revenues
2000 GOSUB 6000
2010 REM Heading
2020 PRINT"THIS PROGRAM COMPUTES THE NET":
     PRINT"PRESENT VALUE OF AN INVESTMENT."
2030 PRINT"NET PRESENT VALUE IS THE AMOUNT":
     PRINT"OF DOLLARS TODAY WHICH WILL"
2040 PRINT"GENERATE A FUTURE CASH FLOW,":
     PRINT"USING PREASSIGNED INTEREST RATE."
2050 REM Length of cash flow
2060 PRINT "HOW MANY PERIODS ARE IN YOUR":
     INPUT"CASH FLOW ";N:DIMR(N)
2070 PRINT:REM Interest rate
2080 PRINT"WHAT NOMINAL INTEREST RATE (IN":
     PRINT"PERCENT FORM) WOULD YOU LIKE TO"
2090 INPUT "USE (E.G. 10 = 10%) ";R
2100 GOSUB 6000
2110 REM Frequency of discounting
2120 PRINT"IN COMPUTING THE NET PRESENT":
     PRINT"VALUE OF YOUR CASH FLOW,"
2130 PRINT"INTEREST IS DISCOUNTED WITH ANY":
     PRINT"FREQUENCY PER PERIOD YOU DESIRE."
2140 PRINT"WOULD YOU LIKE CONTINUOUS'':
     INPUT"DISCOUNTING (Y/N) ";CD$
2150 PRINT:IF CD$="Y"THEN 2170
2160 PRINT"HOW MANY TIMES WITHIN EACH":
     PRINT"PERIOD SHOULD INTEREST BE":
     INPUT "DISCOUNTED ";F
2170 RETURN
3000 GOSUB 6000
3010 BK$="                                        " : REM 35 Spaces
3020 PRINT"PLEASE ENTER EXPECTED NET":
     PRINT"REVENUE (REVENUE MINUS COST) IN"
3030 PRINT"EACH PERIOD"
3040 FOR I = 1 TO N
3050 II = 204 :GOSUB 7000
3060 II = 192 :GOSUB 7010
3080 INPUT N$ :R(I) = VAL(N$)
3090 NEXT I :RETURN
4000 NPV = R(0)
4010 E = 2.71828183
4020 R = R/100
4030 IF CD$ = "Y" THEN DN = E↑R :GOTO 4050
4040 DN = (1 + R/F)↑F
4050 DF = DN
4060 FOR I = 1 TO N
4070 NPV = NPV + R(I)/DF
4100 DF = DF*DN
4110 NEXT :RETURN
5000 GOSUB 6000 :PRINT:PRINT:PRINT:PRINT:PRINT
5010 NPV = INT( (NPV + .0005)*1000)/1000
5020 PRINT"NET PRESENT VALUE = ";NPV
5030 PRINT:RETURN
6000 CLS : RETURN
7000 PRINT@II,BK$: RETURN
7010 PRINT@II,"PERIOD #"I;"  "; :RETURN
```

Mr. Flynn has an MA in economics from Virginia Polytechnic Institute and a Ph.D in econometrics from Georgetown University. He is employed as an operations research analyst with the Department of Defense. You may contact Mr. Flynn at 1704 Drewlaine Dr., Vienna, VA 22180.

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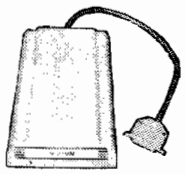

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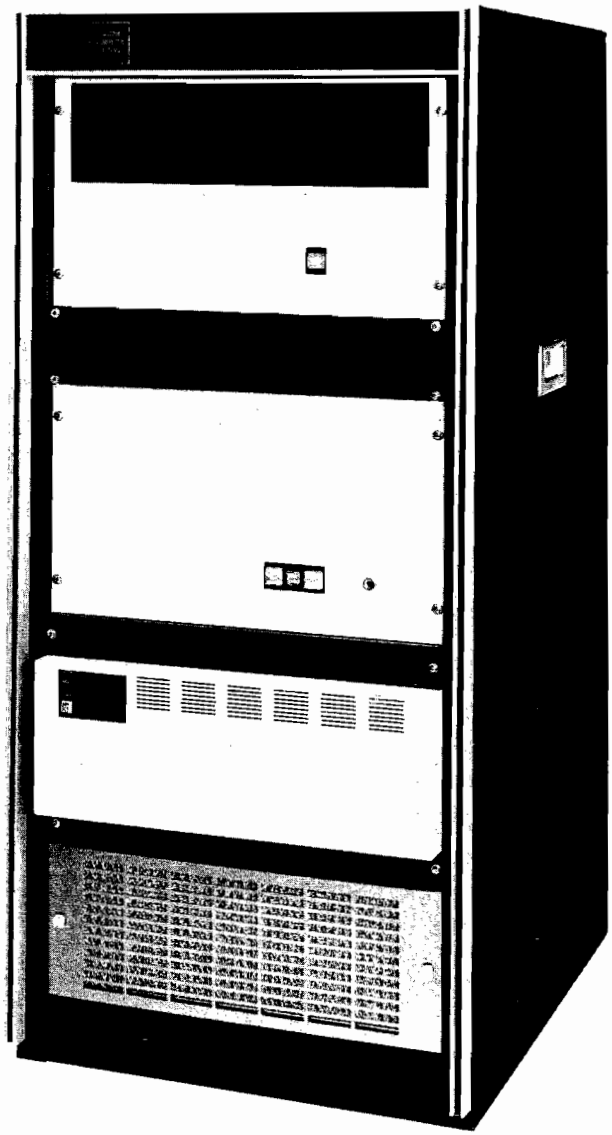

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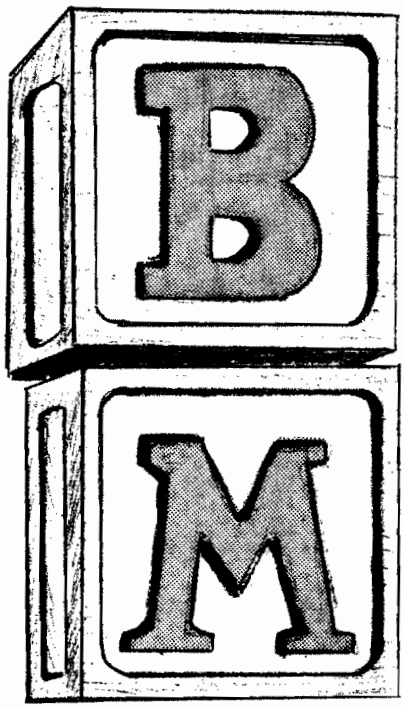
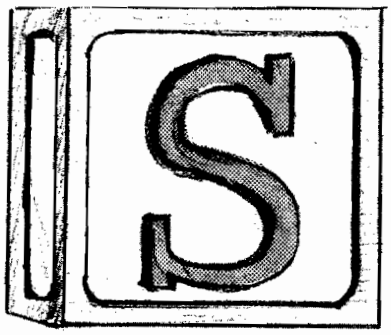


A Machine Code String Array Sort for OSI

by
John
Rippon



This machine-language program sorts the members of a string array into alphabetical order in far less time than would be needed using BASIC.

A routine called for in a number of my programs sorts students' names into alphabetical order. The task of putting strings into alphabetical order can, of course, be tackled in many ways. If the strings are stored in a BASIC program as members of a string array then you may choose either to rearrange the string array directly, or to create a pointer array, additional to the string array. The successive members of the pointer array are integers corresponding to the string array subscripts when the strings are placed in alphabetical order. The two methods are illustrated in figure 1.

Which method is used will depend on the exact application. The machine code routine described here is a direct sort and uses the rather inefficient, but easily understood, bubble sorting technique. It is called in a BASIC program by the USR function.

Bubble Sort

The bubble sort compares adjacent pairs of strings and swaps pairs in the wrong order. The first and second strings are compared and swapped if necessary, followed by the second and third, and so forth. After the last pair has been checked the process is repeated from the first and second strings again. One less string needs checking on each successive pass through the list since the last string of each pass is placed in its correct position. Eventually all strings will be in correct order. For N strings, the number of passes through these successively diminishing loops before the order is correct is N-1 in the worst case. In this case the last string has to bubble its way, one place at each pass, up to the top of the list. (Some increase in efficiency can be made if the order of checking the strings is reversed on alternate passes.)

In BASIC, the string bubble sort routine looks like listing 2.

This method is fine, in theory, but two major difficulties arise when using such a program on the C1P. First, the number of swaps required to sort a randomly distributed list of N strings is approximately proportional to N squared so that, as the number of strings is increased, the time required to make the sort may become inconveniently long. Second, and more important, everytime a string swap is made the three assignment statements on lines 1050 and 1060 each cause a string to be added to the string storage area in RAM. If N is too large, the number of swaps needed will cause the available string storage area to be filled; the now well documented garbage collector string array bug in the Microsoft BASIC-IN-ROM will be encountered. Unless you have made one of the software or firmware modifications to eradicate the bug it will indicate its presence by a continual flicker of the video screen at about 1½ second intervals while it goes around an endless loop looking, unsuccessfully, for places to relocate your strings. In practice, I found about 40-50 strings with an average length of 15 characters to be the upper limit on my 16K RAM machine before running into trouble.

String Vector Swaps

Since we are not creating any new strings but rather just swapping the order of the existing ones, adding further strings to RAM, as described above, is redundant in a bubble sort routine. In O.S.I. BASIC every string array element has a 4-byte pointer that contains information on the length of the string and the address in RAM at which the string is stored. Thus, whenever two strings require swapping all you need to do is swap their two 4-byte pointers. While such a swap routine could be written in BASIC, the

high-speed nature of machine-code operation makes the latter mode of programming a better idea. Listing 1 shows the machine code bubble sort routine, which easily fits into the unused page 2 area of RAM in the C1P.

The routine is called within a BASIC program by the statement S=USR(N), where N is the variable standing for the number of strings to be sorted, and S returns the number of passes through the list for the sort to be completed.

To keep the routine as short as possible its use is limited to sorting one array in any one BASIC program. This array is identified by inserting an appropriate DIM statement ahead of any other array reference in the BASIC program.

The strings to be sorted must have subscripts 1 to N inclusively. The machine code is position independent.

Array Sort
requires:
OSI-CIP with BASIC in ROM

How It Works

The routine bears a close analogy to the BASIC program in listing 2.
The zero-page locations used in the routine are:

$24,$25 - pass count, analogous to I in listing 2.
$26,$27- string count, corresponds to J
$28,$29- contains the address minus one of the current string pointer
$2E - swap flag. 00 = no swaps, FF = swap made in last pass
$31 to $37 - the pointers for the current pair of strings being compared are stored in these locations
$AE,$AF - contains number of strings, N, in fixed-point format

First, the value of N is transferred to $AE, $AF by the INVAR subroutine called at $240. At addresses $243 to $254 the pass count and string count are set to unity and the swap flag is cleared. $255 to $260 takes the Variable End Pointer ($7D $7E), adds ten to it and stores the resulting address in $28,$29- (high byte in $29).

Provided the array to be sorted is the first encountered in the BASIC program the address in $28 $29 at this point will be one less than the address of the string pointer for A$(1) - the first string to be examined. After string comparison and swapping, this address is increased by four at $29D to $2A7 to point to one less than the string pointer for A$(2) and etc.

At $2A8 to $2BE the value of N-I-J is calculated. When this value is found to be zero, i.e. J=N-I, the main loop is exited by a branch to $2C7.

At $2C7 the swap flag is checked and, if no swaps were made, the current value of the pass count, I, is transferred back to BASIC via the OUTVAR subroutine ($2DC to $2E2). If the swap flag is set, the string count, J, is incremented and then compared with N at $2CB to $2DB. If the incremented count is not equal to N the program branches in two steps back to $24B where the swap flag is cleared and the main loop is re-entered.

String Comparisons

Whether or not two strings require swapping is, of course, determined by comparison of correspondingly positioned characters in each string - starting from the left-hand end. If, however, two strings are identical up to and including the right-hand end character of the shorter of the two strings, then it is generally agreed that the longer string is placed after the shorter one in an alphabetical list. Thus, for example "CAT" comes ahead of "CATWALK."

At $261 to $26A the two current string pointers are transferred to $31-37 (One byte in each pointer is a null and one of these is not transferred). The length of the shorter string is transferred to the X-Register at $26B to $272.

Comparison of the string character pairs is made at $273 to $278. The swapping of the two pointers is made at $279 to $28E together with the setting of the swap flag. After swapping, the program branches to $29D again for the next string pair.

If it is necessary to move on to the next character-pair comparison the BNE's at $28F to $292 are ignored and at $293 to $296 the character index (Y) is incremented. If the end of a string has not been reached, the program branches back to $273 for the next character-pair check.

Finally, if all characters agree in pairs, the string lengths are compared at $297 to $29C. If the longer one is the first one, a branch is made to the swap routine.

Using this routine I have found that 250 randomly-ordered strings can be sorted into alphabetical order in a time of the order of five to ten seconds; but if your list has two dozen ANDERSONS, 15 HIGGENBOTTOMS and 30 CHRISTENSONS randomly distributed throughout, then, perhaps the times may not be so impressive!

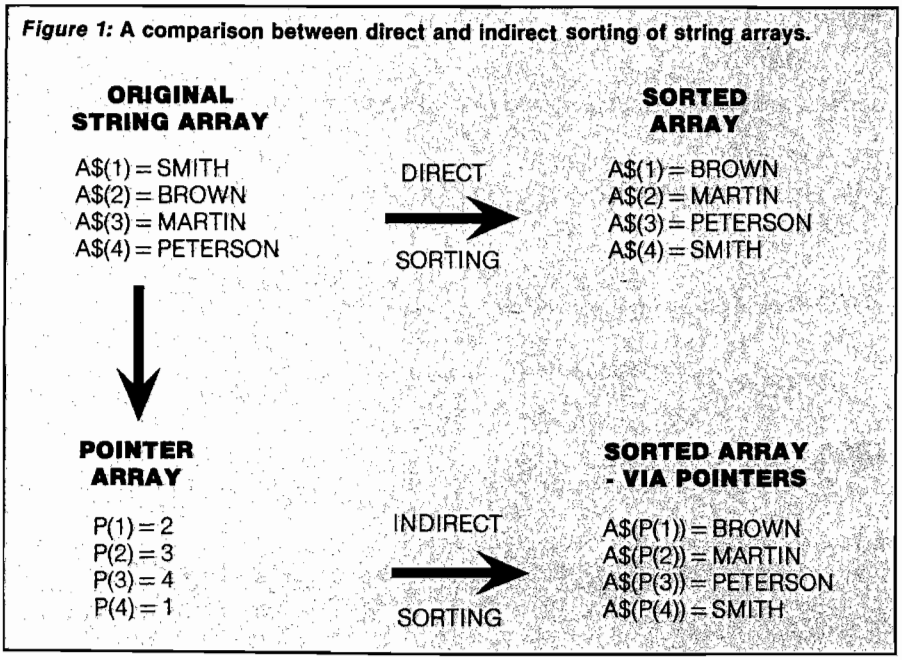


Figure 1: **A comparison between direct and indirect sorting of string arrays.**

John Rippon is head of mathematics and physics at Taita College, New Zealand, where he uses a C1P to introduce students to microcomputing. You may contact him at 32 Tilbury Street, Lower Hutt, New Zealand.

(Listings appear on next page)

Listing 1

```
7E00 20 05 AE          JSR J1
7E03 A9 00             LDA #00
7E05 85 24             STA Z1
7E07 85 25             STA Z2
7E09 E6 25             INC Z2
7E0B A2 00        L8   LDX #00
7E0D 86 2E             STX Z3
7E0F 86 26             STX Z4
7E11 86 27             STX Z5
7E13 E6 27             INC Z5
7E15 18                CLC
7E16 A9 0A             LDA #0A
7E18 65 7D             ADC Z6
7E1A 85 28             STA Z7
7E1C 8A                TXA
7E1D 65 7E             ADC Z8
7E1F 85 29             STA Z9
7E21 A0 07        L13  LDY #07
7E23 B1 28        L2   LDA (Z7),Y
7E25 99 30 00          STA Z10,Y
7E28 88                DEY
7E29 D0 F8             BNE L2
7E2B A6 31             LDX Z11
7E2D E4 35             CPX Z12
7E2F 90 02             BCC L3
7E31 A6 35             LDX Z12
7E33 B1 36        L3   LDA (Z13),Y
7E35 D1 32             CMP (Z14),Y
7E37 10 16        L9   BPL L4
7E39 A0 07             LDY #07
7E3B B9 2C 00     L5   LDA Z15,Y
7E3E 91 28             STA (Z7),Y
7E40 88                DEY
7E41 C0 03             CPY #03
7E43 D0 F6             BNE L5
7E45 B9 34 00     L6   LDA Z16,Y
7E48 91 28             STA (Z7),Y
7E4A 88                DEY
7E4B 10 F8             BPL L6
7E4D 84 2E             STY Z3
7E4F D0 0C        L4   BNE L7
7E51 D0 B8        L16  BNE L8
7E53 C8                INY
7E54 CA                DEX
7E55 D0 DC             BNE L3
7E57 A5 35             LDA Z12
7E59 C5 31             CMP Z11
7E5B 30 DA             BMI L9
7E5D 18           L7   CLC
7E5E A9 04             LDA #04
7E60 65 28             ADC Z7
7E62 85 28             STA Z7
7E64 90 02             BCC L10
7E66 E6 29             INC Z9
7E68 38           L10  SEC
7E69 A5 AF             LDA Z17
7E6B E5 25             SBC Z2
7E6D A8                TAY
7E6E A5 AE             LDA Z18
7E70 E5 24             SBC Z1
7E72 AA                TAX
7E73 98                TYA
7E74 E5 27             SBC Z5
7E76 A8                TAY
7E77 8A                TXA
7E78 E5 26             SBC Z4
7E7A D0 03             BNE L11
7E7C 98                TYA
7E7D F0 08             BEQ L12
7E7F E6 27        L11  INC Z5
7E81 D0 9E             BNE L13
7E83 E6 26             INC Z4
7E85 D0 9A             BNE L13
7E87 A5 2E        L12  LDA Z3
7E89 F0 11             BEQ L14
7E8B E6 25             INC Z2
7E8D D0 02             BNE L15
7E8F E6 24             INC Z1
7E91 A2 02        L15  LDX #02
7E93 B5 23        L17  LDA Z19,X
7E95 D5 AD             CMP Z20,X
7E97 D0 B0             BNE L16
7E99 CA                DEX
7E9A D0 F7             BNE L17
7E9C A5 24        L14  LDA Z1
7E9E A4 25             LDY Z2
7EA0 4C C1 AF          JMP J18
```

Listing 2

```
   1000 REM ARRAY BUBBLE SORT
   1010 FORI=1TON-1:S=0
   1020 FORJ=1TON-I
   1030 IFA$(J)<=A$(J+1)THEN1090
   1040 REM SWAP STRINGS
   1050 A$(0)=A$(J):A$(J)=A$(J+1)
   1060 A$(J+1)=A$(0)
   1070 REM SET SWAP FLAG
   1080 S=-1
   1090 NEXTJ
   1100 IFSTHENNEXTI
   1110 REM ARRAY SORTED
  OK
```

Listing 3

```
60 REM   ###STRING BUBBLE SORT - CALL P=USR(N)###
70 REM   ###N = # STRINGS, P = # OF PASSES TO SORT###
80 REM   ###DIMENSION STRING TO BE SORTED AT TOP OF PROGRAM###
90 REM   ###POSITION-INDEPENDENT CODE###
100 DATA32,5,174,169,0,133,36,133,37,230,37,162,0,134,46
110 DATA134,38,134,39,230,39,24,169,10,101,125,133,40,138,101
120 DATA126,133,41,160,7,177,40,153,48,0,136,208,248,166,49
130 DATA228,53,144,2,166,53,177,54,209,50,16,22,160,7,185
140 DATA44,0,145,40,136,192,3,208,246,185,52,0,145,40,136
150 DATA16,248,132,46,208,12,208,184,200,202,208,220,165,53,197
160 DATA49,48,218,24,169,4,101,40,133,40,144,2,230,41,56
170 DATA165,175,229,37,168,165,174,229,36,170,152,229,39,168,138
180 DATA229,38,208,3,152,240,8,230,39,208,158,230,38,208,154
190 DATA165,46,240,17,230,37,208,2,230,36,162,2,181,35,213
200 DATA173,208,184,202,208,247,165,36,164,37,76,193,175
210 FORI=576TO738:READJ:POKEI,J:NEXT
220 POKE11,64:POKE12,2
```

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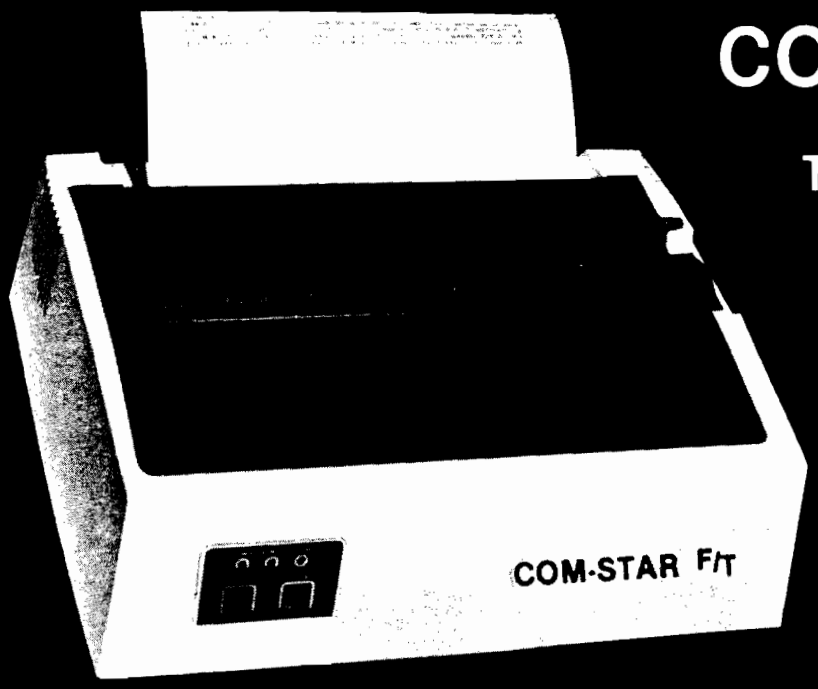

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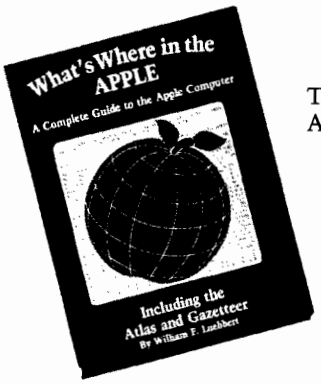

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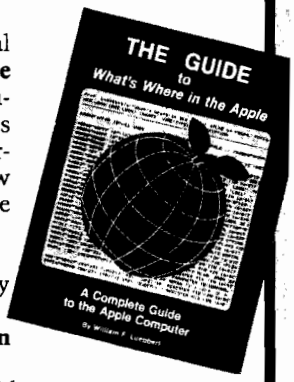

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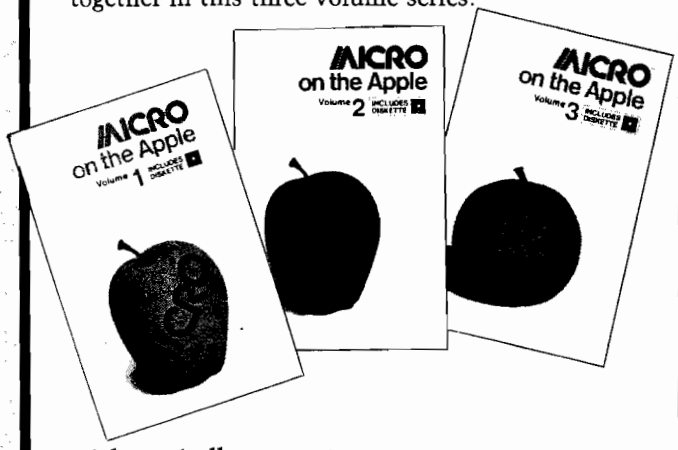

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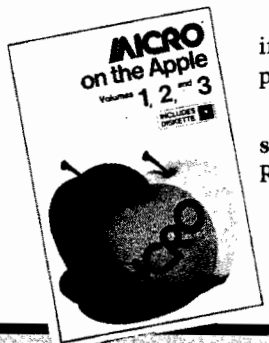

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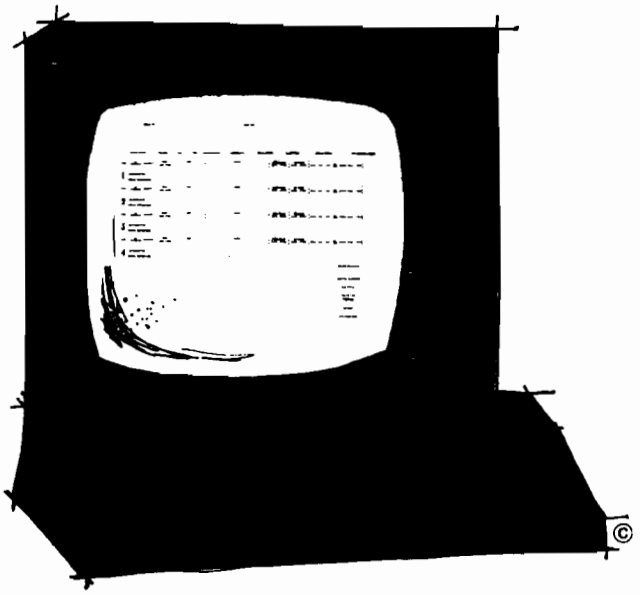

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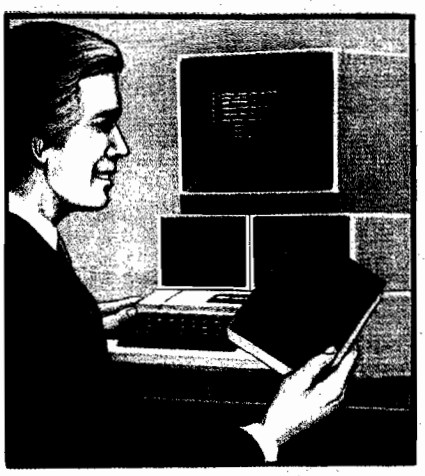

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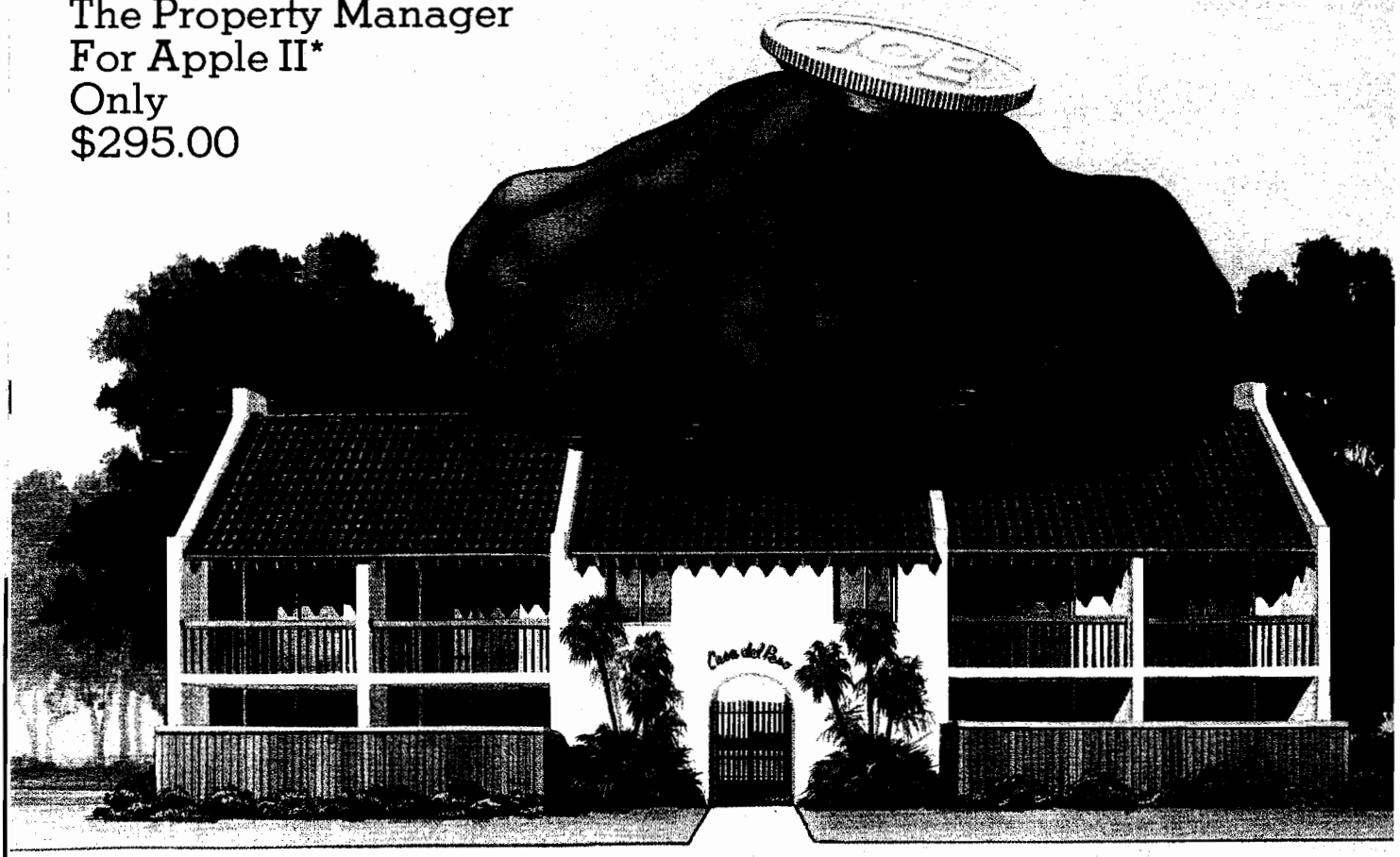

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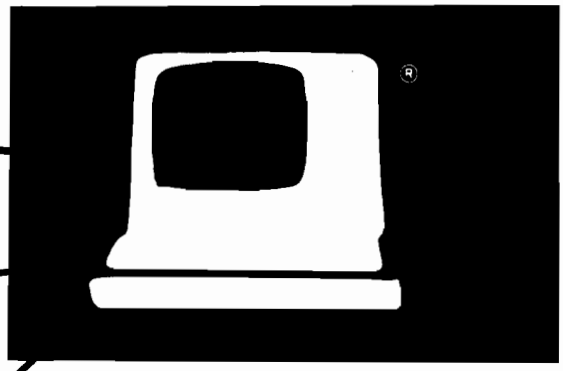

by John Steiner

Anyone who has written a letter, term paper, or article by hand, can truly appreciate the invention of the typewriter. It made a tedious job easier. Now we have word processors — an improvement over the typewriter. A couple of years ago when my Color Computer was new, I started to write an electronics book. After typing the introduction and its six revisions on a typewriter, I was ready for a word processor.

At the time, the Color Computer was "just a toy" with little workable software and *no* word processors. The manuals that came with the computer suggested text editing as a useful application and even had some simple text editing routines. These were just what I needed to assist me in completing my task. In the process of expanding the routines, I learned most of what I know about BASIC. This article will teach you about the powers of string handling in BASIC.

The routines included here can be used by any program that manipulates text. They are the heart of the homebrew word processor. You can write your own menu functions and recreate a word processor, reorganize the text entry and edit routines to create assembler files, use the file routines for a disk or tape-based filing system, use the search routine to find variables in program listings, or use the print routine to format any line-oriented text.

I have stripped the routines down to their essentials, and will make comments on how they can be expanded into more powerful functions. Each routine is stand-alone and can be edited to fit your individual requirements. Since the routines are written in Microsoft Extended Color BASIC they may be easily modified to run on many Microsoft interpreters.

GET A KEY Routine

Listing 1 is a BASIC loader that will load a self-contained, relocatable machine-language keyboard polling routine. In addition, it reserves string space and a small space in upper memory to hold the machine-language routine. The routine uses a call to the POLCAT routine in BASIC ROM and is mostly unchanged from the Color BASIC manual. I've used it in many of my programs.

In addition to disabling the BREAK key, the routine allows the use of special function keys in the form of control keys. Control keys can be defined by the BASIC program for your own use, as will be seen in the main program routine. To use the control function, just press the "DOWN ARROW" key, then press the control key desired. If you are in lower-case mode, you will have to press "SHIFT", while pressing the key. For example, in the word processor, pressing "DOWN ARROW" "E" will invoke the editor function.

It is recommended that you load this routine by a pre-loader as shown, so that the BASIC code that POKEs it into memory will not take up memory space. In disk BASIC, line 120 will cause the main processor program to be loaded and run. In tape BASIC, change line 120 to CLOAD. Keep the main program on tape immediately following this routine. When the OK prompt appears indicating a good load, just type RUN.

If you are using a disk system, issue a PCLEAR 1 in one of the first lines of this program. You could store the routine in page one of graphics memory, starting at $0E00 normally. Just change the DEFUSR in the edit to point to the correct start address. On a tape system, before loading the routine, enter a POKE 25,6 : NEW. This line will

cause the processor to load at $600, effectively a PCLEAR 0, providing you with more available memory space for string storage.

TEXT INPUT Routine

The main program input routine in listing 2 uses control characters to provide various functions. Line 50 defines where the machine-language "get a key" routine is located. Line 70 calls the routine, and the main keyboard loop is entered. The variable A$ is used to contain the text as it is input from the keyboard. The machine-language routine uses variable A to return the ASCII value of the key just pressed. If A is over 32, it is a valid text character and will be assigned to A$. If not, it is a control character, and the subroutine at 140 is called. This routine will determine the function of the control character. For example, the backspace key is ASCII code number 8, so lines 160 and 170 handle backspace functions, both erasing the previously typed letter from the screen and deleting it from the string. The ENTER key (code number 13) is flagged and converted to a value of 92, the reverse backslash. This code can be used by a print routine to sense the end of a paragraph.

Control E is used to exit this routine and send control back to the main menu *via* the RETURN in line 110. Line 120 looks for a question mark, period, or exclamation point to check for the end of a sentence. If either of these is found, the sentence counter, X, is incremented, and the value of A$, which contains the new sentence, is assigned to array A$ (). Other control keys could be defined to display a help menu, search for special commands, or any other special purpose.

To use the editor routine, just type. There is no reason to press ENTER, except when you change paragraphs. After each sentence, or 190 characters, the sentence counter is incremented. If you make a typing error, just backspace and retype. You could backspace all the way to the beginning of text. If you notice an error more than a few characters away, leave it for the edit routine.

PRINT Routine

Listing 3 contains a general purpose print routine. The routine will take lines of any length and format them into constant length lines. The main loop reads in each array item (A$) and searches for spaces between words. Each word is added to B$ until its length is just under the variable CL (characters per line) or the backslash is found. Either of these conditions will cause B$ to be sent to the printer. The routine could increment a line and page counter, print a special header or footer string and page number, and do a form feed to the top of the next sheet when the line counter exceeds a certain number. A margin variable could be added to the print line that would allow the setting of a left margin.

LINE EDITOR Routine

Listing 4 contains a line editor routine. Each line of text is displayed, one at a time. As in the input routine, text is contained in the array A$(). The editor will scroll through text one line at a time by using the up and down arrows. Entering a B or E will move the editor to the beginning or end of the array respectively. A help routine can be stored starting at 2400. To invoke the edit function, enter a "Y" to the prompt "REWRITE SENTENCE?".

To edit the line, type in the text you want removed and press ENTER. Next, just type in the corrected text and the newly corrected text will be displayed. If the editor cannot find the phrase or word to be changed, it will prompt you. The process is easier to perform than describe. The editor will delete the line being displayed if you enter a left arrow (shift-up arrow) at the "PHRASE TO DELETE" prompt. Entering an up arrow will open a space and allow you to enter a sentence.

FILE LOAD and SAVE Routines

Listings 5 and 6 are simple BASIC file input and output routines. Error trapping is used to make sure the filename is in proper format. In the load routine the variable R is a record counter and will increment as each array item is read from the disk or tape buffer. The EOF function checks for the last item in the file and sends control to the CLOSE statement. The save routine uses variable I as an item counter. The routines as configured will write to disk. To allow access for tape files, just change the buffer numbers in the OPEN, EOF, INPUT, PRINT, and CLOSE statements to # – 1.

GLOBAL SEARCH and REPLACE Routine

The global search routine in listing 7 was added to the program just because I wanted to have the power of more professional word processors. The routine uses the powerful INSTR function to search each item in the array for a target string. Line 4130 searches the A$ () array for the phrase located in D$. If found, the variable F will contain the number representing the first character position in A$() that D$ occurs. As an example, if A$ (S) contains "John Smith" and D$ contains "Smith", upon completion F will contain the number 6, the first character position of the search string. If F contains the value zero, the search string was not found.

If a match is found, you are shown the first sentence that contains the search string. You are then prompted to enter a "C" to change only this occurrence, an "A" to change all occurrences, or "ENTER" to let the occurrence stand. If "C" were chosen, global search calls the edit routine described earlier, and automatically edits the line.

If "A" were chosen, the routine will continue

to increment the sentence counter and complete any editing throughout the array. Once "A" is chosen, there will be no way to edit the text selectively at that point. This option would only be used, for example, when you have incorrectly misspelled a word or name throughout an entire text. In another application, this routine could be used to change PRINT to PRINT #-2, in a BASIC program, allowing hard copy output in the modified program.

Conclusion

Now, a couple of hints that will help to protect your files. I have written the processor text entry routine to GOSUB automatically to the file save routine in many programs before returning to the main menu. This option allows the file to be saved before any editing function occurs, and is a safety against power outages or other nasty occurences.

The lack of an ON ERROR GOTO statement could cause problems; for example I/O errors could cause you to lose a lot of data. To protect yourself, note the first line of the menu on the disk or tape label. If the program should crash, enter GOTO ln, where ln is the first line of the menu. The program will return to the menu with all data intact. It can then be saved correctly, printed, etc..Do *not* type RUN or RUN ln, which will reset all variables and strings to zero and null.

Though the program is not as attractive as commercial word processors, it has written an entire book and several magazine articles, and served me fine as a 16K word processor, then a 32K processor. For the occasional letter or term paper, it is more than adequate. There are both disk and tape versions, and a version to right- and left-justify text automatically when using a Radio Shack Line Printer VIII. An Epson driver has been installed to run an MX-80, and soon there might be an automatic right justify routine for the new Gemini printer. In addition, the disk version contains a routine that will check for the presence of a file before trying to load it.

The complete program is available for anyone who would like it. The following versions are available on disk or tape: Epson/Gemini or Line Printer VIII; 16K or 32K. Because of the individual module construction, you need only to specify the version you would like. I will put the modules together and include them on a single tape. Send a $10 check and a return envelope with two stamps to:

John Steiner
508 Fourth Ave NW
Riverside, ND 58078

These routines have taught me a lot about BASIC programming. Write me if you have any questions about the routines (include a stamped return envelope, please), or call at (701) 282-0293. I will be glad to assist you in any way I can.

John Steiner is a contributing editor for MICRO, and our CoCo Bits columnist. You may contact him at 508 Fourth Ave., N.W., Riverside, ND 58078.

Text Editor requires:
Color Computer w/ extended BASIC

Listing 1

```
10 REM--GET A KEY ROUTINE LOADER
20 REM--V. 1.6--JOHN STEINER--3/31/83
30 CLS:PRINT"LOADING WORD PROCESSOR"
40 CLEAR15000,32684
50 FOR I=1 TO 28:READ B:POKE32734+I,B:NEXT
60 DATA173,159,160,0
70 DATA39,250,129,10,38,12
80 DATA173,159,160,0,39,250
90 DATA129,65,45,2
100 DATA128,64,31,137,79
110 DATA126,180,244
120 LOAD "WORDPROC/PRO",R
```

Listing 2

```
10 REM---WORDPROC/BAS--VERSION 3.0--APR, 1983--JOHN STEINER
20 REM-------INPUT ROUTINE-------
30 X=0:Y=0
40 CLS
45 REM DEFINE GET A KEY ROUTINE
50 DEFUSR0=32735
60 X=X+1
65 REM CALL GET A KEY
70 A=USR(0)
75 REM IF CTRL, GO CHECK, ELSE ADD TO LINE
80 IF A<32 GOSUB 140 ELSE A$=A$+CHR$(A)
85 REM PRINT BACKSPACE, PRINT NEW CHARACTER, PRINT CURSOR
90 PRINT CHR$(8) CHR$(A) CHR$(255);
95 REM GO IF SENTENCE TOO LONG
100 IF LEN(A$)>190 GOSUB 190
105 REM GO BACK TO MAIN MENU
110 IF A=5 THEN RETURN
115 REM NEW SENTENCE ON ., !, OR ?
120 IF A=46 OR A=63 OR A=33 THEN A$(X)=A$:A$="":GOTO 60
130 GOTO 70
135 REM CHANGE RETURN KEY TO BACKSLASH
140 IF A=13 THEN A=92: A$=A$+CHR$(92)
```

Listing 2 *(continued)*

```
150 IF A=5 THEN A$(X)=A$:A$="":RETURN
155 REM BACKSPACE ROUTINE
160 IF A=8 AND A$="" AND X>1 THEN X=X-1:A$=A$(X) ELSE
    IF X=1 AND A=8 AND A$="" THEN RETURN
170 IF A=8 AND LEN(A$)>0 THEN A$=LEFT$(A$,LEN(A$)-1)
180 RETURN
185 REM NEW SENTENCE ROUTINE
190 A$(X)=A$:A$="":X=X+1:RETURN
```

Listing 3

```
1000 REM---PRINT ROUTINE--VER 1.6--APR, 1983--JOHN STEINER
1010 CLS:PRINT:PRINT "PRINTING ";N$
1020 B$=" ":I=0
1030 SP=0
1040 I=I+1
1050 IF I>X THEN GOTO1200
1055 REM PRINT LAST LINE AND START NEW PARAGRAPH
1060 IF LEFT$(A$(I),1)="" GOSUB 1210:B$="":SP=0:GOTO 1190
1070 SQ=1
1075 REM LOOK FOR SPACE BETWEEN WORDS
1080 SP=INSTR(SP+1,A$(I)," ")
1090 IF SP=0 THEN SP=LEN(A$(I))+1
1100 IF LEN(B$)+SP-SQ>CL THEN 1180
1110 C$=MID$(A$(I),SQ,SP-SQ)
1120 IF C$=""THEN C$=""
1130 B$=B$+C$
1140 SQ=SP
1150 IF SP>=LEN(A$(I)) THEN 1030
1160 GOTO 1080
1170 GOSUB 1210
1180 B$=""
1190 GOTO 1110
1200 RETURN
1205 REM PRINT THE CURRENT LINE
1210 PRINT#-2,B$;CHR$(13);:RETURN
```

(Continued on next page)

Listing 4

```
2000 REM EDIT ROUTINE——VER 1.0——APR, 1983——JOHN STEINER
2010 Y=1
2020 CLS:PRINT:PRINT Y;:PRINT A$(Y)
2030 IF LEN(A$(Y)) > 191 THEN PRINT "PLEASE REEDIT
     TO SHORTEN LONG SENTENCE ":SOUND 50,1
2040 PRINT"REWRITE SENTENCE?"
2050 PRINT"PRESS <H> FOR HELP"
2060 REM GET COMMAND AND EXECUTE
2070 S$=INKEY$:IF S$="" THEN 2070
2080 IF S$="H" OR S$="h" GOSUB 2400
2090 IF S$=CHR$(94) AND Y>1 THEN Y=Y-1
2100 IF S$="B" OR S$="b" THEN Y=1
2110 IF S$=CHR$(10) AND Y<X THEN Y=Y+1
2120 IF S$="E" OR S$="e" THEN Y=X
2130 IF S$="Y" OR S$="y" THEN S=Y:GOSUB 2150
2140 IF S$=CHR$(13) THEN RETURN ELSE 2020
2150 PRINT"TO REMOVE SENTENCE, ENTER <←>"
2160 PRINT"TO INSERT SENTENCE, ENTER <↑>"
2170 LINE INPUT"PHRASE TO DELETE?";D$
2180 IFD$="←" GOSUB 2350:RETURN
2190 IFD$="↑" GOSUB 2380:RETURN
2200 REM LOOK FOR PHRASE
2210 F=INSTR(A$(S),D$)
2220 REM CAN'T FIND PHRASE
2230 IF F<1 THEN PRINT D$" -IS NOT IN YOUR SENTENCE.":
     FOR I=1 TO1000:NEXT:RETURN
2240 LINEINPUT"PHRASE TO INSERT? ";I$
2250 L=LEN(D$)
2260 FOR Z=1 TO LEN(A$(S))
2270 IF MID$(A$(S),Z,L)=D$ THEN 2290
2280 NEXT
2290 E=Z-1+LEN(D$)
2300 REM REPLACE PHRASE
2310 A$(S)=LEFT$(A$(S),Z-1)+I$+RIGHT$(A$(S),LEN(A$(S))-E)
2320 IF X<R-1 THEN X=X+1
2330 RETURN
2340 REM DELETE ROUTINE
2350 FORI=1TOX:A$(S)=A$(S+1):S=S+1:NEXT
```

Listing 4 *(continued)*

```
2360 X=X-1:RETURN
2370 REM INSERT ROUTINE
2380 FORI=X TO S STEP-1:A$(I+1)=A$(I):NEXT
2390 X=X+1:LINE INPUT"SENTENCE TO INSERT? ";A$(S):RETURN
2400 REM LOCATE HELP ROUTINE HERE
```

Listing 5

```
3000 REM LOAD A FILE——V 1.0——FEB, 1982——JOHN STEINER
3010 CLS:PRINT:PRINT "":PRINT"TO LOAD A FILE PRESS ANY KEY"
3020 PRINT "PRESS <M> TO RETURN TO MENU"
3030 ME$=INKEY$:IFME$=""THEN3030
3040 IF ME$="M" OR ME$="m" THEN CLS:RETURN
3050 X=0:R=0
3060 PRINT"TO RETURN TO MENU, ENTER <MENU>"
3070 INPUT"FILE NAME";N$
3080 IF LEN(N$)<1 OR LEN(N$)>8 THEN PRINT
     "IMPROPER FILE NAME, ONE TO EIGHT LETTERS ONLY":GOTO 3070
3090 IF N$="MENU"THEN RETURN
3100 OPEN"I",# 1,N$
3110 PRINT"LOADING FILE ";N$
3120 R=R+1
3130 IF EOF(1) THEN 3160
3140 LINEINPUT#1,A$(R)
3150 GOTO 3120
3160 CLOSE#1
3170 X=R:R=0:RETURN
```

Listing 6

```
4000 REM SAVE A FILE——VER 1.0——FEB, 1982——JOHN STEINER
4010 CLS:PRINT:PRINT "":PRINT"TO SAVE A FILE PRESS ANY KEY"
4020 PRINT "PRESS <M> TO RETURN TO MENU"
4030 ME$=INKEY$:IFME$=""THEN4030
4040 IF ME$="M"OR ME$="m"THEN CLS:RETURN
4050 PRINT"TO RETURN TO MENU, ENTER <MENU>"
4060 INPUT"NEW FILE NAME";PA$
4070 IF PA$="MENU"THEN RETURN
4080 IF PA$<>"" THEN N$=PA$
4090 IF LEN(N$)<1 OR LEN(N$)>8 THEN PRINT
     "IMPROPER FILE NAME, ONE TO EIGHT LETTERS ONLY":GOTO4060
4100 IF A$(X)="" THEN X=X-1:GOTO4100
4110 CLS:PRINT "SAVING FILE ";N$
4120 OPEN"O",#1,N$
4130 FOR I=1 TO X
4140 PRINT #1,A$(I)
4150 NEXT
4160 CLOSE#1
4170 RETURN
```

Listing 7

```
5000 REM——GLOBAL SEARCH——V.2.2——SEPT, 1982
5010 CLS:PRINT"GLOBAL SEARCH ROUTINE"
5020 PRINT"PRESS ANY KEY TO CONTINUE
5030 PRINT"PRESS <M> TO RETURN TO MENU
5040 B$=INKEY$:IF B$="" THEN 5040
5050 IF B$="M" THEN RETURN
5060 CLS:PRINT""
5070 LINEINPUT"PHRASE TO DELETE? ";D$
5080 IF LEN(D$)=0 THEN PRINT"PLEASE ENTER A PHRASE, OR":GOTO 5030
5090 LINEINPUT"PHRASE TO INSERT? ";I$
5100 IF I$=D$ THEN PRINT "YOU CANNOT ENTER A PHRASE YOU
     WANT REPLACED":GOTO5090
5110 PRINT"SEARCHING"
5120 CT=0:FOR S=1 TO X
5130 F=INSTR(A$(S),D$)
5140 IF A$(S)=""THEN5180
5150 IF F>0 AND B$<>"A"THEN GOSUB 5230
5160 REM THIS GOSUB CALLS THE EDIT ROUTINE
5170 IF F>0 AND B$="A" THEN GOSUB 2250:F=0:CT=CT+1:S=S-1
5180 NEXT
5190 CLS
5200 PRINT "PRESS ANY KEY TO CONTINUE..."
5210 IF INKEY$=""THEN5210
5220 RETURN
5230 CLS:PRINT:PRINT S,,A$(S):PRINT "<A>CHANGE";CHR$(13);
     "<C>CHANGE ALL";CHR$(13);"<ENTER> LEAVE"
5240 B$=INKEY$:IF B$="" THEN 5240
5250 REM THIS GOSUB CALLS THE EDIT ROUTINE
5260 IF B$="C" THEN GOSUB 2250:F=0:CT=CT+1:S=S-1:RETURN
5270 IF B$=CHR$(13) OR B$="A"THEN RETURN
5280 SOUND 100,1:GOTO 5240
```


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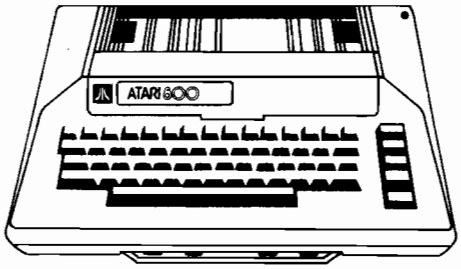

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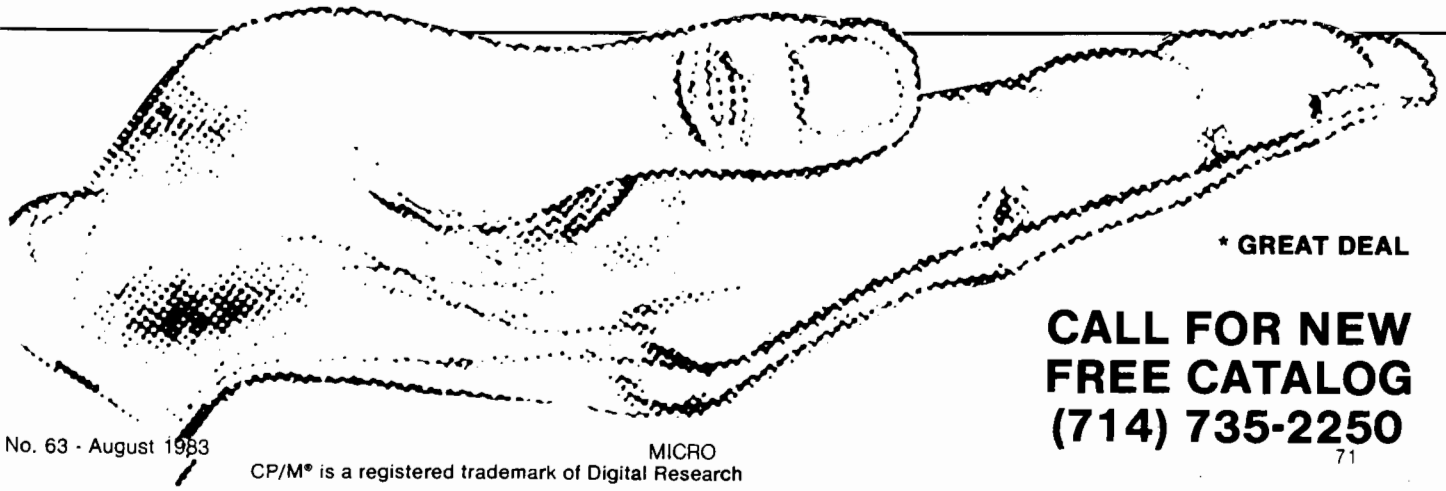

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Mode 10 Atari Painting Program Part II

Photos taken from AMDEK Color I Monitor.

by Paul Swanson

Last month, part 1 (MICRO 62:66) contained operating instructions and the listing of the program. If you downloaded it from a bulletin board service, check to be sure no lines were altered. The services listed in last month's issue placed them in the download files under the name MODE10.

The bulk of this month's installment is a description of the program, so you should have last month's MICRO handy. You may want to make some changes to add two new features: cassette capability and vertical fill.

Cassette Interface

Since many Atari computers still have no disks, a save/load to disk doesn't help too much. A very simple change can make the program write out the file to any peripheral. That change is in the subroutine that opens the file, in lines 10000 through 10050, as listed below. Note that line 10040 has been deleted.

```
10000 ? "ENTER FILE SPEC - MAX. 8
      CHARACTERS:"
10010 INPUT FILE$
10020 IF LEN(FILE$) < 2 THEN 11000
10030 TRAP 11000
10050 OPEN #3,DIRECTION,0,FILE$:RETURN
```

MODE 10
requires:
Atari 400/800/1200

If you want to save to cassette, when it comes time to save the screen, enter C: when asked for a file spec. Enter C: to load the picture back from tape, also. For disk storage precede the filename with D:, D1:, D2:, etc., as required.

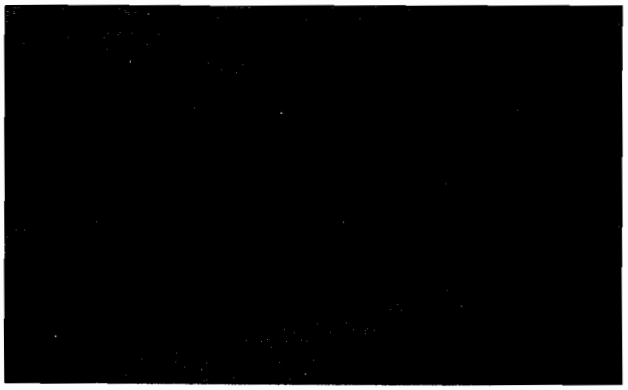
Pay attention to the screen instructions when making a change like this, also. You may want to eliminate the "ON DISK" and "FROM DISK" portions of the screen displays from lines 3060, 3070, 3200, and 3300.

Vertical Fill

It may be useful to have the program fill in a vertical direction as well as horizontal. Since there are now four different fill directions, the directions will be selected with the four arrow keys (unshifted and *without* the control key).

To implement this change, start with the keyboard interpret routine in lines 3000 to 3030. The new version of the routine is listed below. Note that lines 3002 and 3004 and new variable VFILL have been added.

```
3000 N = PEEK(KB):POKE KB,255: IF N = 7 THEN
     VFILL = 0:FILLFLAG = 1:GOTO BEGIN
3002 IF N = 14 THEN FILLFLAG = 0:VFILL = -1:
     GOTO BEGIN
3004 IF N = 15 THEN FILLFLAG = 0:VFILL = 1:
     GOTO BEGIN
3010 IF N = 6 THEN VFILL = 0:FILLFLAG - 1:GOTO
     BEGIN
3012 IF N = 31 OR N = 30 THEN GOTO 8000
3020 IF N = 18 THEN FILLFLAG = 0:VFILL = 0:
     GOTO BEGIN
3030 IF N < > 58 THEN GOTO BEGIN
```



Also you should add:

```
932  VFILL = 0: FILLFLAG = 0
1002 IF FILLFLAG = 0 AND VFILL = 0 THEN 1040
1170 CURSORFLAG = 0:CURSORCOUNT = 4:IF
     (FILLFLAG = 0 AND VFILL = 0) OR
     STRIG(0) = 1 THEN GOTO BEGIN
1180 X1 = X:Y1 = Y:COLOR SELCOLOR
1192 Y1 = Y1 + VFILL*INCREMENT:IFY1 > 191 OR
     Y1 < 0 THEN GOTO BEGIN
1200 LOCATE X1,Y1,TESTEND: IF TESTEND =
     SELCOLOR THEN GOTO BEGIN
1210 PLOT X1,Y1:GOTO 1190
```

MODE10 Program Description -- Initialization

Initialization begins with reading the joystick read table at lines 50 through 70. These constants form a look-up table that makes reading the joystick a little faster. BASIC is a rather slow language, so as many ways to pick up some speed as possible should be implemented. The array JOY is set up as a two-dimensional array using the first dimension as the reading, which is in the range of 1 to 15. Several elements are unused, so these are filled in with zeroes.

The next section, at line 100, sets up the string assignment location on an even 1K boundary. Players and missiles, display lists, and screens all have restrictions relative to memory boundaries. Starting the strings on a 1K boundary makes it possible to adhere to these restrictions. Display lists may not cross a 1K boundary, so these are defined next.

There are three display lists used in the main part of the program. One is the standard operating system display list, which will be established and maintained by the operating system so that the POSITION, PLOT, and other BASIC commands will work on it. GRAPHICS 10 automatically sets this up and reserves memory for it. There will also be a "Help" screen and a general selection screen used to select the colors, both of which are maintained in strings. HELPDL$ is the display list for the screen in HELPSC$ and SELDL$ is the display list for the screen SELSC$.

The display lists are defined in the statements at lines 160 through 200. The "Help" screen is a 6-line mode 0 screen. In the display list, the lower case "P" is ASCII code 112 ($70), which blanks 8 scan lines for each command. The upper case B (ASCII 66=$42) is a "load memory scan" instruction. It will display a mode 0 line ("instruction mode" 2 is operating system mode 0) starting the memory scan at the address in the two bytes that follow it. The memory scan contains the address of the screen memory that is to be displayed.

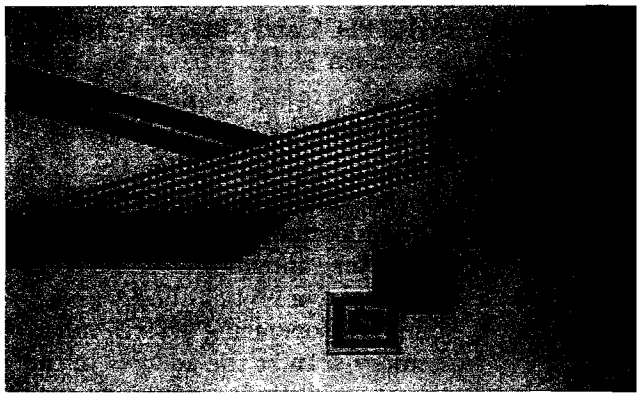
The address for the memory scan is zero in the next two bytes, but it will be filled in later. The five bytes that follow the address are one-byte commands that display the five remaining mode 0 lines. For this mode, the memory scan is increased by 40 for each line. The upper case "A" that ends this list is a "jump on vertical blank" instruction (decimal 65 = $41), which causes a wait until the television frame is complete, followed by a branch to the address in the two bytes that follow it. This address is also filled in later on in the initialization.

The second display list is for the color selection screens. It is basically the same as the "Help" screen display list except that it will display IR mode $F (=decimal 15) lines, which is the mode for operating system modes 8 through 11. Another location in memory determines which of these modes will be displayed, and that will be used later in the program.

One significant difference in this second display list is the inverse video lower case "p" just before the "jump on vertical blank" instruction. This is a "blank 8 lines" instruction with the display list interrupt enabled. A display list interrupt will be used later in the program to change colors on the select screens. If you do not get the arrow on the color selection screens, check the last lower case "p" in this display list. It must be inverse video in order to implement the display list interrupt.

ADRSETUP is a subroutine that takes an address stored in the variable A and converts it to the two-byte format required for insertion into the display lists, returned as the variable A$. Lines 190 and 200 show how this subroutine is used by placing the addresses of the display lists in the "jump on vertical" blank instructions.

The screens stored in the strings must be initialized. The operating system is not maintaining these screens, so the BASIC program must maintain them. The "Help" screen is set to all spaces, which will be altered later. The color selection screen is set up for 16 different colored



boxes. The GTIA modes (operating system modes 9, 10, and 11) all require four bits per pixel, so the bytes must be set up with two pixels each. The bytes in this string will each hold two pixels of one color, which makes initialization a little easier. All colors will be on the screen.

To convert a particular color number to the code required for two pixels in each byte, just multiply the color times 17. The first "box" is color zero, so line 230 starts the string with ASCII zeroes. The loop in lines 240 through 250 prepare four dots in each color by setting pairs of bytes equal to all of the numbers from 17 to 255 that are divisible by 17. Line 260 copies this one screen line to the rest of SELSC$ so that there are six lines altogether, forming the rectangular colored boxes.

The subroutine ADRSETUP is used again in the next section (lines 280 and 290). These lines insert the screen starting locations into the display list "load memory scan" instructions.

The single player used as the arrow in the color selection routines is set up next. The string area was set on a 1K boundary and then several items were DIMensioned after that. An easy addition shows that the pointer used to locate the strings is now 640 bytes after the 1K boundary. This is exactly where the second player starts when two-line resolution is used. The 128 bytes needed for this are set aside at line 310 and the string used for the player, PL2$, is initialized to all zeroes. Anyone familiar with using players and missiles will note that the system equates refer to this as player 1 because the players start with player 0, but only one player is to be used, so confusion is not likely. It may be more proper to call this PL1$.

The text is added to the "Help" screen at lines 340 through 380. The screen, HELPSC$, is now set up in ATASCII, but that isn't going to work. The screens are interpreted using a slightly different order for the characters. This is done so that the colors for modes 1 and 2 work out a little better, but it causes one slight problem here. The codes must be turned around to agree with the screen codes.

Most of the initialization time is spent in this conversion loop, which occupies lines 390 and 392. First, the inverse video bit is stripped off and stored in N1. Then all codes between 32 and 95 are decreased by 32, all codes between 0 and 31 are increased by 64, and all codes between 96 and 127 are left as they are. The inverse video bit is then restored and the converted code is stored back into the string. The "Help" screen could be set up in the converted format, eliminating the time required for that loop, but it would be very hard to read in the listing.

The GRAPHICS 10 screen is declared and a set of colors is inserted into the color registers next. Although initialization is not yet complete, altering the screen here serves as an indication that initialization is almost over and actually makes it seem like it is a little shorter than it really is. After that, some constants are defined that will be used in the other sections of the program.

The display list interrupt is read into memory by lines 610 and 620 and line 630 initializes the proper vector to point to it. The alternate screen set up next is the one that uses only nine boxes instead of the 16. It will be displayed by altering one byte of the display list in SELDL$. BUFF$ and RCOL are used to store the colors and screen images so that they may be stored on disk and read from disk more easily. The other variables DIMed in line 910 are used to store machine language, file names, and other miscellaneous information.

Lines 930 through 982 set up the program for the cursor being near the center and set the initial values of flags and counters.

The Main Program

After all that initialization, the main program text is relatively short. There is one main loop, which reads and interprets the operator input, and a series of routines that carry out the various commands. That loop starts by reading the joystick at line 1000.

The cursor must flash so that it can be seen. This flashing cursor is maintained at a rate set by counting using the variable CURSORCOUNT. If the fill is on, a tone is also sent out, which is done in lines 1002 through 1030. Line 1040 and line 1050 reverse the color of the pixel when CURSORCOUNT reaches four, then resets CURSORCOUNT to zero. The cursor color is flashed by alternating it between the proper color for that spot and the next sequential color register. UNDERCURSOR contains the number of the color that is plotted at that location and CURSORFLAG keeps track of whether that color, or an alternate one, is there.

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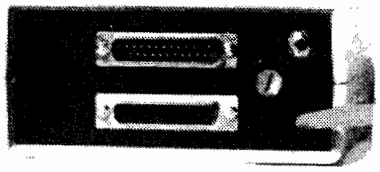

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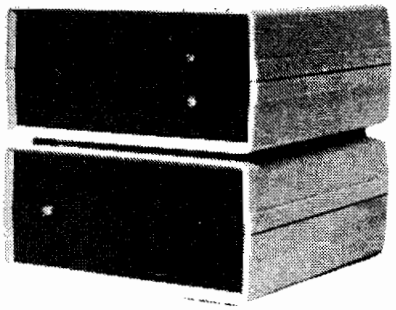

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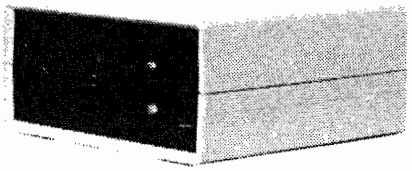

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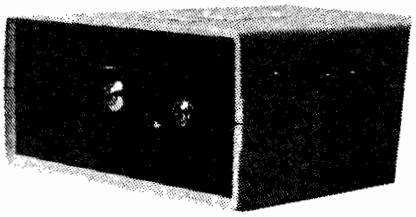

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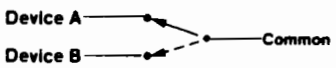

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To keep the drawing and cursor move routine loops as short as possible, the joystick and trigger values are checked next. If either indicate an action, line 1050 branches out to the routine that performs the action; otherwise, the function keys and keyboard are checked. If neither of those inputs indicates any actions, line 1074 restarts the loop.

Line 1080 begins the cursor movement and draw functions. First, if the joystick is moved or the trigger is pushed, line 1080 turns off the attract mode so that the screen will not start rotating colors. Normally this is done by pressing a keyboard key, but no key is pressed while drawing with the joystick.

Lines 1110 and 1120 plot the UNDERCURSOR color at the current cursor location to guarantee that the alternate color is not there if the cursor is moved. If the trigger is down, then the selected color (SELCOLOR) is put there instead.

The move cursor routine increments the positions of the cursor according to the joystick position. With the lookup table in the JOY array, this can all be done on one line. INCREMENT is either one or two and it is line 1140 that controls which columns and rows the dots will display when an increment of two is in force.

Line 1150 keeps the cursor on the screen. It sets X and Y to the remainder of dividing each by their upper limits, which causes the cursor to wrap if directed off the screen. Lines 1160 and 1170 take care of the bookkeeping work required for the new position. Setting CURSORCOUNT to four when the cursor moves causes it to flash more frequently to make it more visible.

If the fill flag is on for a right or left fill, the routine at lines 1180 through 1210 perform the fill operation. The temporary horizontal position during the fill is kept in the variable X1, which is incremented for a right fill or decremented for a left fill until either the same color is hit or the edge of the screen is encountered. INCREMENT controls whether every pixel or every other pixel is checked. FILLFLAG is +1 for a right fill, −1 for a left fill, or zero for no fill.

Various keys are also defined for specific functions and are interpreted in lines 3000 through 3030. That routine reads the keyboard code, so it is not checking the ATASCII value of the reading. Left fill is implemented by the letter L, for example, and the key code for that is zero. Line 3010 sets FILLFLAG to −1 if the code is zero, then restarts the loop. Line 3012 checks for one (code 31) or two (code 30) and goes to line 8000 to reset the increment if either of those keys is pressed. Line 3020 checks for C (cancel fill) and sets FILLFLAG accordingly. The R for right fill is set at line 3000 just after the keyboard reading.

To access the disk commands, a D is pressed, which is code 58. Execution falls through line 3030 on that code. That routine first saves the screen into the buffer BUFF$ (the GOSUB 2000), then clears the screen to a selector of functions. This uses the keyboard handler by opening, reading, and closing the keyboard (line 3100), so the ATASCII values of the keys are actually read. Reading using a GET statement is possible here because the "action" is stopped anyway. In the loop used for drawing, if GET were used, hitting the CAPS/LOWR or Atari keys would freeze the action while the keyboard handler waits for a decodable key.

Load and save are both handled by using a subroutine at line 10000. This subroutine gets the file name and opens the file. On return, the two routines that load and save do the PRINTing and INPUTting as required. Notice that INPUT is used to retrieve the information from disk. The only codes that are critical are 155, which is the RETURN character ($9B), and 44, which is the comma ($2C). Neither of those codes can be generated by correct mode 10 colors. Knowing that the RETURN code and the code for comma will not be in the data allows use of PRINT and INPUT.

Selection 3 effects a return to the current picture. Lines 3400 to 3420 read the picture that is currently in the buffer BUFF$ back into the screen area, sets all of the colors, and defines UNDERCURSOR to the color under the cursor position.

Function keys are also used as input and are interpreted at lines 4000 and 4010. The FOR/NEXT loop at line 4000 ends only when the function key is released, allowing PEEK(CONSOL) to equal seven. Line 5020 stores the location of the display list for the operating system mode 10 screen so that it may be restored later. Line 4010 branches according to which switch is pressed.

The "Help" screen is displayed in response to the OPTION key. The routine that handles this starts at line 4100 POKEing a zero into the GTIA location (PRIOR in the manuals) turns off the GTIA mode allowing the text to display normally. That line continues by taking the address of the display list out of the display list itself, setting the operating system's display list pointer to point to the HELP screen display list.

Line 4102 makes sure that there are no function keys pressed. This looks redundant, but it eliminates possible key bounce, which would cause the "Help" screen to flash on and off the screen very quickly. Once that is done, line 4110 checks for any operator input. If any keyboard or function key is pressed, the trigger is pressed, or the joystick is moved, line 4120 restores the mode 10 drawing and goes back to the interpretation routines to execute the command indicated. Lines

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4130 through 4150 are not used in the program but are the remains of an earlier version. They may be removed without affecting program operation. My apologies for this oversight to all who entered this program *via* the keyboard.

Line 4200 begins the routine that changes the colors in the color registers. It uses similar screens in different GTIA modes to select the color and luminance. MAXSEL indicates the maximum number of selections to be displayed, MSG is the line number of a DATA statement containing the message for the arrow, and line 5040 is the subroutine that allows selection. The location identified as GTIA in this program causes the screen to be mode 9 if it contains 64, mode 10 if it contains 128, or mode 11 if it contains 192. COLUSED is the variable used to assemble the color selected and COLNO is the register number selected for the change. COLSAV restores one color register borrowed for the background.

The routine starting at line 4300 functions similarly but is simpler in that all it selects is the color for the "paintbrush," so it goes through only one screen of selection. Both of these last two routines borrow the last part of the "Help" screen display routine to restore everything and go back to the main loop.

Subroutines

The subroutines and other miscellaneous supportive statements start at line 5000 with the routine that changes an address stored in the variable A to the two-byte format needed for display lists. Line 5020 is a subroutine that reads the pointer to the operating system screen and stores it in SHI and SLO. Line 5030 is the inverse, used to restore the pointer.

Line 5040 begins a subroutine that sets up the player for the SELECT and START functions and reads the operator's choice. MSG is the line number containing the text to display in the player and that is read into the variable F$. Line 5050 sets the arrow head into the player, then lines 5070 through 5080 read the character formats for each letter into the player area. Lines 5090 and 5100 contain all of the POKEs required to implement two-line resolution player/missiles and line 5110 sets the horizontal position under box zero.

Line 5120 checks the joystick and trigger and line 5130 makes the selection and returns if the trigger is pressed. Lines 5140 and 5150 keep track of the arrow's position and move it according to the joystick. If the arrow is moved, line 5160 produces a tone for a short time and this small loop is repeated. Note the DATA statements containing the text at lines 6000 through 6030.

The numbers in the DATA statement at line 7000 comprise the display list interrupt. This is POKEd into page 6. To save time if there are changes in this interrupt routine, the DATA statement ends with a 256, which is not a valid code to POKE. The routine that reads this into page 6 reads until it gets to a value of 256. Adding to the routine then does not require counting the entries.

Line 8000 is a little out of place, numerically. It belongs with the other routines in the main part of the program. This routine sets the increment to 1 or 2. The keyboard codes for 1 and 2 are 31 and 30, respectively, so subtracting the code from 32 results in the correct number, once it is checked that the code is either 30 or 31.

Line 10000 begins the subroutine that gets the file name and opens the file. In the main part of the program, DIRECTION is set at 4 for reading from the disk or 8 for writing to the disk so that only one OPEN statement is required. It uses line 11000 for any errors detected in the file name. Add TRAP 40000 between the OPEN statement and the RETURN statement to avoid possible problems from the TRAP 11000 statement.

The final subroutine uses a machine-language program to move data from the screen area to the buffer and *vice versa*. The machine-language routine moves 256 bytes at a time, so it must be used repeatedly to move all 8K bytes. Line 20010 finds the location of the screen by locating the operating system display list and looking at the two bytes in its load memory scan instruction. Line 20020 is the loop that moves the screen and line 20030 reads the colors directly from the shadow registers. Once this subroutine is completed, the mode screen used for the disk functions selector can be declared without losing the mode 10 screen data. Also, this subroutine defines Q$ with the machine language that will also be used at line 3410 to restore the mode 10 screen.

Adding Functions

In making changes to the program, the general structure should make it easier to locate places to tap and to find places in the line numbering to add more routines. There are also a few "insurance" statements left in the code, like line 3989. If you add a routine at line 3500, for example, and leave off the return to the loop, this GOTO BEGIN will do it for you. There is also a STOP at line 4990 to prevent an omission in the main portion of the program from running into the first subroutine.

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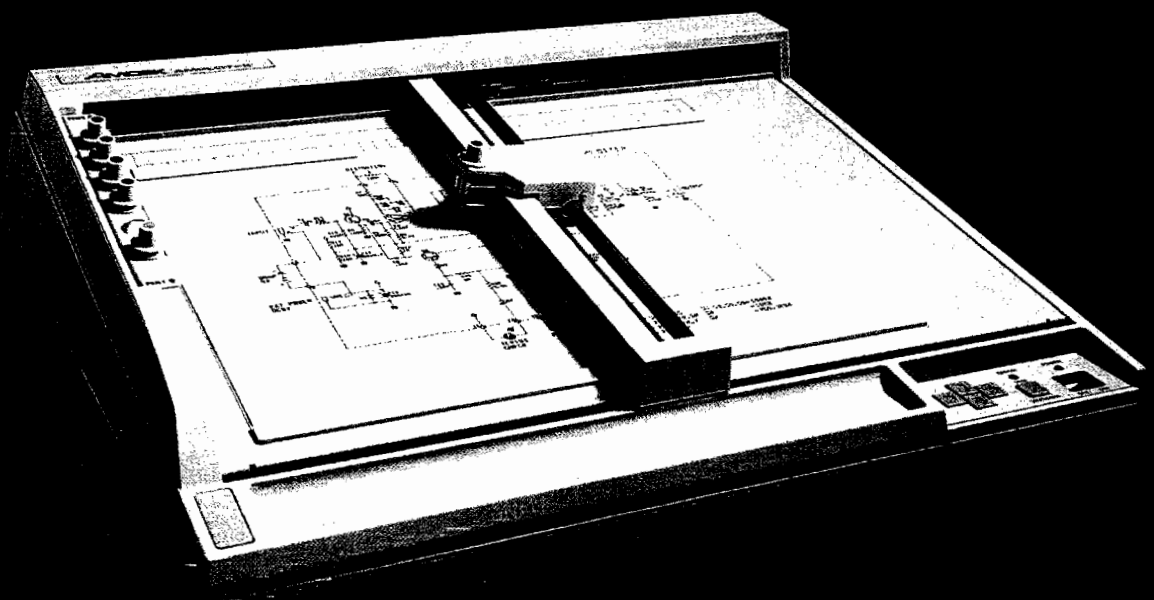

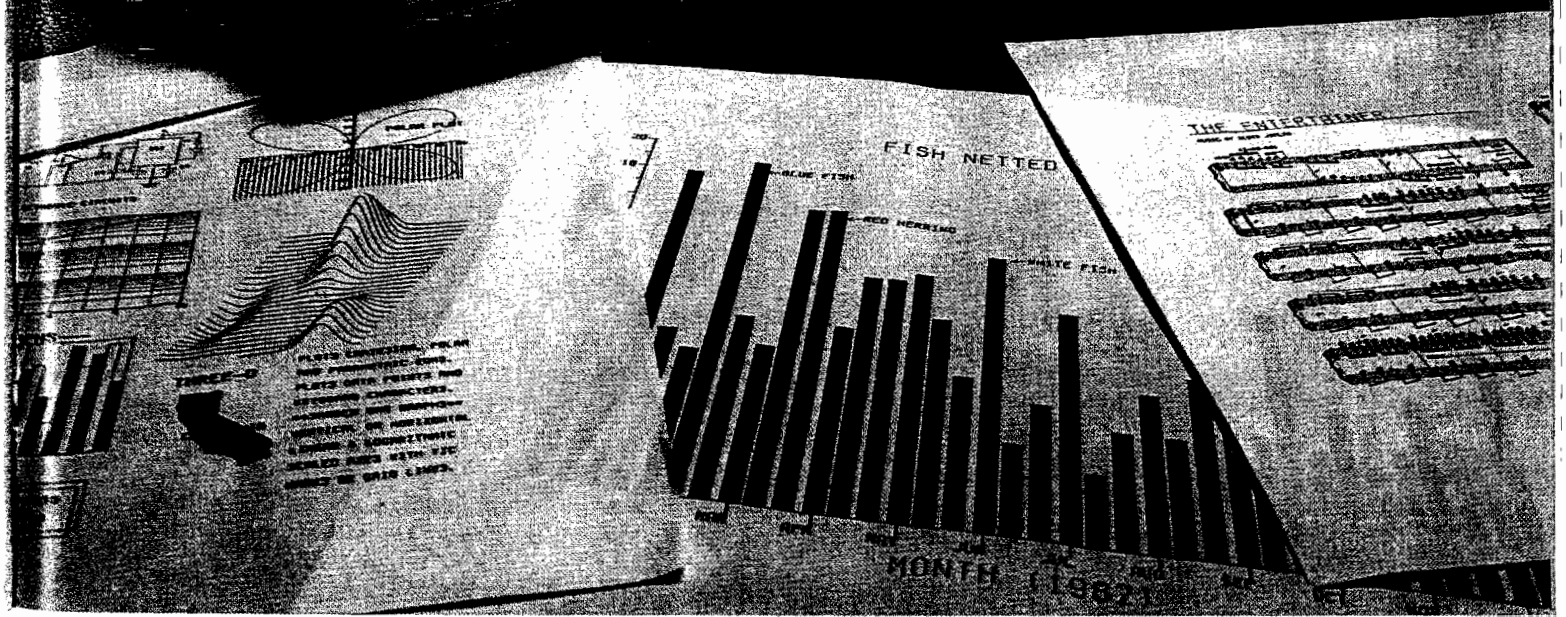

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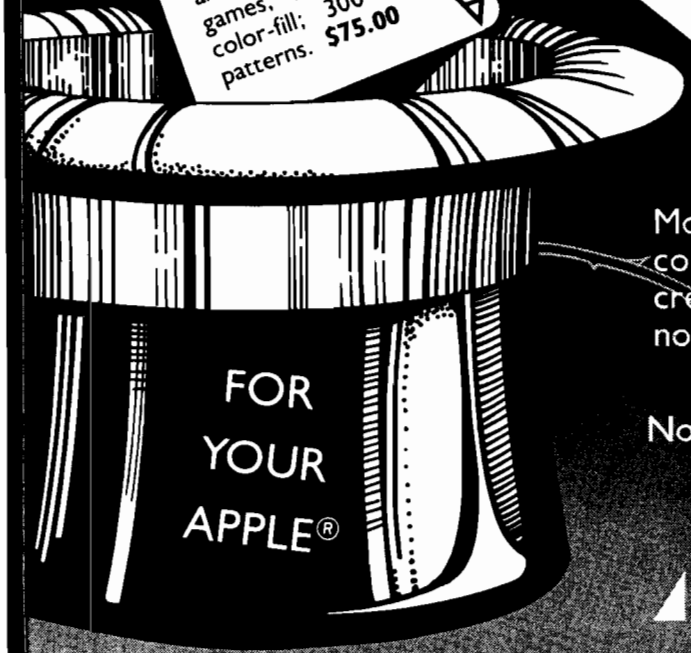

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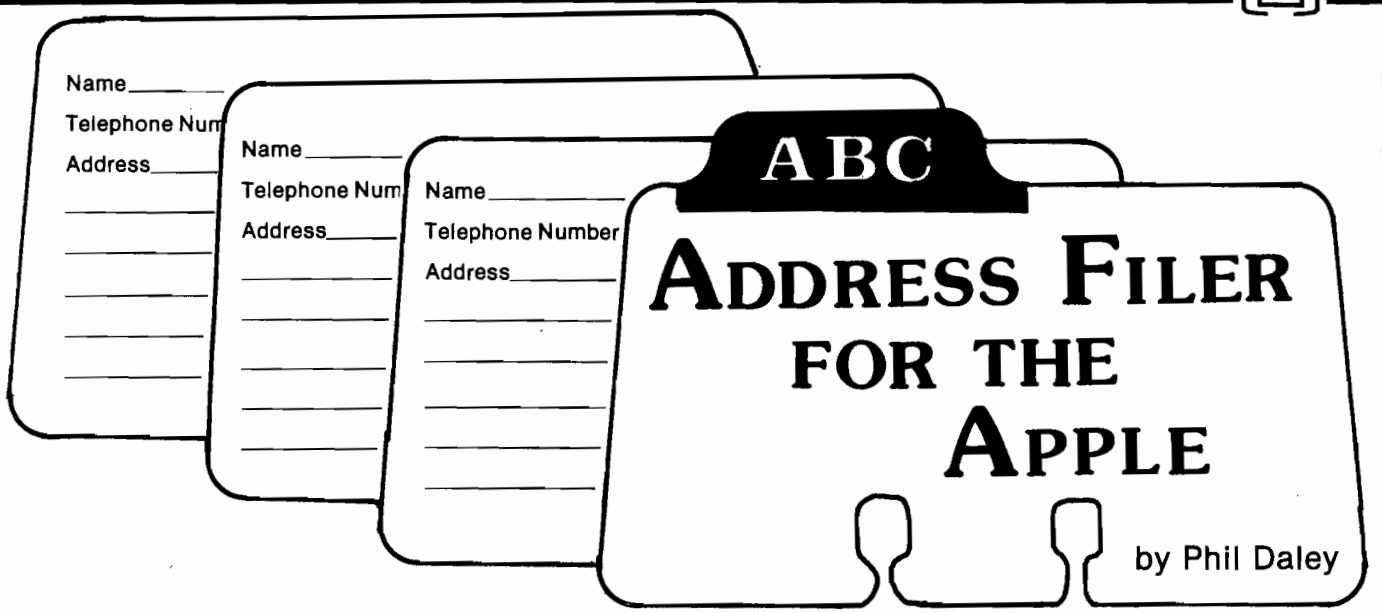

ABC ADDRESS FILER FOR THE APPLE

by Phil Daley

This article presents a short, concise but useful file program that demonstrates random-access techniques on the Apple.

Address Filer
requires: Apple II with disk drive
80-column card optional

This program creates and maintains a random-access file of names, addresses, and phone numbers and includes an option for zip sorting and hardcopy printout for mailing-list purposes. If you have a mailing-list/word processor that accepts random-access files, you can use this file maker as a database for form-letter mailings

The major difference between random and sequential files is the ability to read or write each record individually, without having to read or write the whole file. The syntax 'PRINT CHR$(4) "OPEN <filename>,Lnn" and PRINT CHR$(4) "READ (or WRITE) < file name>,Rn" ' is the correct method for accessing such a file. Note that Lnn is the LENGTH parameter and *must* be specified when OPENing the file. Lnn can be any number within reason, but if it is much longer than each actual record length, you will waste a lot of unnecessary space on the disk. The best method for determining the length to use is to count the number of bytes necessary for storing your information (including a carriage return after each field) and add a few extra bytes in case you decide to change anything as you develop your program. It is not necessary for the fields to be the same length in each record, but the total record length must not be exceeded or DOS will write records on top of each other. The record length must be the same every time the file is opened, as DOS uses that parameter to calculate where the different record numbers are stored.

Warning: Never WRITE to a random file without specifying the length parameter when OPENing it. DOS will assume it is a sequential file (even if you specify a record number) and write at the beginning of the file (ruining your file) without issuing any error messages! (I discovered this the hard way.)

I wrote the program to allow an 80-column card in slot 1-7 so that upper/lower-case fields can be entered. If you don't have an 80-column card, a "0" to the "What slot?" question will suffice; or you could delete those lines altogether.

Notes on Program Operation

1. Telephone numbers should be entered as ten digits. The hyphens will be inserted on printout.
2. Use the two-digit state codes. The zip-sort routine assumes the zip code starts in byte 4 of the state field.
3. While the sort is not fast, it rewrites the file in sorted order so that printouts will be sorted without re-sorting every time.
4. During edit mode, a < return > signifies that current information is correct.
5. The zip sort arranges the record numbers into zip-code order in an array that is used to index the rewriting of the file.

I hope this relatively easy program increases your use of random files. They are the most efficient way to manage lengthy files.

(Listing appears on next page)

Listing 1: Address Filer Listing

```
1Ø D$ = CHR$ (4): HOME : VTAB 1Ø
    : PRINT "8Ø COLUMN CARD IN S
    LOT #";: INPUT AA$:AA = VAL
    (AA$): PRINT D$"PR#"AA: PRINT
    : GOSUB 5ØØ: GOSUB 5ØØ: GOTO
    16Ø
2Ø GOSUB 9Ø: GOSUB 5ØØ
3Ø VTAB 1: PRINT "IF DONE, ENTER
    'DONE'": POKE 34,1
4Ø V = V + 1: IF V > 1226 THEN RETURN
5Ø VTAB 1Ø: PRINT "Input Name
    ]": VTAB
    1Ø: HTAB 11: INPUT "";A$: IF
    A$ = "DONE" OR A$ = "done" THEN
    GOSUB 12Ø: RETURN
6Ø PRINT "Input Street Address
    ]": VTAB
    11: HTAB 21: INPUT "";Z$: PRINT
    "Input City
    ]": VTAB 12: HTAB 11
    : INPUT "";S$: PRINT "Input
    State and ZIP]": VTAB
    13: HTAB 2Ø: INPUT "";T$: PRINT
    "Input Phone #]": VTAB
    14: HTAB 13: INPUT "";P$: GOSUB
    5ØØ: GOSUB 11Ø: GOTO 4Ø
7Ø PRINT D$"OPEN"W$: PRINT D$"DE
    LETE"W$
8Ø PRINT D$"OPEN "W$",L1ØØ": PRINT
    D$: RETURN
9Ø GOSUB 5ØØ: VTAB 5: PRINT "WHA
    T NAME FOR THE FILE": INPUT
    W$: IF LEN (W$) = Ø THEN POP
    : RETURN
1ØØ GOSUB 7Ø: RETURN
11Ø PRINT : PRINT D$;"WRITE "W$"
    ,R"V: PRINT A$: PRINT Z$: PRINT
    S$: PRINT T$: PRINT P$: PRINT
    D$: RETURN
12Ø PRINT D$"WRITE"W$",RØ: PRINT
    V - 1: PRINT D$"CLOSE": RETURN
13Ø PRINT : PRINT D$;"READ "W$",
    R"V: IF V = Ø THEN INPUT V:
    GOTO 15Ø
14Ø INPUT A$: INPUT Z$: INPUT S$
    : INPUT T$: INPUT P$
15Ø PRINT D$: RETURN
16Ø X$ = "**********************
    ****************":XX$ = "*

        *": IF AA < > Ø THEN
    X$ = X$ + X$:XX$ = LEFT$ (X
    X$,38) + " " + RIGHT$ (XX$
    ,38)
17Ø PRINT X$: FOR X = 1 TO 2Ø: PRINT
    XX$: NEXT : PRINT X$:BB = 8:
    BC = 27: IF AA = Ø THEN BC =
    12
18Ø VTAB BB: HTAB BC + 3: PRINT
    "ADDRESSER": VTAB BB + 2: HTAB
    BC + 1: PRINT "(C) Copyright
    ": PRINT : HTAB BC: PRINT "B
    y M I C R O INK": FOR X = 1 TO
    5ØØ: NEXT
19Ø GOSUB 5ØØ: VTAB 8: PRINT "Do
    you want to:": PRINT : PRINT
    TAB( 1Ø)"1 Make an address
    file": PRINT TAB( 1Ø)"2 C
    hange an address file": PRINT
    TAB( 1Ø)"3 Print an addres
    s file": PRINT TAB( 1Ø)"4
    Sort by Zip": PRINT TAB( 1Ø
    )"5 Quit":VZ = Ø
2ØØ HTAB 1Ø: GET SS$: IF VAL (S
    S$) > 5 THEN 2ØØ
21Ø PRINT : ON VAL (SS$) GOSUB
    2Ø,24Ø,23Ø,45Ø,22Ø: GOTO 19Ø
22Ø GOSUB 5ØØ: END
23Ø W = 1: GOSUB 41Ø: PRINT D$"OP
    EN "W$",L1ØØ": PRINT D$: GOSUB
    5ØØ: PRINT "EVERYTHING OK": GET
    J$: PRINT : PRINT D$"READ "W
    $",RØ": INPUT X: FOR V = 1 TO
    X: GOSUB 13Ø: PRINT D$"PR#1"
    : PRINT S$", "T$: PRINT "(" LEFT$
    (P$,3)") " MID$ (P$,4,3)"-" RIGHT$
    (P$,4):PRINT:PRINT:NEXT:PRINT
    D$"PR#"AA: RETURN
24Ø GOSUB 41Ø: PRINT D$"OPEN "W$
    ",L1ØØ": PRINT D$"READ "W$",
    RØ": INPUT V: PRINT D$: GOSUB
    5ØØ:N = V: INPUT "ADD(A), CH
    ANGE(C), OR QUIT(Q) ";F$: IF
    LEFT$ (F$,1) = "A" THEN 4ØØ
25Ø IF LEFT$ (F$,1) = "Q" THEN
    RETURN
26Ø PRINT "YOU HAVE "V" ADDRESSE
    S.": PRINT "If you wish to e
    dit a specific address, Type
    in 'N' and": PRINT "hit RET
    URN, and enter the Number of
    the Address.": PRINT "To RE
    TYPE, type 'Y' , If DONE, ty
    pe 'D'.": PRINT "To run thro
    ugh addresses in order, hit
    RETURN."
27Ø FOR X = 1 TO N
28Ø V = X: GOSUB 13Ø: PRINT A$: PRINT
    Z$: PRINT S$", "T$: PRINT : INPUT
    "Retype (Y/N/D) ";Q$: IF Q$ =
    "N" THEN INPUT V: GOTO 32Ø
29Ø IF Q$ = "Y" THEN 33Ø
3ØØ IF Q$ = "D" THEN X = N
31Ø NEXT : PRINT D$"CLOSE": RETURN
32Ø GOSUB 13Ø
33Ø PRINT "("A$")": INPUT Q$: IF
    Q$ < > "" THEN A$ = Q$
34Ø PRINT "("Z$")": INPUT Q$: IF
    Q$ < > "" THEN Z$ = Q$
35Ø PRINT "("S$")": INPUT Q$: IF
    Q$ < > "" THEN S$ = Q$
36Ø PRINT "("T$")": INPUT Q$: IF
    Q$ < > "" THEN T$ = Q$
37Ø PRINT "("P$")": INPUT Q$: IF
    Q$ < > "" THEN P$ = Q$
38Ø GOSUB 11Ø: PRINT "CHANGE ANO
    THER? ": INPUT Q$: IF LEFT$
    (Q$,1) = "Y" THEN X = X + 1:
    GOTO 28Ø
39Ø RETURN
4ØØ GOSUB 13Ø: PRINT "Y o u have
    "V" Addresses and the last
    one is": PRINT : PRINT A$: PRINT
    Z$: PRINT S$", "T$: GOTO 3Ø
41Ø IF W$ < > "" THEN RETURN
42Ø GOSUB 5ØØ: VTAB 5
43Ø PRINT "What is the name of":
    PRINT "File you wish to wor
    k with?": PRINT " If you nee
    d CATALOG, Hit Return": INPUT
    W$: IF W$ < > "" THEN RETURN
44Ø PRINT D$"CATALOG": GOTO 43Ø
45Ø R = Ø: GOSUB 5ØØ: VTAB 1Ø: GOSUB
    41Ø: GOSUB 8Ø:V = Ø: GOSUB 1
    3Ø: DIM B(V),C(V): PRINT "RE
    ADING":QQ = V: FOR V = 1 TO
    QQ: GOSUB 13Ø:B(V) = VAL
    ( RIGHT$ (T$,5)): NEXT :I = 1:
    PRINT "SORTING":D1 = Ø
46Ø M = Ø:N = Ø:D = 1ØØØØØ: FOR J
    = 1 TO QQ: IF M AND B(J) =
    B(E) THEN N = N + 1
47Ø IF B(J) < D AND B(J) > = D1
    THEN D = B(J):E = J:M = 1:N
    = 1
48Ø NEXT :D1 = D + 1: FOR K = 1 TO
    N:C(I) = E:I = I + 1: NEXT :
    IF I < = QQ THEN 46Ø
49Ø PRINT "WRITING":A$ = ".SORTE
    D":A1$ = W$:A2$ = A1$ + A$:W
    $ = A2$: GOSUB 8Ø: FOR I = 1
    TO QQ:V = C(I):W$ = A1$: GOSUB
    13Ø:W$ = A2$:VZ = VZ + 1:V =
    VZ: GOSUB 11Ø: NEXT : PRINT
    D$"WRITE"A2$",RØ": PRINT QQ:
    PRINT D$"CLOSE": RETURN
5ØØ IF AA > Ø THEN PRINT CHR$
    (12): RETURN
51Ø HOME : RETURN
```

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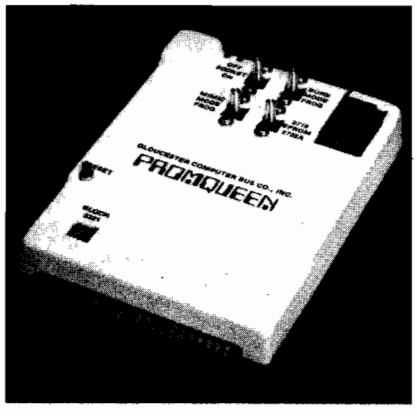

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Capturing Network Com

Utilization of network information sources is improved by allowing the user to save the entire dialogue on disk so that the information can be thoroughly reviewed at a later time.

The availability of vast amounts of information *via* the large computer networks provides significant benefits to even the computer hobbyists. I have used the networks for information sources, shopping, news, electronic mail, etc.

One of the first things I learned is that a "dumb" terminal places significant restrictions on effective utilization of computer telecommunications. This article details a program I developed to capture communications with a second computer and to generate a copy of the information while off-line, which helps minimize connect-time charges. The only restriction is that the computer you are talking to must echo your input, and the other computer must not require an echo of its output.

My system is an OSI C4P-MF with 32K RAM. I use a Radio Shack Modem I and an Epson MX-80 printer. The programs are written for use on the OS-65D Version 3.3 operating system, but Version 3.2 will work as well.

Three programs are required to utilize this system effectively. The main program, called MODEM, is the operational part of the program and is written in BASIC. The second program is the machine-code portion of MODEM. The third program is called QUICK and is the program to output information saved on disk. The machine-code portion will be discussed first, since it provides the heart of the communications system.

Machine-Code Program

The machine-code program is not very complex (see listing 1). In fact, the heart of the program is included in the first 25 lines. In simple terms, the program does the following:

1. It checks for a character input from the modem
2. If there is a character, it outputs the character
3. It does the file housekeeping
4. It checks the keyboard for a character input
5. If there is a character input, it sends the character

The program then repeats this sequence.

The assembly listing of the machine-code program is almost self-explanatory, but a few of the operations need more explanation. The modem input sequence is straightforward. If the status register is empty, the program branches to the JSFILE location. If a character is available, it is loaded into the accumulator and masked to seven bits. (You cannot receive OSI graphics characters with this program.) The program accepts all ASCII characters except one.

In lines 90-110, the double quote ('') is replaced by a single quote ('). Something in the operating system causes the computer to hang if the first character in a character string is a double quote. (This has no effect on any of the programs in my article. I have been experimenting with programs to manipulate and edit the information on disk, but they are incomplete.)

In line 120, PRINT is a JSR to the output routine in the operating system kernel. This routine allows you not only to display the received character on the CRT but to store it in memory also. This decision is made during execution of the BASIC program.

The file housekeeping routine at line 280 simply reminds you how much memory has been used by communications storage. The routine prints the memory page number in hexadecimal on the right side of the screen each time the page number changes. The function of this display is explained later. If the save-to-disk option is not selected, this routine is not called by the program.

The keyboard routine at line 520 returns either an ASCII code or a zero. The routine I use was developed by Don VanSyckel and was published in the December 1981 issue of the *Aardvark Journal*. (Permission to use this copyrighted material was received.) I chose this routine over several others because it provides both upper and

NETWORKS

munications on OSI

by Robert F. Soloman

lower case and all ASCII control codes. The selection of a keyboard routine is not critical, except that it must be a non-waiting type of routine; it must check for a key to be pressed but not wait for the key. (This is the reason the keyboard routine in the monitor cannot be used.)

If no character is returned from the keyboard routine, the program jumps back to the beginning. If a character is returned, it is transmitted to the modem and then jumps to the beginning. The remote computer echoes the character you sent and this echo character is what you see on the screen. You are now operating in a full duplex mode. The only exception is the Control-B code. This key combination causes the program to return to the BASIC program.

MODEM Program

The MODEM program is the BASIC program that does all the housekeeping and saving on disk. It calls the machine-code program as a USR(X) routine (see listing 2). Saving communications to disk is actually a two-stage process: the machine-code program stores the communications data in reserved upper memory then, in the BASIC program, this memory is transferred to disk.

This approach uses the operating system kernel to dispatch the output to more than one device. The CRT screen display is called as device 2 and memory storage as device 5. These devices also can be selected by setting a status bit to 1 at decimal location 8994 in the kernel. The CRT is bit 1 and memory is bit 4. An advantage is that these devices can be enabled at the same time so that each character is both displayed and stored in memory.

The memory output routine does all the housekeeping such as incrementing memory pointers, etc. The kernal output routine is called from line 120 of the Assembly program. The program requires the use of a buffer disk — a disk that has been initialized but has no directory or established files.

The constant PA is the pass number and is POKED to decimal location 15336 (constant PD). It keeps track of how many times the machine-code program has been called. It also determines on which tracks of the disk the current data will be saved.

Since my computer has been set up with a selector switch to use the modem or printer from the same ACIA, GOSUB 6000 gives a reminder to select the modem.

Line 12 eliminates string delimiters. GOSUB 5000 allows you to select between a dumb terminal, which gives display only, or a terminal that allows you to save to memory. Decimal location 15337 (constant SD) is used as a disk-save flag. It is set to zero for dumb terminal use and to 99 to indicate disk save. Line 5030 sets line 130 in the assembly listing to enable the file routine for the disk save function. Line 5050 sets assembly line 130 to NOPs for dumb terminal use.

Line 15 saves PA and resets the upper memory limits. Line 40 sets the USR(X) location ($3A7E) and sets the ACIA protocol. Line 65 checks the save flag. If it is zero (dumb terminal), it jumps directly to the machine-code program.

The two disk commands in line 66 set up the memory output. The command "MEM F000,4800" sets the first memory storage location for memory storage to $4800. ($F000 is the memory input pointer, which is not used.) The command "IO, 12" sets the output dispatch word to select both CRT and memory output.

After you exit the machine-code program, line 85 retrieves the pass number and sets the keyboard and CRT as the only input and output devices. Line 1000 checks for dumb terminal arrangement, the program branches to the decision routine at line 4800.

If the program is in the disk-save mode, the program asks if the file is complete. This routine selects end-of-file strings to be appended to the file. These are used to indicate when you have output all the useful information from a file.

As long as the file is not complete, the program will return to the machine-code routine after saving the information on the proper tracks. If the buffer disk becomes filled, the program will instruct you to use a second buffer disk. If you do not change buffer disks, you will write over the previously saved information.

Should you respond "YES" to the file complete prompt, the program will branch to the decision routine at line 4800 after saving on disk. You can still continue with modem communications from this point without overwriting previously stored information.

One of the exit options (option 3) is to run the program called QUICK, which outputs the disk information.

QUICK

This program takes the communications information from disk and outputs it to the CRT and/or the printer as you request. You are asked to specify the first and last tracks to be output (see listing 3).

You can stop at any time by hitting the ESC key, which causes a jump to the exit menu. You have the option of going to the next track, restarting the program, or quitting.

The QUICK program functions by calling each track into the disk buffer. Each location in the buffer is PEEKed sequentially and that character is output to the printer.

Usage

After boot-up, open the system and then type < RUN"MODEM" >. From this point, the program prompts you all the way through. As written, you must answer < YES > or < Y > to the modem switch prompt before you can continue.

The next prompt will ask if you wish to save to disk. If you answer < NO>, the program will function as a dumb terminal. If you answer < YES>, you will be instructed to insert the buffer disk into the drive. After you get the message "Modem Ready", you can go online. If you are in the disk-save mode, a "48" will be visible on the right side of the screen.

At this point you can dial up the network and proceed with your log-on and other communications. There is only one important restriction in the use of this program: the network or bulletin board you access must have provision for suppressing output under your control. (The network I use accepts Control-S as a stop code and Control-Q as a start code. These are the normal ASCII DC3 and DC1 codes, respectively.)

There are only two situations in which you would need to suppress output. One, is when your memory storage area (in the disk save mode) is almost full. The other is when you wish to exit to change to or from the disk-save mode.

An example of changing save modes would be when you want to save only a portion of your network communication. Things such as stock market data, news stories, or reference information may need more study; so you would want to have a hard copy.

The program keeps track of where you are in the memory storage area. Each time a page in memory changes, the new page number (in hex) is displayed on the right side of the CRT screen. You must remain aware of this value so the page location does not exceed the boundary of your memory. If you exceed the limits, the computer places the information in a nonexistent memory location. The highest value for the memory page is 7F for a machine with 32K of memory.

When you approach the end-of-memory storage, type Control-S to stop the network and then type Control-B. This returns you to the BASIC part of the program. You will then see the prompt "IS FILE COMPLETE". If you want to stop saving to disk, answer < YES > or < Y > to this prompt. If you answer < NO>, you will automatically return to the machine-code program and get a "Modem Ready" prompt.

If you answered yes to the file complete prompt, you will go to the exit menu. You should select option 1, return to modem.

After you have returned to the machine-code program, type a Control-Q and you are back in business. Each time your memory is almost full, repeat this sequence. The program will tell you when the disk is almost full and that you should use a second buffer disk.

When you want to log-off the network, use the following sequence: Log-off; after log-off is verified, type Control-B then hang up; answer the exit prompts as they come up. (Answer < YES > to the file complete prompt.)

To get a hard copy of the communications select exit option 3. You will be instructed and the QUICK program will run. All the information on the buffer disk will be printed on the CRT and/or printer. After you see "temporary End of File", hit the Escape button. All the information after this message is garbage. You can restart on the next batch of information from the next pass number (the first track numbers for each pass are 1, 8, 15, 22, 29, and 36). If the message was "End of File" there is no more information on the disk that relates to this communication.

Installation

The installation of the program can be accomplished by more than one method, the most efficient being Assembler. However, a lot of computer users are not familiar with assembly-language programming, so another method of installing the program is described in detail.

The instructions are for a system running the OSI OS-65D operating system Version 3.3. Instructions for other memory limits and for Version 3.2 are given later.

First, initialize a disk and copy the operating system and BEXEC* only. Then create two files with each file being two tracks long. The first program is titled MODEM and the second is titled QUICK. Since the QUICK program is easiest to implement, I will create that one first. Using option 7 in BEXEC*, create a single disk buffer. Then enter the program as listed and type:

```
DISK!"PUT QUICK" < CR >
```

For the MODEM program, type NEW and then type in the following:

```
10 REM MACHINE CODE <CR>
20 END
```

Then type

```
DISK! "PUT MODEM"   CR
```

Remove the disk and reboot using Tutorial Disk Two. Then type

```
RUN"BUFFER" <CR>
```

Answer E to the Enable prompt. Remove the Tutorial disk and put the MODEM disk in the drive. Type the following sequence:

```
DISK!"LOAD MODEM" <CR>
BYTE 370 <CR>
DISK!"PUT MODEM" <CR>
```

Reboot your MODEM disk and type:

```
DISK!"LOAD MODEM" <CR>
```

Now type in the machine-code installation program (listing 4) and type RUN.

This sequence does the following: first it creates buffer space ahead of the program for the machine-code routine; then it POKEs the machine-code routine into the buffer and saves it on disk. To put the actual MODEM program on disk, type

```
DISK!"LOAD MODEM" <CR>
NEW < CR >
```

Now type in the MODEM program and then type

(Continued on page 88)

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DISK!"PUT MODEM"<CR>

Your program is now complete and ready for checkout. The only other thing you will need is one or more buffer disks. To create these, open the system and place a blank disk in the drive. Type EXIT<CR> after a BASIC "OK" prompt. Then type "INIT" <CR> and respond Y to the "Are you sure" question. The computer will do the rest.

Testing

Testing the program can be done off-line. Assuming that all the instructions up to this point have been followed, you can commence testing.

Disconnect the DB-25 connector from your modem and connect pins 2 and 3 together temporarily. This connects the computer's output to the modem to the input from the modem, so whatever you transmit is immediately received. Then bootup and run the MODEM program without saving to disk. After you get the "Modem Ready" prompt, you can type whatever you want. It should be correctly displayed on the CRT. I suggest typing all characters in both upper and lower case to verify all is well.

If this works properly, all is well. If it does not, then check carefully over your work — especially the machine code. If all works, type Control-B and you should come back to the exit menu. Now try saving on disk by following the prompts. After you have something in there, type Control-B and answer yes to the file-end question. You should now hear the computer dump to disk. Run the QUICK program to see how it works. Providing everything is okay you are now ready to go on-line.

Use on Other Systems

The basic approach of this series of programs can probably be used by a number of other systems. However, since I am not familiar with the intricacies of other operating systems I suggest that this series of programs be used as a guide only.

Similarly, the various configurations of OSI machines are also quite extensive and beyond the scope of this article. It should be possible to use this program on a C1P, but special attention must be given to the variations in the keyboard. It is my intention to develop this program for the C1P at a later date.

I have, however, translated these programs for use with an OSI C4P running OS-65D Version 3.2 in 24K and present those changes here. Because of the numerous combinations of memory size and operating system, I will not attempt to generalize. Those users who want to adapt to their system can learn enough from studying these programs to implement their own configuration.

The changes required to adapt to the 3.2 version encompass all three programs. Listing 5 shows those data lines that must be changed in the machine-code installation program. For those who would rather work in the Assembler, the only change required is to make the starting address $327E. To establish the buffer space for the machine-code program, you will need to use the CHANGE program to allocate 370 bytes before the workspace. All other installation instructions are the same.

The MODEM program for use on 3.2 is listed in its entirety in listing 6. Because of the extensive changes necessitated by the reduction in memory available, a complete listing is more readable than a list of corrections.

The QUICK program requires only two changes. They are

```
510 DISK!"CA 327E=" + TS$ + ",1"
520 FORAD=0TO2047:CH=PEEK
    (12926+AD):CH=CHAND127:
    IFCH<10THENCH=20
```

Conclusion

The electronic transfer of information is now within reach of computer hobbyists. Using this development can be valuable in both personal and professional environments. These programs were developed to make it easier for the user to gain the advantages of electronic communications.

Robert Solomon is an operations engineer at NASA Lewis Research Center where he is responsible for altitude testing of jet engines. Most of his computer programming is done in assembler and BASIC, but he has worked with FOCAL and is trying to understand FORTH. Bob's most unusual hardware/software accomplishment is interfacing the computer to a Wurlitzer organ and developing the software for it. You can contact him *via* SOURCE network ID ST1117 or by writing to 5868 Joanne Court, North Ridgeville, OH 44039.

(Listings begin on page 90)

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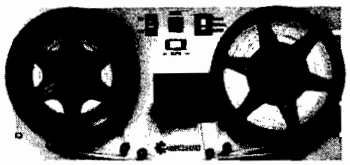

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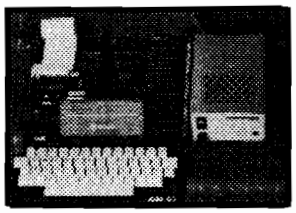

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Listing 1

```
  5                     ; LISTING I
 10                           ; MODEM CODE FOR SOURCE USE ONLY
 20 3A7E                      *=$3A7E
 30 3A7E 204426    OPEN       JSR $2644
 40 3A81 AD00FC    AGAIN      LDA $FC00  ; CHECK FOR MODEM INPUT
 50 3A84 4A                   LSR A
 60 3A85 900E                 BCC JSFILE ; NO THEN LEAVE ROUTINE
 70 3A87 AD01FC               LDA $FC01  ; GET MODEM CHARACTER
 80 3A8A 297F                 AND #$7F   ; MASK IT
 90 3A8C C922                 CMP #$22   ; CHECK FOR DOUBLE QUOTE
100 3A8E D002                 BNE PRINT  ; IF NOT  GO PRINT IT
110 3A90 A927                 LDA #$27   ; MAKE IT A SINGLE QUOTE
120 3A92 204323   PRINT      JSR $2343  ; GO TO OUTPUT ROUTINE
130 3A95 20B43A   JSFILE     JSR FILE   ; DO FILE HOUSEKEEPING
140 3A98 20F23A   JSKEY      JSR KEY    ; GO CHECK KEYBOARD
150 3A9B F0E4     ZERO       BEQ AGAIN  ; NO INPUT START OVER
160 3A9D C902                 CMP #$02   ; CHECK FOR CTRL B
170 3A9F F00F                 BEQ OUT    ; IF SO THEN EXIT
180 3AA1 48       SPLIT      PHA        ; SAVE KEYBOARD CHARACTE
190 3AA2 AD00FC   CLRSND     LDA $FC00  ; MAKE SURE XMIT BUFFER
200 3AA5 4A                  LSR A      ; EMPTY
210 3AA6 4A                  LSR A
220 3AA7 90F9                BCC CLRSND
230 3AA9 6B                  PLA        ; WHEN EMPTY GET KEYBOAR
240 3AAA 8D01FC              STA $FC01  ; AND SEND IT
250 3AAD 4C813A              JMP AGAIN  ; START OVER
260 3AB0 4C4426   OUT        JMP $2644  ; RETURN TO BASIC
270 3AB3 EA       ADTEMP     NOP        ; TEMPORARY STORAGE FOR
280 3AB4 AD9223   FILE       LDA $2392  ; GET CURRENT PAGE NUMBE
290 3AB7 CD B33A             CMP ADTEMP ; SEE IF IT CHANGED
300 3ABA F01E                BEQ DONE   ; IF NO CHANGE THEN RETU
310 3ABC 8DB33A              STA ADTEMP ; SAVE PAGE NUMBER
320 3ABF 4A                  LSR A      ; CONVERT PAGE NUMBER
330 3AC0 4A                  LSR A      ; TO TWO ASCII CHARS
340 3AC1 4A                  LSR A      ; AND DISPLAY ON CRT
350 3AC2 4A                  LSR A
360 3AC3 20DB3A              JSR HEXOUT
370 3AC6 8DFED1              STA $D1FE
380 3AC9 ADB33A              LDA ADTEMP
390 3ACC 20DB3A              JSR HEXOUT
400 3ACF 8DFFD1              STA $D1FF
410 3AD2 A920                LDA #$20
420 3AD4 8DBED1              STA $D1BE
430 3AD7 8DBFD1              STA $D1BF
440 3ADA 60       DONE       RTS
450 3ADB 290F     HEXOUT     AND #$0F
460 3ADD C90A                CMP #$0A
470 3ADF 18                  CLC
480 3AE0 3002                BMI HEX1
490 3AE2 6907                ADC #$07
500 3AE4 6930     HEX1       ADC #$30
510 3AE6 60                  RTS
520 DF00=              KYBD = $DF00
530 0213=              CHR2 = $0213
540 0214=              TEMP = CHR2+1
550 0215=              CHR1 = TEMP+1
560 0216=              CNT = CHR1+1
570 3AE7 20A13B   KYAA       JSR RD01
580 3AEA 2907                AND #$07
590 3AEC D06E                BNE KY06
600 3AEE A020                LDY #$20
610 3AF0 D06A                BNE KY06
620 3AF2 8A       KEY        TXA        ; START OF ROUTINE TO
630 3AF3 48                  PHA        ; GET ASCII VALUE FROM
640 3AF4 98                  TYA        ; KEYBOARD OR RETURN
650 3AF5 48                  PHA        ; A ZERO
660 3AF6 20A13B   KY01       JSR RD01
670 3AF9 2920                AND #$20
680 3AFB F018                BEQ KY02
690 3AFD A91B                LDA #$1B
700 3AFF D078                BNE KY10
710 3B01 8D1502   KYBB       STA CHR1
720 3B04 A902                LDA #$02
730 3B06 8D1602              STA CNT
740 3B09 A005     KYCC       LDY #5
750 3B0B A2C8     KYDD       LDX #$C8
760 3B0D CA       KYEE       DEX
770 3B0E D0FD                BNE KYEE
780 3B10 88                  DEY
790 3B11 D0F8                BNE KYDD
800 3B13 F0E1                BEQ KY01
810 3B15 A201     KY02       LDX #$01
820 3B17 8A       KY03       TXA
830 3B18 0A                  ASL A
840 3B19 AA                  TAX
850 3B1A D005                BNE KY04
860 3B1C 8D1502              STA CHR1
870 3B1F F062                BEQ KY11
880 3B21 20A33B   KY04       JSR RD
890 3B24 F0F1                BEQ KY03
900 3B26 209A3B              JSR CONV
910 3B29 8C1402              STY TEMP
920 3B2C 8A                  TXA
930 3B2D 209A3B              JSR CONV
940 3B30 98                  TYA
950 3B31 0A                  ASL A
960 3B32 0A                  ASL A
970 3B33 0A                  ASL A
980 3B34 6D1402              ADC TEMP
990 3B37 AB                  TAY
1000 3B38 B9AE3B             LDA TABLE,Y
1010 3B3B A005               LDY #5
1020 3B3D D9C03B  KY05       CMP EXC-1,Y
1030 3B40 F01F               BEQ KY07
1040 3B42 88                 DEY
1050 3B43 D0F8               BNE KY05
1060 3B45 8D1402             STA TEMP
1070 3B48 AA                 TAX
1080 3B49 109C               BPL KYAA
1090 3B4B A080               LDY #$80
1100 3B4D 20A13B             JSR RD01
1110 3B50 2906               AND #$06
```

(Continued)

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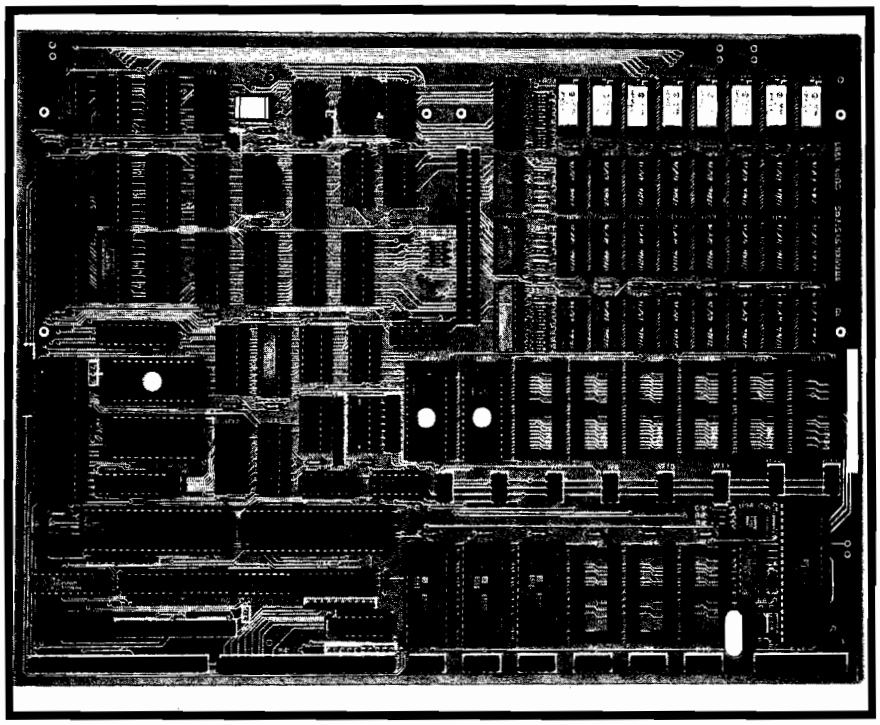

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1120 3B52 F008                  BEQ KY06
1130 3B54 A090                  LDY #$90
1140 3B56 E0B0                  CPX #$B0
1150 3B58 3002                  BMI KY06
1160 3B5A A070                  LDY #$70
1170 3B5C 18          KY06      CLC
1180 3B5D 98                    TYA
1190 3B5E 6D1402                ADC TEMP
1200 3B61 A8          KY07      TAY
1210 3B62 20A13B                JSR RD01
1220 3B65 AA                    TAX
1230 3B66 2980                  AND #$80
1240 3B68 F005                  BEQ KY08
1250 3B6A 18                    CLC
1260 3B6B 98                    TYA
1270 3B6C 6910                  ADC #$10
1280 3B6E A8                    TAY
1290 3B6F 8A          KY08      TXA
1300 3B70 2940                  AND #$40
1310 3B72 F004                  BEQ KY09
1320 3B74 98                    TYA
1330 3B75 291F                  AND #$1F
1340 3B77 A8                    TAY
1350 3B78 98          KY09      TYA
1360 3B79 CD1502      KY10      CMP CHR1
1370 3B7C D083                  BNE KYBB
1380 3B7E CE1602                DEC CNT
1390 3B81 D086                  BNE KYCC
1400 3B83 A296        KY11      LDX #$96
1410 3B85 CD1302                CMP CHR2
1420 3B88 D002                  BNE KY12
1430 3B8A A214                  LDX #$14
1440 3B8C 8E1602      KY12      STX CNT
1450 3B8F 8D1302                STA CHR2
1460 3B92 68                    PLA
1470 3B93 A8                    TAY
1480 3B94 68                    PLA
1490 3B95 AA                    TAX
1500 3B96 AD1502                LDA CHR1
1510 3B99 60                    RTS
1520 3B9A A0FF        CONV      LDY #$FF
1530 3B9C C8          C001      INY
1540 3B9D 0A                    ASL A
1550 3B9E 90FC                  BCC C001
1560 3BA0 60                    RTS
1570 3BA1 A901        RD01      LDA #$01
1580 3BA3 EA          RD        NOP
1590 3BA4 EA                    NOP
1600 3BA5 8D00DF                STA KYBD
1610 3BA8 AD00DF                LDA KYBD
1620 3BAB EA                    NOP
1630 3BAC EA                    NOP
1640 3BAD 60                    RTS
1650 3BAE B1          TABLE     .BYTE $B1,$B2,$B3,$B4,$B5,$B6,$B7,0
1650 3BAF B2
1650 3BB0 B3
1650 3BB1 B4
1650 3BB2 B5
1650 3BB3 B6
1650 3BB4 B7
1650 3BB5 00
1660 3BB6 B8                .BYTE $B8,$B9,$30,$3A+$80,$2D+$80,$7F,0,0
1660 3BB7 B9
1660 3BB8 30
1660 3BB9 BA
1660 3BBA AD
1660 3BBB 7F
1660 3BBC 00
1660 3BBD 00
1670 3BBE AE                .BYTE $2E+$80,'LO'
1670 3BBF 4C
1670 3BC0 4F
1680 3BC1 0A          EXC       .BYTE $0A,$0D,$20,$30,$7F
1680 3BC2 0D
1680 3BC3 20
1680 3BC4 30
1680 3BC5 7F
1690 3BC6 57                    .BYTE 'WERTYUI',0
1690 3BC7 45
1690 3BC8 52
1690 3BC9 54
1690 3BCA 59
1690 3BCB 55
1690 3BCC 49
1690 3BCD 00
1700 3BCE 53                    .BYTE 'SDFGHJK',0
1700 3BCF 44
1700 3BD0 46
1700 3BD1 47
1700 3BD2 48
1700 3BD3 4A
1700 3BD4 4B
1700 3BD5 00
1710 3BD6 58                    .BYTE 'XCVBNM',$2C+$80,0
1710 3BD7 43
1710 3BD8 56
1710 3BD9 42
1710 3BDA 4E
1710 3BDB 4D
1710 3BDC AC
1710 3BDD 00
1720 3BDE 51                    .BYTE 'QAZ ',$2F+$80,$3B+$80,'P'
1720 3BDF 41
1720 3BE0 5A
1720 3BE1 20
1720 3BE2 AF
1720 3BE3 BB
1720 3BE4 50
```


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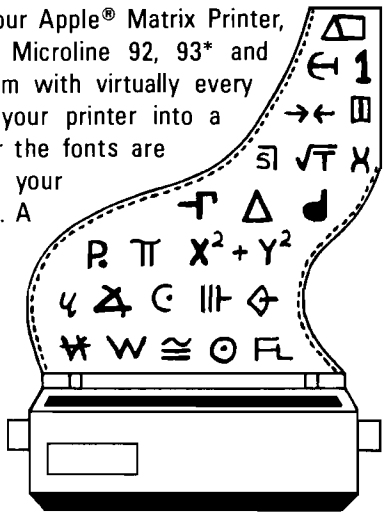

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Listing 2

```
1 REM LISTING 2
5 REM SOURCE MODEM FOR VERSION 3.3 AND 32K
10 PA=0:PD=15336:SD=15337:JF=14997:GOSUB6000
12 POKE2888,0:POKE8722,0:POKE2972,13:POKE2976,13
13 GOSUB5000
15 POKEPD,PA:POKE133,71:POKE 132,255:PRINT
40 POKE8955,126:POKE8956,58:POKE63235,52:POKE64512,22
60 PRINT:PRINT:PRINT"MODEM READY"
65 IFPEEK(SD)=0GOTO70
66 DISK!"MEM F000,4800":DISK!"IO ,12"
70 X=USR(X)
85 PA=PEEK(PD):DISK!"IO 02,02":GOTO1000
1000 IF PEEK(SD)=0GOTO4800
2000 PA=PA+1:B$="TEMPORARY END OF FILE":PRINT
2020 INPUT"IS FILE COMPLETE";ZZ$
2030 IFLEFT$(ZZ$,1)="Y"GOTO2060
2040 PRINT#5:PRINT#5,B$:FE=99:GOTO2070
2060 PRINT#5:PRINT#5,"FILE END":FE=0
2070 ONPAGOTO2100,2200,2300,2400,2500,2600
2100 DISK!"SA 01,1=4800/8":DISK!"SA 02,1=5000/8"
2110 DISK!"SA 03,1=5800/8":DISK!"SA 04,1=6000/8"
2120 DISK!"SA 05,1=6800/8":DISK!"SA 06,1=7000/8"
2130 DISK!"SA 07,1=7800/8":GOTO2850
2200 DISK!"SA 08,1=4800/8":DISK!"SA 09,1=5000/8"
2210 DISK!"SA 10,1=5800/8":DISK!"SA 11,1=6000/8"
2220 DISK!"SA 12,1=6800/8":DISK!"SA 13,1=7000/8"
2230 DISK!"SA 14,1=7800/8":GOTO2850
2300 DISK!"SA 15,1=4800/8":DISK!"SA 16,1=5000/8"
2310 DISK!"SA 17,1=5800/8":DISK!"SA 18,1=6000/8"
2320 DISK!"SA 19,1=6800/8":DISK!"SA 20,1=7000/8"
2330 DISK!"SA 21,1=7800/8":GOTO2850
2400 DISK!"SA 22,1=4800/8":DISK!"SA 23,1=5000/8"
2410 DISK!"SA 24,1=5800/8":DISK!"SA 25,1=6000/8"
2420 DISK!"SA 26,1=6800/8":DISK!"SA 27,1=7000/8"
2430 DISK!"SA 28,1=7800/8":GOTO2850
2500 DISK!"SA 29,1=4800/8":DISK!"SA 30,1=5000/8"
2510 DISK!"SA 31,1=5800/8":DISK!"SA 32,1=6000/8"
2520 DISK!"SA 33,1=5800/8":DISK!"SA 34,1=7000/8"
2530 DISK!"SA 35,1=7800/8":GOTO 2850
2600 DISK!"SA 36,1=4800/8":DISK!"SA 37,1=5000/8"
2610 DISK!"SA 38,1=5800/8":DISK!"SA 39,1=6000/8"
2630 GOTO2850
2720 PRINT!(28):PRINT
2730 PRINT"*** WARNING - DISK IS FULL ***":PRINT
```

(Continued)

Listing 2 *(Continued)*

```
2740 INPUT"INSTALL BUFFER DISK TWO THEN TYPE <CR>";ZZ$
2850 IF PA=5ANDFE=99 GOTO2910
2860 PRINT:PRINT"PASS";PA;" COMPLETE":PRINT
2870 IF PA=6THENPA=0
2875 IFFE=0GOTO4810
2880 GOTO15
2910 PRINT
2920 PRINT"*** WARNING - NEXT BLOCK MUST END BEFORE
     67":PRINT:PRINT
2930 INPUT"HIT <CR> TO CONTINUE";ZZ$
2940 GOTO15
4800 PRINT!(28):PRINT
4810 PRINT"SELECT":PRINT:PRINT"   1 >  RETURN TO
     MODEM":PRINT
4820 PRINT"   2 >  QUIT":PRINT:PRINT"   3 >  RUN
     QUICK":PRINT
4825 PRINT"   4 >  CHANGE MEMORY SAVE":PRINT
4830 INPUTQQ:IFQQ<1ORQQ>4GOTO4800
4850 ONQQGOTO15,8000,4870,7000
4870 PRINT:INPUT"INSERT MODEM DISK THEN HIT <CR>";ZZ$
     :RUN"QUICK"
5000 PRINT
5010 PRINT:INPUT"DO YOU WANT TO SAVE TO DISK ";QQ$
5020 PRINT:IFLEFT$(QQ$,1)<>"Y"GOTO5050
5030 POKESD,99:POKEJF,32:POKEJF+1,180:POKEJF+2,58
5035 PRINT!(28):PRINT
5040 INPUT"INSERT BUFFER DISK THEN HIT <CR>";ZZ$
5045 RETURN
5050 POKESD,0:POKEJF,234:POKEJF+1,234:POKEJF+2,234
5060 RETURN
6000 PRINT!(28):PRINT
6020 INPUT"IS OUTPUT SWITCH IN MODEM POSITION";QZ$
6030 IFLEFT$(QZ$,1)<>"Y"GOTO6020
6040 RETURN
7000 GOSUB5000
7010 GOTO15
8000 POKE63235,0:POKE64512,17
8020 X=PEEK(8960):POKE133,X:END
```

Listing 3

```
5 REM LISTING 3
10 REM QUICK OUTPUT
15 POKE133,127:POKE132,255
20 POKE2888,0:POKE8722,0:POKE2972,13:POKE2976,13
25 POKE63235,0:POKE64512,17
30 PRINT!(28):PRINT:PRINT"QUICK OUPUT PROGRAM":PRINT
40 PRINT:INPUT"WHAT IS THE FIRST TRACK TO BE OUTPUT ";FT
50 PRINT:INPUT"WHAT IS THE LAST TRACK TO BE OUTPUT ";LT
60 PRINT:PRINT"SELECT THE OUTPUT OPTION :":PRINT
70 PRINT"     1 > PRINTER ONLY":PRINT
80 PRINT"     2 > CRT ONLY":PRINT
90 PRINT"     3 > CRT AND PRINTER":PRINT
100 PRINT"    4 > QUIT":PRINT
105 PRINT:PRINT"*** NOTE > HIT <ESC> TO END PROGRAM EARLY":PRINT
110 INPUT"SELECTION";X
115 PRINT:INPUT"INSERT BUFFER DISK THEN HIT <CR>";ZZ$
120 IFX<1ORX>4GOTO60
130 IFX=4GOTO2000
140 IFX>2GOTO200
150 IFX=2GOTO180
```

Listing 3 *(Continued)*

```
160 DISK!"IO ,01":GOTO500
180 DISK!"IO ,02":GOTO500
200 DISK!"IO ,03"
500 FORTT=FTTOLT:GOSUB800
510 DISK!"CA 3A7E="+TS$+",1"
511 REM FOR VERSION 3.2 CHANGE CALL ADDRESS IN 510
512 REM TO 327E
520 FORAD=0TO2047:CH=PEEK(14974+AD):CH=CHAND127:IFCH<10THENCH=20
521 REM FOR VERSION 3.2 CHANGE PEEK LOCATION IN 520
522 REM TO 12926+AD
530 GOSUB900
540 PRINTCHR$(CH);
550 NEXTAD
560 PRINT#2:PRINT#2,"******************"
570 PRINT#2:PRINT#2,"TRACK ";TS$;" COMPLETE":PRINT#2
580 PRINT#2,"******************":PRINT#2
590 NEXTTT
595 GOTO2000
800 T$=STR$(TT):IFTT>9GOTO820
810 T$="0"+RIGHT$(STR$(TT),1)
820 TS$=RIGHT$(T$,2):RETURN
900 CL=PEEK(57100)
910 IFCL=33ORCL=32GOTO3000
920 RETURN
2000 POKE2888,27:POKE8722,27:POKE2972,58:POKE2976,44
2010 DISK!"IO ,02":END
3000 OP=PEEK(8994):DISK!"IO ,02":PRINT:PRINT"SELECT :":PRINT
3010 PRINT"   1 >  NEXT TRACK":PRINT
3020 PRINT"   2 >  RESTART":PRINT
3030 PRINT"   3 >  QUIT":PRINT
3040 INPUT"SELECTION :";XX
3050 IFXX<1ORXX>3GOTO3000
3060 ONXXGOTO3070,30,2000
3070 POKE8994,OP:AD=2047:RETURN
```

Listing 4

```
5 REM LISTING 4
10 REM MODEM MACHINE CODE GENERATOR
20 FORX=14974TO15332
30 READC:POKEX,C:NEXTX
40 DISK!"PU MODMMC"
50 END
100 DATA32,68,38,173,0,252,74,144,14,173
110 DATA1,252,41,127,201,34,208,2,169,39
120 DATA32,67,35,32,180,58,32,242,58,240
130 DATA228,201,2,240,15,72,173,0,252,74
140 DATA74,144,249,104,141,1,252,76,129,58
150 DATA76,68,38,234,173,146,35,205,179,58
160 DATA240,30,141,179,58,74,74,74,74,32
170 DATA219,58,141,254,209,173,179,58,32,219
180 DATA58,141,255,209,169,32,141,190,209,141
190 DATA191,209,96,41,15,201,10,24,48,2
200 DATA105,7,105,48,96,32,161,59,41,7
210 DATA208,110,160,32,208,106,138,72,152,72
220 DATA32,161,59,41,32,240,24,169,27,208
230 DATA120,141,21,2,169,2,141,22,2,160
240 DATA5,162,200,202,208,253,136,208,248,240
250 DATA225,162,1,138,10,170,208,5,141,21
260 DATA2,240,98,32,163,59,240,241,32,154
270 DATA59,140,20,2,138,32,154,59,152,10
280 DATA10,10,109,20,2,168,185,174,59,160
290 DATA5,217,192,59,240,31,136,208,248,141
```

(Continued on next page)

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Listing 4 *(Continued)*

```
300 DATA20,2,170,16,156,160,128,32,161,59
310 DATA41,6,240,8,160,144,224,176,48,2
320 DATA160,112,24,152,109,20,2,168,32,161
330 DATA59,170,41,128,240,5,24,152,105,16
340 DATA168,138,41,64,240,4,152,41,31,168
350 DATA152,205,21,2,208,131,206,22,2,208
360 DATA134,162,150,205,19,2,208,2,162,20
370 DATA142,22,2,141,19,2,104,168,104,170
380 DATA173,21,2,96,160,255,200,10,144,252
390 DATA96,169,1,234,234,141,0,223,173,0
400 DATA223,234,234,96,177,178,179,180,181,182
410 DATA183,0,184,185,48,186,173,127,0,0
420 DATA174,76,79,10,13,32,48,127,87,69
430 DATA82,84,89,85,73,0,83,68,70,71
440 DATA72,74,75,0,88,67,86,66,78,77
450 DATA172,0,81,65,90,32,175,187,80
```

Listing 5

```
5 REM LISTING
10 REM MACHINE CODE CHANGES FOR VERSION 3.2
20 FORX=12926TO13284
120 DATA32,67,35,32,180,50,32,242,50,240
140 DATA74,144,249,104,141,1,252,76,129,50
150 DATA76,68,38,234,173,146,35,205,179,50
160 DATA240,30,141,179,50,74,74,74,74,32
170 DATA219,50,141,254,209,173,179,50,32,219
180 DATA50,141,255,209,169,32,141,190,209,141
200 DATA105,7,105,48,96,32,161,51,41,7
220 DATA32,161,51,41,32,240,24,169,27,208
260 DATA2,240,98,32,163,51,240,241,32,154
270 DATA51,140,20,2,138,32,154,51,152,10
280 DATA10,10,109,20,2,168,185,174,51,160
290 DATA5,217,192,51,240,31,136,208,248,141
300 DATA20,2,170,16,156,160,128,32,161,51
330 DATA51,170,41,128,240,5,24,152,105,16
```

Listing 6

```
  1 REM LISTING
  5 REM SOURCE MODEM FOR VERSION 3.2 WITH 24K
  10 PA=0:PD=13288:SD=13289:JF=112949:GOSUB6000
  12 POKE2888,0:POKE8722,0:POKE2972,13:POKE2976,13
  13 GOSUB5000
  15 POKEPD,PA:POKE133,63:POKE 132,255:PRINT
  40 POKE8955,126:POKE8956,50:POKE63235,52:POKE64512,22
  60 PRINT:PRINT:PRINT"MODEM READY"
  65 IFPEEK(SD)=0GOTO70
  66 DISK!"MEM F000,4000":DISK!"IO ,12"
  70 X=USR(X)
  85 PA=PEEK(PD):DISK!"IO 02,92":GOTO1000
1000 IF PEEK(SD)=0GOTO4800
2000 PA=PA+1:B$="TEMPORARY END OF FILE":PRINT
2020 INPUT"IS FILE COMPLETE";ZZ$
2030 IFLEFT$(ZZ$,1)="Y"GOTO2060
2040 PRINT#5:PRINT#5,B$:FE=99:GOTO2070
2060 PRINT#5:PRINT#5,"FILE END":FE=0
2070 ONPAGOTO2100,2200,2300,2400,2500,2600,2700,2800,2900,3000
2100 DISK!"SA 01,1=4000/8":DISK!"SA 02,1=4800/8"
2110 DISK!"SA 03,1=5000/8":DISK!"SA 04,1=5800/8"
2120 GOTO3850
2200 DISK!"SA 05,1=4000/8":DISK!"SA 06,1=4800/8"
2210 DISK!"SA 07,1=5000/8":DISK!"SA 08,1=5800/8"
2220 GOTO3850
2300 DISK!"SA 09,1=4000/8":DISK!"SA 10,1=4800/8"
2310 DISK!"SA 11,1=5000/8":DISK!"SA 12,1=5800/8"
2320 GOTO3850
2400 DISK!"SA 13,1=4000/8":DISK!"SA 14,1=4800/8"
2410 DISK!"SA 15,1=5000/8":DISK!"SA 16,1=5800/8"
2420 GOTO3850
2500 DISK!"SA 17,1=4000/8":DISK!"SA 18,1=4800/8"
2510 DISK!"SA 19,1=5000/8":DISK!"SA 20,1=5800/8"
2520 GOTO3850
2600 DISK!"SA 21,1=4000/8":DISK!"SA 22,1=4800/8"
2610 DISK!"SA 23,1=5000/8":DISK!"SA 24,1=5800/8"
2620 GOTO3850
2700 DISK!"SA 25,1=4000/8":DISK!"SA 26,1=4800/8"
2710 DISK!"SA 27,1=5000/8":DISK!"SA 28,1=5800/8"
2720 GOTO3850
2800 DISK!"SA 29,1=4000/8":DISK!"SA 30,1=4800/8"
2810 DISK!"SA 31,1=5000/8":DISK!"SA 32,1=5800/8"
2820 GOTO3850
2875 IFFE=0GOTO4810
2900 DISK!"SA 33,1=4000/8":DISK!"SA 34,1=4800/8"
2910 DISK!"SA 35,1=5000/8":DISK!"SA 36,1=5800/8"
2920 GOTO3850
3000 DISK!"SA 37,1=4000/8":DISK!"SA 38,1=4800/8"
3010 DISK!"SA 39,1=5000/8"
3020 GOTO3850
3720 PRINT:PRINT
3730 PRINT"*** WARNING - DISK IS FULL ***":PRINT
3740 INPUT"INSTALL BUFFER DISK TWO THEN TYPE <CR>";ZZ$
3850 IF PA=10ANDFE=99 GOTO3910
3860 PRINT:PRINT"PASS";PA;" COMPLETE":PRINT
3870 IF PA=11THENPA=0
3880 GOTO15
3910 PRINT
3920 PRINT"*** WARNING - NEXT BLOCK MUST END BEFORE 57":PRINT:PRINT
3930 INPUT"HIT <CR> TO CONTINUE";ZZ$
3940 GOTO15
4800 PRINT:PRINT
4810 PRINT"SELECT":PRINT:PRINT"   1 >  RETURN TO MODEM":PRINT
4820 PRINT"   2 >  QUIT":PRINT:PRINT"   3 >  RUN QUICK":PRINT
4825 PRINT"   4 >  CHANGE MEMORY SAVE":PRINT
4830 INPUT00:IF00<10R00>4GOTO4800
4850 ON00GOTO15,8000,4870,7000
4870 PRINT:INPUT"INSERT MODEM DISK THEN HIT <CR>";ZZ$:RUN"QUICK"
5000 PRINT
5010 PRINT:INPUT"DO YOU WANT TO SAVE TO DISK ";Q0$
5020 PRINT:IFLEFT$(Q0$,1)<>"Y"GOTO5050
5030 POKESD,99:POKEJF,32:POKEJF+1,180:POKEJF+2,50
5035 PRINT:PRINT
5040 INPUT"INSERT BUFFER DISK THEN HIT <CR>";ZZ$
5045 RETURN
5050 POKESD,0:POKEJF,234:POKEJF+1,234:POKEJF+2,234
5060 RETURN
6000 PRINT:PRINT
6020 INPUT"IS OUTPUT SWITCH IN MODEM POSITION";QZ$
6030 IFLEFT$(QZ$,1)<>"Y"GOTO6020
6040 RETURN
7000 GOSUB5000
7010 GOTO15
8000 POKE63235,0:POKE64512,17
8020 X=PEEK(8960):POKE133,X:END
```

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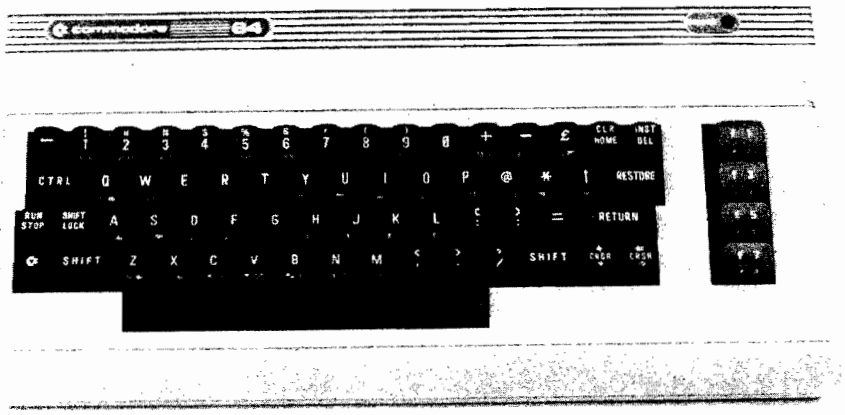
A Product Catalog for Commodore, Color Computer, and Texas Instruments

Last month we provided descriptions, comparisons, and pictures of the most popular low-cost computers. This month and next month we will offer a catalog of peripherals and software available for these machines. Please note that this list is not meant to be comprehensive.



Commodore

V = VIC P = PET 64 = C64

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EPROM Programmers

V, Promqueen, Arbutus, $99.00
V, EPROM Programmer, MWS, $79.95
P, Branding Iron, Eastern House, $75

Video Boards

P, 40/80-column Board, Execom
V, 40/80 Video Cartridge, Quantum, $159.95
V, 40/80 Video Cartridge w/ 16K, Quantum, $259.95
V, Video Pak, Data 20, $299.95
64, Video Pak 80, Data 20, $179.95
64, Z-80 Video Pak, Data 20, $299.95
P, Color Chart, CGRS/Microtech, $139.95
P, Visible Memory, MTU, $495.00

Light Pens

V,64, Cardriter-1, Cardco, $39.95
V,64, Edumate Light Pen, Prog. Inst., $29.95

Alternate Processors

P, Z-RAM, Comp. Mark., ?
64, Z-80 Video Pak, Data 20, $299.95

Multi-user Systems

P, Superbus 4.0, Cyberia
P, Arbiter 1.4, Batt. Incl., $150.00
P, MUPET, CMD, $550.00
P, MUPET II, CMD, $995.00
P, Diskshare, Questar, $749.00
V,64, Interpod, Comp. Workshops, $200.00

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V,64, Auto Clock, Micro World, $129.95
64, Ten Key Pad, Qual. Comp., $69.95

Cassette Interfaces

V,64,P, Univ. Tape Interface & Dupl., MicroWare, $49.50
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P, ARROW, DataCap, $60.00

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V,64, Parallel Printer Driver Cartr., MicroWare, $29.95
V,64, Tymac Connection, MicroWare, $119.95
V,64, Smart ASCII, Midwest, $59.95
V,64, Card?, Cardco, $79.95
V,64, UPA-20 cable, World Elec., $19.95
V,64, MW-302 interface, Micro World, $119.95
P, 36-pin parallel interface, CMC, $129.00
P, 40-pin parallel interface, CMC, $129.00
P, Epson MX-70 interface, CMC, $129.00
P, PIE-C, LemData, $119.95

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V,64, Serial printer interface, Data 20, $69.95
P, Portmaker, CGRS/Microtech, $69.95
P, RS-232 serial adaptor, CMC, $149.00

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V, V-Link(avail. with RAM), Richvale, $149.00
64, C64-Link, Comp. Mark., $169.00
V, VIE, Micro-Systems, $99.95
64, CIE, Micro-Systems, $99.95
P, SADI communications adaptor, CMC, $295.00

RAM Expansions and Expander Boards

V, Expand-O-RAM, MicroWare, $119.00
V, 16K RAM/ROM board, World Elec., $24.95 up
V, 4-slot expander board, BAZ, $44.00
64, 7-slot expander board, BAZ, $69.00
V, 8K, Century Micro, $47.70
V, 16K, Century Micro, $69.90
V, Cardboard-3, Cardco, $39.95
V, Cardboard-6, Cardco, $99.95
V, 24K Golden RAM Expansion Chassis, Voice World, $149.24
V, DataSpan (5-slot expansion), Dig. Interf. Sys., $84.95
V, 16K, Data 20, $79.95

V, 4-slot chassis, Data 20, $49.95
V,64, Soft-Aware Box, Soft-Aware, $149.00

Speech Synthesizers
V, Voice Synthesizer, Protecto, $79.00

Printers (specially for VIC)
V, Alphacom VP42 Printer Set, Alphacom, $209.95

Disk Drive
P, PEDISK (IBM compatible), CGRS/Microtech, $595.00 up

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V, Terminal-40, Midwest, $29.95
64, '64 Terminal, Midwest, $29.95
V,64, 300 baud Modem/Term. Emulator, BAZ, $89.00
P,64, Standard Term. Comm. Package, Eastern House, $129.95
P, Compack, CGRS/Microtech, $129.95

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64, C64-FORTH, Performance, $99.95
P, FORTH for PET, AB Computers, $50.00
V, VIC FORTH, HES, $59.95
P, fullFORTH, CGRS/Microtech, $75.00
P,64, KMMM Pascal, Wilserv, $85.00
V,64, Tiny FORTH, Abacus, $19.95
V, Tiny Pilot, Abacus, $17.95
P, Tiny Pascal Plus, Abacus, $39.95
P,64, COMAL, Instrutek, $495.00

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64, 64MON, Commodore, $45.00
V, VICMON, Commodore, $45.00
64,V, HESMON, HES, $39.95

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P,64, MAE, Eastern House, $99.95
P, EARL for PET, AB Computers, $65.00
V,64, Assembly/Devel. Syst & Book, Abacus, $29.95
P,64, PAL, Pro-Line, $99.95

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Sprite Shaper/deluxe, Quality, $24.95
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Sprite Designer, Academy, $16.95
Sprite-Aid, Abacus, $14.95
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64, Screen-Graphics-64, Abacus, $24.95
V, Game Prog. Dev. System, French Silk, $49.95
V, SuperExpander Cartridge, Commodore, $70.00
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P, Supergraphics, AB Computers, $40.00
P, VIGIL, Abacus, $35.00
V, HESPLOT, HES, $17.95

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64, Sound Shaper/regular, Quality, $9.95
64, Sound Shaper/deluxe, Quality, $14.95
64, The Staff, Prof.Micro.Serv., $22.95
V, The Staff, Prof.Micro.Serv., $17.95
64, Synthy-64, Abacus, $29.95

Programming Utilities
P, POWER, Professional, $89.00
64, POWER64, Pro-Line, $99.95
V,64, VicTree, Skyles, $89.95
64, PTD-6510 Debugger, Pterodactyl, $65.10
64, DisKit 64, Pterodactyl, $75.00
P, SYSRES, Solidus, $75.00
P, SM-KIT, AB Computers, $40.00
P, Programmer's Toolkit PAICS, $40.00
P, Subsort, AB,Eastern House, $35.00
P,64, The Tool, CMD, $65.00
P,64, Master, CMD, $65.00

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64,P, PETSpeed, Small Syst. Eng., $150.00
P, Integer BASIC Compiler, Small Syst. Eng., $150.00
P, Tiny BASIC Compiler, Abacus, $19.95
P, DTL BASIC Compiler, CMD, $350.00

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V, Word Wizard, MicroWare, $34.95
64, Script 64, Comp. Mark., $99.95
64, Quick Brown Fox, Quick Brn. Fox, $65.00
V, Wordwiz, World Elec., $14.95
64,V, The Editor, Powerbyte, $34.95
V, TOTL Text 2.0, TOTL, $25.00
V, TOTL Text 2.5, TOTL, $35.00
64, TOTL Text 2.6, TOTL, $40.00
64, Busiwriter 64, Skyles, $99.00
P, Superscript, Precision
P,64, Paper Clip, Batt. Incl., $125.00
P(80), WordPro 4, Professional
P(40), WordPro 3, Professional
64, WordPro 3/64, Professional, $89.95
V, Un-word Processor, Midwest, $19.95
V, VIC-Nic, Type Thrift, $19.50
V, Rapidwriter, HD Mfg., $39.95
P(80), Wordcraft Ultra, Comp. Mark.
8096, Silicon Office, Comp. Mark.
P, Copywriter, IDPC, $159.00
V, Wordcraft 20, United Microware
64, EasyWriter, Commodore
P,V,64, PaperMate, AB, $40.00

Spelling/Dictionary Programs
P,64, Spellmaster, Spellmaster, $89.00
P(80), SpellPro, Pro-Line, $179.95

Mailing List
V,64, Mailing List, Micro Spec, $99.95
V, Mailing List, World Elec., $14.95
64, The Mailer, Susie, $38.00
V,64, TOTL Label, TOTL, $20.00

Spreadsheets
64, Calc Result, Comp. Mark.
V, BusiCalc, Skyles, $49.00
64, BusiCalc, Skyles, $69.00
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P(80), BusiCalc, Skyles, $89.00
V, PractiCalc, Comp. Softw., $39.95
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P, FlexFile, AB, $110.00
V, VI-Data, United Microw.
64, C64 File, RAK, $9.95
P, The Manager, CMD, $250.00
V,64, Data Base Manager, Micro Spec
64, The Manager, Commodore, $49.95
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P(80), ASERT, CFI, $450.00
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P, KRAM, Comp. Factory, $100.00
P(80), The Wiz, Tamarack, $495.00

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80227

(continued on page 112)

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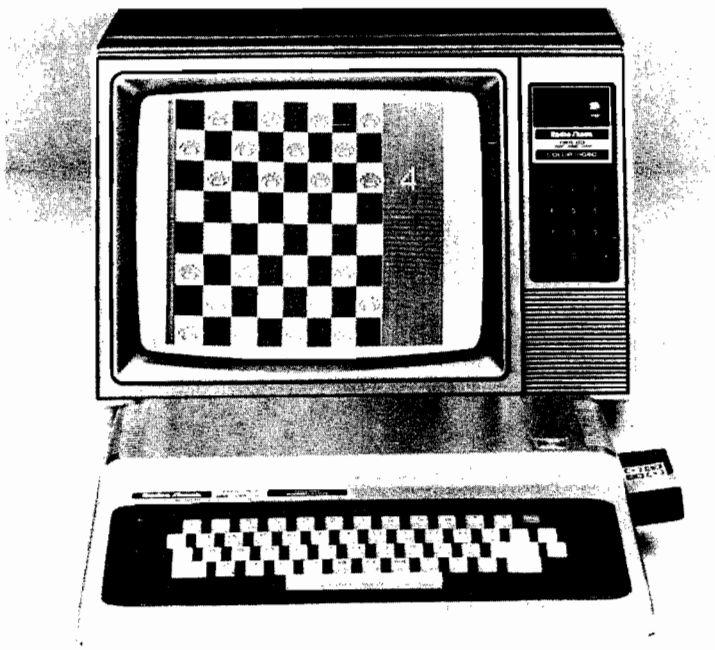

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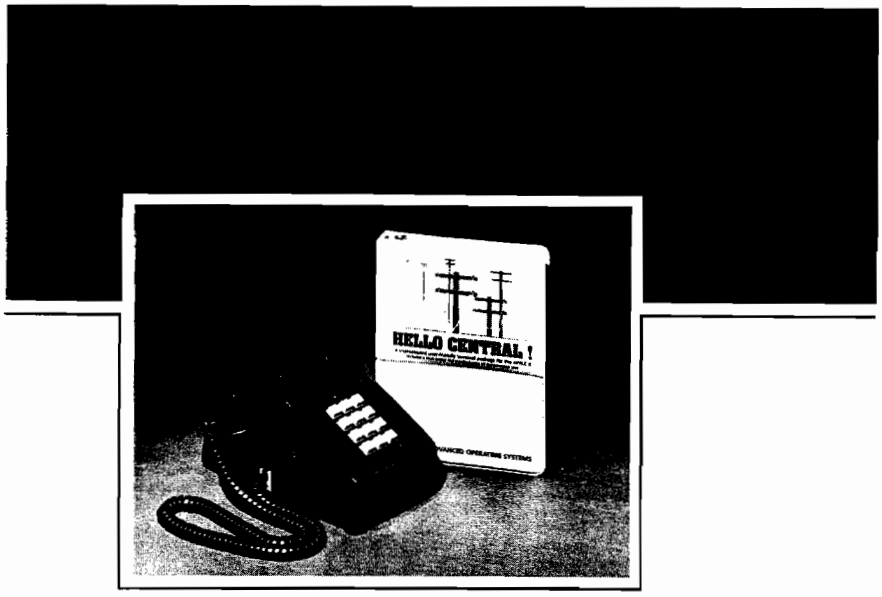

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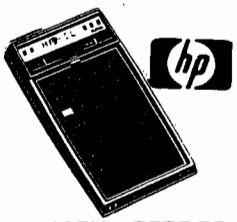

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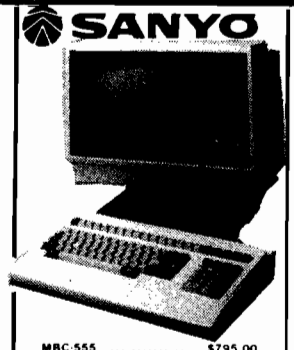

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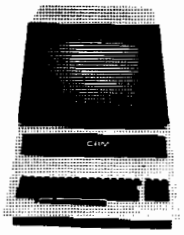

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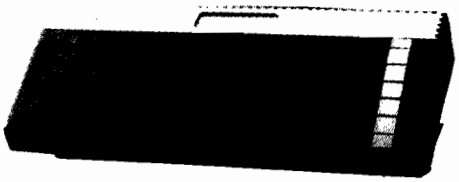

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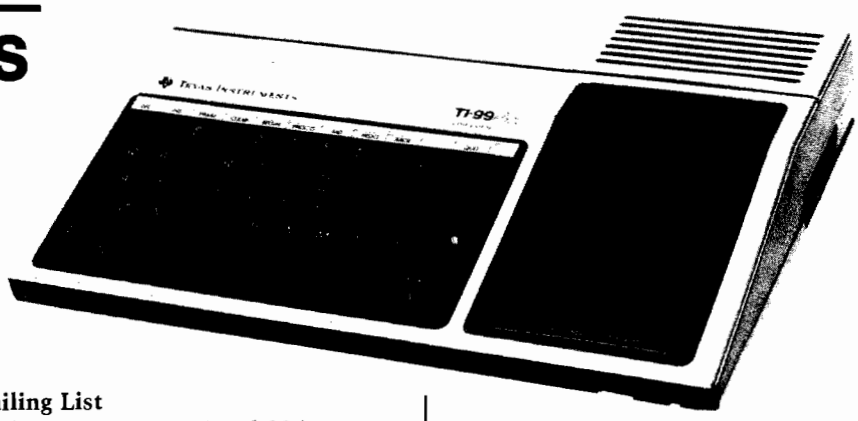

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MICRO

It's All Relative Part 6

by Jim Strasma

The final article in a 6-part series on relative files for Commodore computers. Included is the source code for the machine-language part of a popular public-domain mail list.

The sixth and final part of MICRO's series on using relative files on Commodore disk drives features the machine-language code that makes the mail list safe for new users and fast enough for large lists.

Since so many MICRO readers have Commodore 64's now, and no other good mail lists have yet appeared for that model, the source listing this time is for the 64. However, the same source code should work on any other disk-compatible Commodore model. Simply tell the assembler which model you have. (Those without Eastern House Software's MAE assembler might have to make some changes, but all variables are in the listing.)

Due to the size of the listing, I'll not say much at this time. However, three items need attention. First, a bug. If you've tried (and failed) to open a relative file on the 1541 using commands in part two of this series (MICRO 56, page 53), you'll be glad to know that it isn't your fault. As printed, an "ell" became a "one" and a comma was omitted. Here is the correct form. Be sure to jot it down, as I've not seen this published correctly anywhere before.

```
1260 OPEN 1,UN,2,STR$(DD)+":"
     +F$+",L,"+CHR$(RL)
```

If you are missing parts of this series (MICRO 55:37, 56:52, 57:33, 58:85, 60:61), you can order back issues from MICRO. If you have a Commodore 64 or a PET/CBM with BASIC 4.0, you can obtain a working copy of the program, its source code, and instructions from the author at the address below. Please enclose $15.00 and mention the "mail disk." Specify 1541/4040 format or 8050/8250 format. Commodore 64 owners are especially urged to get the disk as the changes needed on the 64 were numerous and difficult.

Some of you may never have used source code before. For the most part it's like a BASIC program; you type it in and it works. Unlike BASIC, however, there are two ways to type in source listings. First, if you have a good assembler, such as MAE, Commodore's, or PAL, type in all the information on each line, beginning with the line numbers halfway across the page. If you do not have an assembler use the second method to type in a copy for the 64. Using a machine-language monitor, type the left part of each line up to, but not including, the line number.

Various users' groups have *Micromon* and *Supermon* for the 64. Both are excellent for this work and free except for copying charges. Instructions for using a simple monitor are in the *PET Personal Computer Guide* from Osborne/McGraw-Hill and in the August/September issue of the *Midnite /PAPER*, both available from Commodore dealers or the author.

ROM Utility's source code includes four main options: an improved INPUT command, an INSERT/DELETE option for adding or deleting an element anywhere in an array, a PETSCII to ASCII converter for non-Commodore printers, and a [STOP] key disable routine that works even during program loads. Bennett's original version for the PET/CBM included two other commands, but these were not used in the mail list and have been omitted to save space.

Each command uses a small trick to transfer its information from BASIC to machine language. Just as the cursor keeps track of where you are on the screen, a program pointer keeps track of where the next statement is in a BASIC program. Normally it would choke on non-BASIC information following a SYS command. Bennett avoids this by having the machine-language program move the program pointer past added information before returning to BASIC. Thus, BASIC never sees the additions.

The first command in the listing is INPUT. Its syntax is:

SYS IN,n1,n2,$

where n1 is a number defining options, n2 is the length of the input field [1-255], and $ is the string variable that is to be filled by the routine. The possible numbers for n1 and their meanings are:

0	=	Anything goes
1	=	Numbers only
2	=	. and + and – allowed
4	=	Upper and lower-case alphabet allowed
8	=	Force alphabet to upper case
16	=	Space allowed
32	=	Allow Y or N — make them upper case
64	=	Disallow null field
256	=	Change null to 0
512	=	Change null to Y
1024	=	Change null to N
2048	=	Change null to space

These may be combined. Thus, a value of 7 for n1 means the following are allowed: Upper and lower-case letters, AND numbers, AND decimal points, and plus and minus signs.

Before calling this routine, define the string variable and move it to upper memory as described in part 2 of this series. Once in the routine, entry is ended by pressing RETURN. SHIFTED-RETURN empties the field and starts over. The DELETE key works as usual but not the cursor controls.

The second command is to INSERT or DELETE an array element. Its syntax is:

SYS DL,n1,n2,n3,v(0),w(0),zz

where n1 is 0 for insert and 1 for delete, n2 is the place of the element within the array, n3 is the total number of array elements (plus 1 on insert), V(0) and W(0) are names of arrays, and ZZ ends the list of arrays to be handled. Two-dimensional arrays are not allowed, and the name ZZ must come last.

The next three commands disable the STOP key. Use SYS DI to kill the STOP key but preserve the clock during a program. Then use SYS EL to keep it killed during a program load. When the program ends, use SYS EN to fix the STOP key again.

The last command converts strings from PETSCII to ASCII characters, usually so they can be printed on non-Commodore printers. Its syntax is:

SYS SM,n1,$

where n1 is a 1 when converting and 2 when the result is to be forced to upper case. "$" may be any string variable.

I would like to add a few words about using the assembler. First, this file is large. You will need to use the SET command within MAE to reserve a file buffer about twice the usual size, say from $1000 to $4FFC. Second, wherever possible I used Commodore's official labels for locations in ROM and low memory. Finally, ROM Utility may be burned into an EPROM; it doesn't need to change itself.

In closing, let me thank you for your patience through this long series. We both know more about relative files than when we started last December, and an excellent Public Domain business program is now better understood. I hope you find its secrets useful in your own work.

You may contact Jim Strasma at 1238 Richland Ave., Lincoln, IL 62656.

ROM Utility for Bennett's Mail List

```
0010 ;****************************************
0020 ;*     UNIVERSAL ROM UTILITY V1.0       *
0030 ;*   BASED ON CHRIS BENNETT'S ORIGINAL  *
0040 ;*    AS OF MAY 30, 1983 JFS & BAA      *
0050 ;****************************************
0060
0070 ;ASSEMBLER DIRECTIVES
0080           .OS                  ;DO STORE OBJECT CODE
0090
0100 ;GET INFO FOR CONDITIONAL ASSEMBLY
0110           .PR "ENTER ROM 2=2001, 4=8032 & 4032, 6=C64, 8=
0120 ROM       .IN ROM
0130
0140 ;ROM-DEPENDENT VARIABLES
0150
0160           IFP ROM-6
0170 ;IF FOR VIC-20 OR COMMODORE 64
0180 POKER     .DE $14
0190 VARTAB    .DE $2D
0200 STREND    .DE $31
0210 VARNAM    .DE $45
0220 VARPNT    .DE $47
0230 FOUR6     .DE $53              ;NEXT 16 LOCATIONS SWAPPED
0240 FLEN      .DE $60              ;LENGTH OF STRING
0250 FSTR      .DE $61              ;POINTER TO LINKBACK
0260 STKEY     .DE $91
0270 CHRIS     .DE $92
0280 CINV      .DE $0314            ;IRQ VECTOR
0290           ***
0300
0310           IFE ROM-8
0320 ;IF FOR  VIC-20 (REQUIRES 24K ADDED RAM)
0330 START     .DE $6C00
0340 CHKCOM    .DE $CEFD            ;CHECK_COMM
0350 FRMEVL    .DE $CD9E            ;INP_EVAL
0360 GETADR    .DE $D7F7            ;FLT_FIXED
0370 KEY       .DE $EABF            ;ON HARDWARE IRQ
0380           ***
0390
0400           IFE ROM-6
0410 ;IF FOR COMMODORE 64
0420 START     .DE $C000
0430 CHKCOM    .DE $AEFD            ;CHECK_COMM
0440 FRMEVL    .DE $ADA4            ;INP_EVAL
0450 GETADR    .DE $B7F7            ;FLT_FIXED
0460 KEY       .DE $EA31            ;ON HARDWARE IRQ
0470           ***
0480
0490           IFM ROM-5
0500 ;IF FOR CBM OR PET
```

(continued)

ROM Utility *(continued)*

```
0510 START      .DE $7B00
0520 POKER      .DE $11
0530 BENNETT    .DE $0F
0540 VARTAB     .DE $2A
0550 STREND     .DE $2E
0560 VARNAM     .DE $42
0570 VARPNT     .DE $44
0580 FOUR6      .DE $50          ;NEXT 16 LOCATIONS SWAPPED
0590 FLEN       .DE $5D          ;LENGTH OF STRING
0600 FSTR       .DE $5E          ;POINTER TO LINKBACK
0610 STKEY      .DE $9B
0620 CHRIS      .DE $8F
0630 CINV       .DE $90          ;IRQ VECTOR
0640            ***
0650
0660            IFE ROM-4
0670 ;IF FOR CBM/PET BASIC 4.0
0680 CHKCOM     .DE $BEF5        ;CHECK_COMM
0690 FRMEVL     .DE $BD98        ;INP_EVAL
0700 GETADR     .DE $C92D        ;FLT_FIXED
0710 KEY        .DE $E455        ;ON HARDWARE IRQ
0720            ***
0730
0740            IFE ROM-2
0750 ;IF FOR CBM/PET BASIC 2.0
0760 CHKCOM     .DE $CDF8        ;CHECK_COMM
0770 FRMEVL     .DE $CC9F        ;INP_EVAL
0780 GETADR     .DE $D6D2        ;FLT_FIXED
0790 KEY        .DE $E62E        ;ON HARDWARE IRQ
0800            ***
0810
0820 ;RELATIVE & ROM-INDEPENDENT VARIABLES
0830 RCNT       .DI FOUR6+4      ;TEMPLF
0840 MCNT       .DI RCNT+2
0850 PNT1       .DI MCNT+2
0860 PNT2       .DI PNT1+2
0870 LENGTH     .DI RCNT+8
0880 ED         .DI FOUR6+4
0890 ED2        .DI ED+1
0900 MX         .DI ED2+1
0910 HADR       .DI MX+1         ;HIGHTR
0920 LLENGTH    .DI FOUR6+9      ;TEMPF2
0930 CURSOR     .DI LLENGTH+1    ;DECCNT
0940 CLOCK      .DI LLENGTH+2    ;TENEXP
0950 SADR       .DI LLENGTH+3    ;GRBTOP
0960 ABS        .DE START+$0500  ;ABSOLUTE VARIABLES
0970 HARD_INT   .DI KEY+3        ;IGNORES STOP KEY & CLOCK
0980 BSOUT      .DE $FFD2        ;OUTPUT TO CHANNEL
0990 GETIN      .DE $FFE4        ;GET CHAR. FROM QEUE
1000 CLOCK_UPDT .DE $FFEA        ;INCREMENT CLOCK
1010
1020            .BA ABS
1030
1040 ;ABSOLUTE VARIABLE STORAGE
C500-  1050 BUFFER     .DS 150
C596-  1060 PCNT       .DS 2
C598-  1070 ECNT       .DS 2
C59A-  1080 ZP_0F      .DS 1
C59B-  1090 ZP_50      .DS 17
C5AC-  1100 SWITCH     .DS 1
       1110
       1120            .BA START
       1130            .MC $7B00        ;DON'T OVERWRITE ASSEMBLER
       1140
       1150 ;JUMP TABLE OF COMMANDS
C000- 4C 14 C0 1160            JMP INPUT_RTN    ;GOTO INPUT ROUTINE
C003- 4C 04 C2 1170            JMP INS_DEL      ;GOTO INSERT/DELETE ROUTIN
C006- 4C 23 C3 1180            JMP DISABLE      ;GOTO DISABLE STOP KEY ROU
C009- 4C 30 C3 1190            JMP ENABLE       ;GOTO ENABLE STOP KEY ROUT
C00C- 4C 3F C3 1200            JMP EN_LOAD      ;GOTO ENABLE LOAD ROUTINE
C00F- 4C 7D C3 1210            JMP STR_MOD      ;GOTO STRING MODIFICATION
       1220
C012- 31 EA    1230 VEC_SAVE   .SI KEY          ;VECTOR INTERRUPT
       1240
       1250 ;GENERAL PURPOSE INPUT ROUTINE
C014- 20 E7 C3 1260 INPUT_RTN  JSR SAVE_ZP
C017- 20 0F C3 1270            JSR INPUT
C01A- A5 14    1280            LDA *POKER
C01C- 85 57    1290            STA *ED
C01E- A5 15    1300            LDA *POKER+1
C020- 85 58    1310            STA *ED2
C022- 20 0F C3 1320            JSR INPUT        ;READ EDIT LENGTH
C025- A5 14    1330            LDA *POKER
C027- 85 59    1340            STA *MX
C029- D0 04    1350            BNE A2
C02B- 20 F3 C3 1360 A1         JSR REST_ZP
C02E- 60       1370            RTS
       1380
C02F- C9 95    1390 A2         CMP #149
C031- B0 F8    1400            BCS A1
C033- 20 0F C3 1410            JSR INPUT        ;GET STRING ADDRESS
C036- A5 47    1420            LDA *VARPNT
C038- 85 5A    1430            STA *HADR
C03A- A5 48    1440            LDA *VARPNT+1
C03C- 85 5B    1450            STA *HADR+1
C03E- 20 51 C3 1460            JSR NULL_STR
C041- A9 20    1470 ISTART     LDA #32          ;BLANK OUT BUFFER
C043- A0 94    1480            LDY #148
C045- 99 00 C5 1490 B1         STA BUFFER,Y
C048- 88       1500            DEY
C049- 10 FA    1510            BPL B1
C04B- A9 00    1520            LDA #0
C04D- 85 5C    1530            STA *LLENGTH
C04F- A5 92    1540            LDA *CHRIS       ;SAVE TI
C051- 18       1550            CLC
C052- 69 04    1560            ADC #4
C054- 85 5E    1570            STA *CLOCK
C056- A9 2A    1580            LDA #'*          ;PUT OUT MX *'S
C058- 85 5D    1590            STA *CURSOR
```

(continued)

EVER WONDER HOW YOUR APPLE II WORKS?

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This relocatable program traces and displays the actual machine operations, *while* it is running *and* without interfering with those operations. Look at these *FEATURES:*

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***QUICKTRACE** is a beautiful way to show the incredibly complex sequence of operations that a computer goes through in executing a program*

Price: $50

QUICKTRACE was written by John Rogers.
QUICKTRACE is a trademark of Anthro-Digital, Inc.

QUICKTRACE requires 3548 ($E00) bytes (14 pages) of memory and some knowledge of machine language programming. It will run on any Apple II or Apple II Plus computer and can be loaded from disk or tape. It is supplied on disk with DOS 3.3.

QUICKTRACE DEBUGGER

```
                 Last address                    Disassembly
Last Instruction FF69- A9 AA          LDA   #$AA

                 Top seven bytes of stack        Processor codes  User defined location & Contents
Stack            ST=7C A1 32 D5 43 D4 C1  NV-BDIZC  0000=4C

                 Accumulator  X reg.  Y reg.  Stack pointer  Processor status  Content of referenced address
Contents         A=AA  X=98  Y=25  SP=F2  PS=10110001  [ ]=DD

                                                 Disassembly  Reference address
Next Instruction FF6B- 85 33          STA   $33  [$0033]
```

Anthro-Digital, Inc.
P.O. Box 1385
Pittsfield, MA 01202
413-448-8278

ROM Utility *(continued)*

```
C05A- A4 59     1600          LDY *MX
C05C- 20 D2 FF  1610 B2       JSR BSOUT
C05F- 88        1620          DEY
C060- D0 FA     1630          BNE B2
C062- A9 9D     1640          LDA #157          ;BACKSPACE MX TIMES
C064- A4 59     1650          LDY *MX
C066- 20 D2 FF  1660 B3       JSR BSOUT
C069- 88        1670          DEY
C06A- D0 FA     1680          BNE B3
C06C- 20 A4 C1  1690 GET_CHAR JSR GET1
C06F- A8        1700          TAY
C070- A5 57     1710          LDA *ED           ;GET EDIT FLAG
C072- AA        1720          TAX
C073- 29 01     1730 T1       AND #1            ;TEST FOR NUMERIC
C075- F0 0C     1740          BEQ T2
C077- 98        1750          TYA
C078- C9 30     1760          CMP #48
C07A- 90 07     1770          BCC T2            ;< ZERO
C07C- C9 3A     1780          CMP #58
C07E- B0 03     1790          BCS T2            ;> NINE
C080- 4C 6F C1  1800 J1       JMP ADD_CHAR
                1810
C083- 8A        1820 T2       TXA
C084- 29 02     1830          AND #2            ;TEST FOR '.' '+' & '-'
C086- F0 0D     1840          BEQ T4
C088- 98        1850          TYA
C089- C9 2E     1860          CMP #'.
C08B- F0 F3     1870          BEQ J1
C08D- C9 2B     1880          CMP #'+
C08F- F0 EF     1890          BEQ J1
C091- C9 2D     1900          CMP #'-
C093- F0 EB     1910          BEQ J1
C095- 8A        1920 T4       TXA
C096- 29 0C     1930          AND #12           ;TEST FOR BOTH ALPHA FLAGS
C098- F0 1A     1940          BEQ T16
C09A- 98        1950          TYA
C09B- 29 7F     1960          AND #$7F
C09D- C9 41     1970          CMP #65           ;< A
C09F- 90 13     1980          BCC T16
C0A1- C9 5B     1990          CMP #91           ;> Z
C0A3- B0 0F     2000          BCS T16
C0A5- 8A        2010          TXA
C0A6- 29 08     2020          AND #8            ;TEST FOR FORCE UPPER CASE
C0A8- D0 04     2030          BNE FORCE_UP
C0AA- 98        2040          TYA
C0AB- 4C 6F C1  2050          JMP ADD_CHAR
                2060
C0AE- 98        2070 FORCE_UP TYA
C0AF- 09 80     2080          ORA #$80
C0B1- 4C 6F C1  2090 J2       JMP ADD_CHAR
                2100
C0B4- 8A        2110 T16      TXA
C0B5- 29 10     2120          AND #16           ;TEST FOR BLANK
C0B7- F0 05     2130          BEQ T32
C0B9- 98        2140          TYA
C0BA- C9 20     2150          CMP #32
C0BC- F0 F3     2160          BEQ J2
C0BE- 8A        2170 T32      TXA
C0BF- 29 20     2180          AND #32           ;TEST FOR Y & N
C0C1- F0 0B     2190          BEQ T64
C0C3- 98        2200          TYA
C0C4- 09 80     2210          ORA #$80
C0C6- C9 D9     2220          CMP #217          ;= 'Y'
C0C8- F0 E7     2230          BEQ J2
C0CA- C9 CE     2240          CMP #206          ;= 'N'
C0CC- F0 E3     2250          BEQ J2
C0CE- 98        2260 T64      TYA
C0CF- C9 0D     2270          CMP #13
C0D1- D0 56     2280          BNE B6
C0D3- A5 5C     2290 CAR_RET  LDA *LLENGTH       ;CARRIAGE RETURN
C0D5- D0 2D     2300          BNE FINI
C0D7- A5 57     2310          LDA *ED
C0D9- 29 40     2320          AND #64
C0DB- F0 03     2330          BEQ C1
C0DD- 4C 6C C0  2340          JMP GET_CHAR
                2350
C0E0- A5 58     2360 C1       LDA *ED2
C0E2- AA        2370          TAX
C0E3- F0 1F     2380          BEQ FINI
C0E5- 6A        2390          ROR A
C0E6- 90 02     2400          BCC C2
C0E8- A0 30     2410          LDY #'0
C0EA- 6A        2420 C2       ROR A
C0EB- 90 02     2430          BCC C3
C0ED- A0 D9     2440          LDY #217          ;= 'Y'
C0EF- 6A        2450 C3       ROR A
C0F0- 90 02     2460          BCC C4
C0F2- A0 CE     2470          LDY #206          ;= 'N'
C0F4- 6A        2480 C4       ROR A
C0F5- 90 02     2490          BCC C5
C0F7- A0 20     2500          LDY #32           ;= BLANK
C0F9- 98        2510 C5       TYA
C0FA- E6 5C     2520          INC *LLENGTH
C0FC- A4 5C     2530          LDY *LLENGTH
C0FE- 99 FF C4  2540          STA BUFFER-1,Y
C101- 20 D2 FF  2550          JSR BSOUT
C104- A0 00     2560 FINI     LDY #0
C106- A5 5C     2570          LDA *LLENGTH
C108- 91 5A     2580          STA (HADR),Y
C10A- C8        2590          INY
C10B- A9 00     2600          LDA #L,BUFFER
C10D- 91 5A     2610          STA (HADR),Y
C10F- C8        2620          INY
C110- A9 C5     2630          LDA #H,BUFFER
C112- 91 5A     2640          STA (HADR),Y
C114- 38        2650          SEC
C115- A5 59     2660          LDA *MX
C117- E5 5C     2670          SBC *LLENGTH
C119- C9 00     2680          CMP #0
C11B- F0 09     2690          BEQ EXIT
C11D- A8        2700          TAY
C11E- A9 20     2710 B5       LDA #32
C120- 20 D2 FF  2720          JSR BSOUT
C123- 88        2730          DEY
C124- D0 F8     2740          BNE B5
C126- 4C 2B C0  2750 EXIT     JMP A1
                2760
C129- C9 14     2770 B6       CMP #20
C12B- D0 1B     2780          BNE B8
C12D- A5 5C     2790          LDA *LLENGTH      ;DELETE CHARACTER ROUTINE
C12F- D0 03     2800          BNE DEL_CHAR
C131- 4C 6C C0  2810          JMP GET_CHAR
                2820
C134- 20 F9 C1  2830 DEL_CHAR JSR AST_BKSP
C137- C6 5C     2840 DEL2     DEC *LLENGTH
C139- A9 9D     2850          LDA #157
C13B- 20 D2 FF  2860          JSR BSOUT
C13E- A5 92     2870          LDA *CHRIS
C140- 18        2880          CLC
C141- 69 04     2890          ADC #4
C143- 85 5E     2900          STA *CLOCK
C145- 4C 6C C0  2910          JMP GET_CHAR
                2920
C148- C9 8D     2930 B8       CMP #141
C14A- D0 1A     2940          BNE TEST_ED
C14C- A5 5C     2950          LDA *LLENGTH      ;SHIFT-RETURN
C14E- D0 03     2960          BNE NULL
C150- 4C 6C C0  2970          JMP GET_CHAR
                2980
C153- 20 F9 C1  2990 NULL     JSR AST_BKSP
C156- A4 5C     3000          LDY *LLENGTH
C158- A9 9D     3010 B10      LDA #157
C15A- 20 D2 FF  3020          JSR BSOUT
C15D- 20 F9 C1  3030          JSR AST_BKSP
C160- 88        3040          DEY
C161- D0 F5     3050          BNE B10
C163- 4C 41 C0  3060          JMP ISTART
                3070
C166- 8A        3080 TEST_ED  TXA
C167- 29 3F     3090          AND #$3F
C169- F0 03     3100          BEQ TEST_OK
C16B- 4C 6C C0  3110          JMP GET_CHAR
                3120
C16E- 98        3130 TEST_OK  TYA
C16F- E6 5C     3140 ADD_CHAR INC *LLENGTH
C171- A4 5C     3150          LDY *LLENGTH
C173- 99 FF C4  3160          STA BUFFER-1,Y
C176- 20 D2 FF  3170          JSR BSOUT
C179- A5 5C     3180          LDA *LLENGTH
C17B- C5 59     3190          CMP *MX
C17D- B0 03     3200          BCS GET2          ;LENGTH >= MX
C17F- 4C 6C C0  3210          JMP GET_CHAR
                3220
C182- 20 E4 FF  3230 GET2     JSR GETIN         ;GET A CHARACTER
C185- C9 00     3240          CMP #0
C187- F0 F9     3250          BEQ GET2
C189- C9 0D     3260          CMP #13
C18B- D0 03     3270          BNE CC1
C18D- 4C D3 C0  3280          JMP CAR_RET
C190- C9 14     3290 CC1      CMP #20
C192- F0 A3     3300          BEQ DEL2
C194- C9 8D     3310          CMP #141
C196- D0 EA     3320          BNE GET2
C198- A9 9D     3330          LDA #157
C19A- 20 D2 FF  3340          JSR BSOUT
C19D- C6 5C     3350          DEC *LLENGTH
C19F- D0 B2     3360          BNE NULL
C1A1- 4C 41 C0  3370          JMP ISTART
                3380
                3390 ;GET ROUTINE WITH CURSOR CONTROL
C1A4- 20 E4 FF  3400 GET1     JSR GETIN         ;GET A CHARACTER
C1A7- C9 00     3410          CMP #0
C1A9- F0 21     3420          BEQ G1
C1AB- C9 22     3430          CMP #34           ;DOUBLE QUOTE?
C1AD- F0 F5     3440          BEQ GET1          ;YES.
C1AF- C9 0D     3450          CMP #13
C1B1- F0 18     3460          BEQ GET_OK        ;CARRIAGE RETURN
C1B3- C9 14     3470          CMP #20
C1B5- F0 14     3480          BEQ GET_OK        ;DELETE
C1B7- C9 8D     3490          CMP #141
C1B9- F0 10     3500          BEQ GET_OK        ;SHIFT RETURN
C1BB- C9 20     3510          CMP #32
C1BD- 90 0D     3520          BCC G1            ;< 32 , REJECT
C1BF- C9 60     3530          CMP #96
C1C1- 90 08     3540          BCC GET_OK        ;< 96 , ACCEPT
C1C3- C9 C1     3550          CMP #193
C1C5- 90 05     3560          BCC G1            ;< 193 , REJECT
C1C7- C9 DB     3570          CMP #219
C1C9- B0 01     3580          BCS G1            ;>= 219 , REJECT
C1CB- 60        3590 GET_OK   RTS
                3600
C1CC- 38        3610 G1       SEC
C1CD- A5 5E     3620          LDA *CLOCK
C1CF- E5 92     3630          SBC *CHRIS
C1D1- B0 D1     3640          BCS GET1
C1D3- A5 5D     3650          LDA *CURSOR
C1D5- C9 2A     3660          CMP #'*
C1D7- F0 04     3670          BEQ G3
C1D9- A9 2A     3680          LDA #'*
C1DB- D0 02     3690          BNE G4
C1DD- A9 20     3700 G3       LDA #32
C1DF- 85 5D     3710 G4       STA *CURSOR
C1E1- 20 D2 FF  3720          JSR BSOUT
C1E4- A9 9D     3730          LDA #157
C1E6- 20 D2 FF  3740          JSR BSOUT
C1E9- A5 92     3750          LDA *CHRIS
C1EB- 18        3760          CLC
C1EC- 69 04     3770          ADC #4
C1EE- C9 FF     3780          CMP #$FF
C1F0- D0 02     3790          BNE G5
C1F2- A9 00     3800          LDA #$00
C1F4- 85 5E     3810 G5       STA *CLOCK
C1F6- 4C A4 C1  3820          JMP GET1
                3830
C1F9- A9 9D     3840 AST_BKSP LDA #157
C1FB- 20 D2 FF  3850          JSR BSOUT
C1FE- A9 2A     3860          LDA #'*
C200- 20 D2 FF  3870          JSR BSOUT
```

(continued)

ROM Utility *(continued)*

```
C203- 60        3880            RTS
                3890
                3900 ;INSERT / DELETE ROUTINE FOR ARRAYS
C204- 20 E7 C3  3910 INS_DEL    JSR SAVE_ZP
C207- 20 0F C3  3920            JSR INPUT           ;READ INSERT/DELETE FLAG
C20A- A5 14     3930            LDA *POKER
C20C- 8D AC C5  3940            STA SWITCH          ;0=INSERT, 1=DELETE
C20F- 20 0F C3  3950            JSR INPUT           ;READ INSERT/DELETE POSITI
C212- A5 14     3960            LDA *POKER          ;AND SAVE IN
C214- 8D 96 C5  3970            STA PCNT            ;TEMPORARY AREA (PCNT)
C217- A5 15     3980            LDA *POKER+1
C219- 8D 97 C5  3990            STA PCNT+1
C21C- 20 0F C3  4000            JSR INPUT           ;READ END OF ARRAY COUNT
C21F- A5 14     4010            LDA *POKER          ;AND SAVE IN
C221- 8D 98 C5  4020            STA ECNT            ;TEMPORARY AREA (ECNT)
C224- A5 15     4030            LDA *POKER+1
C226- 8D 99 C5  4040            STA ECNT+1
C229- 20 0F C3  4050 CHECK      JSR INPUT           ;READ ARRAY VARIABLE.
C22C- A5 45     4060            LDA *VARNAM         ;IF THE VARIABLE
C22E- C9 5A     4070            CMP #'Z             ;NAME IS ZZ, THEN
C230- D0 0A     4080            BNE NOTEND          ;RETURN TO BASIC
C232- A5 46     4090            LDA *VARNAM+1
C234- C9 5A     4100            CMP #'Z
C236- D0 04     4110            BNE NOTEND
C238- 20 F3 C3  4120            JSR REST_ZP
C23B- 60        4130            RTS
                4140
C23C- A2 05     4150 NOTEND     LDX #5              ;CALCULATE LENGTH OF
C23E- A9 80     4160            LDA #$80            ;ARRAY ITEM.
C240- 24 46     4170            BIT *VARNAM+1       ;FLOAT = 5
C242- F0 02     4180            BEQ NEXT22          ;% = 2
C244- A2 03     4190            LDX #3              ;$ = 3
C246- 24 45     4200 NEXT22     BIT *VARNAM
C248- F0 02     4210            BEQ NEXT33
C24A- A2 02     4220            LDX #2
C24C- 86 5F     4230 NEXT33     STX *LENGTH         ;AND STORE INTO LENGTH
C24E- A5 47     4240            LDA *VARPNT         ;STORE ADDRESS OF ZERO
C250- 85 5D     4250            STA *PNT2           ;ARRAY POSITION INTO
C252- A5 48     4260            LDA *VARPNT+1       ;PNT2.
C254- 85 5E     4270            STA *PNT2+1
C256- AD 96 C5  4280            LDA PCNT            ;RESTORE INSERT/DELETE
C259- 85 57     4290            STA *RCNT           ;POSITION INTO RCNT
C25B- AD 97 C5  4300            LDA PCNT+1
C25E- 85 58     4310            STA *RCNT+1
C260- AD 98 C5  4320            LDA ECNT            ;RESTORE END OF ARRAY
C263- 85 59     4330            STA *MCNT           ;COUNTER INTO MCNT.
C265- AD 99 C5  4340            LDA ECNT+1
C268- 85 5A     4350            STA *MCNT+1
C26A- AD AC C5  4360            LDA SWITCH          ;IF 0 THEN INSERT.
C26D- D0 51     4370            BNE DELETE          ;IF >0 THEN DELETE.
C26F- A6 5F     4380 INSERT     LDX *LENGTH         ;LOAD ITEM LENGTH MINUS 1
C271- CA        4390            DEX
C272- 18        4400 LOOP1      CLC
C273- A5 5D     4410            LDA *PNT2           ;PNT2 = PNT2 + MCNT*LENGTH
C275- 65 59     4420            ADC *MCNT           ;(LAST OCCURANCE OF
C277- 85 5D     4430            STA *PNT2           ;TABLE PLUS 1)//
C279- A5 5E     4440            LDA *PNT2+1
C27B- 65 5A     4450            ADC *MCNT+1
C27D- 85 5E     4460            STA *PNT2+1
C27F- CA        4470            DEX
C280- 10 F0     4480            BPL LOOP1
C282- 38        4490 LOOP2      SEC
C283- A5 5D     4500            LDA *PNT2           ;PNT1 POINTS TO
C285- E5 5F     4510            SBC *LENGTH         ;PNT2 MINUS LENGTH
C287- 85 5B     4520            STA *PNT1           ;(LAST OCCURANCE)
C289- A5 5E     4530            LDA *PNT2+1
C28B- E9 00     4540            SBC #0
C28D- 85 5C     4550            STA *PNT1+1
C28F- A4 5F     4560            LDY *LENGTH         ;LOAD ITEM LENGTH MINUS 1
C291- 88        4570            DEY
C292- B1 5B     4580 LOOP3      LDA (PNT1),Y        ;MOVE X OCCURANCE
C294- 91 5D     4590            STA (PNT2),Y        ;TO X+1 OCCURANCE
C296- 88        4600            DEY
C297- 10 F9     4610            BPL LOOP3
                4620
                4630            IFE ROM-4
                4640            JSR FIX_STR         ;FIX UP LINKBACK POINTER
                4650            ***
                4660
C299- A5 59     4670            LDA *MCNT           ;SUBTRACT 1 FROM MCNT
C29B- D0 02     4680            BNE NEXT1
C29D- C6 5A     4690            DEC *MCNT+1
C29F- C6 59     4700 NEXT1      DEC *MCNT
C2A1- A5 59     4710            LDA *MCNT           ;WHEN MCNT EQUALS RCNT
C2A3- C5 57     4720            CMP *RCNT           ;THEN GO TO CHECK
C2A5- D0 09     4730            BNE SUB3            ;NEXT ARRAY VARIABLE
C2A7- A5 5A     4740            LDA *MCNT+1
C2A9- C5 58     4750            CMP *RCNT+1
C2AB- D0 03     4760            BNE SUB3
                4770
                4780            IFE ROM-4
                4790            JSR ZERO_LINK
                4800            ***
                4810
C2AD- 4C 29 C2  4820            JMP CHECK
                4830
C2B0- 38        4840 SUB3       SEC
C2B1- A5 5D     4850            LDA *PNT2           ;SUBTRACT ITEM LENGTH
C2B3- E5 5F     4860            SBC *LENGTH         ;FROM PNT2
C2B5- 85 5D     4870            STA *PNT2
C2B7- A5 5E     4880            LDA *PNT2+1
C2B9- E9 00     4890            SBC #0
C2BB- 85 5E     4900            STA *PNT2+1
```

(Continued on page 110)

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ROM Utility *(continued)*

```
C2BD- 4C 82 C2  4910            JMP LOOP2
                4920
C2C0- A6 5F     4930 DELETE     LDX *LENGTH         ;PNT2 POINTS TO DELETE
C2C2- CA        4940            DEX
C2C3- 18        4950 LOOP4      CLC
C2C4- A5 5D     4960            LDA *PNT2           ;PNT2 POINTS TO ITEM
C2C6- 65 57     4970            ADC *RCNT           ;TO BE DELETED
C2C8- 85 5D     4980            STA *PNT2
C2CA- A5 5E     4990            LDA *PNT2+1
C2CC- 65 58     5000            ADC *RCNT+1
C2CE- 85 5E     5010            STA *PNT2+1
C2D0- CA        5020            DEX
C2D1- 10 F0     5030            BPL LOOP4
C2D3- 18        5040 LOOP5      CLC
C2D4- A5 5D     5050            LDA *PNT2           ;PNT1 POINTS TO
C2D6- 65 5F     5060            ADC *LENGTH         ;THE ARRAY ITEM
C2D8- 85 5B     5070            STA *PNT1           ;ONE HIGHER THAN PNT2
C2DA- A5 5E     5080            LDA *PNT2+1
C2DC- 69 00     5090            ADC #0
C2DE- 85 5C     5100            STA *PNT1+1
C2E0- A4 5F     5110            LDY *LENGTH         ;LOAD ITEM LENGTH MINUS 1
C2E2- 88        5120            DEY
C2E3- B1 5B     5130 LOOP6      LDA (PNT1),Y        ;MOVE X+1 OCCURANCE
C2E5- 91 5D     5140            STA (PNT2),Y        ;TO X OCCURANCE
C2E7- 88        5150            DEY
C2E8- 10 F9     5160            BPL LOOP6
                5170
                5180            IFE ROM-4
                5190            JSR FIX_STR         ;FIX LINKBACK POINTER
                5200            ***
                5210
C2EA- E6 57     5220            INC *RCNT           ;ADD 1 TO RCNT
C2EC- D0 02     5230            BNE NEXT2
C2EE- E6 58     5240            INC *RCNT+1
C2F0- A5 59     5250 NEXT2      LDA *MCNT           ;WHEN MCNT EQUALS RCNT
C2F2- C5 57     5260            CMP *RCNT           ;THEN GO TO CHECK
C2F4- D0 09     5270            BNE ADD3            ;NEXT ARRAY VARIABLE
C2F6- A5 5A     5280            LDA *MCNT+1
C2F8- C5 58     5290            CMP *RCNT+1
C2FA- D0 03     5300            BNE ADD3
                5310
                5320            IFE ROM-4
                5330            JSR ZERO_LINK
                5340            ***
                5350
C2FC- 4C 29 C2  5360            JMP CHECK
                5370
C2FF- 18        5380 ADD3       CLC
C300- A5 5D     5390            LDA *PNT2           ;ADD ITEM LENGTH
C302- 65 5F     5400            ADC *LENGTH         ;TO PNT2
C304- 85 5D     5410            STA *PNT2
C306- A5 5E     5420            LDA *PNT2+1
C308- 69 00     5430            ADC #0
C30A- 85 5E     5440            STA *PNT2+1
C30C- 4C D3 C2  5450            JMP LOOP5
                5460
                5470            IFE ROM-4
                5480 FIX_STR    LDA *LENGTH         ;BYPASS IF NOT STRING ARRA
                5490            CMP #3
                5500            BNE FIX_EXIT
                5510            LDY #0
                5520            LDA (PNT2),Y        ;GET LENGTH
                5530            BEQ FIX_EXIT        ;EXIT IF ZERO
                5540            STA *FLEN           ;SAVE IT
                5550            INY
                5560            LDA (PNT2),Y
                5570            STA *FSTR           ;SAVE ADDRESS OF STRING
                5580            INY
                5590            LDA (PNT2),Y
                5600            STA *FSTR+1
                5610            CMP *VARTAB+1       ;CHECK WITH TOP OF BASIC
                5620            BCC FIX_EXIT        ;STRING WITHIN BASIC
                5630            BEQ FIX_EQ
                5640            BCS FIX_NEXT        ;WITHIN STRING AREA
                5650 FIX_EQ     LDA *FSTR
                5660            CMP *VARTAB
                5670            BCC FIX_EXIT        ;WITHIN BASIC
                5680
                5690 FIX_NEXT   LDY *FLEN
                5700            LDA *PNT2
                5710            STA (FSTR),Y
                5720            INY
                5730            LDA *PNT2+1
                5740            STA (FSTR),Y
                5750 FIX_EXIT   RTS
                5760
                5770 ZERO_LINK  LDA *LENGTH
                5780            CMP #3
                5790            BNE FIX_EXIT
                5800            LDY #0
                5810            LDA #0
                5820            STA (PNT1),Y
                5830            INY
                5840            STA (PNT1),Y
                5850            INY
                5860            STA (PNT1),Y
                5870            RTS
                5880            ***
                5890
C30F- 20 FD AE  5900 INPUT      JSR CHKCOM          ;CHECK FOR COMMA
C312- 20 A4 AD  5910            JSR FRMEVL          ;INPUT & EVALUATE EXPRESSI
C315- 20 F7 B7  5920            JSR GETADR          ;CONVERT FLOAT TO FIXED
```

(continued)

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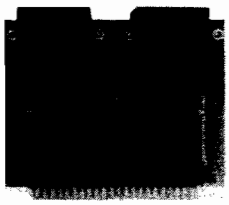

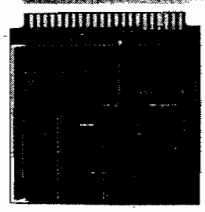

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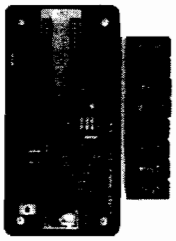

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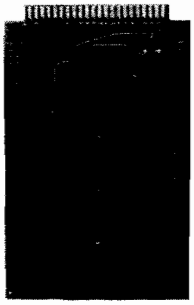

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ROM Utility *(continued)*

```
C318- 60        5930            RTS
                5940
                5950 ;STOP KEY ENABLE AND DISABLE ROUTINES
C319- 20 EA FF  5960 STOP       JSR CLOCK_UPDT
C31C- A9 FF     5970            LDA #$FF
C31E- 85 91     5980            STA *STKEY
C320- 4C 34 EA  5990            JMP HARD_INT
                6000
C323- 78        6010 DISABLE    SEI
C324- A9 19     6020            LDA #L,STOP
C326- 8D 14 03  6030            STA CINV
C329- A9 C3     6040            LDA #H,STOP
C32B- 8D 15 03  6050            STA CINV+1
C32E- 58        6060            CLI
C32F- 60        6070            RTS
                6080
C330- 78        6090 ENABLE     SEI
C331- AD 12 C0  6100            LDA VEC_SAVE
C334- 8D 14 03  6110            STA CINV
C337- AD 13 C0  6120            LDA VEC_SAVE+1
C33A- 8D 15 03  6130            STA CINV+1
C33D- 58        6140            CLI
C33E- 60        6150            RTS
                6160
C33F- 78        6170 EN_LOAD    SEI
C340- AD 12 C0  6180            LDA VEC_SAVE
C343- 18        6190            CLC
C344- 69 03     6200            ADC #3
C346- 8D 14 03  6210            STA CINV
C349- AD 13 C0  6220            LDA VEC_SAVE+1
C34C- 8D 15 03  6230            STA CINV+1
C34F- 58        6240            CLI
C350- 60        6250            RTS
                6260
                6270 ;NULL THE STRING BEING USED
C351- A0 00     6280 NULL_STR   LDY #0
C353- B1 5A     6290            LDA (HADR),Y
C355- 85 5C     6300            STA *LLENGTH
C357- F0 23     6310            BEQ NULL_EXIT
C359- C8        6320            INY
C35A- B1 5A     6330            LDA (HADR),Y
C35C- 85 5F     6340            STA *SADR
C35E- C8        6350            INY
C35F- B1 5A     6360            LDA (HADR),Y
C361- 85 60     6370            STA *SADR+1
C363- C5 32     6380            CMP *STREND+1
C365- 90 15     6390            BCC NULL_EXIT
C367- F0 02     6400            BEQ NULL_EQ
C369- B0 06     6410            BCS NULL_OK
C36B- A5 5F     6420 NULL_EQ    LDA *SADR
C36D- C5 31     6430            CMP *STREND
C36F- 90 0B     6440            BCC NULL_EXIT
C371- A4 5C     6450 NULL_OK    LDY *LLENGTH
C373- A5 5C     6460            LDA *LLENGTH
C375- 91 5F     6470            STA (SADR),Y
C377- C8        6480            INY
C378- A9 FF     6490            LDA #$FF
C37A- 91 5F     6500            STA (SADR),Y
C37C- 60        6510 NULL_EXIT  RTS
                6520
                6530 ;ROUTINE TO MODIFY STRING DATA
C37D- 20 0F C3  6540 STR_MOD    JSR INPUT
C380- A5 14     6550            LDA *POKER
C382- 48        6560            PHA
C383- D0 01     6570            BNE ST2
C385- 60        6580 ST1        RTS
C386- C9 03     6590 ST2        CMP #3
C388- B0 FB     6600            BCS ST1             ;> 2
C38A- 20 0F C3  6610            JSR INPUT
C38D- A0 00     6620            LDY #0
C38F- B1 47     6630            LDA (VARPNT),Y
C391- 85 5C     6640            STA *LLENGTH
C393- C8        6650            INY
C394- B1 47     6660            LDA (VARPNT),Y
C396- 85 5A     6670            STA *HADR
C398- C8        6680            INY
C399- B1 47     6690            LDA (VARPNT),Y
C39B- 85 5B     6700            STA *HADR+1
C39D- 68        6710            PLA
C39E- C9 02     6720            CMP #2
C3A0- F0 2B     6730            BEQ OPTION_2        ;CONVERT TO UPPER CASE
C3A2- A4 5C     6740 OPTION_1   LDY *LLENGTH        ;ASCII PRINTER CONVERSION
C3A4- F0 26     6750            BEQ STR_EXIT
C3A6- 88        6760 OP1_LOOP1  DEY
C3A7- C0 FF     6770            CPY #$FF
C3A9- F0 21     6780            BEQ STR_EXIT
C3AB- B1 5A     6790            LDA (HADR),Y
C3AD- C9 41     6800            CMP #65             ;< A
C3AF- 90 0C     6810            BCC OP1_NEXT1
C3B1- C9 5B     6820            CMP #91             ;> Z
C3B3- B0 08     6830            BCS OP1_NEXT1
C3B5- 18        6840            CLC
C3B6- 69 20     6850            ADC #$20
C3B8- 91 5A     6860            STA (HADR),Y
C3BA- 4C A6 C3  6870            JMP OP1_LOOP1
                6880
C3BD- C9 C1     6890 OP1_NEXT1  CMP #193            ;NOT LOWER CASE
C3BF- 90 E5     6900            BCC OP1_LOOP1
C3C1- C9 DB     6910            CMP #219
C3C3- B0 E1     6920            BCS OP1_LOOP1
C3C5- 29 7F     6930            AND #$7F
C3C7- 91 5A     6940            STA (HADR),Y
C3C9- 4C A6 C3  6950            JMP OP1_LOOP1
C3CC- 60        6960 STR_EXIT   RTS
                6970
C3CD- A4 5C     6980 OPTION_2   LDY *LLENGTH
C3CF- F0 FB     6990            BEQ STR_EXIT
C3D1- 88        7000 OP2_LOOP1  DEY
C3D2- C0 FF     7010            CPY #$FF
C3D4- F0 F6     7020            BEQ STR_EXIT
C3D6- B1 5A     7030            LDA (HADR),Y
C3D8- C9 41     7040            CMP #65             ;LOWER CASE A
C3DA- 90 F5     7050            BCC OP2_LOOP1
C3DC- C9 5B     7060            CMP #91
C3DE- B0 F1     7070            BCS OP2_LOOP1
C3E0- 09 80     7080            ORA #$80
C3E2- 91 5A     7090            STA (HADR),Y
C3E4- 4C D1 C3  7100            JMP OP2_LOOP1
                7110
                7120 SAVE_ZP
                7130
                7140            IFE ROM-4
                7150            LDA *BENNETT
                7160            STA ZP_0F
                7170            ***
                7180
C3E7- A0 10     7190            LDY #16
                7200
C3E9- B9 53 00  7210 SV_LOOP1   LDA FOUR6,Y
C3EC- 99 9B C5  7220            STA ZP_50,Y
C3EF- 88        7230            DEY
C3F0- 10 F7     7240            BPL SV_LOOP1
C3F2- 60        7250            RTS
                7260
                7270 REST_ZP
                7280
                7290            IFE ROM-4
                7300            LDA ZP_0F
                7310            STA *BENNETT
                7320            ***
                7330
C3F3- A0 10     7340            LDY #16
C3F5- B9 9B C5  7350 RS_LOOP1   LDA ZP_50,Y
C3F8- 99 53 00  7360            STA FOUR6,Y
C3FB- 88        7370            DEY
C3FC- 10 F7     7380            BPL RS_LOOP1
C3FE- 60        7390            RTS
                7400
                7410            .EN
END OF MAE PASS1
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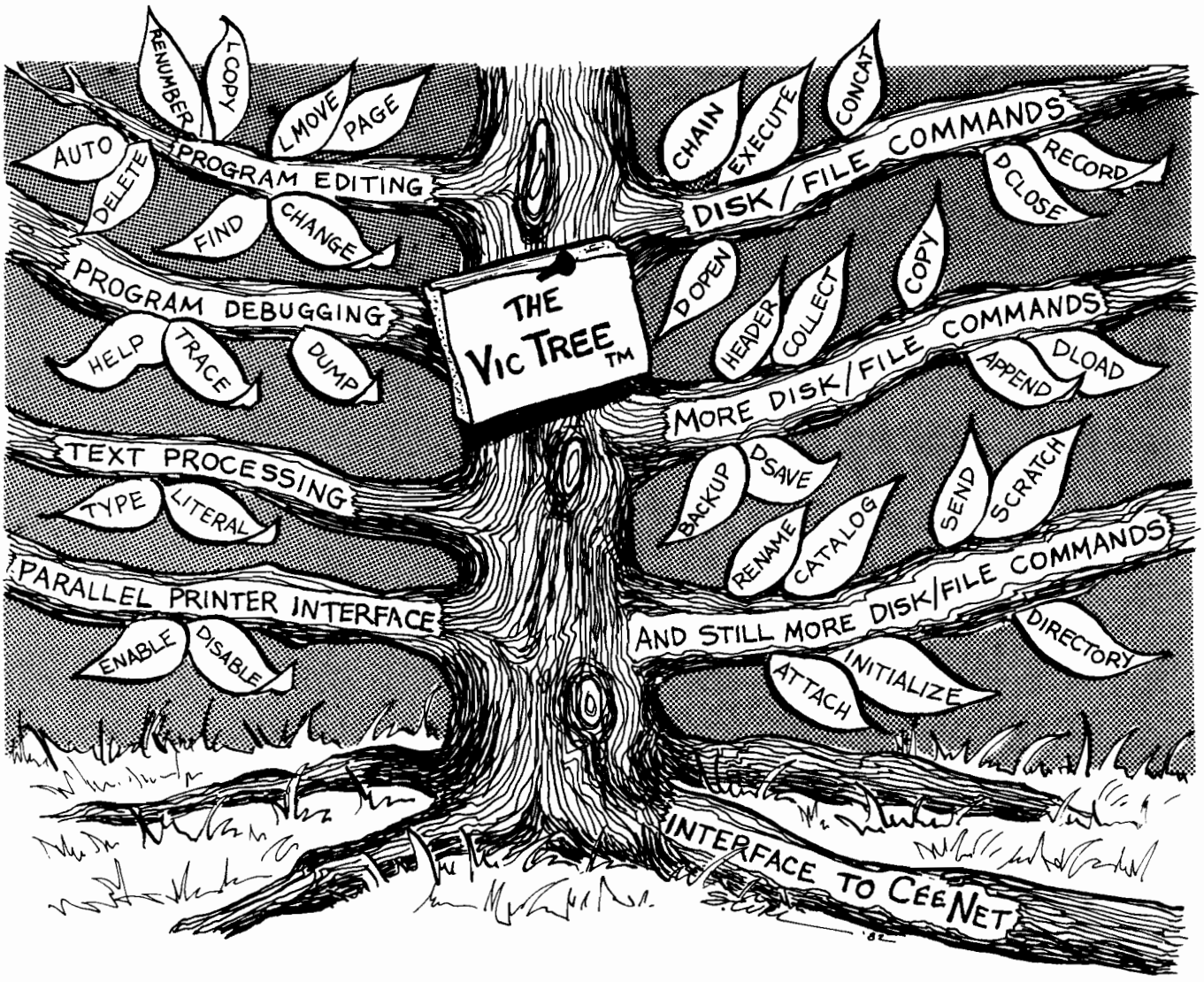

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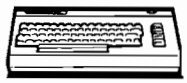

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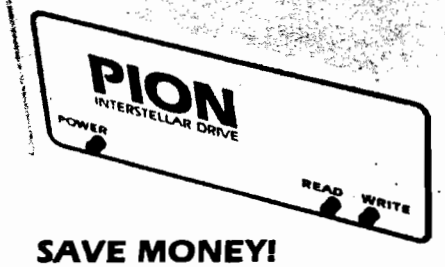

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CoCo Bits

by John Steiner

This month I have expanded my column to include information about Rainbowfest, the Color Computer's first national show. Since the topic for this month is word processing, I have a few comments on using the CoCo as a word processor, which is something I have done for over two years. Before getting started with the new agenda, however, I have some old business that concerns upgrading to 64K.

64K Upgrade

Last month I described how to convert a 16K D board to 64K. This month I describe how to convert the E and F boards. The upgrades are easy to do, and with 4164 ICs at less than $1.00 a byte there is little excuse not to upgrade. Remember, if you break the seal on the bottom center screw you will void your Radio Shack warranty; you may want to wait the 90 days before upgrading. The E board upgrade is easy compared to the D board modification since the E board is already designed to accept 4164. If you have a 16K computer, remove capacitors C61, C31, C64, C35, C67, C45, C70, and C48. Move the jumper between U8 and U4 to the 32K position. Move the jumper near C44 and the ROM port to the 16K/32K position. Next, move the three jumpers located by the keyboard connector to the 32K position and use a wire-wrap tool to jumper the stakes next to U29 to be in the LOW position. Connect the two stakes to the left of C44 together. If you were to install the 64K chips at this point, you would have a standard 32K Radio Shack computer. The 1.1 ROM required with the D board is already in place on the E board.

If you have a 32K computer, you can start the modification at this point. Remove IC U29 and bend pins 4, 5, and 6 straight up. Do not flex these pins too much as they may break. Be sure that they are bent straight enough so that they won't touch the metal RF shield to the left of the IC when it is reinstalled. Connect pin 6 of U29 to pin 8 of U29. Solder only to the very top of pin 8 as it must be reinserted in the socket. Be careful not to drip solder onto the lower part of the IC pin. Reinsert the IC into its socket being careful not to bend any pins underneath the IC.

In a similar fashion, remove IC U11 and bend pin 5 straight up. Reinstall it in the socket. Next connect pin 4 of U29 to pin 5 of U11, and pin 5 of U29 to TP1. This completes the modification.

Install the 4164 ICs in sockets U20-U27. If you have a 32K machine it will already have these chips. However, since Tandy did not expect to use the upper bank of RAM, they bought mediocre 32K chips. You can replace all of these chips or run a memory diagnostic to test the upper bank. You will need to replace only the chips that indicate bad cells. Most of the conversions I have seen required the replacement of only two or three ICs. This finishes the upgrade.

If you have a new F board, the project is really simple. The 32K F board will access 64K just by calling MAP type 1. If you have a 16K computer, remove the shield from around the RAM chips. The F board is identified by the fact that the shield does not cover the 6809, VDG, PIAs, or ROMs. To remove the shield, reach under the computer circuit board. You will find tabs bent under the board attached to the shield. Bend the tabs to a vertical position and lift off the shield. Remove capacitors C58, C60, C62, C64, C66, C68, C70, and C72. Move two jumpers to the left of U21 and one jumper above U28 down to the 64K position. Install a jumper of wire-wrap wire between the two stakes at the left of U17; then install the 64K chips.

Many programs are now supporting a check for 64K capacity and more are being introduced daily. You don't need Flex to use the extra RAM anymore. My thanks to Bob Rosen of Spectrum Projects for providing upgrade instructions and allowing me to pass them along. Yes, Bob does have 64K RAM chips and installation instructions available. The latest price I've seen for 4164's is $49.95 each.

Next month I will have a program listing that will call and use the 64K memory map and provide a simple memory test of upper RAM.

CoCo as a Word Processor

One question I often get asked is "How can you possibly use that cheap keyboard for any serious work?" The answer is "Quite well!" Although the keyboard is probably the largest objection to CoCo as a word processor, it is easy for me to use. With the short keystroke required, I can type over 70 WPM accurately, something I can't begin to do on an Apple keyboard. If you must have a "professional" board, you can install one of several add-on replacement boards. Probably the nicest keyboard I've seen is from Mark Data Products. It costs $69.95 and has the same layout as the original CoCo board. Others, including one from Macrotron Company, have user-definable function keys. I haven't tried either of these boards.

A more difficult problem with using CoCo as a word processor is its relatively small screen display, which allows only 32 characters by 16 lines. For occasional work it is tolerable, and there are several solutions.

One advantage of using a word processor is that you can see the text as it might look on the printed page. There are two ways of implementing this on the commercial word processors I have seen for Coco. Disk and ROM *Scripsit* and Nelson's original *Color Writer* use a window to look at the text. The programs scroll the text past the screen horizontally and vertically. I have never used *Color Writer*, but I have used both Disk and ROM *Scripsit*. *Telewriter* and the latest *Color Writer* use a high-resolution graphics screen to provide up to 85 characters by 24 lines on screen. The disadvantages of this method are that you must use a monitor (and modify CoCo to accept one), and the extra memory required for a large graphics screen is taken from the available text buffer.

(Continued on next page)

One advantage of the graphics screen is the ability to have actual lower-case letters on the screen display (which overcomes a major objection to CoCo's reverse video representation of lower-case letters). Disk *Scripsit* uses a graphics screen to display lower-case letters but continues to use the 32 × 16 display window; the memory penalty you pay is approximately 6K of buffer space.

While on the subject of graphics display, if you have a 32K upgrade that just piggy-backs 4116 RAMs to the top of the existing 16K RAMs, you will not be able to use Disk *Scripsit's* graphics display. The computer cannot access the upper 16K as graphics memory, which it must do in this program. Adding a lower-case hardware modification is useful when using *Scripsit*. The lower-case modification board from Micro-Technical Products is an excellent accessory for anyone using *Scripsit*. With this board you can have upper/lower case and the extra 6K buffer.

Since I got my CoCo, I've used four word processors: a home brew, *Color Scribe*, ROM and Disk *Scripsit*, and *Telewriter*. Here I discuss some of the things I like and dislike about each of the commercial programs. Hopefully you can use the information to make a decision as to which processor might be best for you.

Color Scribe

Color Scribe from Computerware has the best and most versatile text formatter. It can handle files larger than RAM memory, change print formats from within the text, right and left justify, etc. The major reason I don't use it often is because it has a line-oriented editor. Each line must be no longer than 127 characters and must be terminated with a carriage return. The program is disk oriented and handles files well, but I can't get used to the editor.

Disk and ROM Scripsit

Disk and ROM *Scripsit* from Tandy are similar, but the disk version is more powerful. The program is document oriented with text entry a continuous process. Formatting is its weakest point. Text cannot be reformatted from within a print; left and right justify at the same time are not allowed. The disk version does allow some simple formatting codes such as underline commands and font commands to the printer.

A powerful printing capacity in the disk version is the built-in software spooler. You have the option of printing a file to the disk and then sending the file from disk to printer. The printer will receive data from the disk and you can continue editing, saving or loading another file, or working on a new file.

Editing with *Scripsit* is easy. Characters are deleted by typing over them. If you want to insert characters in a line, you must specify an insert mode. The screen display lets you see the entire page, but you have to use the arrow keys to move around the page.

Scripsit is relatively slow. I don't enjoy using it because I can type fast enough to fill its 32-character type-ahead buffer. I don't have audio on my monitor so I do not hear the beep in the speaker that warns me the buffer is full. Consequently I miss characters. This problem is noticeable only if you are a fast typist. The program slows even more if you are printing from the spooler or using the graphics display. A disk with *Scripsit* on it must reside in drive zero whenever you are editing.

Telewriter by Cognitec

I have used *Telewriter 2.0* and am currently writing this using *Telewriter 64*. The processor is document oriented, but the newest version contains a page-finder feature. This allows you to find out where the pages break and change text so that one line of a new paragraph is not at the bottom of a page or one line of an old paragraph at the top of a new page. The latest version allows right and left justification of text and ASCII or binary files. Using the original version with a spelling checker is difficult due to its binary file format.

When entering text, you are always in the insert mode. When you type, text is inserted at the cursor. If you are inserting in a line, you must realign the text with a control command. The normal 51 × 24 screen display is readable even on a TV. On a monitor it is excellent. I often use the 64 × 24 mode on the monitor, though it is a little hard to read. The 85-character mode could be used for entry but is better used just to check for hyphenation, paragraph formatting, and page breaks.

The printer routine contains drivers for all types of printers, but the Epson driver is excellent, allowing any print font, underlining, and selectable baud rates.

Telewriter's bad points are, to me, just picky annoyances. The page-numbering routine doesn't reset after a print, and I often find multiple prints having large page numbers. The disk version I/O routines must always be accessed through a BASIC program, which seems to take unnecessary time. Formatting is excellent, but headers always print on the top of the page following the last page of text, causing wasted paper. You cannot move a block of text in one step; instead, you must copy the block to its new position and then delete the block in the first position. My last gripe is that you cannot have a light character on a dark screen. Letters are displayed black on a white (or green) background.

As you can probably tell, my favorite is *Telewriter 64*. It does a good job, even with its faults. When coupled with an Epson printer, its power is surprising for a word processor that costs well under $100.00.

All in all, for the occasional word-processing task, don't sell CoCo short. Yes, there may be better word-processing computers on the market, and better software, but I'll bet that they don't sell for $299.00. All three of the software processors above sell for less than $70.00 each.

Rainbowfest

The weekend of April 22 through 24 I attended Rainbowfest, a national Color Computer show sponsored by Rainbow magazine, at the Hyatt Regency Woodfield in Schaumberg, Illinois. Judging from the crowds, Rainbowfest will probably become an annual event.

I don't know of many people associated with CoCo who weren't there. The exhibits and seminars were top notch and the major complaint was that there was not enough room for people to view the exhibits. As I cannot begin to describe everything that went on, I will limit the discussion to newly introduced products and to topics covered in the seminars. Addresses of the companies mentioned can be found at the end of the column.

I saw (and heard) several voice synthesizers designed to interface with the ROM port. All of them use the popular Vo-Trax synthesis chip. One that particularly caught my attention was *Colorspeak* by Bumblebee Software.

J&M Systems displayed a new disk controller for CoCo. This controller, totally compatible with RS DOS, contains no pots or alignment adjustments. It comes with gold-plated edge connectors standard. J&M sells several compatible drive units in attractive light-colored cases.

While on the topic of disk systems, Amdek had their new 3 1/2" micro disk on display. One disassembled unit showed the inner workings of the two-drive 624K capacity unit, which uses a standard RS controller card.

Software was everywhere. The days of poor and nonexistant CoCo software are gone. One item of note that I will have more to say about in future columns is the release of *Elite•CALC* from Elite Software in Pennsylvania. *Elite•CALC* is the first CoCo spreadsheet program to truly compare with *VisiCalc*. The program retails for $44.95 and contains powerful sort, graphic display, and format capabilities.

Frank Hogg Labs demonstrated an upgraded Flex DOS. Frank has added fine scrolling and other niceties to the software. Yes, I have sent my original in to be upgraded.

Peter Stark of Star-Kits demonstrated *StarDOS* and *DBLS*, his data-base lookup system. *DBLS* can read the Spell & Fix dictionary and look up any word in seconds. Pete also demonstrated *Humbug*, a powerful CoCo monitor program.

There were several seminars of interest for CoCo users of all skill levels. One of the more interesting presentations, called "BASIC Faster and Better" by E.R. Bailey of Micrologic, Inc., contained a series of tips and references that allow you to write faster-executing BASIC code. Mr. Bailey has a small booklet available that covers the topics of the seminar. Micrologic specializes in utilities for the BASIC programmer including a space remover, variable and line-number cross references, and LLIST formatter, among others.

Probably the most well-attended seminar was a last-minute program with Steve Bjork. Steve works for Datasoft, Inc., which has purchased the rights for the Zaxxon video game. I was interested to learn that the Zaxxon ROM is over 960K in the arcade version. The CoCo version is amazingly like the original and arcade enthusiasts will have trouble finding a more realistic representation. Steve's presentation included many comments about graphics programming on different types of computers.

Rumors abound that Radio Shack will be coming out with two new Color Computers sometime this month. The Color II will be a smaller version of the CoCo with 64K RAM and Standard BASIC selling for $239. The second will be the 64K CoCo with a new deluxe typewriter keyboard selling for $399. Both will contain the new ROMs previously mentioned in this column. There will probably be some disk imcompatability for older CoCos with the 1.0 Disk ROM; replacing it with the 1.1 ROM will require replacing the BASIC and Extended BASIC ROMs as well. It is also rumored that the expansion port will be removed from the side and replaced with a slot in the bottom for an expansion chassis. OS9 availability is still a question mark because of the disagreement with Microware over calling the new DOS "RS9".

The Color Computer also has a "mouse" that plugs into the joystick port. The mouse is primarily for games and will sell for $49.95.

Addresses of companies mentioned in this column are listed below.

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007

Bumblebee Software
Box 25427
Chicago, IL 60625

Cognitec
704 Nob St.
Del Mar, CA 92014

Computerware
Box 668
Encinitas, CA 92024

Datasoft
9421 Winnetka Ave.
Chatsworth, CA 91311

Elite Software
Box 11224
Pittsburgh, PA 15238

Frank Hogg Labs
770 James St.
Syracuse, NY 13203

J&M Systems
137 Utah NE
Albuquerque, NM 87108

Macrotron
Box 3257
St Louis, MO 63130

Mark Data Products
24001 Alicia Pkwy., No. 226
Mission Viejo, CA 92691

Micrologic
Box 193
Brady, PA 16028

Micro Technical Products
123 N. Sirrine, Suite 106-A2
Mesa, AZ 85201

Nelson Software
9072 Lyndale Ave. S.
Minneapolis, MN 55420

Spectrum Projects
93-15 86th Drive
Woodhaven, NY 11421

Star-Kits
Box 209 - R
Mt. Kisco, NY 15049

Tandy-Radio Shack
300 One Tandy Center
Fort Worth, TX 76102

You may contact Mr. Steiner at 508 Fourth Ave. NW, Riverside, ND 58078.

MICRO

MICRO™

Apple Slices

by Jules Glider

We would like to welcome Jules Gilder, our new Apple columinst. Jules is currently editor of *Microcomputer Software Newsletter.* Previously he served as vice president in charge of computer software at Children's Television Workshop (producers of Sesame Street), editorial director of the software division at Hayden Publishing, and editor of *Personal Computing* magazine.

In the past, this column has concentrated on programs and programming techniques, which are covered quite well by the rest of the magazine. MICRO has decided to make it more news oriented. I'll be telling you what's new at Apple Computer these days, what new products are available for the Apple and how good they are, and pass along rumors from well-placed sources that will be of interest to you.

Recently there have been quite a few new Apple-related products introduced. This month I'm going to briefly look at three of them. In the coming months, we will be discussing additional new products and taking a more in-depth look at some that have already been mentioned. Among the items recently introduced are a new Apple-compatible computer with significantly more power than the Apple //e, a plug-in board for the Apple that can increase its speed by almost four times, a 68000 microprocessor board that will run all Apple BASIC, FORTRAN, and Pascal programs at speeds up to 20 times faster than the Apple's 6502, and a detachable keyboard for the Apple.

Albert challenges Apple

With the Apple look-a-like market so crowded these days, it's hard to get excited about another Apple-compatible computer, so when I first heard about Albert, I ignored it. It was only when I saw it at a recent computer show that I realized this was not just another Apple clone.

The Albert is everything the Apple //e should have been, but isn't. Like the //e, it includes upper- and lowercase capability from the keyboard and 64K of RAM. While the Apple //e can be expanded to 128K by adding an additional 64K of RAM on a separate card, the Albert can be expanded to 192K by simply plugging in additional chips in the empty sockets on the motherboard. In addition to this, the Albert also includes built-in parallel and RS-232 (serial) printer interfaces as well as an RS-422/423 interface for use with Ethernet or other compatible networking systems. Another nice feature of the Albert is its data security lock. With this feature, you can keep the computer on and leave it unattended.

Other features of this new Apple competitor include audio input and digitizing circuitry for voice recognition applications, audio output of real (digitized) or artificial voices, RGB video graphics interface, clock/calendar, high-speed analog electronics for fast and accurate joystick control, and a mini graphics tablet.

In addition to all these hardware features, Albert comes with five software packages that include an enhanced spreadsheet, word processor, spelling checker, mailing list, and data manager. With all of these extras, the Albert sells for only $1595. A comparably priced Apple //e would cost about $2800.

Speed up with The Accelerator

For those of you who wish that your Apple could work faster, take heart. It can. A new card from Saturn Systems, called The Accelerator II, can speed up the operation of your Apple 3.6 times. The card, which uses a 6502B microprocessor, operates at 3.6 MHz (the standard 6502 used in the Apple runs at 1 MHz) and can be plugged into any empty slot.

Along with the faster microprocessor, the card also contains 64K of 150ns RAM chips. This memory duplicates the original 48K of Apple memory and adds a fast, built-in language card. When the power to the Apple is turned on, The Accelerator causes the Apple's standard microprocessor and memory to be disabled and The Accelerator takes over. When this happens, all programs, including those written in BASIC, Pascal, Fortran and machine language, run about 3.6 times faster. The only programs that will not enjoy this increase in speed are CP/M-based programs that run with a Z80 card in the Apple.

To overcome problems that could crop up with interface cards that expect an Apple operating at 1 MHz, Saturn has set up The Accelerator so that whenever any input or output operations are performed, the microprocessor speed is slowed down to 1 MHz. With this card in your Apple, the standard 6502 and memory are almost totally ignored. They are only used to drive the video display. Some enterprising programmer should be able to find a way to convert this slow 48K of RAM into a RAM disk or use both the original processor and memory as a smart printer buffer. Price is $599.

Add the power of a 68000 to your Apple

Several 68000 adaptors have been available for the Apple, but this latest one from Analytical Engines, Inc., looks like a winner. Known as the Saybrook 68000 co-processor, the board is capable of running at 10 to 20 times the speed of the Apple. The standard Saybrook board comes with an 8 MHz MC 68000 32/16 bit microprocessor, which is the same as the one used in Apple's Lisa. This is upgradeable to a 12.5 MHz processor if additional speed is needed.

The board also comes with it's own 128K of RAM. Once 256K RAM chips become widely available, the board can be upgraded to 512K by simply replacing the chips. The price of the Saybrook 68000 card is $1550. While this may seem like a lot, remember that along with the board, the user gets a complete UCSD p-System with Pascal, FORTRAN-77 and BASIC compilers. This alone normally sells for $1425. In addition, the card comes with an Applesoft-compatible 68000 BASIC so that most Applesoft programs can be run without modification. Also included is a 68000 assembler program. In addition to the p-System, two other operating systems will soon be available for use: CP/M 68K and UNIX.

You may contact Mr. Gilder at REDLIG Systems, Inc., 2068 79th St., Booklyn, NY 11214.

MICRO

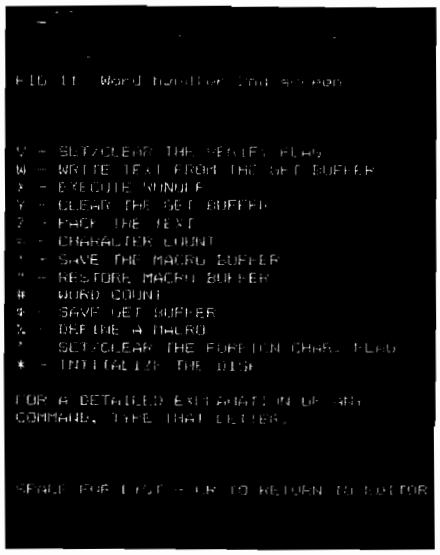
Word Processing on Your Apple

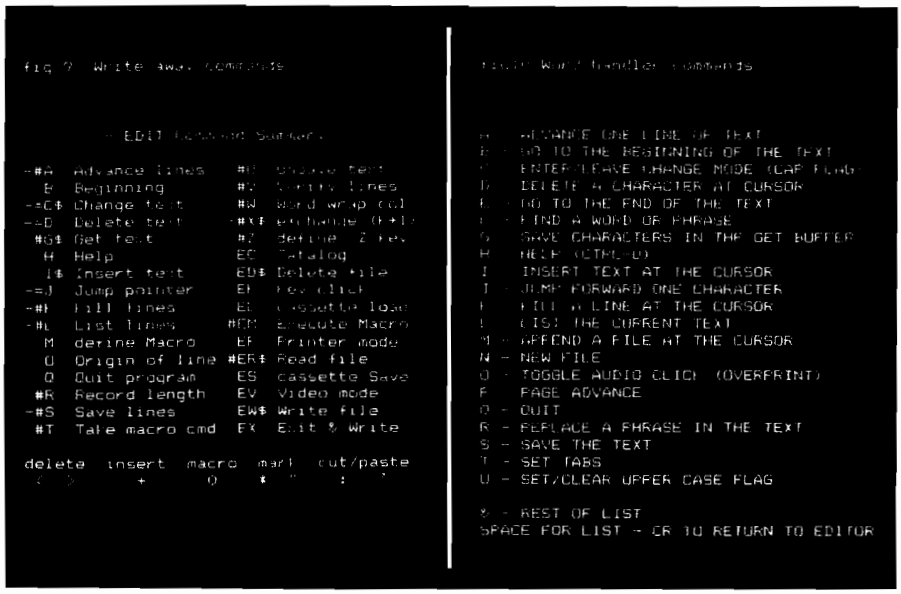
(Continued from page 29)

have ever seen, including many suggestions for custom patching, using external terminals, and modifying printer codes. The Training Guide is written for a person not aquainted with a computer and should be good for typists who are learning word processing. One of the most amazing things about WordStar is the on-screen help menus, which just about eliminates the need for reading the manual, if you are familiar with computers. The amount of on-screen help is dictated by the "help level" function that can be set from the beginning or main menus.

WordStar allows screen editing of documents up to 240 columns with horizontal wrapping of the screen! It allows rejustification of margin settings on-screen, and does on-screen left, right, and center justification. The software also implements printer spooling with no additional hardware. WordStar has hyphen-help, continous scrolling, block moving — not only horizontal blocks, but vertical columns — and a multitude of printer controls. It is next to impossible to exit the system without saving the file. WordStar does spelling checking and mail merge with additional programs from Micropro.

All of this comes at a price. Because WordStar is available for so many different computers, the routines, especially the screen routines, are necessarily general. This causes the program to be slower in execution speed than some more specifically 80-column Apple oriented. It doesn't





scroll the entire screen when scrolling quickly through the text, but just the cursor line, reprinting the entire screen when you stop scrolling. However, the on-screen formatting makes this the most "what you see is what you get" word processor around.

The Executive Secretary — Word Processing System
SOF/SYS, Inc.; 4306 Upton Avenue South; Minneapolis, MN 55410

The Executive Secretary is one of only two programs that I could type in a letter, save it to disk, and print it on the printer without reading the manual. It can be done on WordStar because of the complete screen menus. It can be done on the Secretary because of the simplicity and user friendliness of the program. The program is copy protected; you can receive a backup by returning the registration card. In addition to the well-written 89-page manual, there is a sketchy reference card and a lower-case IC for installing in the Apple][+ keyboard character generator socket.

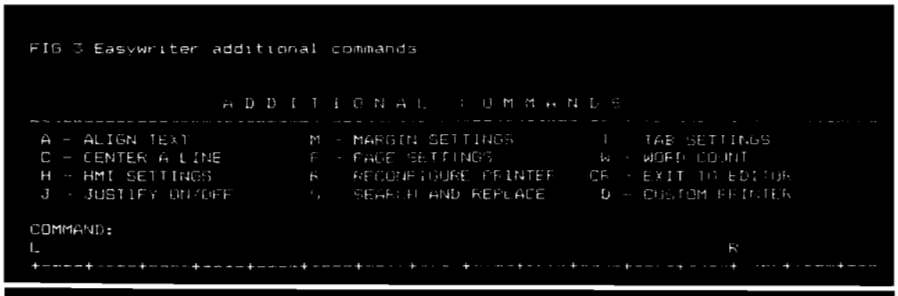
This program operates on standard text files, can use files from other programs such as Visicalc, and includes utilities for transfers between disks and to and from a modem. It also includes a form letter option, conditional printing, document indexing, headers and footers, preprinted forms and a card file function, which will do mailing lists. It recognizes most 80-column cards and displays lower case in 40-column mode. The Secretary is the easiest to use of the word processors listed.

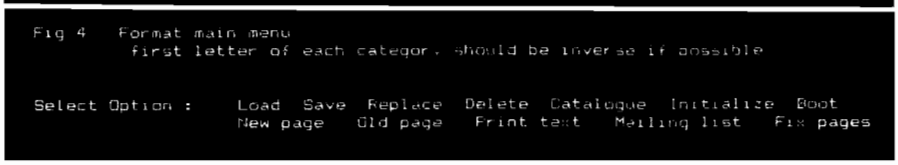
The screen display is a good representation of the final printout, unless the document is more than 80 columns wide (it allows up to 240 columns). The Secretary does rejustification, but on the whole, the screen updating is extremely slow. The editor is good at creating a new document and fair to poor at editing an existing one. The insert mode throws everything after the cursor to the bottom of the screen. The ESCape key changes from "type" to "edit", but not vice-versa. "Return" to move the cursor up a line is certainly non-standard. The cursor itself, an inverse up-arrow, covers the letter at the current location. There is no type-ahead buffer so that the cursor movements, which are slow, cannot be speeded up with the repeat key. While a full-featured text editor, I wouldn't want to use the Secretary for many long documents that needed many changes.

Magic Window II — Word Processing System
ARTSCI, Inc.; 5547 Satsuma Ave.; North Hollywood, CA 91601

Magic Window offers several screen modes — 40, 70, or 80 columns. The 40/80 mode is for standard character display with horizontal scrolling for 80 columns. The 70-column mode uses the high-resolution graphics screen and allows 70 columns across. The screen display routine is fast for scrolling and insertion but the characters are difficult to read. The 80-column mode appears to recognize standard 80-column

(Continued on next page)



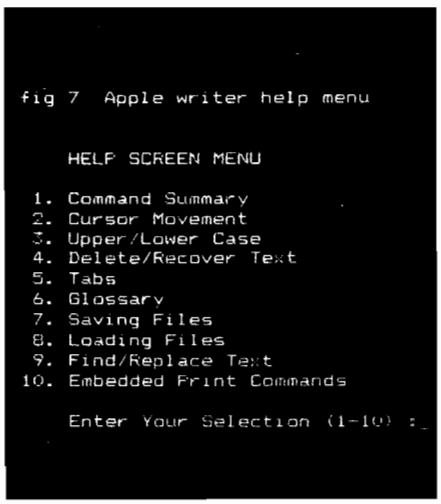


cards, and presents the clearest on-screen display.

The 164-page documentation is complete and well written, especially for the novice. In addition to the protected program disk, you receive an I/O drivers disk and a color-coded quick reference card. For $20 you can receive a backup of the master disk. The program is easy to use and has the function keys grouped in sections. The color coding on the card makes finding the keys for the commands easier.

The insert command only inserts one letter at a time and only allows insertions until the total line length is reached, not wrapping additional words to the next line. It is necessary to split the line to insert words and sentences, and then rejustify the text a line at a

Magic Window also includes a set of commands to work with "unformatted" files. This includes standard text files made with another program such as time. The cursor, a blinking ":" covers the current letter.



Visicalc, or BASIC programs. ARTSCI also publishes Magic Words, a spelling checker, and Magic Mailer, a mailing list program, that are compatable with Magic Window. This is an easy-to-use program, compatible with all types of hardware, with some limitations on screen display.

Additional special packages

There are two other text processors I have received lately. They are slightly different than a standard word processor in that they are designed with special tasks in mind. One operates on special character sets, fonts designed by the user or special ones supplied on the program disk. The second is a special purpose text processor designed for columnar material, outlines, screenplays, scripts, and user-definable formats.

FONTRIX — Dedicated to the absence of limits
Data Transforms, Inc.; 616 Washington St., Suite 106; Denver, CO 80203

This is the most incredible program that I have seen for writing in different type styles both on-screen and for hard-copy printouts. The program has two modes, standard hi-res graphic files and Graffiles, files that can be 16 hi-res screens big. You can choose the heighth/width relationship and the hi-res screen scrolls both vertically and horizontally to accomodate your dimensions.

The copyable program disk comes complete with 11 different type styles and a font editor to define your own. Styles include Greek, math, script, and Old English. Also on the disk are many printer drivers for most popular printer/interface combinations.

Positioning on the screen is with either cursor controls or joystick placement. Typing produces the letters in whatever font is currently chosen. Fonts can be switched during composition by returning to the menu and loading a new font from disk. The screen display is exactly what you get, or you can choose degree of magnification. The 132-page documentation is clear, logically organized, and well written. The program is user friendly and easy to learn.

The only point to remember is that moving the hi-res screen around takes a while and the program is as slow as a snail when typing horizontally over the space of several screens. The screen dumps are much faster than any I have used before. The program really produces beautiful documents. Just take a look at the instruction manual.

PowerText — Word Processing System
Beaman Porter, Inc.; Pleasent Ridge Road; Harrison, NY 10528

This program comes on an unprotected disk with a five-year unconditional warranty, both items I would like to see more often. This is a complicated, extra-function word-processing package that is not simple to use. It has very powerful formatting features enabling you to type complicated charts, movie scripts and other special formatted material easily, leaving the formatting itself to the program. The samples included are demonstrative of the power of the program, including automatic generation of Tables of Contents, page numbering and breaking, up to 14 columns per 132 character line, justification, type-ahead buffer and word wrap.

Unfortunately, everything has a price. This sytem is somewhat difficult to learn, especially since what you type in on the screen bears no resemblence to the final output. It requires setting up "style files" to identify the particular formatting information for various document types. It requires a good deal of imagination on your part to visualize the final product. This is a convenient program if you have special format documents to produce, or work a lot with charts and tables.

New Publications

Word Processors and Information Processing, A Basic Manual on What They Are and How to Buy, by Dan Poynter. Para Publishing, P. O. Box 4232, Santa Barbara, CA 93103, 1982, 170 pages, paperback.
ISBN 0-915516-31-4 $11.95

The Complete Book of Word Processing and Business Graphics, by Walter Sikonowiz. Micro Text Publications, Inc., Prentice-Hall, Inc., Englewood Cliffs, NJ 07632, 1982, 212 pages paperback.
ISBN 0-13-158659-9 $14.95

Word Processing Primer, by Mitchell Waite and Julie Arca. BYTE/McGraw-Hill, 70 Main Street, Peterborough, NH 03458, 1982, 188 pages, paperback.
ISBN 0-07-067761-1 $14.95

Word Processing for Small Businesses, by Steven F. Jong. Howard W. Sams & Co., Inc., 4300 West 62nd St., Indianapolis, IN 46268, 1983, 190 pages, paperback.

Doing Business with SuperCalc, by Stanley R. Trost. Sybex Inc., 2344 Sixth Street, Berkeley, CA 94710, 1983, 248 pages, paperback.
ISBN 0-89588-095-4 $12.95

How to Buy a Business Computer and Get It Right the First Time, by Edward M. Cross. Reston Publishing Company, Inc., A Prentice-Hall Company, Reston, VA 07632, 1983, 213 pages, paperback.
ISBN 0-8359-2922-1 $14.95

How to Choose Your Small Business Computer, by Mark Birnbaum and John Sickman. Addison-Wesley Publishing Company, Reading MA 01867, 1983, 150 pages, paperback.
ISBN 0-201-10187-4 $9.95

Word Processing Buyer's Guide, by Arthur Naiman. BYTE/McGraw-Hill, 70 Main St., Peterborough, NH 03458, 1983, 325 pages, paperback.
ISBN 0-07-045869-3 $15.95

Microcomputers for Accountants, by Theodore Needleman. Prentice-Hall, Inc., Englewood Cliffs, NJ 07632, 1983, 183 pages, paperback.
ISBN 0-13-580688-7 $14.95

A Guide for Selecting Computers and Software for Small Businesses, by Paul G. Enockson. Reston Publishing Company, A Prentice-Hall Company, Reston, VA 22090, 1983, 109 pages, hardcover.
ISBN 0-8359-2642-7 $19.95

Mastering VisiCalc, by Douglas Hergert. Sybex, 2344 Sixth St., Berkeley, CA 94710, 1983, 217 pages, paperback.
ISBN 0-89588-090-3 $11.95
plus $1.50 s/h.

MICRO on the OSI, Technical Editor: Kerry Lourash. MICRO Ink, P.O. Box 6502, Amherst, NH 03031, 1983, 190 pages, paperback.
ISBN 0-938222-12-0 $19.95

Microcomputer Controlled Toys and Games and How They Work, by Van Waterford. Tab Books, Inc., Blue Ridge Summit, PA 17214, 1983, 230 pages, paperback.
ISBN 0-8306-1407-9 $9.95

Microcomputers on the Farm, by Jack O. Beasley. Howard W. Sams and Co. Inc., 4300 West 62nd St., Indianapolis, IN 46268, 1983, 204 pages, paperback.
ISBN 0-672-22011-3 $14.95

What Do You Do After You Plug It In? by William Barden, Jr. Howard W. Sams and Co. Inc., 4300 West 62nd St., Indianapolis, IN 46268, 1983, 198 pages, paperback.
ISBN 0-672-22008-3 $10.95

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MICRO™

Interface Clinic

by Ralph Tenny

Now the secret is out! Last month, I revealed my ignorance by vastly over-estimating how fast a BASIC program would run. You will remember that we studied a circuit which would sample up to eight data points and input those data points on the serial port. I then promised to present both BASIC and assembly-language programming to drive the hardware. Well, if you slow the serial adapter by a factor of about 500, it can be read by BASIC! Since the circuit shown could sample eight points repetitively at a rate of 130 complete samples per second, the version for BASIC would have to slow down enough to take about 5 seconds per complete cycle. If that would be fast enough for you, change C1 to 22 uF and C2 to 1 uF and use it.

Meanwhile, we shall concentrate on the faster version this month, using assembly-language programs as the driver. A couple of lessons back we dealt with the concept of *worst case design*, which means doing design calculations using only the most unfavorable performance parameters shown in the data sheets. In the serial adapter design presented last month, anyone who used about 10 volts for a power supply may have had reasonable performance from the SERIAL IN drive circuit; at 5 volts, the circuit is marginal. Figure 1 shows Q2 and R5 added to give adequate SERIAL IN drive with a 5 volt supply. The problem is with IC TG; the series impedance of a transmission gate reduces dramatically with increased Vcc, and the SERIAL IN line wasn't being driven hard enough.

Let's review the sampling concept prior to programming. U1 is a sequencer that successively enables outputs 1 through 8; these outputs in turn gate a maximum of eight logic level inputs onto the SERIAL INPUT line via Q2. U2d similarly drives the CD input of the serial port, giving us a timing pip that will signal when to sample the SERIAL INPUT.

It can be almost traumatic for anyone to troubleshoot a hardware circuit if it doesn't work properly. The pin numbers used in my circuit are shown in figure 1, and listing 1 will help prove the circuit is working. If it isn't, refer to the end of this column for additional hints. If your circuit is working, let's proceed. The program in listing 1 makes sure that the PIA is properly initialized, then measures the period of each cycle of the CD IN signal. From last month, let's remember that Q1 drives the CD line in a pattern of 12 evenly-spaced pulses, separated by an "off" period approximately twice as long as the period of the clock signal. The program logs 20 samples of the CD IN drive so we can examine them.

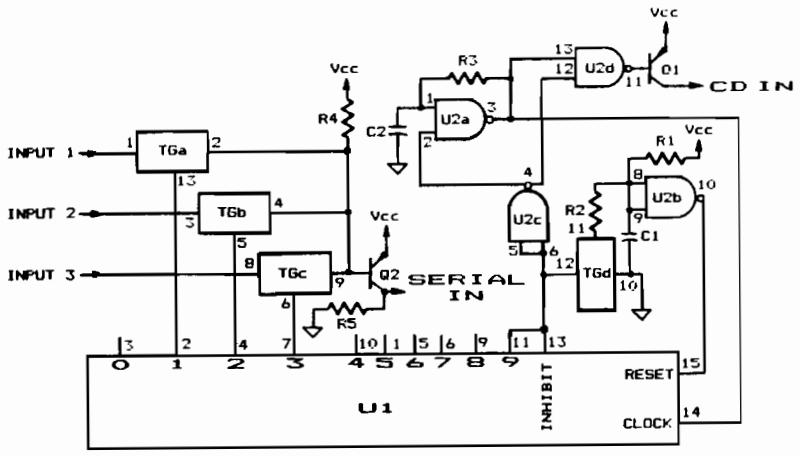
Once the readings are logged, we may have a problem. The *easy way* to handle a program like listing 1 is to use either an Editor/Assembler program to enter and assemble the program, or else the machine-language code can be entered using a debug monitor. It is possible to enter hexadecimal code directly into memory with a BASIC program, but other typical functions of the debug monitor program are needed unless the program runs on the first try. If you don't have a debugger, I can recommend the Radio Shack EDTASM + cartridge for CoCo owners; perhaps similar packages are available for some other computer you may be using. For the following discussion, I will assume that you have a debug monitor that allows you to execute a program and examine memory. Note that listing 1 terminates in an RTS; most debuggers allow a Jump to a user program and will resume control after an RTS command.

After you have listing 1 entered into memory, connect the serial adapter to the serial port and turn it on. Execute the program and examine memory beginning at $1024. For my particular version of the serial adapter, I found a number of $1D values bracketed between two $37 values. There are twelve $1Ds, which indicates that the clock "beats" a few times more than necessary to sample eight inputs. Depending on individual circuit variations, you might get eleven to thirteen clock pulses, so we need more information.

Listing 2 watches the CD input, waiting for the long clock period. Note that the two programs are almost identical for the first eleven lines, but then listing 2 checks for a count greater than $25, looping until the long clock cycle shows up. On the next clock cycle, a new record of cycle counts is started; this time, the RS-232 port is read and the value indexed into a lookup table. When the long cycle comes around again, eight successive values from the lookup table are built into one serial word and the program stops.

Now we need to interpret the results from a sample run of listing 2,

***Figure 1*: A replay from last month, with pin numbers added (see text).**



keeping in mind certain things we can deduce from the program and the schematic of figure 1.

Connect logic 0 to inputs 1, 2 and 3; if you have more inputs, set them to logic 1. Look at figure 1 and note that unless an input of logic 0 is connected to the gate of Q2 through one of the transmission gates, Q2 will be off and R5 will pull the SERIAL IN line to ground. Inside the computer, this will be translated into a logic 1 at the PIA. If you do not have a schematic of CoCo, you need to know that the SERIAL IN line is Bit 0 of the PIA port. If your debugger has *breakpoint* capability, set a breakpoint for $1040; if not, temporarily patch location $1040 with $39, which is an RTS. (A breakpoint capability allows the debugger to halt the program in mid-stride, so that you can examine memory to see what the program has accomplished up to that point.) Either way, we must examine the lookup table (beginning at label BUFR, $104D).

Let's assume that the following values are recorded in the lookup table:

05 05 04 04 04 05 05 05 05 05 05 05.

We can see that Bit 0 of all the data values is logic 0 except for the 3rd, 4th, and 5th bytes. This tells us that inputs 1, 2 and 3 were sampled by clock pulses 3, 4, and 5, respectively. Once we know that, we can patch location $103F with $09 (in this case; your circuit could be different and you must choose the value that brackets the correct data) instead of the $0B shown. Now remove the breakpoint or replace the $39 at $1040 with the original value of $64 and run the program again.

The new lookup table values will now be:

02 02 02 02 02 02 02 02 02 02 02 02

and location $1059 (label WORD) will contain $F8, which is (in binary) 11111000, showing that the three least-significant inputs were logic 0. At this point, you can write your own program or modify listing 2 to capture the data from WORD and make use of it however you like.

Let's recap and consider some important facts. We have created a circuit that repeatedly serializes eight bits of logic data and makes this data stream available to the computer whenever the program decides to look at it. The software will read a single complete sample in 1/70 of a second (assuming the worst case timing), and ignore the port until another reading is needed. If this approach has seemed to be convoluted and somewhat contrived, note that I assumed that only the SERIAL IN and CD lines were available; that is, the SERIAL OUT line can be tied up with a dedicated output scheme such as was outlined in session 4. If the output adapter could have spared a single line to start the sample process, this input adapter *and* the control software could have been more straightforward. I also hoped to illustrate what can be accomplished with simple, off-the-shelf components. It is also possible to use more complex ICs to do the same task; we will tackle this type of project soon.

The HELP section: if your circuit does not operate and you do not have an oscilloscope to troubleshoot it, here is a method requiring only a voltmeter. Begin by disconnecting R3 from pin 3 of U2a (leave all other connections) and tie R3 to Vcc. Increase C2 to about 1 uF, and connect a normally open pushbutton switch between pin 1 of U2a and circuit common. Now, each time you push the button, U2a will generate one clock pulse. With this arrangement, you can use a voltmeter or a logic probe to check the circuit's condition after each clock pulse.

Put logic 0 on alternate inputs so that Q2's output will change sometime. Apply power and use the voltmeter to determine the logic level of each node of the circuit. U2a, pin 3 will be low except when the switch is closed. The RESET circuit should reset U1 whenever Output 9 goes high; this operation will be automatic and happen too fast for a voltmeter to catch it. Instead, check Output 0; it will be high after a RESET and stay until the next clock pulse. Force a RESET by temporarily shorting across C1 with a 100 ohm resistor, then check for Output 0 to be high. Now, apply successive clock pulses. Check each output of U1 in turn, and note that Q2 changes output level when it should. If the adapter is tied to the computer when the SERIAL IN line goes high, you can enter PRINT PEEK (&HFF20) and verify that enough drive is being applied to change the input line on the PIA. Although this method is slow, you can verify the whole circuit, then return to the discussion above when you have it working. Good luck!

(Listings appear on next page)

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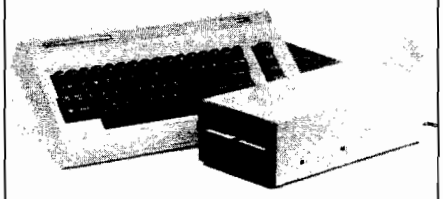

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Interface Clinic Listings

Listing 1

```
                    * This program will calibrate a Serial Port Adapter
                    *
                    * Equates
              FF20  PORT    EQU   $FF20     SERIAL IN port
              FF21  CTLR    EQU   $FF21     Control register
              0020  COUNT   EQU   $20       Count register
1000                        ORG   $1000
1000 86  34         START   LDA   #$34      Init control register
1002 B7  FF21               STA   CTLR
1005 8E  0014               LDX   #20       Set index
1008 B6  FF20               LDA   PORT      Clear IRQA
100B 0F  20         STRT1   CLR   COUNT     Zero counter
100D F6  FF21       IN      LDB   CTLR      Test for IRQA set
1010 0C  20                 INC   COUNT     Record operation
1012 C4  80                 ANDB  #$80      Mask to MSB
1014 27  F7                 BEQ   IN        Not set, Try again
1016 B6  FF20               LDA   PORT      Otherwise, Clear IRQA
1019 96  20                 LDA   COUNT     and keep a record
101B A7  89 1024            STA   BUFR,X
101F 30  1F                 LEAX  -1,X      Decrement index
1021 26  E8                 BNE   STRT1     Loop until Index = 0
1023 39             EXIT    RTS             Then quit
1024                BUFR    RMB   20        List of counts
                            END   START
```

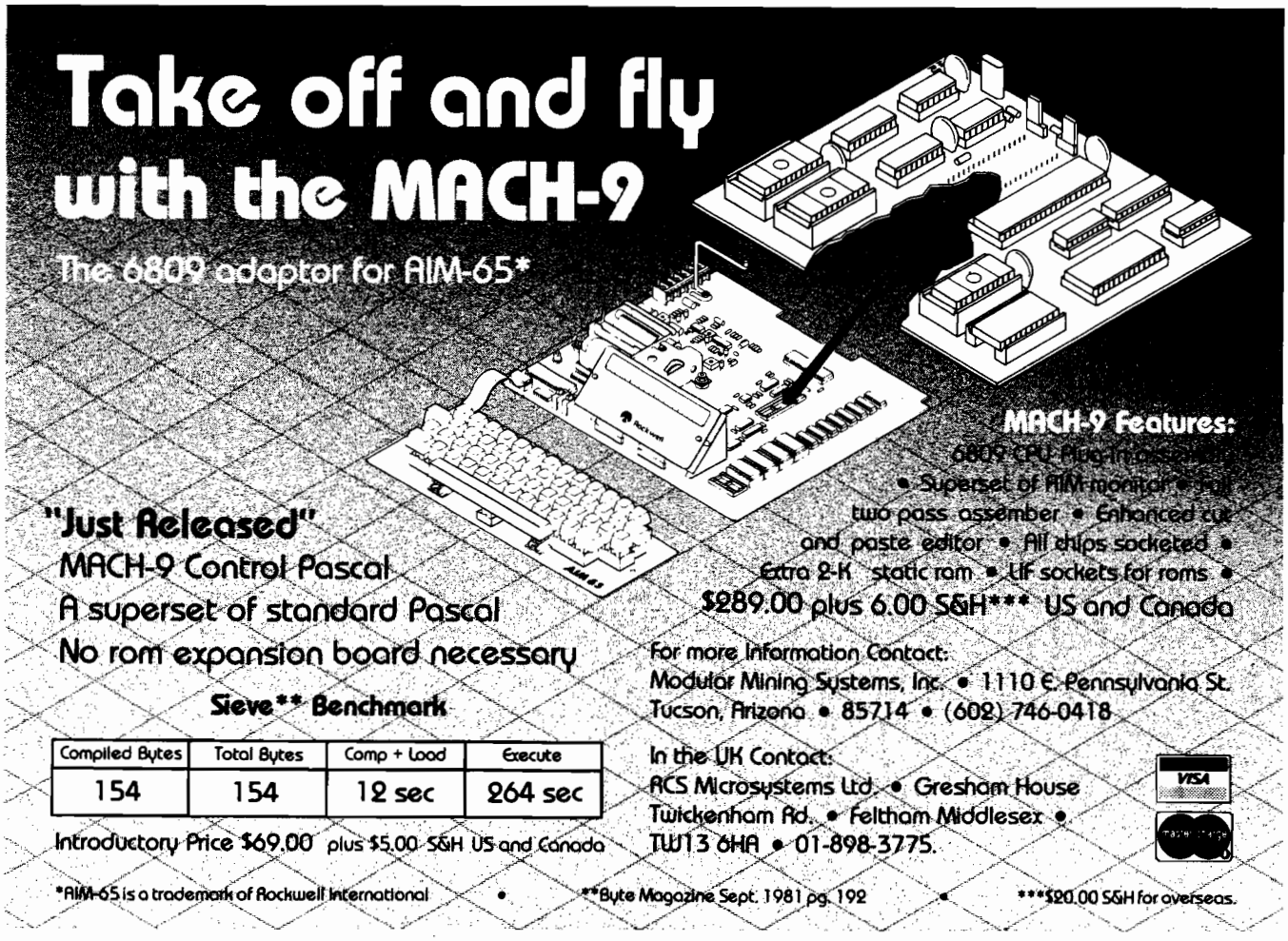
Listing 2

```
                    * This program will input from a Serial Port Adapter
                    *
                    * Equates
              FF20  PORTA   EQU   $FF20     SERIAL IN port
              FF21  CTLR    EQU   $FF21     Control register
```

Listing 2 *(continued)*

```
              FF22  PORTB   EQU   $FF22
              0020  COUNT   EQU   $20       Count register
1000                        ORG   $1000
1000 86  34         START   LDA   #$34      Init control register
1002 B7  FF21               STA   CTLR
1005 8E  0000               LDX   #0        Set index
1008 B6  FF20               LDA   PORTA     Clear IRQA
100B 0F  20         STRT1   CLR   COUNT     Zero counter
100D F6  FF21       IN      LDB   CTLR      Test for IRQA set
1010 0C  20                 INC   COUNT     Record operation
1012 C4  80                 ANDB  #$80      Mask to MSB
1014 27  F7                 BEQ   IN        Not set, Try again
1016 B6  FF20               LDA   PORTA     Otherwise, Clear IRQA
1019 96  20                 LDA   COUNT     Test for long cycle
101B 81  25                 CMPA  #$25
101D 23  EC                 BLS   STRT1     Loop until long cycle
101F 0F  20         STRT2   CLR   COUNT     New set of numbers
1021 F6  FF21       IN2     LDB   CTLR      Test for IRQA again
1024 0C  20                 INC   COUNT     Count operations
1026 C4  80                 ANDB  #$80      Mask to MSB
1028 27  F7                 BEQ   IN2       Loop until new edge
102A B6  FF20               LDA   PORTA     and reset IRQA
102D B6  FF22               LDA   PORTB     Read RS232 line
1030 A7  89 104D            STA   BUFR,X
1034 96  20                 LDA   COUNT     Test count
1036 81  25                 CMPA  #$25
1038 22  04                 BHI   BUILD     Assemble input word
103A 30  01                 LEAX  1,X       Increment index
103C 20  E1                 BRA   STRT2     Loop until long cycle
103E 86  0B         BUILD   LDA   #11       Set a counter
1040 64  89 104D    SHIFT   LSR   BUFR,X    Shift bit into carry
1044 79  1059               ROL   WORD      Shift bit into word
1047 30  1F                 LEAX  -1,X      Step back through buffer
1049 4A                     DECA            Count bits
104A 26  F4                 BNE   SHIFT     Loop until 8 bits recovered
104C 39             EXIT    RTS             then quit
104D                BUFR    RMB   12        List of counts
1059 00             WORD    FCB   0
                            END   START
```

MICRO



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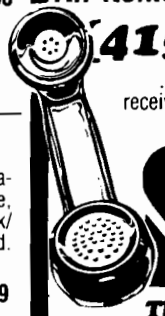

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Reviews in Brief

Product Name: **Face Maker**
Equip. Req'd: Apple II with Applesoft or Apple II+ with 48K RAM, DOS 3.3
Price: $34.95
Manufacturer: Spinnaker Software
215 First St.
Cambridge, MA 02142
Author: Design Ware
Copy Protection: Yes

Description: *Face Maker* is an educational program that helps children ages 4 to 8 learn to use a computer and perform simple tasks on it. The program also develops keyboard familiarity and memory concentration. The child types in choices to design a face, to animate a face, or to match the animation sequence the computer chooses.

Pluses: *Face Maker* is well written and will interest a young child. The user will practice for hours guessing the sequences of animation and trying to improve his/her score.

Minuses: The key sequences are somewhat complicated for a 4-year old.

Skill level required: If the child is not a good reader, close supervision will be required in the beginning.

Reviewer: Phil Daley

Product Name: **The Prime Plotter**
Equip. Req'd: Apple II+ with 16K RAM card or Apple IIe, one disk drive
Price: $240.00
Manufacturer: Primesoft Corp.
P.O. Box 40
Cabin John, MD 20818
(301) 229-4229

Description: *The Prime Plotter* is a surprisingly complete plotting package designed for a variety of applications. Routines to create X-Y plots, 3-D pie charts, bar graphs, and figure charts make the product the most powerful plotting package this reviewer has seen. Extensive statistics routines permit curve fitting and trend analysis. Labeling of axes is permitted with a wide choice of fonts. Area fill routines add appeal to all graphs. The product is superb for creating "slide-show" presentations of generic data. The package is modular and allows extensions (through add-on modules, such as 3-D plotting and mapping), as well as customization of statistical modules for users' needs. Also, it interfaces with popular pen plotters, such as HP 7470A, STROBE, HIPLOT, and SWEET-P.

Pluses: A feature is provided to permit loading of data in DIF format thereby allowing the user to interface with VisiCalc. The program is entirely menu driven and the user-input error trapping has no apparent holes. User-definable fonts can be employed for labeling. File chaining for long slide shows is a particularly beneficial inclusion.

Minuses: The product is excellent, but I think it may be slightly overpriced; the market will be the final judge.

Documentation: The documentation is as complete as the product. A series of tutorials leads the user through each of many features. It is written professionally and devoid of needless corporate hype. The chapters are categorized correctly and anticipate user questions as they would occur.

Skill level required: A prospective buyer should have experience with graphing data. Knowledge of the *value* of the features is more important than knowing the program itself since the tutorials' quality makes the learning process so easy.

Reviewer: Chris Williams

Product Name: **MM-100 Modem**
Equip. Req'd: Appropriate computer terminal configuration
Price: $99.95
Manufacturer: Mura Corporation
177 Cantiague Rock Road
Westbury, NY 11590

Description: The Mura model *MM-100* is a manual originate-answer direct-connect modem. The inexpensive FSK interface allows communications *via* telephone lines. Connection to the terminal is *via* a standard RS-232 interface connector. The unit is wired as a data set and must connect to a data terminal. Other configurations will require an adapter cable. Data rates up to 300 baud are supported, and the unit is compatible with Bell 103 standards. Interface to the phone line is *via* a modular phone plug.

Pluses: The modem provides a spare modular jack for ease of installation. All that is required is to unplug the existing phone and plug in the modem. The phone can then be plugged into the jack on the modem. Power-on and carrier-detect lights are standard and easy to see. The modem is full-duplex, and its small size takes up little room.

Minuses: None noted.

Documentation: A seven-page booklet is included that describes hookup and operation of the unit. In addition, separate sheets explain connection charges and rules regarding this type of equipment.

Skill level required: None required.

Reviewer: John Steiner

Product Name: **Spectrum Stick**
Equip. Req'd: TRS-80 Color Computer
Price: $39.95 plus shipping

(Continued on page 128)

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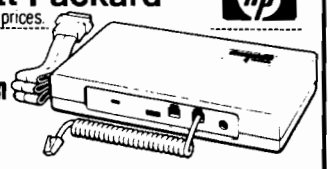

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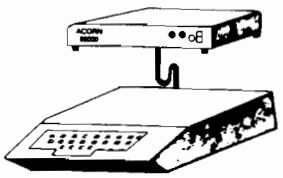

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Reviews in Brief *(continued)*

Manufacturer: Spectrum Projects
93-15 86th Drive
Woodhaven, NY 11421

Description: The *Spectrum Stick* is an analog joystick that will replace the original equipment Radio Shack joystick. The joystick is in a 3" × 6" blue mini-box. The large handle and smooth control action provide a realistic arcade feel. A red pushbutton above the joystick is available for fire-when-ready applications.

Pluses: The smooth action and wide range of the joystick make it superior in operation to the Tandy sticks. A red LED mounted into the base goes on whenever the computer is powered up. This feature provides a handy power-on indication, a feature lacking on the CoCo. The stick has no trouble reaching all corners of the graphic screen, an ability not shared by the Radio Shack stick. An extra long cord is provided.

Minuses: The box is light duty and a long drop might break the posts that hold the assembly screws. The sample unit arrived in that condition. A bit of epoxy corrected the problem. [*Editor's Note:* A company representative explains defective glue caused this problem, which has since been resolved.]

Documentation: None needed.

Skill level required: None required.

Reviewer: John Steiner

Product Name: **ABC (Version 1.02)**
Equip. req'd: Atari 400/800 w/48K RAM and disk drive(s)
Price: $69.95
Manufacturer: Monarch Data Systems
P.O. Box 207
Cochituate, MA 01778

Description: *ABC* is a BASIC compiler that converts programs written in Atari BASIC into a compact pseudo-code. An included run-time interpreter is appended to the compiled code so no cartridge need be installed in the computer when the compiled program is run. Compiled code runs considerably faster than the equivalent BASIC-language program but slightly slower than Assembly language. *ABC* uses integer arithmetic only. In addition to all the floating-point functions, this compiler does not support BYE, CLOAD, CONT, CSAVE, DEG, DOS, ENTER, LIST, LOAD, LPRINT, NEW, RAD, RUN, SAVE, or the exponential operator.

Pluses: There is a choice of three load addresses. A utility program is included that will assist in generating relocatable code. Moderately large programs compile in a few minutes to relatively compact programs, often smaller

than the original BASIC code if one excludes the 4K + run-time interpreter. The low cost, as compared to similar products, means good value.

Minuses: All floating-point operations must be rewritten in integer arithmetic or eliminated. Some compile-time errors abort with no explanation.

Documentation: Documentation for Version 1.0 is provided. It satisfactorily explains *ABC*'s use and techniques for modifying one's BASIC programs before compiling. Suggestions for simulating some unsupported functions are valuable.

Skill level required: Beginner/intermediate programmer (minimum).

Reviewer: Tim Kilby

Product Name: **BASIC Commander**
Equip. req'd: Atari 400/800/1200XL w/16K RAM
Price: $34.95
Manufacturer: MMG Micro Software
P.O Box 131
Marlboro, NJ 07746

Description: *BASIC Commander* is a utility program for the Atari BASIC programmer. Built-in commands are activated by single keystrokes. Commands are either functions or phrases that are printed on the screen. Functions include renumber, automatic line numbering, block delete, and DOS functions. Pre-programmed phrases such as LOAD "D: are printed on the screen with a single key press. Three keys are available for the user to program with up to 36 characters in each phrase. It can be a command, remark, string of characters, or whatever.

Pluses: The renumber and block-delete functions are fast and efficient. Access to DOS through BASIC is convenient.

Minuses: There is no way to save a user-programmed function. Also, my review copy did not re-initialize on SYSTEM RESET — a major handicap. MMG says that this latter problem has been corrected in its latest version.

Documentation: Documentation is quite adequate for using the utility.

Skill level required: Beginner programmer.

Reviewer: Tim Kilby

(Continued on next page)

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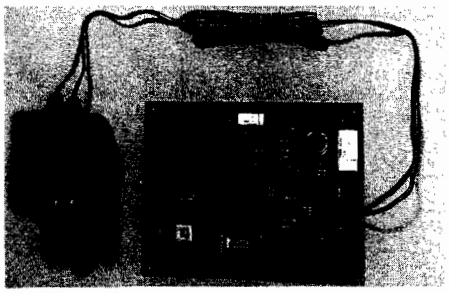

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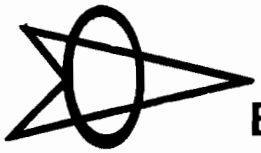

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Reviews in Brief *(continued)*

Product Name: **TGS: The Graphic Solution**

Equip. Req'd: Apple II or Apple II+

Price: $149.95

Manufacturer: Accent Software, Inc.
3750 Wright Place
Palo Alto, CA 94306
(415) 856-6505

Copy Protection: Yes. Back-up provided. Additional back-ups cost $10.00

Language: Applesoft with machine-language subroutines

Description: *The Graphic Solution* is an animation package for the construction of Apple-generated "movies" that contain text and graphics. TGS includes a powerful hi-res screen editor that features instant toggling between the hi-res screen and a magnification of a piece of the display on the lo-res screen.

Pluses: TGS provides a solution to the problem of developing animated sequences. The user can create a series of Applesoft shapes using the exploded lo-res screen, instantaneously switching to the hi-res to view the results. The shapes can be assembled into a string of frames that are woven at user-selectable speeds into a film. The development is aided by the ability to define a Macro, a series of TGS commands that can be executed with a single key stroke.

Minuses: Several hours of study are required to learn to use TGS. This is particularly true because it is not menu driven. Since the commands must be memorized, a reference card would be handy. TGS includes a brief reference card to remind you how to get from one function to another; however, it would be nice to have a list of options available within each function. The manual does not include an index.

Documentation: The 175-page manual that accompanies TGS is well written and serves as a tutorial on the TGS features. It begins with the basic functions and builds towards more complex operations. The disks that come with the package include example sequences, which can be used while completing the tutorial. The lessons contain exercises with answers at the end of the manual.

Skill level required: No programming knowledge is required. Anyone who spends a few hours going through the tutorials will be able to create animated sequences.

Reviewer: David Morganstein

Product Name: **HELLO CENTRAL!**

Equip. req'd: Apple II or Apple II+, DOS 3.3, communications modem

Price: $99.00

Manufacturer: Howard W. Sams & Co., Inc.
4300 West 62nd St.
Indianapolis, IN 46268

Description: The *HELLO CENTRAL!* Apple software package has full telecommunications capabilities including buffered upload and disk download and a character-oriented editor for manipulating the text in the buffer. *HELLO CENTRAL!* may be used to place calls and receive text through its terminal mode; two directories, computer and voice-call are provided for facility. Disk-based text files may also be transmitted through the terminal mode, and communication is interruptable in both directions. The *HELLO CENTRAL!* programs are menu-driven and will configure to your system's hardware and printer requirements.

Pluses: *HELLO CENTRAL!* places calls with automatic dialing and provides a re-dial option. It will also dial for you on voice calls, instructing you to pick up the phone when the connection is made. BASIC programs may be transmitted and received as text files — they may be restored for use with the EXEC command. The terminal buffer holds 18,000 characters that will be saved automatically onto a disk file when the buffer is filled.

Minuses: None noted.

Documentation: The manual included in the package provides an extensive straightforward account of the capabilities of *HELLO CENTRAL!* In 46 pages it anticipates every question the user could ask and every situation that could arise during the program operation. Addenda are also included to keep the manual up to date. *(Editor's note:* The manufacturer states that the documentation is being re-worked and expanded to be even more thorough than before. Updates will be available to all registered owners.)

Skill level required: The program menus make this package easy to use for beginners. No programming knowledge required.

Reviewer: John Hedderman

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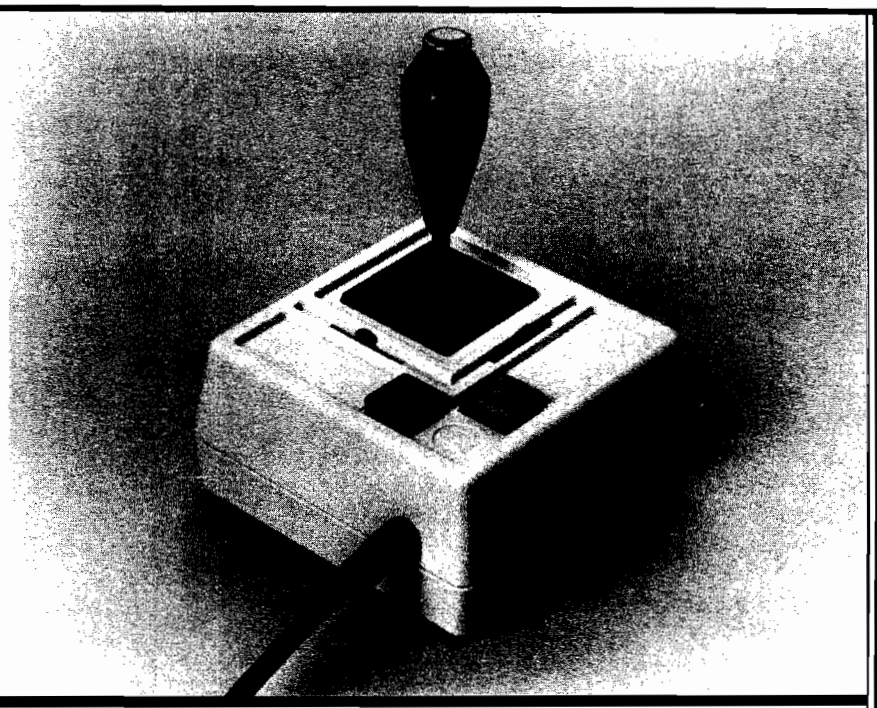
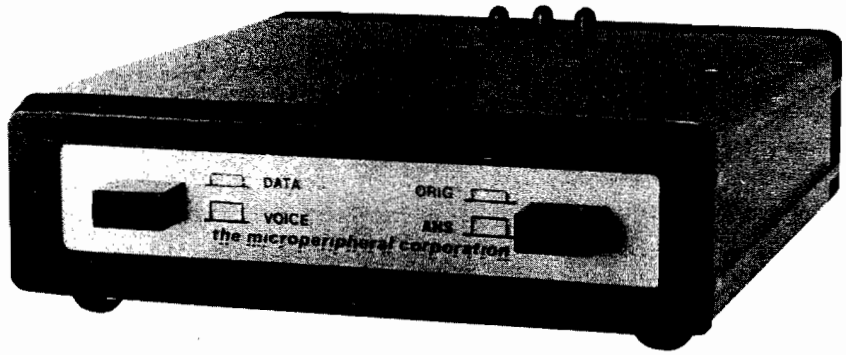




THE KEY — Serial Version

STAFF Computer Technology Corporation announces a serial version of **THE KEY** (for the DEC LSI-11, Apple, and IBM PC), a hardware module that protects software products from being pirated. THE KEY provides the computer with a unique identification. The interactions of the software and THE KEY are used to form inquiry/response pairs. The use of many inquiry/response pairs enhances the security. The serial Key can be used with any computer system having an RS-232 interface.

By requiring the use of THE KEY, software suppliers can control the use of their software. Since THE KEY can be on only one system at a time, a single-user license can now, in fact, be limited to a single user. License periods can be enforced by requiring the return of THE KEY. Demonstration or evaluation packages, which include THE KEY, may be circulated to representatives and prospective licensees without loss of control.

For further information contact Mary T. Gibson, STAFF Computer Technology Corporation, 10457 J Roselle Street, San Diego, CA 92121; (619) 453-0303.

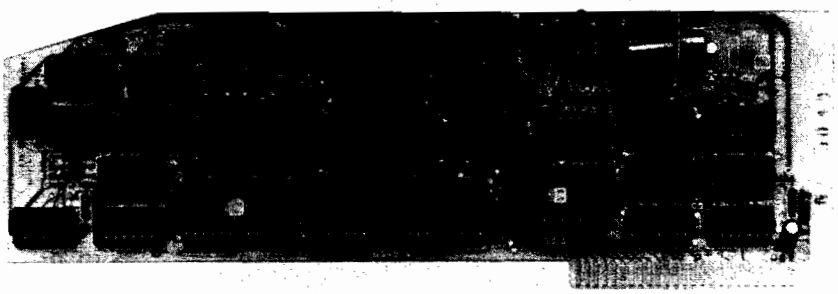
Commodore/Atari Automodem Features Parallel Printer Port

The Microperipheral Corp. announces **AutoPrintMicroconnection,** a low-cost modem for the VIC-20, Commodore 64, and Atari computers. The unit features both an autodial and autoanswer capability. In addition, it has a built-in Centronics-compatible parallel printer port. It operates at 300 baud (Bell 103) in either originate or answer mode and is FCC Type Accepted. The combination modem and printer interface plugs directly into the computer without the need for additional interface devices. Telecommunications software is provided in the user manual.

The printer port permits connecting conventional parallel printers such as the Epson and Oki. With the modem connected to the phone line, the printer will simultaneously provide hard copy of whatever appears on the screen. Word processing software is available, which routes text to the printer *via* the modem.

The price is **$149.95.** For additional information contact Norene Scott, Director of Sales, The Microperipheral Corp., 2565 152nd Ave. N.E., Redmond, WA 98052; (206) 881-7544.

Franklin Computer Enters Microcomputer Accessory Market with 80-Column Card



Franklin Computer Corporation introduces the **ACE Display Card.** The product expands the video display capabilities of Franklin ACE 1000 and Apple II computers to a full 80 columns by 24 lines to provide easier viewing and greater versatility.

The new Franklin display card provides four cursor choices, reverse video as a standard feature, and accommodates the full upper- and lower-case 128-character ASCII set, including line-drawing graphics. Lower-case characters have true descenders.

The Franklin display card operates automatically, switching between 40 and 80 columns and between text and graphics, to suit the program in use. The card operates with CP/M and PASCAL programs.

Suggested retail price is **$199.00.** Additional information may be obtained from Franklin Computer Corporation, 2128 Route 38, Cherry Hill, NJ 08002; (609) 482-5900.

SELECT-A-RAM — 64K for the VIC-20

Advanced Processor Systems introduces the **SELECT-A-RAM**, a 64K memory expansion cartridge for the Commodore VIC-20. The SELECT-A-RAM provides two expansion slots for program and game cartridges or additional memory expansion up to 192K. Decoding circuitry in the SELECT-A-RAM allows switching of RAM and ROM in 8K blocks by inputs generated from the keyboard or by software command.

SELECT-A-RAM plugs directly into the memory expansion slot on the VIC-20 and is powered by the VIC-20 supply. Other features include write protection, reset switch, and optional external power. The use of high density dynamic RAMs with transparent refresh makes the SELECT-A-RAM the lowest cost-per-bit memory expansion product on the market today for the Commodore VIC-20.

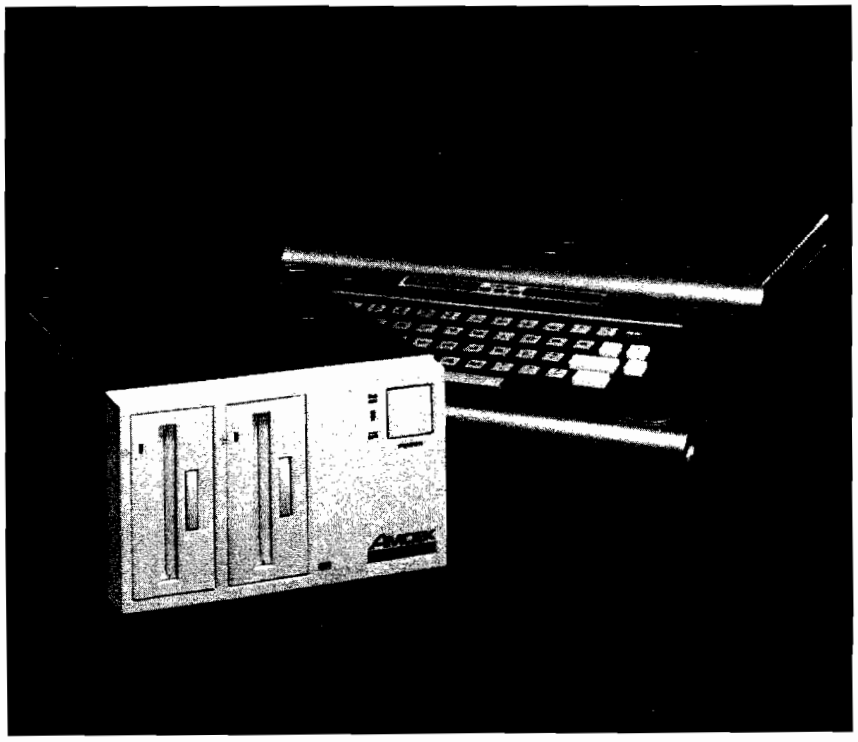
The price is **$169.00.** Contact Advanced Processor Systems, P.O. Box 43006, Austin, TX 78745-0001; (512) 441-3202.

3" Micro-Floppy Disk Drive System for Radio Shack Color Computer

Amdek Corporation has introduced the **Amdisk III,** a 3" Dual Disk Drive System compatible with the Radio Shack Color Computer. The system provides up to 624K of double-density formatted storage capacity. Interfacing with the computer is simple because the Amdisk III unit is completely compatible with the Radio Shack Disk Operating System, TRSDOS.

The unit provides faster access time than 5¼" drives, and utilizes a 3" cartridge-type media. The media is constructed of hard plastic and includes an automatic shutter mechanism for protection, which remains closed until it is inserted into the drive.

Suggested retail price for the Amdisk III disk drive system is **$599.00.** The media is **$6.99** each. For further information contact Amdek Corporation, 2201 Lively Blvd., Elk Grove Village, IL 60007; (312) 364-1180.



MICRO

Software Catalog

Wordcraft 20 Brings Budget-Priced Word Processing to VIC-20 Owners

UMI's new **Wordcraft 20** lets the home computerist have quality word processing economically. If you have a TV, adding a VIC-20 at $140 (or less), a disk drive ($300), printer ($400), and Wordcraft 20 ($149.95) can provide you with complete word processing for less than $1,000. Writing may be stored using the two-tape cassette player rather than the disk drive, lowering the cost by $230.

Wordcraft 20 plugs into the VIC-20 just like any game or memory cartridge. The cartridge contains 16K of program on ROM chips. An additional 8K of RAM memory is in Wordcraft 20 Plus, priced at **$199.95** — providing a comprehensive feature not available in other low-cost word processors for the VIC.

The program is extremely powerful and capable of creating perfect documents, correspondence, and personalized form letters. It can create and print out mailing lists and other special-purpose projects — all at less than one third the price of conventional word processing programs designed to run on more sophisticated office-type personal computers.

Price is **$149.95.** For more information contact United Microware Industries, Inc., 3503-C Temple Ave., Pomona, CA 91768; (212) 986-6668.

Amper-Magic

Amper-Magic for the Apple II, Apple II Plus, and Apple IIe lets BASIC programmers use machine-language routines without needing to know anything about machine language. Attach any number of routines (we supply 50 and you can add relocatable routines from any other source) and then call them by name. Amper-Magic automatically takes care of addresses and variables even while you edit the BASIC program! Routines become a part of your program so you never need to BLOAD again. No charge for commercial license.

Price is **$75.00** for Volume 1, **$35.00** for Volume 2. Contact Anthro-Digital, Inc., 103 Barlett Ave., Pittsfield, MA 01201.

Police Artist

SIR-TECH Software, Inc. enters the home and educational software market with the publication of **Police Artist**™ for the Apple II, Apple II Plus, and Apple IIe with 48K and one disk drive. The player is an eye witness to a crime and must remember the culprit's face in order to pick it out of a police lineup or reconstruct it from a catalog of face parts. The program creates more than 1,000,000 different faces, each with a unique name. The disk contains three separate games at various difficulty levels and displays best scores.

For more information contact Sir-Tech Software, Inc., 6 Main Street, Ogdensburg, NY 13669; (315) 393-6633.

Batting Statistics Program for Baseball Leagues

Rainbow Computing, Inc. announces **BAT-STAT**, a menu-driven program designed to keep statistics for a baseball team of up to 20 players. Player statistics are given for both "This Game" and "Season." Team totals for current game and season are also provided on the report. Ten statistical categories are provided: At Bats, Runs, Hits, Batting Average, Doubles, Triples, Home Runs, Sacrifices, Walks, and Runs Batted In. BAT-STAT automatically computes batting averages.

BAT-STAT features easy data entry and editing, error-handling, blank score sheet printing, and game and season report printing. It requires an Apple II Plus, 48K or Apple IIe, and a single disk drive with DOS 3.3.

The price is **$49.95** on floppy diskette. For further information write RCI Marketing, 19517 Business Center Drive, Northridge, CA 91324; (213) 349-0300.

New Adventure Game

Sirius is proud to announce an addition to their line of software. **CRITICAL MASS** is an adventure game with challenging riddles, a real-time clock, and fast action sequences for the Apple II, Apple II+, and Apple IIe.

For further information contact Sirius Software, Inc., 10364 Rockingham Drive, Sacramento, CA 95827; (916) 366-1195.

(Continued on page 136)

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VIC-20 or C-64

Software Catalog
(continued)

TRS-80 Color Author

Color Author allows educators (without previous experience) to create instructional materials for delivery on the TRS-80 computer. The system is menu-driven with options listed to guide the user through the lesson-creating process. Lessons consist of a series of frames, which may contain tutorial text, questions, and graphics. Special display features of Color Author include normal and double-sized text, reverse video, underlining, bold-face, and special graphics characters. Graphics can be created for frames by using a joystick, and feedback messages and hints can be set to appear after correct and incorrect responses.

Available from Radio Shack.

Menu-driven Copy Utility

COLORCOPY is a menu-driven copy utility for the TRS-80 Color Computer that copies data files or programs — disk to tape, tape to disk, or disk to disk. It also kills files or programs.

Many options are provided: it copies basic programs, machine-language programs, or data files; allows selection by groups of filenames or extensions, or individual files by menu selection; writes multiple copies of files to tape; backs up a disk to tape; restores a tape to disk; copies files in alphabetic sequence, and much more.

Written in BASIC with machine-language subroutines, COLORCOPY requires 32K and DOS. It is supplied on cassette or diskette with complete instructions.

Price is **$15.00** ppd. for cassette or **$20.00** for diskette. Available from COCOPRO, P.O. Box 37022, St. Louis, MO 63141.

Software from Hallie

Diet! will make your Apple II computer more popular than your refrigerator. Selected features include: your ideal weight and calories needed to maintain that weight, effect of exercise on weight loss, weight charts, insults or compliments (your choice!) about your weight change, and more! Visual prompts, anytime review of directories, and "no calorie" menus make this program especially easy to use.

Diet! sells for **$15.95** and is available from Hallie Software, Box 4383, Auburn Heights, MI 48057.

Genealogical Software System for the Apple

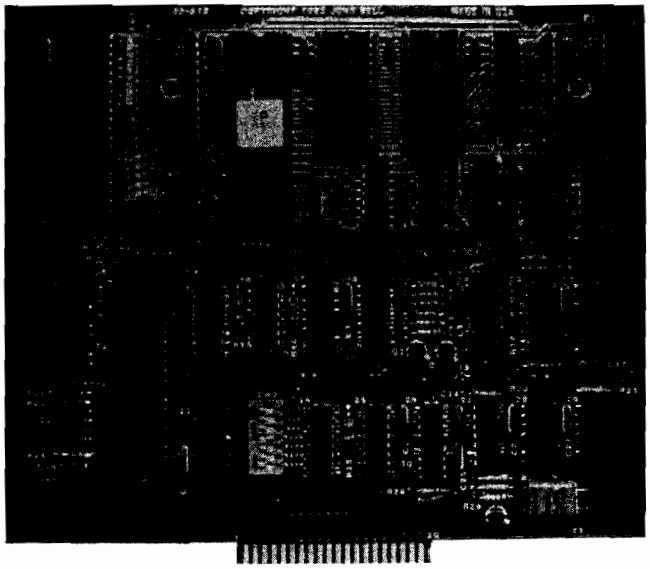
The Family Connection is a powerful, handy genealogical program that is available from Discovery Software. It will allow you to create and maintain a series of individual records about each member on your family tree. The Family Connection is designed for the Apple II series of computers (or an Apple II workalike) with 48K of memory and two disk drives (using DOS 3.3). A printer is optional, but recommended.

Price is **$99.50.** Contact Discovery Software, P.O. Box 68821, Indianapolis, IN 68821 or P.O. Box 9336, Cincinnati, OH 45209; (317) 291-1433.

(Continued on page 138)

VIDEO TERMINAL BOARD 82-018

This is a complete stand alone Video Terminal board. All that is needed besides this board is a parallel ASCII keyboard, standard NTSC monitor, and a power supply. It displays 80 columns by 25 lines of UPPER and lower case characters. Data is transferred by RS232 at rates of 110 baud to 9600 baud — switch selectable. The UART is controlled (parity etc.) by a 5 pos. dip switch.

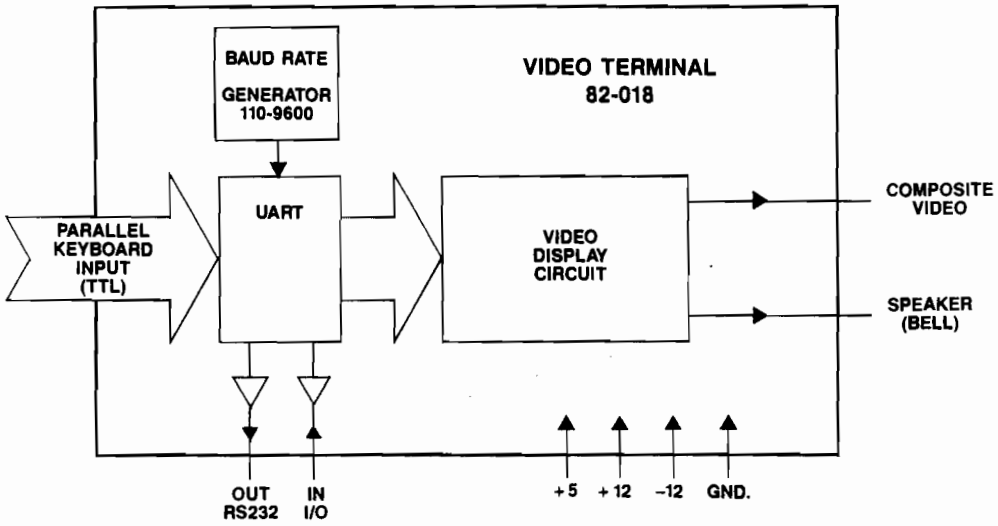


Complete source listing is included in the documentation. Both the character generator and the CRT program are in 2716 EPROMS to allow easy modification to your needs.

This board uses a 6502 Microprocessor and a 6545-1 CRT controller. The 6502 runs during the horz. and vert. blanking (45% of the time). The serial input port is interrupt driven. A 1500 character silo is used to store data until the 6502 can display it.

Features

- **6502 Microprocessor**
- **6545-1 CRT controller**
- **2716 EPROM char. gen.**
- **2716 EPROM program**
- **4K RAM (6116)**
- **2K EPROM 2716**
- **RS232 I/O for direct connection to computer or modem.**
- **80 columns x 25 line display**
- **Size 6.2″ x 7.2″**
- **Output for speaker (bell)**
- **Power +5 700Ma.**
  +12 50Ma.
  –12 50Ma.



This board is available assembled and tested, or bare board with the two EPROMS and crystal.

Assembled and tested	#82-018A	$199.95
Bare board with EPROMS and crystal	#82-018B	$ 89.95

Both versions come with complete documentation.

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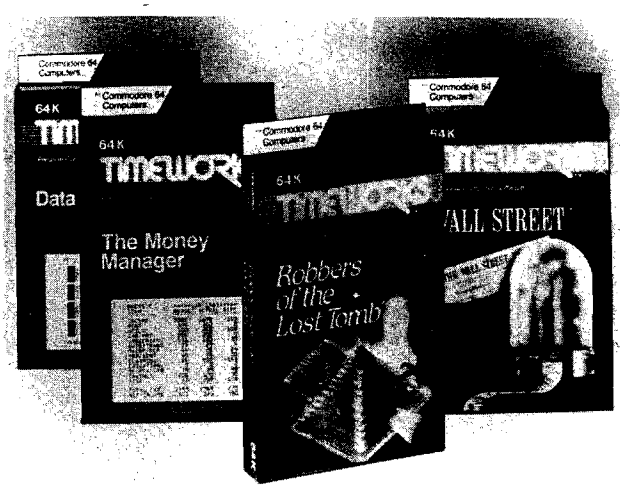
Software Catalog
(continued)

Eleven New Commodore 64 Programs from TIMEWORKS

Eleven new programs for the Commodore 64 are being introduced nationally by TIMEWORKS, INC., independent publisher of personal computer software. The first four of these programs now available include WALL STREET, a competitive game of financial speculation; ROBBERS of the LOST TOMB, great adventure search for the Sacred Tablets from a lost 100-room Egyptian tomb; THE MONEY MANAGER, home and business budget and cash flow system; and the DATA MANAGER, a general information storage and retrieval system with features usually found in more expensive programs.

TIMEWORKS' new Commodore 64 programs come with complete and comprehensive, yet easy-to-understand manuals, are simple to operate, and are complete with sound effects and color. They are available on both cassette and 5¼" disk. Each carton includes superior dynamic graphics, intriguing descriptions, and program specifications to aid in indentification of program parameters.

Prices range from **$21.95** to **$29.95.** Contact TIMEWORKS, INC., 405 Lake Cook Road, Building A, Deerfield, IL 60015; (312) 291-9200.



Apple IIe Version of Micro Cookbook Released

Virtual Combinatics announces the release of the Apple IIe version of **Micro Cookbook.** Use of "point technology" increases Micro Cookbook's user friendliness. "Point and select" recipes by name, category, or available ingredients using a joystick, paddle, or keyboard cursor control. Features of the Apple IIe version include: multiple direction screens, index recovery, upper and lower case, full cursor editing control, multiple disk drive support, and an expandable shopping list (allowing non-food related products to be added). Nutrition and calorie guides, food buying and storage hints, a glossary of cooking terms, and carefully researched recipes are also included.

(Continued)

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Software Catalog
(continued)

Micro Cookbook takes full advantage of the Apple IIe's additional functions (80-column display, 64K expandable to 128K).

For more information contact Gerry Fager, Mattie Associates, 84 State Street, Boston, MA 02109; (617) 227-5075.

Okidata Introduces Revolutionary Downline Loading Program

Designed for the Okidata Microline 92, 93, and 84 Step 2 printers, **Personal Touch** is user-friendly for the Apple II+ and Apple IIe computers. It will soon be available for the IBM personal computer. This major breakthrough in downline loading allows all users to form new characters by creating dot matrix patterns. When the diskette is inserted into the computer, concise instructions appear on the screen. A large graphic representation guides the user through easy dot placement using keyboard commands, and another display shows how the formatted characters will look when they are printed. The new characters can be stored on the diskette and downline loaded into the Okidata memory for printing. An added bonus for the user is the inclusion of Greek, superscript/subscript, math, ASCII, and italics character sets as part of the program.

Manufacturer's list price for Personal Touch is **$89.00.** The diskette is accompanied by an easy-to-follow user's manual. Available from Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054; (609) 235-2600, TWX: 710-897-0792.

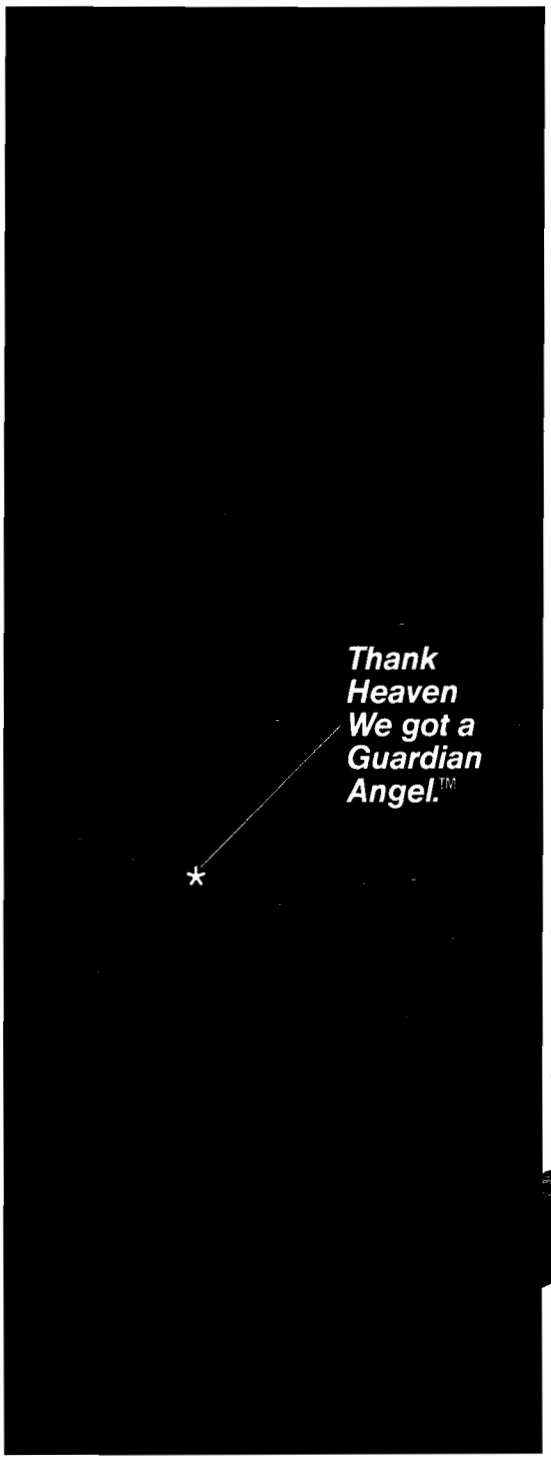
eRAM 80 Expands Apple Memory and Adds Character

eRAM 80 from Quadram Corporation is a low-cost peripheral card designed to double the amount of text that can be displayed on the Apple IIe and improve its memory. eRAM 80 adds 40 extra characters to the Apple IIe's regular 40-character format, allowing up to 80 characters to be displayed per line. With eRAM 80, the display screen can be programmed for either standard 40-column or extended 80-column text display and allows the Apple IIe user to switch back and forth between the two formats.

Depending on which text format is being used, eRAM 80 provides the Apple IIe with either 64K or 63K bytes of memory in addition to the 64K already installed on the Apple's main logic board.

Retail price for the eRAM 80 card is **$159.00.** For additional information contact Quadram Corporation, 4357 Park Drive, Norcross, GA 30039: (404) 923-6666, or TWX 810-766-4915 (QUADRAM NCRS).

(Continued on next page)



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Guardian Angel, with LED power status indicator, automatically safeguards data from blackouts, brownouts for just $595.*

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*Patents pending, UL listed, FCC approved, 240V/50 Hz version available. Dealers and OEM inquiries invited.

Software Catalog
(continued)

TEXTWRITER I for 6809 Tape Systems

You can now use TSC TEXT EDITOR with Granite Computer Systems' **TEXTWRITER.** TEXTWRITER + EDITOR enables you to produce letters, ads, and text. This package creates a powerful and low-cost line-oriented word-processing system.

A variety of MENU-driven options are provided to display or omit line or page numbers, output the entire text file or one or more text segments, multiple copies, etc.

TSC EDITOR is normally loaded into low memory starting at $0000. The text buffer occupies the next higher contiguous block of memory. TEXTWRITER is loaded above the buffer. The size of the text buffer is obviously a function of available memory.

Matrix printers such as Epson and Okidata use control characters ($00-$1F) to control various options such as wide characters, line skipping, etc. This is not a problem with TEXTWRITER, but it is with EDITOR as supplied by TSC. EDITOR checks for control characters in keyboard and disk/tape input. Detailed instructions are given for modifications to EDITOR so that control characters can be used in text. The few necessary patches are supplied.

Object program on KC cassette is priced at **$50.00.** Available from Granite Computer System, Route 2, Box 445, Hillsboro, NH 03244; (603) 464-3850.

Super Hi-Res Space Game

Treat that itchy joystick finger to something special with the newest game release from Mark Data Products. **GLAXXONS** is a super hi-res space game for the Radio Shack Color Computer and TDP-100 that pits your playing skills against squadrons of swooping, diving enemy spacecraft. Your goal in this fast and furious game is to eliminate as many aliens as possible while avoiding your own destruction — not easy! Seven selectable skill levels coupled with automatic game acceleration provide a challenge for both novice and expert players.

This machine-language program is available on 16K cassette for **$24.95** and 32K disk for **$29.95.** Available at your favorite dealer or from Mark Data Products, 24001 Alicia Parkway, Suite 207, Mission Viejo, CA 92691.

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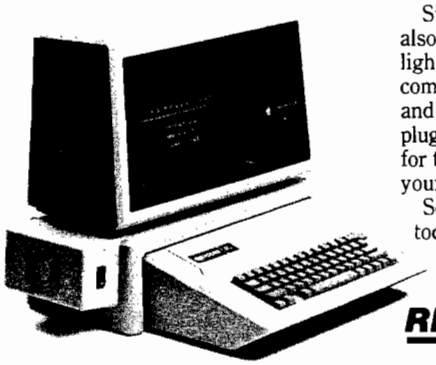

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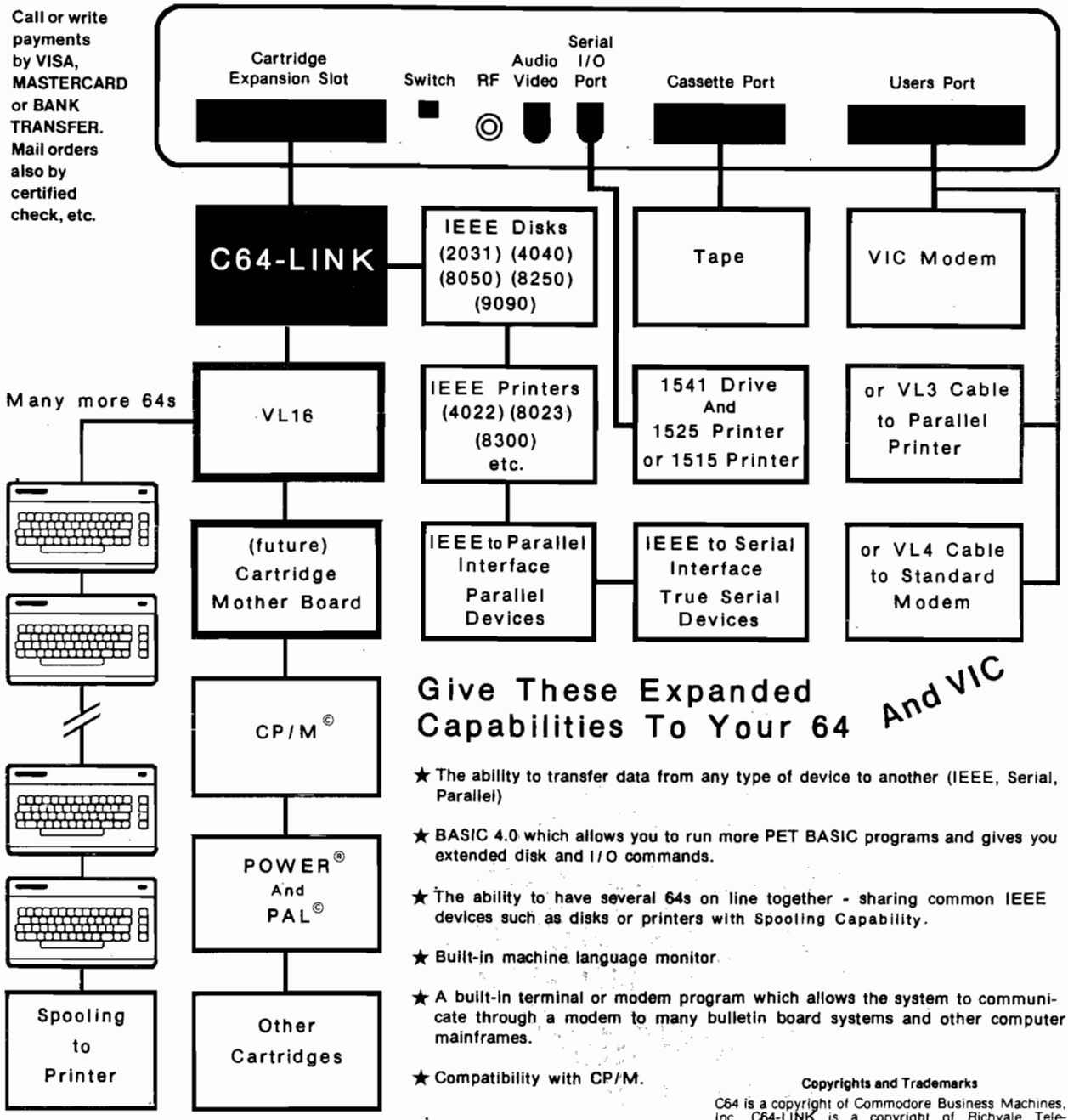

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Next Month in MICRO

September features

Education

Find out:

- How you can help establish an effective computer curriculum in your school system
- Who manufacturers educational software
- What Nathan Schulhof and the people of Silicon Valley Systems do for disabled children
- What kinds of programs kids are writing in LOGO
- More about Turtle Graphics — an educational language

PLUS: Atari Painting Program Continues
Peripherals Catalog for Atari and Color Computer

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Introducing 5 new disk programs

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Compatible with 64K Apple computers. Features: 100 employees per disk, time card adding, automatic overtime, user changeable taxtables, five miscellaneous deductions — fixed or percentage amounts, tips, automatic printing of checks, W-2 forms, and reports. Bill Martin, 6485 Diana Drive #2, Poland, OH 44514, 216-757-2143.

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Peripherals for the VIC-20 and C64

Light pen model BR2064, very accurate readings in vertical and horizontal, push button switch, excellent documentation and software listings included. $26.95. 51K PLUS expansion memory expands VIC-20 to 56K ram, assembled and tested. Excellent documentation. $140.00. Miami Valley Micro Systems, 3341 Sheffield Rd., West Carrollton, OH 45449.

GIMIX

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