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the variable A\$ to the screen area. You may change the name of the variable in your own programs, but it must be the first variable used in the program.

Once the string is reassigned to the screen, any operations you perform on the string will show up on the screen.

Addressing the screen as a string may seem awkward at first, but it is incredibly fast. Once you understand it, you'll be able to write programs that do screen manipulations with machine language speed. In the case of the GRAPHICS 7 screen, a byte represents four pixels. This makes color selection rather odd. Instead of using the COLOR statement to select colors 0-3, the values 0, 85, 170, and 255 represent the four different colors.

Although the memory representation makes working with solid colors rather arcane, it makes working with patterns a breeze (for an example, see the Atari version of *Laser Chess*™ in the July 1987 issue of *COMPUTE!*). In some graphics modes such as mode 15 (available only on XLs and XEs), the two col-

ors blend well enough to appear to be a new color. A patterned screen fill is done in the demo program in lines 320-360. Use this table to replace the numbers in lines 320 and 340 for other color combinations.

Colors	Values
0 and 1	17, 68
0 and 2	34, 136
0 and 3	51, 204
1 and 2	102, 153
1 and 3	119, 221
2 and 3	187, 238

For instance, if you want to use colors 2 and 3 in the demo, replace the 102 in line 320 with 187 and replace the 153 in line 340 with 238.

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Stringing The Atari Screen

```

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    1987":POSITION 7,10:PR
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    ons, Inc."
BN 3 POSITION 10,12:PRINT "A
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PN 4 FOR I=1 TO 1500:NEXT I
JO 10 GRAPHICS 7:CLR:DIM A$
    (40*80),COL(4),B$(40*8
    0),TEMP$(40*80):A$(40*
    80)=CHR$(0)
NL 20 VTAB=PEEK(134)+PEEK(13
    5)*256
MB 30 ATAB=PEEK(140)+PEEK(14
    1)*256
ND 40 OFFS=PEEK(88)+PEEK(89)
    *256-ATAB
CO 50 HI=INT(OFFS/256):LO=OF
    FS-HI*256
JH 60 POKE VTAB+2,LO:POKE VT
    AB+3,HI
JE 70 REM **SOLID COLOR FIL
    L**
NJ 75 PRINT "SOLID COLOR FIL
    L":GOSUB 1000
PD 80 FOR T=0 TO 4:READ COL:
    COL(T)=COL
BK 90 A$(1,1)=CHR$(COL)
BL 100 A$(2)=A$
NH 105 GOSUB 1000
CF 110 NEXT T
FO 120 DATA 0,85,170,255,0
PB 200 REM **FILL PART OF S
    CREEN**
HE 210 PRINT "PARTIAL SCREEN
    FILL":FOR T=0 TO 3:W
    HERE=400*T+1:REM USE
    400 BECAUSE 10 LINES
    OF 40 BYTES EACH
HO 220 A$(WHERE,WHERE)=CHR$(
    COL(T))
AK 230 A$(WHERE+1,WHERE+399)
    =A$(WHERE,WHERE+398):
    REM DO 10 LINES
NL 235 GOSUB 1000
CJ 240 NEXT T
NE 300 REM **PATTERN FILL**
    *
```

```

PD 310 PRINT "PATTERNED SCRE
    EN FILL"
MK 315 GOSUB 1000
PL 320 A$(1,1)=CHR$(102)
KO 330 A$(2,40)=A$:REM 40 BE
    CAUSE USING BR. 7
CI 340 A$(41,41)=CHR$(153):R
    EM NEXT LINE DOWN
KA 350 A$(42,80)=A$(41)
AH 360 A$(81)=A$:REM DUPLICA
    TE FIRST 2 LINES DOWN
    ENTIRE SCREEN
NL 370 GOSUB 1000
HH 400 REM **SCREEN DUPLICA
    TION**
IN 410 PRINT "DUPLICATE PART
    OF SCREEN"
NL 415 GOSUB 1000
CN 420 FOR X=0 TO 159:COLOR
    X/54
OK 430 PLOT X,0:DRAWTO X/2,7
    9
CP 440 NEXT X
AK 450 FOR I=1 TO 3
NO 560 A$(I*800+1,I*800+800)
    =A$:REM 800 FOR 20 LI
    NES
CE 570 NEXT I
NO 580 GOSUB 1000
PJ 600 REM **FAST SCREEN SW
    APPING**
IB 610 PRINT "SCREEN FLIPPIN
    G"
KA 620 B$=A$
CE 630 FOR Y=1 TO 30:COLOR R
    ND(0)*3+1
JB 640 PLOT RND(0)*159,RND(0)
    *79:DRAWTO RND(0)*15
    9,RND(0)*79
DD 650 NEXT Y
EC 660 FOR K=1 TO 30
BC 670 TEMP$=A$:A$=B$:B$=TEM
    P$
CI 680 NEXT K
OA 690 GOSUB 1000
FJ 700 REM **PARTIAL SCREEN
    SWAPPING**
II 710 PRINT "PARTIAL SCREEN
    SWAPPING"? " (TOP W
    ITH BOTTOM"
EB 720 FOR K=1 TO 30:B$=A$(1
    ,40*40):A$(1,40*40)=A
    $(40*40+1):A$(40*40+1
    )=B$:NEXT K
IE 800 REM **ANIMATION**
AK 810 PRINT "ANIMATION"
BB 820 A$(1,1)=CHR$(0):A$(2)
    =A$
BJ 830 FOR T=0 TO 3
LE 840 COLOR 1:FOR Y=1 TO 10
    :COLOR Y:PLOT T+4,Y+T
    *20:DRAWTO T+30+4,Y+T
    *20:NEXT Y
DA 850 NEXT T
DD 855 GOSUB 1000
KB 860 B$=A$
BB 870 A$(1,1)=CHR$(0):A$(2)
    =A$
FA 880 X=10:Y=10:DX=1:DY=1
EB 890 X=X+DX:Y=Y+DY
LE 900 IF X=100 THEN DX=-1
CH 910 IF X=5 THEN DX=1
IN 920 IF Y=60 THEN DY=-1
DB 930 IF Y=6 THEN DY=1
AH 940 H=INT(X/4):L=X-H*4
LB 950 A$(H+40*Y+1,H+40*Y+48
    0)=B$(L*800+1,L*800+4
    80)
HJ 960 GOTO 890
KB 1000 FOR DELAY=1 TO 100:N
    EXT DELAY
KC 1010 RETURN
```

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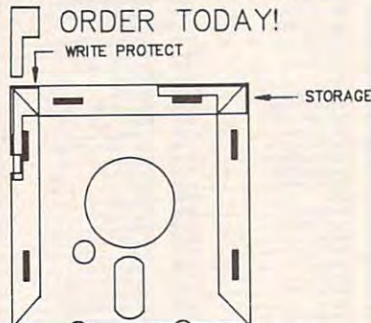
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Laser Chess™ Mixup

Last month's "CAPUTE!" column mistakenly stated that the Atari version of *Laser Chess* on the April-June COMPUTE! Disk could not be run from the disk menu. Actually, *Laser Chess* runs just fine when selected from the menu of the Atari disk. It is the Commodore 64 version of *Laser Chess* on the May-July Commodore edition of the COMPUTE! Disk that will not run properly when loaded from the menu. We regret any confusion this may have created.

The problem with the Commodore 64 version does not occur until a playing piece is destroyed by a laser blast. If the game is loaded from the COMPUTE! Disk menu, it will lock up at the end of the explosion animation sequence. This problem does not occur if the program is loaded directly. To run the Commodore 64 version of *Laser Chess* from the COMPUTE! Disk

without using the menu, simply use the command LOAD "LASER-CHESS.JUN",8 and type RUN.

Smart Alec

Line 1419 in Program 1 from this article for the Commodore 64 in the September issue (p. 81) contains a spurious question mark and is missing the final digit. The line should read as follows:

```
1419:F6 A9 00 99 A7 02 AA A5 01
```

IBM Monte Carlo Enhancements

The IBM version (Program 5, p. 35) of this card-game program from the September issue works properly as printed, but reader Robert St. John was disappointed at the lack of color and the fact that the program recognizes only lowercase letters. Other readers with color monitors may want to try his suggested changes and additions to enhance game play:

```
KN 110 KEY OFF:WIDTH 40:COLOR 1,
2,2
BP 140 DIM C$(52),COL(52),V$(13),
T$(4),CL(4)
IF 170 READ A:T$(I) = CHR$(A):RE
AD CL(I):NEXT
JI 200 DATA 3,4,4,4,5,0,6,0
PK 230 COLOR CL(J):PRINT " ";
V$(I);T$(J);
KO 250 COLOR 1
HP 300 IF C$(P)="" THEN C$(P)=V$(
J)+T$(I):COL(P)=CL(I):GO
TO 330
QO 342 LOCATE 17,5:PRINT SPACE$(
28)
PD 372 PRINT:PRINT TAB(11)"Press
Q to quit"
HM 380 A$=INKEY$:IF A$="" THEN 3
80
OP 382 IF A$="h" OR A$="H" THEN
C=4:GOTO 420
LP 384 IF A$="m" OR A$="M" THEN
C=5:GOTO 420
MF 386 IF A$="e" OR A$="E" THEN
C=6:GOTO 420
JG 388 IF A$="q" OR A$="Q" THEN
CLS:END
IM 390 GOTO 380
OE 450 COLOR COL(CT):PRINT "
";C$(CT);
BO 590 C$(I)=C$(I+1):COL(I)=COL(
I+1)
FD 630 C$(I)=C$(I+1):COL(I)=COL(
I+1)
OL 770 IF A$="q" OR A$="Q" THEN
RUN
```

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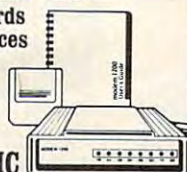
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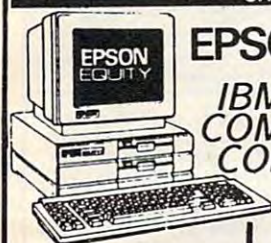
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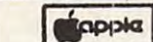


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COMPUTE!'s Guide To Typing In Programs

Computers are precise—type the program *exactly* as listed, including necessary punctuation and symbols, except for special characters noted below. We have provided a special listing convention as well as a program to check your typing—"The Automatic Proofreader."

Programs for the IBM, TI-99/4A, and Atari ST models should be typed exactly as listed; no special characters are used. Programs for Commodore, Apple, and Atari 400/800/XL/XE computers may contain some hard-to-read special characters, so we have a listing system that indicates these control characters. You will find these Commodore and Atari characters in curly braces; *do not type the braces*. For example, {CLEAR} or {CLR} instructs you to insert the symbol which clears the screen on the Atari or Commodore machines. A complete list of these symbols is shown in the tables below. For Commodore, Apple, and Atari, a single symbol by itself within curly braces is usually a control key or graphics key. If you see {A}, hold down the CONTROL key and press A. This will produce a reverse video character on the Commodore (in quote mode), a graphics character on the Atari, and an invisible control character on the Apple.

Graphics characters entered with the Commodore logo key are enclosed in a special bracket: [A>]. In this case, you would hold down the Commodore logo key as you type A. Our Commodore listings are in uppercase, so shifted symbols are underlined. A graphics heart symbol (SHIFT-S) would be listed as S. One exception is {SHIFT-SPACE}. When you see this, hold down SHIFT and press the space bar. If a number precedes a symbol, such as {5 RIGHT}, {6 S}, or {8 Q>}, you would enter five cursor rights, six shifted S's, or eight Commodore-Q's. On the Atari, inverse characters (white on black) should be entered with the inverse video

Atari 400/800/XL/XE

When you see	Type	See
{CLEAR}	ESC SHIFT <	↵ Clear Screen
{UP}	ESC CTRL -	↑ Cursor Up
{DOWN}	ESC CTRL =	↓ Cursor Down
{LEFT}	ESC CTRL +	← Cursor Left
{RIGHT}	ESC CTRL *	→ Cursor Right
{BACK S}	ESC DELETE	⌫ Backspace
{DELETE}	ESC CTRL DELETE	⌫ Delete character
{INSERT}	ESC CTRL INSERT	⌫ Insert character
{DEL LINE}	ESC SHIFT DELETE	⌫ Delete line
{INS LINE}	ESC SHIFT INSERT	⌫ Insert line
{TAB}	ESC TAB	→ TAB key
{CLR TAB}	ESC CTRL TAB	⌫ Clear tab
{SET TAB}	ESC SHIFT TAB	⌫ Set tab stop
{BELL}	ESC CTRL 2	🔔 Ring buzzer
{ESC}	ESC ESC	⌨ ESCape key

Commodore PET/CBM/VIC/64/128/16/+4

When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	⌫	[1]	COMMODORE 1	⌫
{HOME}	CLR/HOME	⌫	[2]	COMMODORE 2	⌫
{UP}	SHIFT ↑ CRSR ↓	⬆	[3]	COMMODORE 3	⬆
{DOWN}	↑ CRSR ↓	⬆	[4]	COMMODORE 4	⬆
{LEFT}	SHIFT ← CRSR →	⬅	[5]	COMMODORE 5	⬅
{RIGHT}	← CRSR →	⬅	[6]	COMMODORE 6	⬅
{RVS}	CTRL 9	⌛	[7]	COMMODORE 7	⌛
{OFF}	CTRL 0	⌛	[8]	COMMODORE 8	⌛
{BLK}	CTRL 1	⬛	{ F1 }	f1	⬛
{WHT}	CTRL 2	⬜	{ F2 }	SHIFT f1	⬜
{RED}	CTRL 3	⬜	{ F3 }	f3	⬜
{CYN}	CTRL 4	⬜	{ F4 }	SHIFT f3	⬜
{PUR}	CTRL 5	⬜	{ F5 }	f5	⬜
{GRN}	CTRL 6	⬜	{ F6 }	SHIFT f5	⬜
{BLU}	CTRL 7	⬜	{ F7 }	f7	⬜
{YEL}	CTRL 8	⬜	{ F8 }	SHIFT f7	⬜
				←	⬅

key (Atari logo key on 400/800 models).

Whenever more than two spaces appear in a row, they are listed in a special format. For example, {6 SPACES} means press the space bar six times. Our Commodore listings never leave a single space at the end of a line, instead moving it to the next printed line as {SPACE}.

Amiga program listings contain only one special character, the left arrow (-) symbol. This character marks the end of each program line. Wherever you see a left arrow, press RETURN or move the cursor off the line to enter that line into memory. Don't try to type in the left arrow symbol; it's there only as a marker to indicate where each program line ends.

The Automatic Proofreader

Type in the appropriate program listed below, then save it for future use. The Commodore Proofreader works on the Commodore 128, 64, Plus/4, 16, and VIC-20. Don't omit any lines, even if they contain unfamiliar commands or you think they don't apply to your computer. When you run the program, it installs a machine language program in memory and erases its BASIC portion automatically (so be sure to save several copies before running the program for the first time). If you're using a Commodore 128, Plus/4 or 16, do not use any GRAPHIC commands while the Proofreader is active. You should disable the Commodore Proofreader before running any other program. To do this, either turn the computer off and on or enter SYS 64738 (for the 64), SYS 65341 (128), SYS 64802 (VIC-20), or SYS 65526 (Plus/4 or 16). To reenable the Proofreader, reload the program and run it as usual. Unlike the original VIC/64 Proofreader, this version works the same with disk or tape.

On the Atari, run the Proofreader to activate it (the Proofreader remains active in memory as a machine language program); you must then enter NEW to erase the BASIC loader. Pressing SYSTEM RESET deactivates the Atari Proofreader; enter PRINT USR(1536) to reenable it.

The Apple Proofreader erases the BASIC portion of itself after you run it, leaving only the machine language portion in memory. It works with either DOS 3.3 or ProDOS. Disable the Apple Proofreader by pressing CTRL-RESET before running another BASIC program.

The IBM Proofreader is a BASIC program that simulates the IBM BASIC line editor, letting you enter, edit, list, save, and load programs that you type. Type RUN to activate. Be sure to leave Caps Lock on, except when typing lowercase characters.

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a hexadecimal number (on the Apple) or a pair of letters (on the Commodore, Atari, or IBM) appears. The number or pair of letters is called a *checksum*.

Compare the value displayed on the screen by the Proofreader with the checksum printed in the program listing in the magazine. The checksum is given to the left of each line number. Just type in the program a line at a time (without the printed checksum), press RETURN or Enter, and compare the checksums. If they match, go on to the next line. If not, check your typing; you've made a mistake. Because of the checksum method used, do not type abbreviations, such as ? for PRINT. On the Atari and Apple Proofreaders, spaces are not counted as part of the checksum, so be sure you type the right number of spaces between quote marks. The Atari Proofreader does not check to see that you've typed the characters in the right order, so if characters are transposed, the checksum still matches the listing. The Commodore Proofreader catches transposition errors and ignores spaces unless they're enclosed in quotation marks. The IBM Proofreader detects errors in spacing and transposition.

IBM Proofreader Commands

Since the IBM Proofreader replaces the computer's normal BASIC line editor, it has to include many of the direct-mode IBM BASIC commands. The syntax is identical to IBM BASIC. Commands simulated are LIST, LLIST, NEW, FILES, SAVE, and LOAD. When listing your program, press any key (except Ctrl-Break) to stop the listing. If you enter NEW, the Proofreader prompts you to press Y to be especially sure you mean yes.

Two new commands are BASIC and CHECK. BASIC exits the Proofreader back to IBM BASIC, leaving the Proofreader in memory. CHECK works just like LIST, but shows the checksums along with the listing. After you have typed in a program, save it to disk. Then exit the Proofreader with the BASIC command, and load the program as usual (this replaces the Proofreader in memory). You can now run the program, but you may want to re-save it to disk. This will shorten it on disk and make it load faster, but it can no longer be edited with the Proofreader. If you want to convert an existing BASIC program to Proofreader format, save it to disk with SAVE "filename",A.

Program 1: Atari Proofreader

By Charles Brannon

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:READ A:POKE I,A:CK=CK+A:NEXT I
120 IF CK<>19072 THEN ? "Error in DATA Statements. Check Typing.":END

130 A=USR(1536)
140 ? :? "Automatic Proofreader Now Activated."
150 END
160 DATA 104,160,0,185,26,3,201,69,240,7
170 DATA 200,200,192,34,208,243,96,200,169,74
180 DATA 153,26,3,200,169,6,153,26,3,162
190 DATA 0,189,0,228,157,74,6,232,224,16
200 DATA 208,245,169,93,141,78,6,169,6,141
210 DATA 79,6,24,173,4,228,105,1,141,95
220 DATA 6,173,5,228,105,0,141,96,6,169
230 DATA 0,133,203,96,247,238,125,241,93,6
240 DATA 244,241,115,241,124,241,76,205,238
250 DATA 0,0,0,0,0,32,62,246,8,201
260 DATA 155,240,13,201,32,240,7,72,24,101
270 DATA 203,133,203,104,40,96,72,152,72,138
280 DATA 72,160,0,169,128,145,88,200,192,40
290 DATA 208,249,165,203,74,74,74,24,105
300 DATA 161,160,3,145,88,165,203,41,15,24
310 DATA 105,161,200,145,88,169,0,133,203,104
320 DATA 170,104,168,104,40,96
```

Program 2: IBM Proofreader

By Charles Brannon

```
10 "Automatic Proofreader Version 3.0 (Lines 205,206 added/190 deleted/470,490 changed from V2.0)
100 DIM L$(500),LNUM(500):COLOR 0,7,7:KEY OFF:CLS:MAX=0:LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,CHR$(4)+CHR$(70):ON KEY(15)GOSUB 640:KEY (15) ON:GOTO 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:PRINT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-INT(LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:POKE 1052,34:POKE 1054,0:POKE 1055,79:POKE 1056,13:POKE 1057,28:LINE INPUT L$:DEF SEG:IF L$="" THEN 150
170 IF LEFT$(L$,1)="" THEN L$=MID$(L$,2):GOTO 170
```



```

180 IF VAL(LEFT$(L$,2))=0 AND
MID$(L$,3,1)="" THEN L$=M
ID$(L$,4)
200 IF ASC(L$)>57 THEN 260 'no
line number, therefore co
mmand
205 BL=INSTR(L$," "):IF BL=0 T
HEN BL=L$:GOTO 206 ELSE B
L$=LEFT$(L$,BL-1)
206 LNUM=VAL(BL$):TEXT$=MID$(L
$,LEN(STR$(LNUM))+1)
210 IF TEXT$="" THEN GOSUB 540
:IF LNUM=LNUM(P) THEN GOSU
B 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$)
:CKSUM=(CKSUM+ASC(MID$(L$,
I)))AND 255:NEXT:LOCATE
Y,1:PRINT CHR$(65+CKSUM/1
6)+CHR$(65+(CKSUM AND 15))
+" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM
THEN L$(P)=TEXT$:GOTO 150
'replace line
240 GOSUB 580:GOTO 150 'insert
the line
260 TEXT$="":FOR I=1 TO LEN(L$)
:A=ASC(MID$(L$,I)):TEXT$=
TEXT$+CHR$(A+32*(A>96 AND
A<123)):NEXT
270 DELIMITER=INSTR(TEXT$," ")
:COMMAND$=TEXT$:ARG$="":IF
DELIMITER THEN COMMAND$=L
EFT$(TEXT$,DELIMITER-1):AR
G$=MID$(TEXT$,DELIMITER+1)
ELSE DELIMITER=INSTR(TEXT
$,CHR$(34)):IF DELIMITER T
HEN COMMAND$=LEFT$(TEXT$,D
ELIMITER-1):ARG$=MID$(TEXT
$,DELIMITER)
280 IF COMMAND$<>"LIST" THEN 4
10
290 OPEN "scrn:" FOR OUTPUT AS
#1
300 IF ARG$="" THEN FIRST=0:P=
MAX-1:GOTO 340
310 DELIMITER=INSTR(ARG$,"-"):
IF DELIMITER=0 THEN LNUM=V
AL(ARG$):GOSUB 540:FIRST=P
:GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELIM
ITER)):LAST=VAL(MID$(ARG$,
DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRST
=P:LNUM=LAST:GOSUB 540:IF
P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(S
TR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GOT
O 370
360 CKSUM=0:A$=N$+L$(X):FOR I=
1 TO LEN(A$):CKSUM=(CKSUM+
ASC(MID$(A$,I)))AND 255
:NEXT:A$=CHR$(65+CKSUM/16)
+CHR$(65+(CKSUM AND 15))+
"
370 PRINT #1,A$+N$+L$(X)
380 IF INKEY$<>" " THEN X=P
390 NEXT:CLOSE #1:CKFLAG=0
400 GOTO 130
410 IF COMMAND$="LLIST" THEN O
PEN "lpt1:" FOR OUTPUT AS
#1:GOTO 300
420 IF COMMAND$="CHECK" THEN C
KFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN 4
50
440 GOSUB 600:OPEN ARG$ FOR OU
TPUT AS #1:ARG$="":GOTO 30
0
450 IF COMMAND$<>"LOAD" THEN 4
90

```

```

460 GOSUB 600:OPEN ARG$ FOR IN
PUT AS #1:MAX=0:P=0
470 WHILE NOT EOF(1):LINE INPU
T #1,L$:BL=INSTR(L$," "):B
L$=LEFT$(L$,BL-1):LNUM(P)=
VAL(BL$):L$(P)=MID$(L$,LEN
(STR$(VAL(BL$)))+1):P=P+1:
WEND
480 MAX=P:CLOSE #1:GOTO 130
490 IF COMMAND$="NEW" THEN INP
UT "Erase program - Are yo
u sure";L$:IF LEFT$(L$,1)=
"Y" OR LEFT$(L$,1)="Y" THE
N MAX=0:LNUM(0)=65536!:GOT
O 130:ELSE 130
500 IF COMMAND$="BASIC" THEN C
OLOR 7,0,0:ON ERROR GOTO 0
:CLS:END
510 IF COMMAND$<>"FILES" THEN
520
515 IF ARG$="" THEN ARG$="A:"
ELSE SEL=1:GOSUB 600
517 FILES ARG$:GOTO 130
520 PRINT "Syntax error":GOTO 1
30
540 P=0:WHILE LNUM>LNUM(P) AND
P<MAX:P=P+1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:L
NUM(X)=LNUM(X+1):L$(X)=L$(
X+1):NEXT:RETURN
580 MAX=MAX+1:FOR X=MAX TO P+1
STEP -1:LNUM(X)=LNUM(X-1)
:L$(X)=L$(X-1):NEXT:L$(P)=
TEXT$:LNUM(P)=LNUM:RETURN
600 IF LEFT$(ARG$,1)<>CHR$(34)
THEN 520 ELSE ARG$=MID$(A
RG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34)
THEN ARG$=LEFT$(ARG$,LEN(
ARG$)-1)
620 IF SEL=0 AND INSTR(ARG$,".
")=0 THEN ARG$=ARG$+".BAS"
630 SEL=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT "St
opped.":RETURN 150
650 PRINT "Error #";ERR:RESUME
150

```

Program 3: Commodore Proofreader

By Philip Nelson, Assistant Editor

```

10 VEC=PEEK(772)+256*PEEK(773)
:LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADER
FOR ";:IF VEC=42364 THEN
{SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
C-20"
40 IF VEC=35158 THEN GRAPHIC C
LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
46:GRAPHIC CLR:PRINT "128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
E ADR,BYT:ADR=ADR+1:CHK=CHK
+BYT:NEXT
80 IF CHK<>20570 THEN PRINT "E
RROR* CHECK TYPING IN DATA
STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
RS=SA+RF:HB=INT(RS/256):LB=
RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
*ERROR* RELOAD PROGRAM AND

```

```

{SPACE}CHECK FINAL LINE":EN
D
120 POKE SA+149,PEEK(772):POKE
SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
14,22:POKE SA+18,23:POKE SA+
29,224:POKE SA+139,224
140 PRINT CHR$(147);CHR$(17);"
PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
EEK(LO)+256*PEEK(HI))-1,0:N
EW
160 DATA 120,169,73,141,4,3,16
9,3,141,5,3
170 DATA 88,96,165,20,133,167,
165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
1,199,157,227,3
190 DATA 202,16,248,169,19,32,
210,255,169,18,32
200 DATA 210,255,160,0,132,180
,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
1,34,208,8,72
220 DATA 165,176,73,255,133,17
6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
3,167,165,168,105
250 DATA 0,133,168,202,208,239
,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
211,3,32,210,255
270 DATA 104,74,74,74,168,1
85,211,3,32,210
280 DATA 255,162,31,189,227,3,
149,199,202,16,248
290 DATA 169,146,32,210,255,76
,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
116,117,151,128,129,167,136
,137

```

Program 4: Apple Proofreader

By Tim Victor, Editorial Programmer

```

10 C = 0: FOR I = 768 TO 768 +
68: READ A:C = C + A: POKE I
,A: NEXT
20 IF C < > 7258 THEN PRINT "ER
ROR IN PROOFREADER DATA STAT
EMENTS": END
30 IF PEEK(190 * 256) < > 76 T
HEN POKE 56,0: POKE 57,3: CA
LL 1002: GOTO 50
40 PRINT CHR$(4);"IN#A$300"
50 POKE 34,0: HOME: POKE 34,1:
VTAB 2: PRINT "PROOFREADER
INSTALLED"
60 NEW
100 DATA 216,32,27,253,201,141
110 DATA 208,60,138,72,169,0
120 DATA 72,189,255,1,201,160
130 DATA 240,8,104,10,125,255
140 DATA 1,105,0,72,202,208
150 DATA 238,104,170,41,15,9
160 DATA 48,201,58,144,2,233
170 DATA 57,141,1,4,138,74
180 DATA 74,74,74,41,15,9
190 DATA 48,201,58,144,2,233
200 DATA 57,141,0,4,104,170
210 DATA 169,141,96

```


MLX Machine Language Entry Program For Commodore 64

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future machine language (ML) programs from COMPUTE!. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0-9 and the letters A-F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a check-

sum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0-9 and the letters A-F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, a numeric keypad is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:

7	8	9	0
4 U	5 I	6 O	F P
1 J	2 K	3 L	E :
A M	B ,	C .	D /
0 Space			

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice

versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to

restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should not be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT address, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you

can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD "filename",8 for disk or LOAD "filename" for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD "filename",8,1 for disk or LOAD "filename",1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy thoroughly before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
30,950 MODIFIED, LINES 4
85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
4=254:Z5=255:Z6=256:Z7=
127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
:BS=PEEK(55)+Z6*PEEK(56)
:H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="LEFT"
:S$=" ":D$=CHR$(20):Z$=
CHR$(27):T$="RIGHT"
CQ 140 SD=54272:FOR I=SD TO SD
+23:POKE I,0:NEXT:POKE
{SPACE}SD+24,15:POKE 78
8,52
FC 150 PRINT "{CLR}"CHR$(142)CH
R$(8):POKE 53280,15:POK
```

```
E 53281,15
EJ 160 PRINT T$ {RVS}{RVS}
{2 SPACES}{B @}
{2 SPACES}"SPC(28)"
{2 SPACES}{OFF}{BLU} ML
X II {RED}{RVS}
{2 SPACES}"SPC(28)"
{12 SPACES}{BLU}"
FR 170 PRINT "{3 DOWN}"
{3 SPACES}COMPUTER'S MA
CHINE LANGUAGE EDITOR
{3 DOWN}"
JB 180 PRINT "{BLK}STARTING ADD
RESS{4}"::GOSUB300:SA=A
D:GOSUB1040:IF F THEN18
0
GF 190 PRINT "{BLK}{2 SPACES}EN
DING ADDRESS{4}"::GOSUB
300:EA=AD:GOSUB1030:IF
{SPACE}F THEN190
KR 200 INPUT "{3 DOWN}{BLK}CLEA
R WORKSPACE [Y/N]{4}":A
$:IF LEFT$(A$,1)<>"Y"TH
EN220
PG 210 PRINT "{2 DOWN}{BLU}WORK
ING..."::FORI=BS TO BS+
EA-SA+7:POKE I,0:NEXT:P
RINT "DONE"
DR 220 PRINTTAB(10)" {2 DOWN}"
{BLK}{RVS} MLX COMMAND
{SPACE}MENU {DOWN}{4}":
PRINT T$ {RVS}E{OFF}NTE
R DATA"
BD 230 PRINT T$ {RVS}D{OFF}ISP
LAY DATA":PRINT T$
{RVS}L{OFF}LOAD FILE"
JS 240 PRINT T$ {RVS}S{OFF}AVE
FILE":PRINT T$ {RVS}Q
{OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
MID$( "EDLSQ",I,1) THEN A
=I:I=5
FD 270 NEXT:ON A GOTO420,610,6
90,700,280:GOSUB1060:GO
TO250
EJ 280 PRINT "{RVS} QUIT ":INPU
T "{DOWN}{4}ARE YOU SURE
[Y/N]":A$:IF LEFT$(A$,
1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
LEN(IN$)<4 THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
=MID$(IN$,3):GOSUB320:A
D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
$(B$,J,1):B=ASC(A$)-C4+
(A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
H$,B+1,1):B=A-B*C6:PRI
NT MID$(H$,B+1,1):RETR
RN
RR 360 A=INT(AD/Z6):GOSUB350:A
=AD-A*Z6:GOSUB350:PRINT
":
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK+Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT "{DOWN}STARTING AT
{4}":GOSUB300:IF IN$<>
N$ THEN GOSUB1030:IF F
{SPACE}THEN400
EX 410 RETURN
HD 420 PRINT "{RVS} ENTER DATA
{SPACE}":GOSUB400:IF IN
$=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
```



```

      THEN PRINT IN$:PRINT"
      {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:BS
      =S$:FOR J=1 TO 2:IF F T
      HEN BS=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$LS$;IF I<
      24 THEN PRINT"{OFF}";
HD 470 GET AS:IF AS=N$ THEN 470
FK 480 IF (AS>" / "ANDAS<" ")OR(A
      S>"@ "ANDAS<"G ")THEN 540
GS 485 A=-(AS="M")-2*(AS="," )-
      3*(AS="." )-4*(AS="/" )-5
      *(AS="J")-6*(AS="K")
FX 486 A=A-7*(AS="L")-8*(AS=":
      ") -9*(AS="U")-10*(AS="I
      ") -11*(AS="O")-12*(AS="
      P")
CM 487 A=A-13*(AS=S$):IF A THE
      N AS=MID$("ABCD123E456F
      0",A,1):GOTO 540
MP 490 IF AS=R$ AND((I=0)AND(J
      =1)OR F) THEN PRINT B$;:
      J=2:NEXT I=24:GOTO 550
KC 500 IF AS="{HOME}" THEN PRI
      NT B$:J=2:NEXT I=24:NEX
      T:F=0:GOTO 440
MX 510 IF (AS="{RIGHT}")AND F TH
      ENPRINT B$LS$;GOTO 540
GK 520 IF AS<>L$ AND AS<>D$ OR
      ((I=0)AND(J=1)) THEN GOS
      UB1060:GOTO 470
HG 530 AS=L$+S$+L$:PRINT B$LS$;
      J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT AS;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$:
      IF IN$=N$ THEN CLOSE3:
      GOTO 220
QC 560 FOR I=1 TO 25 STEP 3:BS=
      MID$(IN$,I):GOSUB 320:IF
      I<25 THEN GOSUB 380:A(I
      /3)=A
PK 570 NEXT I:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [43]";F=1:GOTO 440
HJ 580 GOSUB 1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO 700
GQ 600 F=0:GOTO 440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB 400:IF IN$=N$ THEN 2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
      {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
      BREAK[43]{DOWN}"
KS 630 GOSUB 360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB 380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB 350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO 220
KC 660 GET AS:IF AS=R$ THEN GO
      SUB 1080:GOTO 220
EQ 670 IF AS=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO 630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE

```

```

      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[43]";IN$:IF IN$=N$
      {SPACE}THEN 220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [43]";
FP 730 GET AS:IF AS="T" THEN PR
      INT"T{DOWN}":GOTO 880
HQ 740 IF AS<>"D" THEN 730
HH 750 PRINT"D{DOWN}":OPEN 15,8
      ,15,"I0":B=EA-SA:IN$="
      0":IN$:IF OP THEN 810
SQ 760 OPEN 1,8,8,IN$+"P,W":G
      OSUB 860:IF A THEN 220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN 800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O 940
GS 800 GOSUB 1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [43]":GOSUB 860:GOTO 220
MA 810 OPEN 1,8,8,IN$+"P,R":G
      OSUB 860:IF A THEN 220
GE 820 GET#1,AS,B$:AD=ASC(AS+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO 850
RX 830 FOR I=0 TO B:GET#1,AS:P
      OKE BS+I,ASC(AS+Z$):IF(
      I<>B)AND ST THEN F=2:AD
      =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO 960,970
SA 860 INPUT#15,A,AS:IF A THEN
      CLOSE1:CLOSE15:GOSUB 10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0 THEN 92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB 1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO 690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO 970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO 930
KM 920 A=SA:B=EA+1:GOSUB 1010:P
      OKE 780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB 1010:ON OP GOTO 950:SY
      S 63591
AE 940 GOSUB 1080:PRINT"{BLU}**
      SAVE COMPLETED **":GOT
      O 220
XP 950 POKE147,0:SYS 63562:IF
      {SPACE}ST>0 THEN 970
FR 960 GOSUB 1080:PRINT"{BLU}**
      LOAD COMPLETED **":GOT
      O 220
DP 970 GOSUB 1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[43]":ON F GOSUB 98
      0,990,1000:GOTO 220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (" :GOSUB 360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT " :
      AD=SA+AD:GOSUB 360:PRINT
      D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN

```

```

RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
      )OR(AD>49151 AND AD<53
      248) THEN GOSUB 1080:F=0
      :RETURN
HC 1050 GOSUB 1060:PRINT"{RVS}
      {SPACE}INVALID ADDRESS
      {DOWN}{BLK}":F=1:RETU
      RN
AR 1060 POKE SD+5,31:POKE SD+6
      ,208:POKE SD,240:POKE
      {SPACE}SD+1,4:POKE SD+
      4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
      TO 1090
PF 1080 POKE SD+5,8:POKE SD+6,
      240:POKE SD,0:POKE SD+
      1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
      KE SD+4,0:POKE SD,0:PO
      KE SD+1,0:RETURN

```

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Attention Programmers

COMPUTE! magazine is currently looking for quality articles on Commodore, Atari, Apple, and IBM computers (including the Commodore Amiga and Atari ST). If you have an interesting home application, educational program, programming utility, or game, submit it to COMPUTE!, P.O. Box 5406, Greensboro, NC 27403. Or write for a copy of our "Writer's Guidelines."

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MLX Machine Language Entry Program For Apple

Tim Victor, Editorial Programmer

To make it easier to enter machine language programs into your computer without typos, COMPUTE! is introducing its "MLX" entry program for the Apple II series. It's our best MLX yet. It runs on the II, II+, IIe, and IIC, and with either DOS 3.3 or ProDOS.

A machine language (ML) program is usually listed as a long series of numbers. It's hard to keep your place and even harder to avoid making mistakes as you type in the listing, since an incorrect line looks almost identical to a correct one. To make error-free entry easier, COMPUTE! generally lists ML programs for Commodore and Atari computers in a format designed to be typed in with a utility called "MLX." The MLX program uses a checksum system to catch typing errors almost as soon as they happen.

Apple MLX checks your typing on a line-by-line basis. It won't let you enter invalid characters or let you continue if there's a mistake in a line. It won't even let you enter a line or digit out of sequence. Best of all, you don't have to know anything about machine language to enter ML programs with MLX. Apple MLX makes typing ML programs almost foolproof.

Using Apple MLX

Type in and save some copies of Apple MLX on disk (you'll want to use MLX to enter future ML programs in COMPUTE!). It doesn't matter whether you type it in on a disk formatted for DOS 3.3 or ProDOS. Programs entered with Apple MLX, however, must be saved to a disk formatted with the same operating system as Apple MLX itself.

If you have an Apple IIe or IIC, make sure that the key marked CAPS LOCK is in the down position. Type RUN. You'll be asked for the starting and ending addresses of the ML program. These values vary for each program, so they're given at the beginning of the ML program listing and in the program's accompanying article. Find them and type them in.

The next thing you'll see is a menu asking you to select a function. The first is (E)NTER DATA. If you're just starting to type in a program, pick this. Press the E key, and the program asks for the address where you want to begin entering data. Type the first number in the

first line of the program listing if you're just starting, or the line number where you left off if you've already typed in part of a program. Hit the RETURN key and begin entering the data.

Once you're in Enter mode, Apple MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight bytes and a checksum. When you enter a line and hit RETURN, Apple MLX recalculates the checksum from the eight bytes and the address. If you enter more or less than nine numbers, or the checksum doesn't exactly match, Apple MLX erases the line you just entered and prompts you again for the same line.

Invalid Characters Banned

Apple MLX is fairly flexible about how you type in the numbers. You can put extra spaces between numbers or leave the spaces out entirely, compressing a line into 18 keypresses. Be careful not to put a space between two digits in the middle of a number. Apple MLX will read two single-digit numbers instead of one two-digit number (F 6 means F and 6, not F6).

You can't enter an invalid character with Apple MLX. Only the numerals 0-9 and the letters A-F can be typed in. If you press any other key (with some exceptions noted below), nothing happens. This safeguards against entering extraneous characters. Even better, Apple MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, Apple MLX will catch your mistake.

Apple MLX also checks to make sure you're typing in the right line. The address (the number to the left of the colon) is part of the checksum recalculation. If you accidentally skip a line and try to enter incorrect values, Apple MLX won't let you continue. Just make sure you enter the correct starting address; if you don't, you won't be able to enter any of the following lines. Apple MLX will stop you.

Editing Features

Apple MLX also includes some editing features. The left- and right-arrow keys allow you to back up and go forward on the line that you are entering, so you can retype data. Pressing the CON-

TROL (CTRL) and D keys at the same time (*delete*) removes the character under the cursor, shortening the line by one character. Pressing CTRL-I (*insert*) puts a space under the cursor and shifts the rest of the line to the right, making the line one character longer. If the cursor is at the right end of the line, neither CTRL-D nor CTRL-I has any effect.

When you've entered the entire listing (up to the ending address that you specified earlier), Apple MLX automatically leaves Enter mode and redisplay the functions menu. If you want to leave Enter mode before then, press the RETURN key when Apple MLX prompts you with a new line address. (For instance, you may want to leave Enter mode to enter a program listing in more than one sitting; see below.)

Display Data

The second menu choice, (D)ISPLAY DATA, examines memory and shows the contents in the same format as the program listing. You can use it to check your work or to see how far you've gotten. When you press D, Apple MLX asks you for a starting address. Type in the address of the first line you want to see and hit RETURN. Apple MLX displays program lines until you press any key or until it reaches the end of the program.

Save And Load

Two more menu selections let you save programs on disk and load them back into the computer. These are (S)AVE FILE and (L)OAD FILE. When you press S or L, Apple MLX asks you for the filename. The first time you save an ML program, the name you assign will be the program's filename on the disk. If you press L and specify a filename that doesn't exist on the disk, you'll see a disk error message.

If you're not sure why a disk error has occurred, check the drive. Make sure there's a formatted disk in the drive and that it was formatted by the same operating system you're using for Apple MLX (ProDOS or DOS 3.3). If you're trying to save a file and see an error message, the disk might be full. Either save the file on another disk or quit Apple MLX (by pressing the Q key), delete an old file or two, then run Apple MLX again. Your typing should still be safe in memory.

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Apple MLX: Machine Language Entry Program

For instructions on entering this program, please refer to "COMPUTE! Guide to Typing In Programs" elsewhere in this issue.

```
88 100 N = 9: HOME : NORMAL : PR
    INT "APPLE MLX": POKE 34,
    2: ONERR GOTO 610
CC 110 VTAB 1: HTAB 20: PRINT "S
    TART ADDRESS": GOSUB 530
    : IF A = 0 THEN PRINT CHR
    $ (7): GOTO 110
8C 120 S = A
```

```
E3 130 VTAB 2: HTAB 20: PRINT "E
    ND ADDRESS ": GOSUB 530
    : IF S > A OR A = 0 THE
    N PRINT CHR$ (7): GOTO 13
    0
20 140 E = A
85 150 PRINT : PRINT "CHOOSE: (E)
    NTER DATA": HTAB 22: PRI
    NT "(D)ISPLAY DATA": HTAB
    8: PRINT "(L)OAD FILE (
    S)AVE FILE (Q)UIT": PRIN
    T
AE 160 GET A$: FOR I = 1 TO 5: I
    F A$ < > MID$ ("EDLSQ", I,
    1) THEN NEXT : GOTO 160
93 170 ON I GOTO 270, 220, 180, 200
    : POKE 34, 0: END
AF 180 INPUT "FILENAME: "; A$: IF
    A$ < > "" THEN PRINT CHR
    $ (4): "BLOAD": A$: "A": S
    A1 190 GOTO 150
38 200 INPUT "FILENAME: "; A$: IF
    A$ < > "" THEN PRINT CHR
    $ (4): "BSAVE": A$: "A": S: "
    , L": (E - S) + 1
92 210 GOTO 150
C2 220 GOSUB 590: IF B = 0 THEN
    150
9E 230 FOR B = B TO E STEP 8: L =
    4: A = B: GOSUB 580: PRIN
    T A$: " ": L = 2
85 240 FOR F = 0 TO 7: V(F + 1) =
    PEEK (B + F): NEXT : GOS
    UB 560: V(9) = C
F2 250 FOR F = 1 TO N: A = V(F):
    GOSUB 580: PRINT A$: " ":
    NEXT : PRINT : IF PEEK (4
    9152) < 128 THEN NEXT
94 260 POKE 49168, 0: GOTO 150
CC 270 GOSUB 590: IF B = 0 THEN
    150
48 280 FOR B = B TO E STEP 8
A6 290 HTAB 1: A = B: L = 4: GOSUB
    580: PRINT A$: " ": CAL
    L 64668: A$ = "": P = 0: GO
    SUB 330: IF L = 0 THEN 15
    0
F9 300 GOSUB 470: IF F < > N THE
    N PRINT CHR$ (7): GOTO 2
    90
27 310 IF N = 9 THEN GOSUB 560:
    IF C < > V(9) THEN PRINT
    CHR$ (7): GOTO 290
72 320 FOR F = 1 TO 8: POKE B +
    F - 1, V(F): NEXT : PRINT
    : NEXT : GOTO 150
8E 330 IF LEN (A$) = 33 THEN A$
    = 0: P = 0: PRINT CHR$ (7
    ):
22 340 L = LEN (A$): 0$ = A$: 0 =
    P: L$ = "": IF P > 0 THEN
    L$ = LEFT$ (A$, P)
E8 350 R$ = "": IF P < L - 1 THE
    N R$ = RIGHT$ (A$, L - P -
    1)
55 360 HTAB 7: PRINT L$: FLASH
    : IF P < L THEN PRINT MID
    $ (A$, P + 1, 1): NORMAL :
    PRINT R$:
78 370 PRINT " ": NORMAL
E6 380 K = PEEK (49152): IF K <
    128 THEN 380
C1 390 POKE 49168, 0: K = K - 128
58 400 IF K = 13 THEN HTAB 7: PR
    INT A$: " ": RETURN
8A 410 IF K = 32 OR K > 47 AND K
    < 58 OR K > 64 AND K < 7
    1 THEN A$ = L$ + CHR$ (K)
    + R$: P = P + 1
C1 420 IF K = 4 THEN A$ = L$ + R
    $
5F 430 IF K = 9 THEN A$ = L$ + "
    " + MID$ (A$, P + 1, 1) +
    R$
8A 440 IF K = 8 THEN P = P - (P
    > 0)
```

```
93 450 IF K = 21 THEN P = P + (P
    < L)
9D 460 GOTO 330
37 470 F = 1: D = 0: FOR P = 1 TO
    LEN (A$): C$ = MID$ (A$, P
    , 1): IF F > N AND C$ < >
    " " THEN RETURN
88 480 IF C$ < > " " THEN GOSUB
    520: V(F) = J + 16 * (D =
    1) * V(F): D = D + 1
5F 490 IF D > 0 AND C$ = " " OR
    D = 2 THEN D = 0: F = F +
    1
88 500 NEXT : IF D = 0 THEN F =
    F - 1
17 510 RETURN
85 520 J = ASC (C$): J = J - 48 -
    7 * (J > 64): RETURN
AB 530 A = 0: INPUT A$: A$ = LEFT
    $ (A$, 4): IF LEN (A$) = 0
    THEN RETURN
6F 540 FOR P = 1 TO LEN (A$): C$
    = MID$ (A$, P, 1): IF C$ <
    "0" OR C$ > "9" AND C$ <
    "A" OR C$ > "Z" THEN A =
    0: RETURN
20 550 GOSUB 520: A = A * 16 + J:
    NEXT : RETURN
28 560 C = INT (B / 256): C = B -
    256 * C - 255 * (C > 127
    ): C = C - 255 * (C > 255)
28 570 FOR F = 1 TO 8: C = C * 2
    - 255 * (C > 127) + V(F):
    C = C - 255 * (C > 255):
    NEXT : RETURN
DA 580 I = FRE (0): A$ = "": FOR
    I = 1 TO L: T = INT (A / 1
    6): A$ = MID$ ("0123456789
    ABCDEF", A - 16 * T + 1, 1)
    + A$: A = T: NEXT : RETUR
    N
IF 590 PRINT "FROM ADDRESS ": G
    OSUB 530: IF S > A OR E <
    A OR A = 0 THEN B = 0: R
    ETURN
8D 600 B = S + 8 * INT ((A - S)
    / 8): RETURN
86 610 PRINT "DISK ERROR": GOTO
    150
```

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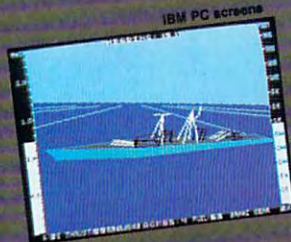
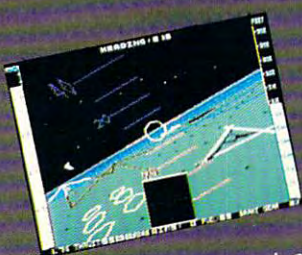
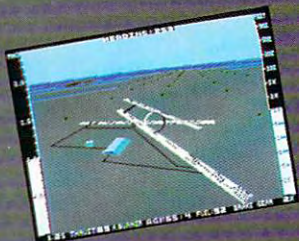
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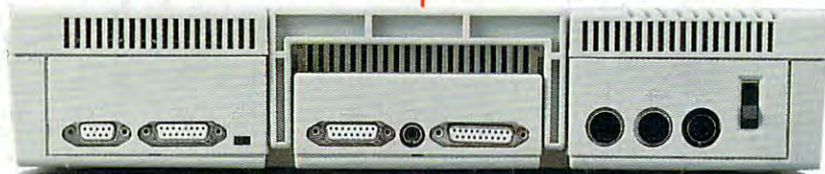


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