

What does this display tell you? It tells me that this person may be in trouble. He has only \$0A03 (2563 decimal) bytes left for his symbol table when he assembles this program. Depending on the size and number of his labels, that may or may not be enough space. But that's only the first problem.

Where is the object code going to go? Aside from poor, overworked page 6 (\$0600 to \$06FF), there just *isn't* any memory free (and page 6 probably isn't big enough to hold the output from this assembly, anyway). What to do? Well, the obvious answer is to assemble your object code directly to the tape recorder. You do that simply by giving the command:

ASM „#C:

to ASMED. Then you can use NEW, check memory with SIZE again, and LOAD the object code back in memory, ready to debug it. Not bad. Time-consuming, but it works.

Or does it? Many people complain that after producing an object tape they cannot reload it successfully (usually, they get an ERROR 138, timeout). Why? Simply because ASMED turns on the cassette recorder at the beginning of pass 1, even though it may be a minute or two before pass 2 writes anything to the tape. Also, if you are producing a listing, the time taken to write the tape increases to the point where other start/stop errors are possible. There is no total fix for these problems, but here are some suggestions which might help.

First, do your assembly twice, once for the object code and once for the listing. During the object code assembly, turn off the listing (by using .OPT NOLIST as, say, line 1). Before starting the assembly, zero your tape counter. Then, as the object code is assembled to cassette, listen in (turn up the volume on your television). When you hear the first burst of data being sent to the cassette (near the beginning of pass 2 of the assembly), note the value of the tape counter. Then, to reload the object tape, rewind the tape to about five to ten seconds ahead of the counter value you noted. And that's about as good as you can do using ASMED with a cassette recorder.

Before going on, I'd like to discuss a point I sidestepped a couple of paragraphs ago. I noted that the SIZE command gave the memory used by ASMED (exclusive of symbol table space). Perhaps not obvious to many first-time users of ASMED is that you may *not* direct object code (via *) to memory anywhere between those first and second numbers. (And you'd better leave a healthy hunk alone above the second number for the symbol table.)

What happens if you don't follow this rule?

Typically, you find that your object code tries to share space with your source. Bye-bye, source. Or, worse, you may find the object code sitting on top of the symbol table. This can cause some extremely bizarre symptoms. I have seen ASMED start spitting out hundreds of errors for a single line when this happened.

Despite the fact that ASMED is one of the most bug-free programs I have ever encountered, it has a few very bad design flaws. And as we just noted, one of them is that it will assemble code right on top of memory it is using for other purposes.

However, for the disk user with 40K or more of RAM, ASMED presents no real problems if used properly. Since both the source code *and* the object code may be on the disk, the only real limitations are the sizes of the files. Obviously, the object file can be loaded in after giving a NEW command, so it need only fit between the second and third numbers given when the SIZE command is used.

But what about the source file? At first glance, it might appear that your source file is limited to what can be edited in memory. Not so! Albeit tedious, there is a way to assemble very large source files with ASMED. Simply edit the source code in pieces, none larger than ASMED's buffer space. Then, when all are ready, use the *append* capability of Atari DOS's option C to append one file after another to the first piece of the source. (*Please* do this on a copy of your master disk. It's very easy to make a mistake and append in the wrong direction.) Now you can assemble this giant source file.

There are, of course, some real disadvantages with doing things this way. The biggest of these is obvious: What happens when you get an assembly error in the middle of the fourth of the appended files? You have to edit that file and then go through the backup and append process all over again. Another problem is simply the speed of ASMED. If you expect to assemble 16K of *object* code, even without a listing to the printer, you might as well go out to a movie while you wait. A double feature. Finally, ASMED's extravagant use of zero page memory (leaving you, the programmer, only about 32 bytes) can be a real killer with large programs.

Well, we've wandered a little off the original track here, but it's all been germane to the problems of assembling large programs on your Atari. Is there a general solution to these problems? Several, if you have a disk drive. What are they? Just a nice selection of other assemblers.

ASMED is a usable introduction to machine language programming, but it is (after all) only 8K bytes long, and a lot of features had to be pared to make it fit. So when it begins to grate

on your nerves, get rid of it. What do you get instead?

Since my company (OSS) produces MAC/65 (also a cartridge-based assembler, editor, and debugger), any answer I give is bound to be prejudiced. So I will simply tell you to go out and compare the prices, features, and speeds of the various assemblers available. You might, for instance, consult *The Book of Atari Software*, 1984, from either the Book Company or Addison-Wesley, which describes several assemblers and gives comparison charts. The advantage of getting a second assembler is that you now know what parts of ASMED you did *not* like, and you can look for assemblers that fix these areas.

16 Megabytes?

The topic heading here does not refer to any secret projects going on behind closed doors. Rather, I have been asked (more times than I can count) about the 16-bit version of the 6502 which has been developed by the Western Design Center (of Mesa, Arizona). I believe it is designated as the 65816, and is purported to be faster than a Motorola 68000 in many operations and capable of addressing 16 megabytes of memory. The question I am asked is fairly obvious: "Can I put this chip in my Atari and address 16 megabytes and make BASIC run faster and . . . ?" The answer is simple: *no*.

I can't let an answer like that sit around naked, so let's see if we can't flesh it out a bit. First, in order to address 16 megabytes, you have to have 16 megabytes. Have you seen any 800XLs with a lot of spare RAM floating around lately? Further, addressing 16 megabytes means you must have 24 address lines. (The 16 address lines in your Atari computer can access only 64K.) There simply isn't any place provided on the Atari circuit boards for such an expanded address bus.

Now, at least one version of the 65816 is purported to be pin-compatible with existing 6502s. If this is wrong, I apologize. I admit I am repeating what I have been told. Presuming this to be true, though, it may barely be possible to imagine an expansion box for an 800XL which can properly decode some sort of I/O signal to "bank" in additional RAM. I suspect, though, that the pin-compatible version may be so compatible that it limits you to 64K of memory.

So far, however, this highly hypothetical discussion has assumed that the chip will be compatible enough (with a 6502) to fool the rest of an 800XL's circuitry. I'm not convinced that this will prove to be true. Why? Because the 65C02 (which, you may or may not recall, is a CMOS version of the 6502 which adds a few—still all 8-bit—instructions and capabilities) does

not work in an 800XL. Even though it works great in older Atari 800s.

I am not sure why the 65C02 is incompatible with the 800XL, but I have been told it is because Atari started using a custom version of the 6502 in its newer machines. (The story is that the newer CPU is the same one found in the 2600 game machines, and it has one or two pins used differently.) In any case, the problems with the 65C02 cause me to doubt that the 65816 will enjoy a better fate.

Last, let us assume that you really can plunk a 65816 down into the middle of your 800XL. Will it do you any good? Not unless you are a heavyweight in machine language. Compatible means just that: It executes all standard 8-bit 6502 instructions in the same old way. And where are you going to get any of the new 16-bit instructions from? I dunno. It is extremely doubtful that any major software vendor will be able to justify the expense of developing programs which use the 65816 in an Atari, since using the chip involves doing nasty things to your computer that very, very few users are willing to try.

And there you have it. I hope I am wrong about much of the above, solely for my own personal satisfaction with such a 16-bit machine. But—sigh—I am probably mostly right. (But what if . . . nah . . . it couldn't happen.) ©



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PROGRAMMING THE TI

C. Regena

Multiplication Maze

First, a correction. In "Alphabet Song," which appeared in this column in the August issue, change line 1910 GOTO 330 to 1910 ON SP GOTO 330,340 so the program will work properly whether you have the speech synthesizer or not.

Readers have been sending quite a few letters about the "Simple Math" program in the July column. Many of you want to know how to rewrite the program to add higher numbers or modify it for subtraction, multiplication, or division. That particular program used numbers less than five so the sum would be less than ten, and the answer would be one digit. CALL KEY was used to get the answer. To use higher numbers or receive an answer that can be two digits, use two CALL KEY loops. It is better to avoid INPUT wherever possible because INPUT is so easy to crash. This month's program illustrates how to receive an answer that may be either one or two digits long.

Some of the following tips may be useful to you. For subtraction, choose a random number A from one to nine, then a random number B from one to nine. The total of the two numbers is $A+B$. For the subtraction problem, use $A+B$ for the top number, and B for the number to be subtracted. The answer will be A, which is a one-digit number. For multiplication, choose a random number A from one to nine, then a random number B from one to nine. The answer is $A*B$ and can be a one- or two-digit answer.

For division, choose a random number A from one to nine, then a random number B from one to nine. The product is $A*B$. To write a division problem, use $A*B$ for the dividend and B for the divisor. The answer will be A. This procedure makes sure you will have whole numbers

for the answers, and the answers will be one-digit numbers.

The Faster The Better

This month's program, "Multiplication Maze," is another example of a math drill. First, the program draws a maze. Within the maze are the numbers from one to nine. A random factor or multiplier is chosen and appears in the upper-left corner of the maze. The player uses the arrow keys (on E, S, D, and X) to move, and must go to each number on the maze and type the product of his factor times the number. The faster the player goes around the maze and gets all nine answers, the lower the time score will be. The player should try to get as low a time as possible. (The best score around our house was under 200.) The answer must be correct to continue, so if the student misses answers, it takes up valuable time.

Lines 100-240 clear the screen, then print the title and instructions. Lines 250 and 260 define graphics character 96 to be a solid white square for the design of the maze. If you want to economize, CALL COLOR(9,16,16) will also make a solid square, and you do not need to define character 96. The first method is used in case you want to add other objects in the maze and use other character numbers in color set 9. Lines 270-280 change the colors for the numbers to be printed in the maze so they will be black with a white background.

Line 290 uses DEF to define a function R(X) as a random number from 0 to $X-1$. This simplifies programming in later statements wherever random numbers are needed. For example, line 590 uses R(3) and R(5) to generate random numbers from 0 to 2 and from 0 to 4, respectively. Line 660 uses $R(9)+1$, which gives a random

number from 1 to 9.

Lines 300–350 READ values from DATA to limit nine areas for placing the numbers in the maze. The numbers are placed randomly, but this makes sure the numbers are spread throughout the maze. Each area goes from column XA(I) to XB(I) and from row YA(I) to YB(I). As you type the DATA statements, notice that there are three groups of four numbers for each DATA statement. Be sure you get the commas right and don't put an extra comma at the end of a line.

Keeping Track Of Data

Lines 360–440 define characters and symbols for the black-on-yellow color set. The RESTORE statement tells the computer to start reading the next data with line 410. Although this line is not necessary in this program, in general the RESTORE statement can help you keep track of which DATA statements go with which READ statements. In this case, if you happen to make a typing error in lines 330–350, it won't affect the data for the next READ statements, which need data in lines 410–420. These lines define the numbers in order, starting with character 104 as zero and continuing to character 104+9 as nine.

Line 450 initializes the lowest time or low score to be 99999. Later games will use whatever score has previously been the lowest score.

Lines 460–480 wait for the player to press a key to start the game. In the CALL KEY statement, if the status S is 0 or -1, either the same key is being pressed or no keys have been pressed. When a key is pressed, S will be 1.

Lines 490–500 clear the screen, then change the screen color to magenta. You can use whatever color you want (darker colors will look better with the white maze), but I've always liked purple.

Lines 510–560 draw a grid of white lines for the base of the maze. Lines 570–610 randomly erase some of the white squares to create the maze. The loop goes from row 3 to row 21, using only the odd-numbered rows. The CALL HCHAR statements pick a column from 4 to 8 and from 18 to 22 and draw a random number of spaces from 2 to 10. This automatically leaves some vertical paths throughout the maze so it is always possible to reach every point.

Lines 620–640 define the nine possible multipliers, the numbers from 1 to 9, in the array FF(I).

Lines 650–750 randomly place the nine multipliers in the nine areas of the screen, making sure the number has not been used before and that the number is on a white square.

Game Setup

Lines 760–800 initialize the variables which are

used to move the player's factor. The player's factor always starts in the upper-left corner of the maze, row 2 and column 4. NR and NC are used to calculate the new row and new column when the factor moves. P is the character number of the previous spot, or the white square.

Lines 810–820 randomly choose the player's factor, which is a number from 2 to 9. GR is then calculated, which will be the graphics character number for the factor with the yellow background.

Line 830 initializes the time T, which is used for scoring. T is incremented within the CALL KEY loops as the computer is waiting for the player to press an acceptable key.

Line 840 repeats the main game loop nine times, so the player needs to go to nine multipliers and give the answers.

Lines 850–890 place the player's factor on the maze and increment the time T. Lines 900–920 detect the player's keypress, which must be an arrow key. CALL KEY(1,K,S) checks the left half of the keyboard. If a key is not pressed, or the key pressed is not an arrow key, the program branches back to line 880 to increment the time. In line 910, the first check is $K+1 < 1$ because checking for zero does not always work with some TI-99/4A computers. Line 920 saves several IF-THEN statements by using an ON-GOTO statement. If an arrow key is pressed, K equals 0, 2, 3, or 5 and the program branches to the appropriate direction.

Checking For Valid Moves

Lines 930–1030 define DR and DC depending on the arrow key pressed. DR is the change in row number, and DC is the change in column number. Line 1040 calculates the possible new position on row NR and column NC. Lines 1060–1070 make sure the new position is still within the boundaries of the maze.

Line 1080 checks character G in the new position. In line 1090, if G is 96 or a white square, the move is valid, and the program branches back to line 850 to move the player's factor. But in lines 1100–1120, if G is 32 or a space, the player cannot move and the computer sounds a low beep. Then the program branches back to increment the time and get another keypress.

Line 1130 starts the procedure which results if the player's factor has hit another number. Line 1130 changes the number to an asterisk, and line 1140 sounds a prompting tone. Lines 1150–1190 print the multiplication problem on row 23. Since G is the character number of the number hit on the maze, $G-48$ is the number, AM. The number to be printed with a yellow background will be $104+AM$. The answer will be AM times the player's factor, M.

Lines 1200-1240 blink a question mark and increment the time while waiting for the student to press a number. This time, zero is used in the CALL KEY statement to detect a key pressed anywhere on the keyboard. Line 1240 makes sure the key pressed is a number from 1 to 9 to be accepted. Line 1250 prints the number the player presses.

Line 1260 calculates the correct answer B, and line 1270 defines B\$ as the player's answer. Line 1280 checks the length of the correct answer (which can be one or two digits). If the length is 2, then lines 1290-1350 get the player's second digit, which may be a number from 0 to 9. If the answer is only a one-digit number, the program branches to line 1360.

Sound Effects

Line 1360 checks the answer, and if the answer is incorrect, lines 1370-1420 play an "uh-oh" sound, clear the player's answer B\$, and branch back for another answer. The answer must be correct to continue the game.

Lines 1430-1460 play a musical arpeggio for the correct answer, then line 1470 clears the problem, and line 1480 continues the game for nine multipliers.

When all nine multipliers have been answered correctly, lines 1490-1510 play a tune of 30 random notes. Lines 1520-1530 clear the screen and print the score. Lines 1540-1560 calculate and print the lowest score.

Lines 1570-1610 print the option to try again and branch according to the player's keypress of Y or N. Line 1620 ends the program.

You can try this program as listed or adapt it to other types of problems. To modify it for addition, simply change all * signs to +. To change to division, you can use a factor M, then put all the possible quotients in the maze. To change to a nonmath subject, define some objects in the maze. Then whenever the player hits an object, print a history question, vocabulary word, or whatever.

If you want to save typing time and effort, I'll make you a copy of this program if you send a self-addressed, stamped envelope, a blank cassette or disk, plus a \$3 copying fee to:

C. Regena
P.O. Box 1502
Cedar City, UT 84720

Please be sure to specify the title of the program and that you need the TI version.

Multiplication Maze

```
100 CALL CLEAR
110 PRINT " *****
"
```

```
120 PRINT " * MULTIPLICATION MAZE *
"
130 PRINT " *****
"
140 PRINT ": "A RANDOM FACTOR IS CHO
SEN."
150 PRINT ": "USE THE ARROW KEYS TO M
OVE"
160 PRINT "AROUND THE MAZE."
170 PRINT ": "GO IN ANY ORDER AND TOU
CH"
180 PRINT "EACH OF THE NUMBERS IN T
HE"
190 PRINT "MAZE. AS YOU HIT A NUMB
ER"
200 PRINT "YOU WILL NEED TO MULTIPL
Y"
210 PRINT "THAT NUMBER TIMES THE FA
CTOR"
220 PRINT "AND TYPE THE PRODUCT "
230 PRINT ": "MOVE AS QUICKLY AS POSS
IBLE"
240 PRINT "TO GET THE LOWEST SCORE.
"
250 CALL CHAR(96,"FFFFFFFFFFFFFFFF"
)
260 CALL COLOR(9,16,1)
270 CALL COLOR(3,2,16)
280 CALL COLOR(4,2,16)
290 DEF R(X)=INT(X*RND)
300 FOR I=1 TO 9
310 READ XA(I),XB(I),YA(I),YB(I)
320 NEXT I
330 DATA 5,10,2,8,12,20,2,6,22,30,2
,8
340 DATA 4,10,10,16,12,20,8,14,22,3
0,10,16
350 DATA 4,10,18,22,12,20,16,22,22,
30,18,22
360 RESTORE 410
370 FOR I=0 TO 12
380 READ A$
390 CALL CHAR(104+I,A$)
400 NEXT I
410 DATA 00384444444438,00103010101
038,0038440810207C,003844180444
38,00081828487C08,0078407804443
8
420 DATA 00384078444438,007C0408102
02,00384438444438,003844443C047
8,0044287C2844,0000007C007C,003
8440810001
430 CALL COLOR(10,2,12)
440 CALL COLOR(11,2,12)
450 LT=99999
460 PRINT ": "PRESS ANY KEY TO START
"
470 CALL KEY(0,K,S)
480 IF S<1 THEN 470
490 CALL CLEAR
500 CALL SCREEN(14)
510 FOR I=2 TO 22 STEP 2
520 CALL HCHAR(I,4,96,27)
530 NEXT I
540 FOR I=4 TO 30 STEP 2
550 CALL VCHAR(3,I,96,19)
560 NEXT I
570 RANDOMIZE
580 FOR I=3 TO 21 STEP 2
590 CALL HCHAR(I,4+R(3)*2,32,R(5)*2
+2)
```

```

600 CALL HCHAR(1,18+R(3)*2,32,R(5)*
    2+2)
610 NEXT I
620 FOR I=1 TO 9
630 FF(I)=1
640 NEXT I
650 FOR I=1 TO 9
660 F(I)=R(9)+1
670 IF FF(F(I))=0 THEN 660
680 A(I)=F(I)
690 FF(F(I))=0
700 X(I)=R(XB(I)-XA(I))+XA(I)
710 Y(I)=R((YB(I)-YA(I))/2)*2+YA(I)
720 CALL GCHAR(Y(I),X(I),G)
730 IF G=32 THEN 700
740 CALL HCHAR(Y(I),X(I),48+F(I))
750 NEXT I
760 ROW=2
770 COL=4
780 P=96
790 NR=2
800 NC=4
810 M=R(8)+2
820 GR=104+M
830 T=0
840 FOR I=1 TO 9
850 CALL HCHAR(ROW,COL,P)
860 ROW=NR
870 COL=NC
880 T=T+1
890 CALL HCHAR(ROW,COL,GR)
900 CALL KEY(1,K,S)
910 IF (K+1<1)+(K>5) THEN 880
920 ON K+1 GOTO 930,880,960,990,880
    ,1020
930 DR=1
940 DC=0
950 GOTO 1040
960 DR=0
970 DC=-1
980 GOTO 1040
990 DR=0
1000 DC=1
1010 GOTO 1040
1020 DR=-1
1030 DC=0
1040 NR=ROW+DR
1050 NC=COL+DC
1060 IF (NR<2)+(NR>22) THEN 880
1070 IF (NC<4)+(NC>30) THEN 880
1080 CALL GCHAR(NR,NC,G)
1090 IF G=96 THEN 850
1100 IF G<>32 THEN 1130
1110 CALL SOUND(50,165,4)
1120 GOTO 880
1130 CALL HCHAR(NR,NC,114)
1140 CALL SOUND(150,1497,2)
1150 CALL HCHAR(23,14,GR)
1160 CALL HCHAR(23,15,114)
1170 AM=G-48
1180 CALL HCHAR(23,16,104+AM)
1190 CALL HCHAR(23,17,115)
1200 CALL HCHAR(23,18,32)
1210 CALL HCHAR(23,18,116)
1220 T=T+1
1230 CALL KEY(0,KEY,ST)
1240 IF (KEY<49)+(KEY>57) THEN 1200
1250 CALL HCHAR(23,18,KEY-48+104)
1260 B=AM*M
1270 B$=CHR$(KEY)
1280 IF LEN(STR$(B))<2 THEN 1360

```

```

1290 CALL HCHAR(23,19,32)
1300 CALL HCHAR(23,19,116)
1310 T=T+1
1320 CALL KEY(0,KEY,ST)
1330 IF (KEY<48)+(KEY>57) THEN 1290
1340 CALL HCHAR(23,19,KEY-48+104)
1350 B$=B$&CHR$(KEY)
1360 IF B$=STR$(B) THEN 1430
1370 CALL SOUND(100,330,3)
1380 CALL SOUND(100,292,3)
1390 B$=""
1400 CALL HCHAR(23,19,32)
1410 CALL HCHAR(23,18,116)
1420 GOTO 1230
1430 CALL SOUND(100,524,3)
1440 CALL SOUND(100,660,3)
1450 CALL SOUND(100,784,3)
1460 CALL SOUND(150,1048,3)
1470 CALL HCHAR(23,14,32,6)
1480 NEXT I
1490 FOR I=1 TO 30
1500 CALL SOUND(40,R(500)+900,2)
1510 NEXT I
1520 CALL CLEAR
1530 PRINT "YOUR SCORE IS";T
1540 IF T>LT THEN 1560
1550 LT=T
1560 PRINT :::"THE LOWEST SCORE IS"
    ;LT
1570 PRINT :::::"TRY AGAIN--Y OR N"
1580 CALL KEY(0,K,S)
1590 IF K=89 THEN 490
1600 IF K<>78 THEN 1580
1610 PRINT : "NO" ::
1620 END

```

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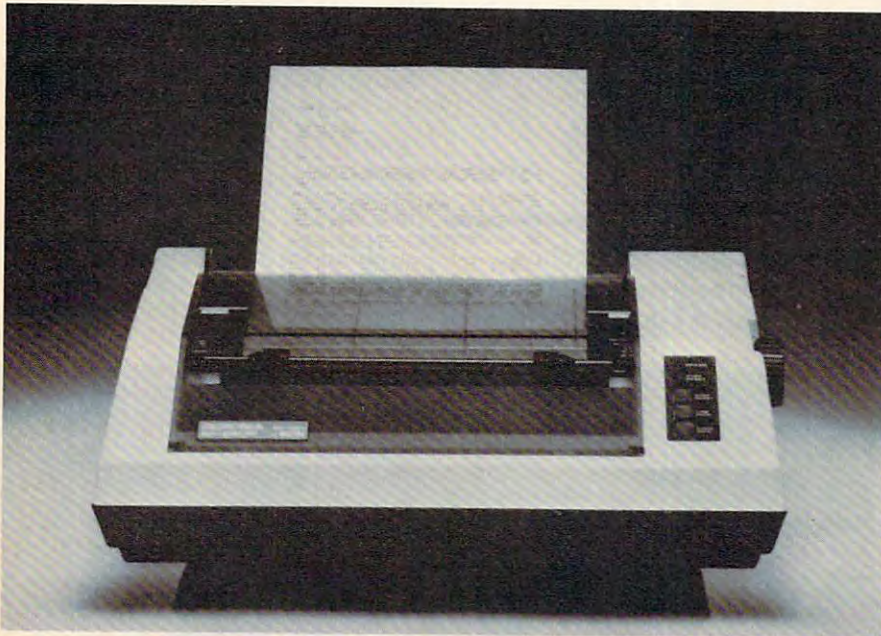
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NEWS & PRODUCTS



Axiom Corporation's GP-550 dot-matrix printer offers both draft and near letter-quality printing for \$299.

Dual Mode Dot-Matrix Printer

A \$299 dot-matrix printer that can print in both near letter-quality and draft modes, the GP-550, has been introduced by Axiom Corporation. It is compatible with most personal computers.

In draft mode, the GP-550 can print up to 86 characters per second with six different character sets: pica, expanded pica, elite, expanded elite, condensed, and expanded condensed. The near letter-quality mode prints up to 43 characters per second and has 12 character sets: pica, expanded pica, elite, expanded elite, italic, expanded italic, superscript, expanded superscript, expanded subscript, subscript, proportional, and expanded proportional.

The printer also has a high-resolution graphics mode with 140 different characters, 18 different print fonts, and self-testing.

The GP-550 can print three copies, including the original, on either fanfold or cut sheet paper. It offers both pinfeed and friction feed as well as bottom feed.

Built-in interfaces for many home computers, such as Apple, Commodore, Atari, and Texas Instruments, are included. An additional model, the GP-550PC, has an interface for the IBM PC and PC compatibles. Units with built-in interfaces start at \$319.

Axiom Corporation
1014 Griswold Avenue
San Fernando, CA 91340

Health Monitoring System For Apple, IBM

Avant-Garde Publishing Corporation has introduced *An Apple A Day . . .*, the first entry in its To Your Health series, which includes a data base for medical information and a treatment guide for many ailments.

Designed to run on Apple II and IBM PC computers, the program has files for names, addresses, phone numbers, and directions to all family medical and emergency facilities. It also has space to keep information on health-related tax deductions and insurance policies.

Other files keep track of immunization records, physician visits, x-rays, lab tests, and special conditions such as allergies to medications.

Suggested retail price for Apple II computers with 48K of memory and one or two disk drives is \$79.95. The IBM PC version, which requires 64K of memory, retails for \$99.95.

Avant-Garde
P.O. Box 30160
1907 Garden Avenue
Eugene, OR 97403

Commodore Magazine Indexes

Altacom, Inc. has introduced *PcDex* and *PcDex Quarterly*, two magazine resource guides for the Commodore 64, VIC-20,

and PET/CBM computers.

PcDex indexes items from 12 Commodore and related general microcomputer magazines—including *COMPUTE!* and *COMPUTE!'s GAZETTE*—in six separate categories: subject, title, program listings, software reviews, hardware reviews, and tables of contents. Other features include cross-referencing, program descriptions, updates and revisions, specific machine requirements, and suggestions for locating back issues.

The guide covers magazines published between January 1982 and April 1984. Yearly updates to include the current three years also are planned.

PcDex Quarterly follows the same format, but will be published four times a year with an annual cumulation. It will include any new publications which appear. *PcDex Quarterly* is available by subscription only at \$17.95 for one year. *PcDex* is available for \$14.95.

Altacom, Inc.
P.O. Box 19070
Alexandria, VA 22314

Strategy Game For 64, Atari

One of the new releases from Microcomputer Games is *Panzer-Jagd*, a solitaire strategy game for the Commodore 64 and Atari home computers that simulates a tank battle between the Russians and the Germans in 1943.

As leader of the German tank division, you maneuver your troops across the terrain of the Soviet Union. The mission is to capture the sector.

The Atari version of *Panzer-Jagd* also includes *Panzerrun*, which adds new terrain and victory conditions to the game. As the leader of a diversionary attack, the mission is to penetrate as far as possible through

enemy lines.

Cassette versions for the 64 and Atari with 32K of memory retail for \$25. The disk version for Atari with 48K of memory and the Commodore 64 retails for \$30.

Microcomputer Games
The Avalon Hill Game Company
4517 Harford Road
Baltimore, MD 21214

Integrated Software For Apple IIc

Word processing, budgeting, and list management functions are integrated into one software

package in *Jane*, now available for the Apple IIc from Arktronics Corporation.

Jane utilizes a set of pictures to represent system commands and functions. Four onscreen windows allow all three applications to be displayed and used at the same time.

The package includes *Janewrite*, a word processor; *Janecalc*, a spreadsheet calculator; and *Janelist*, a personal filing system.

Jane runs on all Apple II computers with at least 64K of memory. Suggested retail price is \$179.

Arktronics Corporation
520 East Liberty Street
Ann Arbor, MI 48104



Cardco has released the CARD/?AT, a parallel printer interface for Atari home computers.

Parallel Printer Interface For Atari

Cardco has announced CARD/?AT, a parallel interface for Atari computers that allows users to connect their computers with any standard parallel printer.

The interface supports all standard Atari printing commands, and works with all standard Atari programs. The Atari

850 Interface Module is not needed. All cables and connectors are included with the interface.

The suggested retail price of the CARD/?AT is \$79.95.

Cardco, Inc.
300 South Topeka
Wichita, KS 67202

www.commodore.ca

LET'S CLEAR UP A 'BASIC' MISUNDERSTANDING ABOUT COMPUTERS.

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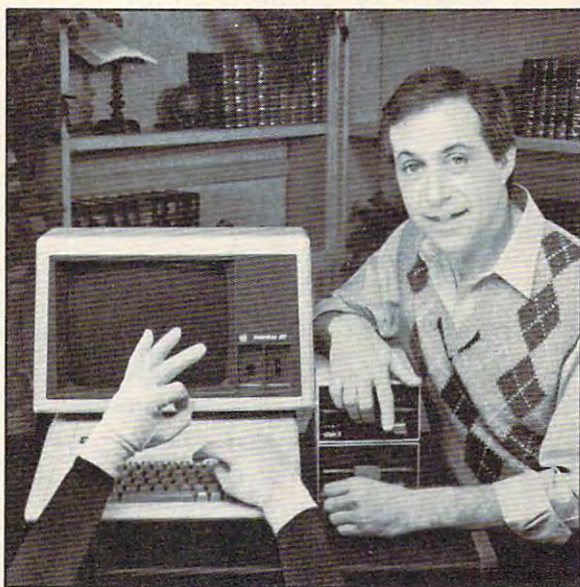
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Memory Expansion, Mouse For PCjr

PCjr Booster, an expansion card which adds 128K of Random Access Memory (RAM) to the IBM PCjr, has been introduced by Microsoft Corporation. The booster also is available with a serial mouse which supports *Colorpaint*, a drawing program for the PCjr.

In addition to the memory expansion, the booster includes a clock/calendar, mouse support, and a copy of Microsoft's *Flight Simulator*.

It enables the PCjr to run languages and large programs such as Microsoft's *Multiplan* and *Lotus 1-2-3* at faster speeds. JBASIC, a software enhancement to the IBM BASIC cartridge, also is included. It allows standard BASIC programs to run on the PCjr as much as 22 percent faster, with twice as much screen memory.

The PCjr Booster with sockets for 128K of memory retails for \$295; with the memory included, the retail price is \$495. Microsoft's serial mouse is available for \$195.

Microsoft Corporation
10700 Northup Way
Bellevue, WA 98004

Home Financial Management Software

Your Personal Net Worth, a home financial management software system for Apple, Atari, Commodore 64, and IBM PCjr computers, has been announced by Scarborough Systems, Inc.

The program comes with two disks, one of which has been preformatted with accounts, but only one disk drive

is necessary.

Functions of the program include: setting up a budget with up to 350 categories; keeping a record of all banking and credit card transactions; maintaining a record of the user's net worth; listing tax deductible items; recording stock, bond, and other investment transactions; and documenting household valuables, collectibles, and important papers.

The Apple, Atari, and Commodore 64 formats retail for \$79.95. The PCjr version retails for \$99.95.

Scarborough Systems, Inc.
25 North Broadway
Tarrytown, NY 10591

Text Adventure For Commodore, Atari, Apple, IBM

Epyx has introduced a new text adventure game based on Isaac Asimov's science fiction detective novel, *Robots of Dawn*. The game is available in versions for the Commodore 64, Atari, Apple, and IBM PC and PCjr computers.

In *Robots of Dawn*, you play the detective "Lije" Bailey as you investigate the murder of Dr. Fastolfe, the father of positronic humanoid robot design. You question an array of suspects from far-flung cultures to determine who committed the murder. Even your robotic friend, R. Daneel, is under suspicion. Visit parts of the city uncovering clues, question suspects, and try to find anyone with a motive.

Circumstances vary each time you play the game, and you can engage in conversations with the game's characters.

The retail price is expected to be in the \$29-\$35 range for the different computers.

Epyx, Inc.
1043 Kiel Court
Sunnyvale, CA 94089

Atari to CP/M Computer Interface

USS Enterprises has introduced an Atari XL version of its Critical Connection, an Atari to CP/M computer interface which allows an Atari owner to use the disk drives, printer, and keyboard of any computer system running CP/M, as long as the system has a serial port at 19,200 baud.

The original version works with Atari 400 and 800 computers. The new version, Critical Connection XL, interfaces Atari XL computers with CP/M units.

Features include automatic install for many systems, including Kaypro, Heath-Zenith, and NorthStar; hardware that connects the CP/M serial port to the Atari disk/printer port; and software.

Both versions of Critical Connection have a suggested retail price of \$175. The company requests that the names of both the Atari and CP/M system be provided when ordering.

USS Enterprises
6708 Landerwood Lane
San Jose, CA 95120

New Product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

COMPUTE! welcomes notices of upcoming events and requests that the sponsors send a short description, their name and phone number, and an address to which interested readers may write for further information. Please send notices at least three months before the date of the event, to: Calendar, P.O. Box 5406, Greensboro, NC 27403.

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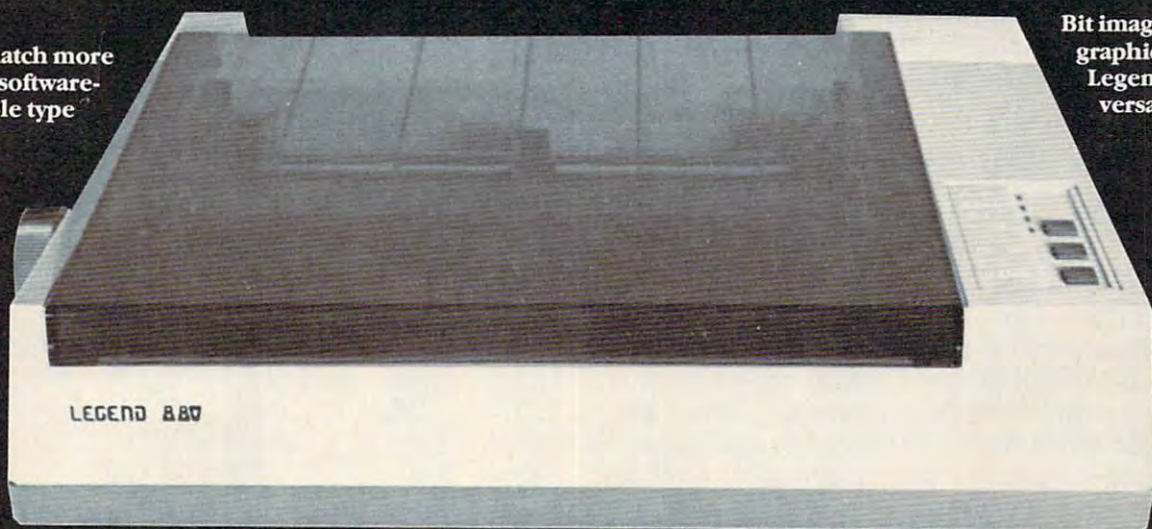
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For more information, contact:
CAL-ABCO Peripherals Division
6041 Variel Avenue, Woodland Hills
CA 91367. Telephone (818) 704-9100
Outside CA call toll free 1-800-321-4484
Telex 662436. Dealer inquiries invited

COMPUTE!'s Guide To Typing In Programs

Before typing in any program, you should familiarize yourself with your computer. Learn how to use the keyboard to type in and correct BASIC programs. Read your manuals to understand how to save and load BASIC programs to and from your disk drive or cassette unit. Computers are precise—take special care to type the program *exactly* as listed, including any necessary punctuation and symbols. To help you with this task, we have implemented a special listing convention as well as a program to help check your typing—the “Automatic Proofreader.” Please read the following notes before typing in any programs from COMPUTE!. They can save you a lot of time and trouble.

Since programs can contain some hard-to-read (and hard-to-type) special characters, we have developed a listing system that spells out in abbreviated form the function of these control characters. You will find these special characters within curly braces. For example, {CLEAR} or {CLR} instructs you to insert the symbol which clears the screen on the Atari or Commodore machines. A 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. Commodore machines have a special control key labeled with the Commodore logo. Graphics characters entered with the Commodore logo key are enclosed in a new kind of special bracket. A graphics character can be listed as [<A>]. In this case, 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.

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 (printed in white on black) should be entered with the Atari logo key. Since spacing is sometimes important, any more than two spaces will be listed, for example, as: {6 SPACES}. A space is never left at the end of a line, but will be moved to the next printed line as {SPACE}. There are no special control characters found in our IBM PC/PCjr, TI-99/4A, and Apple program listings. For your convenience, we have prepared this quick-reference key for the Commodore and Atari special characters:

Atari 400/800/XL

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

When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	⌫	{GRN}	CTRL 6	⌫
{HOME}	CLR/HOME	⌫	{BLU}	CTRL 7	⌫
{UP}	SHIFT ↑ CRSR ↓	⬆	{YEL}	CTRL 8	⌫
{DOWN}	↓ CRSR ↑	⬇	{F1}	f1	⌫
{LEFT}	SHIFT ← CRSR →	⬅	{F2}	f2	⌫
{RIGHT}	→ CRSR ←	➡	{F3}	f3	⌫
{RVS}	CTRL 9	⌫	{F4}	f4	⌫
{OFF}	CTRL 0	⌫	{F5}	f5	⌫
{BLK}	CTRL 1	⌫	{F6}	f6	⌫
{WHT}	CTRL 2	⌫	{F7}	f7	⌫
{RED}	CTRL 3	⌫	{F8}	f8	⌫
{CYN}	CTRL 4	⌫			⌫
{PUR}	CTRL 5	⌫			⌫

The Automatic Proofreader

Also, we have developed a simple, yet effective program that can help check your typing. Type in the appropriate Proofreader program for your machine, then save it for future use. On the VIC, 64, or Atari, run the Proofreader to activate it, then enter NEW to erase the BASIC loader (the Proofreader will still be active, hidden in memory, as a machine language program). Pressing RUN/STOP-RESTORE or SYSTEM RESET deactivates the Proofreader. You can use SYS 886 to reactivate the VIC/64 Proofreader, or PRINT USR(1536) to reenable the Atari Proofreader. The IBM Proofreader is a BASIC program that lets you enter, edit, list, save, and load programs that you type. It simulates the IBM's BASIC line editor.

Using The Automatic Proofreader

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a number (on the Commodore) or a pair of letters

(Atari or IBM) appears. The number or pair of letters is called a *checksum*. Try making a change in the line, and notice how the checksum changes.

All you need to do is compare the value provided by the Proofreader with the checksum printed in the program listing in the magazine. In Commodore listings, the checksum is a number from 0 to 255. It is set off from the rest of the line with *rem*. This prevents a syntax error if the checksum is typed in, but the REM statements and checksums need *not* be typed in. It is just there for your information.

In Atari and IBM listings, 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) and compare the checksum generated by the Proofreader to the checksum in the listing. If they match, go on to the next line. If not, check your typing: You've made a mistake. On the Commodore and Atari Proofreader, spaces are not counted as part of the checksum, and no check is made to see that you've typed in the characters in the right order. If characters are transposed, the checksum will still match the listing. Because of the checksum method used, do not use abbreviations, such as ? for PRINT. However, the Proofreader does catch the majority of typing errors most people make. The IBM Proofreader is even pickier; it *will* detect errors in spacing and transposition. Also, be sure you leave Caps Lock on, except when you need to enter lowercase characters.

Special Proofreader Notes For Commodore Cassette Users

The Proofreader resides in the cassette buffer, which is used during tape LOADs and SAVEs. Be sure to press RUN/STOP-RESTORE before you save or load a program, to get the Proofreader out of the way. If you want to use the Proofreader with tape, run the Proofreader, then enter these two lines *exactly* as shown, pressing RETURN after each one:

```
A$="PROOFREADER.T":B$="{10 SPACES}"
:FORX=1TO4:A$=A$+B$:NEXT
FORX=886TO1018:A$=A$+CHR$(PEEK(X))
:NEXT:OPEN 1,1,A$:CLOSE1
```

Then press RECORD and PLAY on a blank tape, and a special version of the Proofreader will be saved to tape. Anytime you need to reload the Proofreader after it has been erased, just rewind the tape, type OPEN1:CLOSE1, then press PLAY. When READY comes back, enter SYS 886.

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 will prompt 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 into the normal BASIC environment (this will replace the Proofreader in memory). You can now run the program, but you may want to resave 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 a program to Proofreader format, save it to disk with SAVE "filename",A.

VIC/64 Proofreader

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MADE {SPACE}AN ERROR":PRINT"IN DATA STATEMENTS.":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Atari Proofreader

```
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
1536 DATA 104,160,0,185,26,3
1542 DATA 201,69,240,7,200,200
1548 DATA 192,34,208,243,96,200
1554 DATA 169,74,153,26,3,200
1560 DATA 169,6,153,26,3,162
1566 DATA 0,189,0,228,157,74
1572 DATA 6,232,224,16,208,245
1578 DATA 169,93,141,78,6,169
1584 DATA 6,141,79,6,24,173
1590 DATA 4,228,105,1,141,95
1596 DATA 6,173,5,228,105,0
1602 DATA 141,96,6,169,0,133
1608 DATA 203,96,247,238,125,241
1614 DATA 93,6,244,241,115,241
1620 DATA 124,241,76,205,238,0
1626 DATA 0,0,0,0,32,62
1632 DATA 246,8,201,155,240,13
1638 DATA 201,32,240,7,72,24
1644 DATA 101,203,133,203,104,40
1650 DATA 96,72,152,72,138,72
1656 DATA 160,0,169,128,145,88
1662 DATA 200,192,40,208,249,165
1668 DATA 203,74,74,74,74,24
1674 DATA 105,161,160,3,145,88
1680 DATA 165,203,41,15,24,105
1686 DATA 161,200,145,88,169,0
1692 DATA 133,203,104,170,104,168
1698 DATA 104,40,96

```

IBM Proofreader

```

10 'Automatic Proofreader Version 2.00 (
  Lines 270,510,515,517,620,630 changed
  from V1.0)
100 DIM L$(500),LNUM(500):COLOR 0,7,7:KE
  Y OFF:CLS:MAX=0:LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,CHR$(4)+CHR
  $(70):ON KEY(15) GOSUB 640:KEY (15)
  ON:GOTO 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:PRINT"Proofr
  eader Ready."
150 LINE INPUT L$:Y=CSRLIN-INT(LEN(L$)/W
  )-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:POKE 1052,34:
  POKE 1054,0:POKE 1055,79:POKE 1056,1
  3:POKE 1057,28:LINE INPUT L$: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$=MID$(L$,4)
190 LNUM=VAL(L$):TEXT$=MID$(L$,LEN(STR$(
  LNUM))+1)
200 IF ASC(L$)>57 THEN 260 'no line numb
  er, therefore command
210 IF TEXT$="" THEN GOSUB 540:IF LNUM=L
  NUM(P) THEN GOSUB 560:GOTO 150 ELSE
  150
220 CKSUM=0:FOR I=1 TO LEN(L$):CKSUM=(CK
  SUM+ASC(MID$(L$,I))*I) AND 255:NEXT:
  LOCATE Y,1:PRINT CHR$(65+CKSUM/16)+C
  HR$(65+(CKSUM AND 15))+""+L$
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(MI
  D$(L$,I)):TEXT$=TEXT$+CHR$(A+32*(A>9
  6 AND A<123)):NEXT

```

```

270 DELIMITER=INSTR(TEXT$," "):COMMAND$=
  TEXT$:ARG$="":IF DELIMITER THEN COMM
  AND$=LEFT$(TEXT$,DELIMITER-1):ARG$=M
  ID$(TEXT$,DELIMITER+1) ELSE DELIMITE
  R=INSTR(TEXT$,CHR$(34)):IF DELIMITER
  THEN COMMAND$=LEFT$(TEXT$,DELIMITER
  -1):ARG$=MID$(TEXT$,DELIMITER)
280 IF COMMAND$<>"LIST" THEN 410
290 OPEN "scrn:" FOR OUTPUT AS #1
300 IF ARG$="" THEN FIRST=0:P=MAX-1:GOTO
  340
310 DELIMITER=INSTR(ARG$,"-"):IF DELIMIT
  ER=0 THEN LNUM=VAL(ARG$):GOSUB 540:F
  IRST=P:GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELIMITER)):LAS
  T=VAL(MID$(ARG$,DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRST=P:LNUM=LA
  ST:GOSUB 540:IF P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(STR$(LNUM(X
  )),2)+""
350 IF CKFLAG=0 THEN A$="":GOTO 370
360 CKSUM=0:A$=N$+L$(X):FOR I=1 TO LEN(A
  $):CKSUM=(CKSUM+ASC(MID$(A$,I))*I) A
  ND 255:NEXT:A$=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 OPEN "lpt1:
  " FOR OUTPUT AS #1:GOTO 300
420 IF COMMAND$="CHECK" THEN CKFLAG=1:GO
  TO 290
430 IF COMMAND$<>"SAVE" THEN 450
440 GOSUB 600:OPEN ARG$ FOR OUTPUT AS #1
  :ARG$="":GOTO 300
450 IF COMMAND$<>"LOAD" THEN 490
460 GOSUB 600:OPEN ARG$ FOR INPUT AS #1:
  MAX=0:P=0
470 WHILE NOT EOF(1):LINE INPUT #1,L$:LN
  UM(P)=VAL(L$):L$(P)=MID$(L$,LEN(STR$(
  VAL(L$)))+1):P=P+1:WEND
480 MAX=P:CLOSE #1:GOTO 130
490 IF COMMAND$="NEW" THEN INPUT "Erase
  program - Are you sure":L$:IF LEFT$(
  L$,1)="y" OR LEFT$(L$,1)="Y" THEN MA
  X=0:GOTO 130:ELSE 130
500 IF COMMAND$="BASIC" THEN COLOR 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 130
540 P=0:WHILE LNUM>LNUM(P) AND P<MAX:P=P
  +1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:LNUM(X)=LNU
  M(X+1):L$(X)=L$(X+1):NEXT:RETURN
580 MAX=MAX+1:FOR X=MAX TO P+1 STEP -1:L
  NUM(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$(ARG$,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"Stopped.":RE
  TURN 150
650 PRINT "Error #":ERR:RESUME 150

```

MLX Machine Language Entry Program For Commodore 64

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost fail-safe entry of machine language programs published in COMPUTE!. You need to know nothing about machine language to use MLX—it was designed for everyone.

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file.

Using MLX

Type in and save the appropriate version of MLX (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX for the 64 asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

When you run MLX, you'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the space bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, 64 MLX redefines part of the keyboard as a numeric keypad (lines

581-584):

U	I	O		7	8	9
H	J	K	L	become	0	4 5 6
M	,	.			1	2 3

64 MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later. MLX recognizes these commands:

SHIFT-S: Save
SHIFT-L: Load
SHIFT-N: New Address
SHIFT-D: Display

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk, as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

64 MLX: Machine Language Entry

```
10 REM LINES CHANGED FROM MLX VERSION 2.0
   0 ARE 750,765,770 AND 860           :rem 50
20 REM LINE CHANGED FROM MLX VERSION 2.01
   IS 300                               :rem 147
100 PRINT"[CLR]";CHR$(142);CHR$(8);:PO
    KE53281,1:POKE53280,1              :rem 67
```

```

101 POKE 788,52:REM DISABLE RUN/STOP :rem 119
110 PRINT"[RVS]{39 SPACES}"; :rem 176
120 PRINT"[RVS]{14 SPACES}[RIGHT]{OFF}[*]
    £[RVS]{RIGHT} {RIGHT}{2 SPACES}[*]
    {OFF}[*]£[RVS]£[RVS]{14 SPACES}"; :rem 250
130 PRINT"[RVS]{14 SPACES}[RIGHT] [G]
    {RIGHT} {2 RIGHT} {OFF}£[RVS]£[*]
    {OFF}[*]{RVS}{14 SPACES}"; :rem 35
140 PRINT"[RVS]{41 SPACES}" :rem 120
200 PRINT"{2 DOWN}[PUR]{BLK} MACHINE LANG
    UAGE EDITOR VERSION 2.02{5 DOWN}" :rem 238
210 PRINT"[5]{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}"; :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F) :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210 :rem 235
225 PRINT:PRINT:PRINT :rem 180
230 PRINT"[5]{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F) :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230 :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230 :rem 176
260 PRINT:PRINT:PRINT :rem 179
300 PRINT"[CLR]";CHR$(14):AD=S :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":": :rem 33
315 FORJ=ATO6 :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320 :rem 228
390 IFN=-211THEN 710 :rem 62
400 IFN=-204THEN 790 :rem 64
410 IFN=-206THENPRINT:INPUT"[DOWN]ENTER N
    EW ADDRESS";ZZ :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410 :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310 :rem 238
420 IF N<>-196 THEN 480 :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0 :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":": :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);":": :rem 66
460 GETA$:IFA$>" "THENPRINT:PRINT:GOTO310 :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310 :rem 50
480 IFN<0 THEN PRINT:GOTO310 :rem 168
490 A(J)=N:NEXTJ :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    ); :rem 94
511 IFN=-1THENA=6:GOTO315 :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530 :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000 :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0 :rem 227
550 AD=AD+6:IF AD<E THEN 310 :rem 212
560 GOTO 710 :rem 108
570 N=0:Z=0 :rem 88
580 PRINT"[£]"; :rem 81
581 GETA$:IFA$=" "THEN581 :rem 95
582 AV=- (A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0" :rem 134
584 IFAV>0THENA$=CHR$(48+AV) :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670 :rem 229
590 IFA>128THENN=-A:RETURN :rem 137
600 IFA<>20 THEN 630 :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}[LEFT] {LEFT}";:GOTO690 :rem 62
620 GOTO570 :rem 109
630 IFA<48ORA>57THEN580 :rem 105
640 PRINTA$;:N=N*10+A-48 :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600 :rem 229
660 Z=Z+1:IFZ<3THEN580 :rem 71
670 IFZ=0THENGOSUB1000:GOTO570 :rem 114
680 PRINT",";:RETURN :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
    :rem 149
691 FORI=1TO3:T=PEEK(S%-1) :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
    :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN :rem 7
710 PRINT"[CLR]{RVS}*** SAVE ***{3 DOWN}"
    :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
    ALONE TO CANCEL SAVE){DOWN}":rem 106
720 F$="":INPUT"[DOWN] FILENAME";F$:IFF$=
    ""THENPRINT:PRINT:GOTO310 :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)" :rem 228
740 GETA$:IFA$<>"T"ANDAS$<>"D"THEN740 :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15 :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$)
    ):POKE782,ZK/256 :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469 :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66 :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253 :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496 :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780 :rem 111
775 PRINT"[DOWN]DONE.{DOWN}":GOTO310 :rem 113
780 PRINT"[DOWN]ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720 :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720 :rem 103
790 PRINT"[CLR]{RVS}*** LOAD ***{2 DOWN}"
    :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
    ALONE TO CANCEL LOAD)" :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO310 :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)" :rem 227
820 GETA$:IFA$<>"T"ANDAS$<>"D"THEN820 :rem 34

```

```

830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
      :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$)
      ):POKE782,ZK/256
      :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
      T$):SYS65469
      :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
      66
      :rem 70
850 POKE780,0:SYS65493
      :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
      :rem 111
865 PRINT"[DOWN]DONE.":GOTO310
      :rem 96
870 PRINT"[DOWN]ERROR ON LOAD.{2 SPACES}T
      RY AGAIN.{DOWN}":IFDV=1THEN800
      :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
      ;E2$:CLOSE15:GOTO800
      :rem 102
1000 REM BUZZER
      :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
      165
      :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
      5
      :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
      273,0:POKE54272,0:RETURN
      :rem 202
2000 REM BELL SOUND
      :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
      47
      :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
      ,0
      :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
      :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
      GOTO1000
      :rem 89

```

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Modifications Or Corrections To Previous Articles

Atari Canyon Runner

The problem with this game from the October issue (Program 4, page 68) is not just a few missing bytes, as it might appear. A defective version of the program which creates MLX format listings added extraneous numbers to the machine language data. Fortunately, the problem is relatively easy to fix, and if you saved your typing you haven't lost any work.

If you haven't typed in "Canyon Runner" yet, you should enter the data as shown in the October issue. After you enter line 9896, you can either use the MLX Save option (CTRL-S), or add the line 9902 shown below to move to the Save feature. After you have a complete copy of Canyon Runner as published, proceed with the correction process.

First, create a temporary modified version of MLX to remove invalid bytes from your Canyon Runner data. Do this by adding one of the following sets of lines to MLX:

- If you created a boot tape, add:

```

AJ 935 IF NOT READ THEN 940
BA 936 BUFFER$(FIN-BEG+103)=CHR$(0)
      : BUFFER$(277)=BUFFER$(281)
      : BUFFER$(529)=BUFFER$(533)
      : BUFFER$(781)=BUFFER$(785)
WJ 937 BUFFER$(1033)=BUFFER$(1037)
      : BUFFER$(1285)=BUFFER$(1289)
      : BUFFER$(1537)=BUFFER$(1541)
```

- If you created a binary file on disk, add:

```

AF 825 IF NOT READ THEN 830
FL 826 BUFFER$(FIN-BEG+127)=CHR$(0)
      : BUFFER$(253)=BUFFER$(257)
      : BUFFER$(505)=BUFFER$(509)
      : BUFFER$(757)=BUFFER$(761)
KF 827 BUFFER$(1009)=BUFFER$(1013)
      : BUFFER$(1261)=BUFFER$(1265)
      : BUFFER$(1513)=BUFFER$(1517)
```

- If you created a boot disk, add:

```

NH 1185 BUFFER$(283)=BUFFER$(287)
      : BUFFER$(535)=BUFFER$(539)
      : BUFFER$(787)=BUFFER$(791)
OG 1186 BUFFER$(1039)=BUFFER$(1043)
      : BUFFER$(1291)=BUFFER$(1295)
      : BUFFER$(1543)=BUFFER$(1547)
```

These changes are only for fixing Canyon Runner; they are *not* corrections to MLX, and you should not incorporate them as permanent modifications to MLX. The only errors in Atari MLX as published in the October issue were in the article, which failed to mention that on the Atari the special MLX functions are obtained

with the CTRL key instead of the SHIFT key. For example, press CTRL-S to save your typing, CTRL-L to reload, CTRL-N to switch to a new address, etc. Also, the instructions for using the LOAD command are only for the Commodore 64.

Next, run the modified MLX (use 8192 for the start and run/init addresses, and 9904 as the ending address). Use the Load option (CTRL-L) to reload your Canyon Runner data. Use the Display option (CTRL-D) to examine lines 9866-9896. The data which was previously at lines 9890 and 9896 should appear to have moved up to 9866-9872. If this is not the case, check your typing of the MLX modifications and repeat this step.

Finally, use the MLX New Address option (CTRL-N) to change the entry address to 9878, then add the following lines:

```

9878: 114, 105, 102, 032, 116, 105, 212
9884: 104, 101, 109, 097, 103, 121, 023
9890: 116, 108, 117, 099, 105, 102, 041
9896: 102, 105, 100, 000, 000, 000, 219
9902: 000, 000, 000, 000, 000, 000, 174
```

After you enter line 9902, MLX will move to the Save option. For safety, don't overwrite your existing copy of the Canyon Runner data. Use a different tape or disk if you are creating a boot version, or a different filename if you are creating a binary file. The result should be a working copy of Canyon Runner.

VIC Horse Racing

To get the proper checksum for line 670 of this game from the October issue (page 84), add a hyphen between BETS and HORSE. This correction should not affect the operation of the game.

COMPUTE!'s PC & PCjr Magazine Corrections

The following are corrections for the final issue of COMPUTE!'s PC & PCjr magazine (October):

The IBM Automatic Proofreader in that issue (page 49) contains errors in lines 360 and 620 that cause problems with saving and loading programs. The lines should read:

```

360 CKSUM=0: A$=N$+L$(X): FOR I=1 TO LEN(A$): CKSUM=(CKSUM+ASC(MID$(A$, I)
      *I) AND 255: NEXT I: A$=CHR$(65+CKSUM/16)+CHR$(65+(CKSUM AND 15))+ "
620 IF INSTR(ARG$, ".")=0 THEN ARG$=ARG$+".BAS"
```

Early versions of the IBM Automatic Proofreader also require that you insert a space between a SAVE or LOAD command and the filename. The current version does not.

Line 1360 was omitted from "Pyramid Power" (page 40). This line should read 1360 REM.

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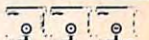
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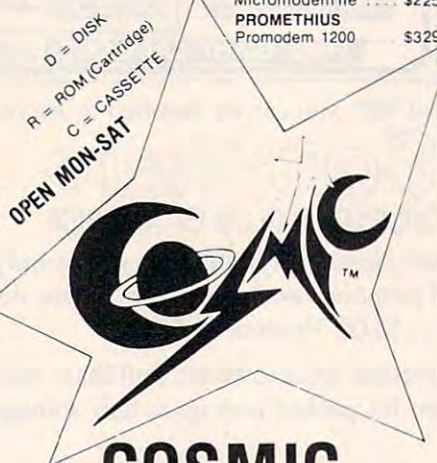
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