Go on line in the world's fastest growing technology.

NEW! DATA COMMUNICATIONS TRAINING FROM NRI

Practical training includes computer, modem, test instruments, and access to exclusive NRI communications network.

Satellites . . . microwave . . . fiber optics . . . dedicated land lines. Suddenly the world is communicating in a new and different way, via digital data systems. People talking to computers . . . computers to computers . . . information is stored, retrieved, and relayed in nanoseconds.

Industry, opportunities to triple

Data and telecommunications is already a $150 billion industry and is expected to triple over the next five years. One typical company has grown from $85 million to $650 million . . . a 765% growth since 1978 alone. The need for qualified technicians to install, maintain, and service this enormous investment in high-tech equipment is tremendous even now. Opportunities and salaries can go nowhere but up and up.

NRI will train you at home

You can learn at home in your spare time to become a data communications technician with NRI at-home training. NRI will start you with the basics, build upon your knowledge with easy-to-follow, bite size lessons to take you into the world of digital data communications. You'll learn what it takes to work on satellite, microwave, fiber optic, and telephone data links.

And you'll learn at your own comfortable pace, without classroom pressures or evenings away from your family. Over the past 70 years, NRI has taught the latest high-tech skills to almost 2 million students to become the world's largest and most successful school of its kind.

Hands-on training includes computer, modem, breakout box and much more

NRI takes you far beyond "book learning." As part of your course, you receive plenty of practical hands-on training that gives you real-world skills. You get the Radio Shack Color Computer, with 16K memory to teach you the systems and language of data communications plus you get an operating modem to let you tie in with world-wide communications networks.

You build your own RS-232C interface breakout box, an indispensable installation and trouble-shooting instrument you'll use throughout your career. You receive a professional digital multimeter and the NRI Discovery Lab, where you construct solid-state circuits and demonstrate practical applications of the theory you've learned.

Exclusive NRI data network

You'll learn what data communications is all about by actually becoming part of an operating network. You'll go on line to "talk" to your instructor, take your final exam by computer link, communicate with other NRI students and leave messages on the NRI "bulletin board."

As part of your course, you'll also receive membership in THE SOURCE [sm], a regular $100 value. A phone call ties you into computers loaded with instant news, stock quotes, electronic mail, educational programs, games, even discount shopping and travel reservations.

Move into the future, send for Free Catalog

You can't find training like this anywhere else . . . only NRI trains you at home for an exciting and rewarding career in the brilliant new world of Data Communications. Mail the coupon right now for our big catalog of high-tech electronic careers showing all the equipment you get, detailed lesson descriptions, and career opportunities. Look it over and decide where you want your future to grow. Act now. There's a real need for trained data communications technicians.

Training includes all this equipment you keep . . . 16K computer, modem, breakout box, digital multimeter and the exclusive NRI Discovery Lab.

TRS-80 is a trademark of the Radio Shack division of Tandy Corp.
SM a service mark of Source Telecomputing Corp., a subsidiary of the Reader's Digest Association, Inc.

NRI Schools
McGraw-Hill Continuing Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016
We'll give you tomorrow.

All Career courses approved under GI bill.
☐ Check for details

198-034

CHECK ONE FREE CATALOG ONLY

- ☐ Data Communications
- ☐ Computer Electronics with Microcomputers
- ☐ Color TV, Audio, and Video System Servicing
- ☐ Electronics Design Technology
  - ☐ Digital Electronics
    - ☐ Communications Electronics • FCC Licenses • Mobile CB • Aircraft • Marine
- ☐ Industrial Electronics
- ☐ Basic Electronics
- ☐ Small Engine Servicing
- ☐ Appliance Servicing
- ☐ Automotive Servicing
- ☐ Auto Air Conditioning
- ☐ Air Conditioning, Heating, Refrigeration, & Solar Technology
- ☐ Building Construction

Name (Please Print) Age

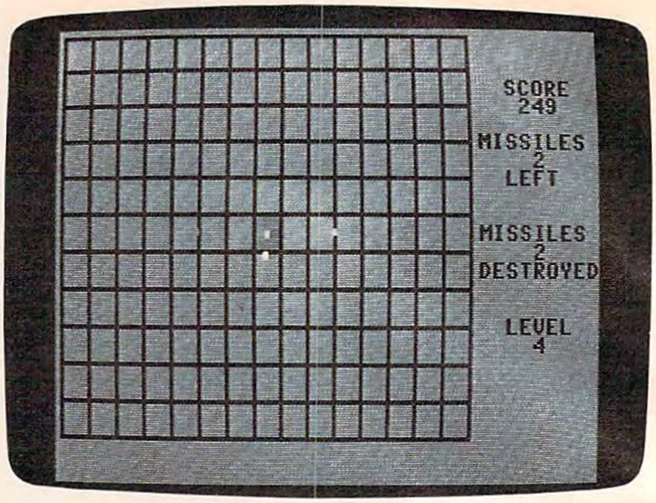
Street

City/State/Zip

Accredited by the Accrediting Commission of the National Home Study Council 000-000

```
MP 645 DATA 4,230,215,230,217,202,208,
       242,198,218,16,238,96
KP 1000 REM THIS PORTION OF PROGRAM IS
        {3 SPACES}USED TO VERIFY THAT
        DATA LINES HAVE{3 SPACES}BEEN
        READ CORRECTLY BEFORE RUNNING.
        ..
CE 1005 GRAPHICS 0:S=PEEK(136)+PEEK(13
        7)*256
AG 1010 N=PEEK(S)+PEEK(S+1)*256:IF N>5
        14 THEN ? N;" - ";:A=0:FOR I=S
        +5 TO S+PEEK(S+2)-2:A=A+PEEK(I
        ):NEXT I:? A
IG 1015 IF N=645 THEN END
CM 1020 S=S+PEEK(S+2):GOTO 1010
```

Program 2: 64 Trident



"Trident," 64 version.

```
49152 :032,041,197,169,000,141,068
49158 :032,208,169,011,141,033,088
49164 :208,169,060,141,132,003,213
49170 :169,147,032,210,255,173,236
49176 :030,208,169,000,141,120,180
49182 :003,169,144,032,210,255,075
49188 :160,000,185,071,201,201,086
49194 :008,240,007,153,000,050,244
49200 :200,076,038,192,169,138,093
49206 :133,252,169,197,133,253,167
49212 :160,000,177,252,201,000,082
49218 :240,012,032,210,255,230,021
49224 :252,208,243,230,253,076,054
49230 :062,192,169,063,141,021,214
49236 :208,169,200,141,248,007,033
49242 :141,250,007,141,251,007,119
49248 :141,252,007,141,253,007,129
49254 :169,201,141,249,007,169,014
49260 :000,162,000,157,000,208,123
49266 :232,224,015,208,248,169,186
49272 :015,141,039,208,169,146,070
49278 :141,000,208,169,141,141,158
49284 :001,208,169,140,141,002,025
49290 :208,169,135,141,003,208,234
49296 :169,002,141,040,208,169,105
49302 :004,141,041,208,169,014,215
49308 :141,042,208,169,007,141,096
49314 :043,208,169,013,141,044,012
49320 :208,169,000,141,016,208,142
49326 :169,255,141,062,003,032,068
49332 :011,194,169,255,141,015,197
49338 :212,169,128,141,018,212,042
49344 :173,030,208,169,049,032,085
49350 :136,196,169,254,141,066,136
49356 :003,169,255,141,067,003,074
49362 :032,154,196,169,017,141,151
49368 :005,212,169,243,141,006,224
49374 :212,169,033,141,004,212,225
49380 :032,249,192,032,139,193,041
49386 :032,249,192,032,193,194,102
49392 :032,064,196,032,015,197,008
49398 :076,228,192,141,060,003,178
49404 :142,061,003,173,000,220,083
49410 :041,008,208,039,174,000,216
49416 :208,232,224,000,208,014,126
49422 :173,016,208,009,001,141,050
49428 :016,208,141,137,197,076,027
49434 :042,193,173,016,208,041,187
49440 :001,201,001,208,005,224,160
49446 :009,208,001,202,142,000,088
49452 :208,173,000,220,041,004,178
49458 :208,039,174,000,208,202,113
49464 :224,000,208,014,173,016,179
49470 :208,041,254,141,016,208,162
49476 :141,137,197,076,088,193,132
49482 :173,016,208,041,001,201,202
49488 :000,208,005,224,026,208,239
49494 :001,232,142,000,208,173,074
49500 :000,220,041,001,208,012,062
49506 :174,001,208,202,224,054,193
49512 :208,001,232,142,001,208,128
49518 :173,000,220,041,002,208,242
49524 :012,174,001,208,232,224,199
49530 :228,208,001,202,142,001,136
49536 :208,173,060,003,174,061,039
49542 :003,032,060,195,096,173,181
49548 :062,003,041,003,168,173,078
49554 :129,197,201,000,208,033,146
49560 :192,000,240,111,173,130,230
49566 :197,201,000,208,022,192,210
49572 :001,240,100,173,131,197,238
49578 :201,000,208,011,192,002,016
49584 :240,089,173,132,197,201,184
49590 :000,240,082,185,129,197,247
49596 :201,000,240,069,170,192,036
49602 :001,208,032,173,137,197,174
49608 :041,008,201,000,240,023,201
49614 :138,056,233,001,201,000,067
49620 :208,027,173,137,197,041,227
49626 :195,141,137,197,138,056,058
49632 :233,002,076,241,193,138,083
49638 :201,146,144,005,233,001,192
49644 :076,241,193,105,001,153,237
49650 :129,197,185,133,197,201,004
49656 :141,144,005,233,001,076,080
49662 :002,194,105,001,153,133,074
49668 :197,136,192,255,208,175,143
49674 :096,238,062,003,173,062,132
49680 :003,206,132,003,041,003,148
49686 :141,063,003,170,160,000,047
49692 :169,000,141,064,003,238,131
49698 :063,003,206,064,003,153,014
49704 :129,197,200,192,004,208,202
49710 :248,169,028,141,129,197,190
49716 :169,192,141,137,197,173,037
49722 :027,212,041,127,105,044,102
49728 :141,133,197,224,000,240,231
49734 :069,169,008,141,130,197,016
49740 :169,008,013,137,197,141,229
49746 :137,197,173,027,212,041,101
49752 :127,105,044,141,134,197,068
```

AARDVARK LTD.

NOW THE BEST COST LESS

DUNGEONS OF DEATH - A serious role playing game for up to 6 players. You get a choice of race and characters that grow from game to game. You also get a graphic maze and a 15 page manual.

Available On: TRS80C 16K EXT., CMD64, VIC20 13K, IBMPC, TRS80C 32K, MC10 16K

TAPE $14.95 **DISK $19.95**

BAG-IT-MAN - The ultimate arcade game for TRS80C or MCD64. This one has three screens full of BAGS OF GOLD, CARTS & ELEVATORS TO RIDE IN, MINE SHAFTS, and TWO NASTY GUARDS. Great sound and color and continuous excitement.

Available On: TRS80C 32K, CMD64

TAPE $19.95 **DISK $24.95**

QUEST - A different kind of Graphic Adventure, it is played on a computer generated mape of Alesia. You'll have to build an army and feed them through combat, bargaining, exploration of ruins and temples, and outright banditry! Takes 2 - 5 hours to play and is different each time.

Available On: TRS80C 16K, CMD64, VIC20 13K, MC10 16K, TI99 (EXT. BASIC), IBMPC

TAPE $14.95 **DISK $19.95**

STARFIRE - If you enjoyed StarRaiders or StarWars, you will love Starfire. It is not a copy, but the best shoot-em-up, see them in the window space game on the CMD64 or TRS80C. The fantastic graphics will put you right in the control room as you hyperspace from quadrant to quadrant fighting the aliens and protecting your bases.

Available On: TRS80C 16K, CMD64

TAPE $19.95 **DISK $24.95**

WIZARDS TOWER - A fantasy game played on a map of forests and dungeons - with dragons and wizards to kill. Similar to QUEST and fun for adults, but a little simpler and playable for the younger set (8 - 60).

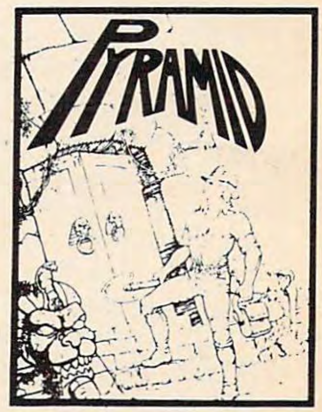
Available On: TRS80C 16K EXT., CMD64, VIC20 13K, TI99, IBMPC

TAPE $14.95 **DISK $19.95**

PYRAMID - ONE OF THE TOUGHEST ADVENTURES. Average time through the pyramid is 50 - 70 hours. Clues are everywhere and some ingenious problems make this popular around the world.

Available On: TRS80C 16K, CMD64, MC10 16K, TIMEX, IBM PC, TI99, VIC20 13K

TAPE $14.95 **DISK $19.95**



AARDVARK offers over 120 original high quality programs. Send one dollar for a current catalog and receive a $1.00 gift certificate good towards your next purchase.

Authors - **AARDVARK** pays top dollar for high quality programs. Send a copy today for a personal review and editorial help.

TO ORDER: Send amount indicated plus $2.00 shipping, per order. Include quantity desired and your preference of tape or disk. Be sure to indicate type of system and amount of memory. When using charge card to order by mail, be sure to include expiration date.

MasterCard CHARGE CARDS WELCOME VISA **1-313-669-3110** PHONE ORDERS ACCEPTED 8:00 a.m. to 8:00 p.m. E.S.T., MON-FRI

AARDVARK *Action Software* 2352 S. COMMERCE • WALLED LAKE, MI 48088 • (313) 669-3110

CMD64 / TRS80C / IBMPC / VIC20 / TI99

Notes On The Commodore 64 Version

Kevin Martin, Editorial Programmer

To stop the incoming missiles, you must direct your defensive missile to its target with a joystick plugged into port 2. Once you destroy one of the enemy missiles, preparations are made by the computer to launch another antimissile. If you destroy all the incoming missiles in one attack wave, you are moved on to a higher difficulty level where the speed of the incoming missiles is increased. If you lose, you can start over by pressing the fire button.

The 64 version of "Trident" is similar to the Atari version. It is written entirely in machine language and must be entered with MLX, the machine language editor program found elsewhere in this issue. Be sure you read the MLX article and understand how to use that program before you start typing the data for Program 2. MLX requires that you input the starting and ending addresses for your machine language. For Trident, the starting address is 49152 and the ending address is 51659. After typing in Trident, be sure to use the MLX Save option to store a copy of your work on tape or disk. After saving, you can load it back into the computer by typing:

LOAD "TRIDENT",8,1 for disk

or

LOAD "TRIDENT",1,1 for tape.

To run Trident, type:

SYS 49152

The Commodore 64 version has one major enhancement. It allows you to choose a level of difficulty, which determines the speed of the incoming missiles. Each successive level has an increased speed. You have four choices, which can be selected by pressing the appropriate function key:

- f1: Beginner
- f3: Intermediate
- f5: Advanced
- f7: Expert

```
49758 :169,203,045,137,197,141,218
49764 :137,197,224,001,240,034,165
49770 :169,055,141,135,197,173,208
49776 :027,212,041,127,105,067,179
49782 :141,131,197,224,001,240,028
49788 :015,169,227,141,136,197,241
49794 :173,027,212,041,127,105,047
49800 :067,141,132,197,224,000,129
49806 :208,005,169,007,141,021,181
49812 :208,224,001,208,005,169,195
49818 :015,141,021,208,224,002,253
49824 :208,005,169,031,141,021,223
49830 :208,224,003,208,005,169,215
49836 :063,141,021,208,238,063,138
49842 :003,032,013,196,173,132,215
49848 :003,201,014,240,003,238,115
49854 :132,003,096,173,129,197,152
49860 :201,000,240,012,141,004,026
49866 :208,173,133,197,141,005,035
49872 :208,076,222,194,169,000,053
49878 :141,004,208,169,000,141,109
49884 :005,208,173,130,197,201,110
49890 :000,240,012,141,006,208,065
49896 :173,134,197,141,007,208,068
49902 :076,251,194,169,000,141,045
49908 :006,208,169,030,141,007,037
49914 :208,173,131,197,201,000,136
49920 :240,012,141,008,208,173,014
49926 :135,197,141,009,208,076,004
49932 :024,195,169,000,141,008,037
49938 :208,169,070,141,009,208,055
49944 :173,132,197,201,000,240,199
49950 :012,141,010,208,173,136,198
49956 :197,141,011,208,076,053,210
49962 :195,169,000,141,010,208,253
49968 :169,111,141,011,208,173,093
49974 :137,197,141,016,208,096,081
49980 :173,030,208,141,065,003,168
49986 :173,065,003,041,004,201,041
49992 :004,208,022,169,000,141,104
49998 :129,197,032,013,196,032,165
50004 :217,196,173,021,208,041,172
50010 :251,141,021,208,076,154,173
50016 :196,173,065,003,041,008,070
50022 :201,008,208,030,169,000,206
50028 :141,130,197,173,137,197,059
50034 :041,247,141,137,197,032,141
50040 :013,196,032,238,196,173,200
50046 :021,208,041,247,141,021,037
50052 :208,076,154,196,173,065,236
50058 :003,041,016,201,016,208,111
50064 :022,169,000,141,131,197,036
50070 :032,013,196,032,249,196,100
50076 :173,021,208,041,239,141,211
50082 :021,208,076,154,196,173,222
50088 :065,003,041,032,201,032,030
50094 :208,022,169,000,141,132,078
50100 :197,032,013,196,032,004,142
50106 :197,173,021,208,041,223,025
50112 :141,021,208,076,154,196,220
50118 :096,169,015,141,024,212,087
50124 :169,010,141,132,003,162,053
50130 :255,142,001,212,202,142,140
50136 :068,003,032,015,197,174,193
50142 :068,003,224,000,208,239,196
50148 :169,050,141,132,003,032,243
50154 :015,197,238,032,208,173,073
50160 :032,208,041,015,201,000,225
50166 :208,241,169,000,141,024,005
50172 :212,173,000,220,041,016,146
50178 :208,249,104,104,104,104,107
50184 :104,104,076,003,192,169,144
50190 :146,141,000,208,169,141,051
50196 :141,001,208,162,007,160,187
50202 :035,024,032,240,255,206,050
50208 :063,003,238,064,003,173,064
```

Looks like a Ferrari. Drives like a Rolls. Parks like a Beetle.

Ask your computer dealer to take the cover off a world-class disk drive.

The all new, 1984 Indus GT.™

The most advanced, most handsome disk drive in the world.

A flick of its power switch can turn an Atari into a Ferrari.

Or an Apple into a Red Hot Apple.

Looks like a Ferrari.

The Indus GT is only 2.65" high. But under its front-loading front end is slimline engineering with a distinctive European-Gran flair.

Touch its LED-lit CommandPost™ function control AccuTouch™ buttons. Marvel at how responsive it makes every Atari or Apple home computer.

Drives like a Rolls.

Nestled into its soundproofed chassis is the quietest and most powerful disk drive power system money can buy. At top speed, it's virtually unhearable. Whisper quiet.

Flat out, the GT will drive your Atari track-to-track 0-39 in less than one second. Increasing data transfer 400%. (Faster than any other drive. And as fast as any Apple disk drive.)

And each GT comes with the exclusive *GT DrivingSystem*™ of software programs.* World-class word processing is a breeze with the *GT Estate WordProcessor*.™ And your dealer will describe the two additional programs that allow GT owners to accelerate their computer driving skills. *Included as standard equipment.

Also, the 1984 Indus GT is covered with the *GT PortaCase*.™ A stylish case that conveniently doubles as a 80-disk storage file.

Parks like a Beetle.

The GT's small, sleek, condensed size makes it easy to park.

And its low price makes it easy to buy. \$449 for Atari. \$329 for Apple.

So see and test drive the incredible new 1984 Indus GT at your nearest computer dealer soon.

The drive will be well worth it.

INDUS™

The all-new 1984 Indus GT Disk Drive.

The most advanced, most handsome disk drive in the world.

For dealer information, call 1-800-33-INDUS. In California, 1-800-54-INDUS, 213/882-9600.

```
50214 :063,003,024,105,048,032,057
50220 :210,255,162,012,160,035,110
50226 :024,032,240,255,173,064,070
50232 :003,024,105,048,032,210,222
50238 :255,096,165,197,201,004,212
50244 :208,011,169,060,141,132,021
50250 :003,169,049,032,136,196,147
50256 :096,201,005,208,011,169,002
50262 :042,141,132,003,169,050,111
50268 :032,136,196,096,201,006,247
50274 :208,011,169,035,141,132,026
50280 :003,169,051,032,136,196,179
50286 :096,201,003,208,011,169,030
50292 :027,141,132,003,169,052,128
50298 :032,136,196,096,173,141,128
50304 :002,041,001,201,000,208,069
50310 :247,096,141,082,003,162,097
50316 :017,160,035,024,032,240,136
50322 :255,173,082,003,032,210,133
50328 :255,096,173,066,003,174,151
50334 :067,003,024,105,002,144,247
50340 :001,232,141,066,003,142,237
50346 :067,003,173,062,003,074,040
50352 :074,141,072,003,173,066,193
50358 :003,174,067,003,024,109,050
50364 :072,003,144,001,232,141,013
50370 :066,003,142,067,003,162,125
50376 :004,160,034,024,032,240,182
50382 :255,173,067,003,174,066,176
50388 :003,032,205,189,096,173,142
50394 :004,208,201,138,144,003,148
50400 :076,199,195,096,173,004,199
50406 :208,201,138,144,248,076,221
50412 :199,195,173,006,208,201,194
50418 :156,176,003,076,199,195,023
50424 :096,173,009,208,201,133,044
50430 :144,003,076,199,195,096,199
50436 :173,011,208,201,151,176,156
50442 :003,076,199,195,096,142,209
50448 :060,003,140,061,003,162,189
50454 :000,160,000,232,208,253,107
50460 :200,204,132,003,208,247,254
50466 :174,060,003,172,061,003,251
50472 :096,169,147,032,210,255,181
50478 :169,000,141,032,208,169,253
50484 :011,141,033,208,169,154,000
50490 :032,210,255,162,012,160,121
50496 :016,024,032,240,255,162,025
50502 :000,189,036,201,201,000,185
50508 :240,007,232,032,210,255,028
50514 :076,071,197,162,021,160,001
50520 :007,024,032,240,255,162,040
50526 :000,189,044,201,201,000,217
50532 :240,007,232,032,210,255,052
50538 :076,095,197,169,000,162,037
50544 :000,157,000,208,232,224,165
50550 :017,208,248,173,000,220,216
50556 :041,016,208,237,096,000,210
50562 :000,000,000,000,000,000,130
50568 :000,252,019,176,195,178,188
50574 :195,178,195,178,195,178,237
50580 :195,178,195,178,195,178,243
50586 :195,178,195,178,195,178,249
50592 :195,178,195,178,195,178,255
50598 :195,178,195,174,032,032,204
50604 :032,032,032,032,032,032,108
50610 :032,221,032,221,032,221,169
50616 :032,221,032,221,032,221,175
50622 :032,221,032,221,032,221,181
50628 :032,221,032,221,032,221,187
50634 :032,221,032,221,032,221,193
50640 :032,221,032,032,032,032,077
50646 :032,032,032,032,032,171,033
50652 :195,219,195,219,195,219,182
50658 :195,219,195,219,195,219,188
50664 :195,219,195,219,195,219,194
50670 :195,219,195,219,195,219,200
50676 :195,219,195,219,195,179,166
50682 :032,032,032,032,032,032,186
50688 :032,032,032,221,032,221,058
50694 :032,221,032,221,032,221,253
50700 :032,221,032,221,032,221,003
50706 :032,221,032,221,032,221,009
50712 :032,221,032,221,032,221,015
50718 :032,221,032,221,032,032,088
50724 :083,067,079,082,069,032,192
50730 :032,171,195,219,195,219,049
50736 :195,219,195,219,195,219,010
50742 :195,219,195,219,195,219,016
50748 :195,219,195,219,195,219,022
50754 :195,219,195,219,195,219,028
50760 :195,179,032,032,032,032,062
50766 :032,032,032,032,032,221,203
50772 :032,221,032,221,032,221,075
50778 :032,221,032,221,032,221,081
50784 :032,221,032,221,032,221,087
50790 :032,221,032,221,032,221,093
50796 :032,221,032,221,032,221,099
50802 :032,032,032,032,032,032,050
50808 :032,032,032,171,195,219,033
50814 :195,219,195,219,195,219,088
50820 :195,219,195,219,195,219,094
50826 :195,219,195,219,195,219,100
50832 :195,219,195,219,195,219,106
50838 :195,219,195,179,077,073,064
50844 :083,083,073,076,069,083,111
50850 :032,221,032,221,032,221,153
50856 :032,221,032,221,032,221,159
50862 :032,221,032,221,032,221,165
50868 :032,221,032,221,032,221,171
50874 :032,221,032,221,032,221,177
50880 :032,221,032,032,032,032,061
50886 :032,032,032,032,032,171,017
50892 :195,219,195,219,195,219,166
50898 :195,219,195,219,195,219,172
50904 :195,219,195,219,195,219,178
50910 :195,219,195,219,195,219,184
50916 :195,219,195,219,195,179,150
50922 :032,032,076,069,070,084,085
50928 :032,032,032,221,032,221,042
50934 :032,221,032,221,032,221,237
50940 :032,221,032,221,032,221,243
50946 :032,221,032,221,032,221,249
50952 :032,221,032,221,032,221,255
50958 :032,221,032,221,032,032,072
50964 :032,032,032,032,032,032,212
50970 :032,171,195,219,195,219,033
50976 :195,219,195,219,195,219,250
50982 :195,219,195,219,195,219,000
50988 :195,219,195,219,195,219,006
50994 :195,219,195,219,195,219,012
51000 :195,179,032,032,032,032,046
51006 :032,032,032,032,032,221,187
51012 :032,221,032,221,032,221,059
51018 :032,221,032,221,032,221,065
51024 :032,221,032,221,032,221,071
51030 :032,221,032,221,032,221,077
51036 :032,221,032,221,032,221,083
```

```
51042 :077,073,083,083,073,076,051
51048 :069,083,032,171,195,219,105
51054 :195,219,195,219,195,219,072
51060 :195,219,195,219,195,219,078
51066 :195,219,195,219,195,219,084
51072 :195,219,195,219,195,219,090
51078 :195,219,195,179,032,032,218
51084 :032,032,032,032,032,032,076
51090 :032,221,032,221,032,221,137
51096 :032,221,032,221,032,221,143
51102 :032,221,032,221,032,221,149
51108 :032,221,032,221,032,221,155
51114 :032,221,032,221,032,221,161
51120 :032,221,068,069,083,084,221
51126 :082,079,089,069,068,171,228
51132 :195,219,195,219,195,219,150
51138 :195,219,195,219,195,219,156
51144 :195,219,195,219,195,219,162
51150 :195,219,195,219,195,219,168
51156 :195,219,195,219,195,179,134
51162 :032,032,032,032,032,032,154
51168 :032,032,032,221,032,221,026
51174 :032,221,032,221,032,221,221
51180 :032,221,032,221,032,221,227
51186 :032,221,032,221,032,221,233
51192 :032,221,032,221,032,221,239
51198 :032,221,032,221,032,032,056
51204 :032,032,032,032,032,032,196
51210 :032,171,195,219,195,219,017
51216 :195,219,195,219,195,219,234
51222 :195,219,195,219,195,219,240
51228 :195,219,195,219,195,219,246
51234 :195,219,195,219,195,219,252
51240 :195,179,032,032,076,069,111
51246 :086,069,076,032,032,221,050
51252 :032,221,032,221,032,221,043
51258 :032,221,032,221,032,221,049
51264 :032,221,032,221,032,221,055
51270 :032,221,032,221,032,221,061
51276 :032,221,032,221,032,221,067
51282 :032,032,032,032,032,032,018
51288 :032,032,032,171,195,219,001
51294 :195,219,195,219,195,219,056
51300 :195,219,195,219,195,219,062
51306 :195,219,195,219,195,219,068
51312 :195,219,195,219,195,219,074
51318 :195,219,195,179,032,032,202
51324 :032,032,032,032,032,032,060
51330 :032,221,032,221,032,221,121
51336 :032,221,032,221,032,221,127
51342 :032,221,032,221,032,221,133
51348 :032,221,032,221,032,221,139
51354 :032,221,032,221,032,221,145
51360 :032,221,032,032,032,032,029
51366 :032,032,032,032,032,171,241
51372 :195,219,195,219,195,219,134
51378 :195,219,195,219,195,219,140
51384 :195,219,195,219,195,219,146
51390 :195,219,195,219,195,219,152
51396 :195,219,195,219,195,179,118
51402 :032,032,032,032,032,032,138
51408 :032,032,032,221,032,221,010
51414 :032,221,032,221,032,221,205
51420 :032,221,032,221,032,221,211
51426 :032,221,032,221,032,221,217
51432 :032,221,032,221,032,221,223
51438 :032,221,032,221,032,032,040
51444 :032,032,032,032,032,032,180
51450 :032,173,195,177,195,177,175
51456 :195,177,195,177,195,177,092
51462 :195,177,195,177,195,177,098
51468 :195,177,195,177,195,177,104
51474 :195,177,195,177,195,177,110
51480 :195,189,032,032,032,032,024
51486 :032,032,032,032,032,000,190
51492 :084,082,073,068,069,078,234
51498 :084,000,080,082,069,083,184
51504 :083,032,070,073,082,069,201
51510 :032,066,085,084,084,079,228
51516 :078,032,084,079,032,083,192
51522 :084,065,082,084,000,224,093
51528 :000,000,224,000,000,224,008
51534 :000,000,000,000,000,000,078
51540 :000,000,000,000,000,000,084
51546 :000,000,000,000,000,000,090
51552 :000,000,000,000,000,000,096
51558 :000,000,000,000,000,000,102
51564 :000,000,000,000,000,000,108
51570 :000,000,000,000,000,000,114
51576 :000,000,000,000,000,000,120
51582 :000,000,000,000,000,000,126
51588 :000,000,000,127,254,000,001
51594 :127,254,000,127,254,000,132
51600 :127,254,000,127,254,000,138
51606 :127,254,000,127,254,000,144
51612 :127,254,000,127,254,000,150
51618 :127,254,000,127,254,000,156
51624 :127,254,000,127,254,000,162
51630 :127,254,000,000,000,000,043
51636 :000,000,000,000,000,000,180
51642 :000,000,000,000,000,000,186
51648 :000,000,000,000,000,000,192
51654 :008,013,013,013,013,013,015
```

©

Dancing Feats For Commodore 64, Atari, And Coleco Adam

Tony Roberts, Assistant Managing Editor

Take a Commodore 64, Atari, or Coleco Adam, add a joystick and a program from Softsync, and you have created a musical instrument that can be played easily by nonmusicians.

The program, *Dancing Feats*, is subtitled *The One Man Joystick Band*. *Dancing Feats* provides the backup, and you use the joystick to make a melody. The music rings out instantly, because there's virtually nothing—in terms of music—to learn.

The kind of music *Dancing Feats* makes is dependent on the decisions you make from a series of menus. The main menu provides the following choices: Choose Bass, Choose Beat, Choose Style, Choose Tempo, and Choose Ending. For each of these choices, there is a submenu. For example, if you select Choose Beat, the submenu asks you to choose from Jazz, Rock, Blues, or Boogie Woogie.

Go through the process for each of the main menu headings, and then you're ready to play.

Making Music

Dancing Feats follows your instructions and begins performing in its role as a backup band. It goes through a chord progression, playing in the style and tempo you selected.

Your joystick provides the melody. As you push it in various directions, different notes are added to the composition. The program sees to it that the note you're playing is compatible with the chord being played by the computer. Pressing the fire button on the joystick will change the octave of the note you're playing.

Once a song is under way, you play as long as you like. When you're ready to end your composition, press the space bar, and the program will begin to play the ending you selected before you began. The possible endings are The Duke, The Elvis, The Chance, and The Mozart.

As you play, the screen displays a visual accompaniment to your music. Colored bars dance on the screen for each note you play. The positioning of the bars is relative to the pitch of the note being played. Low notes are displayed on the left, high notes are displayed on the right.

The screen also shows you what chord the computer is playing and what note you are playing.

The program includes an a cappella mode, in which you can play melody without accompaniment.

An Educational Tool

Dancing Feats does provide the user with a simple musical instrument, but there are some differences between it and a conventional instrument. With *Dancing Feats*, the musician is not in full control. You can't use your joystick to play *Mary Had a Little Lamb* or your favorite pop tune. You can play only notes that are compatible with the chords the computer is playing.

If, for example, you keep the joystick in the same position while the computer plays a C chord, you'll get the same note. But when the computer switches to an F chord, that same position on the joystick will play a different note.

The music that results from *Dancing Feats*, while lively and enjoyable, cannot be composed note for note in the conventional sense. Nevertheless, *Dancing Feats* does provide nonmusicians or beginning musicians with the opportunity to learn something about music and music theory. For example, by experimenting with the options under Choose Tempo in the main menu, the user will learn the differences among adagio, allegretto, allegro, and vivace.

Dancing Feats cannot hope to duplicate what might result from solid training and years of practice on a conventional instrument, but it certainly allows those who haven't had such training to make a little music that sounds pretty good.

Children too young to tackle the intricacies of a violin or saxophone will enjoy the upbeat computer backup, and will be thrilled to make music many times more sophisticated than their dimestore xylophone can produce.

Dancing Feats
Softsync, Inc.
14 East 34th St.
New York, NY 10016
(212) 685-2080
Atari or Commodore 64 disk $29.95
Atari or Commodore 64 tape $24.95
Coleco Adam, $29.95

©

A Singing/ Talking Voice For VIC And 64

Arthur B. Hunkins

The Alien Group of New York City has come up with a significant advance in microcomputer voice synthesis with Voice Box, a peripheral for the VIC and 64 that can *sing* as well as speak. And with Voice Box you can program vocal *inflection* to create voices which are expressive and lifelike with virtually unlimited nuance.

Voice Box consists of the hardware peripheral, speech synthesis software on tape or disk, and *Music System* software, which drives both the singing voice and three-voice music from the Commodore SID chip (available only for the 64, on disk).

Plugs Into The User Port

The Voice Box itself is a sturdy, secure, 1.5 × 3 × 4-inch black box that plugs into the User Port. It consists of a 3 × 4-inch circuit board with seven chips and assorted components, an internal 2 × 3-inch speaker (.8 watt), and two external dials. One dial regulates the volume, the other the pitch range (the higher the faster for spoken material).

Voice Box produces only the vocal sound; sounds coming from the 64 SID chip require an external amplifier and speaker.

Volume is adequate for personal or small group use, but there is no provision for external amplification or headphones.

Voice Box software is different for VIC and 64, though the documentation—which is thorough and clear—differs only in detail. Software is offered on cassette for VIC and on disk for 64.

All Phonemes Are Used

Voice Box synthesizes phonemes, and is capable of producing all 64 phonemes used by the English language. The software permits programming either in English, in phonemes, or in BASIC, using number codes for phonemes.

You can incorporate the SPEAK subroutine into your BASIC programs (2K free memory required) to permit English or phoneme speech coding. If your program leaves only about 700 bytes free, you can use the PSPEAK subroutine, that allows phoneme coding only.

The Talking Head

There are three other programs in the driving software. One is the SPEAK routine with an alien face added in character graphics with a moving mouth for vocal animation. A second program allows the user to type in words to be spoken by the face.

Most elaborate and perhaps most fascinating is a SPELL program, in which an alien professor asks you to spell words, and either congratulates or chastises you, depending on your answers.

There also is a provision for adding your own words. All you need to do is to furnish the phonetic spellings in DATA statements.

Changing The Pronunciation

Many of the spoken words provided by Voice Box are difficult to understand, even though the professor will repeat them as often as you like. But you can experiment with inflection, vowel length, and timing to have Voice Box speak the way you want. The documentation provides a number of hints on improving pronunciation.

The software normally permits speech in four pitches, to give you vocal inflections through a simple system of notated slashes. But in combination with the *Music System*, Voice Box has the potential for continuous, infinite inflection.

The *Music System*

Unfortunately, the *Music System* software is available only for the 64, because it uses the SID chip. I recommend it even if you don't have Voice Box, since it provides an outstanding method for programming your own SID sound arrangements.

Music System is menu-driven. From a main menu, select SYNTHESIZER SETTINGS, and a densely packed screen displays SID sound options. You use the cursor controls, and the + and – keys, to select options. After you choose the new instrumentation, press the f7 key to hear the results.

By pressing other function keys, you can record a melody. Pitch is entered in a piano-like arrangement of the upper two rows on the keyboard. After you record your melody, you can go back and edit the pitch and rhythm.

Three-Voice Digital Recorder

What *Music System* gives you is a three-voice digital recorder with synchronizing click track (metronome), changeable tempo independent of pitch, and the ability to vary the sound of any line. You can try out and rerecord arrangements at will. And all this uses about 90 percent of the SID chip's potential. You have the ability to program pitch, waveform (including pulse width), filter type, filter resonance, filter routing select, filter cutoff point, overall amplitude, and all ADSR parameters.

You can get a single-speed phasing by internally cycling the pulse width, and you can set the rate of sweep of the filter cutoff point during a note.

This switchable effect requires specifying a beginning and ending cutoff point. (The sweep can be triggered by any selected oscillator, as it begins a new note.)

A third option, here exercised on playback (like the rhythmic editing mentioned earlier), provides for the addition of *accents* for selected notes per voice. The programming techniques behind these three effects bode well for the future of SID sound synthesis.

There are a few limitations, though. There is no pitch transposition, and no microtones. Only one type of filtering can be selected at a time, there is no ring modulation, only 15 pulse-width settings are available, and the modulating capabilities of both ADSR and Oscillator 3 are not implemented.

The Singing Voice

To work with the singing voice, select LYRIC EDITOR from the main menu. Text is entered in phonemes, with slashes between the sounds to be sung to different notes. A total of nine lines of text with 77 phonemes each is permitted. As a pronunciation aid, there is a "trial" line; a series of phonemes entered here will be sung in monotone when you hit RETURN.

After text is entered, pitch is added in the same way as with the SID oscillators, using the top two keyboard rows—complete with vocal tone and text. As before, rhythm can be edited later. The voice has a fixed-rate amplitude vibrato that can be edited in later, and a programmable glissando on selected pitches. It is this variable-rate slide that can theoretically be applied to achieve subtlety of inflection in speech synthesis. You are not told how to do this, but it can be done. Perhaps Alien Group or an enterprising independent programmer will soon show us.

Disk Save Option

Several other choices are available from the main menu. One allows SAVEing to disk; both a text and a music file are stored. There is a MEDLEY option, where you can string together several selections to be played in succession. And there is a program to redraw the face. During playback of any song, you can select video of a male singer with moving mouth and eyebrows, by choosing among mouth and eyebrow shapes.

Actually, the entire screen can be changed in high-resolution, multicolor graphics mode, and you can SAVE these new faces.

Voice Box represents a substantial step forward in speech synthesis. The cost, considering software and hardware flexibility, is reasonable. With all its power and options, it is remarkably easy to use, either alone or incorporated into other programs.

Voice Box
(for VIC-20 or Commodore 64; tape, disk for 64 only)
$95

Music System *(disk, for 64 only)*
$25

The Alien Group
27 West 23rd St.
New York, NY 10010

©

AMDC 3-Inch Disk Drives For Atari

Richard DeVore

The AMDC-1 is a single-drive, single-sided, dual-density 3-inch disk drive with a parallel printer port. The AMDC-2 is the dual drive version. AMDC-2 lists for $850. However, AMDEK has announced special introductory pricing. Through June 30, 1984, the AMDC-1 will sell for $550, and the price of the AMDC-2 will be $760. The AMDC-1 may be upgraded to the AMDC-2 for $300. The Atari 810 single-density single drive lists for the same price as the AMDC-1 but has only half the storage capacity and cannot run a parallel printer.

The AMDISK AMDC-1 uses 3-inch disks which are designed to be used on both sides. A nice feature is that the drive has a LED which is keyed to whichever side of the disk is in use. When the A side is in position, the LED is green. When the B side is in position, the LED is red. This eliminates confusion over which side of the disk is in use, and prevents problems such as formatting the wrong side. A simple slide switch on the disk write-protects it, eliminating the need for a supply of write-protect tabs.

A Disk In Your Pocket

These disks are available from Amdek and Maxell for a suggested retail price of $6.99. Extra protection is offered by the disk enclosure, which seals the disk surfaces completely until the disk is inserted into the drive.

The enclosure is made of a hard plastic and has a sliding metal cover over the read/write

LET US ANALYZE YOUR RETURN BEFORE THE I.R.S. DOES IT FOR YOU...

introducing . . .

THE TAX CONSULTANT™

(FOR ATARI 400/800 AND THE COMMODORE 64 COMPUTERS)

NOW YOU CAN HAVE COMPLETE TAX PREPARATION AT HOME!

only $95.00 tax deductible!

and your return will be closely checked and analyzed before the I.R.S. ever sees it! THE TAX CONSULTANT™ is a sophisticated yet very friendly program for the novice user. THE TAX CONSULTANT™ will help you to calculate, prepare and print your return. But then, at your request, THE TAX CONSULTANT™ will check your return very closely and issue an itemized print-out indicating those items that in its judgment may be questioned. *No other tax preparation package offers this feature!*

- **Features** –
- On-screen Prompts
- Continuous tax/refund readout
- Fast, 100% machine language
- All required I.R.S. forms included
- Easy to follow tutorial in manual
- Prints all necessary forms
- Multi-color screens
- Inexpensive updates

Plus!

A TAX PLANNING MODULE THAT, WHEN USED WITH THE ANALYSIS MODULE, WILL PROVIDE YOU WITH A YEAR-ROUND TOOL TO PLOT YOUR TAX STRATEGIES

Dealer inquiries welcome!

Information

(707) 422-9591

Mail Orders to: **Morbius Software Co., Inc.**
Dept. CP, P.O. Box 1702
Vacaville, CA 95696

Name ______________________

Address ______________________

City, State ______________________

☐ CHECK/MONEY ORDER ZIP ____________

☐ VISA Interbank #(MC) ____________

☐ MASTERCARD Expires ____________

Card No. ______________________

Signature ______________________

Price $95.00 plus $4.00 shipping and handling. Calif. residents add 6% sales tax. Please allow two weeks for checks to clear.
System Requirements: Atari 400/800 with 48K & one disk drive; Commodore 64 with one disk drive. Printer recommended.
ATARI 400/800 is a trademark of Atari, Inc.
Commodore 64 is a trademark of Commodore Electronics, Ltd.
THE TAX CONSULTANT is a trademark of GMG Associates

VISA master charge

MASTERCARD/VISA CALL TOLL-FREE!

CALIF **1-800-821-6771** NATION **1-800-821-6770**

Telephone operators standing by Mon.-Fri. 8 am to 5 pm, Saturdays 9 am to 1 pm, PST area of the disk surface. This cover is automatically moved aside when the disk is inserted into the drive. This cover, and their small size, allows them to be carried in a shirt pocket with relative impunity. Their small size also makes it possible to mail them in a standard envelope.

The drive formats the 3-inch disks so that they are fully compatible with the 5¼-inch disks you're used to. This, in effect, makes them transparent to the computer, which accepts them as a 5¼-inch disk.

During my tests of the AMDC-2 I used it in both single- and double-density modes with no problems at all. I was able to fill all the disk sectors in both single- and double-density modes, and consistently read all the information. In transferring full disks of programs from one drive to the other, including from 3-inch to 5¼-inch and back, the units performed perfectly.

Four Drives And A Printer

The drives contain a controller which will take care of four drives and a Centronics-type parallel printer or plotter. It also allows the use of 5¼-inch and the 3-inch drives in any combination. DIP (dual in-line pin) switches mounted on the rear panel of the unit allow the 3-inch drives to be used as any drive, from drive 1 to drive 4. The factory setting is drive 1 for the AMDC-1 and drives 1 and 2 for the AMDC-2.

Being able to add noncontroller disk drives to the AMDC is a bonus. Low-cost units are available and may be single- or double-sided. You may also use 40- or 80-track drives. These capabilities allow for a massive amount of storage at reasonable cost. The use of double-sided or 80-track drives requires the DOS/XL operating system to access the additional storage potential.

Connecting the external drives requires setting the drive to respond to the proper signal, connecting them to the cable, and plugging the power cord in. External drives must have their own power supplies and cabinets.

Switches Select Options

There are eight DIP switches located on the upper right-rear panel of the AMDC. These allow the following configurations:

Switches 1 through 4 are density selection switches that allow you to configure the drives for either single or double density on boot-up. The density of the boot drive is determined by the disk installed at boot-up. These switches have no effect if the controller is set for DOS 3.0.

Switches 5 and 6 determine which drive will be the boot drive. The factory setting is for drive 1, but any drive up to and including 4 may be selected for this function.

Switch 7 is used when more than three drives are connected to the controller, and is particularly useful when there is a 5¼-inch drive attached. When this switch is on, the external drive will be recognized as drive 1. When it is off, the 3-inch drives are 1 and 2, and the external drive is drive 3.

Switch 8 sets drives that have been selected as dual density to 256 bytes per sector when off. When switch 8 is on, it sets all drives to be Atari 1050 compatible for use with DOS 3.0. When switch 1 is on, disks with 256 bytes per sector will not be recognized.

The 3-inch drives are also available as a dual drive without a controller. This version is called the AMDISK IIIB and is fully compatible with the AMDC-1 or 2. The AMDISK IIIB in conjunction with an AMDC-2 lets you have a total of four double-density drives that take up about the same desk space as one Atari disk drive.

If you have 5¼-inch dual-density disk drives with controllers that use the industry standard 34-pin ribbon cable for drive connection, you can use the AMDISK IIIB as add-on drives.

Parallel Printer Port

The printer port on the AMDC is software-compatible with the Atari 850 interface. This enables the use of data base programs, word processors, and LPRINT statements from BASIC. The printer port also uses the same 15 pin D connector as the 850. This port is located on the upper rear panel of the AMDC. Since the pinout is the same as the 850 interface, any Atari-compatible printer cable will work with your printer or plotter.

Should you already own an Atari 850 interface, one printer/plotter may be attached to it, and another to the AMDC. Since they both respond to the same signals from the computer, it is possible to have the equivalent of a printer switch by simply turning on the unit you wish to use and turning off the other.

Drives Supplied With DOS/XL

The AMDC drives will be supplied with the DOS/XL operating system by Optimized Systems Software, Inc., of Cupertino, CA. This is a menu-driven version of OSA+ Version 2.0 and OSA+ Version 4.1. This allows compatibility with the Atari operating system as well as the use of double-sided or 80-track drives. DOS/XL was not ready at the time of this review, but both OSA+ versions performed as advertised.

Amdek also will provide a group of utility programs and a patch to Atari DOS which will permit it to function under double density. Most of these utilities are quite complex and are intended for programmers who wish to take full advantage of all the drives' capabilities.

Two of these utilities, however, will be of value to anyone: Config and Version. Config configures the drives as to type and density, and Version tells you

the version number and date of the AMDC operating software which may help should you have a problem.

The more complex utilities are:

FREFORM – This allows you to specify the sector order on the disk. This would be a way to protect programs from being copied.

TIME EXTEND – This may be used to change the printer port time-out value from the normal 20 seconds to any value from 1 to 255 seconds. This may be useful when setting up a plotter or if you want to make it 5 seconds to match the normal 850 interface timing.

CONTD – Use this program to set the controller and drives to match the diskettes in the drives.

IDTABLE – Use this program to change the drive numbers as far as the computer is concerned. You may make drive 2 your boot drive, for instance.

IDENT – A program to check how many drives are presently attached and operating in the system.

The AMDC-1 and 2 have a formatted capacity of 92K per side in 40-track single-density, and 184K per side in 40-track double-density. In DOS 3 mode they have 127K in double-density. Each of the figures above is doubled since you can use both sides of the disk. If you connect an 80-track, double-density, double-sided drive to the system using DOS/XL, you can get 736K.

Software Compatibility

At the time this review was written the following software vendors had agreed to make all of their software available on the 3-inch format: LJK, Synapse, Brøderbund, Sirius, and Penguin, with more expected, including some educational vendors. This may make it unnecessary to have any other drive to get full use of your computer.

The AMDC-2 takes up less space than the 5¼-inch dual drive I have been using, not to mention the fact that the Atari 850 interface was not needed. This space saving also eliminated the additional expense, cables, and power supplies that would have been required with another configuration.

This, and the fact that software will be available in the 3-inch disk format, makes the AMDC disk drives an impressive alternative to the standard 5¼-inch drives. The extra protection of the media and ease of use make them especially good in teaching environments. In short, if you are in the market for a disk drive, the AMDC suits your needs perfectly and deserves serious consideration.

AMDC Disk Drive
AMDEK Corp.
2201 Lively Blvd.
Elk Grove, IL 60007
(312) 364-1180
AMDC-1 $599
AMDC-2 $850

©

MORE DISK DRIVE FOR YOUR MONEY ....

In fact, with the ASTRA 1620, you get two superb Disk Drives for the price of one. The ASTRA 1620 is Single or Double Density (software selectable) and completely compatible with ATARI DOS or OSA+ DOS. When used as Double Density, the ASTRA 1620 has the same capacity as Four ATARI 810® Disk Drives.

DOUBLE OR SINGLE DENSITY

The ASTRA 1620 can be either single or double density, depending on the software selected. One drive can be configured for single density and the other drive for double density, or any combination desired. The ASTRA 1620 is compatible with virtually any software available for ATARI® Disk Drives. The ASTRA 1620 is smooth, quiet and fast. In Single Density mode, the ASTRA 1620 stores 88K bytes of programs or files. In Double Density, the ASTRA 1620 stores 176K bytes, simply twice as much.

TWO DRIVES ... Yes, two superb disk drives in the same size enclosure normally used for one drive. The ASTRA 1620 measures 7⅞" wide x 11⅞" deep x 5⅞" high.

Two drives will open a new dimension of computing for you. The program disk can be in one drive and the data disk can be in the other. This will eliminate time consuming disk changes. Backing up disks and copying files will never be easier. Just follow the instructions on the screen and walk away. The job will be completed within minutes. We have simplified copying from single to double density. With two drives, it's just as easy as copying in one mode. No disk switching!

Two double density drives give you the power that much larger and more expensive computers have without giving up any of the features available on the ATARI® Home Computer.

EASY TO USE ... The ASTRA 1620 comes complete with everything you need. Just plug it in, chain it up, and turn it on.

The ASTRA 1620 comes with OSA+ DOS (The best disk operating system available for the ATARI® computer!). The OSA+ DOS is completely compatible with all existing ATARI DOS files. Because the OSA+ user manual is very complete and technical, we include our own simplified user manual. Between the two furnished manuals, you have the information necessary to perform any task required of your disk drive.

The ASTRA 1620 also contains a data cord, power transformer, and operator manual.

ASTRA SYSTEMS

5230 Clark Avenue, Suite 19
Lakewood, California 90712

Phone
(213) 804-1475

COMMODORE 64

(more power than Apple II at half the price)

$99.50*

- 170K DISK DRIVE $159.00*
- TRACTION FRICTION PRINTER $109.00*

COMPUTER AND SOFTWARE SALE

WE HAVE THE BEST SERVICE

WE HAVE THE LOWEST PRICES

VIC-20

(a real computer at the price of a toy)

$69.50

- 40-80 COLUMN BOARD $59.00
- 32K RAM EXPANDER $95.00

* COMMODORE 64 COMPUTER $99.50

You pay only $199.50 when you order the powerful 84K COMMODORE 64 COMPUTER! LESS the value of the SPECIAL SOFTWARE COUPON we pack with your computer that allows you to SAVE OVER $100 off software sale prices!! With only $100 of savings applied, your net computer cost is $99.50!!

SOFTWARE BONUS PACK $29.95

When you buy the Commodore 64 Computer from Protecto Enterprizes you qualify to purchase ONE SOFTWARE BONUS PACK for a special price of $29.95!! Normal price is $49.95 (40 programs on disk or 24 programs on 5 tapes).

* 170K DISK DRIVE $159.00

You pay only $259.00 when you order the 170K Disk Drive! LESS the value of the SPECIAL SOFTWARE COUPON we pack with your disk drive that allows you to SAVE OVER $100 off software sale prices!! With only $100 of savings applied, your net disk drive cost is $159.00.

* TRACTION FRICTION PRINTER $109.00

You pay only $209.00 when you order the Comstar T/F deluxe line printer that prints 8 1/2 x 11 full size, single sheet, roll or fan fold paper, labels etc. 40, 66, 80, 132 columns. Impact dot matrix, bi-directional, 80 CPS. LESS the value of the SPECIAL SOFTWARE COUPON we pack with your printer that allows you to SAVE OVER $100 off software sale prices!! With only $100 of savings applied your net printer cost is only $109.00.

80 COLUMN BOARD $99.00

Now you program 80 COLUMNS on the screen at one time! Converts your Commodore 64 to 80 COLUMNS when you plug in the 80 COLUMN EXPANSION BOARD!! List $199 **SALE $99** PLUS—you also can get an 80 COLUMN BOARD WORD PROCESSOR with mail merge, terminal emulator, ELECTRONIC SPREAD SHEET. List $59.00 **SALE $24.95** if purchased with 80 COLUMN BOARD!! (Tape or Disk)

80 COLUMNS IN COLOR EXECUTIVE WORD PROCESSOR $69.00

This EXECUTIVE WORD PROCESSOR is the finest available for the COMMODORE 64 computer! The ULTIMATE for PROFESSIONAL Wordprocessing application! DISPLAYS 40 OR 80 COLUMNS IN COLOR or Black and White! Simple to operate, powerful text editing with a 250 WORD DICTIONARY, complete cursor and insert/delete key controls line and paragraph insertion, automatic deletion, centering, margin settings and output to all printers! Includes a powerful mail merge. List $99.00 **SALE $69.00.** 20,000 WORD DICTIONARY - List $24.95 **SALE $19.95.** EXECUTIVE DATA BASE - List $89.00 **SALE $59.00.** (Disk only).

SPECIAL SOFTWARE COUPON

We pack a SPECIAL SOFTWARE COUPON with every COMMODORE 64 COMPUTER-DISK DRIVE-PRINTER-MONITOR we sell! This coupon allows you to SAVE OVER $100 OFF SALE PRICES! $200-$300 savings are possible!! (example)

PROFESSIONAL SOFTWARE COMMODORE 64

Name	List	Sale	Coupon
Executive Word Processor	$99.00	$69.00	$59.00
Executive Data Base	$89.00	$59.00	$46.00
20,000 Word Dictionary	$24.95	$19.95	$14.95
Electronic Spreadsheet	$89.00	$59.00	$46.00
Accounting Pack	$69.00	$49.00	$32.00
Total 5.2 Word Processor			
Tape	$69.00	$56.00	$37.00
Disk	$79.95	$63.00	$42.00
Total Text 2.6 Word Processor			
Tape	$44.95	$39.00	$26.00
Disk	$49.00	$42.00	$29.00
Total Label 2.6			
Tape	$24.95	$18.00	$12.00
Disk	$29.95	$23.00	$15.00
Programmers Helper (Disk)	$59.00	$39.00	$29.95
Basic Tutor (Tape/Disk)	$29.95	$24.95	$15.00
Typing Teacher (Tape/Disk)	$29.95	$24.95	$15.00
Sprite Designer (Disk)	$16.95	$14.95	$10.00
Medicinemen (Tape)	$19.95	$17.95	$12.00
Weather War II (Tape)	$19.95	$17.95	$12.00
Professional Joy Stick	$24.95	$15.95	$11.00
Light Pen	$39.95	$19.95	$16.95
Dust Cover	$ 8.95	$ 6.95	$ 4.60

(See other items in our catalog!)

Write or call for Sample SPECIAL SOFTWARE COUPON!

EXECUTIVE QUALITY PROFESSIONAL BUSINESS SOFTWARE

The Cadillac of business programs for Commodore 64 Computers

Item	List	*SALE
Inventory Management	$99.00	$59.00
Accounts Receivable	$99.00	$59.00
Accounts Payable	$99.00	$59.00
Payroll	$99.00	$59.00
General Ledger	$99.00	$59.00

(*COUPON PRICE $49.00)

VIC-20 COMPUTER $69.50

This 25K VIC-20 computer includes a full size 66 key typewriter keyboard color and graphics keys, upper/lower case, full screen editor, 16K level II microsoft basic, sound and music, real time floating point decimal, self teaching book, connects to any T.V. or monitor!

40-80 COLUMN BOARD $59.00

Now you can get 40 OR 80 COLUMNS on your T.V. or monitor at one time! No more running out of line space for programming and making columns! Just plug in this Expansion Board and you immediately convert your VIC-20 computer to 40 OR 80 COLUMNS!! List $129. **SALE $59.00.** You can also get an 80 COLUMN BOARD WORD PROCESSOR with mail merge, terminal emulator, ELECTRONIC SPREAD SHEET!! List $59.00. **SALE $24.95** if purchased with 80 COLUMN BOARD! (Tape or Disk).

32K RAM EXPANDER $95.00

This cartridge increases programming power over **8 times!!** Expands total memory to 57K (57,000 bytes). Block switches are on outside of cover! Has expansion port!! Lists for $199 **(OUR BEST BUY!)**

60K MEMORY EXPANDER $49.00

Sixslot — Switch selectable — Reset button — Ribbon cable — CARDCO. A must to get the most out of your VIC-20 Computer!

8K RAM CARTRIDGE $39.00

Increases programming power 2 1/2 times. Expands total memory to 33K (33,000 bytes). Memory block switches are on outside of cover! Includes FREE $16.95 game.

16K RAM CARTRIDGE $55.00

Increases programming power 4 times. Expands total memory to 41K (41,000 bytes). Memory block switches are an outside cover! CARDCO Includes FREE $29.95 adventure game!!

12" GREEN SCREEN MONITOR $99.00

Excellent quality GREEN PHOSPHOROUS VIDEO MONITOR with antiglare, 1920 characters (80 characters x 24 rows). Save your TV! a must for 80 column word processors. PLUS $9.95 for VIC 20 or Commodore 64 Cable.

12" AMBER SCREEN MONITOR $119.00

Premium quality AMBER VIDEO MONITOR With antiglare, (80 characters x 24 rows), exceptionally clear screen, faster scanning. PLUS $9.95 for VIC 20 or Commodore 64 Cable.

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

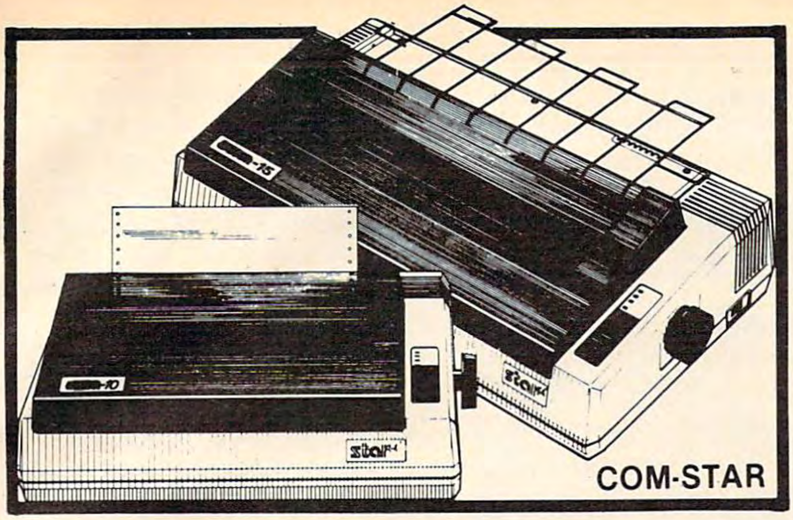
Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII orders. WE DO NOT EXPORT TO OTHER COUNTRIES.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Canada orders must be in U.S. dollars. VISA — MASTER CARD — C.O.D.

PROTECTO

ENTERPRIZES (WE LOVE OUR CUSTOMERS)

BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order



FANTASTIC PRINTER SALE

as low as **$149.00**

• 15 Day Free Trial - 180 Day Immediate Replacement Warranty

	LIST	SALE
80 COLUMN THERMAL PRINTER — 60 CPS	$199	**$149**
80 COLUMN TRACTOR-FRICTION PRINTER — 80 CPS	$399	**$209**
PREMIUM QUALITY 10″ CARRIAGE T/F PRINTER — 120 CPS	$499	**$289**
PREMIUM QUALITY 15½″ CARRIAGE PRINTER — 120 CPS	$599	**$379**
HIGH SPEED PREMIUM QUALITY T/F 10″ PRINTER — 160 CPS	$699	**$499**
HIGH SPEED PREMIUM QUALITY T/F 15½″ PRINTER — 160 CPS	$799	**$599**

80 COLUMN THERMAL PRINTER — 60 CPS
Bi-directional, dot matrix, prints 8½″ letter size paper, full 80 columns, high resolution graphics, dot bit addressable, special symbols and true decenders! (Centronics parallel interface)

80 COLUMN TRACTOR-FRICTION PRINTER — 80 CPS
Bi-directional, dot matrix, impact, prints single sheets, continuous feed paper, adjustable columns, 40 to 132 characters! Roll paper adapter $32.95. Centronics parallel interface)

PREMIUM QUALITY 10″ CARRIAGE T/F PRINTER — 120 CPS
Bi-directional, impact, 9 x 9 dot matrix with double strike for 18 x 18 dot matrix. High resolution bit image (120 x 144 dot matrix) underlining back spacing, left and right margin settings, true lower decenders, with super and sub scripts. Prints standard, italic, block graphics, special characters, plus 24 of user definable characters and much more!! Prints single sheets, continuous feed and roll paper! (Centronics parallel interface)

PREMIUM QUALITY 15½″ CARRIAGE PRINTER — 120 CPS
Has all the features of the Premium Quality 10″ Carriage T/F Printer above plus a 15½″ carriage and more powerful electronic components to handle large business forms! (Centronics parallel interface)

HIGH SPEED PREMIUM QUALITY T/F 10″ PRINTER — 160 CPS
Save printing time with these plus features: 160 CPS speed, 100% duty cycle, 8K buffer diverse character fonts special symbols and true decenders, vertical and horizontal tabs. This is Red Hot Efficiency!!! (Serial or Centronics parallel interface)

HIGH SPEED PREMIUM QUALITY T/F 15½″ PRINTER — 160 CPS
Has all the features of the 10″ Carriage high speed printer plus a 15½″ carriage and more powerful electronics to handle larger business forms! (Serial or Centronics parallel interface)

PARALLEL PRINTER INTERFACES: (IN STOCK)

- For VIC-20 and COMMODORE 64 — **$49.00**
- For all APPLE COMPUTERS — **$69.00**
- For ATARI 400 and 800 COMPUTERS — **$79.00**

NOTE: *Other printer interfaces are available at computer stores!*

SALE SALE

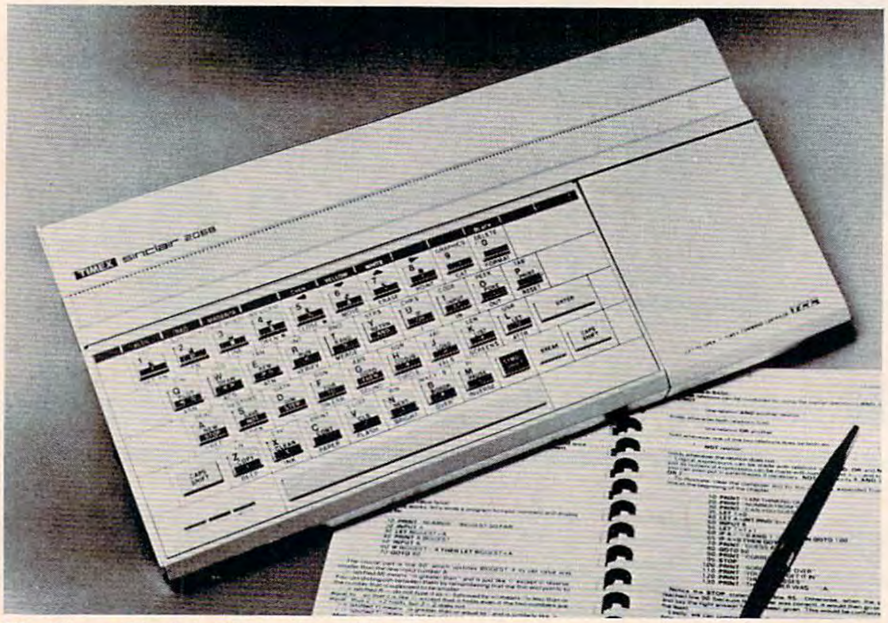
WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA.

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Canada orders must be in U.S. dollars. We accept Visa and MasterCard. We ship C.O.D.

PROTECTO
ENTERPRIZES (WE LOVE OUR CUSTOMERS)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

The Timex/Sinclair 2068

John Krause, Assistant Technical Editor



The Timex/Sinclair 2068 offers 72K of internal memory, eight colors, and sound.

The Timex/Sinclair 2068 is the latest addition to the Timex line of home computers. Retailing for $199.95, the 2068 features 72K of internal memory, eight colors, and sound, making it the most powerful Timex computer yet. The 72K is achieved through the use of bank switching and consists of 24K of ROM and 48K of RAM, of which about 38K is available for BASIC programs. The 2068 comes with three programs on cassette tape so you can put the computer to good use immediately if you have a suitable tape recorder.

The keyboard is full size and has 42 keys arranged in the familiar QWERTY layout. Timex describes the keys as being "full-travel," but they feel more like those on a calculator. They click into position when pressed and snap back when released. Each time a key is pressed, a faint sound can be heard from the internal speaker. This enables you to type without having to look up at the screen to verify that each keystroke was entered. All keys repeat when held down. And small raised dots on the F and J keys make it easier for touch-typists to find the home keys.

To the right of the keyboard is a cartridge port. Timex sells ready-to-run programs on cartridge which you use by simply opening the cartridge door and inserting the cartridge in the slot. Two joystick ports are available—one on the right side of the computer and one on the left. Both are standard Atari-style ports, compatible with a wide variety of joysticks. Located in the back of the computer are ports for connecting a tape recorder and a television or monitor, as well as a port for peripherals such as a printer or modem.

Using The Keyboard

As Timex admits in the manual, the keyboard may seem hopelessly complicated at first. Most of the keys have five or more different functions. The reason for so many functions is that the 2068, like all Timex computers, uses one-key BASIC commands. On most other computers, if you want the PRINT command, for example, you would type the letters P-R-I-N-T. But on the 2068, all you do is hit the P key. (It's not always that simple, as we'll see in a moment.) Since there are more BASIC commands than keys, each key must serve more than one function. Which function the computer uses depends on which shift key is pressed, if any, and which mode the computer is in at the time.

Five modes are available: keyword, letter, extended, capital, and graphic. The current mode is indicated on the screen by the cursor, which displays the initial of the mode—either K, L, E, C, or G. The extended, capital, and graphic modes can be switched in and out using keyboard commands. The keyword and letter modes are chosen automatically by the computer depending on which would be correct for the particular situation.

Let's examine all the different functions available via the P key. To get a lowercase P, you press the P key when in letter mode. To get a capital P, press P when in capital mode, or press CAPS SHIFT-P while in letter mode. To get the PRINT command, press P while in keyword mode. The quotation mark is chosen by pressing SYMBOL SHIFT-P while in either keyword, letter, or capital mode. To get TAB, you press P when in extended mode. To choose RESET, press SYMBOL SHIFT-P while in extended mode. The same general procedure applies to the other letter keys. This keyboard might be difficult to *learn*, but it's not difficult to *use* once you get used to it.

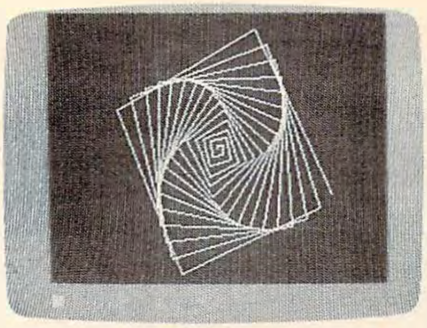
Two-Part Screen

The screen can display 24 lines with 32 characters each and is divided into two parts. The top part, normally 22 lines, is used for program output and listings. The bottom two lines are for entering commands and program lines, and also for displaying error messages by the computer. When you type in a program, each step is entered in the bottom part and is added to the listing above when ENTER is pressed. You can change any program step by moving an arrow to the step, using the up-arrow and down-arrow keys, and pressing EDIT. The step will appear in the bottom part, allowing you to insert or delete characters and then replace the step by pressing ENTER.

Several Graphics Modes

Characters can appear on the screen in many forms. Each character position has six parameters: PAPER, INK, FLASH, BRIGHT, INVERSE, and OVER. INK sets the character color and PAPER sets the background color. The available colors are blue, red, magenta, green, cyan, yellow, white, and black. The border color can also be changed using the BORDER command. INVERSE reverses the colors of INK and PAPER to print inverse characters. FLASH causes characters to flash by rapidly switching INVERSE on and off. BRIGHT makes characters appear brighter for emphasis. OVER allows you to create special characters by overstriking one character with another, as on a typewriter. For example, you could underline a letter by printing over it with the underline character.

Eight graphics characters are available from graphic mode. Eight more can be obtained by using the inverse of these characters. You can also create your own graphics characters and store them "under" the letter keys A-U. Most computers give you the ability to define your own characters, but the procedure is not easy and usually requires sacrificing other characters. On the 2068, however, it's a breeze. Each character consists of an 8-by-8 matrix of pixels. Each pixel can show either the INK color or the PAPER color. Think of the INK color as a 1 and the PAPER color as a 0. Each row of eight pixels is defined



High-resolution graphics is available on the 2068.

separately. To define the top row of pixels for a character stored "under" the E key, for example, you would type

```
POKE USR "e", BIN 01001100
```

The other seven rows are similarly defined. Then if you press the E key while in graphic mode, you'll get your character. It's that easy. Moreover, you don't have to sacrifice any of the normal characters.

One of the best features of the 2068 is its high-resolution graphics capability. The screen is 256 pixels wide and 192 pixels high. Three commands are available for drawing in high resolution. The PLOT command puts a dot at a specified place on the screen. DRAW draws a line and CIRCLE draws a circle or arc.

Simple Or Complex

The 2068 has both simple and complex ways of creating sounds. If all you need is a simple beep, you can use the BEEP command followed by two numbers representing the pitch, which has a range of ten octaves, and the duration of the note. For more complex sounds, you use the SOUND command. It allows you to play up to three notes at once and produce special effects. Consequently, it is also more difficult to use.

The SOUND command is followed by up to 15 pairs of numbers. Each pair specifies a number to be stored in one of 15 registers within the sound synthesizer chip. These registers control the pitch (eight octaves), duration, and volume of up to three voices or channels. Each channel can play either a tone or a noise waveform. The envelope of the sound can be changed by specifying the rate of attack (increasing volume), and decay (decreasing volume). You can play the envelope once or make it repeat automatically.

With all these features, you can create a wide variety of sounds. But it's a shame that these sounds must be heard through the small internal speaker. It would have been better to have an audio output to give you the option of using your monitor's speaker or an audio system. This would give higher quality sound and better volume control.

Included Software

Like all Timex computers, the 2068 has the ability to use a conventional tape recorder for loading and storing programs. Using an ordinary tape recorder has its drawbacks, however. The volume level must be set just right or the program will not load properly. Fortunately, the same volume level works for all programs, so you should have to adjust the volume only once. If you do not already own a cassette recorder, you can purchase the Timex/Sinclair 2020 Computer Program Recorder. It is designed especially for use with Timex/Sinclair computers and can also be used as a conventional tape recorder for speech or music.

The first program is Keyboard Tutorial. It summarizes the material covered in the manual to familiarize you with the keyboard. It also demonstrates the sound and graphics capabilities of the 2068. As each key is introduced, a picture of the keyboard is drawn, using high-resolution graphics accompanied by sound effects. The appropriate key flashes, allowing the user to find its exact location on the keyboard. At the end of the tutorial is a practice session to test your ability to use the keyboard.


WAREHOUSE PRICES
Call us toll free for prices directly from our warehouse inventory. Save on our volume purchases.
Largest selection of discounted hardware and software.
800-372-0214 / 800-432-0368
IN FLORIDA
13" Color Monitor $199.00
(for Commodore & Atari)
Seikosha Dot Matrix Printer $199.00
Direct Connect to Atari (no 850 interface needed)
Gemini 15 Dot Matrix Printer $325.00
Elephant Disk 10 pack (SS/SD) . . . . $ 16.99
Maxell Disk 10 pack (SS/DD) . . . . . $ 23.99
RANA 1000 Disk Drive (for Atari) $319.00
ATARI
COLECO
COMMODORE
SANYO
NEC
and more
VISA
MasterCard
Send $1 for our complete catalog.
COMPUTER WAREHOUSE
Computers and Software at warehouse prices.
8764 S.W. 133 STREET, MIAMI, FLORIDA 33156
(305)271-8072

The second program is Turtle Graphics. It lets you draw high-resolution pictures by guiding a "turtle" around on the screen. By typing commands from the keyboard you can tell the turtle to move forward so many pixels and turn left or right so many degrees. As the turtle moves, it leaves behind a trail. The power of Turtle Graphics is its ability to repeat a sequence of commands many times to create interesting patterns on the screen.

The third program is Home Accounting, which helps you keep track of your household budget or business records. You enter your budget and actual amount spent for each month, and the computer calculates the difference. You can display a bar graph of each month's budget versus your actual expenses.

Timex seems to realize the importance of software. They promise to have a "plentiful" supply of programs ranging in price from $9.95 to $19.95 on cassette, $12.95 to $29.95 on cartridge. Cassette programs developed for the ZX Spectrum can also be used on the 2068.

Documentation

The 290-page *User Manual* explains all the features of the 2068 well. Part I introduces the major features and assumes the user has no computer experience. It also explains how to load programs on tape cassettes so the included software can be used right away. For those who want to write their own programs, Part II provides an introduction to programming in T/S 2068 BASIC. It covers the use of variables, arrays, arithmetic functions, subroutines, and the concepts of looping and branching. Part III describes more advanced features to allow the experienced computer user to get the most from the computer. Such features include user-defined graphics, input and output, and music and sound effects.

The appendices go into detail about the memory configuration and briefly mention several "enhanced display modes," including a 64-character wide screen, a dual screen mode, and an extended color mode. Exactly how these modes are used is not clear, but they are discussed in more detail in the *T/S 2068 Advanced Programming Concepts Manual*.

Throughout the manual there are illustrations showing exactly which keys to press and roughly what should appear on the screen. Beginners will enjoy the cartoons, featuring an old woman and her cat, which have nothing to do with the computer, but help make the computer less intimidating.

Besides a tape recorder, you can add two more peripherals. The 2068 is compatible with the Timex/Sinclair 2040 Thermal Printer used by the TS1500 and TS1000 computers. It prints graphics and text and retails for $99.95. A modem is also available to provide access to data banks and telecommunications services. Special programs for use with the modem provide home shopping and banking capabilities. Other peripherals will be announced, including bulk storage devices. Peripherals are connected to the expansion port, which can accept only two at a time.

In terms of memory, graphics, and sound, the Timex/Sinclair 2068 is an impressive entry into the under $200 market. And, where some other computers require that you spend an additional $60 to $70 for a cassette recorder, you can use any player with the 2068. Furthermore, the included software enables you to use the computer immediately, without spending another cent.

Timex/Sinclair 2068 Personal Color Computer
Timex Computer Corporation
Waterbury, CT 06720
(203) 573-5000
$199.95

©

Snake Byte For VIC, 64, Apple, And Atari

Tony Roberts, Assistant Managing Editor

Since the advent of microcomputers, snake games have been a mainstay of the menu of available entertainment software. Generally, snake games are simple, yet they have the power to charm and challenge.

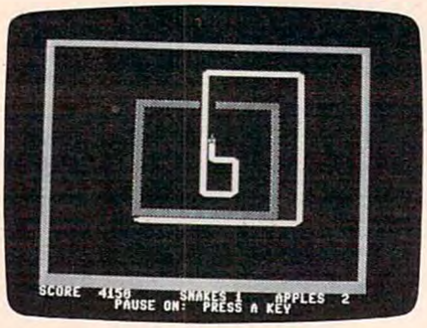
One of my favorite games in this genre is *Cleanup*, which was programmed years ago for the TRS-80 Model I. Despite its lack of color, sound, or sophisticated graphics, *Cleanup* remains one of the most frequently played programs in my game collection.

A more modern program of the same ilk is *Snake Byte* from Sirius Software. This program takes the same captivating idea, mixes in color and sound, a number of screens, and a time factor, and the result is a game I'll play again and again.

Gobbling Up Apples

The object of *Snake Byte* is to guide your snake to the apples that appear on the screen. Gobble up an apple, and another appears. Your snake also grows longer. Gobble up ten apples without hitting a wall or any part of your own ever-growing body, and a door to the next level opens. Thread your way through the door and you start over again, this time on a more complicated screen. As you move from level to level, the obstacles become more difficult.

As you play, bars on each side of the display inch toward the top of the screen. Should they complete their journey before you've eaten an apple, you are penalized: Three more apples are added to the total you must



In Snake Byte, *the snake gobbles up apples and grows longer as it threads its way to more complicated screens.*

eat before completing the level.

Your snake is controlled from the keyboard; there is no provision for joysticks. The keyboard, however, offers several options. You can control up-down movement with your left hand and right-left movement with your right. Or you can play with one hand using the I, J, K, and M keys. A third option allows you to use the › and ‹ keys to achieve clockwise and counterclockwise movement. Despite its simplicity, I was unable to master this variation.

Perilous Purple Plums

Another aspect of *Snake Byte* that adds to the challenge is the option for playing with one or two purple plums in the arena. The plums offer the potential for higher scores, but at the same time they add to your headaches.

The plums bounce around the screen, deflecting off walls, obstacles, and your snake. Unless a plum hits your snake on the head, no harm is done. Sometimes it is possible to use the snake's body to corral the plums, temporarily keeping them out of your way.

The Commodore 64 version is a little easier to control. Guiding the snake into the door that leads to the next level is more difficult on the VIC than it is on the Commodore 64. The more highly defined screen on the 64 provides additional room to maneuver through tight spots, and that's the part of the game you'll probably enjoy most. Even people who aren't normally exhibitionistic seem to love to play this type of game with an audience and have them ooh and aah as the player escapes impossible predicaments.

This game is more akin to a ballet than to a battlefield. It generates neither the hyperactivity associated with hyperspace flight nor the heart-pounding excitement of protecting a planet.

Snake Byte can even be a relaxing game. The snake, winding its way around the screen, has a hypnotic quality—a tonic that calms the nerves. It's enjoyable both when played for a few minutes as a counterpoint to more serious pursuits and when played seriously for the challenge.

Snake Byte
Sirius Software
10364 Rockingham Drive
Sacramento, CA 95827
(916) 366-1195
Apple and Atari disk, $29.95
Commodore 64 disk, $34.95
VIC-20 cartridge, $39.95

©

WordPro 3 Plus/64

Larry Bihlmeyer

As word processing programs compete in the Commodore 64 market, better programs are available at lower costs. *WordPro 3 Plus/64*, by Professional Software Inc., is part of this trend.

WordPro, in its other versions, has long been the standard for comparison in office and small business word processing applications.

WordPro 3 Plus/64 comes on disk with a complete instruction manual of 160 pages. The manual is well organized into these categories: introduction, getting started, functions, editing text, advanced functions, file handling, disk drive commands, summaries, programmer's notes, example letter, care of diskettes, glossary, warranty and disclaimer, printer information, index and addenda.

There are far too many commands to adequately cover, so this review will only highlight some of the more interesting features.

Set-up Options

To start *WordPro*, you load a short boot program and then load the main word processing program. This process takes about 90 seconds. Then the screen clears and a message appears with the title "Word Processor Three Plus" and you are asked what kind of printer you have. Six printers can be selected—Spinwriter, Diablo, Qume, Tec, 8027, and Other.

Next, the number of lines available for main text is shown, and you can choose up to about 329 lines. A second storage area, called "Extra Text" (it's like a buffer), can also be allocated.

Finally, the main screen appears with a status line at the top. First, you see a sequence of characters like :X:I:S:C:N. Here, X indicates the extra text mode, I insert mode, S shift lock mode, C control mode, and N numeric mode. When you select one of these modes, the corresponding indicator letter will be highlighted (background color changes) so you can tell quickly what mode you are in.

Advanced Features

Editing is done with the normal 64 cursor controls. Special functions, selected with the "control" key, then get you into more advanced features. For example, Control-D will delete words and sentences. And Control-F will search for a given string of characters. Other more unique control functions allow you to append lines from the extra text area, put a variable block on screen, duplicate a range of lines, go to numeric mode, set up tabs, transfer a range of lines, underline, access bold type or disk utilities or subscript and superscript, add and subtract columns of numbers, sound a beeper, and perform global functions.

There are 23 format commands and 47 control functions. For instance, cn turns on centering and pt sets the pitch.

The Extra Text area is like a buffer where you can store text, for reference or for eventual addition to the main text. You can write and store standard or "boilerplate" paragraphs to use repeatedly in letters. Extra text can be used either manually or automatically, with the variable blocks feature.

Although there are a lot of commands to learn, the instruction manual includes many examples which you can copy, and in no time you'll be using the commands on your own. You can also copy the feature summary sheets and have them nearby for quick reference.

Finally, there is a section called "Programmer's Notes" which will help if you run into complications, or want to do more with the input/output features. This will be useful for readers with various types of printers.

Printer Connections

And speaking of printers, this is the only area where I find any shortcomings with *WordPro 3 Plus/64*. The program supports only printing to device #4 on the serial port, so if you use the RS-232 port with a printer interface, you will not be able to print using *WordPro 3 Plus/64*.

If you are unsure of your printer/interface requirements, you should either contact your *WordPro* dealer for an actual tryout on your equipment or find out what interface you need.

Overall, *WordPro 3 Plus/64* is one of the most complete word processing programs on the market in its price range. It'll handle home needs and even most needs of small business.

WordPro 3 Plus/64
Professional Software Inc.
51 Fremont Street
Needham, MA 02194
$89.95 ©

Richard Mansfield, Senior Editor

Computer Amnesia

Here's a nasty little problem that can completely baffle you if you don't know what's causing it. We'll provide a short utility program that will cure this deadly error—but first, let's explore the symptoms. It appears in several disguises.

As you begin to write longer and more complicated programs, sooner or later your computer will halt execution and announce that you're OUT OF MEMORY. You know you're not. When you ask for a report of free memory (? FRE, or whatever command your BASIC uses), there's a lot of room left. But the computer is claiming that it has no more memory left. What's going on?

Something's Gone Awry

Try Program 1. After you type RUN, the computer will obediently follow your instructions and then grind to a halt. Your machine won't smolder, but something's gone awry. Clearly, these three lines cannot be using up all the memory in even the smallest computer.

Notice that there is no RETURN instruction to match the GOSUB. We are continuously GOSUBing, but always jumping back without a proper RETURN. That's variation one of this problem. Whenever the computer comes upon a GOSUB, it makes a mental note of where it is currently located so it can RETURN there. In Program 1, the computer would make a note that "line 150" was the correct place to RETURN. These mental notes are put on a *stack*, a zone in memory from addresses 256–511 (in 6502-based computers). As each note gets put on the stack, it takes up more room in the stack.

When the computer comes upon a RETURN instruction, it pulls off the most recent note and knows where to jump back to. Program 1, however, has no RETURN and so those notes keep piling up in the stack. Pretty soon, the computer is out of stack memory because each GOSUB puts a two-byte-sized note on the stack. To make things worse, some versions of BASIC use part of stack memory for their own purposes, making the stack smaller still.

A Common Stack Stuffer

In a cleanly written program, you'll always RETURN from every GOSUB. When you're writing large programs, however, that's easier said than done. It's hard to keep track of everything. Added to that, there's an even more subtle way to run out of stack space: early exit loops.

Look at Program 3. It's a very common technique to set up a loop and then test something, exiting the loop if the test succeeds. In such cases, you keep bouncing between FOR and NEXT until the IF part is satisfied. (For the moment, don't pay any attention to lines 10–20 and the SYS statement.) When, in line 110, A = 1, we jump out of that FOR/NEXT loop and into another one. And we start searching for B. *The first loop was never completed*. That is, we left an unsatisfied NEXT A because it didn't get to count up to 5 as it wanted to. It wouldn't make much difference if these NEXTs were unsatisfied except that this condition, too, leaves something on the stack. This isn't quite the stack stuffer that unRETURNed GOSUBs are, but it does eventually cause an overflow and an OUT OF MEMORY.

Solving The Problem

So, if you run into this mysterious memory loss, check through your program first for early exits from GOSUBs (that's the most likely cause). Then, if that's not it, look at your FOR/NEXT loops. The cure for GOSUBs is to create a RETURN to satisfy each one. The cure for the loops is to *use the same variable name again*. In Program 3, if we write IF A, IF A, IF A, instead of IF A, IF B, IF C, there would be no problem. Reusing an IF variable will clean the stack for you.

Experienced programmers make it a habit to use I for almost every FOR/NEXT loop, J if they need a loop within the I loop, and T for timing loops. That way, they keep the stack clean without having to think about it.

Lines 10–20 in Programs 2 and 3 are a short utility that can be attached to any program and give a report of the memory left within the stack.

Jeff and Marilyn Mitchell "designed" their new program themselves. CodeWriter wrote all the computer code. The Mitchells' dream is thriving on fulfilling other people's wishes. Their new home business needs very special information fast: Which fantasies are still open? What's our next completion date? Can we get a list of all fantasies needing out of state travel?

They got it all—with no computer hassle.

And you can too, with CodeWriter. No programming. No. 'computerese'. At home or at the office, you create your own programs to handle any information you want—at your fingertips; Payables, receivables, inventory, credit cards, tax details, club or church records—always organized your way.

You work with CodeWriter in plain English. Simply 'draw' any screen layout, add any calculations you'd like done—or help messages you need—and you're done. CodeWriter writes all the BASIC code.

In minutes you've got YOUR OWN PROGRAM on YOUR OWN DISK. You don't need CodeWriter again until you want a new program.

You can begin with **Home FileWriter™** and expand to more complete business systems with full report and menu design features.

You can get CodeWriter for the Commodore 64®, Atari®, Apple®, IBM PC®, Commodore Business Machine®, Victor 9000®, and Kay Pro II®, computers. Prices range from $69 to $249.

You think this much power can't come this easy? There are thousands of CodeWriter systems in use all over the world—80% are first time computer owners. CodeWriter writes solutions the first time you try!

"This is our first business, our first computer, and our first program—and we really did it ourselves!"

CodeWriter™ A Dynatech Company Dynatech Microsoftware Inc.

7847 N. Caldwell Ave. Niles, Ill. 60648
Toll-Free 1-800-621-4109 (in Ill. 312-470-0700)

AVAILABLE AT **TOYS "Я" US** ® All Locations Check White Pages

COMPUTER MAIL ORDER

TERMINALS

914 .... $569.00
924 .... $689.00
925 .... $739.00
950 .... $929.00
970 .... $1039.00

COMPUTERS

Teleport Portable .... CALL
800A $1099.00
802 .... $2699.00
803 .... $1949.00
802H $4695.00
806/20 .... $4999.00
816/40 .... $9199.00
1602 .... $3399.00
1603 .... CALL

TeleVideo

Spirit XL Portable $3999.00
IIE-1 .... $1569.00
IIE-2 .... $1899.00
IIE-3 .... $2399.00
IIE-4 .... $3299.00
PC-E $1579.00
PC-1 .... $2399.00
PC-2 .... $2799.00
PC-XL $3599.00
1620 .... $3599.00
1630 .... $5499.00
1640 .... $6499.00
Cyma Software .... CALL

SANYO

MBC-550 PC ... CALL
MBC-555 PC ... CALL
MBC 1100 .... $1499.00
FDD 3200-320K Drive $389.00
MBC 1150 .... $1899.00
MBC 1200 .... $1849.00
FDD 6400-640K Drive $469.00
MBC 1250 .... $2099.00
PR 5500 Printer $599.00

MONITORS

AMDEK

300 Green $149.00
300 Amber $159.00
310 Amber $169.00
Color 1 .... $279.00
Color 1 Plus $299.00
Color 2 .... $399.00
Color 2 Plus $419.00
Color 3 .... $349.00
Color 4 .... $699.00

BMC

12" Green $79.99
12" Green HI-RES $119.99
9191-13" Color $249.99

GORILLA

12" Green $88.99
12" Amber $95.99

NEC

JB 1260 Green $109.99
JB 1201 Green $149.99
JB 1205 Amber $159.99
JC 1215 Color $299.99
JC 1216 RGB $429.99

PRINCETON GRAPHICS

HX-12 RGB $519.00

TAXAN

12" Green $119.00
12" Amber $129.00
Taxan 1 RGB $279.00

USI

Pi 1, 9" Green $99.99
Pi 2, 12" Green $119.99
Pi 3, 12" Amber $149.99
Pi 4, 9" Amber $139.99
1400 Color $269.99

ZENITH

ZVM 122 Amber $109.99
ZVM 123 Green $89.99
ZVM 135 Color/RGB $469.99

MODEMS

ANCHOR

Mark I (RS-232) $79.00
Mark II (Atari) $79.00
Mark III (TI-99) $109.00
Mark IV (CBM/PET) $125.00
Mark V (Osborne) $95.00
Mark VI (IBM-PC) $169.00
Mark VII (Auto Ans/Auto Dial) $119.00
Mark XII (1200 Baud) $299.00
TRS-80 Color Computer $99.00
9 Volt Power Supply $9.00

HAYES

Smartmodem 300 .... $219.00
Smartmodem 1200 .... $509.00
Smartmodem 1200B $459.00
Micromodem II $265.00
Micromodem II Plus $299.00
Micromodem IIE $269.00
Micromodem 100 .... $299.00
Smart Com II $89.00
Chronograph $199.00

NOVATION

J-Cat $99.99
SmartCat 103 .... $179.00
SmartCat 103/212 .... $399.00
AutoCat $219.00
212 AutoCat $549.00
Apple Cat II $249.00
212 Apple Cat $569.00
Apple Cat 212 Upgrade $309.00
Cat $139.99
D-Cat $149.00
PC-Cat $339.00

ZENITH

ZT-1 .... $309.00
ZT-10 .... $339.00
ZT-11 .... $369.00

APPLE INTERFACE CARDS & BUFFERS

Choose from PKASO, Orange Micro, MPC, MicroMax, Tymac, Quadram & Practical Peripherals .... CALL

NEC PRINTERS

NEC 2050 .... $999.00
NEC 3550 .... $1699.00

PERCOM/TANDON DRIVES

5¼" 320K Floppy $229.00
5 Meg Hard w/Controller $1399.00
10 Meg Hard w/Controller $1699.00
15 Meg Hard w/Controller $2095.00
20 Meg Hard w/Controller $2399.00

AMDEK

310A Amber Monitor $169.00
DXY 100 Plotter $599.00
Color II $399.00

AST RESEARCH, INC.

Six Pak Plus...from $279.00
Combo Plus II...from $279.00
Mega Plus...from $309.00
I/O Plus II...from $139.00

QUADRAM

Quadlink $519.00
Quadboard...as low as $289.00
Quad 512 Plus...as low as $249.00
Quadcolor...as low as $219.00
Chronograph $89.00
Parallel Interface Board $89.00
64K RAM Chips Kit $59.00

MICRO PRO

WordStar/Mail Merge $349.00
InfoStar $299.00
SpellStar $159.00
CalcStar $99.00

MICROSTUF

Crosstalk $105.00

MICROSOFT

Multiplan $159.00

pfs

	APPLE	IBM
Write:	79.00	89.00
Graph:	79.00	89.00
Report:	79.00	79.00
File:	79.00	89.00
Solutions*: as low as	16.00	16.00

*Call On Titles

IBM

ASHTON-TATE

dBASE II $389.00
Friday! $185.00

IUS

EasyWriter II $249.00
EasySpeller $119.00
EasyFiler $229.00

CONTINENTAL SOFTWARE

1st Class Mail/Form Letter $79.00
The Home Accountant Plus $88.00

SYNAPSE

File Manager $89.00

LOTUS

1-2-3 .... $319.00

PROFESSIONAL SOFTWARE

PC Plus/The Boss $349.00

VISICORP

	IBM	APPLE
VisiCalc		159.00
VisiCalc 4	159.00	
VisiCalc-Advanced		269.00
VisiWord/Spell	249.00	
Visitrend/Plot	199.00	199.00
VisiLink		169.00
VisiFile	199.00	169.00
VisiSchedule	199.00	199.00
Visidex		159.00
VisiPlot		135.00
VisiTerm		75.00
Desktop Plan	199.00	169.00
Bus. Forecast Model	75.00	75.00
Stretch Calc	75.00	75.00
VisiTutor Calc	59.00	59.00
VisiTutor-Advanced	75.00	75.00
VisiTutor Word	59.00	59.00
Vision Calc	249.00	
Vision Graph	129.00	
Vision Mouse	159.00	
Vision Host	319.00	

PRINTERS

AXIOM

AT-100 Atari Interface $239.00
CD-100 CBM 64/VIC 20 .... $239.00
GP-100 Parallel Interface $199.00

BMC

401 Letter Quality $589.00
BX-80 Dot Matrix $269.00

CENTRONICS

122 Parallel $399.00
739-1 Parallel $299.00
739-3 Serial $349.00

C.ITOH

Gorilla Banana $209.00
Prowriter 8510P $379.00
Prowriter 1550P $679.00
A10 (18 cps) $569.00
F10-40 .... $999.00
F10-55 .... $1499.00

COMREX

ComWriter II Letter Quality $499.00

DIABLO

620 Letter Quality $949.00
630 Letter Quality $1749.00

DAISYWRITER

2000 .... $999.00
Tractor Feed $109.00

EPSON

MX-80FT, MX-100, RX-80, RX-80FT, FX-80, FX-100 .... CALL

IDS

Prism 80...For Configurations ... CALL
Prism 32...For Configurations ... CALL

MANNESMAN TALLY

160L $589.00
180L $799.00
Spirit 80 .... $309.00

NEC

2010/2030 .... $899.00
8023 Dot Matrix $379.00
8025 Dot Matrix $669.00
3510 Serial/Letter Quality $1449.00
3530 Parallel/Letter Quality $1499.00
7710/7730 Serial/Parallel $1949.00

OKIDATA

82, 83, 84, 92, 93, 2350, 2410 ... CALL

SMITH CORONA

TP-2 .... $439.00
Tractor Feed $119.00

SILVER REED

500 Letter Quality $469.00
550 Letter Quality $699.00

STAR

Gemini 10X $299.00
Gemini P15 .... $399.00
Delta 10 .... $559.00
Serial Board $75.00

TOSHIBA .... CALL
TRANSTAR .... CALL

PRINTER CABLES

Available for Atari, Commodore, IBM, Apple, Epson, Kaypro, Televideo, Franklin, Eagle, Sanyo, Osborne, NEC, Zenith and many others. We supply all your computer needs!

PAPER SUPPLIES

1000 shts. 8½x11 Tractor Paper ... 19.99
1000 shts. 14½x11 Tractor Paper .. $24.99
1 or 2" Address Labels $9.99

WEST

800-648-3311

In NV call (702)588-5654, Dept 0306
Order Status Number: 588-5654
P.O. Box 6689, Stateline, NV 89449

CANADA

800-268-4559

In Toronto call (416)828-0866, Dept 0306
Order Status Number: 828-0866
2505 Dunwin Drive, Unit 1B
Mississauga, Ontario, Canada L5L1T1

EAST

800-233-8950

In PA call (717)327-9575, Dept 0306
Order Status Number: 327-9576
Customer Service Number: 327-1450
477 E. Third St., Williamsport, PA 17701

VISA

No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the UPS Continental United States with no waiting period for certified checks or money orders. Add 3% (minimum $5.00) shipping and handling on all C.O.D. and credit card orders. Larger shipments may require additional charges. NV and PA residents add sales tax. All items subject to availability and price change. We stock manufactuer's and third party software for most all computers on the market. Call today for our new catalog.

As written, the DATA line contains the information for the Commodore 64 version of this utility, "Stackwatch." Replacements for this line to make it work on other computers are given below.

If you've been working on a long, complicated program and are getting an odd out-of-memory error, add lines 10–20 to the long program. They'll stick a machine language program down in a safe place. Then, put SYS 864 into various places in your program. You can then quickly locate which loop or GOSUB is unclosed. When the number printed on screen by Stackwatch takes a big dip, hit the STOP key and see where you are.

To make Stackwatch work on other Commodore computers and the Apple, you must change the last three items in the DATA line, line 10, as follows:

for Original ROM PET:	**159,220,96**
Upgrade ROM PET:	**217,220,96**
4.0 BASIC PET:	**131,207,96**
VIC-20:	**205,221,96**
64:	**(as printed)**
For Apple:	**10 DATA 186,169,0,32,36,207,96**

There is no comparable number printing routine within the Atari operating system, but Charles Brannon has provided the following replica for those who know machine language and want to implement Stackwatch on the Atari.

For TI, you can run these BASIC tests, but the TI's brain chip will not run Stackwatch.

```
ØØØØ                    *=    $6ØØ
Ø6ØØ                    .OPT OBJ
                ;Test routine
Ø6ØØ A9ØØ               LDA   #Ø
Ø6Ø2 A264               LDX   #1ØØ
Ø6Ø4 2ØØ8Ø6             JSR   PRNUM
Ø6Ø7 6Ø                 RTS
                ;
                ;MSB in A, LSB in X
                ;Prints number to screen
                ;
Ø6Ø8 86D4       PRNUM   STX   $D4
Ø6ØA 85D5               STA   $D5
Ø6ØC 2ØAAD9             JSR   $D9AA
Ø6ØF 2ØE6D8             JSR   $D8E6
                ;
                ;Print ASCII number pointed to
                ;by $F3 and $F4
                ;The last digit of the number will be signalled by bit 7
                ;If it is set, then we have the last digit
Ø612 AØØØ               LDY   #Ø
Ø614 84CB       LOOP    STY   $CB        ;Save Y index
Ø616 B1F3               LDA   ($F3),Y    ;Get char
Ø618 48                 PHA              ;save it on stack
Ø619 297F               AND   #$7F       ;mask off high bit (or it would be invers
e)
Ø61B 2Ø27Ø6             JSR   PRCHAR     ;print character
Ø61E 68                 PLA              ;restore character
Ø61F 3ØØ5               BMI   EXIT       ;test for high bit set
Ø621 A4CB               LDY   $CB        ;restore Y index
Ø623 C8                 INY
Ø624 DØEE               BNE   LOOP
Ø626 6Ø         EXIT    RTS
                ;
                ;This routine pushes the high,low bytes of the address
                ;of the CIO print character routine onto the stack,
                ;creating an artificial return address
                ;In effect, we have an indirect jump
Ø627 AA         PRCHAR  TAX
Ø628 AD47Ø3               LDA $Ø347
Ø62B 48                   PHA
Ø62C AD46Ø3               LDA $Ø346
Ø62F 48                   PHA
Ø63Ø 8A                   TXA
Ø631 AØ92                 LDY #$92
Ø633 6Ø                   RTS
                ;
Ø634                      .END
```

Program 1: Memory Collapse

```
100 GOSUB 150
150 X = X + 1:PRINT X
160 GOTO 100
```

Program 2:
Stackwatch Attached To Program 1

```
10 DATA 186, 169, 0, 32, 205, 189, 96
20 FOR A=864TO870:READ D:POKE A,D:NEXT A
100 GOSUB 150
150 X=X+1:PRINTX
160 SYS864:GOTO100
```

Program 3: Too Many Loops

```
10 DATA 186,169,0,32,205,189,96
20 FORA=864TO870:READD:POKEA,D:NEXTA
100 FORA=1TO5
110 IFA=1THEN130
120 NEXTA
130 SYS864:FORB=1TO5
140 IFB=1THEN160
150 NEXTB
160 SYS864:FORC=1TO5
170 IFC=1THEN190
180 NEXTC
190 SYS864:FORD=1TO5
200 IFD=1THEN220
210 NEXTD
220 SYS864:FORE=1TO5
230 IFE=1THEN250
240 NEXTE
250 SYS864:FORF=1TO5
260 IFF=1THEN280
270 NEXTF
280 SYS864:FORG=1TO5
290 IFG=1THEN310
300 NEXTG
310 SYS864:FORH=1TO5
320 IFH=1THEN340
330 NEXTH
340 SYS864:FORI=1TO5
350 IFI=1THEN370
360 NEXTI
370 SYS864:FORJ=1TO5
380 IFJ=1THEN400
390 NEXTJ
```

©

New Directions For Computer Camps

Fred D'Ignazio, Associate Editor

I thought that this camp would be about programming. I didn't know that it would be so much fun!

Ashley Bell, age 8

Ashley was one of the youngest campers at the Computer FUNdamentals camp at Hollins College, in Roanoke, Virginia, last summer. Her comments reflect the kind of computer activities she participated in at the camp. However, if she had gone to another camp, she might have learned about computers in a completely different way.

The Changing Face Of Computer Camps

Most educators agree that the first computer camp was organized by Dr. Michael Zabinski in Connecticut, in 1978. Now, six years later, Zabinski's organization offers five camps annually, in locations from Simsbury, Connecticut, to Portland, Oregon. In addition to Zabinski's camps there are hundreds of other computer camps throughout the U.S.

The first camps were mostly attended by boys. The boys studied "hard-core" computer subjects like BASIC programming, computer hardware, and hooking up different devices to computers. Compared to today's models, the computers at the first camps were primitive. They consisted of early Apple computers, TRS-80 (Model I's), Commodore PETs, and other computers whose names we have all but forgotten.

Today's campers enter a new world filled with the latest personal computers and peripheral devices such as speech synthesizers, graphics pads, light pens, and robots. They study a variety of subjects, including the impact of computers on society, computers for handicapped people, and computers in the arts and humanities.

Today, girls represent a much larger proportion of the campers. In some camps, they number as many as a third.

At most camps you will also see a few campers who have some sort of mental or physical disability. Campers in wheelchairs are a common sight at many camps.

So are adults. The newest computer camps cater to both youngsters and oldsters. In fact, it's predicted that many of the most avid campers in 1984 will be men and women in their 60s and 70s.

How To Choose A Computer Camp

There are hundreds of computer camps to choose from, each with its own philosophy and personality. And you can find the right one for you, if you look hard enough.

The first thing you should look at is the type of camp. Is it sponsored locally or nationally? Is it for children, adults, or both? Do the counselors concentrate on programming or on computer literacy and applications? Is the camp residential or a day camp?

There are benefits and drawbacks associated with each type of camp. For example, if a camp is locally sponsored, it may be more suited to the needs of the people in your community. But local sponsorship doesn't necessarily mean high-quality sponsorship. Generally speaking, the best local computer camps are affiliated with a community college or university.

Residential computer camps are nice because they take the children away from home for a week

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. His books include Katie and the Computer *(Creative Computing),* Chip Mitchell: The Case of the Stolen Computer Brains *(Dutton/Lodestar),* The Star Wars Question and Answer Book About Computers *(Random House), and* How To Get Intimate With Your Computer (A 10-Step Plan To Conquer Computer Anxiety) *(McGraw-Hill).*

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in COMPUTE!.

COMPUTE!'s First Book of VIC Games

Authors: COMPUTE! Magazine Contributors
Price: $12.95
On Sale: Now

The VIC-20 is a versatile computer. Its programmable color, graphics, and sound can add a lot to game programs.

Over the past few years, COMPUTE! Magazine has published a wide variety of games for the VIC. But some back issues are hard to find or unavailable.

That's why the editors of COMPUTE! have chosen the best games, revised them, and added previously unpublished games, putting them together into *COMPUTE!'s First Book of VIC Games*. Each game has been tested and debugged and is ready to type into a VIC-20.

First Book of VIC Games contains fast-action arcade games that require quick reflexes, as well as strategy games that test logical skills. For $12.95 you get two dozen games, including:

Time Bomb — You hear the time bomb ticking, and you have to find your way through the maze to defuse it. But the maze is larger than the screen, and you can't always see where the dead ends are.

Closeout — The local department store is having a sale. You try to snatch as many sale items as possible, while avoiding the horde of bargain hunters who are trying to thwart you.

Cryptic Numbers — A good logic game. The computer picks a pattern of numbers that you have to guess. After each turn you learn how close you were.

Air Defense — Missiles are falling out of the sky onto your city. Aim carefully; you get only one shot at each missile.

Thunderbird — Your goal is to break out of the playing field by using the thunderbird that controls the satellite.

Sky Diver — Put on your parachute, jump out of the plane, and try to land on one of the targets. Watch out for wind currents that may blow you off course.

Deflector — A ball is bouncing around the screen. You can aim it toward targets by strategically placing deflectors that change its direction.

Hidden Maze — Lost in a maze, you're trying to get out. But it is dark, and you can see only a few spaces in front of you.

Outpost — Your small fortress is under siege. You have two types of lasers and some torpedoes. Unfortunately, the energy supply is dwindling and the computer is on the blink. The supply ship may (or may not) show up in time to make repairs.

Table of Contents

First Book of VIC Games is more than just a book of program listings. Each program is annotated and explained; you can modify the games if you like or use the many programming techniques in your own games. Also included is a useful program you can use to draw mazes for games you write. Three chapters show you how to develop a game program. Another tells you how to take advantage of the VIC's sound, graphics, and color capabilities. The index lists references where you can learn more about programming. And *First Book of VIC Games* is spiral bound to lie flat while you are typing in programs.

To order directly, call
TOLL FREE
800-334-0868
(919-275-9809 in NC)

ORDER NOW

Available at computer dealers and bookstores nationwide. Or send a check or money order to COMPUTE! Books, P. O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U. S. funds only.

Computer Outlet

Business Specials

Bank Street Writer
$48.00

Home Accountant
$48.00

Household Finance (D)
$23.00

Home Inventory (D)
$12.00

Paper Clip
Word Processor
$89.00

Omnicalc (D)
$34.00

Practicalc (D) 64
$39.00

Multiplan
$65.00

HESWARE

Hes Modem	.69

COMMODORE

Automodem	.95

CHALKBOARD

Power Pad	.89
Programming Kit	.18

KOALA TECHNOLOGIES CORPORATION

Koala Pad Touch Tablet	69

commodore 64

"New" 801 Graphics Printer $269

1530 Datasette .... $ 64

1541 Disk Drive .... $ 259

1600 Modem .... $ 89

1702 Commodore Monitor . $289

VIC 1311 Joystick .... $ 8

VIC 1312 Game Paddles ... $ 16

Avalon Hill

B-1 Nuclear Bomber (C)	$ 12
Midway Campaign (C)	$ 12
Nukewar (C)	$ 12
Planet Miners (C)	$ 12
Computer Stocks & Bonds (C)	$ 15
Andromeda Conquest (C)	$ 14
Computer Football Strategy (C)	$ 12
Telengard (C)	$ 16

Broderbund

David's Midnight Magic	$ 23
Choplifter (CT)	$ 34
Serpentine (CT)	$ 27
Sea Fox (CT)	$ 27

CBS Software

Math/Addition & Subtraction (D)	$ 17
Math/Mult./Division (D)	$ 17

Datamost

Monster Smash	$ 23
Paint Magic	$ 33

Davidson

Speed Reader II/D	$ 17
Word Attack/D	$ 34
Mathblaster/D	$ 34

Don't Ask (Tronix)

S.A.M.	$ 45
Chatterbee	$ 27

EPYX/Automated Simulations

Jump Man (D)	$ 27
Temple of Apshai	$ 27
Jumpman Jr./CRT	$ 27
Pitstop/CRT	$ 27

Hayden

Micro Addition (D) or (C)	$ 15
Micro Division (D or C)	$ 15
Micro Multiplication (D or C)	$ 15
Micro Subtraction (D or C)	$ 15
Monkey See, Monkey Spell	$ 20
Sargon II	$ 23

Human Engineered Software

Retro Ball (CRT)	$ 27
Hesmon (CRT)	$ 27
Turtle Graphics II (CRT)	$ 45
Heswriter 64 (CRT)	$ 35
Gridrunner (CRT)	$ 23
Paint Brush (CRT)	$ 23
Synthesound 64	$ 23

Infocom

Zork I, II, III Ea.	$ 27
Deadline (D)	$ 34
Starcross	$ 27
Witness	$ 34
Planetfall	$ 34
Infidel	$ 34

Lightning

Mastertype/D	$ 27
Songwriter/D	$ 27

Spinnaker

Snopper Troops #1 (D)	$ 30
Face Maker (D)	$ 23
Kindercomp (D)	$ 20
Hey Diddle	$ 20
In Search of the Most Amazing Thing	$ 27
Fraction Fever (CRT)	$ 20
Alphabet Zoo (CRT)	$ 20
Delta Drawing (CRT)	$ 20
Kids of Keys (CRT)	$ 23
Delta Music (CRT)	$ 23

Sierra On-Line

Frogger (D)	$ 25
Crossfire	$ 15
Jaw Breaker	$ 20
Threshold (CRT)	$ 27
Sammy Light Foot (CRT)	$ 20
Apple Cider Spider	$ 23

Sirius Software

Blade of Blackpool (D)	$ 27
Type Attack (CRT)	$ 27
Critical Mass (D)	$ 27
Bandits	$ 23

Strategic Simulations

Combat Leader	$ 27
Geopolitique 1990	$ 27
Knights of the Desert	$ 27

Sub-Logic

Flight Simulator II/D	$ 39
Night Mission Pinball	$ 20

Timeworks

Data Manager	$ 17
Wall Street	$ 17
Electronic Checkbook	$ 17
Money Manager	$ 17
General Ledger	$ 65

Apple Hit List

The Quest	$ 17
Minit Man	$ 17
The Coveted Mirror	$ 17
Zork I, II, III ea.	$ 29
Deadline	$ 35
Starcross	$ 35
Witness	$ 35
Plantfall	$ 35
Enchanter	$ 35
Infidel	$ 34
Wizardry	$ 34
Knight of Diamonds	$ 25
Legacy of Llylgammon	$ 29
Spare Change	$ 25
Lode Runner	$ 29
Temple of Apshai	$ 29
Jumpman	$ 29
Zaxxon	$ 29
Pooyan	$ 22
Sargon III	$ 35
Songwriter	$ 29
Sammy Lightfoot	$ 22

Apple/Educational

Sticky Bear Numbers/Xerox	$ 30
Sticky Bear ABC/Xerox	$ 30
Sticky Bear Opposites/Xerox	$ 30
Sticky Bear Shapes/Xerox	$ 30
In Search of Most Amazing Thing Spinnaker	$ 29
Hey Diddle Diddle/Spinnaker	$ 22
Snooper Troops 1 & 2/Spinnaker Ea.	$ 30
Delta Drawing/Spinnaker	$ 34
Story Machine/Spinnaker	$ 23
Face Maker/Spinnaker	$ 23
Rhymes & Riddles/Spinnaker	$ 20
Alphabet Zoo/Spinnaker	$ 20
Plato Whole Numbers	$ 39
Plato Decimals	$ 39
Plato Fractions	$ 39
PDI Preschool Builder	$ 24
Match Wits/CBS	$ 20
Mastering the S.A.T./CBS	$ 99
Early Games for Young Children/ Counterpoint	$ 22
Early Games Music/Counterpoint	$ 22
Wizare Microzine/Scholastic	$ 29
Juggles Rainbow/Learning Co.	$ 22
Bumble Games/Learning Co.	$ 29
Bumble Plot/Learning Co.	$ 29
Gertrudes Secrets/Learning Co.	$ 30
Gertrudes Puzzles/Learning Co.	$ 30
Rocky's Boots/Learning Co.	$ 34
Compu-Read/Edu Ware	$ 23
Spelling Bee with Reading Primer	$ 27
Algebra I/Eduwae	$ 34
Fractions/Eduware	$ 34
Decimals/Eduware	$ 34
Master Type/Lighting	$ 29
Type Attack/Sirius	$ 29
S.A.T. Word Attack/Hartcourt Base	$ 35
Word Attack/Davidson	$ 36
Math Blaster/Davidson	$ 36
Speed Reader II/Davidson	$ 48
Spellicopter/Designware	$ 29
Micro Multiplication/Hayden	$ 22

VIC 20 Software

Kindercomp/CRT	$ 23
Story Machine/CRT	$ 23
FaceMaker/CRT	$ 23
Lode Runner/CRT	$ 23
Mastertype/CRT	$ 27
Q Bert/CRT	$ 35
Frogger/CRT	$ 35
Star Trek/CRT	$ 27
Buck Rogers/CRT	$ 27
Early Games/CASS	$ 20
Early Games Match Maker	$ 20
Pipes/CRT	$ 20
Serpentine/CRT	$ 20
A.E./CRT	$ 23
Sea Fox/CRT	$ 23
Sky Blazer/CRT	$ 23
Temple of Apshai	$ 27
Fun with Music	$ 27
Submarine Commander	$ 27
Computer War	$ 27
B-1 Nuclear Bomber	$ 12
Tank Arcade	$ 12

COMPUTER OUTLET

Computer Outlet

We offer the largest selection of software and hardware for Apple, Atari, Commodore, IBM and Kaypro at 25 to 40% off retail.

1095 East Twain, Las Vegas, NV 89109 • Mon.-Fri. 8AM to 6PM, Sat. 9AM to 5PM

Cuts Prices

Atari, Inc.

Entertainer System	$ 64
482 Educator	$110
483 Programmer	$ 52
Communicator II	$209
Atari Accounting	$169
CX4104 Mailing List	$ 19
CXL4007 Music Composer	$ 42
Programming 2 & 3	Ea. $ 22
Conversational Languages	Ea. $ 45
CX4018 Pilot	$ 55
CX405 Pilot	$ 99
CXB 126 Microsoft Basic II	$ 62
CXL 4020 Centipede	$ 33
CXL4006 Super Breakout	$ 26
CXL4008 Space Invaders	$ 26
CXL4009 Computer Chess	$ 26
CXL4011 Star Raiders	$ 33
CXL4012 Missile Command	$ 26
CXL4013 Asteroids	$ 26
The Bookeeper	$102
Home Filing Manager	$ 65
Atari Speed Reading	$ 54
Home Manager Kit	$ 55
Family Finance	$ 36
Time Wise	$ 23
Galaxian	$ 33
Defender	$ 33
Paint	$ 33
Qix	$ 33
Dig Dug	$ 33
ET Phone Home	$ 34
Atari Writer	$ 75
Donkey Kong	$ 36
Donkey Kong, Jr.	$ 38
Pac Man	$ 33
Ms. Pac Man	$ 36
Atari Logo	$ 72
Mickey in the Great Outdoors/D	$ 30
Peter Pan's Daring Escape	$ 36
Joust	$ 43
Robotron 2084	$ 33
Pole Position	$ 36
Eastern Front CT	$ 42

Business & Utilities

Visicalc	$169
Computari's Financial Wizard	$ 45
New Color Accountant	$ 65
Spell Wizard	$ 65
Letter Perfect	$ 69
Letter Wizard	$ 45
Bank Street Writer	$ 48
Money Wizard	$ 45
Text/Spell Wizard Combo	$ 53
Syn File +	$ 65
Syn Text	$ 23
Syn Mail	$ 34
Basic Compiler	$ 55
Graphics Generator	$ 17
Micropainter	$ 23
Graphics Master	$ 23
Miles Payroll System	$119
Homeword	$ 39

Atari Specials

600XL	CALL
800XL	CALL
1400XL	CALL
1450XLD	CALL
1010 Recorder	$ 85
1050 Disk Drive	$ 415
1027 Printer	$299
1025 Printer	$429
830 Modem	$145
850 Interface	$179

Educational

My First Alphabet (D)	$ 26
Monkey See, Monkey Spell (C)$14 (D)$ 17	
Pop'R Spell	$ 20 (D) $22
Do It Yourself Spelling (C)	$ 16
Vocabulary Builder	(C)$ 13 (D)$ 19
Preparing for the SAT (C) $ 66	(D)$ 79
Crossword Magic (D)	$ 34
Wizware Microzine (D)	$ 27
Einstein Memory Trainer (D)	$ 53
Compumath Fractions (C) $ 23	(D)$ 29
Compumath Decimals (C) $ 23	(D)$ 29
Addition/Subtraction (C) $ 14	(D) $ 17
Mult/Division	(C) $ 14 (D) $ 17
Hey Diddle Diddle (D)	$ 20
Snooper Troops 1&2 (D) ea.	$ 30
Story Machine (D) $ 23	(CT) $27
Face Maker (D or CT)	$ 23
Delta Drawing (CT)	$ 27
Rhymes & Riddles (D)	$ 20
Fraction Fever (CT)	$ 23
Kindercomp (D or CT)	$ 20
Magic Melody Box	$ 14
States & Capitals (C)	$ 12
European Countries & Captials (C)	$ 12
Sammy the Sea Serpent (C) $ 13	(D) $ 19
Preschool IQ Builder (C) $ 13	(D) $ 24

SUPER SAVINGS

Verbatim Disks S/D (10 per box)	**$ 26.00**
Disk Savers (Plastic Sleeves)	**$ 4.50**
Disk Savers (Plastic Sleeves) multi-colored	**$ 4.50**
Flip'n File Diskette Holder w/Lock (holds 25)	**$ 19.00**
Flip 'n File Diskette Box (holds 50)	**$ 22.50**
Library Carrying Case (holds 10)	**$ 2.50**
Gorilla Banana Printer	**$209.00**
Percom Printer Port Drive 88S1PD	**$489.00**
Percom Single Density Drive	**$339.00**
Rana 1000 Disk Drive S/D with DOS	**$375.00**
Alphacom 80 Col. Graphics Printer	**$189.00**
Amdek Color I Monitor	**$315.00**

Modems

Hayes Smartmodem 300 Baud	$209
Hayes Smartmodem 1200	$499
Signalman Modem II	$ 79
Atari Modem	$115

Monitors

Leading Edge Green Hi-Res 12"	$ 89
USI Amber	$169
NEC Green Screen	$169
Leading Edge Amber Hi-Res 12"	$ 89

Atari Hit List

Q Bert/CRT	$ 35
Frogger/CRT	$ 35
Popeye/CRT	$ 35
Chess/CRT	$ 39
Astrochase	$ 35
Songwriter	$ 27
Deadline	$ 35
Zork I, II, III ea.	$ 27
Starcross	$ 27
Witness	$ 35
Planetfall	$ 35
Enchanter	$ 35
Infidel	$ 35
Temple of Apshai	$ 27
Gateway to Apshai	$ 27
Pitstop	$ 27
M.A.S.H.	$ 27
Porky's	$ 27
Baja Buggies	$ 23
Starleague Baseball	$ 23
Starleague Football	$ 23
Zaxxon	$ 27
In Search of the Most Amazing Thing	$ 27
Cosmic Balance II	$ 27
Chopliter	$ 23
Sky Blazer (D)	$ 22
Serpentine (D)	$ 22
Sea Fox (D)	$ 20
Blue Max	$ 23
Arcade Machine (D)	$ 39
Dark Crystal (D)	$ 26
Flight Simulator	$ 36
Chess (D)	$ 45
Checker (D)	$ 34
Raptillian (D,C)	$ 23
Submarine Commander (CT)	$ 34
Jumbo Jet Pilot (CT)	$ 34
Soccer (CT)	$ 34
Starcross (D)	$ 27
Zaxxon (D,C)	$ 27
Miner 2049er (CT)	$ 34
Twerps (D)	$ 23
Flip Out (D)	$ 20
The Birth of the Phoenix	$ 16
Protector II	(D)$ 23 (CT)$ 29
Baseball (CT)	$ 34
Preppie II (D,C)	$ 23
Arcade Machine (D)	$ 39
Cap n' Cosmos (D)	$ 29
Spy's Demise (D)	$ 15
Repton (D)	$ 27
Critical Mass (D)	$ 27
Millionaire (D)	$ 55
Poker Sam (D)	$ 17
Jump Man (D)	$ 27
Hellfire Warrior (D,C)	$ 27
Trion (D)	$ 27
Adventure in Time (D)	$ 20
Wavy Navy (D)	$ 23
Final Orbit (CT)	$ 23
Pharoah's Curse (D,CT)	$ 23

Printers

Leading Edge Gorilla	$209
NEC 8023A	$459
Okidata MS 82A	Call
Okidata ML 83A	Call
Okidata MI 84P	Call
Okidata ML 92P	Call
C. ITOH 8510 Prowriter	$399
Mannesmann Tally 160L	$629
Gemini 10X	$315

COMPUTER OUTLET

To Order Call Toll Free 1-800-634-6766

Information & Inquiries 1-702-369-5523 • We accept VISA and MasterCard

ORDERING INFORMATION AND TERMS: *For Fast Delivery send cashier checks, money orders or direct bank wire transfers. Personal and company checks allow 3 weeks to clear. Charges for C.O.D. orders are $3.00 minimum or 1% for orders over $300. School purchase orders welcomed. Prices reflect a cash discount only and are subject to change without notice. Please enclose your phone number with any orders.* ***SHIPPING: — Software:*** *$3.00 minimum.* ***SHIPPING — Hardware:*** *(Please call)* ***SHIPPING — Foreign Orders:*** *APO & FPO orders: $10 minimum and 15% of all orders over $100. Nevada residents add 5 3/4% sales tax. All goods are new and include factory warranty. Due to our low prices, all sales are final. All returns must be accompanied by a return authorization number. Call 702-369-5523 to obtain one before returning goods for replacement.*

or two of fun, physical exercise, and computer instruction. But some educators feel that residential camps are a fad. Their outdoor activities are often an afterthought, and the camps cannot compare, in terms of staff, program, or facilities, to the regular summer camps, which, on their own, are beginning to offer computer activities. Also, residential camps are expensive and relatively inefficient if your main goal is to introduce your child to computers.

Campers draw on each other's skills and interests to program a computer. Courtesy of Computer FUNdamentals Camp. (Photo by Walker Healy, Jr.)

In the past, most computer camps were for kids. Now adult camps are springing up all over the country.

Many families send their kids to computer camp so they can come back and tell the family which computer to buy. But why let your kids have all the fun? Why not attend computer camp at the same time as your son or daughter? Then you and your kids can decide together which computer is right for the family.

New "mixed-age" camp classes are springing up that include people of all ages. Being in a class with several bright youngsters can be unnerving, but it can also add a new dimension to your computing. Kids approach computers as *explorers*. By imitating them you can begin computing fearlessly and playfully.

The Need For Continuing Support

The best computer camps offer a balanced approach—some computer programming and some computer activities. But beware. If you get your child started in either side of computing, his or her appetite for more computing is liable to increase. When you look for a computer camp you should try to find one that will be around to satisfy your and your child's computing interests no matter how sophisticated they become.

Dr. Zabinski, for example, believes that computer camps "breed kids who are sophisticated with computers, so they can't just drop them." His camps emphasize programming as opposed to computer activities. "We train the youngsters in computers, so it is our responsibility to be around when they become more sophisticated and need more advanced training."

Zabinski's philosophy is "to motivate kids and excite them with examples they can relate to and identify with." His camps have been so popular and successful that he and his staff have to revamp their curriculum each year just to keep up with the kids they trained the previous year.

According to Zabinski, "We used to be content teaching kids to program in BASIC and Pascal. Now I feel that teaching new programming languages is just moving sideways. We can't afford to move sideways. Kids can master new languages in just a couple of weeks. Our objective in 1984 is to teach kids how to interface computers with each other and how to interface computers with other machines. We'll teach kids how to create their own computer languages, and how to use modems and bulletin boards and get computers communicating over the telephone."

Zabinski emphasizes that his highly technical curriculum is not aimed at just teenagers and older children. "Take nine-year-olds," he says. "Nine and ten-year-olds are not what they used to be. We have one nine-year-old who learned Assembler and won a national Assembler Language contest on the TRS-80 computer.

"There are plenty of sophisticated kids at all ages," contends Zabinski. "Computer camps are often these kids' only outlet. We've helped to create these kids, so we have to be ready when they come back to us each year. We can't abandon them."

Computer FUNdamentals

Nancy Healy and Dr. Barbara Kurshan run the Computer FUNdamentals Camp at Hollins College, in Roanoke, Virginia. Kurshan and Healy agree with Zabinski that computer camps need to keep upgrading their curriculum to keep up with the newest computers and the increasing sophistication of the average camper. But Kurshan and Healy stress computer applications as opposed to computer programming. And, above all, they want their campers to have fun.

According to Healy, "What makes our camp different is that it is oriented toward fun, and, at the same time, the kids become good computer users. Also, we don't mix physical activities and computer instruction. This lets our handicapped campers do everything that all the other kids do.

"Another reason our camp is different," Healy continues, "is that our camp isn't just for math and science freaks. Kids who love music and the arts are equally interested and involved.

"After the first few days at camp, it is easy to see who knows what. The 'knowers' are those who attract people around them. But the great thing is that each child brings a different skill with him, like typing, music, art, programming, or math. The kids work together and draw on each other's skills and interests. That way everybody gets a chance to shine."

The Computer That Ate Manhattan

Like their counterparts at other camps, computer campers at Hollins spent most of their time last summer using real computers as electronic notebooks, typewriters, telephones, libraries, and mailboxes. But camp counselors also encouraged the children to spend time inventing totally new fantasy computers. Children described these computers and what things they could do. One boy, for example, made up a story about a computer that ate Manhattan.

One of the big projects during the camp was for the children to build their own *junk computers*. The children designed and built the junk computers out of all kinds of things, including buttons, wires, beads, tupperware, TV sets, and aluminum foil. One boy built a computer out of a nonworking TV set and a working walkie-talkie. The boy hid the walkie-talkie inside the TV set. Another boy built a junk computer that played beach music. The cardboard computer had a tape recorder hidden inside.

A local elementary school PTA in Roanoke sent two children to the camp on scholarships. The children were to learn as much as possible about computers during camp so they could help their teachers use the school's two new computers the following fall. The children, one 10 and the other 11, were chosen on the basis of an essay on why they wanted to go to computer camp. They wrote down everything they learned at camp in a spiral notebook, and were among the camp's most conscientious students.

Training A Future Sally Ride

While the camp was in progress at Hollins, America was glued to the TV set watching its first female astronaut, Sally Ride, blast off the earth in the Space Shuttle. This inspired the kids to create a computer-controlled rocket launching at camp.

The rocket was finally launched on the same day that Sally and her teammates brought the real Shuttle back to the earth. It even featured a computer-screen simulation of the rocket taking off and a speech synthesizer, in robot nasal monotone, doing the countdown: 5 ... 4 ... 3 ... 2 ... 1 ... IGNITION!

In honor of Sally Ride, the girl campers got to operate the computer to control the rocket launch.

Computer mania at the National Computer Camps. Courtesy of National Computer Camps. (Photo by Walker Healy, Jr.)

And the local TV station in Roanoke was so excited by this project that they filmed the rocket launch and, on the evening news, mixed the tape with a film of the real Space Shuttle take-off.

Computer Camp Resources

If you're interested in learning more about computer camps, you might want to send for *The Computer Camp Book*. It's a complete guide to computer camps and features a national directory of computer camps. The book is available for $12.95 from

The Computer Camp Book
P.O. Box 292
Yellow Springs, OH 45387

For an additional $4, you can get a copy of an updated directory of computer camps.

Two of the leading computer camps in the U.S. are the Atari Computer Camps and the National Computer Camps. You can learn more about them by writing:

Dr. Linda Gordon
Atari Computer Camps
Dept. AL
40 E. 34th Street
New York, NY 10012

Dr. Michael Zabinski, Director
National Computer Camps
P.O. Box 585
Orange, CT 06477

You can learn more about the Hollins College Computer FUNdamentals Camp by writing:

Dr. Barbara Kurshan
Nancy Healy
Computer FUNdamentals Camp
Hollins College
Hollins, VA 24020

To find out more about the Hollins camp's robot mascot, you can write:

Bill Glass
TASMAN TURTLE & TURTLE TOT
Harvard Associates, Inc.
260 Beacon Street
Somerville, MA 02143

©

TI Aquarium

Michael A Covington

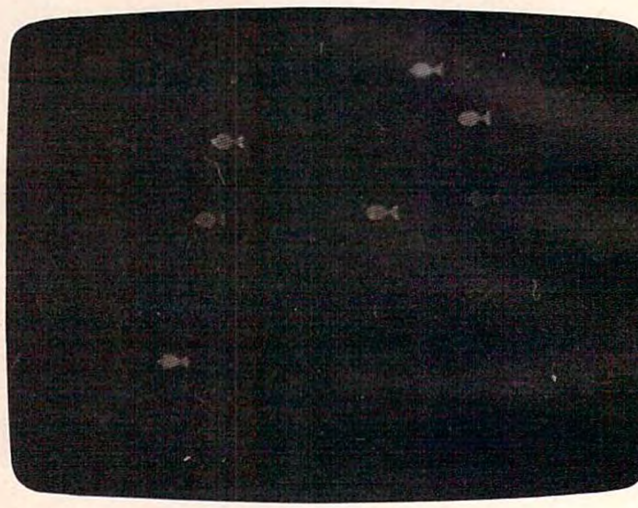
Turn your TI into an aquarium. And the best part is, you never have to change the water. For TI-99/4A with Extended BASIC. The program also demonstrates some basic sprite techniques.

Recent studies have shown that the relaxing experience of watching fish glide around in an aquarium can lower your blood pressure and have other beneficial effects. This program (which we present somewhat with tongue in cheek) enables you to avoid the expense and bother of a real aquarium by using your TI-99/4A to simulate one.

Lines 310 to 330 establish the characteristics of a double-sized, fish-shaped sprite. Lines 400 to 430 read a number from the DATA statement (340) and, treating it both as a sprite number and as a color number, create a fish accordingly. When the sprite is created, it has the same color as the background (color 1, "transparent").

It is made visible by a separate COLOR statement because newly created sprites tend to appear momentarily in the wrong place before jumping to the specified location. If this phenomenon were visible, it would detract from the atmosphere of tranquility.

The subroutine at line 610, which is called several times while the fish are being created and repeatedly after they are on the screen, makes random changes in sprite motion so that the fish move in realistic bobbing movements rather than in straight lines at constant speed.



Relax and watch the fish glide by in "TI Aquarium."

TI Aquarium

```
140 ! REQUIRES EXTENDED BASIC.
150 CALL SCREEN(2)
160 CALL CLEAR
170 FOR I=1 TO 14 :: CALL COLOR(I,1
    5,1):: NEXT I
180 PRINT "TI AQUARIUM": : : :
190 PRINT "This program allows you
    to"
200 PRINT "use your TI-99 to enjoy
    the"
210 PRINT "relaxing sight of fish"
220 PRINT "swimming by, without the
    "
230 PRINT "expense and bother of a"
240 PRINT "real aquarium."
250 PRINT : :"To end the program, p
    ress"
260 PRINT "any key while the fish a
    re"
270 PRINT "being displayed."
280 FOR D=1 TO 1500 :: NEXT D
290 CALL CLEAR
300 RANDOMIZE
310 A$="000000081C3E7FFFFE7C381000
    000000000000F0F8FCFEFEFCF8F000
    000000"
320 CALL CHAR(120,A$)
330 CALL MAGNIFY(3)
340 DATA 9,6,4,7,8,10,11,12,14,0
350 CALL SCREEN(2)
360 !
```

```
370 ! Put fish on the screen, with
    sprite numbers and
380 ! colors based on the DATA stat
    ement
390 !
400 READ Q
410 IF Q=0 THEN 540
420 CALL SPRITE(#Q,120,1,90+30*(RND
    -0.5),1,4*RND-3,5*RND+1)
430 CALL COLOR(#Q,Q)
440 GOSUB 610
450 GOSUB 610
460 GOSUB 610
470 FOR D=1 TO 300 :: NEXT D
480 GO TO 400
490 !
500 ! Now that all the fish are on
    the screen, make
510 ! random changes in their motio
    n and check for
520 ! a key being pressed.
530 !
540 GOSUB 610
550 CALL KEY(5,CODE,STATUS)
560 IF STATUS<>0 THEN CALL CLEAR ::
     STOP
570 GO TO 540
580 !
590 ! Subroutine: Change the motion
    of a
600 ! randomly chosen sprite
605 !
610 CALL MOTION(#INT(11*RND)+3,4*RN
    D-2,5*RND+2)
620 RETURN
```

©

RELATIONAL OPERATORS

Eric Brandon

Relational operators can make your BASIC programs more efficient. Here are some techniques which use relational operators on the Commodore, Atari, TI, Apple, IBM PC and PCjr, Color Computer, and Timex/Sinclair machines.

BASIC has a very useful, but little-known feature. A relational expression such as 2+3>4 is interpreted by BASIC as a value of –1 (or 1, depending on the computer) if the expression is true, and a value of 0 if the expression is false. On all Commodore machines, the TI-99/4A, the Color Computer, the IBM PC and the PCjr, a relational expression which is true gives a value of –1. A relational expression which is true on the Atari, Apple, and Timex/Sinclair computers produces a value of 1. A value of 0 results for a relational expression which is false on each computer.

As an example, enter PRINT 2=2. You should get a result of –1 (or 1) since the expression is true. Now type in: PRINT 2=3. This time, the result is 0 because the expression is false.

Related to this is the fact that the statement

IF Q THEN 100

will be interpreted identically to the statement

IF Q<>0 THEN 100

Can you see why? Both expressions evaluate as true, if Q is nonzero.

Cycling A Variable

Suppose you wanted to continually cycle a variable, say J, from 1 to 10. One way to do this would be:

```
10 J=0
20 J=J+1
25 PRINT J
30 IF J<10 THEN 20
40 GOTO 10
```

However, by using a relational expression, we can do this:

```
5 N=-1:REM N=-1 FOR TRUE (MAY BE 1 DEPEND
  ING ON YOUR MACHINE)
10 J=0
20 J=J*(J<10)*N+1
25 PRINT J
40 GOTO 20
```

In this routine, N must be defined as +1 or –1, depending on your machine. Of course, there's really no need for a separate statement to define N. You could easily incorporate the value of N into the expression in line 20. If a true statement produces a –1 on your computer, line 20 becomes J=–J*(J<10)+1. In this case, as long as J is less than 10, BASIC returns a value of –1 for (J<10). So, –J times –1 plus 1 increases the value of J by one. When J reaches a value of 10, (J<10) gives a value of zero. Adding one to zero starts the cycle over again.

Note that the relational operators are the last items to be resolved. Recall that numeric arguments are resolved in this order: *, /, +, –. This can be easily demonstrated by these two examples: PRINT 2*3=3. This gives a result of 0 since it is equivalent to PRINT 6=3.

Now try PRINT 2*(3=3). This gives –2 (or 2) since it is equivalent to 2*(–1) [or 2*(1)].

More Efficient Tabulation

For another example, suppose you wish to tabulate a score in a math drill program within a subroutine beginning at line 100. A scoring scheme is devised so that the player is awarded a greater number of points the more problems he has solved. You would like the player to get 100 points for each of the first five correct answers, and 1000 points for any correct answers thereafter. If we let X be the total number of correct answers, a common way of doing this would be:

```
99 REM SCORING SUB
100 IF X>5 THEN 130
110 TALLY=TALLY+100
120 GOTO 140
130 TALLY=TALLY+1000
140 RETURN
```

Using relational operators, however, we can shorten this to (defining N as +1 or –1 as before):

```
99 REM SCORING SUB
100 N=-1
110 TALLY=TALLY+(X<6)*100*N+(X>5)*1000*N
120 RETURN
```

Fewer IF-THEN Statements

Still another example: If you want to transfer program execution to line 1000 if the value of variable I is 100, and to line 2000, if I is 500, several IF-THEN statements would usually be required:

```
100 IF I=100 THEN 1000
110 IF I=500 THEN 2000
```

On most machines, this can be easily done with relational operators as:

```
90 N=-1
100 ON N*(I=100)+N*2*(I=500) GOTO 1000,20
    00
```

On the Timex/Sinclair, since the ON-GOTO statement is not supported in BASIC, you would use GOTO with a conditional expression in the following manner (N=1, so it's not included here):

```
100 GOTO (I=100)*1000+(I=500)*2000+(I<>10
    0 AND I<>500)*200
200 REM RETURN TO MAIN LOOP OF PROGRAM
```

If you use this powerful technique with imagination, you will find that your programs can be shorter, faster, and easier to write. ©

EGGHEAD SOFTWEAR℠

Egghead Bytes Back

For people who don't know the difference between a microchip and a potato chip.

Introducing Egghead.

Everybody's been discounting computer hardware. It's about time some smart egg figured out how to sell the hot quality software brokers want at lower prices.

That's eggsactly what the hottest new discounter in software is doing.

Simply order from Egghead's new Software Simplified Catalog & Buyers' Guide. Hundreds of items—listed by popularity, with the differences between products, what they do and the hardware with which they're compatible. You'll get eggsactly what you want. Fast. With no hassle. No intimidation. Save time. Save money. You'll be eggstatic.

The Catalog/Buyers' Guide is *free* with any software program order. For Catalog only send $1 plus 4 bits postage & handling today.

For ordering software programs only by phone, *24 hours a day, 7 days a week,* in all states except California: 1-800-227 1617 Ext. 445. In California: 1-800-772-3545 Ext. 445.

Just give your VISA or MasterCard number. To order *Catalog* by phone: (206) 451-8155.

FINANCIAL MANAGEMENT BUSINESS

PRODUCT	MANUFACTURER	COMPUTERS	RETAIL PRICE	EGGHEAD PRICE
FINANCIAL SPREADSHEETS				
1. 123 Lotus	Lotus	IBM,DEC,TIP,WANG	495	325
2. Visicalc	Visicorp	AP,AT,IBM ,COM	250	177
3. Multiplan	Microsoft	IBM	275	170
4. Supercalc 3	Sorcim	IBM	395	260
5. Supercalc 2	Sorcim	AP,CP/M,IBM,DEC,TIP	295	190
ACCOUNTING				
6. General Accounting	BPI	AP,CP/M,IBM,DEC	395	263
7. General Ledger	Peachtree	IBM	750	475

FINANCIAL MANAGEMENT PERSONAL

PRODUCT	MANUFACTURER	COMPUTERS	RETAIL PRICE	EGGHEAD PRICE
8. Home Accountant	Continental	AP,TRS,AT,	75 AP	49
9. Home Accountant	Continental	C64,TIP, IBM	150 IBM	95
10. Dollars & $ense	Monogram	AP,IBM	125	84
11. Tax Preparer	Howard	AP,IBM	250	187
12. Tax Manager	MicroLab	AP,IBM	180	120
13. Tax Strategist	XQ Software	IBM	395	295
14. Investment Strategist	XQ Software	IBM	395	295

WORD PROCESSING

PRODUCT	MANUFACTURER	COMPUTERS	RETAIL PRICE	EGGHEAD PRICE
BUSINESS				
15. WordStar	MicroPro	AP,IBM	495	295
16. Multimate	Softword	IBM	495	325
17. Easy Writer II	IUS	IBM	395	225
18. Pie Writer	Hayden	AP,IBM	200	131
19. Word Perfect with Math, Mail-Merger and Speller	Satellite Software	IBM,TIP	495	320
20. Volkswriter	Lifetree	IBM	195	155
21. Peachtree Text 5000	Peachtree	IBM	395	239
22. Word	MicroSoft	IBM	375	275
23. Word/Mouse	MicroSoft	IBM	475	346
24. PFS Write	Software Pub.	IBM, APe	140	95
PERSONAL				
25. Bank Street Writer	Broderbund	AP,AT,C64	69.95	46
26. Homeword	Sierra-on-line	AP	49.95	35
27. Word Handler	Silicon Valley	AP	59.95	38
COMMUNICATIONS				
28. Crosstalk	Microstuf	IBM	195	136

DATA MANAGEMENT/UTILITY

PRODUCT	MANUFACTURER	COMPUTERS	RETAIL PRICE	EGGHEAD PRICE
DATA MANAGEMENT				
29. dBase II	Ashton-Tate	AP, CP/M,IBM,DEC,VTR,TIP	700	450
30. PFS File	Software Pub.	AP,IBM,TIP	140	95
31. PFS Report	Software Pub.	AP,IBM,TIP	125	85
32. PFS Graph	Software Pub.	AP,IBM,TIP	140	95
33. DB Master	Stoneware	AP,IBM	595	395
34. VisiFile	Visicorp	AP,IBM,TIP	300	210
35. Mailmerge	MicroPro	AP, CP/M, IBM,DEC,TIP	250	148
36. File Manager	Synapse	AT,IBM	99.95	66
UTILITIES				
37. Norton Utility	Peter Norton	IBM	80	55
38. Basic Compiler	MicroSoft	AP,DEC,IBM,Cp/M	395	276
39. Macro Assembler	MicroSoft	CP/M	200	143
40. ProKey 3.0	RoseSoft	IBM	129.95	87
41. ProKey 1.0	RoseSoft	IBM	75.00	52

CHILDREN'S EDUCATIONAL AND GAMES
Hundreds listed in brochure—average 20-35% below retail

For mail use Money Orders, Check or Cashier's Check, VISA or MasterCard #. No C.O.D.'s please.

Shipping and handling: UPS Surface, add $3 per item. UPS Blue Label (faster) add $7 per item. Washington State Residents add 7.9% sales tax.

While most software suppliers charge a surcharge for credit card purchases, Egghead charges nothing extra.

We encourage the use of your credit cards. All prices subject to availability and price change. All products shipped with manufacturers' warranty.

Name_______________

Address_______________

City, State, Zip_______________

☐ VISA or ☐ MasterCard #_______________

1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10☐ 11☐ 12☐ 13☐ 14☐ 15☐ 16☐
17☐ 18☐ 19☐ 20☐ 21☐ 22☐ 23☐ 24☐ 25☐ 26☐ 27☐ 28☐ 29☐ 30☐ 31☐ 32☐
33☐ 34☐ 35☐ 36☐ 37☐
38☐ 39☐ 40☐ 41☐

EGGHEAD SOFTWEAR℠
10636 Main St. #206
Bellevue, WA 98004
Phone (206) 451- 8155

c

Glenn M. Kleiman

GETTING STARTED

Let's consider some of the steps involved in the introduction of computers in schools, and some of the difficult issues teachers, parents, and school administrations must face.

Computers are tools. They are different from most other tools in that they operate on information and can be programmed to serve a wide variety of purposes. But they are the same as other tools in that they can be used well or poorly. A hammer can be used to build furniture or to destroy it. A computer can be used to create original stories, music, and art; to explore complex scientific relationships; or to play the most mindless of games.

How computers affect students depends upon how the students use them, the quality and appropriateness of computer activities and software, and the manner in which computers are integrated with other educational activities.

In many schools, individual teachers, parents, or students have brought computers into classrooms. Since those who do so are typically knowledgeable and excited about computers, they are usually successful in integrating computers with classroom activities, and in teaching students about them. However, implementing computers on a school-wide or district-wide basis is a more complex task, one that requires a great deal of thought, careful planning, and an ongoing effort.

Computer Comfort

The first step towards using computers as educational tools is for teachers, administrators, parents, and students to become aware of the possibilities, to develop an interest in trying some of them. Understanding the possible uses of computers and having a general understanding of their nature is often called *computer awareness*.

The next step is *computer comfort*. This means that everyone involved should actually use a computer and become comfortable with the mechanics of loading and running programs, entering information, using printers and so on. There is no substitute for hands-on experience in coming to appreciate the potential of computers. At this stage, it is best to try a variety of programs to experience the different possibilities. The aim is to develop more concrete knowledge about what computers can do, and to gain critical skills in evaluating software.

Once past the awareness and comfort levels, the real work begins. Decisions have to be made about how computers will be used and whether some students or classes will have priority over others. How will computers be integrated into the curriculum at each grade level? Will they be used primarily for lessons and drills or to teach computer programming?

If programming is to be taught, which language (Logo, BASIC, Pascal) will be selected? Should the computers be used primarily in math and science classes or mainly for word processing? Will educational computer games be used? What about computer art and music? Will all students get equal access to the computers? Should gifted children or those in need of remedial assistance be given priority?

There are no "right" answers to these difficult questions. Each group of decision makers must decide how to best allocate the available computer resources to meet the needs of their school or district.

Selecting Products

Other important questions focus on the setting in which the computers will be used. Will they be

$u¢h A Deal

*Lowest Prices — Guaranteed!**

COMMODORE 64

Just for You!

PERSONAL FINANCE

Continental Home Accountant (D) $47
Continental Tax Advantage (D) $33
Continental FCM First Class Mail $29
Softsync Personal Accountant (D&C) .. $23
CheckEase (C&D) $24
Timeworks Electronic Checkbook (D&C) $19
Timeworks Money Manager (D&C) $19
M.S.I. Inventory (D) $16
Creative Household Finance (D) $23
Creative Household Finance (C) $19
Creative Home Inventory (D) $13
Creative Home Inventory (C) $10
Creative Loan Analyzer (D) $13
Creative Loan Analyzer (C) $10

WORD PROCESSING

Broderbund Bank St. Writer (D) $45
Hesware Omniwriter (D) $49
Rainbow Writers Asst. (D) $49
Blue Sky Script 64 (D) $69
Cardco Write N ow! (D) $39
Muse Supertext (D) $88
On-Line HomeWord (D) $39

ELECTRONIC SPREADSHEETS

Hesware Multiplan (D) $75
Hesware Omnicalc (D) $37
MSI Practicalc (D&C) $35
MSI Programmable Spreadsheet (D) ... $55
B. SKY CALC Result Easy (D) $49
Home Calc (D) $26
Home Calc (C) $22

HOME APPLICATIONS

Spinnaker Aerobics (D) $33
Softsync Computer Mechanic (D) $19
Softsync Computer Mechanic (C) $16
Creative Car Costs (D) $13
Creative Car Costs (C) $10
Creative Decision Maker (D) $13
Creative Decision Maker (C) 10
Hesware Time & Money Manager (D) $39
Timeworks Data Manager (D&C) $19
Compuserve Starter Kit (5 hrs) $29

ART & MUSIC

Epyx Fun with Art (CT) $27
Epyx Fun with Music (CT) $27
Hesware Synthesound (CT) $33
Hesware Paintbrush (CT) $19
Spinnaker Delta Drawing (CT) $26
Koala SpiderEater $23
Koala Geometric Designs $23
Koala Crystal Flowers $23
Koala Logo Designs $29
Delta Music (CT) $26

EDUCATION

Spinnaker Alphabet Zoo (CT) $23
Spinnaker Cosmic Life (CT) $23
Spinnaker Facemaker (CT) $23
Spinnaker Fraction Fever (CT) $23
Spinnaker Kids on Keys (CT) $23
Spinnaker Kindercomp (CT) $19
Spinnaker Story Machine (CT) $26
Spinnaker Up For Grabs (CT) $26
Spinnaker Delta Drawing (CT) $26
Creative I Am Your 64 I (D) $19
Cretive I Am Your 64 II (D) $19
Hesware Turtle Graphics II (CT) $39
Hesware Type 'N' Writer (CT) $26
Delta Music (CT) $26

COMMODORE 64 Cont'd.

LANGUAGES & UTILITIES

Hesware 6502 Pro Devel Sys (D) $19
Hesware Hesmon 64 (CT) $26
Hesware 64 Forth (CT) $45
Acess Spritemaster (D&C) $23
Timeworks Programmer Kits I, II, III (D&C) .... each $19
Blue Sky Last One (D) $79
Blue Sky 80 Column (D) $29
Blue Sky Graphic Designer (D) $29
Blue Sky 64 Statistics (D) $29
Blue Sky Super Basic (D) $29
Blue Sky Add On Basic (D) $29
Blue Sky Super Copy (D) $29

BUSINESS SOFTWARE

Total Business 3.6 (D) $65
Total Time Mgmt. (D) $25
Total Lable-Mail (D) $15
Total Research Asst. (D&C)........... $25
Cymbal General Ledger (D) $45
Cymbal Acct. Receivable (D) $45
Cymbal Acct. Payable (D) $45
Cymbal Inventory Control (D) $45
Cymbal Invoice Writer (D) $45

GAMES

Epyx Dragon Riders of Pern (D&C) $25
Epyx Silicon Warrier (CT) $25
Sega Congo Bongo (CT) $25
Synapse Blue Max (D&C) $22
Sublogic Pinball (D&C) $20
Hesware Maze Master (CT) $26
Broderbund Choplifter (CT) $27
Epyx Pitstop (CT) $27
SubLogic Flight Simulator............. $27

COMMODORE VIC 20

PERSONAL PRODUCTIVITY

Creative Home Office (D) $22
Creative Home Office (C) $19
Creative Household Finance (D) $17
Creative Household Finance (C) $13
Creative Home Inventory (D) $13
Creative Home Inventory (C) $10
M.S.I. Practicalc Plus (D) $35
M.S.I. Practicalc Plus (T) $33
M.S.I. Practicalc (D) $32
M.S.I. Practicalc (T) $29
Hesware Vic Fourth (CT) $39
Hesware Hes Mon (CT) $26
Cardco Write Now $27
Hesware 6502 Pro Dev Sys $19
Epyx Fun with Art (CT) $26
Epyx Fun with Music (CT) $26
Broderbund Mastertype (CT) $24

EDUCATIONAL SOFTWARE

Hesware-Spinnaker
KinderComp (CT) $23
Story Machine (CT) $23
Face Maker (CT) $23
Kids On Keys (CT) $23
Alphabet Zoo (CT) $23
Hesware Turtle Graphics (CT) $26
Creative Pipes (C) $19
Creative Spills & Fills (C) $19
Creative Hangman & Hangmath (C) ... $10

GAMES

Creative Choplifter (CT) $19
Epyx Temple of Apshai (C) $24
Sega Congo Bongo (CT) $25
Sega Star Trek (CT) $25

Rock Bottom Prices on Peripherals!

HESWARE

Just for You!

Hescard Vic 5 Slot $39
HesModem Vic & C64 .... $47

GRAPHICS TABLET

CHALKBOARD POWERPAD......... $79
(C64 & Atari)
Software Packages
Logic Master $27
Leo's Links $27
Programmers Kit $19
BearJam $25
KOALAPAD ATARI C64 .... $67

PRINTERS

STAR MICRONICS

FREE freight & ribbon!
STX-80 Thermal 60CPS $177
GEMINI 10X Dot 120CPS $287
GEMINI 15X Dot 120CPS $497
DELTA 10X Dot 160CPS $597
DELTA 15X Dot 160CPS $747
POWER T DAISY 18CPS $497
RADIX 10 Dot 200 50CPS $847
RADIX 15 Dot 200 50CPS $997

BMC PRINTERS

BMC BX80 .... $267
BMC DAISY 101 .... $597
BMC DAISY 401 .... $697

MODEMS

NOVATION

Smart Cat 103-212 1200 .... $415
212 Auto Cat........................ $575
Cat $137
D-Cat $155
J-Cat $119

ANCHOR MODEMS

(with power & cable)
Mark 7 300 baud $129
Mark 12 300-1200 baud $319
Volksmodem 300 baud $79

MONITORS

BMC 13" Composite Color $229
BMC 12" Low Res Green $85
BMC 12" Low Res Amber $99
BMC 12" Hi Res Green.............. $119
BMC 12" Hi Res Amber $129
USI 12" Green Hi-Hi Res $129
USI 12" Amber Hi-Hi Res $139
USI 14" Composite Color $279
Monitor cable w above $10

COMMODORE DISK DRIVES

Concord Disk Drive................. $279
Commodore 1541 .... $269

WICO JOYSTICKS

The Boss $14
3 Way Grip Stick $21

CARDCO

Numeric Keypad C64 .... $29
Graphic Printer Interface $69
Economy Printer Interface $39
Commodore 64 5 Slot $49
16K Board $53
Cassette Interface $27

MAXELL DISKS

MD1 SS-DD $27
MD2 DS-DD $40

COMMODORE 64 and ATARI COMPUTERS

Pinball Construction Set (D) $40
M.U.L.E. (D) $40
Worms? (D)......................... $35
Archon (D) $40
Hard Hat Mack (D) $35
Murder on the Zinderneuf (D) $40
The Tesseract Strategy (D) $40
Word Flyer (D) $35
The Cut & Paste Word Processor (D).. $50
D-Bug (D) $35
Axis Assassin (D) $35
Music Construction Set (D) $40
Financial Cookbook (D) $50
Dr. J. & Larry Bird One on One (D) .. $40

ELECTRONIC ARTS™

Home Software for the Commodore 64
The Standard for Sophicated
Software in the '80's

FREE DISKETTE
with each purchase of electronic arts software

$u¢h A Deal

CALL TOLL FREE
1-800-431-8697
Orders Only!

12629 N. Tatum Blvd., #138
Phoenix, AZ 85032
602-968-9128

For Information, Customer Service Release Dates, etc.
Call
602-955-3857

(C) = Tape (D) = Disk (CT) = Cartridge

*TERMS OF OFFER: If you find a price for any software or peripheral in this issue that is lower than our advertised price, we'll guarantee to beat it! Valid only on product in similar in-stock conditions. Valid only on prices appearing in print in this issue.

ORDERING & TERMS: Send cashier check, money order; personal/company checks allow 3 weeks bank clearance. VISA/MasterCard accepted. Provide phone number with order. SHIPPING: Software add $4.00 for first piece, add $1.00 each additional piece. Hardware add 3% or $10.00 whichever is greater. Returns must have authorization number (call 602-968-9128 for authorization number). All returned merchandise subject to restocking fee and **must** come with **all** original packaging. No returns allowed after 30 days from shipping date. Prices are for cash; VISA and MasterCard add 3%. Prices subject to change without notice. All products subject to availability from manufacturers and/or suppliers. All prices in U.S. dollars.

placed in classrooms, in the library, or in a special computer laboratory room? How will their use be supervised, and by whom? Who will take care of maintenance and demonstrations of how to properly use the computers?

After decisions are made about how the computers will be used, by whom, and in what settings, it's time to start selecting hardware and software. Again, there are many questions. Should one brand of computers be purchased, or are different ones best for different purposes? For which brands of computers is the best software available? For which computers are good versions of the BASIC, Logo, and Pascal languages available? How much memory is needed, and are disk drives and printers needed for each computer? Are color video monitors essential, or will black-and-white do? Are modems needed? Which word processing program is best for students? What about lesson and drill programs? Where can good science simulations be obtained? These are just some of the questions that need to be addressed.

The relative importance of such questions, and the appropriate answers to each, depends on the prior decisions about how computers will be used, as well as the constraints imposed by the available budget, space, and personnel.

Hardware Is Not The Only Budget Item

At this stage, careful budget planning is critical so that sufficient money will be available for software, peripherals such as printers, staff training, maintenance, and supplies (such as disks and paper). This point cannot be overemphasized. Many schools have invested all their available funds in hardware, only to discover that it is useless without appropriate software and staff training.

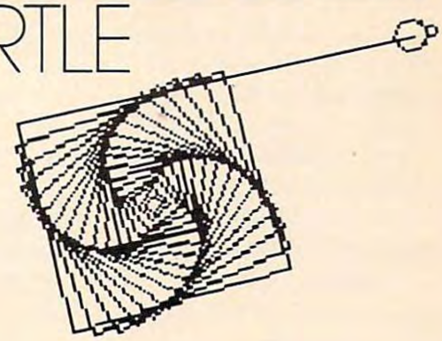
Once the computers are installed, there is another set of concerns. How will requests to use computers be handled? What about keeping up with new developments and the ongoing acquisition of new hardware and software? What should be done to encourage students and teachers who are uncomfortable using computers? What should be done about students who are so interested in computers they neglect other areas of study? How are computers changing the social structure of classes? Has a group of interested students evolved into a computer elite which tries to monopolize the computers? If so, how can this clique be led to serve as peer tutors to help and encourage the other students? Will teachers be uncomfortable because some students will know more than they do about the computers? What about students interested in more advanced programming or in forming a computer club?

The Challenge Of Computers In Education

As with any educational innovation, many new questions arise. This presents an exciting new challenge to educators: to adapt new technology to improve children's education.

Current claims about computers can be compared to prior claims about the educational potential of television, and this comparison raises serious concerns. Computers in education are now at a stage similar to that of television a few decades ago.

The enormous educational potential of television is well established; most children have learned a great deal from television. Unfortunately, much of what they have learned consists of advertising jingles and other trivia. With a few notable exceptions, television has not fulfilled its potential as an educational tool. The same could happen with computers; they could end up being used primarily as mindless electronic toys. Since computers are just beginning to be widely used, the directions we set in the next few years will be critical in determining whether their potential as educational tools will be fulfilled. ©

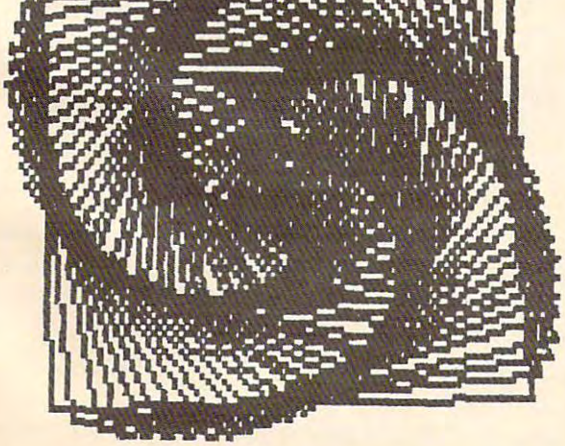


David D. Thornburg, Associate Editor

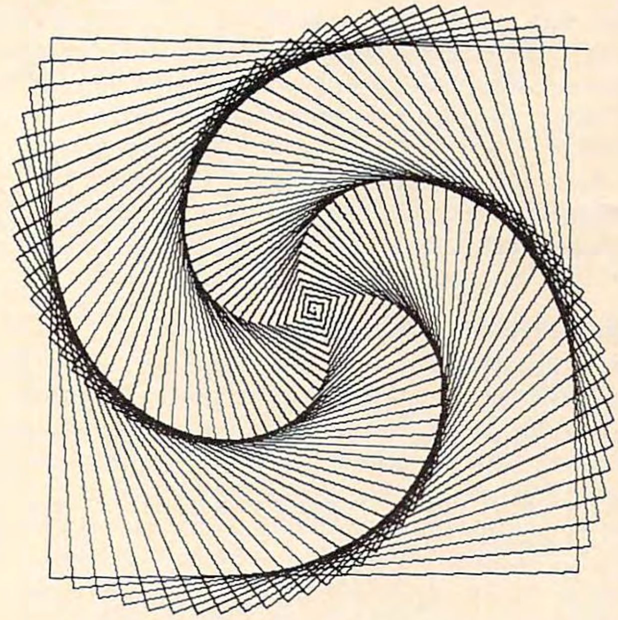
Atari Logo— The Plot Thickens

Perhaps it is because I am in the somewhat enviable position of working with four versions of Logo on a daily basis, but I sometimes get concerned about issues that might not bother most people. In the case of Atari Logo, I find myself wishing that I could draw lines with a higher resolution than that available from graphics mode 7. Unfortunately, even though the computer supports many other graphic modes, Atari Logo does not.

For example, if I draw a closely spaced squiral pattern on the screen, I get a dense and somewhat fuzzy picture like this:



Instead, I would like to get a nice crisp picture like this:



Obviously, since I *did* get a nice crisp picture, I was able to solve the problem. The trick is to have your turtle graphics pictures drawn with the Atari 1020 color graphics printer. This device is a four-color pen plotter that draws pictures on plain white paper with black, blue, green, or red ballpoint pens. As you can see from the picture above, the resolution of this plotter is quite high and the lines are crisp and thin.

Plotter Commands

The key to plotting Logo procedures is to generate the plotter commands as the picture is being drawn. This task was first tackled by Peter Cann at the Atari Cambridge Research Laboratory and then modified by Jason Gervich in Atari Customer Relations before being given to me. Naturally, I tinkered with the procedures some, so the results should not be blamed on anyone at Atari.

My goal was to build a set of plotting procedures that would work in the following way: If a procedure to draw a picture was typed by itself, it would appear only on the display screen. If, instead, the user typed

```
DRAW [procedurename]
```

the procedure would be drawn *both* on the screen and on the plotter. Having two ways to examine a procedure lets you save the plotter for the final debugged version. This saves on pen wear and on time, since the plotter is not nearly as fast as the screen turtle.

The key procedure is shown below:

```
TO DRAW :LIST
SETWRITE "P:
( TYPE CHAR 27 CHAR 27 CHAR 7 )
( PR "M240,0\*I\*M INT 2 * YCOR ", INT (-2) *
  XCOR )
RUN :LIST
SETWRITE [ ]
END
```

Basically, all this does is set the plotter up in the graphics mode and zero the pen position prior to running the procedure. Once the procedure is finished, the plotter is turned off (with the SETWRITE [ ] command). Note that the line that looks cryptic includes some backslashes (\ ). These are used to let Logo know that the following asterisks are to be taken literally, and do not indicate multiplication.

Movement And Color

Well, if we just run our procedure, we might ask by what magic the plotter is supposed to know how to draw the lines. The answer is that anytime we move the location of the turtle, we must send this information to the plotter as well. Since the turtle graphics commands for turtle movement are FD and BK, we must create new ones that also send messages to the plotter. Because I am intrinsically lazy, it was appealing to define new motion commands called F and B as follows:

```
TO F :X
FD :X
PLOT
END

TO B :X
BK :X
PLOT
END
```

Clearly, from these procedures, you can see that our PLOT is very thin. To thicken the PLOT, we add:

```
TO PLOT
( PR IF PEN = "PD ["D] ["M] INT 2 * YCOR ", INT
  (-2) * XCOR )
END
```

This procedure examines the pen position of the turtle along with the turtle location, and sends the plotter pen scurrying to its corresponding position. In order to take maximum advantage of the plotter paper width, I rotated the plot by 90 degrees so that as the screen image moves from left to right, the plotted image moves from top to bottom. This gives a very nice-sized image, even though the plotter paper is only 4.5 inches wide.

Of course, there is always the possibility that you might want to clear the screen. Since this should also move the plotter pen to the origin, we add the command:

```
TO C
CS
PR "M0,0
END
```

Changing the pen color is also easy—especially with these procedures:

```
TO PENBLACK
( TYPE CHAR 67 CHAR 48 )
END

TO PENBLUE
( TYPE CHAR 67 CHAR 49 )
END

TO PENGREEN
( TYPE CHAR 67 CHAR 50 )
END

TO PENRED
( TYPE CHAR 67 CHAR 51 )
END
```

The crafty among you will no doubt find that you can modify these four procedures to change the screen pen and pen colors as well.

Printing Procedures

The remaining plotter procedure that I find useful lets you get a "plotted" printout of your procedure listings:

```
TO P.PROCS
SETWRITE "P:
( TYPE CHAR 27 CHAR 27 CHAR 14 )
POPS
SETWRITE [ ]
END
```

I suggest that you enter these procedures into an otherwise empty workspace and save them in a file called PLOTTER. Then, whenever you want to plot the results of your handiwork later on, you can read these into your workspace by typing:

```
LOAD "D:PLOTTER
```

A High-Res Pen At A Low-Res Price!

Our NEW Edumate Light Pen™ is revolutionizing the world of computer graphics. Before the Edumate, hi-resolution light pens cost in excess of $100.00. Now for $29.95 you can accurately draw on your TV or monitor, play games or utilize educational programs.

Each Edumate Light Pen™ comes with FREE programs* including a draw routine, games and a disk utility that allows you to enter information into the computer with just a touch of your pen. Our entire line of Playground Software™, a fun-filled educational series for kids is light pen compatible.

It's EASY to use; just connect the light pen to your computer's joystick port and load the software. Within seconds you'll be able to use your computer by simply touching the screen!

The Edumate Light Pen™ is ideal for preschoolers, artists, engineers, educators, and all computer enthusiasts seeking a quick and easy way to interact with their computer.

* 5 programs for Atari 400/800™ computers
* 4 programs for Vic 20™ computers
* 3 programs for Commodore 64™ computers

Enjoy the world of computer graphics with the Edumate Light Pen™ — It's still the right pen at the right price — only better.

For Atari 400/800/1200®, Commodore 64®, Vic 20®

Prices subject to change without notice. See your local dealer or order direct. New catalog available.
Add $3.00 for postage and handling. Credit card orders call toll free: 1-800-334-SOFT
P.O. Box 3470, Dept. C, Chapel Hill, NC 27514 919-967-0861

futurehouse

and get your masterpiece recorded for posterity.

The squiral pattern at the beginning of this article was obtained by entering:

```
DRAW [SQUIRAL 91]
```

in which SQUIRAL had the following definition:

```
TO SQUIRAL :ANGLE
MAKE "SIDE 0
REPEAT 180 [F :SIDE RT :ANGLE MAKE "SIDE
  :SIDE +1]
END
```

To see an even more spectacular picture (one that I call a snowflake sunset), enter:

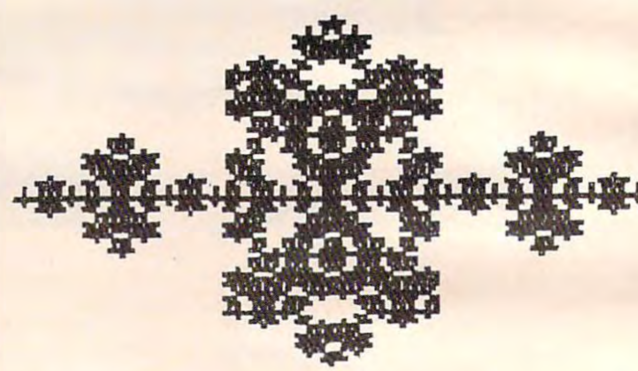
```
DRAW [SETUP SN 300 9]
```

in which SETUP and SN have the following definitions:

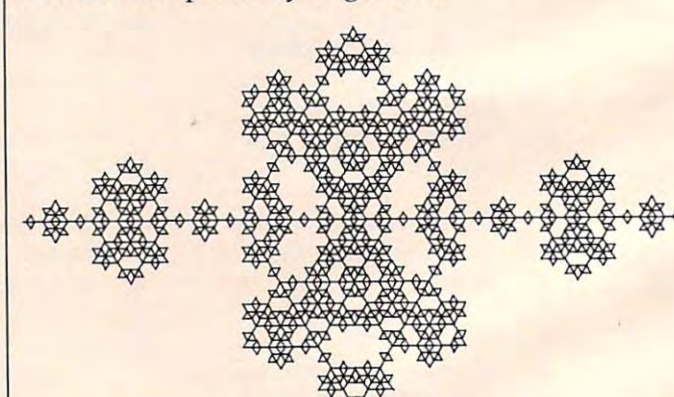
```
TO SETUP
PU SETPOS [-150 0] PLOT SETH 90 PD
HT
END

TO SN :S :L
IF :S < :L [F :S STOP]
SN :S / 3 :L
LT 60
SN :S / 3 :L
RT 120
SN :S / 3 :L
RT 120
SN :S / 3 :L
LT 120
SN :S / 3 :L
LT 120
SN :S / 3 :L
RT 60
SN :S / 3 :L
END
```

On the screen you get this:



And, on the plotter, you get this:



The snowflake sunset is one level of a fractal curve. You can experiment with different generations of this curve by changing the second number when you use SN (for example, SN 300 30). For the purposes of this month's column, this curve nicely demonstrates the value of connecting a pen plotter to your Atari Logo system! ©

SOUND SHAPER

Steven Kaye

"Sound Shaper" manipulates volume and frequency to give the VIC a smoother, more musical sound. We've also included versions for the 64, Atari, and TI. See the "Automatic Proofreader" article on page 60 before typing in the 64 and Atari versions.

One of the main differences between the sound the Commodore 64 can produce and sound produced by the VIC is the shape of the sound's waveform. The VIC produces only square waves. One microsecond the sound is off, the next it's on. This abrupt onset of sound produces somewhat nonmusical music. The tones sound electronic and unlike any acoustic instrument.

The Commodore 64, on the other hand, can simulate musical instruments by controlling the waveshape of the sound produced. Instead of turning the sound on and off abruptly, it can increase and decrease the amplitude (volume) more gradually under control of the programmer. It is important to bear in mind that the onset-offset or rise-fall time is still on the order of fractions of milliseconds, but it is not instantaneous as is the case with the VIC. It is this programmable rise-fall time that allows the Commodore 64 to sound more like a traditional acoustic instrument. We cannot control the actual waveshape of sounds on the VIC, but we can simulate wave-shaping by modulating the volume.

The first part of Program 1 demonstrates a simple application of this technique. It plays the entire frequency range for one of the VIC's four voices. First, the program asks for two inputs, the rise time and the fall time. Values between .5 and 10 seem to work best. Then the frequency value is POKEd into the appropriate register (line 140). Two separate FOR-NEXT loops (lines 150 and 180) control the rise and fall times. As the volume varies between 0 and 15, the input variables control the rate of volume change. Experiment with different rise-fall time values.

Frequency manipulation can also be used to produce unique effects. The second part of Program 1 shows how to produce an echo effect by rapidly alternating a frequency with its complementary frequency. Again we move through the frequency scale. In line 270 we use the amplitude modulation technique described above. Lines 280 and 300 POKE the frequency and then the frequency subtracted from 383 into the appropriate voice register.

On the first time through the loop, voice 2 (36875) is POKEd with 128 and then rapidly alternated with 255 (255 = 383 – 128) while the sound fades as variable DB decreases. The timing loops in 290 and 310 as well as the step value in line 270 can be manipulated to increase or decrease the reverberation effect. Voice 2 was chosen for the example, but any of the four voices will produce interesting sounds.

Program 1: VIC Sound Shaper

```
40 PRINT"{CLR}{9 DOWN}"TAB(2)"{RVS}SHAPIN
   G{OFF} {RVS}VIC{OFF} {RVS}SOUNDS{OFF}"
                                   :rem 179
45 FOR T=1 TO 1500:NEXT            :rem 244
50 PRINT"{CLR}{7 DOWN}{6 RIGHT}SHAPED (1)
   "                                :rem 37
55 PRINTTAB(9);"{DOWN}OR":PRINTTAB(7)"
   {DOWN}ECHO (2)"                 :rem 166
60 PRINT"{4 DOWN}{9 RIGHT}";:INPUT I$:IFV
   AL(I$)<1OR VAL(I$)>2THEN50       :rem 15
70 ONVAL(I$)GOTO100,240             :rem 49
100 REM*** THIS PART PRODUCES "SHAPED" MU
    SICAL NOTES***                 :rem 213
110 PRINT "{3 DOWN}{2 RIGHT}RISE AND FALL
     TIME"                          :rem 36
115 PRINT"VALUES MUST EXCEED 0"     :rem 95
116 INPUT R,D:IF (R=0)OR(D=0) THEN 116
                                    :rem 45
120 V=36878:S=36875                 :rem 13
130 FOR F=128 TO 255 STEP3          :rem 71
```

Notes For 64, Atari, And TI Versions

Since the Commodore 64 has a programmable sound envelope, we added Program 2 to make the SID chip more accessible. By changing values entered for attack, decay, sustain and release, you can control the shape of the sounds produced by the program. The second part of the program produces an echo effect very similar to the effect produced in the VIC version. The parameters set in the first part are also used for the sounds produced in the second part.

The Atari and TI versions of "Sound Shaper" are designed to alter the shape of sounds in the same fashion as the VIC version. Since sound generation in these computers is similar to the VIC's, the logic in these versions is essentially the same as in the VIC version. In the Atari version (Program 3), you may also change the distortion quality of the sound. Since the execution speed differs considerably between TI console and Extended BASIC, users with console BASIC will not hear a smooth shaping of the sounds in the first part of the TI version (Program 4). Extended BASIC provides much better results.

```
140 POKE S,F                             :rem 137
150 FOR DB=0 TO 15 STEP 5/R              :rem 107
160 POKE V,DB                            :rem 206
170 NEXT                                 :rem 215
180 FOR DB=15 TO 0 STEP -5/D             :rem 141
190 POKE V,DB                            :rem 209
200 NEXT                                 :rem 209
210 FORT=1 TO 50:NEXT                    :rem 189
220 NEXT                                 :rem 211
230 POKE V,0:END                         :rem 135
240 REM*** THIS PART CREATES AN ECHO EFFE
    CT***                                :rem 71
250 V=36878:S=36875                      :rem 17
260 FOR P=128 TO 255 STEP 3              :rem 85
270 FOR DB=15 TO 1 STEP -.5              :rem 73
280 POKE V,DB:POKE S,P                   :rem 9
290 FOR T=1 TO 10:NEXT                   :rem 193
300 POKE S,383-P                         :rem 92
310 FOR J=1 TO 10:NEXT                   :rem 176
320 NEXT:NEXT                            :rem 77
330 POKE V,0                             :rem 119
```

Program 2: 64 Sound Shaper

```
15 PRINT"{CLR}SET PARAMETERS FOR SOUND AN
   D ECHO"                               :rem 12
20 CHIP = 54272                          :rem 199
22 FOR T=CHIP TO CHIP + 24 : POKET,0:NEXT
                                         :rem 234
30 INPUT "ATTACK RATE (0-15)";AT$:AT=VAL(
   AT$):IF AT<0 OR AT>15 THEN 30   :rem 82
40 INPUT "DECAY RATE (0-15)";DE$:DE=VAL(D
   E$):IF DE<0 OR DE>15THEN 40    :rem 198
50 INPUT "SUSTAIN VOLUME (0-15)";SU$:SU=V
   AL(SU$):IF SUS<0OR SU>15THEN50 :rem 35
60 INPUT "RELEASE RATE(0-15)";RE$:RE=VAL(
   RE$):IF RE<0ORRE>15THEN60      :rem 171
80 POKECHIP+24,15:POKECHIP+5,16*AT+DE
                                  :rem 209
90 POKECHIP+6,16*SU+RE             :rem 68
100 FOR T= 20{2 SPACES}TO 80 STEP 5:POKEC
    HIP+4,17                      :rem 103
110 POKECHIP,50:POKECHIP+1,T      :rem 223
115 FORJ= 1 TO 500+1.7↑AT+1.7↑DE:NEXTJ
                                  :rem 141
120 POKECHIP+4,16:FORH=1TO2↑RE:NEXT:NEXT
                                  :rem 107
200 FOR T= 20 TO 80 STEP 5        :rem 232
210 FOR DB = 15 TO 1STEP -.5       :rem 67
215 PRINT"{HOME}{5 DOWN}*ECHO*{6 LEFT}
    {7 SPACES}"                   :rem 242
220 POKECHIP+4,17:POKECHIP+24,DB:POKECHIP
    +1,T:FORP=1TO10:NEXT          :rem 111
230 POKECHIP+1,100-T:FORJ=1TO10:NEXT:NEXT
    :NEXT                         :rem 202
240 POKECHIP+4,16                 :rem 219
```

Program 3: Atari Sound Shaper

```
NN 3 ? "{CLEAR}":POSITION 12,12:? "SOU
     NDSHAPER"
FO 4 POKE 752,1
OK 5 DIM I$(5),VO$(5),DS$(5)
OC 6 FOR T=1 TO 300:NEXT T
MD 10 PRINT "Shape (1) or Echo (2)";
FP 20 INPUT I$
EC 21 IF VAL(I$)<1 OR VAL(I$)>2 THEN 1
      0
EF 40 REM *** THIS PROGRAM PRODUCES SH
      APED MUSICAL NOTES ***
NL 50 PRINT "Voice (0-3)";:INPUT VO$
AF 55 IF VAL(VO$)>3 OR VAL(VO$)<0 THEN
       50
EL 57 VO=VAL(VO$)
DJ 60 PRINT "Distortion(0-14)";:INPUT
      DS$
BN 65 IF VAL(DS$)<0 OR VAL(DS$)>14 THE
      N 60
DA 67 DS=VAL(DS$)
BH 68 ON VAL(I$) GOTO 70,195
FC 70 ? "Rise Fall Time";:INPUT R,D
KC 75 IF R<1 OR D<1 THEN 70
LJ 95 ? "{CLEAR}";:POSITION 12,12:? "*
      Shaped Notes*"
JE 100 FOR F=121 TO 60 STEP -4.1
EF 120 FOR DB=0 TO 15 STEP (1/R)*15
KJ 130 SOUND VO,F,DS,DB
FK 140 NEXT DB
GH 150 FOR DB=15 TO 0 STEP -(1/D)*15
KM 160 SOUND VO,F,DS,DB
GB 165 NEXT DB
BG 170 FOR T=1 TO 50:NEXT T
BO 180 NEXT F
NE 190 POKE 752,0:END
AA 195 ? "{CLEAR}";:POSITION 12,12:? "
       ***ECHO EFFECT***"
JP 200 FOR P=121 TO 60 STEP -4.1
HD 210 FOR DB=15 TO 1 STEP -0.5
LD 220 SOUND VO,P,DS,DB
AP 230 FOR T=1 TO 10:NEXT T
HM 240 SOUND VO,181-P,DS,DB
PN 250 FOR J=1 TO 10:NEXT J
CG 260 NEXT DB:NEXT P
ND 270 POKE 752,0:END
```

ATARI

600XL .... CALL
800XL .... CALL
1200XL $409*
*Reflects $100 Atari Rebate

1050 DRIVE	$335	MICROBITS INFC	$78
1025 PRINTER	$399	80 COLUMN BD	$249
1020 COLOR PTR	$219	TECHNICAL NOTES	$25
1027 PRINTER	$279	REAL TIME CLK	$38
1010 RECORDER	$72	810 DRIVE	$419

DRIVES

ASTRA 1620 .... $469
RANA 1000 .... $295
PERCOM 88-S1 ..... $298
PERCOM 40-S1 ..... $418
PERCOM 40-S2 ..... $718
PERCOM 44-S1 ..... $510
PERCOM 44-S2 ..... $929

MEMORIES

48K RAM (INTEC) $95
64K RAM (INTEC) ... $119
48K RAM (MOSAIC) . $109
64K RAM (MOSAIC) . $145
128K RAM DISK $299
32K RAM (MOSAIC) .. $68

ATARI SOFTWARE

ADVENTURE INT'L
Adv. 1-12 each (C) $18
Preppie (C/D) $20
Preppie II (C/D) $23
Diskey (D) $33
Sea Dragon (C/D) $23

APX
Eastern Front (C/D) .. $23
747 Land Sim. (C/D) .. $17
Fig-Forth (C) $30

ATARI INC.
Microsoft Basic II (R) . $62
Mickey in Great Outdoors (C/D) $36
Paint (D) $30
Speed Reading (C) ... $54
Qix (R) $30
Dig Dug (R) $30
Atari Writer (R) $68
Donkey Kong (R) $30
Time Wise (D) $23
Visicalc (D) $139
Juggles House (C/D) . $22
Juggles Rnbw (C/D) .. $22
Pilot (Home) $55
Galaxian $30
Defender $30
ET $34
Microsoft Basic (D) .. $62
Macro Ass. & Edit (D) . $62
Assembler Editor (R) . $42
Basic Cartridge (R) . $45
Pac Man (R) $30
Centipede (R) $30
Caverns of Mars (D) .. $28
Star Raiders (R) $30
Conv. Lang. Ea. (C) ... $42
Music Composer (R) .. $31
Super Breakout (R) ... $26
My First Alphabet (D) . $26
Prog. 2 & 3 (ea.)(C) $21
Word Processor (D) . $102
Pilot (Educ.) $92
Touch Typing (C) $19
Home File Mngr (D) .. $36

AUTOMATED SIMUL.
Hellfire Warrior (C/D) . $27
Kng Arthr's Heir (C/D) $20
Invasion Orion (C/D) .. $17
Temple of Aps. (C/D) . $27
Star Warrior (C/D) ... $27
Dragon's Eye (D) $20
Crush Crumble (C/D) . $20

AVALON HILL
VC (D) $17
B-1 Nuc. Bomber (C) . $12
Legionnaire (C) $23

BRODERBUND
Sky Blazer (D) $22
Bank St. Writer (D) ... $46
A.E. (D) $23
Arcade Machine (D) .. $39
Choplifter (D) $23

CBS
Mountain King (R) ... $27
Boulders & Bombs (R) $27
Krazy (each) $34

CONTINENTAL SOFT.
Home Accountant (D) $48
Tax Advantage (D) ... $39

DATASOFT
Text Wizard (D) $65
Graphic Master (D) ... $27
Micro Painter (D) $23
Lisp Interpreter (D) .. $79
Graphics Gen.(D) $17
Basic Compiler (D) .. $65
Zaxxon (C/D) $27

DON'T ASK
Sam (D) $39
P.M. Animator (D) $23
Teletari (D) $27

EDU-WARE
Prisoner II (D) $27
Spelling Bee (D) $27
Compu-Read (D) $20
Compu-Math Fr. (D) . $27
Compu-Math Dec. (D) . $27

EDUCATIONAL SOFT.
Tricky Tutorial 1,2,3 or 4 (C/D) $15
Tricky Tutorial 5,6 or 7 (C/D) $22

INFOCOM
Suspended (D) $34
Zork I, II or III (D) ... $27
Starcross (D) $27
Deadline (D) $34

JV SOFTWARE
Jrny to Plnts (C/D) $20
Action Quest (C/D) ... $20
Ghost Encount. (C/D) . $20

LJK
Letter Perfect (D) $74
Data Perfect (D) $74

ON-LINE
Ultima II (D) $39
Marauder (D) $23
Lunar Leeper (D) $20
Wiz & Princess (D) ... $22
Frogger (C/D) $23
Crossfire (R) $23

OPTIMIZED SYSTEMS
C-65 (D) $58
Bug-65 (D) $23
Max-65 (D) $58
Basic A + (D) $58

ROKLAN
Gorf (D) $27
Gorf (R) $30
Wizard of Wor (D) $27
Wizard of Wor (R) $30

SIRIUS
Alpha Shield (R) $27
Wavy Navy (D) $23
Bandits (D) $23

SPINNAKER
Snooper Troop 1,2 (D) . $30
Kindercomp (D) $20
Rhymes & Riddles (D) $20
Hey Diddle Diddle (D) $20
Srch Amzng Thngs (D) $27
Story Machine (D) $23
Face Maker (D) $23

STRATEGIC SIM.
Cosmic Balance (D) .. $27
Cosmic Balance II (D) $27
Tigers In Snow (C/D) . $27
Battle of Shiloh (C/D) $27
Battle of Norm. (C/D) $27
Galactic Gladiator (D) $27
Cytron Masters (D) ... $27

SYNAPSE SOFTWARE
File Mngr 800 + ... $65
Protector II (D) $23 (R) $29
Shamus ...... (D) $23 (R) $29
Fort Apocalypse (C/D) $23
Shamus II (C/D) $23
Necromancer (C/D) $23
Pharoh's Curse (C/D) . $23

THORN EMI
Soccer (R) $34
Jumbo Jet (R) $34
Submarine Comm. (R) $34

USA
Atari World (D) $39
3-D Sprgrphcs (C/D) . $27

MISCELLANEOUS
Sargon II .. (C) $20 (D) $23
Financial Wizard (D) .. $41
Castle Wolfenstein (D) $20
Master Type (D) $27
Millionaire (D) $52
Astro Chase (D) $22
Ali Baba (D) $22
Miner 2049er (R) $34
Sammy Sea Serp. (C) . $13
Pinball (D) $20

SPECIALS

Gemini 15X Printer $399
Axiom AT-100 Printer (with interface $229
Astra Double Density Dual Drive $469
Rana 1000 Drive $319
Bit-3 80 Column Board $245
Mannesmann Talley 160L Printer $589
Atari 400 Keyboard (In Home) $35
Programmer Kit .. $48   Entertainer Kit ... $64
Wico Joystick ... $23   Wico Trackball ... $49

ASTRA 1620
DISK DRIVE SYSTEM
MORE FOR YOUR MONEY
DOUBLE OR SINGLE DENSITY
TWO DRIVES
SPECIAL **$469**

Printers/Etc.

GEMINI 10X .. $279   **PROWRITER** . $345
GORILLA .... $199   **SMITH TPI** ... $488

CITOH
Prowriter $345
Prowriter II $629
Starwriter $1149
Printmaster $1448

NEC
8023 A-C $409
3510 .... $1375
3530 .... $1579
3550 .... $1779
7710/7730 .... $1998

SILVER REED P $669
QUME 11/40 + ... $1299

OKI-DATA
Microline 82A $398
Microline 83A $638
Microline 84P $958
Microline 92 .... $488
Microline 93 .... $858

DIABLO
620R $939
630R $1719

MONITORS

AMDEK
Color I $289
V300 .... $139
V300A $149
Color II $449

NEC
GRN (JB1260) $115
GRN (JB1201) $155
Color Composite ... $298
RGB Color $598

MODEMS

HAYES
Smartmodem $209
Smartmodem 1200 .. $498
Micromodem II $259

NOVATION
J-Cat $99
Apple Cat II $259
D-Cat $149

D = Disk
R = ROM (Cartridge)
C = Cassette

COSMIC COMPUTERS
UNLIMITED

727 BREA CANYON RD., SUITE 16
WALNUT, CA 91789
ORDER LINES OPEN MON-SAT 8 am - 8 pm

(800) 626-7642

PLEASE FOR ORDERS ONLY
SORRY, NO COD'S

(714) 594-5204

FOR TECHNICAL INFO, ORDER INQUIRIES, OR FOR CALIFORNIA ORDERS

Add $2.50 shipping per software order in continental U.S. Add $5.00 shipping per software order for AK, HI, FPO-APO. Add $10.00 or 15% (whichever is greater) per software order for non-U.S. Call for cost of hardware shipping. Calif. residents add 6½% sales tax. Cashiers checks or money orders filled within 24 hours for items in stock. Personal checks require 4 weeks to clear. MasterCard and Visa OK for software only within continental U.S., add 3% surcharge. Include card no., expiration date and signature. Due to our low prices, all sales are final. All defective returns must have a return authorization number. Please call to obtain one before returning goods for replacement or repair. Prices & availability subject to change.

COMMODORE

CBM 64 .... **CALL**
1541 DISK DRIVE ... **$239**

1701 Color Monitor	$255	1530 Recorder	$59
1525 Printer	$239	1600 Modem	$59
1520 Color Ptr	$169	1650 Auto Modem	$89
Card ? (Infc)	$60	CMB 64 Ref Guide	$18
Light Pen	$29	The Connection (Infc)	$85
Cassette Infc	$29	MSD Disk Drive	$339
Card ? Software	$16	PTI 45 Lot Board	$59

64 SOFTWARE 64

Multiplan .... CALL
Script 64 .... $77
Calc Result Prof. $114
Calc Result Easy $68
The Home Accountant $48
Delphis Oracle $89
Word Pro 3 with Spell $78

ACCESS SOFTWARE
Neutral Zone (C/D) ... $26
Sprite Master (C/D) ... $27

AVALON HILL
Nukewar (C) $12
Planet Miners (C) $12
Androm. Conquest (C) $14
Midway Campaign (C) $12
North Atl. Convoy (C) . $12
Comp. Stcks/Bnds (C) $15
Computer Football (C) $18
Telengard (C) $16

BATTERIES INCLUDED
Paper Clip (D) $85
Delphis Oracle(D) 89

BRODERBUND
Choplifter (R) $29
Serpentine (R) $27
Seafox (R) $27
David's Midnight (D) .. $23

COMMODORE
Easy File (D) $75
Easy Finance (D) $38
Easy Mail (D) $38
Easy Script (D) $75
Easy Schedule (D) ... $59
Logo (R) $75
Pilot (D) $75
Assembler (D) $38
Music Machine (D) ... $25
Music Composer (D) .. $25
Meza Music (D) $75
Video/Music Supt. (D) $38
Jupiter Lander (R) ... $25
Radar Rat Race (R) ... $25
Sea Wolf (R) $25
Kickman (R) $25

COMM-DATA
Pakacuda . (C) $14 (D) $18
Escp. MCP . (C) $14 (D) $18
Centropods (C) $14 (D) $18

COMPUTERMAT
Arcade-Pak (C) $18
Education-Pak (C) $18

CREATIVE SOFTWARE
Moondust (R) $25
Trashman (R) $25
Save New York (R) ... $25
Astroblitz (R) $25
Household Fin. (D) ... $25

DATA 20
Video Pak 80 .... $139
Z80 Video Pak $229

EN-TECH
Finance Calc 64 ..... $34
Data Base 64 .... $56
Invoice Ease 64 ..... $56

EPYX
Temple of APS (D) ... $27
Upper Reach. APS (D) $14
Jumpman (D) $27

HES
HES Modem $59
6502 Prof.Dev.Sys.(C) . $22
Hesmon 64 (R) $27
Turtle Graphics II (R) .. $41
Heswriter 64 (R) $32
Gridrunner (R) $27
Retroball (R) $27

INFOCOM
Zork I, II or III (D) $27
Deadline (D) $35
Starcross (D) $27

JIN SAM
Mini-Jini (R) $75

LITTLE WIZARD
Pro.Mail.List (C)$22 (D)$25
Stockmaster (Inventory) (C)$25 (D)$28

LOGISTIC
Datacalc 64 (C) $55 (D) $59
Home Journal (D) $55

MICROSPEC
Payroll System (D) ... $73
Inventory Pkg (D) $73
General Ledger (D) ... $73
Disk Data Mgr (D) $62
Mail List Mgr (D) $41
Checkbook Mgr (D) ... $39

M-SOFT
M-File (D) $89

ON-LINE
Frogger (D) $23
Jawbreaker (D) $20

PACIFIC COAST SOFT.
PCS (80 Col BD, Word Proc, D.Base,Spreadsheet) CALL
Account PAC (C/D) ... $34
File PAC (D) $30
Editor PAC (C/D) $39
Inquire PAC (D) $57
Happy Tutor Typng (D) $18

PROFESS. SOFTWARE
Wordpro 3 + /64 (D) ... $68

QUICK BROWN FOX
Prof.Word Proc. (R) ... $50

RAINBOW
Writers Assistant $95
Spreadsheet Assist. .. $95
File Assistant $95

SIRIUS
Blade/Blackpoodle (D) $27
Type Attack (D) $27
Repton (D) $27
Critical Mass (D) $27
Snake Byte (D) $23
Way Out (D) $27
Fast Eddie (D) $23
Turmoil (D) $23
Spider City (D) $27
Squish'Em (D) $23
Final Orbit (D) $27
Alpha Shield (D) $27

SKYLES ELEC. WORKS
Busicalc (C/D) $52
Busiwriter (D) $72

SPINNAKER
Snooper Troops 1 (D) . $29
Facemaker (D) $23
Kindercomp (D) $20
Hey Diddle (D) $20
Most Amaz. Thing (D) . $27

SYNAPSE
Fort Apocalypse (C/D) $23
Survivor (C/D) $23
Drelbs (C/D) $23
Pharoh's Curse (C/D) . $23
Protector II (D) $23
Morgal (D) $23
Shamus (D) $23

TAYLORMADE
Touch Typing Tutor 3.0 (D) $21

TIMEWORKS
Rbbrs/Lost Tomb (C/D) $21
Wall Street (C/D) $21
Money Manager (C/D) $21
Data Master (C/D) $21
Dungeons of Alg. Dragons (C/D) $21

TOTL
Text 2.6 ... (C) $32 (D) $34
Label 2.6 .. (C) $15 (D) $17
Time Manager 2.6 (C) . $24
Time Manager 2.6 (D) . $27
Resrch Assist. 2.0 (C) . $24
Resrch Assist. 2.0 (D) . $27

UMI
Motor Mania (C) $20
Renaissance (C) $27

VICTORY
Annihilator (C/D) $16
Kongo Kong (C/D) $16
Trek (C/D) $14
Adv. Pack #1 (C/D) ... $16
Adv. Pack #2 (C/D) ... $16
Grave Robbers (C/D) . [illegible]
Chomper Man (C/D) .. $18

Program 4: TI Sound Shaper

```
100 CALL CLEAR
110 CALL SCREEN(15)
120 PRINT TAB(7);"SHAPING TI SOUNDS "
130 FOR T=1 TO 6
140 PRINT
150 NEXT T
160 PRINT "CHOOSE:"
170 PRINT
180 PRINT
190 PRINT TAB(4);"1) SHAPED MUSICAL NOTES"
200 PRINT
210 PRINT TAB(4);"2) ECHO"
220 PRINT
230 PRINT TAB(4);"3) QUIT"
240 PRINT
250 INPUT A$
260 IF (VAL(A$)<1)+(VAL(A$)>3)THEN 250
270 ON VAL(A$)GOTO 290,520,690
280 REM  THIS PART PRODUCES "SHAPED" MUSICAL NOTES
290 CALL CLEAR
300 CALL SCREEN(13)
310 PRINT TAB(3);"* SHAPED MUSICAL NOTES *"
320 FOR T=1 TO 10
330 PRINT
340 NEXT T
350 PRINT "ENTER RISE AND FALL TIMES -"
360 PRINT "USE VALUES GREATER THAN ZERO";
370 PRINT
380 INPUT R,D
390 IF (R=0)+(D=0)THEN 380
400 FOR F=110 TO 880 STEP 30
410 FOR DB=30 TO 0 STEP -5/R
420 CALL SOUND(-10,F,DB)
430 NEXT DB
440 FOR DB=0 TO 30 STEP 5/D
450 CALL SOUND(-10,F,DB)
460 NEXT DB
470 FOR T=1 TO 50
480 NEXT T
490 NEXT F
500 GOTO 100
510 REM  THIS PART CREATES AN ECHO EFFECT
520 CALL CLEAR
530 CALL SCREEN(14)
540 PRINT TAB(8);"* ECHO EFFECT *"
550 FOR T=1 TO 12
560 PRINT
570 NEXT T
580 FOR F=110 TO 880 STEP 30
590 FOR DB=1 TO 30
600 CALL SOUND(-10,F,DB)
610 FOR T=1 TO 10
620 NEXT T
630 CALL SOUND(-10,990-F,DB)
640 FOR J=1 TO 10
650 NEXT J
660 NEXT DB
670 NEXT F
680 GOTO 100
690 END
```

©

INSIGHT: Atari

Bill Wilkinson

In this column, we continue the discussion of formatted screen techniques.

PUT And GET And The Text Screen

This is another one of those "Did you know?" tidbits. Did you know that when you use GRAPHICS 0 from Atari BASIC you have automatically opened the screen for GETting and PUTting via file number 6? It's true, and it is because Atari BASIC does not check the mode number for the GRAPHICS statement.

GRAPHICS 0 is thus exactly equivalent to:

```
OPEN #6, 12+16,0, "S:"
```

So if you need to GET or PUT from or to the screen, you can do it directly to file #6 without any further ado.

Unfortunately, there are a few gotchas involved in using GET and PUT to the Atari Screen graphics driver ("S:"), some of which you may have seen before, so let's discuss them, as well as ways around them.

The first problem is that if you use PUT #6 combined with POSITION statements or PRINT statements, you will probably end up leaving some inverse video spaces (white boxes) around on the screen, as Program 1 illustrates. This is because the screen graphics driver works almost (but not quite) like the screen editor driver ("E:", the normal channel #0 device which PRINT and INPUT use). Unfortunately, "S:" can't seem to handle its cursor properly, so it may be best to avoid using PUT #6.

Program 1: Problems With PUT #6

```
10 GRAPHICS 0
20 POSITION 30*RND(0),20*RND(0)
30 PUT #6,65+20*RND(0)
40 GOTO 20
```

How can we avoid PUT #6 if we have something we need on the screen? Simple. Use PUT#0 (if you have BASIC XL or any other product which allows PUT to file #0) or PRINT. If you use PRINT, of course, you will have to use

```
PRINT CHR$(X);
```

in place of PUT #0,X. And why does outputting to file #0 work where using #6 does not? Because #0 is opened to "E:", and there are several subtle differences between "E:" and "S:" where cursor positioning and character I/O are concerned.

Unfortunately, while the problems with PUT #6 are fairly easy to get around, the problems with GET #6 must be dealt with directly. And why can't we simply use GET #0 in place of #6 here, as we did with PUT? Because, when you ask "E:" (channel #0) for a character, it waits until the user actually types in an entire line—terminated by a RETURN character—before returning anything at all to its caller (you are the caller via BASIC in this case).

The whole reason for using GET #6 is to allow ourselves to read individual characters from the screen. We simply can't use GET #0 or anything else which accesses "E:".

But this is putting the cart before the horse a little. Before "fixing" the problem, let's illustrate it with Program 2.

Program 2: Problems With GET #6

```
10 GRAPHICS 0
20 PRINT "ABCDEFGHIJKLMNOP"
30 FOR I=2 TO 12 : POSITION I,0
40 GET #6,CHAR
50 POSITION 20,20 : PRINT CHAR
60 FOR J=1 TO 200 : NEXT J : REM jus
   t a delay loop
70 NEXT I
```

I hope you actually stopped while reading to try out that listing. Bizarre, isn't it? It seems that you can't GET data from the screen without destroying it. Now, most of the articles which I have seen which note this problem suggest that the only safe fix is the following:

1. POSITION yourself on the character you want.
2. GET the character to a variable.
3. POSITION yourself again to the same location.
4. PRINT the character back onto the screen.

That fix will indeed work, but I would propose that an alternate solution is to simply print a "left arrow" (backspace) and then the character, thus avoiding the extra POSITION statement. In Program 2, we could simply add this line to fix things up:

```
45 PRINT CHR$(30);CHR$(CHAR);
```

Now that you know how to properly PUT and GET to the screen, you probably have a fair idea of how I built my onscreen editor. It isn't too hard to do anything you want to the GRAPHICS

0 screen, once you get past the quirks in the Atari OS.

Fettering Your NEXT

Probably every BASIC book you have ever seen tells you to properly nest FOR/NEXT loops. Aside from the neatness of it, there are some good and practical reasons. Consider Program 3.

Program 3: Obviously Invalid Nesting

```
10 FOR I=1 TO 6
20   FOR J=1 TO 3
30 NEXT I
40   NEXT J
```

Very few of you would deliberately write a BASIC program which looked like that. Even with the indentation I have given it, it should be obvious that something is wrong.

And, yet, it is fairly easy to write a program which will look proper and yet have the effect of that listing! Don't believe it? Try Program 4.

Program 4: A Subtle Problem

```
100 REM Program task: Print all numb
    ers from 1 to 9, in a nested loo
    p fashion.  When the first sum o
    f 15 or
101 REM greater is found, cease the
    operation.  When the sum is 10 o
    r more, don't print the result.
102 REM Repeat for the products of t
    he same numbers in the same fash
    ion.
110 print "I","J","SUM"
120 FOR I=1 TO 9
130   FOR J=1 TO 9
140     SUM = I+J
150     IF SUM > 14 THEN 200
160     IF SUM > 10 THEN 190
170     PRINT I,J,SUM
180   NEXT J
190 NEXT I
200 PRINT "I","J","PRODUCT"
210 FOR J=1 TO 9
220   FOR I=1 TO 9
230     PROD = I*J
240     IF PROD > 14 THEN 290
250     IF PROD > 10 THEN 280
260     PRINT J,I,PROD
270   NEXT I
280 NEXT J
290 END
```

Now this looks perfectly harmless, if somewhat pointless, right? It looks like it should work fine. Yet, if you will type it in and RUN it, you will find that line 280 will give you a NEXT WITHOUT MATCHING FOR error the first time it is reached. How? Surely line 210 is the FOR which matches the NEXT of line 280.

The Interpreter's Dilemma

If Atari BASIC were a compiler language, it would probably execute that program correctly. However, since it is an interpreter, it must work within the strictures of that mode. Interpreters, by their very nature, cannot easily keep a history of all NEXT usages. It is enough that they remember where the FOR statements are, so that when a NEXT is encountered they can go back to the FOR to execute the loop another time.

Consider, then, the dilemma of the poor interpreter in the above program. In line 160, we are asking it to bypass the end of the inner FOR loop (since we know we are done with the previous usage of it) and start the next iteration of the outer loop (NEXT I). But wait. There is still a FOR J on the runtime stack, yet we are executing a NEXT I. What can we do?

Atari BASIC does what most modern "smart" BASICs do. If it finds a loop variable NEXT which does not match the last FOR on the stack, it presumes that the user has jumped out of the inner loop (as indeed we have here) since that is a common occurrence. So BASIC looks backward in the stack for a matching FOR. Eureka! It finds the FOR I only one level down in the stack, without any intervening GOSUBs, so its supposition seems confirmed. All works well.

However, look at line 150, wherein we jump out of all the loops. What have we left on the runtime stack now? Obviously, both a FOR I and a FOR J. Well, no real problem. After all, we know we jumped all the way out of the loop, don't we? We don't. Why not? Because a BASIC interpreter must presume that the BASIC programmer knows what he or she is doing. It is, unfortunately, perfectly legal to jump in and out of a loop in Atari BASIC. It is, in fact, even legal to have more than one NEXT for any given FOR.

So what can BASIC think when it gets to line 210 but that it is starting the inner FOR loop over again? It leaves the FOR I in place (for all it knows, the next statement it encounters might be a NEXT I) and adds a new FOR J.

Disaster really strikes in line 220. Poor BASIC *is* trying its best. Knowing that it is not uncommon for BASIC programmers to jump out of loops or to jump to the beginning of a loop to start it again, BASIC almost *has* to presume that the FOR I of line 220 is the beginning of a new outer loop. Besides, it already has a FOR I on its runtime stack. How can it allow another?

Well, if this is the beginning of a new outer loop, better throw away the old outer loop and any of its inner loops. Say good-by to the old FOR I and FOR J; we're ready for another outer loop with a new FOR I. Right?

Wrong. But BASIC doesn't know about it while it stays in the FOR I loop, since it encounters no other FORs or NEXTs. In fact, the entire loop executes nicely with no problems, and the FOR is properly removed from the stack when the last value of I is reached. Did you notice that the stack is now empty?

Where did this NEXT J come from? FOR J was an inner loop and was thrown away when the outer loop was restarted.

The Fix In Atari BASIC

Actually, Atari BASIC is not a culprit here. Virtually every BASIC will have this same problem unless it makes a pre-pass through the user's program to detect possible inconsistencies (such as jumping out of nested loops). In point of fact, Atari BASIC is almost a good guy here. Recognizing that even with the best interpretation we could do, we could not prevent users from writing (or needing to write) structures such as I have shown you, we designed a "fix" into Atari BASIC.

The fix takes the form of the POP statement. POP simply removes the last level of the runtime stack. In Program 4, the easiest fix is

```
150 IF SUM > 9 THEN POP : POP : GOTO 200
```

(and a similar fix is needed in line 240, of course).

Notice I said that was the easiest fix. POP is usually not the best fix. Generally, you can write good and properly structured programs, with properly terminating FOR loops, without ever resorting to such extreme measures as the POP statement. Still, it is comforting to know that POP is around. Personally, I tend to use it whenever an error condition occurs and I want to get all the way back out to (for example) the menu level without leaving nasty GOSUBs or FORs on the runtime stack.

A curiosity: Did you notice that if the nesting in lines 200 through 290 is reversed (that is, if the FOR I occurs before the FOR J), the program will work correctly? Do you see why? Fundamentally, because you are now doing what BASIC expected you to do. Go try this example both ways on a Commodore or Radio Shack or whatever computer. Does either method work? I'd be interested in knowing.

If you ever get a NEXT WITHOUT MATCHING FOR error, look for this kind of structure in your program. If you find it, you can fix it with POP, but wouldn't it be nicer to write the program correctly?

A footnote to all of that: Can you begin to get an appreciation of what language designers must contend with? It is not enough that a language do what it is expected to do. A good language will come halfway toward helping its users over the rough spots.

Reading Object Code Files

Here's a loader for binary object files which will place them in memory at the location they were assembled for. The routine is written entirely in Atari BASIC, so it is slow. Next month, we'll present the same routine written in machine language, perhaps even in a version callable from a BASIC program (just to speed things up).

Atari object files have a fixed and reasonable format. The first two bytes of the file are always $FF and $FF (255 and 255, in decimal). They serve as a check that the file is indeed an object file. The next two bytes are the starting address in memory of the first (and perhaps only) "segment," while the following two bytes are the ending address of the segment. These header bytes are followed by enough object bytes to fill up the memory from the starting address through and including the ending address.

If a file has multiple segments, each segment may or may not (programmer's option) be preceded by the same $FF and $FF bytes. Each segment must always be headed by both a start and an end address. Without further ado, then, the loader program, Program 5.

Program 5: Load A Binary Object File

```
100 REM binary object file loader
110 DIM NAME$(30)
120 PRINT "WHAT FILE TO LOAD ";
130 INPUT NAME$
140 OPEN #1,4,0,NAME$
200 REM get and check header
210 TRAP 400
220 GET #1,LOW : GET #1,HIGH
230 TRAP 40000
240 IF LOW=255 AND HIGH=255 THEN GET
    #1,LOW : GET #1,HIGH
250 START = LOW + 256*HIGH
260 GET #1,LOW : GET #1,HIGH
270 QUIT  = LOW + 256*HIGH
300 REM read in a segment
310 FOR ADDR = START TO QUIT
320 GET #1,BYTE
330 POKE ADDR,BYTE
340 NEXT ADDR
350 GOTO 200 : REM try for another s
    egment
400 REM trapped to here, assume end-
    of-file
410 CLOSE #1
```

Since I'm running out of time and space this month, I will let the explanation of object file format, above, serve for now as an explanation of this program. I will warn you, however, that I cheated a bit in line 240 to make the multiple segment loading easier. The routine will try to load *anything* into memory, whether or not it is truly a binary object file. If your memory dies a violent death (fixable only by turning power off and back on), you tried to load something other than an object file with this. Naughty.

Next month some notes on destination strings in Atari BASIC. And maybe—just maybe—we'll play around with Atari screen I/O a little more. ©

C. Regena

File Processing

I've received quite a few letters wondering about files on the TI-99/4A. Files on a computer can be compared to those ordinary big, gray file drawers. Each *file* is a drawer, and you can label your drawers. Each *record* is one of the file folders inside a drawer. On the computer your file cabinet can be either a cassette or a diskette.

You can read about file processing in the *User's Reference Guide* that comes with the computer (pages II-118 to II-136 for the TI-99/4A and pages 144 to 162 for the TI-99/4), so I won't repeat that information here. For some example programs, you can refer to "Color Computer General-Purpose Data Base" in COMPUTE! (May 1983).

If you prefer not to do your own programming, there are several business programs available for the TI, as well as some command modules which utilize file processing. Home Budget Management keeps personal finance records. Personal Record Keeping is a versatile module that helps you set up your own files and records for a small business.

A Spelling Drill

Let's get to an example. This "Spelling Quiz" program presents a drill for spelling words. In many schools, students are sent home with a list of words each Monday with instructions to practice, then a test is given on Friday. TI to the rescue! Enter the spelling words and save them on cassette. Let the computer conduct the drill.

Line 100 DIMensions or reserves space for 30 spelling words on the list. If you have more words, you can change this statement and lines 460–470 to handle more words. Lines 110–150 define graphics characters, and line 1630 draws a smiling face for a correct answer. Please feel free to add your own graphics. Lines 160–310 print the main menu screen of options. When you RUN the program, you have your choice of entering a new word list, editing the existing list, loading a list of previously saved words, saving the present list, reviewing the complete word list, actually performing the quiz, or ending the program.

The first time you RUN the program, you would press 1 to enter a word list, edit the list if necessary, then save the list on cassette for future use. Lines 320–370 contain the procedure that tells you when you try to access an empty list.

Enter The Number Of Words

When you enter a new word list, you are first asked how many words it will contain. This number, N, is unchanged throughout the program and is necessary for saving N items and for performing the quiz for N words. Lines 490–530 ask for the new words, and you type the words in one at a time, pressing ENTER after each word. When you have entered the right number of words, the program returns to the main menu screen.

The edit option is contained in lines 550–960. The complete word list is printed, then you can enter the word you want changed. Lines 640–660 compare the word you entered to the word list so the word can be replaced. If you prefer to delete the word, you can just press the ENTER key. Lines 730–770 adjust N and the positions of the other words if you delete a word.

Lines 1070–1150 save the list of words. The first time you use the program you would enter the words, then save the list for future use.

The OPEN statement is the crux of a file processing program. Line 1090 is OPEN #1:"CS1",INTERNAL,OUTPUT,FIXED which readies device number 1 (you can choose any number or even a variable name that corresponds to a number) labeled Cassette 1. The data file we create is for OUTPUT—we will be filing information on the tape. The format for this output is INTERNAL (versus DISPLAY) and FIXED (versus VARIABLE). This means that the computer will save the output in internal machine format rather than printable ASCII format, and that each record is FIXED at a certain length. Since I didn't specify a length, the computer will assume FIXED 64, or a record length of 64 characters.

COMPUTE!'s Programmer's Reference Guide to the TI-99/4A

Author: C. Regena
Price: $14.95
On Sale: Now

Just about the best way to learn how to program a computer is to sit down with a patient friend who already knows how, and ask questions while you experiment with the computer. Owners of the popular Texas Instruments home computer will find that C. Regena is that kind of friend, and *Programmer's Reference Guide to the TI-99/4A* is that kind of book.

Regena carefully explains every BASIC command and function, and all the techniques needed to program TI graphics, sound, and speech. It's hard to think of a question that she doesn't answer simply and clearly, with hints about ways to write programs that do exactly what you want.

The book also provides dozens and dozens of programs, ranging from very short examples to full-length commercial-quality software. In effect, readers can look over Regena's shoulder as she goes through the programming process step by step, explaining what she's doing as she goes along. Not to mention the fact that the finished programs are valuable in their own right.

Even readers who are familiar with the computer will find this book valuable as a reference, where they can look up information they need and find the answers to particular questions.

Above all, *Programmer's Reference Guide to the TI-99/4A* is a book that lets readers use it however they like. You don't have to start at page one and read through, following someone else's plan for what you should learn first and what can wait until later. Instead, you can explore this book from any point of view, to solve almost any programming problem, and find the answer quickly and easily.

C. Regena is **COMPUTE!** Magazine's regular columnist on the TI-99/4A. She's an experienced and resourceful programmer. Like most of her readers, she taught herself how to program, and she hasn't forgotten what it's like to be a beginner, just starting out with the computer. And with *Programmer's Reference Guide*, TI users now have Regena to help them learn how to make their computer do exactly what they want it to do.

Programmer's Reference Guide to the TI-99/4A is available from **COMPUTE!** Publications, the leading publisher of books and magazines for home, educational, and recreational computing.

Table of Contents

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U.S. funds only.

Store The Program And Data Separately

To try this program, use one tape to store the actual program, then place a blank tape in the recorder to save this word list. This tape will be called the data tape. If you have diskettes you could call it a data diskette.

On the screen you will see cassette operating instructions. The PRINT #1 statement is used to put information on the tape, so line 1100 PRINT #1:N writes the number of words N on the tape. Lines 1110–1130 use PRINT #1 to record the words on the tape. When the data is being recorded you will hear a longer header tone, then a sort of dot-dot-dot sound, a little different sound than a regular program recording. CLOSE #1 closes the file and gives you instructions to turn off the recorder.

There are more efficient ways to save data (by combining strings, for example), but I used this method so it would be easier to understand. As you program, you will probably want to economize to save both memory and time.

The next time you run this program and want to use a previously saved list of words, press option 3, Load Previous List. Lines 970–1050 retrieve the data. The OPEN statement tells the computer what kind of information to expect. Line 990 OPEN #2:"CS1",INTERNAL,INPUT,FIXED opens device number 2—again, you can use any number here. For clarity I used #1 to save the data and #2 for retrieving the data, but you could use the same number for both processes. This statement matches line 1090 in the format of the data saved. Lines 1000–1030 are similar to the output lines. First N is read as input (INPUT #2, or input from device #2), then the words are read in. Line 1040 CLOSE #2 closes the file.

The Quiz Routine

Option 6 is to perform the spelling quiz. Lines 1250–1810 contain this procedure. The word list is in the W$ array, but an identical array T$ is defined for the quiz. A word is chosen in random order, and is printed on the screen. The student reads the word, then presses the ENTER key to erase it. The student then must type the word and press ENTER. If you prefer to have the word flash on the screen for a certain length of time, you can replace lines 1470–1480 with a delay loop or sound delay such as

```
1470 FOR D=1 TO 800
1480 NEXT D
```

or

```
1470 CALL SOUND(1000,9999,30)
1480 CALL SOUND(1,9999,30)
```

If the student spells the word correctly, a smiling face is printed on the screen and TI plays an arpeggio. Correctly spelled words will not be chosen again, but a word that is missed will reappear later in the quiz.

F and FL are variables to keep track of words that are spelled incorrectly. SC is the score and is incremented only if the word is spelled correctly the first try.

Next month I'll have programs that show an easy way to set up a data file and print reports from the file.

Spelling Quiz

```
100 DIM W$(30),T$(30),FL(30)
110 CALL CHAR(97,"071820404C8C808")
120 CALL CHAR(98,"E01804023231010l"
    )
130 CALL CHAR(99,"80988C4740201807"
    )
140 CALL CHAR(100,"011931E20204l8E"
    )
150 CALL COLOR(9,12,1)
160 CALL CLEAR
170 PRINT TAB(5);"** SPELLING QUIZ
    **": : : :
180 PRINT "CHOOSE:"
190 PRINT :"1 ENTER NEW WORD LIST"
200 PRINT :"2 EDIT LIST"
210 PRINT :"3 LOAD PREVIOUS LIST"
220 PRINT :"4 SAVE PRESENT LIST"
230 PRINT :"5 SEE WORD LIST"
240 PRINT :"6 PERFORM QUIZ"
250 PRINT :"7 END PROGRAM": :
260 CALL SOUND(150,1497,4)
270 CALL KEY(0,K,S)
280 IF (K<49)+(K>55)THEN 270
290 CALL CLEAR
300 ON K-48 GOSUB 380,550,970,1060,
    1160,1250,1820
310 GOTO 160
320 PRINT :"SORRY, NO WORDS IN LIST
    ."
330 CALL SOUND(100,330,4)
340 CALL SOUND(100,262,4)
350 CALL SOUND(1000,9999,30)
360 CALL SOUND(1,9999,30)
370 GOTO 160
380 PRINT "** ENTER NEW WORD LIST *
    *"
390 PRINT : :"HOW MANY WORDS?"
400 CALL SOUND(150,1497,4)
410 INPUT N
420 IF N=0 THEN 160
430 IF N>0 THEN 460
440 PRINT :"PLEASE ENTER A NUMBER":
    "GREATER THAN ZERO."
450 GOTO 390
460 IF N<31 THEN 490
470 PRINT :"SORRY, THIS PROGRAM CAN
     ONLYHANDLE UP TO 30 WORDS."
480 GOTO 390
490 PRINT : :"ENTER WORDS ONE AT A
    TIME.": : :
500 FOR I=1 TO N
510 CALL SOUND(150,1497,4)
520 INPUT W$(I)
530 NEXT I
540 RETURN
550 CALL CLEAR
560 PRINT "** EDIT LIST **": :
570 IF N=0 THEN 320
```

```
580 FOR I=1 TO N
590 PRINT W$(I),
600 NEXT I
610 PRINT : :"CHANGE WHICH WORD?"
620 CALL SOUND(150,1497,4)
630 INPUT E$
640 FOR I=1 TO N
650 IF E$=W$(I)THEN 710
660 NEXT I
670 PRINT :"THAT WORD IS NOT IN LIST."
680 CALL SOUND(100,330,4)
690 CALL SOUND(100,262,4)
700 GOTO 780
710 PRINT :"ENTER NEW WORD OR":"PRESS <ENTER> TO DELETE": :
720 INPUT W$(I)
730 IF W$(I)<>"" THEN 780
740 FOR J=I TO N-1
750 W$(J)=W$(J+1)
760 NEXT J
770 N=N-1
780 PRINT : :"PRESS:"
790 PRINT "1 EDIT MORE WORDS"
800 PRINT "2 SEE CURRENT WORD LIST"
810 PRINT "3 RETURN TO MENU SCREEN"
820 CALL KEY(0,K,S)
830 IF K=49 THEN 550
840 IF K=51 THEN 160
850 IF K<>50 THEN 820
860 CALL CLEAR
870 IF N=0 THEN 320
880 FOR I=1 TO N
890 PRINT W$(I),
900 NEXT I
910 PRINT : :"PRESS:"
920 PRINT "1 EDIT A WORD"
930 PRINT "2 RETURN TO MENU SCREEN"
940 CALL KEY(0,K,S)
950 IF K=49 THEN 610
960 IF K=50 THEN 160 ELSE 940
970 PRINT "** LOADING PREVIOUS LIST **"
980 PRINT : :"INSERT DATA CASSETTE.": : :
990 OPEN #2:"CS1",INTERNAL,INPUT ,FIXED
1000 INPUT #2:N
1010 FOR I=1 TO N
1020 INPUT #2:W$(I)
1030 NEXT I
1040 CLOSE #2
1050 RETURN
1060 CALL CLEAR
1070 PRINT "** SAVING LIST **"
1080 IF N=0 THEN 320
1090 OPEN #1:"CS1",INTERNAL,OUTPUT,FIXED
1100 PRINT #1:N
1110 FOR I=1 TO N
1120 PRINT #1:W$(I)
1130 NEXT I
1140 CLOSE #1
1150 RETURN
1160 PRINT "** WORD LIST **": :
1170 IF N=0 THEN 320
1180 FOR I=1 TO N
1190 PRINT W$(I),
1200 NEXT I
1210 PRINT : :"PRESS <ENTER> TO CONTINUE.";
1220 CALL KEY(0,K,S)
1230 IF K<>13 THEN 1220
1240 RETURN
1250 CALL CLEAR
1260 IF N=0 THEN 320
1270 FOR I=1 TO N
1280 T$(I)=W$(I)
1290 FL(I)=0
1300 NEXT I
1310 PRINT "YOU WILL SEE A WORD."
1320 PRINT :"PRESS <ENTER>."
1330 PRINT :"WHEN THE WORD CLEARS,"
1340 PRINT :"SPELL THE WORD THEN"
1350 PRINT :"PRESS <ENTER>."
1360 PRINT : : :"PRESS ANY KEY TO START."
1370 CALL KEY(0,K,S)
1380 IF S<1 THEN 1370
1390 SC=0
1400 FOR I=1 TO N
1410 CALL CLEAR
1420 F=0
1430 RANDOMIZE
1440 R=INT(N*RND+1)
1450 IF T$(R)="" THEN 1440
1460 PRINT T$(R): : :
1470 CALL KEY(0,K,S)
1480 IF K<>13 THEN 1470
1490 CALL CLEAR
1500 INPUT X$
1510 IF X$=T$(R)THEN 1630
1520 CALL SOUND(100,330,2)
1530 CALL SOUND(100,262,2)
1540 FL(R)=1
1550 F=F+1
1560 IF F=2 THEN 1590
1570 PRINT : :"TRY AGAIN."
1580 GOTO 1490
1590 PRINT : :"THE CORRECT SPELLING IS:":T$(R)
1600 PRINT : :"PRESS <ENTER> TO CONTINUE."
1610 CALL KEY(0,K,S)
1620 IF K=13 THEN 1410 ELSE 1610
1630 PRINT TAB(10);"ab":TAB(10);"cd": :
1640 CALL SOUND(100,262,2)
1650 CALL SOUND(100,330,2)
1660 CALL SOUND(100,392,2)
1670 CALL SOUND(150,524,2)
1680 IF F>0 THEN 1410
1690 T$(R)=""
1700 IF FL(R)>0 THEN 1720
1710 SC=SC+1
1720 NEXT I
1730 CALL CLEAR
1740 PRINT "OUT OF";N;"WORDS,"
1750 PRINT :"YOU SPELLED";SC;"CORRECTLY"
1760 PRINT :"ON THE FIRST TRY."
1770 PRINT : : :"TRY AGAIN? (Y/N)"
1780 CALL KEY(0,K,S)
1790 IF K=89 THEN 1250
1800 IF K<>78 THEN 1780
1810 RETURN
1820 PRINT "PRESS:"
1830 PRINT :"1 SAVE WORD LIST"
1840 PRINT :"2 END PROGRAM"
1850 CALL KEY(0,K,S)
1860 IF K=49 THEN 1060
1870 IF K<>50 THEN 1850
1880 CALL CLEAR
1890 END
```

©

COMMODORE
Floating Subroutines

Louis F. Sander

Here is a subroutine that lets you automatically combine BASIC and machine language. It's easy, flexible, and inventive. For all VIC, 64, and all PETs except Original ROM models.

It's often desirable to include one or more machine language (ML) subroutines in your Commodore BASIC program, especially when the program must be optimized for speed. There are several ways of combining the BASIC and ML, each having its own advantages and disadvantages. The method described here puts your ML in a protected area at the end of the BASIC program, where it will automatically SAVE and LOAD along with the BASIC. Other ways of doing the same thing have one huge disadvantage—after the ML is in place, the BASIC program cannot be changed in any way, ever. *This* method overcomes that drawback, letting you make any number of subsequent changes to the BASIC program.

Our new technique requires your ML to be completely relocatable. That is, it requires that your ML will work properly at any place in memory, so long as the proper entry point is used. In some cases this restriction will keep you from using the new technique, but this may not happen often. Many, if not most, useful ML subroutines are completely relocatable, or can be made so.

Reserving Space

As a BASIC program runs, the operating system keeps track of certain important addresses by storing them in zero page locations called *pointers*. One of these is the Start Of Variables (SOV) pointer, which normally holds an address one byte higher than the end of whatever BASIC program is in memory. If that program changes size, the SOV pointer keeps track of its end + 1, so the computer knows where to store its variables without writing over the program. By altering the SOV pointer to make it point artificially high in memory, we can reserve space for ML between the end of BASIC and the newly redefined Start Of Variables.

When we put our ML program into the reserved space, it is effectively made a part of our BASIC program, and there are several accompanying benefits. Since it's part of the BASIC program, the computer will never overwrite it unless told to. Since it lies above the end of program marker (three zeros at the very end of a BASIC program), the computer won't try to relink it when BASIC lines are changed. And when the BASIC program is SAVEd, the ML will go right along with it, because the computer automatically saves everything from the Start Of BASIC to the Start Of Variables.

The trouble comes when we change the BASIC program—as the *real* BASIC program's end moves up or down in memory, our ML moves with it. If our ML program is completely relocatable, it runs the same in any part of memory, so moving it doesn't matter, as far as proper execution goes. What *does* matter is that our ML's entry point is then no longer known, so we can't tell what number to put in our SYS statement.

If we could find the first byte of the relocated ML, we could adjust our SYS statement accordingly, and everything would be fine. Fortunately, BASIC has a pointer which makes the ML easy to find; the pointer in question always holds the address of the first byte in whatever BASIC line is currently being executed. If our BASIC program's final line adds its own length to the address in that pointer, and stores the result in a variable, the variable holds the address of the first byte of our ML. Once we execute this line, say as a subroutine, the BASIC program knows where the ML is, and can easily make the proper SYS calls.

Setting It Up

To use the new technique, you add the ML finder line as the last line in your main BASIC program, then change the SOV pointer so it points above the highest byte you want to reserve for ML. Finally, you execute a CLR (not CLEAR SCREEN, the other one), which corrects some other pointers.

A short BASIC subroutine can make these things automatic and foolproof. You append it to

Important Addresses

	64	VIC	Upgrade & 4.0 PET/CBM
Start Of Variables Pointer	45–46	45–46	42–43
Current Line Pointer	61–62	61–62	58–59
USR Vector	785–786	1–2	1–2

your main BASIC program, RUN it, then delete most of its lines. If your library includes an APPEND program, the automation is easy; if you lack APPENDing capability, doing things manually may be easier. The accompanying programs are the subroutine I use, in versions for all Commodore machines except Original ROM PETs. The comments below apply to all versions:

Line 63991 checks the accuracy of the all-important line 63999, which is the line that finds our machine language.

Lines 63992, 63995, and 63996 move the SOV pointer, which requires the temporary use of two memory locations. The ones used here are the USR vector locations, but you can use others if you'd like.

Line 63997 is a decimal-to-hex converter.

Line 63999 sets variable ML equal to the address of the first byte of the reserved ML area. The line must be entered *exactly* as listed, with no embedded spaces, and must be the last line in your BASIC program. (That's why it has the highest line number allowed in BASIC.)

Here are step-by-step instructions for entering your automation subroutine and checking its accuracy:

1. Type the appropriate subroutine into your computer.

2. SAVE the subroutine onto tape or disk.

3. RUN it and observe the screen. If you get an error message, you've made a mistake in typing line 63999. Reload what you SAVEd, correct your error, then go to step 2.

4. If there is no error message, enter a 6 in response to the # BYTES prompt. You'll get some screen messages and a READY prompt.

5. At this point, there should be six bytes reserved for ML, just above the end of your BASIC program. Your screen should show the addresses of the lowest and highest bytes in the reserved area. Immediately below the ML area should be the three zeros which mark the end of BASIC; immediately above it should be four bytes of 218 decimal, which were put there as a marker by the ZZ% business in line 63996.

If you know how to examine memory, you should check that the zeros and 218's are where they whould be, for proof that your subroutine is working correctly. (If you use a monitor to examine memory, the hex version of the 218's will announce the good news in dramatic fashion. Try it.) If the zeros and 218's aren't in the right places, something is wrong; check your work, find the errors, and start again from step 2.

6. Now put something into those six bytes and SAVE the subroutine. Turn your computer off to destroy what is in memory, then LOAD what you just saved. Check to make sure your six bytes of ML traveled along with the BASIC. If they did, you're finished.

Using It

The subroutine you SAVEd in step 2 has now been proven to work perfectly. The one you saved in step 6 is OK too, but it has some ML appended to it. When you want to add some machine language to the end of a BASIC program, just put the step 2 subroutine at the end of the BASIC program, in one of these ways:

1. LOAD the BASIC program, then use an APPEND routine to add the subroutine, or

2. LOAD the subroutine, then type in the BASIC program, or

3. LOAD and LIST the subroutine, then LOAD the BASIC; add the subroutine to it by putting your cursor on each of the previously LISTed subroutine lines and hitting RETURN. The VIC's screen is too small for this; all others are fine, but you *must* be careful with your cursor, or important subroutine lines will scroll off the screen as the BASIC loads. When LOADing the main program from the Datassette, put your cursor on the first letter of the READY prompt, type LOAD [space] [space], press PLAY, *then* hit RETURN. Doing otherwise may cause too much scrolling. When using a disk, put your cursor on the first letter of the READY prompt, then enter your LOAD command in the normal way.

Once the subroutine is in place, do a RUN 63991 and follow the instructions on the screen. You can reserve any number of bytes for ML, up to the limit of your memory. The subroutine shows the current boundaries of the ML area, and you should put your ML there immediately, since the boundaries will move if you change the BASIC program. *Caution:* When you delete lines, you *must* do it line by line from the keyboard; Toolkit or other programming aids' deletes will detach your ML from the end of BASIC.

You can now make all sorts of changes to the BASIC program, and your ML subroutine will follow its end up and down like a shadow. You can even delete every line of BASIC; in that case, a SAVE will save your ML as though it were a BASIC program itself. And if you ever want to expand an ML area already in use, you can just reappend the subroutine and run it again; it will tack more reserved area onto that you already have!

To use the ML from the BASIC program, have an early line do a GOSUB 63999, which will put the address of the first ML byte into variable ML. Use this information to find the machine language entry point, then call the ML program at will. If the entry point is the first byte of the ML, SYS ML will do the job; otherwise, use SYS ML + X, where X is the offset of the entry point from the first byte.

So there's the ideal technique for combining BASIC and relocatable ML—it's easy to set up, easy to use, and has no undesirable restrictions. Once you SAVE a fully tested subroutine to automate the setup process, it becomes a fine-tuned tool that you can use with ease for many years.

Program 1: Combining BASIC And ML On The 64

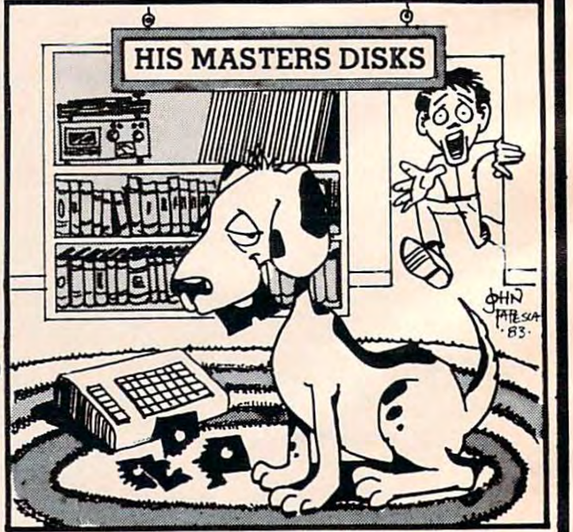
```
63990 REM COMMODORE 64 VERSION
63991 GOSUB63999:IFPEEK(ML-1)+PEEK(ML-2)+
      PEEK(ML-3)THENPRINT"63999 IS BAD":E
      ND
63992 INPUT"{CLR}# BYTES TO RESERVE FOR M
      L";A:J=256:B=PEEK(45)+J*PEEK(46):C=
      A+B
63993 PRINT"{DOWN}NOW PUT THE ML INTO:":P
      RINT"{DOWN}DECIMAL"B"-"C-1:PRINT"
      {DOWN}{4 SPACES}HEX ";
63994 K=4096:H=B:GOSUB63997:PRINT" - ";:H
      =C:GOSUB63997:PRINT
63995 PRINT"{DOWN}THEN DELETE LINES 63991
      -63997.{DOWN}":D=INT(C/J):POKE786,D
63996 POKE785,C-J*D:POKE45,PEEK(785):POKE
      46,PEEK(786):CLR:ZZ%=-9510:END
63997 H=H/K:FORI=1TO4:H%=H:H$=CHR$(48+H%-
      (H%>9)*7):PRINTH$;:H=16*(H-H%):NEXT
63998 REM * 63999 FINDS ML START ADDR
63999 ML=PEEK(61)+256*PEEK(62)+31:RETURN
```

Program 2: Combining BASIC And ML On The VIC

```
63990 REM VIC-20 VERSION
63991 GOSUB63999:IFPEEK(ML-1)+PEEK(ML-2)+
      PEEK(ML-3)THENPRINT"63999 IS BAD":E
      ND
63992 INPUT"{CLR}# BYTES FOR ML";A:J=256:
      B=PEEK(45)+J*PEEK(46):C=A+B
63993 PRINT"{DOWN}NOW PUT THE ML INTO:":P
      RINT"{DOWN}DECIMAL"B"-"C-1:PRINT"
      {DOWN}{4 SPACES}HEX ";
63994 K=4096:H=B:GOSUB63997:PRINT" - ";:H
      =C:GOSUB63997:PRINT
63995 PRINT"{DOWN}THEN DELETE LINES 63991
      -63997.{DOWN}":D=INT(C/J)
63996 POKE2,D:POKE1,C-J*D:POKE45,PEEK(1):
      POKE46,PEEK(2):CLR:ZZ%=-9510:END
63997 H=H/K:FORI=1TO4:H%=H:H$=CHR$(48+H%-
      (H%>9)*7):PRINTH$;:H=16*(H-H%):NEXT
63998 REM * 63999 FINDS ML START ADDR
63999 ML=PEEK(61)+256*PEEK(62)+31:RETURN
```

Program 3: Combining BASIC And ML On PET/CBM

```
63990 REM UPGR/4.0 ROM PET/CBM VERSION
63991 GOSUB63999:IFPEEK(ML-1)+PEEK(ML-2)+
      PEEK(ML-3)THENPRINT"63999 IS BAD":E
      ND
63992 INPUT"{CLR}# BYTES TO RESERVE FOR M
      L";A:J=256:B=PEEK(42)+J*PEEK(43):C=
      A+B
63993 PRINT"{DOWN}NOW PUT THE ML INTO:":P
      RINT"{DOWN}DECIMAL"B"-"C-1:PRINT"
      {DOWN}{4 SPACES}HEX ";
63994 K=4096:H=B:GOSUB63997:PRINT" - ";:H
      =C:GOSUB63997:PRINT
63995 PRINT"{DOWN}THEN DELETE LINES 63991
      -63997.{DOWN}":D=INT(C/J)
63996 POKE2,D:POKE1,C-J*D:POKE42,PEEK(1):
      POKE43,PEEK(2):CLR:ZZ%=-9510:END
63997 H=H/K:FORI=1TO4:H%=H:H$=CHR$(48+H%-
      (H%>9)*7):PRINTH$;:H=16*(H-H%):NEXT
63998 REM * 63999 FINDS ML START ADDR
63999 ML=PEEK(58)+256*PEEK(59)+31:RETURN
```
©



"Should've made a back-up with the Clone Machine."

Big Buffer For Atari

Jeff Brenner

Add a keyboard buffer to your Atari so you can type in characters while a program is running or listing, and even during a SAVE. See the "Automatic Proofreader" article on page 60 before typing these programs.

This article will show you how to add an extremely powerful feature to your Atari computer—a keyboard buffer. A keyboard buffer is a reserved area of computer memory used to temporarily store keypresses while the keyboard is inactive. When the keyboard is ready for input, any stored keypresses will be printed out onto the screen.

Look at this simple program:

```
10 GOTO 10
```

When you run this program, the computer will be put into an infinite loop. If you type in characters while this program is running, the computer will ignore your input.

With a keyboard buffer, you still see nothing when you run the program and type characters. But as soon as you stop the program by pressing the BREAK key, all of the characters that you typed in previously will be printed out.

Most higher-priced computers, such as the IBM Personal Computer, have intricate keyboard buffers controlled by a separate microprocessor. Some lower-priced computers, such as the Commodore 64 and VIC-20, have simple ten-character buffers built into the operating system.

A 100-Character Buffer

Atari computers do not have a buffer, but "Keyboard Buffer" will give your Atari a 100-character buffer.

Here's how Keyboard Buffer works. Each time a key is pressed, the program will check whether the computer is busy or not. If the computer is not prepared for an input, the number representing that keypress will be stored in the buffer (on Page 6, so it won't interfere with BASIC). As soon as the computer is ready to accept input, the characters stored in the buffer will be displayed.

Program 1 is a BASIC program which loads a machine language program into memory. The program is designed to be a subroutine for any BASIC program requiring keyboard input. After you enter this program, LIST it to tape or disk so you can ENTER it later and merge it with your program.

If you press SYSTEM RESET while using the buffer program, it will be necessary to restart the program by typing:

```
A=USR(1536)
```

Program 1: Keyboard Buffer

```
OC 30000 REM KEYBOARD BUFFER
BD 30010 DATA 104,173,8,2,141,96,6,173
         ,9,2,141,97,6,169,0,141,14,21
         2,120,169,52,141,8,2
ON 30020 DATA 169,6,141,9,2,169,98,141
         ,36,2,169,6,141,37,2,169,192,
         141,14,212,169,0,133,204
JN 30030 DATA 133,205,88,96,173,9,210,
         201,159,240,36,152,72,173,252
         ,2,201,255,240,19,164,204,192
         ,100
MN 30040 DATA 240,9,230,204,200,173,9,
         210,153,143,6,104,168,104,64,
         165,204,197,205,208,231,104,1
         68,76
NB 30050 DATA 95,6,173,252,2,201,255,2
         08,35,165,204,197,205,240,23,
         230,205,164,204,192,120,176,1
         5,164
GE 30060 DATA 205,192,120,176,9,185,14
         3,6,141,252,2,76,98,228,169,0
         ,133,204,133,205,76,98,228
LL 30070 T=0
GM 30080 IF PEEK(521)=6 THEN GOTO 3015
         0
NF 30090 FOR I=1 TO 143
PG 30100 READ N:T=T+N
OA 30110 POKE 1535+I,N
HO 30120 NEXT I
FJ 30130 IF T<>18309 THEN PRINT "CHECK
          DATA STATEMENTS":STOP
```

```
JA 30140 A=USR(1536)
NJ 30150 RETURN
```

After you type in Program 1, LIST it to cassette or disk. If you wish to test your work, do not type NEW. Add the lines from Program 2 and RUN.

Program 2: Buffer Test

```
JA 10 REM KEYBOARD BUFFER TEST
NF 20 GOSUB 30000
DG 30 DIM NAME$(30)
OP 40 PRINT "WHAT IS YOUR NAME?";
DL 50 FOR I=1 TO 500
AP 60 A=RND(0)*255
HP 70 SOUND 1,A,10,8
PA 80 NEXT I
DO 90 INPUT NAME$
OO 100 PRINT "YOUR NAME IS ";NAME$
GJ 110 END
```

A Test With Background Music

If you get an error or a CHECK DATA STATEMENTS message, you have made an error in typing Program 1. Check all the DATA statements carefully.

When everything is correct, the computer will print WHAT IS YOUR NAME? and start playing tones. Even though the music is busy playing, type in your name and press RETURN. After the music is over, your name will be printed out and entered automatically.

This is only one example of an application for Keyboard Buffer. If you would like to use Keyboard Buffer while doing your own programming in BASIC, change line 30150 to:

```
30150 END
```

Then RUN the program. When the READY prompt appears, type NEW. Keyboard Buffer will be operational and you can begin programming.

A keyboard buffer can surely improve the quality of any program requiring user input. Since you can enter characters even while the computer is in a lengthy loop, you save time. After using Keyboard Buffer, you will begin to see the advantage of having a constantly monitored keyboard. ©

Commodore Filetracker

Richard C. Wilson

"Filetracker" for VIC or Commodore 64 solves those irritating problems that arise so often, when you can't remember if the file you want is on the disk you're working with, or you can't remember how you spelled the filename. By using Filetracker as a subroutine, you can look up any filename and read or write it while your main program is running.

Other possible uses for Filetracker include cross-checking filenames, generating filenames, compiling a disk library cross-reference index, computing disk space remaining, reformatting directory output to screen or printer, and autorun of programs. See the "Automatic Proofreader" article on page 60 before typing in this program.

Sequential files are very useful tools for storage and retrieval of long data lists on disk. One problem arises occasionally, however: How do you read a sequential file when you don't know its name? The simple answer, of course, is to stop the program, read the disk directory, memorize or write down the filename, then run the program again and enter the correct filename.

This method is less painful if you are using a DOS wedge that allows you to read the disk directory without erasing the program in memory. But it's not very helpful if you are trying to merge data from several related files into a new file, and you must stop repeatedly to look up filenames.

Let The Computer Do It

You can save yourself time and aggravation if you have your computer look up the names on the disk and read the appropriate files. This can be especially useful with a business program which stores each order and account in a separate sequential file. If the account filename is the last four digits of the client's phone number, when an order is written, the account file is read, the account number is added to the order number, and the combined (hyphenated) number becomes the name of the new file. For example, order number 1666 from client 1212 becomes file 1666-1212.

Once the disk starts to fill up (it will hold over 100 such files), sorting out just those order files assigned to account number 1212 can be quite tiresome. "Filetracker" solves such problems.

Selecting The Files You Want

Lines 20–120 read the disk directory. Line 120 prints the number of blocks, name, and file type for each file. (You can delete this line if you don't want to display the entire disk directory.)

The name (only) of each file is stored in the I$ array. Line 150 selects out names of all sequential files and discards the rest. By changing SEQ in this line to PRG, REL, or USR, you can have the line look exclusively for any type of file.

For example, instead of having line 150 return to get another filename when the condition is not met, it could go to one or more secondary routines to create separate arrays for other file types.

Lines 60 and 130 check the Status word to make certain the disk channel is closed. The program ends when there is no more data to be read.

Making It A Subroutine

To use Filetracker in other programs, change the END statement in line 140 to a RETURN, and the program becomes a subroutine.

If you use Filetracker as a subroutine, then the main program should ask for a key word (1212) which would be assigned to a variable (KY$).

Since all the filenames are structured the same way, we can change line 150 to compare KY$ with the account number portion of each sequential filename.

```
150 IF RIGHT$(I$(P),4)<>KY$ THEN I$(P)=""
    :GOTO30
```

If line 120 is left in the routine, all the files listed in the disk directory will be printed on the screen, and the I$ array will contain the names of all (and only) the order files assigned to account number 1212.

You also can write a subroutine to read each of the files into a two- or three-dimensional array, for further processing.

An Array For Each File Type

By adding these lines to Filetracker, you can enter the names of each type of file into a separate array.

```
150 IFLEFT$(N$,3)<>"SEQ"THEN152
151 P=P+1:GOTO30
152 IFLEFT$(N$,3)<>"PRG"THEN154
153 P$(K)=I$(P):I$(P)="":K=K+1:GOTO30
154 IFLEFT$(N$,3)<>"REL"THEN156
155 R$(L)=I$(P):I$(P)="":L=L+1:GOTO30
156 IFLEFT$(N$,3)<>"USR"THENI$(P)+"":GOTO
    30
157 U$(M)=I$(P):I$(P)="":M=M+1:GOTO30
```

Notice that line 150 is modified to branch to line 152, and you will have to DIMension any arrays you introduce into the program.

Filetracker

```
5 DIMI$(151)                          :rem 100
10 PRINT"READING SEQUENTIAL FILES..."
                                      :rem 36
20 P=0:OPEN3,8,0,"$0":GET#3,D1$,D2$
                                      :rem 61
30 GET#3,D1$,D2$:GET#3,D1$,D2$:N=0:rem 20
40 IFD1$<>""THENN=ASC(D1$)           :rem 197
50 IFD2$<>""THENN=N+ASC(D2$)*256      :rem 8
60 GET#3,D2$:IFST<>0THEN140           :rem 64
70 IFD2$<>CHR$(34)THEN60              :rem 88
80 GET#3,D2$:IFD2$<>CHR$(34)THENI$(P)=I$(
   P)+D2$:GOTO80                      :rem 34
90 GET#3,D2$:IFD2$=CHR$(32)THEN90 :rem 84
100 N$=""                             :rem 132
110 N$=N$+D2$:GET#3,D2$:IFD2$<>""THEN110
                                      :rem 144
120 PRINTN;" ";I$(P),N$               :rem 212
130 IFST=0THEN150                     :rem 252
140 CLOSE3:END                        :rem 79
150 IFLEFT$(N$,3)<>"SEQ"THENI$(P)="":GOTO
    30                                :rem 209
160 P=P+1:GOTO30                      :rem 166
```

©

Jim Butterfield, Associate Editor

FACTORS:
A Machine Language Factoring Program
Part 3

This month we conclude the commented listing of our machine language program to find prime factors.

Last month in Part 2, we examined the routines that handle keyboard input and prepare our number for factoring.

Now, here's the division routine. It rolls the dividend left through the joint remainder/quotient area. When we're finished, what's left of the dividend is in the remainder area; the quotient has miraculously appeared on the right.

```
0615 A9 00       DIVIDE LDA #0          ;CLEAN HOUSE
0617 A2 0B              LDX #11         ;12 BYTES
0619 9D 6C 03    DLP1   STA REMDR,X
061C CA                 DEX
061D 10 FA              BPL DLP1
061F A2 00              LDX #0          ;"FROM" POINTER
0621 A0 00              LDY #0          ;"TO" POINTER
0623 8E 48 03           STX BCOUNT
0626 BD 50 03    DLP2   LDA NUMBER,X
0629 D0 06              BNE DLP4
062B E8                 INX             ;DROP HIGH
                                         BYTES
062C D0 F8              BNE DLP2
062E BD 50 03    DLP3   LDA NUMBER,X
0631 99 70 03    DLP4   STA QUOT,Y
0634 E8                 INX
0635 C8                 INY
0636 EE 48 03           INC BCOUNT
0639 E0 08              CPX #8
063B 90 F1              BCC DLP3
063D 0E 48 03           ASL BCOUNT      ;TIMES 8
0640 0E 48 03           ASL BCOUNT      ;CHANGES BYTES
0643 0E 48 03           ASL BCOUNT      ;TO BITS
0646 18                 CLC
0647 A2 0B       DLP5   LDX #11         ;ROLL ENTIRE
0649 3E 6C 03    DLP6   ROL REMDR,X     ;..WORK AREA
064C CA                 DEX             ;..LEFT
064D 10 FA              BPL DLP6
064F A2 03              LDX #3
0651 38                 SEC             ;COMPARE
0652 BD 6C 03    DLP7   LDA REMDR,X     ;..DIVIDEND TO
0655 FD 68 03           SBC DVSR,X      ;..DIVISOR
0658 CA                 DEX             ;FOUR BYTES
0659 10 F7              BPL DLP7
065B 90 0F              BCC NDIV        ;TOO SMALL
065D A2 03              LDX #3          ;NOT TOO SMALL,
065F 38                 SEC             ;SUBTRACT..
0660 BD 6C 03    DLP8   LDA REMDR,X     ;DIVISOR
0663 FD 68 03           SBC DVSR,X
0666 9D 6C 03           STA REMDR,X
0669 CA                 DEX
066A 10 F4              BPL DLP8
066C CE 48 03    NDIV   DEC BCOUNT      ;COUNT BITS
066F D0 D6              BNE DLP5        ;LOOP (CARRY?)
0671 A2 07              LDX #7          ;FINISHED:
0673 3E 70 03    DLP9   ROL REMDR+4,X   ;TRIM
                                         REMAINDER
0676 CA                 DEX
0677 10 FA              BPL DLP9
0679 60                 RTS
```

This is where we try dividing our number into selected divisors and see if we get an even division (remainder zero)

```
067A 8D 6B 03    FLOOK  STA DVSR+3      ;PLANT DIVISOR
067D A9 00       FLOOP  LDA #0
067F 8D 49 03           STA EXP         ;ZERO TO START
0682 20 15 06    FPOWR  JSR DIVIDE
0685 A9 00              LDA #0          ;CHECK
                                         REMAINDER
0687 A2 03              LDX #3
0689 1D 6C 03    FLP1   ORA REMDR,X     ;FOR ZERO
068C CA                 DEX
068D 10 FA              BPL FLP1
068F AA                 TAX
0690 D0 10              BNE FEXIT       ;NOT ZERO?
```

Factor Found

We've found a factor. The quotient now becomes our new number; then we can increment the exponent counter and try again.

```
                 ;MOVE QUOTIENT
0692 EE 49 03           INC EXP         ;ADD ONE
0695 A2 07              LDX #7
0697 BD 70 03    FLP2   LDA QUOT,X      ;QUOTIENT TO
069A 9D 50 03           STA NUMBER,X    ;..ORIG NUMBER
069D CA                 DEX
```

PROSYS

The Professional Systems People And

MICRO WORX

Present Products From

commodore

And

The Software That Makes Them Work!

SOFTWARE

SBSYS

C-64, 8032, 8096 & B-Series

THE SMALL BUSINESS SYSTEM

Available for 1541, 8050 and hard disk drives. GL, AP, AR, INV. and payroll as low as $99.00 each! Call for specific pricing.

PERSYS

VIC 20, C-64, 8032, 8096 & B-Series

THE PERSONAL FINANCIAL SYSTEM

A complete financial package for home and small business, beginning at $69.00 on tape.

VERTICAL PACKAGES INCLUDE:

LEGISYS

8032, 8096 & B-Series.

The total legal office information, accounting and tickler system.

LOADSYS

8032, 8096 & B-Series.

The total truck brokerage accounting system. Call for free intro consulting.

Dealer inquiries invited.

VISA & MasterCard. Add 3% Surcharge.

Shipping paid on prepaid orders.

Prices subject to change without notice.

These are sample unit prices.

We carry support items, cables, games...

WE HAVE IT!

CBM PRODUCTS

8032 Computer	$ 619.00
8050 Disk Drive	979.00
8250 Disk Drive	1279.00
9060 Hard Disk	1979.00
8023 Printer	529.00
6400 Printer	1399.00

C-64 STUFF

C-64 Computer	$219.00
1541 Disk Drive	249.00
1701 Monitor	249.00
1526 Printer	339.00
1600 Modem	69.00

Call Toll-Free by dialing:

Outside Texas:

1-800-221-WORX

Inside Texas:

1-800-692-4265,

wait for beep, then dial 008-3378,
wait for tone and dial 993.

or Lubbock 797-2623,
Ft. Worth: 817/589-2622
807 Melborne Hurst, Tx. 76053

MICRO WORX

4210 D 50th 797-2623 Lubbock, TX 79413

```
069E 10 F7          BPL  FLP2
06A0 30 E0          BMI  FPOWR      ;TRY FOR
                                    ANOTHER
```

We compare the number to the divisor by subtracting. That way, we'll find out whether or not it's time to wrap it up.

```
                    ;CHECK LIMITS
06A2 A2 07    FEXIT LDX  #7         ;EIGHT BYTES
06A4 38             SEC
06A5 BD 70 03 FCHEK LDA  QUOT,X
06A8 FD 64 03       SBC  DVSR-4,X
06AB CA             DEX
06AC 10 F7          BPL  FCHEK
```

If the exponent is nonzero, we've found a divisor and it's time to report it.

```
06AE 08             PHP             ;FREEZE STATUS
06AF AE 49 03       LDX  EXP
06B2 F0 03          BEQ  FPASS
06B4 20 D0 06       JSR  SHOW
06B7 28       FPASS PLP             ;UNFREEZE STAT
06B8 60             RTS
```

Here come the routines for printing numbers SRAP prints the remaining value when we wrap up the line. It's different from printing the other factors, in that the final value might be a very large number.

```
06B9 AD 4A 03 SRAP  LDA  CHAR       ;EQUALS OR PLUS
06BC 20 D2 FF       JSR  $FFD2      ;..PRINT IT
06BF 20 04 07       JSR  SWIPE      ;CLEAR WORK
                                    AREA
06C2 A2 07          LDX  #7         ;EIGHT BYTES!
06C4 BD 50 03 SRAL  LDA  NUMBER,X
06C7 9D 70 03       STA  REMDR+4,X
06CA CA             DEX
06CB 10 F7          BPL  SRAL
06CD 4C 0F 07       JMP  CPR
```

Our main number printing routine coming up. First, the leading character (equals sign or plus sign). Then we place the binary number into a work area, and call the binary-to-decimal output routine, CPR. We may also need to do this for the exponent if it's greater than one.

```
06D0 AD 4A 03 SHOW  LDA  CHAR       ;EQUALS OR PLUS
06D3 20 D2 FF       JSR  $FFD2      ;..PRINT IT
06D6 A9 2A          LDA  #$2A       ;NEXT IS PLUS
06D8 8D 4A 03       STA  CHAR
06DB 20 04 07       JSR  SWIPE      ;CLEAR WORK
                                    AREA
06DE A2 03          LDX  #3         ;FOUR BYTES
06E0 BD 68 03 SLP1  LDA  DVSR,X     ;..TO WORK AREA
06E3 9D 74 03       STA  REMDR+8,X
06E6 CA             DEX
06E7 10 F7          BPL  SLP1
06E9 20 0F 07       JSR  CPR

                    ;PRINT EXPONENT IF APPR
06EC AE 49 03       LDX  EXP
06EF CA             DEX
06F0 F0 11          BEQ  SOUT       ;ONE, DON'T
                                    PRINT
06F2 20 04 07       JSR  SWIPE
06F5 AE 49 03       LDX  EXP
06F8 8E 77 03       STX  REMDR+11
06FB A9 5E          LDA  #$5E       ;UP ARROW
06FD 20 D2 FF       JSR  $FFD2      ;..PRINT IT
0700 20 0F 07       JSR  CPR
0703 60       SOUT  RTS
0704 A2 07    SWIPE LDX  #7         ;EIGHT BYTE
0706 A9 00          LDA  #0         ;CLEAR TO ZERO
0708 9D 70 03 SW1   STA  QUOT,X
070B CA             DEX
070C 10 FA          BPL  SW1
070E 60             RTS
```

Simple, But Curious

CPR, or Character Print, first changes binary into binary coded decimal. To do this, it uses the Decimal mode of the 6502. The method is simple but curious: It shifts the binary bits out of the work area, and shifts them (decimally!) into area DECIML.

```
070F A2 09    CPR   LDX  #9         ;TEN BYTES..
0711 A9 00          LDA  #0         ;..20 DIGITS
0713 9D 78 03 CLP1  STA  DECIML,X   ;..CLEAR
0716 CA             DEX
0717 10 FA          BPL  CLP1
0719 A0 3F          LDY  #63        ;64 BITS
071B A2 07    CLP2  LDX  #7         ;8 BYTES
071D 18             CLC
071E 3E 70 03 CLP3  ROL  REMDR+4,X  ;POP OUT A BIT
0721 CA             DEX             ;..INTO CARRY
0722 10 FA          BPL  CLP3
0724 A2 09          LDX  #9         ;TEN BYTES
0726 78             SEI             ;LOCKOUT IRQ
0727 F8             SED             ;DECIMAL MODE
0728 BD 78 03 CLP4  LDA  DECIML,X   ;SHIFT BIT IN
072B 7D 78 03       ADC  DECIML,X
072E 9D 78 03       STA  DECIML,X
0731 CA             DEX
0732 10 F4          BPL  CLP4
0734 D8             CLD             ;BACK TO BINARY
0735 58             CLI             ;RELEASE IRQ
0736 88             DEY
0737 10 E2          BPL  CLP2
```

Now we print out the decimal digits. They are packed two to a byte, so we must unpack them first. Of course, we remove leading zeros.

```
0739 A2 00          LDX  #0         ;Z SUPPRESS ON
073B 8E 4B 03       STX  ZSUP
073E BD 78 03 CLP5  LDA  DECIML,X   ;HIGH END
0741 48             PHA             ;SAVE IT
0742 4A             LSR  A          ;GET HIGH
0743 4A             LSR  A          ;..4 BITS
0744 4A             LSR  A
0745 4A             LSR  A
0746 20 55 07       JSR  COUT       ;SEND 'EM
0749 68             PLA             ;RECALL IT
074A 29 0F          AND  #$0F       ;LOW 4 BITS
074C 20 55 07       JSR  COUT       ;SEND 'EM
074F E8             INX             ;NEXT BYTE
0750 E0 0A          CPX  #10        ;STOP AT 10
0752 90 EA          BCC  CLP5
0754 60             RTS
```

COUT outputs the individual characters, and implements zero suppression.

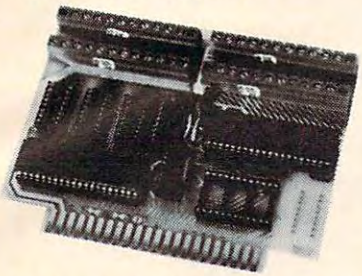
```
0755 D0 06    COUT  BNE  CFL        ;NOT ZERO,
                                    PRINT
0757 CD 4B 03       CMP  ZSUP       ;ZSUP FLAG ON?
075A D0 01          BNE  CFL        ;NO, PRINT
075C 60             RTS             ;ELSE DON'T
075D EE 4B 03 CFL   INC  ZSUP       ;KILL ZSUP FLAG
0760 09 30          ORA  #$30       ;CHANGE TO
                                    ASCII
0762 4C D2 FF       JMP  $FFD2      ;PRINT & RETURN.
```

Finally, here's our table of offset values. They are a great timesaver.

```
0765 01 07 0B 0D TABLE .BYTE 1,7,11,13
0769 11 13 17 1D       .BYTE 17,19,23,29
```

©

NEW! Universal Input/Output Board for VIC-20/64



- 16 channel 8-bit A/D converter with 100 microsecond sampling time.
- 1 D/A output.
- 16 high voltage/high current discrete outputs.
- 1 EROM socket.
- Use multiple boards for additional channels up to 6 boards.

VIC-20 uses MW-311V $205.00
CBM-64 uses MW-311C $225.00

MW-302: VIC-20/64 Parallel Printer Interface.

Works with all centronics type parallel matrix & letter printers and plotters— Epson, C.Itoh, Okidata, Nec, Gemini 10, TP-I Smith Corona, and most others. Hardware driven; works off the serial port. Quality construction: Steel DIN connectors & shielded cables. Has these switch selectable options: Device 4, 5, 6 or 7; ASCII or PET ASCII; 7-bit or 8-bit output; upper & lower case or upper only. Recommended by PROFESSIONAL SOFTWARE for WordPro 3 Plus for the 64, and by City Software for PaperClip.

MW-302 .... $119.95

Dealer inquiries invited.

VISA MasterCard

Micro World Electronix, Inc.
3333 S. Wadsworth Blvd. #C105,
Lakewood, CO 80227
(303) 987-9532 or 987-2671

EXPOTEK
1-800-528-8960

IBM CALL SAVE$
AST, Hercules, Microsoft, Maynard, Persyst, Profitsystems, Quadram, STB, Talltree

Guaranteed Low Prices

MONITORS

Amdek	
Video 300E	129
Video 300A	145
Color I	270
Color I Plus	275
Color II Plus	425
SMC	
12" Green	155
12" Color	219
NEC	
JB 1201	155
JB 1260	115
Taxan	
12" Amber	125
Zenith	
12" Green Screen	95
12" Amber Screen	120

MODEMS

HAYES	
Micro-Modem II	250
Micro-Modem II w/term. pkg.	279
Smart Com II	89
Smart 300	199
Smart 1200	499
U.S. Robotics	
212A Auto Dial	469
Password	375

PRINTERS

DAISYWRITER	
Daisywriter 2000	999
Daisywriter Cable	40
Datasouth	
DS120	595
DS180	1155
DS220	1590
DIABLO	
620 (25CPS/Serial	875
630 (40CPS/Multi-IF)	1710
C, ITOH	
Pro-writer I (8510A) Par	340
Pro-writer (8510A) Serial	499
1550 P	599
1550 BCD	655
F-10 40CPS	1090
F-10 55CPS	1395
EPSON	
All models	Call - Save $
OKI-DATA	
All models	Call - Save $
JUKI	
6100-18	569
MANNESMAN-TALLY	
160L	589
180L	829
NEC	
3550 (For IBM PC)	1705
3510	1365
7710	1890
STAR MICRONICS	
Gemini 10X	CALL
Gemini 15X	CALL
Gemini 15	370
SILVER REED	
EXP 550P	575
TOSHIBA	
P-1350	1499
TRANSTAR	
120 P	499
315 Color Printer	499
Sheet Feeders & Tractors	CALL

CUSTOMER SERVICE (602) 861-1141
TWX 910-950-1194
10439 N. CAVE CREEK RD., #111
PHOENIX, AZ 85020

GET MORE FROM YOUR COMMODORE-64

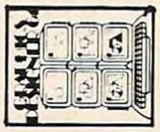
MASTER 64
Add 100 commands, Programmer's Aid, ISAM files, Screen mgmt., machine language monitor 150 pp. 3 ring binder
$84.95 DISK

CHARTPAK 64
best HIRES charting package, Menu driven, interactive, printer hardcopy
$42.95 DISK
CHARTPLOT 64 for plotter output **$84.95 DISK**

ULTRABASIC 64
Add 50 commands: graphics, turtle graphics, game features, sound, tutorial demo
$42.95 DISK$39.95 TAPE

ZOOM PASCAL 64
Produce fast 6502 code. Floating point, integer strings, editor, compiler, translator, samples.
$39.95 DISK

SYNTHY 64
Top rated music synthesizer. Samples and manual **$32.95 DISK**
$29.95 TAPE Also - Rag time Classical XMAS, Albums **$12.95 ea DISK**



GRAPHICS DESIGNER 64
Menu driven drawings floor plans, illustrations, etc. Slide show capability.
$32.95 DISK

POOL 64/20
HIRES graphics with sound Authentic play
$17.95 DISK$14.95 TAPE

SUPER DISK UTILITY
Speed copy 4 ways: total, BAM, Append or File. Dump/modify Sectors, More
$22.95 DISK

MERCURE 64
File Management!
Easiest to use. With builtin tutorial. Fast ISAM retrieval
$32.95

ANATOMY OF COMMODORE 64
Includes commented ROM listing, details internals, descriptions
300 pp book $19.95

FOR MORE SOFTWARE CALL FOR FREE CATALOG

FOR FAST SERVICE
PHONE 616-241-5510
MC, VISA or AMEX accepted
Available At Your Dealer or Write

Abacus Software
P.O. Box 7211
GRAND RAPDIS, MICH 49506

Larry Isaacs

This month we'll cover two topics. First, we'll add a RESET switch so you can easily recover from a program "crash," and then we'll discuss file access for the 1541 disk drive.

When you're using some of the special hardware features of the 64, and especially when you're experimenting with machine language, a simple mistake can cause the 64 to crash. The display just sits there, if there is a display; nothing happens when keys are pressed; and even pressing RUN/STOP—RESTORE doesn't help.

In such cases, it takes a *reset* to bring the 64 back. Naturally, turning the machine off and back on is one way to recover from a crash. Unfortunately, this means that the contents of RAM will be lost, including the program you were working on.

There is another way to reset the computer, without turning it off. You can connect a switch to the User Port to trigger the reset sequence.

A Clean Start Out Of The Gate

As you would expect, the 6510 microprocessor contains some complex circuitry. If the microprocessor is to operate properly, all the various parts of this circuitry must work together in an exactly defined set of steps. A RESET signal gets everything synchronized. When this signal is grounded, the 6510 is forced through a sequence, like horses going into the starting gate to get ready for a race. When the RESET signal is released from ground, all the processor's components start off together.

At this point, the 6510 is ready to start executing machine language instructions. But where will these instructions first come from? The reset process also deals with this question. The first thing the 6510 will do after the RESET signal is released is fetch two bytes from the top two memory locations in the 64. These bytes are the starting address for executing machine instructions. Two such bytes, used to form an address, are called a *vector*; the two bytes mentioned above are called the RESET vector.

RESET Without Losing The Program

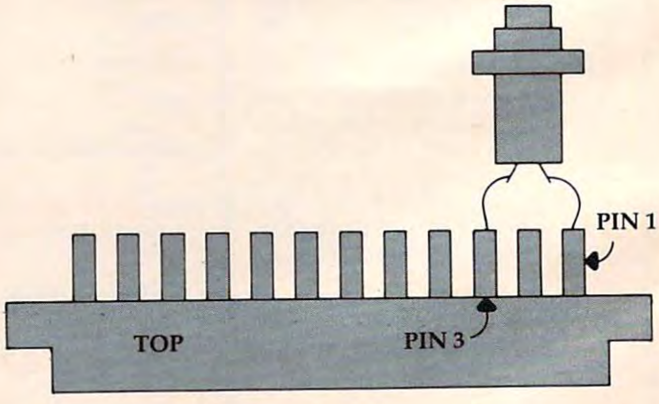
You have access to the RESET signal through two pins in the User Port (the rightmost connector as you face the back of your 64). Triggering a RESET through the User Port will cause a RESET without turning the power off (and memory contents will not be lost). There is a good chance that the program you were working on will still be intact. You can save a fair amount of time while experimenting and debugging by not having to reload the program every time.

To construct a RESET switch, you will need the following items:

Hardware:
1 Momentary contact switch (SPST)
1 24-pin card edge connector
(contacts on .156 inch centers)

You will also need a small amount of wire (preferably stiff wire) as well as a soldering iron and a little solder. If you aren't good at soldering, perhaps you can find a friend who can do the construction for you.

The construction involves connecting one terminal of the switch to pin 1 on the card edge connector, and the other terminal on the switch to pin 3 on the connector:



When construction is finished, plug the connector onto the 64 User Port (with the computer's power off), making sure that the terminals with connected wires are on top. With your switch in place, if your program crashes you just press the switch, and your 64 is RESET.

Visit us at
93Ø Town & Country Village
San Jose,Ca. 95128

We're also at:
16Ø East El Camino Real
Mt. View, Ca. 94Ø4Ø

computer center stores

INSTASHIP

UPS

TO ORDER
TOLL FREE 8ØØ-841-9494
Between 1Øam and 5pm
Pacific Standard Time
FOR INFO (OR IN CALIFORNIA)
4Ø8-246-571Ø
VISA/MASTERCHARGE/COD
5% Shipping on all orders
California residents Please
add 6.5% sales tax
Orders Shipped UPS or UPS Blue
(UPS Blue extra)

ATARI

6ØØXL	16K Computer	154.
8ØØXL	64K Computer	264.
14ØØXL	64K Computer	* *
145ØXLD	64K Computer	* *
1Ø27	Letter Qual.printer	265.
1Ø5Ø	Disk Drive	331.
85Ø	Interface	163.
KX7Ø97	Logo	7Ø.
CX4Ø18	Pilot	55.

COMMODORE/ATARI Modem $149.
Auto Dial/Answer send recieve and
Print simultaneously 3ØØ baud
direct connect w/centronics port,
cable and software listings.

COMMODORE
Executive 64 w/drive and moniter * *
444/T.E.D. * *
SUPER 64 Forth $89.95
Supports floating point
sprites,sound & Hires graphics
Card? +G $89.95
Printer Interface w/Graphics
Word pro. 3+ 64 w/Spellright $83.ØØ
We carry all H.E.S. products
including
Graphic Basic 64 * *
Multiplan 64 $84.95
Omniwriter 64 w/Spellchecker * *

MODEMWARE 64 $39.ØØ
Features UP/DOWNloading,save to Disk
, 64 to 64, and out put to printer
OKIDATA * * PRINTERS
GEMINI * * NOW
SMITH/CORONA * * AVAILIBLE

KOALA PAD w/Koala painter For
APPLE ATARI COMMODORE
89.95 84.95 84.95
We carry all INFOCOM For
APPLE ATARI COMMODORE
Including Zork Infidel Enchanter
ULTIMA III EXODUS For
APPLE ATARI COMMODORE
44.95 44.95 * *
We carry all EPYX software For
APPLE ATARI COMMODORE
Including Gateway to Apshai
Pitstop or Jumpman Jr.
Dragonriders of Pern $25.95ea.
We carry all ELECTRONIC ARTS
software For
APPLE ATARI COMMODORE
Including Music Constuction Set
Pinball Construction Set
Archon - Mule $32.95ea
The Finacial Cookbook * *
We carry all BRODERBUND software
For APPLE ATARI COMMODORE
Including Bank Street Writer * *
We carry all SIERRA ON LINE software
For APPLE ATARI COMMODORE
Including B.C.'s Quest for Tires
Sammy Lightfoot $26.95ea
DATA DEFENDER By RING KING $19.95ea.
Diskette storage case holds 7Ø
disks w/dividers,lock and 2 keys.

* * call for Prices
If you don't see it here call
Prices are subject to change.
P.S. Down as well as up,
give us a call.

If you are working strictly with machine language, you may be able to continue working with your program immediately after using the RESET switch. If you are working with BASIC or are using the DOS Wedge, you must do a little more work to get things back to normal. To restart the DOS Wedge, execute the following command:

```
POKE 186,8:SYS 52224
```

The first POKE is necessary to put the 1541's device number where the Wedge expects to find it. Normally it would be put there automatically when the Wedge is loaded from disk. The SYS command links the Wedge into BASIC again.

Recovering A BASIC Program

When you are working with BASIC programs, using the RESET switch will effectively perform a NEW on your program. To recover the BASIC program, a small machine language routine will be necessary. The following program will POKE the required routine into memory.

```
10 AD=49152:FOR I=0 TO 21
20 READ D:POKE AD+I,D:NEXT
30 DATA 169,8,141,2,8,32,51,165,24
40 DATA 165,34,105,2,133,45,165,35
50 DATA 105,0,133,46,96
60 PRINT"TO EXECUTE, USE SYS" ;AD;":CLR"
```

As written, the routine should be located at 49152 ($C000). The routine will run correctly no matter where it is placed, provided it is some place out of the way. You could put the routine in the cassette buffer by simply setting AD to 828 in line 10. You should execute this program before beginning your experiments with the program under development. Should you be forced to use the RESET switch, you can recover the BASIC program by executing the command:

```
SYS 49152:CLR
```

As you might guess, this will also recover a program which has been inadvertently NEWed. The CLR command is necessary to clean up some pointers that BASIC uses to locate where variables and arrays are to be stored.

Finding The Variables Again

Unfortunately, there isn't an automatic way to recover the old values of the variables or arrays. Recovering arrays is too complicated to be practical. However, some of the variables can be recovered, provided you have an idea of how many there were. To recover a given number of variables, substitute that number for n in the following command:

```
?PEEK(45)+PEEK(46)*256+7*n
```

Substitute the value printed into the N in this additional command:

```
POKE48,INT(N/256) :POKE47,N-PEEK(48)*256
```

At this point you should be able to print the values of the first N variables created by the BASIC program, assuming there were that many.

When you're working with machine language programs, the RESET switch can be especially handy. In addition to not having to reload your programs all the time, the variable storage used by the machine language program should still be intact. This can be very helpful in determining where in the program the crash occurred.

A Corrupted Program Must Be Reloaded

As mentioned before, the great majority of memory will be left unchanged after the reset. However, there is a possibility that the program *was* accidentally corrupted by the crash. Therefore, if you must be sure that there is a good copy in memory, you should reload the program. This obviously implies that you saved a copy before you tried it out.

But for simple experimentation, you can assume that the program in memory is still good and simply execute it again. If it crashes right away, or in a different manner, it may be time to reload the program.

If you've managed to live without a reset switch this long, you may wonder whether you should bother building one. When you are debugging a program which crashes the machine, anything which can help minimize the frustration is desirable.

File Access And The 1541

Now to look some more at the 1541 disk drive. Fortunately, we have a nice thick reference manual for the 64 to provide lots of detailed information. Unfortunately, the *Commodore 64 Programmer's Reference Guide* doesn't cover the 1541 disk drive. Instead, we are left with the *1541 User's Manual*, which isn't totally accurate or clean. To help fill this gap, I will pass on any interesting bits of information I can discover concerning operation of the disk drive.

How many disk files can be open at one time? The only hard facts I could find in the *1541 User's Manual* were under DOS Error Message 70: NO CHANNEL. Here it states that six "direct" access (which I assume to mean random access) or five sequential files may be open at one time. From previous experience, I knew these numbers were not correct.

Since my experiments gave inconsistent results, I am unable to give you a simple answer to the question. Instead, I'll just tell you what I observed, and not try to explain it.

Maximum Of Three Sequential Files

First of all, I was able to open only four random access channels before getting the NO CHANNEL error message. This implies that only three sequential channels may be opened at one time. This I found to be true, provided only one of the three files was opened for writing. Opening three sequential files for writing resulted in an error. It's interesting that opening three sequential files did not result in a NO CHANNEL error, rather there was a DRIVE NOT READY error (74).

Opening two sequential files for writing and one for reading was accepted by the disk drive, provided that the one for reading was opened last. If the file for reading was opened first or second, a DRIVE NOT READY message was returned by the disk drive. Because of this inconsistent operation, I would open no more than two sequential files for writing.

As for relative files, it appears that only one relative file may be opened on the 1541 at one time. Opening a relative file in conjunction with a random access file or sequence file resulted in the same inconsistency as opening two sequential write files. If the relative file was opened first, another file, random or sequential, could be opened afterward without complaints from the disk drive. However, when a random or sequential file was opened first, opening a relative afterward caused the NO CHANNEL error.

Mixing File Types

From these observations, I would say it's safe to use up to four random access files at one time, three squential files (with only one opened for writing), or one relative file. It should also be possible to mix some random access files with sequential channels, if desired. My experiments did not involve reading or writing data to any great extent. To be thorough, this should be done as well. I may be able to report on further experiments in my next column.

I will also try to verify if the 1541 drives currently being sold show the same symptoms as my drive. It is possible that the software inside has been upgraded since I obtained my drive, though I haven't heard any reports of this. ©

Random Music

Roger Hagerty

Looking for some great sound effects for your game programs? "Random Music" plays random combinations of pitch, duration, and volume to produce a wide variety of sounds. And for even more variety, you can use the game paddles to control one of these parameters while the computer selects the others at random.

Displayed on the screen are the digital values of the game paddles (0–255) and paddle buttons (0 or 1). The program plays a random combination of pitch, duration, and volume.

Pressing the right paddle button enables you to control the duration by rotating the right paddle. When the left paddle button is pressed, the pitch is controlled by the value of the left paddle. When both buttons are pressed, the last note is pulsed. By using the noise voice in this mode, you can generate some exciting machine-gun effects. Releasing both buttons returns to the random music mode.

The Atari version uses one voice. The VIC version uses four voices which can be selected by the function keys. In the 64 version, the function keys are used to select the triangle, sawtooth, pulse, and noise waveforms. See the "Automatic Proofreader" article on page 60 before typing in these programs.

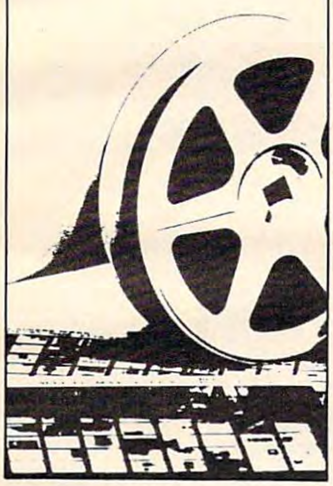
Program 1: Random Music—VIC Version

```
5 GOTO9040                                :rem 59
6 POKE36879,76:PRINT"{CLR}"               :rem 173
10 POKE37139,0:DD=37154:PA=37137:PB=37152
                                          :rem 14
20 PX=36872:PY=36873:K1=4                 :rem 163
100 FORI=1TO4                              :rem 6
110 S(I)=36873+I:NEXTI                    :rem 253
130 V=36878                                :rem 55
131 PRINT"{HOME}{4 DOWN}{RIGHT}{DOWN}
    {BLU}{RVS}LEFT{OFF}{2 SPACES}{RVS}FB"
    ,"{GRN}RIGHT{OFF}{2 SPACES}{RVS}FB
    {OFF}"                                 :rem 61
132 PRINT"{DOWN}{19 SPACES}"              :rem 120
133 GOSUB9000:PRINT"{UP}" PEEK(PX)TAB(6)X
    ;TAB(10)PEEK(PY)TAB(17)Y               :rem 28
134 D1=PEEK(PX):D=PEEK(PY)                 :rem 66
140 Q=INT(RND(1)*4)+1:L=INT(RND(1)*16)
                                          :rem 117
142 R=INT(RND(1)*128)+128                  :rem 83
143 Q1=INT(RND(1)*4)+1                    :rem 179
145 Z=S(Q):Z1=S(Q1)                        :rem 78
150 POKEZ,R:FORC=1TOD :NEXTC               :rem 18
155 POKEV,L                               :rem 152
160 IFXTHEN200                             :rem 63
165 POKEZ1,0                              :rem 178
170 ONQGOTO134,140,131,134                :rem 157
200 FORI=1TO4:POKES(I),0:NEXT              :rem 50
201 D2=PEEK(PX)+128:IFD2>255THEND2=255
                                          :rem 193
202 PRINT"{UP}"D2TAB(17)Y                  :rem 85
203 KY=PEEK(197):IFKY=39THENK1=1 :rem 188
204 IFKY=47THENK1=2                       :rem 139
205 IFKY=55THENK1=3                       :rem 140
206 IFKY=63THENK1=4                       :rem 141
208 IFKY<>39OR47OR55OR63THENKY=YY:rem 150
209 YY=KY                                  :rem 46
210 POKES(K1),D2:POKEV,10                 :rem 208
215 GOSUB9000                             :rem 225
218 Z=X+Y                                  :rem 14
220 ONZGOTO201,200                         :rem 21
230 GOTO170                               :rem 102
9000 POKEDD,127:Y=-((PEEK(PB)AND128)=0):P
     OKEDD,255                            :rem 129
9010 X=-((PEEK(PA)AND16)=0):RETURN
                                          :rem 246
9040 PRINT"{CLR}{RVS}{PUR}{7 SPACES}CONTR
     OLS{7 SPACES}{OFF}"                  :rem 229
9050 PRINT"{RED}QRIGHT PADDLE-CONTROLS DE
     LAY OF RANDOM MUSIC"                 :rem 155
9060 PRINT"QLEFT PADDLE-CONTROLS
     {2 SPACES}PITCH WHEN LEFT FIRE- BUTT
     ON IS{2 SPACES}DEPRESSED"             :rem 38
9070 PRINT"{DOWN}QFUNCTION KEYS DETER-
     {2 SPACES}MINE VOICE WHEN LEFT
     {2 SPACES}FIREBUTTON IS"              :rem 96
9080 PRINT"{RIGHT}DEPRESSED                :rem 60
9090 PRINT"{DOWN}QWHEN BOTH FIREBUTTONS A
     RE DEPRESSED THE{5 SPACES}LAST VOICE
      USED IS{4 SPACES}PULSED";            :rem 16
10000 PRINT" AND REPEATED                 :rem 189
10010 PRINT"{2 DOWN}{RVS}{YEL}PRESS ANY K
      EY TO START                           :rem 2
10020 GETA$:IFA$=""THEN10020                :rem 9
10030 GOTO6                                 :rem 99
```

Program 2: Random Music—64 Version

```
100 GOSUB 440                             :rem 169
110 PRINT"{CLR}{9 DOWN}{13 RIGHT}RANDOM M
    USIC"                                  :rem 74
120 REM CLEAR CHIP                          :rem 2
130 SID =54272:PA=SID+25:FB = 56321:AD=17
    :SR=243:FU=17:D1= 30:WA$="TRIANGLE"
                                          :rem 222
140 FOR T= SID TO SID +24:POKET,0:NEXT
                                          :rem 147
```

This Publication is available in Microform.



University Microfilms International

Please send additional information

for ____________________

Name____________________

Institution____________________

Street____________________

City____________________

State____________________ Zip________

300 North Zeeb Road
Dept. P.R.
Ann Arbor, Mi. 48106

HARMONY

VIDEO & ELECTRONICS

TO ORDER CALL TOLL FREE
800-221-8927 OR (212) 627-1000

2357 Coney Island Ave.
Brooklyn, N.Y. 11223
(212) 627-1000

Open Daily 9-6:30
Sunday 10-4
Friday 9-2

VIDEO

Sony SL2410	554.95	Sony Profeel KX1901	499.95
Sony SL2400	394.95	HR 7110	424.95
Sony SL2000	449.95	JVC HRD 225	629.95
SL 2500 Wireless	539.95	JVC HRD 120	444.95
Sony SL2700 Hi-Fi	Call	JVC HR2650	739.95
NEW! SL5200 Hi-Fi	594.95	JVC HR7100	409.95
Sony HVC2800	889.95	JVC GX70V	839.95
HVC2500 Autofocus	889.95	JVC HR7650	674.95
Sony HVC2400	489.95	JVC HRC3 Compact	499.95
Sony HVC2200	409.95	JVC GXN5	604.95
Panasonic PV1220	384.50	JVC GZ53 Compact	589.95
Panasonic 1720	769.95	RCA VJP900 Rebate	844.95
Panasonic PV1780	719.95	RCA VJT700	759.95
Panasonic PV1320	424.95	RCA VJT250	379.95
Panasonic PV1520	554.95	RCA VJT500	594.95
Panasonic PV6500	804.95	RCA VJP170	659.95
NEW! PV6600	859.95	RCA O11 Camera	629.95
PV5400 Portable	579.50	RCA O12 Camera	464.95
Panasonic 5500	729.95	RCA O16 Camera	519.95
Panasonic PK802	480.95	RCA 017 Camera	814.95
NEW! Autofocus557	559.95	RCA 030	1219.95
Panasonic PK503	524.95	Hitachi VKC3400	1275.00
Panasonic PK957	719.95	Hitachi VT-16A	529.95
Quasar 5435/513	689.95	Hitachi VT18A	609.95
Quasar VK747	699.95	Hitachi VT19A	729.95
Quasar 5435/540	844.95	Hitachi VT7P	844.95
Quasar 5031	384.95	Hitachi VKC870	699.95
Quasar 5335	609.95	Sanyo VCR6400	324.50
Quasar 5235	584.95	Fisher 730 4-Head	724.95
Quasar 5635	829.95	Fisher 515	424.95
Quasar VK727	659.95	NEW! Sanyo 4500	299.95
GE 4016	774.50	Sanyo 7300	709.95
GE 4002	369.95	Sanyo 4300	364.95
GE 4020 Port	614.95	Sanyo 6300	379.95
GE 4012	599.95	Sanyo 6800	449.95
GE 4022	619.95	Zenith 1810	839.95
GE 4024	849.95	Zenith 9775	549.95
Sony Profeel KXT2501	799.95	Zenith 9800	599.95

Write for Free Catalog

VIDEO TAPE—BY CASE ONLY

	VHS T120	VHS T160	HIGH GRADE	BETA L500	BETA L750	BETA L830
TDK	6.85	12.60	9.35	5.85	6.90	8.99
FUJI	7.45	13.10	9.20	6.75	8.10	9.25
JVC	6.60	9.60	9.10	—	—	—
MAXELL	6.50	9.75	9.15	—	6.90	8.99
SCOTCH	6.50	9.99	9.30	6.50	6.90	8.75
SONY	7.30	—	6.35	5.85	6.85	8.60
RCA	6.90	—	9.99	—	—	—
PANASONIC	6.45	—	9.50	—	—	—
MEMOREX	7.10	9.99	9.00	6.10	6.75	8.45

WE CARRY A FULL LINE OF SONY TV & PROFEEL

COMPUTERS

IBM pc STARTER SYSTEM
$1849.95

APPLE 2E with Disk Drive
Monitor & Column Card
$1149.95

Additional Disk Drives	189.95	C. ITOH Star writer	949.95
Eagle p.c.	1599.95	C. ITOH Pro writer 8510	339.95
Kaypo II	1329.95	NEC 3550	1629.95
Hayes 300 Smartmodem	199.95	Gemini 10	279.95
Hayes Micromodem II E	209.95	Gemini 15	349.95
Amdek Monitor	249.95	Epson FX100	659.95
Brother HR15	389.95	Epson FX80	519.95
Okidata 92	389.95	Okidata 93	659.95

COMMODORE		ATARI	
VIC 20	79.95	Atari 1400 XL	CALL
Commodore 64	189.95	Atari 1200 Rebate	199.95
Disk Drive	189.95	Atari 800 Rebate	249.95
1525 Printer	174.95	1027 Printer	254.95
VIC Modem	59.95	1030 Modem	CALL
1650 Modem	109.95	830 Modem	129.95
16K Expander	74.50	1010 Program Recorder	74.50
1701 Monitor	194.95	1020 Printer	199.95
1530 Data Sette	49.95	1025 Printer	284.95

For Info Dial (212) 627-1000 No dealers on advertised specials, please! To order simply dial toll free 800-221-8927 with your MasterCard or VISA and your order will arrive via UPS or send certified check or money order only to: HARMONY VIDEO AND ELECTRONICS, 2357 Coney Island Ave., Brooklyn, N.Y. 11223, and add approximate shipping, postage and insurance charges. Customer Service (212) 627-8888 Mon-Fri. 9-5. Credit cards for phone orders only. All prices and availability subject to change without notice. All orders shipped out of state. Dealer inquiries invited!! MC, VISA.

SAVE AT ELEK-TEK ON PRINTERS

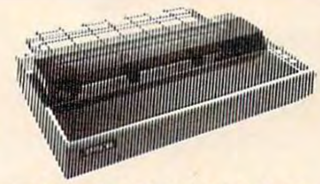
HUGE SAVINGS ON ALL EPSON PRINTERS

CALL FOR SUPER LOW PRICES ON

RX 80 FT FX 80 FX 100

EPSON RX-80
275.00

8750 Ribbon Cartridges for Epson 80 Column Printers 4.00



EPSON MX-100
$500.00

(15 in. wide carriage)
includes Tractor & Friction

8755 Ribbon Cartridges for Epson 132 Column Printers 7.00

Cables for Epson

PA10A 10 ft. 36/36 pin standard parallel	25.00
IB-P10 10 ft. 36/25 pin parallel for IBM	25.00
PA6T 6 ft. 36/16 pin parallel for TI-99/4A	25.00
RS10A 10 ft. 25 pin standard RS-232(full loaded)	21.00
RS1Y RS-232 Y cable for TI-99/4A	35.00

Interfaces

Microtech MCC 2064	65.00
GRAPHSTAR	70.00
GRAPPLER PLUS	120.00
GRAPPLER PLUS (32K) BUFFER	165.00
8148 Ser. (For RX or FX Models)	90.00
8161 IEEE-488 Interface	60.00

DUST COVERS AVAILABLE FOR ALL MODELS

LETTER QUALITY PRINTERS
$500—$1,550
TTX — COMREX — DIABLO

CALL TOLL FREE 800-621-1269
EXCEPT Illinois, Alaska, Hawaii

Corp. Accts. invited. Min Ord. $15.00 Mastercard or Visa by mail or phone. Mail Cashier's Check, Money Ord., Pers. Check (2 wks to clr.) Add $4.00 1st item. **(AK, HI, P.R., Canada add $10.00 first item)** $1.00 ea. add'l shpg. & handl. Shipments to IL address add 6% tax. Prices subj. to change. **WRITE for free catalog. Return policy for defective on arrival replacements only: 90 day mfr. wty. ALL ELEK-TEK MERCHANDISE IS BRAND NEW, FIRST QUALITY AND COMPLETE.**

ELEK-TEK, inc.
6557 N. Lincoln Ave., Chicago IL 60645
(800) 621-1269 (312) 677-7660

```
150 POKESID+24,15                    :rem 200
160 POKE SID+5,AD:POKESID+6,SR       :rem 50
170 IF PEEK(197)>6ORPEEK(197)<3THEN190
                                     :rem 162
180 ON PEEK(197)-2GOSUB320,330,340,350
                                     :rem 10
190 F1=PEEK(FB)AND8:F2=PEEK(FB)AND4
                                     :rem 75
200 IFF1<>0ANDF2<>0THENFB$= "{12 SPACES}"
    :GOSUB410:GOSUB370:GOTO240       :rem 63
210 IF F1=0AND F2=0{2 SPACES}THEN FB$="BO
    TH BUTTONS":GOSUB400:GOSUB360:GOTO250
                                     :rem 33
220 IF F1=0THEN FB$="LEFT{2 SPACES}BUTTON
    ":GOSUB400:GOTO250               :rem 194
230 IF F2 =0THEN FB$="RIGHT BUTTON":GOSUB
    360:GOTO250                      :rem 28
240 D1=INT(RND(0)*255):D2=INT(RND(0)*255)
    :GOSUB410:GOSUB370               :rem 166
250 POKE SID+1,D1:POKESID,50:POKE214,12:P
    RINT:POKE211,8:PRINT"PITCH";D1$;
                                     :rem 198
260 POKESID+4,FU                     :rem 205
270 FORT=1 TO D2:NEXT:POKESID+4,FUAND254
                                     :rem 177
280 PRINT"{4 RIGHT}DELAY";D2$;       :rem 94

290 PRINT"{DOWN}{20 LEFT}WAVEFORM {RVS}";
    WA$;                             :rem 108
300 POKE214,14:PRINT:POKE211,13:PRINTFB$
                                     :rem 177
310 GOTO170                          :rem 101
320 FU=129:WA$=" NOISE{2 SPACES}":RETURN
                                     :rem 24
330 FU =17:WA$="TRIANGLE":RETURN :rem 189
340 FU= 33 :WA$="SAWTOOTH":RETURN:rem 223
350 FU = 65:WA$=" PULSE{2 SPACES}":POKESI
    D+2,245:POKESID+3,7:RETURN       :rem 108
360 D2=PEEK(PA)                      :rem 83
370 D2$=STR$(D2):IF LEN(D2$)=3THEND2$=" "
    +D2$                             :rem 103
380 IF LEN(D2$)=2 THEND2$="{2 SPACES}"+D2
    $                                :rem 114
390 RETURN                           :rem 124
400 D1 = PEEK(PA+1)                  :rem 169
410 D1$=STR$(D1):IF LEN(D1$)=3THEND1$=" "
    +D1$                             :rem 93
420 IF LEN(D1$)=2 THEND1$="{2 SPACES}"+D1
    $                                :rem 106
430 RETURN                           :rem 119
440 PRINT "{CLR}{16 RIGHT}{BLK}CONTROLS":
    POKE53281,1                      :rem 153
450 PRINT"{BLK}{DOWN}{RIGHT}WHEN THE RIGH
    T FIRE BUTTON IS PRESSED,"       :rem 153
460 PRINT"{DOWN}{8 RIGHT}THE RIGHT PADDLE
     CONTROLS"                       :rem 225

470 PRINT"{DOWN}{4 RIGHT}THE DELAY OF THE
     SOUNDS PRODUCED."               :rem 23
480 PRINT"{DOWN}{RIGHT}WHEN THE LEFT FIRE
     BUTTON IS PRESSED,"             :rem 185
490 PRINT"{DOWN}{8 RIGHT}THE LEFT PADDLE
    {SPACE}CONTROLS"                 :rem 145
500 PRINT"{DOWN}{4 RIGHT}THE PITCH OF THE
     SOUNDS PRODUCED."               :rem 26
510 PRINT"{DOWN}{2 RIGHT}IF BOTH BUTTONS
    {SPACE}ARE PRESSED, THEN THE":rem 199
520 PRINT"{DOWN}{2 RIGHT}LAST SOUND PRODU
    CED IS PULSED AND CAN "          :rem 212
530 PRINT"{4 RIGHT}BE CONTROLLED BY EITHE
    R PADDLE."                       :rem 142
540 PRINT"{DOWN}THE FUNCTION KEYS ARE USE
    D TO SELECT THE"                 :rem 75
550 PRINT"{8 RIGHT}WAVEFORM FOR THE SOUND
    ."                               :rem 57
560 PRINT"{9 RIGHT}HIT ANY KEY TO BEGIN"
                                     :rem 47
570 FOR T=1 TO100:NEXT               :rem 242
580 IF PEEK(197)=64 THEN 580         :rem 182
590 RETURN                           :rem 126
```

Program 3: Random Music—Atari Version

```
FO 4 POKE 752,1
OM 5 DIM FB$(12),D2$(3),D1$(3),DT$(3),
     DR$(3),A$(2)
MA 6 ? "{CLEAR}":GOSUB 600:? "{CLEAR}"
JO 8 POSITION 14,10:? "RANDOM MUSIC"
BD 10 F1=PTRIG(0):F2=PTRIG(1)
DM 20 IF F1<>0 AND F2<>0 THEN FB$="
      {12 SPACES}":GOTO 60
NA 30 IF F1+F2=0 THEN FB$="Both Button
      s":GOSUB 350:GOSUB 450:GOTO 70
GH 40 IF F1=0 THEN FB$="Left Button ":
      GOSUB 450:GOTO 70
NL 50 IF F2=0 THEN FB$="Right Button "
      :GOSUB 350:GOTO 70
HK 60 D1=INT(RND(0)*255):D2=INT(RND(0)
      *255):GOSUB 360:GOSUB 460
NP 70 SOUND 0,D1,14,10
FG 80 POSITION 10,12:? "Pitch ";D1$
FA 90 POSITION 20,12:? "Delay ";D2$
BP 100 POSITION 13,13:? FB$
KG 105 FOR T=1 TO D2:NEXT T:SOUND 0,D1
       ,14,0
CM 110 GOTO 10
HH 350 D2=PADDLE(1)
OJ 360 D2$="":DT$=STR$(D2):A=LEN(DT$):
       ON A GOTO 370,380,390
AA 370 D2$(1,2)="  ":D2$(3)=DT$:RETURN
FO 380 D2$(1,1)=" ":D2$(2,3)=DT$:RETUR
       N
CP 390 D2$=DT$
HE 400 RETURN
HG 450 D1=PADDLE(0)
OH 460 D1$="":DR$=STR$(D1):A=LEN(DR$):
       ON A GOTO 470,480,490
PN 470 D1$(1,2)="  ":D1$(3)=DR$:RETURN

FL 480 D1$(1,1)=" ":D1$(2,3)=DR$:RETUR
       N
CN 490 D1$=DR$
HF 500 RETURN
IN 600 SETCOLOR 4,13,10:SETCOLOR 1,8,0
       :SETCOLOR 2,8,10:? "{CLEAR}":PO
       SITION 15,1:? "CONTROLS"
HM 610 POSITION 7,3:? "The right paddl
       e controls "
LG 620 POSITION 3,5:? "the delay of th
       e sounds produced"
AP 630 POSITION 7,7:? "The left paddle
        controls "
MF 640 POSITION 3,9:? "the pitch of th
       e sounds produced "
DH 650 POSITION 4,11:? "When both butt
       ons are pressed,"
CE 660 POSITION 3,13:? "the last note
       played is pulsed "
GF 665 POSITION 9,15:? "Hit any key to
        start"
FC 670 FOR T=1 TO 255:NEXT T
LF 680 A=PEEK(764):POKE 764,255:IF A=2
       55 THEN 680
HP 690 RETURN
```
©

Questions Beginners Ask

Tom R. Halfhill, Features Editor

Are you thinking about buying a computer for the first time, but you don't know much about computers? Or maybe you just purchased a computer and are still a bit baffled. Each month in this column, COMPUTE! *will answer some questions often asked by beginners.*

Q One of the big reasons I bought my computer was for word processing. I have word processing software and a dot-matrix printer. The printer has many print modes for printing expanded characters, condensed characters, double-strike, etc. But my word processor software was not made for this printer and doesn't have commands to switch the printer into these different modes. Is there any way I can use these modes?

A Yes, there is. Review the word processor manual carefully to see if there is a command for sending *escape codes* or *control codes* to the printer. Almost all word processors have some sort of feature like this. Usually they let you embed a nonprinting character in your text—that is, a character that appears on the screen but not in the printout. The escape code (CHR$(27)) followed by a number, or a control code by itself, switches the printer to whatever mode you choose. You'll have to consult your printer manual to learn the code numbers for your particular printer. Look for an appendix.

If you still have no luck, there's yet another solution. Remember that printers can be computers, too. They often contain a microprocessor, RAM, and ROM, though their computing capability is not nearly as powerful as your main computer. Still, printers can often be programmed. Sending codes from your word processor is only one way of doing this. If your word processor does not have this capability, then you'll have to program the printer before you run the word processor.

First, switch on the printer and computer. Second, before loading the word processor, use BASIC to send the proper codes to the printer. Refer to your BASIC manual to find the right command. (Atari and TRS-80 computers use LPRINT; Commodores require you to open a file to the printer and use PRINT#. For example, from a VIC or 64, you could type:

```
OPEN 4,4 : PRINT#4, CHR$(27) + CHR$(7)
```

and this would ring the printer's bell, if it has one.) Next, without turning off the printer, load the word processor. As long as the printer stays on, it should remain in the mode to which you set it. The only drawback of this method is that you cannot switch print modes within a document.

Q I use a cassette tape recorder to store programs on my computer. How safe is it to reuse tapes which have old programs on them? Can I just record over the old programs, or should I erase the tape first?

A We've re-recorded cassette tapes many times with no problems at all. Once with an Atari we even carried this practice to the extreme. It was a charting program that called for weekly updates to keep track of money market interest rates. Each Friday, at the end of the business week, the program was loaded from tape, the figures updated, and the new chart recorded over the old. By year's end, the program had been recorded over itself 52 times before the tape was retired and a new one started for the next year. Not once were there any saving or loading problems. What's more, the tape was the least expensive C-30 cassette sold by Radio Shack. However, this might be stretching things. Maybe we were just lucky.

Nevertheless, this shows that it's quite possible to re-record tapes several times without much risk. Of course, you should always keep a backup in case one recording proves faulty.

If you want to be extra careful, you can erase the tape first. The best way is to use a magnetic bulk tape eraser, available at Radio Shack and other electronic stores. Bulk erasers are electromagnetic devices which wipe a whole tape (or diskette) clean in a matter of seconds. Good erasers clean the tape more thoroughly than the recorder itself can because they generate a much stronger magnetic field, reducing background noise to a minimum. But if you use a bulk eraser, keep it far, far away from your good tapes or disks—you could carelessly destroy an entire software or music library in less time than it would take to hurl the eraser out the window. ©

How To Type COMPUTE!'s Programs

Many of the programs which are listed in COMPUTE! contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to tell exactly what to type when entering one of these programs into your computer, we have established the following listing conventions. There is a separate key for each computer. Refer to the appropriate tables when you come across an unusual symbol in a program listing. If you are unsure how to actually enter a control character, consult your computer's manuals.

Atari 400/800

Characters in inverse video will appear like: INVERSE VIDEO
Enter these characters with the Atari logo key, {⅄}.

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

Graphics characters, such as CTRL-T, the ball character ● will appear as the "normal" letter enclosed in braces, e.g. {T}.

A series of identical control characters, such as 10 spaces, three cursor-lefts, or 20 CTRL-R's, will appear as {10 SPACES}, {3 LEFT}, {20 R}, etc. If the character in braces is in inverse video, that character or characters should be entered with the Atari logo key. For example {■} means to enter a reverse-field heart with CTRL-comma, {5■} means to enter five inverse-video CTRL-U's.

Commodore PET/CBM/VIC/64

Generally, any PET/CBM/VIC/64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S̲ would mean to type the S key while holding the shift key. If you find an underlined key enclosed in braces (e.g., {10 N̲}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's). Some graphics characters are inaccessible from the keyboard on CBM Business models (32N, 8032).

For the VIC and 64, if a key is enclosed in special brackets, ⌈ ⌉, you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as indicated.

Rarely, you'll see in a Commodore 64 program a solitary letter of the alphabet enclosed in braces. These characters can be entered by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A.

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following tables when entering special characters:

VIC And 64

When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT ↑CRSR↓	
{DOWN}	↑CRSR↓	
{LEFT}	SHIFT ←CRSR→	
{RIGHT}	←CRSR→	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	
{PUR}	CTRL 5	

When You Read:	Press:	See:
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{F1}	f1	
{F2}	f2	
{F3}	f3	
{F4}	f4	
{F5}	f5	
{F6}	f6	
{F7}	f7	
{F8}	f8	
←	←	
↑	SHIFT ↑	

All Commodore Machines

Clear Screen	{CLR}	Cursor Left	{LEFT}
Home Cursor	{HOME}	Insert Character	{INST}
Cursor Up	{UP}	Delete Character	{DEL}
Cursor Down	{DOWN}	Reverse Field On	{RVS}
Cursor Right	{RIGHT}	Reverse Field Off	{OFF}

Apple II / Apple II Plus

All programs are in Applesoft BASIC, unless otherwise stated. Control characters are printed as the "normal" character enclosed in braces, such as {D} for CTRL-D. Hold down CTRL while pressing the control key. You will not see the special character on the screen.

Texas Instruments 99/4

The only special characters used are in PRINT statements to indicate where two or more spaces should be left between words. For example, ENERGY {10 SPACES} MANAGEMENT means that ten spaces should be left between the words ENERGY and MANAGEMENT. Do not type in the braces or the words 10 SPACES. Enter all programs with the ALPHA LOCK on (in the down position). Release the ALPHA LOCK to enter lowercase text.

A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE! are written in a computer language called BASIC. BASIC is easy to learn and is built into most computers (on some computers, you have to purchase an optional BASIC cartridge).

BASIC Programs

Each month, COMPUTE! publishes programs for many machines. To start out, type in only programs written for your machine, e.g., "TI Version" if you have a TI-99/4. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from one computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as DOWN}. Anything within a set of braces is a special character or characters that cannot easily be listed in a printer. When you come across such a special statement, refer to the appropriate key for your computer. For example, if you have an Atari, refer to the "Atari" section in "How To Type COMPUTE!'s Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard, break key, and RESET (or STOP) keys may all seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, so always SAVE a copy of your program before you RUN it. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN or ENTER at the end of each line. Use backspace or the back arrow to correct mistakes.

2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type COMPUTE!'s Programs" elsewhere in the magazine).

We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in COMPUTE! *due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on the CAPUTE! page, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!, *please send them to Readers' Feedback, P.O. Box 5406, Greensboro, NC 27403.*

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 was conceived and written by Program Editor Charles Brannon. Important: MLX is required to type in the 64 version of "Trident" in this issue.*

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. You can then use the LOAD command to read the program into the computer, as with any program:

LOAD "filename",1,1 (for tape)
LOAD "filename",8,1 (for disk)

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number appears in the article.

Using MLX

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

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 comma, SPACE bar, or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

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.

The special MLX commands may seem a bit confusing, but as you work with MLX, they will become valuable. For example, what if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

You can use the Save and Load commands to make copies of the completed program. Use Load to reload the tape or disk, then insert a new tape or disk and use Save to make a new copy.

Be sure to save MLX; it will be used for future ML programs in COMPUTE!.

MLX: Machine Language Entry

```
100 PRINT"{CLR}[6]";CHR$(142);CHR$(8);:
    POKE53281,1: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.ØØ{5 DOWN}"
                                    :rem 236
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>4096ØANDS<49152)ORS>53247
    THENGOSUB3ØØØ:GOTO21Ø           :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>4096ØANDE<49152)ORE>53247
    THENGOSUB3ØØØ:GOTO23Ø           :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1ØØØ:GOTO 23Ø
                                    :rem 176
260 PRINT:PRINT:PRINT               :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S:POKEV+21,Ø
                                    :rem 225
310 A=1:PRINTRIGHT$("ØØØØ"+MID$(STR$(AD),
    2),5);":";                       :rem 33
315 FORJ=ATO6                        :rem 33
320 GOSUB57Ø:IFN=-1THENJ=J+N:GOTO32Ø
                                    :rem 228
390 IFN=-211THEN 71Ø                 :rem 62
400 IFN=-204THEN 79Ø                 :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                   :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1ØØØ:GOTO41Ø
                                    :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO31Ø
                                    :rem 238
420 IF N<>-196 THEN 48Ø             :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                       :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    Ø                               :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("ØØØ
    Ø"+MID$(STR$(I),2),5);":";       :rem 30
451 FORK=ØTO5:N=PEEK(I+K):PRINTRIGHT$("ØØ
    "+MID$(STR$(N),2),3);",";        :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO31Ø
                                     :rem 25
470 NEXTK:PRINTCHR$(2Ø);:NEXTI:PRINT:PRIN
    T:GOTO31Ø                        :rem 50
480 IFN<Ø THEN PRINT:GOTO31Ø        :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$(18);:GOSUB57Ø:PRINTCHR$(146
    );                               :rem 94
511 IFN=-1THENA=6:GOTO315           :rem 254
515 PRINTCHR$(2Ø):IFN=CKSUMTHEN53Ø
                                    :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1ØØØ:GOTO31Ø:rem 176
530 GOSUB2ØØØ                       :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,Ø:POKE54273,Ø               :rem 227
550 AD=AD+6:IF AD<E THEN 31Ø        :rem 212
560 GOTO 71Ø                        :rem 108
570 N=Ø:Z=Ø                          :rem 88
580 PRINT"[£]";                      :rem 81
581 GETA$: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$="H"THENA$="Ø"            :rem 134
584 IFAV>ØTHENA$=CHR$(48+AV)        :rem 134
585 PRINTCHR$(2Ø);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN67Ø                   :rem 229
590 IFA>128THENN=-A:RETURN          :rem 137
600 IFA<>2Ø THEN 63Ø                 :rem 10
610 GOSUB69Ø:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}{LEFT} {LEFT}";:GOTO69Ø     :rem 62
620 GOTO57Ø                         :rem 109
630 IFA<48ORA>57THEN58Ø             :rem 105
640 PRINTA$;:N=N*1Ø+A-48            :rem 106
650 IFN>255 THEN A=2Ø:GOSUB1ØØØ:GOTO6ØØ
                                    :rem 229
660 Z=Z+1:IFZ<3THEN58Ø               :rem 71
670 IFZ=ØTHENGOSUB1ØØØ:GOTO57Ø      :rem 114
680 PRINT",";:RETURN                :rem 240
690 S%=PEEK(2Ø9)+256*PEEK(21Ø)+PEEK(211)
                                    :rem 149
691 FORI=1TO3:T=PEEK(S%-I)           :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                    :rem 205
700 PRINTLEFT$("{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$=
    ""THENPRINT:PRINT:GOTO31Ø        :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"         :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN74Ø
                                     :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="@Ø:"+F$
                                    :rem 222
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                  :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE78Ø,LEN(
    T$):SYS65469                    :rem 109
763 POKE78Ø,1:POKE781,DV:POKE782,1:SYS654
    66                               :rem 69
765 K=S+1:POKE254,K/256:POKE253,K-PEEK(25
    4)*256:POKE78Ø,253              :rem 109
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496                 :rem 235
770 IF(PEEK(783)AND1)OR(ST AND191)THEN78Ø
                                    :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO31Ø
                                    :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN72Ø        :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO72Ø            :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                    :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL LOAD)"          :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO31Ø           :rem 144
```

```
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"          :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                    :rem 34
830 DV=1-7*(A$="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$):SYS65469                    :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                              :rem 70
850 POKE780,0:SYS65493              :rem 11
860 IF(PEEK(783)AND1)OR(ST AND191)THEN870
                                    :rem 111
865 PRINT"{DOWN}DONE.":GOTO310      :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                    :rem 172
880 OPEN15,8,15:INPUT#15,E1$,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
```

©

CAPUTE!

Modifications Or Corrections To Previous Articles

Machine Language: Factors

The commands to prepare the computer to enter Program 2, the VIC and 64 version of the machine language factoring routine from the January "Machine Language" column (p. 178), should read:

POKE 4608,0:POKE 44,18:NEW

Commodore Files For Beginners, Part 3

On page 193 of the January issue, lines 340, 350, and 360 should have a semicolon (;) following the CHR$(13).

Disk Explorer For Commodore

This program from the December 1983 issue (p. 298) requires the following corrections, supplied by reader Duane Martin:

```
160 INPUT A$: IF LEFT$(A$,1)="$" THEN 190
1100 GETC$:IFC$=""THEN1040
```

Atari MLX

Line 190 of this machine language editor from the December issue (p. 216) creates a count of data blocks for use in the boot process. However, the line as written may cause problems due to rounding of the block count value when partial blocks are involved. Don Klich suggests the following change to avoid this problem:

```
190 BEG=BEG-24:BUFFER$=CHR$(0):BUFFER$(2)
    =CHR$(INT((FIN-BEG+127)/128))
```

This should not be a factor in getting the "Chopperoids" program to operate correctly. See the February issue for the corrections to Chopperoids.

Comparing Commodore Machine Language Programs

Readers attempting to run this utility from the December 1983 issue (p. 340) on the Commodore 64 should note that lines 240 and 350 contain PET 4.0 BASIC disk status variables which are not supported by the 64's BASIC. In addition to the changes noted in the article, the following are also required:

```
225 OPEN 15,8,15
240 INPUT#15,DS,DS$,D1,D2:IF DS<>0 THEN
    PRINT DS$:STOP
350 INPUT#15,DS,DS$,D1,D2:IF DS<>0 THEN
    PRINT DS$:STOP
```

64 Clock

Overseas readers may be interested to learn that the built-in time-of-day clock in the 64's CIA chip can be adjusted for their 50 Hz household current with a simple POKE. C. J. Ayers of Guildford, Surrey, England, notes that adding the line:

75 POKE 56334,129

to the program from the December issue (p. 344) will cause it to keep proper time on European 64s.

Termulator For The 64

Line 170 of Program 2 of this article from the November 1983 issue (p. 222) should read:

```
170 DATA 133, 106, 32, 189, 255, 169, 192
```

The value 3515 in line 120 will need to be changed to 3485 to reflect the change to the DATA. With this correction, Program 2 will create a tape copy of the data loaded by Program 1 without a filename. To reload "Termulator" from the tape created by Program 2, type:

LOAD "",1,1

Thanks to Stan Lefkowitz for pointing out this correction.

©

ATARI®

ATARI is a trademark of ATARI, INC.

NEW LOWER PRICES!!

ATARI 800XL .... Call

Atari 1050 Disk Drive .... Call
Atari 1010 Recorder 77.00
Atari 1027 Printer .... Call
Atari 850 Interface .... Call

MOSAIC

64K Ram/400 .... 149.00
64K Ram + Cable Kit/400/800 .... 169.00
48K Ram Kit 94.00
16/32 Expander 64.95
32K Ram 77.95
Mosaic Adaptor 49.95

DISK DRIVES

Percom .....
Trak .... Call
Rana .... For
Indus Gt .. Prices

NEW

RS232 Modem Adaptor (Through serial port) 39.95

Koala Touch Tablet 69.95

MONITORS

We carry a full line of AMDEK and USI Monitors.

64 COMODORE 64

Pac-Mac 34.95
Centipede 34.95
Defender 34.95
Dig Dug 34.95
Donkey Kong 34.95
Stargate 34.95
Robotron 34.95

Please call product availability of other 64 software products at same low prices!

3RD Party Printer Interfaces

Interfast I 139.00
Apeface w/cable included 69.95

PRINTERS

SUPER SPECIAL - Prowriter Package with Apeface or Interfast I .... Call
Axiom AT-100 .... 229.00
Axiom AT-550 .... 329.00

ATARI

Programming 2 & 3 - T .. 23.95
Conversational Languages T 44.95
Music Composer - C 32.95
My First Alphabet - D ... 26.95
Touch Typing - T 19.95
Home Filing Manager D 37.95
Mailing List - T 19.95
Caverns of Mars - D 28.95
Computer Chess - C 26.95
Missile Command - C ... 26.95
Super Breakout - C 26.95
Star Raiders - C 32.95
Assembly Editor - C 46.95
Basic - C 41.95
Macroassembler - D 67.95
Pilot (Home Package) C 58.95
Invitation to Programming I T 19.95
Speed Reading - T 55.95
Basketball - C 26.95
Graph-it - T 15.95
Juggles House - D/T 22.95
Pilot (Educator) - C 97.95
Video Easel - C 26.95
Defender - C 32.95
Galaxian - C 32.95
Qix - C 32.95
Dig Dug - C 32.95
ET - C 37.95
Timewise - D 23.95
Atariwriter - C 74.95
Donkey Kong - C 37.95
Ms. Pac-Man - C 39.95
Tennis - C 35.95
Eastern Front - C 32.95
Donkey Kong Jr. - C 39.95
Pengo - C 35.95
Logo - C 79.95
Robitron - C 35.95
Pole Position - C 39.95
Microsoft Basic II - C ... 67.95
Paint - D 33.95
Caverns of Mars - C 32.95
Joust - C 39.95
Visicalc - D 159.95

THORN

War Games - Cart 27.95
Hockey - Cart 27.95
Soccer - Cart 30.95
Submarine Commander - Cart ... 30.95

GAMESTAR

Baja Buggies - D/T 22.95
Starleague Baseball - D/T 22.95
Starbowl Football D/T ... 22.95

SPINNAKER

Up For Grabs - Cart 27.95
Cosmic Life - Cart 23.95
Facemaker - Cart/Disk 23.95
Alphabet Zoo - Cart 23.95
Fraction Fever - Cart 23.95
Kids on Keys - Cart 23.95
Delta Drawing - Cart 27.95
Story Machine - Disk 23.95
Rhymes & Riddles - D 20.95
Amazing Things - D 27.95
Hey Diddle Diddle - D ... 20.95
Snooper Troops 1 or 2 - D .. 30.95
Trains - D 27.95
Aerobics - D 30.95

SIRIUS

Bandits - D 23.95
Way Out - D 27.95
Repton - D 27.95
Twerps - D 23.95
Blade of Blackpoole - D .. 27.95
Type Attack - D 27.95
Beer Run - D 23.95
Critical Mass - D 27.95
Wavy Navy - D 23.95

SIERRA ON-LINE

Homeword - D 34.95
Dark Crystal - D 27.95
Frogger - D/T 23.95
Quest For Tires - D 23.95
Ultima I - D 23.95
Ultima II - D 41.94
Wizard/Princess - D 22.95

SEGA

Buck Rogers - Cart 27.95
Star Trek - Cart 27.95
Congo Bongo - Cart 27.95
Tac Scan - Cart 27.95

EPYX

Gateway To Apshai Cart 27.95
Pitstop - Cart 27.95
Lunar Outpost - Cart ... 27.95
Swat Rescue - Cart 27.95
Silicon Warrior - Cart ... 27.95
Fun With Music - Cart ... 27.95
Jumpman Jr. - Cart 27.95
Dragonriders of Pern D/C 27.95
Temple Of Apshai D/C 27.95
Hellfire Warrior - D/C ... 20.95
Fun With Art - Cart 27.95

INFOCOM

Deadline - D 34.95
Witness - D 34.95
Zork I, II, III - D 27.95
Starcross - D 27.95
Planetfall - D 34.95
Suspended - D 34.95
Enchanter - D 34.95
Infidel - D 34.95

Hundreds of items available for the ATARI ... please call.

LJK

Letter Perfect - D 74.95
Data Perfect - D 74.95
Spell Perfect - D 64.95

BRODERBUND

AE - D 23.95
Arcade Machine - D 41.95
Bank St. Writer - D 49.95
Lode Runner - D 23.95
Drol - D 23.95
Spare Change - D 23.95
Choplifter - D 23.95

DATA SOFT

Money Wizard - D 49.95
Letter Wizard - D 49.95
Spell Wizard - D 34.95
Genesis - D/T 20.95
Heathcliff - D/T 20.95
Pooyan - D/T 20.95
Zaxxon - D/T 27.95
Micropainter - D 23.95

SYNAPSE

Blue Max - D/T 23.95
Dimension X - D/T 23.95
Drelbs - D/T 23.95
Encounter - D/T 23.95
Necromancer - D/T 23.95
Quasimoto - D/T 23.95
Rainbow Walker - D/T ... 23.95
Shamus Case II - D/T ... 23.95
Zeppelin - D/T 23.95

FIRST STAR

Bristles - D/T 20.95
Flip Flop - D/T 20.95
Astro Chase - D 20.95
Boulder Dash - D/T 20.95

STRATEGIC SIMULATIONS

Carrier Force - D 41.95
Combat Leader - D/T ... 27.95
Battle For Normandy -D/T 27.95
Eagles - D/T 27.95

PARKER BROS.

Astrochase - Cart 34.95
Frogger - Cart 34.95
Q'Bert - Cart 34.95
Popeye - Cart 34.95

MISCELLANEOUS

Castle-Wolfenstein - D .. 20.95
Home Accountant - D ... 52.95
Master Type - D/Cart ... 27.95
Spelunker - D 27.95
Flight Simulator II - D ... 37.95
Zombies - D/T 23.95
Mr. Robot - D 23.95
River Raid - Cart 31.95
Diskey - D 34.95
Chatterbee - D 27.95
Rally Speedway - Cart ... 34.95
Ultima III - D 41.95
Miner 2049'er - Cart 34.95
Scraper Caper - Cart ... 34.95
Basic XL - Cart 74.95
Monkey Wrench II - Cart . 49.95
Omnimon 82.95

BOOKS

Compute's First Bk/Games 12.95
Inside Atari DOS 19.95
Mapping the Atari 14.95
Machine Language/ Beginners 14.95
Your Atari Computer ... 16.95
The Atari Assembler 12.95
Visicalc Book-Atari 14.95

ACCESSORIES

WICO Joystick .... Call
Flip 'n' File Trunks 20.95
Flip 'n' File Cart 20.95
Joysensor 24.95
Elephant Disks (Box of 10) 20.00
WICO Trakball 37.95
KRAFT Joystick 15.95

D - Disk T - Cassette C - Cartridge

ComputAbility™

To Order Call Toll Free
800-558-0003

For Technical Info, Order Inquiries, or for Wisc. Orders -
414-351-2007

NO SURCHARGE FOR MASTERCARD OR VISA

COMPUTABILITY
P.O. Box 17882
Milwaukee, WI 53217

MasterCard VISA

ORDER LINES OPEN
Mon-Fri 11 AM - 7 PM CST
Sat 12 PM - 5 PM CST

ORDERING INFORMATION For fast delivery send cashier's check, money order or direct bank transfers. Personal and company checks allow 2 weeks to clear. Charges for COD are $3.00. School Purchase Orders welcome. In CONTINENTAL USA, include $3.00 shipping per software order. Include 3% shipping on all Hardware orders, minimum $3.00. Mastercard & Visa please include card # and expiration date. WI residents please add 5% sales tax. HI, AK, FPO, APO, Canadian orders - add 5% shipping, minimum $5.00. All other foreign orders, please add 15% shipping, minimum $10.00. All goods are new and include factory warranty. Due to our low prices, all sales are final. All defective returns must have a return authorization number. PLease call 414-351-2007 to obtain an RA# or your return will NOT be accepted for replacement or repair. Prices and availability are subject to change without notice.

Lyco Computer Marketing & Consultants

TO ORDER CALL US **TOLL FREE 800-233-8760**
in PA 1-717-327-1824

PERCOM
FOR ATARI COMPUTERS
- AT88S1 ....$299.00
- AT88S2 ....$535.00
- AT**S1PD...$439.00
- RFD40S1...$399.00
- RFD40S2...$675.00
- RFD44S1...$449.00
- AT88 doubler

HARD DISK DRIVES for APPLE IBM-PC
- 5MEG.....$1349.00
- 10MEG ...$1599.00
- 15MEG ...$1999.00
- 20MEG ...$2359.00

Add ... for TRS 80 Drives

TEXAS INSTRUMENT
Disk Drive...$245.00

TRAK DISK DRIVES
- AT-D1 ....$379.00
- AT-D2 ....$399.00
- PRINTER CABLE $22.95
- Software for ATD-2 ....$22.95

RANA DISK DRIVE

COMPUTER CARE
BIB
- 5¼ DISK DRIVE CLEANER $12.75
- COMPUTER CARE KIT $19.75

BLANK DISKETTES
ELEPHANT
- Single Side SD (10).......$17.75
- Single Side DD (10).......$21.75
- Double Side DD (10)......$26.75

MAXELL
- MD I (10)..................$28.75
- MD II (10) $38.75

CERTRON CASSETTES
- CC-10 12 for $15.99
- CC-20 12 for $17.99

INNOVATIVE CONCEPTS
- Disk Storage (holds 10)....$4.95
- Disk Storage (holds 15)....$9.95
- Disk Storage (holds 50)....$26.95

apple®

SSI
- Battle of Shilo $26.75
- Tigers in the Snow....$26.75
- Cosmic Balance $26.75
- Knights of the Desert. $26.75
- Battle for Normandy ..$26.75
- Germany 1985 ....$36.75

RANA DISK DRIVES
- Elite 1.............$295.00
- Elite 2.............$449.00
- Elite 3.............$559.00

MICRO-SCI
- A2 ....call
- A40..........................call
- A70..........................call

MUSE
- Castle Wolfenstein $20.75
- Caverns of Frietag $20.75
- Robot War.............$26.75

CONTINENTAL
- Home Accountant $51.75
- Book of Apple Software . $16.75

BRODERBUND
- Bank Street Writer....... $49.75
- AE $24.75
- LODE RUNNER D $24.75
- Choplifter $24.75
- David's Midnight.........$24.75

SPINNAKER
- Kindercomp...............$21.75
- Story Machine $23.75
- FaceMaker $23.75
- Snooper Trooper.........$29.75
- Delta Drawing............$34.75

EPYX
- Temple of Apshai..........$26.95
- Star Warrior $26.95
- Crush, Crumble & Chomp . $22.75

ADVENTURE
- Saga#1 Adventureland ...$29.95
- Saga#2 Pirate Adventure.$29.95
- Saga#3 Secret Mission...$29.95
- Stone of Sisyphus $24.95

ALIEN GROUP
- Atari Voice Box $99.00
- Apple Voice Box.........$129.00

commodore

- 1212 Programmers Ad.$44.75
- 1213 Vicmon.........$44.75
- Vic 20 dust cover.......$6.99
- Vic 64 dust cover.......$6.99

TIMEWORKS
- INVENTORY..............$59.75
- ACCOUNTS REC $59.75
- ACCOUNTS PAY $59.75
- GENERAL LEDGER.......$59.75
- PAYROLL.................$59.75
- CASH FLOW $59.75
- SALES ANALYSIS.........$59.75
- ELEC. CHECKBOOK.......$59.75
- MONEY MANAGER $59.75
- DATA MANAGER..........$59.75
- WALL STREET $59.75

HES 64
- Sound Box $9.95
- 64Forth $55.75
- Hesmon...................$25.75
- Turtle Graphics........$37.75
- Heswriter $28.75
- Gridrunner $19.75
- Attack of M C $22.75
- Turtle Trainer $22.75
- Turtle Tutor $22.75
- Paint Brush $22.75
- Benji $25.75
- Home Manager...........$28.75
- Time Money Mgr $44.97
- OmniCalc $33.75
- Sword Point.............$19.95
- Hes Modem..............$52.75

CARDCO
- Cardprinter / LQ1.......$499.00
- Cardprint DM1 ....$109.00
- 5 Slot Expansion 64 .....$54.00
- 64 Write NOW............$39.00
- 64 Mail NOW.............$29.00
- 2J Write NOW.............$29.00
- 64 Keypad $29.00
- Universal Cass. Int.......$29.75
- Printer Utility.............$19.75
- 6 Slot Expansion.........$79.95
- 3 Slot Expansion.........$24.95
- PRINTER INTERFACE........$39.75
- PRINTER INTERFACE with full graphics $65.75
- LIGHT PEN $29.75

PARKER 20
- Frogger (ROM)............$33.75
- QBert (ROM) $33.75
- Tutankham (rom) $33.75

SPINNAKER 64
- Kindercomp................$21.75
- Story Machine $23.75
- Face Maker $23.75
- Snooper Trooper...........$29.75
- Delta Drawing.............$34.75
- Shamus II c/d $24.95
- Pinhead c/d $22.95

QUICK BROWN FOX
- QBF Word Processor $49.95

LJK
- Letter Perfect............$105.00
- Data Perfect..............$95.00

ADVENTURE INTERNATIONAL
- S. Adams Adventure $28.75

VIC-64
- Household Finance C/D ..$24.75

VIC 20
- King Arthurs Heir Cass $24.75
- Monster Maze Rom $24.75

ATARI®
Computers for people.

- 600XL ...$CALL
- 800XL........for
- 1400XL...Lowest
- 1450 .....Prices
- 1020 PRINTER..........NOW
- 1025 PRINTER.............IN
- 1027 PRINTER ....STOCK
- 1050 DISK DRIVE ....$SAVES
- 1010 RECORDER......$74.75

SYNAPSE
- BLUE MAX C/D $24.75
- Ft. APOCALYPSE C/D...$24.75
- PHAROAH'S CURSE C/D...$24.75

FIRST STAR
- ASTRO CHASE C/D....$22.75
- BRISTOLS C/D.........$22.75
- FLIP FLOP C/D $22.75

ALIEN GROUP
- Voice Box 2 . $99.75

DON'T ASK
- Sam $41.75
- Abuse $15.95
- Teleatri......$27.95
- Poker Sam ..$24.95

APX
- 3R Math $19.95
- Typo Attack $24.95
- Family Budget $19.95
- F. Cash Flow............ $19.95

BRODERBUND
- Bank Street Writer D...... $49.75
- AE D....................... $24.75
- Apple Panic D.............. $23.75
- Choplifter ROM $32.75
- David's Midnight.......... $24.75
- Stellar Shuttle C/D....... $18.75
- Ft. Apocalypse $24.75

EPYX
- GATEWAY TO ASPHI R.............$28.75
- JUMPMAN JR R $28.75
- PIT STOP R $28.75
- GATEWAY TO

SSI
- Battle of Shilo C/D.. ......$26.75
- Tigers in the Snow C/D....$26.75
- Battle for Normandy C/D ..$26.75
- Knights of the Desert C/D .$26.75
- Cosmic Balance C/D $26.75

ON-LINE
- Frogger $24.95
- Wizard & Prin $26.95

ROKLAN
- Wizard of War..............$29.75
- Gorf $29.75
- Delux Invader $27.95

BIG 5
- Miner 2049................ $32.75

EASTERN HOUSE
- Monkey Wrench 2 ....$52.75

BRODERBUND
- LODE RUNNER D......$24.75
- OPERATION WIRLWIND D $29.75
- DROL D $24.75

PARKER BROTHERS
- Tutankham R............$33.75
- Super Cobra R $33.75
- Astro Chase R...........$33.75
- Frogger R $33.75
- QBert R $33.75
- Popeye R.................$33.75
- Risk R $42.75
- Chess R $42.75

SPINNAKER
- Story Machine R $26.75
- Face Maker R $24.75
- Kinderomp R.............$20.75
- Fraction Fever R $24.75
- Delta Drawing R.........$26.75

Lyco Computer Marketing & Consultants

TO ORDER CALL US **TOLL FREE 800-233-8760**
In PA 1-717-327-1824

PRINTER INTERFACING
Available for IBM PC, Apple, Atari, Vic 20 & Vic 64

PRINTER PAPER AVAILABLE

SAVE on these in-stock PRINTERS

LETTER QUALITY

SMITH CORONA TP2...$449.00

DIABLO 630 ..$1719.00

ALPHACOM 42	$89.00
ALPHACOM 81	$129.00
NEC 8023	$369.00
NEC 8025	$699.00
NEC PC-8200 COMPUTER	$CALL

EPSON

RX-80	$SAVE$
RX-80FT	ON
FX-80	In-Stock
FX-100	EPSON
MX-80FT	PRINTERS
MX-100	$$CALL$$

MANNESMANN TALLY

SPIRIT 80	$CALL
MT 160L	$CALL

OKIDATA

80	$SAVE$
82A	CALL for
83A	LOWEST
84	PRICES
92	on these
93	In-Stock
PACEMARK 2350	PRINTERS

ATARI 850 REPLACEMENTS IN-STOCK

CITOH

GORILLA GX100	$179.00
PROWRITER 8510	$339.00
PROWRITER II	$659.00
8600	$1025.00
STARWRITER	$1099.00
PRINTMASTER	$1499.00

STAR MICRONTICS

GEMINI 10X	$269.00
GEMINI 15X	$CALL
DELTA 10	$479.00

MODEMS

ANCHOR MARK I	$79.00
ANCHOR MARK II	$79.00
HAYES SMART	$239.00
HAYES MICRO II	$309.00
Micro Bit MPP-1000	$129.75
NOVATION	
CAT	$144.00
D-CAT	$155.00
J-CAT	$115.00
APPLE CAT II	$279.00
212 APPLE CAT	$589.00

CORDLESS TELEPHONES from ... $69.75

MONITORS

Sakata Color	$229.00
Amdek Color I	$275.00
Amdek 300 Green	$149.00
Amdek 300 Amber	$149.00
Gorilla Green	$99.00

DUST COVERS

800	$3.99
400	$3.99
1200	$3.99
410	$3.99
810	$3.99
1050	$5.99
PROWRITER	$5.99
GEMINI 10X	$5.99
PERCOM DISK	$5.99
VIC 20/64	$5.99

apple

APPLE DUMPLING GX	$99.75
APPLE DUMPLING 64 (16 Buffer)	$179.75
INFOCOM	
Zork I, II, or III	$26.75
Deadline	$33.75

commodore

HES 20

HES MON Rom	$25.75
Turtle Graphics	$25.75
HES Writer	$25.75
Shamus	$25.75
Protector	$25.75

VIC 64/20

PACMAN	$33.75
DONKEY KONG	$33.75
DIG DUG	$33.75
DEFENDER	$33.75
CENTIPEDE	$33.75

FIRST STAR 64

BRISTOLS C/D	$22.75
FLIP FLOP C/D	$22.75

SYNAPSE 64

ZEPPELIN C/D	$24.75
BLUE MAX C/D	$24.75
DIMENSION X C/D	$24.75

EPYX 64

ASPHI R	$28.75
JUMPMAN JR R	$28.75
PIT STOP R	$28.75

BRODERBUND 64

BANK STREET WRITER	$49.75
CHOPLIFTER	$24.75
LODE RUNNER	$24.75
DROL	$24.75

KOALA TOUCH TABLET...$69.75

PERCOM

AT88S1 ..$299.00
RDF44SI $449.00

GEMINI 10 .... $269.00

	IBM	ATARI	APPLE
PACMAN	$27.95	$29.75	$27.95
DONKEY KONG	$27.95	$29.75	$27.95
DIG DUG	$27.95	$29.75	$27.95
DEFENDER	$27.95	$29.75	$27.95
CENTIPEDE	$27.95	$29.75	$27.95
KOALA TOUCH TABLET	$99.75	$69.75	$84.75
DEADLINE	$34.75	$34.75	$34.75
ENCHANTER	$34.75	$34.75	$34.75
INFIDEL	$34.75	$34.75	$34.75
PLANETFALL	$34.75	$34.75	$34.75
STAR CROSS	$34.75	$34.75	$34.75
SUSPENDED	$34.75	$34.75	$34.75
WITNESS	$34.75	$34.75	$34.75
ZORK I	$34.75	$34.75	$34.75
ZORK II	$34.75	$34.75	$34.75
ZORK III	$34.75	$34.75	$34.75

48K RAM $75.00
64K RAM $99.00

ATARI WRITER $79.00

BUSINESS

Visicalc	$159.75
Letter Perfect	$89.75
Letter Perfect	$89.75
Data Perfect	$89.75
TEXT WIZZARD	$34.75
SPELL WIZZARD	$34.75
File Manager	$69.75
Home File Mgr	$69.75
Bookeeper	$119.75
C.R.I.S.	$199.75

ATARI Computers for people.

MasterCard VISA

TO ORDER

CALL TOLL FREE
800-233-8760

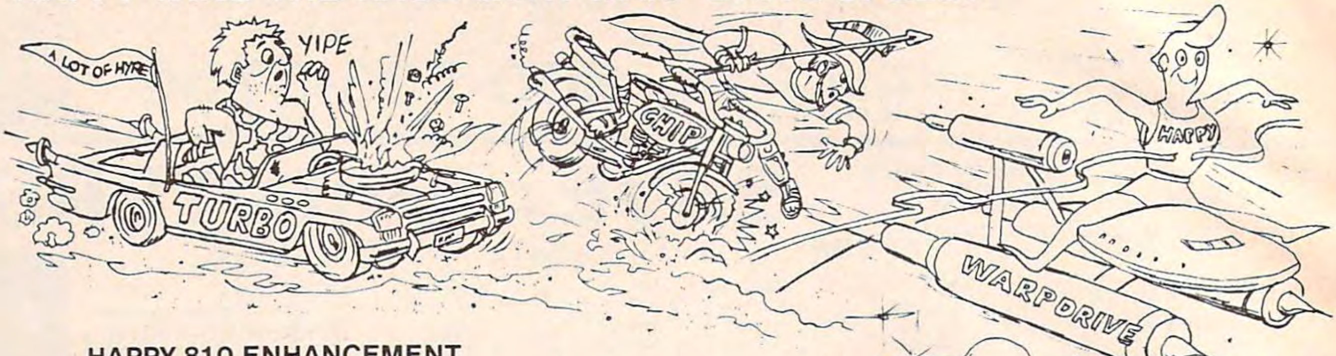
or send order to
Lyco Computer
P.O. Box 5088
Jersey Shore, PA 1774C

Customer Service 1-717-327-1825

POLICY

In-stock items shipped within 24 hours of order. Personal checks require four weeks clearance before shipping. No deposit on C.O.D. orders. Free shipping on prepaid cash orders within the continental U.S. PA residents add sales tax. All products subject to availability and price change. Advertised prices show 4% discount offered for cash, add 4% for Master Card or Visa. DEALER INQUIRIES INVITED.

HAPPY WINS THE RACE WITH WARP DRIVE SPEED!



HAPPY 810 ENHANCEMENT

- The only change needed to run all WARP DRIVE software
- Plug in P.C. board requires no permanent modifications
- Proven reliable in thousands of installations, reduces disk drive wear
- Comes completely assembled and tested, just plug in and use
- Full one year parts and labor guarantee, compatible with existing software
- High quality printed circuit board with gold connectors

NO ONE ELSE HAS THIS PERFORMANCE
Unenhanced whole disk (ATARI rev B format) read time: 112 seconds
Unenhanced whole disk (ATARI rev C fast format) read time: 89 seconds
ENHANCED 810 whole disk (any format) read time with standard software: 68 seconds
ENHANCED 810 whole disk (any format) read time with WARP DRIVE software: 43 seconds
Standard software whole disk write and verify time: 238 seconds
WARP DRIVE software whole disk write and verify time: 62 seconds

NEW HAPPY WARP DRIVE SOFTWARE

WARP SPEED HAPPY BACKUP PROGRAM
- Completely automatic: nothing to figure out, insert disks and press return
- Only program on the market guaranteed to backup any disk
- Can write to a blank disk: format write and verify in one operation
- Automatic program tracing: copies only the tracks that are used
- Efficient memory utilization: reduces the number of disk insertions
- Requires only one ENHANCED disk drive, backups will work on a standard drive

WARP SPEED MULTI DRIVE HAPPY BACKUP PROGRAM
- Same features as above plus support of multiple ENHANCED drives
- Can be used with up to 4 ENHANCED drives
- Source and all destination drives read and write in parallel
- Format write and verify 3 complete disks in less than 3 minutes

WARP SPEED HAPPY COMPACTOR PROGRAM
- Reduces the number of disks required to backup your library
- Combines up to 8 self booting disks into 1 disk with a menu
- Compacted disks run only on an ENHANCED drive
- Pays for itself by saving on disks
- Single or dual ENHANCED drive operation

HAPPY WARP DRIVE DOS
- Improves ATARI DOS 2.0S to use warp speed reading and write with verify
- Use all features of BASIC, PILOT, FMS, and DUP at top warp speed
- Warp speed I/O software module available separate from DOS

HAPPY WARP DRIVE SECTOR COPY PROGRAM
- Standard format whole disk read, write and verify in 105 seconds
- Use with sngle or dual drives, mix ENHANCED and NON-ENHANCED drives

HAPPY CUSTOMIZER PROGRAM (sold separately $99.95)
- Creates custom format disks of any specification
- Any type bad sector, duplicate sector numbers, or interleave
- Easy to use but requires an advanced level user to interpret the results

REVIEWED IN POPULAR MAGAZINES

A.N.A.L.O.G. COMPUTING—July/August 1983 *"...The installation instructions for the Happy 810 Enhancement are among the best I have ever seen. ... The Happy 810 Enhancement is one of the most powerful hardware modifications available to ATARI computer owners."*

ANTIC—July 1983 *"The difference between a normal ATARI 810 disk drive and one equipped with Happy is like the contrast between mass transit and the automobile. A car costs you more initially, but improves the quality of your life. Similarly, if you use your disk drive a lot, installing Happy will markedly enhance your programming life."*

SPECIAL SUGGESTED RETAIL PRICE BEFORE FEBRUARY 28, 1984: *Get the HAPPY 810 ENHANCEMENT with the single and multi drive HAPPY BACKUP PROGRAM, plus the HAPPY COMPACTOR PROGRAM, plus the HAPPY DRIVE DOS, plus the HAPPY SECTOR COPY, all with WARP DRIVE speed, including our diagnostic for $249.95. Existing registered ENHANCEMENT owners may upgrade to WARP DRIVE speed for $15.00 with no hardware changes!*

Price includes shipping by air mail to U.S.A. and Canada. Foreign orders add $10.00 and send an international money order payable through a U.S.A. bank. California orders add $16.25 state sales tax. Cashiers check or money order for immediate shipment from stock. Personal checks require 2-3 weeks to clear. Cash COD available by phone order and charges will be added. No credit card orders accepted. ENHANCEMENTS for other ATARI compatible drives coming soon, call for information. Please specify -H model for all drives purchased new after February 1982, call for help in ENHANCEMENT model selection. Dealers now throughout the world, call for the number of the dealer closest to you.

ATARI 810 is a registered trademark of Atari, Inc.

HAPPY COMPUTERS, INC. • P. O. Box 1268 • Morgan Hill, California 95037 • (408) 779-3830 computer case company

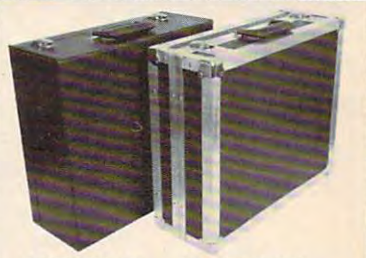
A FLYING COMPUTER DESERVES THE BEST...

FOR PROTECTION AND SECURITY GO WITH TRAV·L·CASE

The Computer Case Company provides top quality cases to satisfy virtually every need of the microcomputer owner. Choose the original Comp-Case for compact, light local transportation or the new Trav-L-Case, which provides the ultimate in protection, for long distance transportation at a price you can afford and in a size which is easy to handle. Over 100 configurations to choose from.

CALL TODAY 1-800-848-7548

5650 Indian Mound Court
Columbus, OH 43213



COMP-CASE TRAV-L-CASE

COMMODORE 64 SOFTWARE

Access
Beach-Head ... 26.95
Neutral Zone ... 26.95

Avalon Hill
Telengard ... (C)16.75(D)20.50
B-1 Bomber ... (C)11.75(D)15.30
Nukewar ... (C)11.75
Midway Campaign ... (C)11.75
T.A.C. ... (D)28.00
Computer Football ... (C)11.75(D)15.30
Flying Ace ... (C)19.00
Stocks and Bonds ... (C)15.00
T.G.I.F. ... (C)15.00(D)18.25

Broderbund
Choplifter ... (CT)27.00
Sea Fox ... (CT)27.00
Serpentine ... (CT(27.00
David's Midnight Magic ... (D)27.00
A.E. ... 27.00

CDS
Frantic Freddy ... 26.95
Pegasus ... 26.95

Commodore
Assembler 64 ... (D)16.90
Bonus Pack ... (D,C)16.90
Codewriter ... (D)47.90
CP/M 2.2 System ... (CT)69.00
Easy Script ... (D)43.00
Easy Mail 64 ... (D)16.90
Easy Spell 64 ... (D)16.90
Easy Calc 64 ... (D)73.75
Easy Lesson/Quiz ... (D)16.90
Easy Finance (1-5) ... (D)19.35
Logo ... (D)47.90
Pilot ... (D)47.90
Pet Emulator ... (D)16.90
Intro to Basic I ... (C)19.35
Screen Editor ... (D)16.90
Super Expander VSP ... (CT)19.50
The Manager ... (D)43.00
Simons Basic ... (D)19.50
Music Machine ... (CT)16.90
Music Composer ... (D)16.90
Word/Name Machine ... (D)16.90
Zortek and the Microchips ... (C)24.80
Inventory Mgmt. ... (D)43.00
Payroll/Checkwriting ... (D)43.00
Accts. Payable ... (D)43.00
Accts. Receivable ... (D)43.00
Gen. Ledger ... (D)43.00
Nevada Cobol ... (D)47.90
Magic Desk ... (CT)74.95
Zork (1-3) ... (D)29.50
Suspended ... (D)29.50
Starcross ... (D)29.50
Deadline ... 29.50
Wizard of Wor ... (CT)21.50
Gorf ... (CT)21.50
Dragons Den ... (CT)24.95
Star Ranger ... (CT)24.95

Continental
Home Accountant ... 50.75
Tax Advantage ... 40.60
F.C.M. ... 76.50

Creative Software
Spitball ... 23.65
Pipes ... 23.65
Decision Maker ... (C)10.15(D)13.50
Household Finance ... (C)13.50(D)16.90
Home Inventory ... (C)10.15(D)13.50
Loan Analyzer ... (C)10.15(D)13.50
Moondust ... (CT)23.65
Astroblitz ... (CT)23.65
Trashman ... (CT)23.65
Save New York ... (CT)23.65

Cyber
Cyberchess ... 34.95

Cymbal
English/Spanish ... 34.95
Preschooler ... 34.95
Science ... 34.95
History/Geography ... 34.95
Music Theory ... 34.95
Mathematics ... 34.95
Trivia ... 34.95

Datasoft
Moonshuttle ... (D,C)20.30
Poo Yan ... (D,C)20.30
Genesis ... (D)27.00
O'Riley's Mine ... (D)20.30
Bruce Lee ... 27.00

Epyx
Pitstop ... (CT)27.00
Temple of Apshai ... (D)27.00
Upper Reaches of Apshai ... (D)13.55
Curse of Ra ... (D)13.55
Sword of Fargoal ... (D)20.30
Jumpman ... (D,C)27.00
Gateway to Apshai ... (D)27.00
Exidy Arcade Classics ... 27.00
Jumpman Jr. ... (CT)27.00

Hes Software
Hes Mon 64 ... (CT)27.00
Turtle Graphics II ... (CT)40.60
Attack of the Mutant Camels ... (CT)20.45
Time Money Manager ... (D)51.00
Omniwriter ... 54.95
Omni Calc ... (D)58.25
Type 'N Writer ... 24.20
Synthesound 64 ... (D)25.50
Multiplan ... 79.95
Hes Writer 64 ... (CT)30.45
Gridrunner ... (CT)20.25
Benji Space Rescue ... (D)30.45

Micro Learn
SAT English I ... 22.75
SAT Math I ... 22.75
Dino Eggs ... 30.30

Micro Prose
Floyd of the Jungle ... (D)23.95
Hellcat Ace ... (D)23.95
Solo Flight ... 26.95
Nato Commander ... 26.95
Wingman ... 26.95
Ming Alley Ace ... 26.95

Sierra on Line
Frogger ... (D,C)23.65
New Jawbreaker ... (D)20.30
Sammy Lightfoot ... (D)21.80
Threshold ... (D)21.80
Lunar Leeper ... (D)21.80
B.C. Qst for Tires ... (D)25.50
O.i's Well ... (D(21.80
Learning W/Leeper ... (D)21.80

Sirus Software
Turmoil ... (D)27.00
Snake Byte ... (D)27.00
Squish 'Em ... (D)23.65
Repton ... (D)27.00
Blade of Blackpoole ... (D)27.00
Type Attack ... (D)27.00
Way Out ... 27.00
Critical Mass ... 27.00

Spinnaker
Face Maker ... (D)23.65
Hey Diddle Diddle ... (D)20.30
Kindercomp ... (D)20.30
Snooper Troops ... (D)27.00
Fraction Fever ... (D)23.65
Amazing Thing ... (D)27.00
Alphabet Zoo ... 23.65
Kids on Keys ... 23.65
Delta Drawings ... 27.25
Up for Grabs ... 27.25
Cosmic Life ... 23.65
Trains ... 27.95
Aerobics ... 30.95

Synapse
Ft. Apocalypse ... (D,C)23.70
Shamus ... (D,C)23.70
Blue Max ... (D,C)23.70
Dimension X ... (D,C)23.70

SSI
Combat Leader ... (D)29.00
Knights of the Desert ... (D)29.00
Computer Baseball ... (D)29.00
Eagles ... (D)29.00
Ring Side Seat ... (D)29.00

Timeworks
Dungeons of Algebra Dragons ... (D,C)19.10
Robbers of the Lost Tomb ... (D,C)19.10
Wall Street ... (D,C)19.10
Money Manager ... (D,C)19.10
Electronic Checkbook ... (D,C)19.10
Word Pro 3 + ... 65.00

commodore
Commodore 64
1541 Disk Drive
1530 Datasette
MPS 801 Printer
1650 Automodem
1702 Color Monitor
1600 Modem
RS 232 Interface
3 Port Expander
6 Port Expander
64 Prog. Ref. Guide
CALL FOR CURRENT PRICE

COLECO
Adam Computer system ... 595.00
Adam Computer Module ... 445.00

Diskettes
BASF 5¼" SSDD 2 Pak ... 5.50
BASF Soft Box (10) ... 23.80

Joysticks
Pointmaster ... 10.95
Pointmaster Pro ... 18.55
Fire Control ... 7.85
Wico Command Ctrl. ... 19.50
Wico "Boss" ... 13.50

Cardco
Card +G ... 68.25
Card A ... 60.50
Card B ... 37.85
Cass. Interface ... 33.25
5 Slot Expansion ... 60.50
Numeric Keypad 30.25

Koala
Koala Touchtablet (D)79.95
GEMINI PRINTERS
O'SULLIVAN FURNITURE
CALL FOR INFORMATION

Terms and Ordering Information: To order call 1-800-527-8698 and send certified checks, money orders or personal checks [allow 2 weeks to clear], or use your Visa, Master Card or American Express. Inside Texas call 1-800-442-8717. Include $2 for P & H [C.O.D. orders add $1.65] UPS Blue Label $4. Canada $6 call for shipping charges on Hardware. Other countries include 10% for P & H. All products factory sealed with manufacturer's warranty. All returns require R.A.#. Prices subject to change without notice. Order desk hours: Mon-Fri 9-6, Sat 9-1 CST.

ATARI, APPLE, VIC 20, T.I., SOFTWARE LISTS AVAILABLE
For further information and inquires call 214-753-0485
FOR ORDERS ONLY CALL TOLL FREE
Outside Texas 1-800-527-8698
Inside Texas 1-800-442-8717

SoftWare Warehouse outlet

P.O. BOX 2511
LONGVIEW, TX.
75606

PRODUCT MART

COMPUCAT
Catalog of Computers and Supplies

Our prices are **WHOLESALE + 10%**
Samples!!!
ATARI 850 INTERFACE — $220
Compucat — $163
ATARI 1027 PRINTER — $350
Compucat — $265

We support the complete **ATARI** and **COMMODORE** product lines.
Ask for our free price list.

You may order in the regular manner or download our *TeleCatalog* and order from your computer or terminal.

(408) 353-1836

Instant shipping (or as fast as we can). *Mastercard & Visa Accepted* (no extra charge). Shipping & handling add 5%. California customers add 6.5% sales tax. Order by *phone* (Mon. - Fri. 10 am - 5 pm PST). Order by *modem* (daily 6 pm - 9 am) from our online TeleCatalog.

COMPUCAT
24500 Glenwood Hwy., Los Gatos, CA 95030

DUST COVERS

For Personal Computers, Peripherals, Game Units–Protective, Long-Lasting Vinyl Resists Both Dust and Liquids.

— CHOICE OF COLORS —

Amdek	IBM PC
Apple	Mattel
Atari	Rana Systems
BMC	Sanyo
Commodore	Star Micronics
Coleco	TI 99/4
Epson	TRS 80
Franklin Ace	*PLUS OTHERS*

GROUP/VOLUME DISCOUNTS AVAILABLE

FOR **FREE BROCHURE** WRITE:
ENCHANTED FOREST
P.O. Box 5261, Newport Beach, CA 92662
(1129 W. Balboa Blvd.)

Dealer Inquiries Invited

FLY Your Computer

FLIGHT SIMULATOR GAMES

NEW **COCKPIT 64**
For the Commodore 64
- 100% Machine Language
- Windshield View
- 7 Airports

$30.

Runway 64 (Commodore 64)	**$25**
Runway 20 (VIC-20)	**$25**
Sky Pilot (VIC-20)	**$18**

ADD $2⁰⁰ FOR DISK VERSION

SUSIE SOFTWARE
709 Wilshire Dr. Mt. Prospect, IL 60056
(312) 394-5165

(M)agreeable™

software

TAX HELPER™
Commodore 64™

Tax HELPER 1.83 performs all arithmetic for Form 1040 and Schedules A, B, and G. Does not calculate tax. Saves results to diskette. Diskette: $17.00 plus $1.25 shipping.

Tax HELPER 2.83 also does Schedules C, D, E, F, G, SE, and W and Form 4562. Calculates tax, prints reports, and more. Diskette: $30.00 plus $1.25 shipping.

(M)agreeable software, inc.
5925 Magnolia Lane • Plymouth, MN 55442
(612) 559-1108

HELPER is a trademark of (M)agreeable Software, Inc.
Commodore is a trademark of Commodore Electronics Ltd.

COMPUTE!
TOLL FREE Subscription Order Line
800-334-0868
In NC 919-275-9809

NEW FOR ATARI
CALORIE AND NUTRITION GUIDE
$39.95

* Analyze 14 vitamins and minerals
* Over 500 foods
* Calculates total calories
* Add or change foods
* Design low calorie diets
* Analyze recipes

Requires 48K memory and 1 disk drive. ATARI 825 printer optional.

Send check or money order to:
V & L ENTERPRISES
P.O. BOX 9667
ALEXANDRIA, VA. 22304
Virginia residents add 4% sales tax
Atari TM of Atari Inc.

Advertise your program or product here and reach hundreds of thousands of readers.

For more information on products advertised in **COMPUTE!**, use the handy reader service cards in the back of the magazine.

Advertisers Index

COMPUTE!

For Fastest Service, Call Our **Toll-Free** US Order Line **800-334-0868** **In NC call 919-275-9809**

My Computer Is:
☐ PET ☐ Apple ☐ Atari ☐ VIC-20 ☐ Commodore 64
☐ TI-99/4A ☐ Timex/Sinclair ☐ Radio Shack Color Computer
☐ Other ______________ ☐ Don't yet have one ...

☐ $24.00 One Year US Subscription
☐ $45.00 Two Year US Subscription
☐ $65.00 Three Year US Subscription

(Readers outside of the US, please see our foreign readers subscription card or inquire for rates).

Name
Address
City State Zip
☐ Payment Enclosed ☐ Bill me
☐ VISA ☐ MasterCard ☐ American Express
Account No. ______________ Expires ______/______

Your subscription will begin with the next available issue. Please allow 4-6 weeks for delivery of first issue. Subscription prices subject to change at any time.
The COMPUTE! subscriber list is made available to carefully screened organizations with a product or service which may be of interest to our readers. If you prefer not to receive such mailings, please check this box. ☐ 343201

COMPUTE! Books

Quan.	Title	Price	S/H	Total
____	Machine Language for Beginners	$14.95	+ $2.00	____
____	Home Energy Applications	14.95	+ 2.00	____
____	COMPUTE!'s First Book of VIC	12.95	+ 2.00	____
____	COMPUTE!'s Second Book of VIC	12.95	+ 2.00	____
____	COMPUTE!'s First Book of VIC Games	12.95	+ 2.00	____
____	COMPUTE!'s First Book of 64	12.95	+ 2.00	____
____	COMPUTE!'s First Book of Atari	12.95	+ 2.00	____
____	COMPUTE!'s Second Book of Atari	12.95	+ 2.00	____
____	COMPUTE!'s First Book of Atari Graphics	$12.95	+ $2.00	____
____	COMPUTE!'s First Book of Atari Games	12.95	+ 2.00	____
____	Mapping The Atari	14.95	+ 2.00	____
____	Inside Atari DOS	19.95	+ 2.00	____
____	The Atari BASIC Sourcebook	12.95	+ 2.00	____
____	Programmer's Reference Guide for TI-99/4A	14.95	+ 2.00	____
____	COMPUTE!'s First Book of TI Games	12.95	+ 2.00	____
____	Every Kid's First Book of Robots and Computers	4.95	+ 1.00	____
____	The Beginner's Guide to Buying A Personal Computer	3.95	+ 1.00	____

For Fastest Service Call Our **TOLL FREE** US Order Line **800-334-0868**. In NC call 919-275-9809.
All orders must be prepaid (money order, check, or charge). All payments must be in US funds. NC residents add 4% sales tax.
☐ Payment enclosed. Please charge my: ☐ VISA ☐ MasterCard ☐ American Express
Acc't. No. Expires
Name
Address
City State Zip
Country
Allow 4-5 weeks for delivery. For air mail outside US: $5.00 3456789101112C

COMPUTE!

Foreign Readers

Subscription rates outside the US:
☐ $30.00 Canada
☐ $42.00 Europe, Australia, New Zealand/Air Delivery
☐ $52.00 Middle East, North Africa, Central America/Air Delivery
☐ $72.00 South America, South Africa, Far East, Elsewhere/Air Delivery
☐ $30.00 International Surface Mail (lengthy, unreliable delivery)

Name
Address
City Postal Code
Country

Payment must accompany this card.
Payment in US Funds drawn on a US Bank; International Money Order; or charge card: ☐ VISA ☐ MasterCard ☐ American Express
Account No. ______________ Expires ______/______

Your subscription will begin with the next available issue. Please allow 4-6 weeks for delivery of first issue. Subscription prices subject to change at any time.
The COMPUTE! subscriber list is made available to carefully screened organizations with a product or service which may be of interest to our readers. If you prefer not to receive such mailings, please check this box. ☐ 343201

The Editor's Feedback:

Computer: ☐ PET ☐ Apple ☐ Atari ☐ VIC-20 ☐ Commodore 64
☐ TI-99/4A ☐ Timex/Sinclair ☐ Radio Shack Color Computer
☐ Other ______________ ☐ Don't yet have one ...

Are you a COMPUTE! Subscriber? ☐ Yes ☐ No I would like to see:

More	Just Right	Fewer	
☐	☐	☐	Specific applications programs.
☐	☐	☐	BASIC programs.
☐	☐	☐	Machine language programs.
☐	☐	☐	Tutorials.
☐	☐	☐	Educational articles.
☐	☐	☐	Detailed explanations of programs.
☐	☐	☐	Games.
☐	☐	☐	Reviews of game software.
☐	☐	☐	Reviews of business software.
☐	☐	☐	Reviews of educational software.
☐	☐	☐	Reviews of hardware.

What do you like best about COMPUTE! ?

What do you like least?

3456789101112C

Place
Postage
Here

COMPUTE! Magazine
P.O. Box 914
Farmingdale, NY 11737

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

COMPUTE! Magazine
P.O. Box 914
Farmingdale, NY 11737

Place
Postage
Here

COMPUTE! Magazine
P.O. Box 5406
Greensboro, NC 27435-0406

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

COMPUTE! Books
Post Office Box 5406
Greensboro, NC 27403

COMPUTE!'s FREE Reader Information Service

Use these cards to request FREE information about the products advertised in this issue. Clearly print or type your full name and address. Only one card should be used per person. Circle the numbers that correspond to the key number appearing in the advertisers index.

Send in the card and the advertisers will receive your inquiry. Although every effort is made to insure that only advertisers wishing to provide product information have reader service numbers, COMPUTE! cannot be responsible if advertisers do not provide literature to readers.

Please use these cards *only* for subscribing or for requesting product information. Editorial and customer service inquiries should be addressed to: COMPUTE!, P.O. Box 5406, Greensboro, NC 27403. Check the expiration date on the card to insure proper handling.

Use these cards and this address only for COMPUTE!'s Reader Information Service. Do not send with payment in any form.

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new U.S. subscription to COMPUTE!: you will be billed for $24.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration 5/31/84 CO384

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new U.S. subscription to COMPUTE!: you will be billed for $24.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration 5/31/84 CO384

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new U.S. subscription to COMPUTE!: you will be billed for $24.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration 5/31/84 CO384

Place
Postage
Here

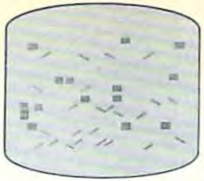
COMPUTE! Reader Service
P.O. Box 11747
Philadelphia, PA 19101

Place
Postage
Here

COMPUTE! Reader Service
P.O. Box 11747
Philadelphia, PA 19101

Place
Postage
Here

COMPUTE! Reader Service
P.O. Box 11747
Philadelphia, PA 19101


Save UP TO 40% on COMPUTE!

Every issue of COMPUTE! contains up to 30 new programs and games. And a year's subscription brings them to you for less than 15 cents each! Plus you'll enjoy the most useful home computer advice, ideas and information anywhere! Subscribe now at up to 40% off the newsstand price. At less than 15 cents per program, this COMPUTE! offer is too good to pass up!

☐ 1 year $24—Save 32%! ☐ 2 years $45—Save 36%!
☐ 3 years $65—Save 40%!

Name ______________________

Address ______________________

City ____________ **State** ________ **Zip** ________

☐ Payment enclosed ☐ Bill me

Charge my ☐ Visa ☐ MasterCard ☐ American Express

______________________ ____/____

Account No. **Exp. date**

COMPUTE! brings you programs and games for the following machines: Atari, PET/CBM, VIC-20, TI 99/4A, Apple, Commodore 64, Radio Shack Color Computer, IBM PC and IBM PCjr.

343B01



Save UP TO 40% on COMPUTE!

Every issue of COMPUTE! contains up to 30 new programs and games. And a year's subscription brings them to you for less than 15 cents each! Plus you'll enjoy the most useful home computer advice, ideas and information anywhere! Subscribe now at up to 40% off the newsstand price. At less than 15 cents per program, this COMPUTE! offer is too good to pass up!

☐ 1 year $24—Save 32%! ☐ 2 years $45—Save 36%!
☐ 3 years $65—Save 40%!

Name ______________________

Address ______________________

City ____________ **State** ________ **Zip** ________

☐ Payment enclosed ☐ Bill me

Charge my ☐ Visa ☐ MasterCard ☐ American Express

______________________ ____/____

Account No. **Exp. date**

COMPUTE! brings you programs and games for the following machines: Atari, PET/CBM, VIC-20, TI 99/4A, Apple, Commodore 64, Radio Shack Color Computer, IBM PC and IBM PCjr.

343B01

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 914
Farmingdale, NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 914
Farmingdale, NY 11737