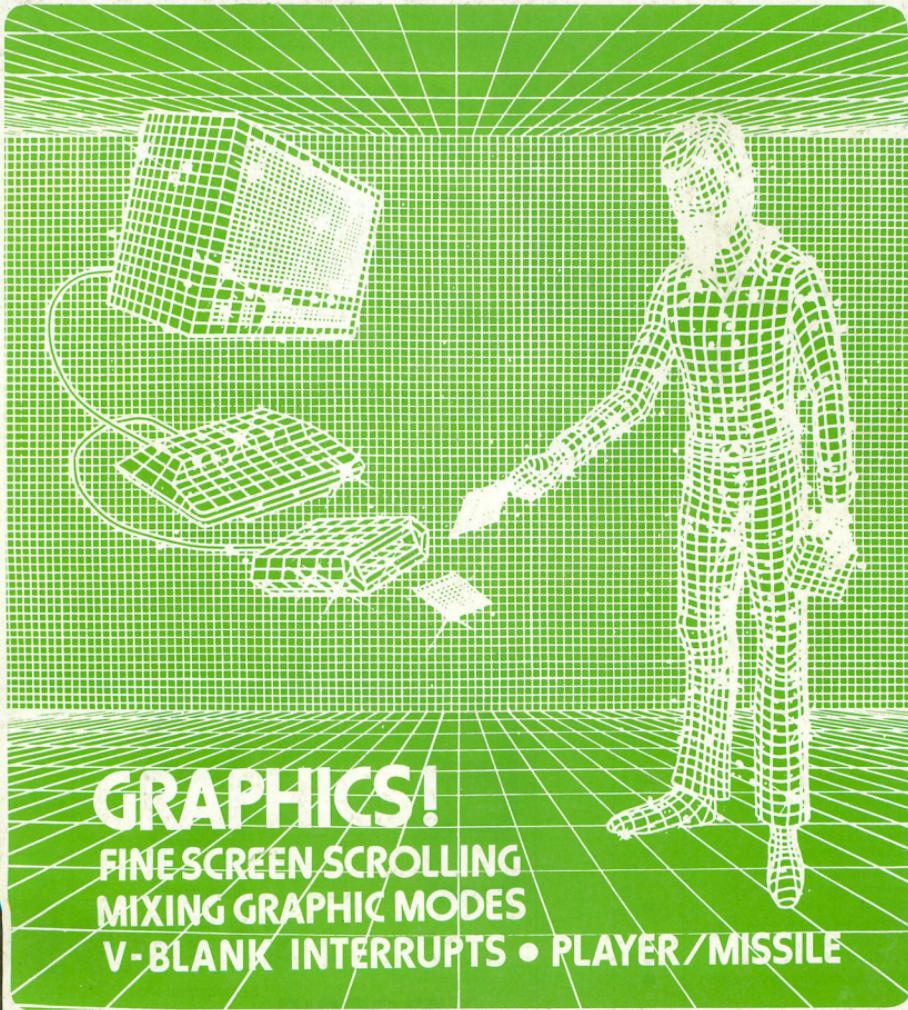


NUMBER 5

\$2.25

A.N.A.L.O.G. 400/800 MAGAZINE™

THE MAGAZINE FOR ATARI COMPUTER OWNERS

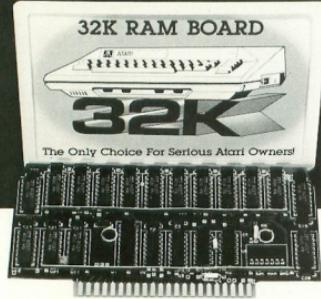


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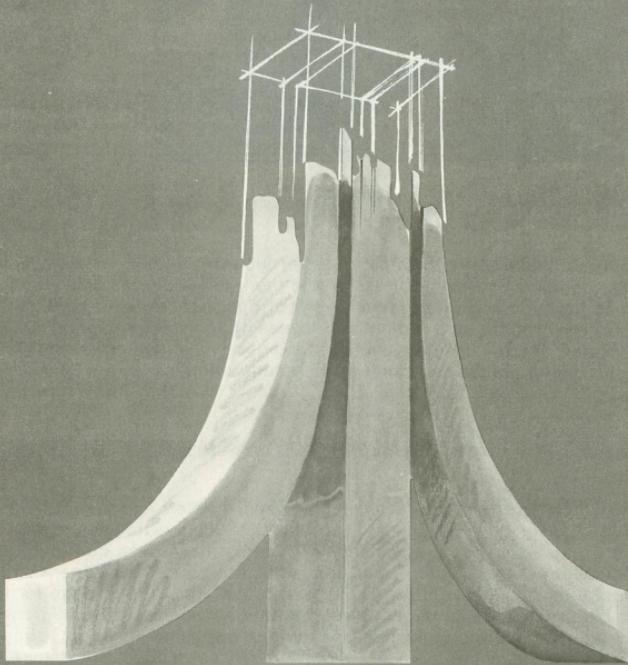
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ATTENTION PROGRAMMERS!

A.N.A.L.O.G. 400/800 Magazine is interested in programs, articles, and software review submissions dealing with the ATARI 400 and 800 home computers. If you feel that you can write as well as you can program, then submit those articles and reviews that have been floating around in your head, awaiting publication. This is your opportunity to share your knowledge with the growing family of ATARI computer owners. A.N.A.L.O.G. pays \$30.00 per printed page for text articles, \$50.00 and up for feature programs, depending on length and complexity. All submissions for publication must be typed, upper and lower case with double spacing. Program listings should be provided in printed form, or on cassette or disk if possible. By submitting articles to A.N.A.L.O.G. 400/800 Magazine, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of A.N.A.L.O.G. If not accepted for publication, the articles and/or programs will remain property of the author. If submissions are to be returned, please supply a self-addressed, stamped envelope. All submissions of any kind must be accompanied by the author's full address and telephone number.

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A.N.A.L.O.G. 400/800 MAGAZINE™

THE MAGAZINE FOR ATARI COMPUTER OWNERS



1982

NUMBER 5

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EDITORIAL

by Lee Pappas

400's & 800's

As we move into the new year we also move a step closer to a new era. As the sales of personal computers soar, and additional software continues to become available for the ATARI, I ask you, what do YOU use your computers for? To me, using an ATARI 400 or 800 for only one application is a waste. When someone says to me, "isn't your ATARI just a game computer?" I reply "yes." That is, of course, if you consider it entertainment when my 800 at the office keeps track of over ten thousand names on a mailing list and regularly runs off software and magazine invoices for several hundred dealers. At this moment, there exists fine software allowing you to do extensive word processing, large mailing lists and varied database management. At the other end of the spectrum there is entertainment in the form of computer games. Now I must admit, when I purchased my 800 two years ago, my excuse for the expenditure was GAMES. Yes, GAMES. However, it wasn't long before my ATARI was helping me write engineering papers, keep track of my video tape collection, and allow me to experience outside services such as Compuserve. After A.N.A.L.O.G. was formed, my 800 moved away from home and now resides on my office desk. My poor 800 sees few games nowadays, however it saves me a great deal of time, taking the drudgery out of business paperwork.

If you haven't figured it out yet, I'm trying to get across the idea "please don't use your computer for only one job." Expand on it and really see what it can do for you.

THE MAGAZINE

A.N.A.L.O.G. has moved to new offices and at the same time has a new staff member to handle the magazine. Jon A. Bell (just shipped from Missouri) is now managing editor of A.N.A.L.O.G. We hope to get this publication on schedule with a more steady interval between issues (2 months). We now have over ten thousand readers, and A.N.A.L.O.G. is distributed in 6 countries, with additional readers in 24 other countries.

Issues 2, 3, and 4 are SOLD OUT. Next issue we will announce availability. Until then please don't inquire — we have no copies left (and I mean none!).

USER GROUPS

Recently I have noticed articles in user group newsletters which contradict the nature of what a

user group should be. It is up to the officers of these clubs to see that software pirating is pushed into oblivion. We get reports of clubs whose main function is to reproduce software at the meetings. I see articles in several newsletters accompanied with program listings so members can duplicate copy-protected disks. What total irresponsibility on the part of club officers! On the other hand, I commend organizations such as ACE, based in Eugene, Oregon for much of the discretion they implement in their publication. I suggest other clubs take a close look at THEIR ethics. □

SOFTWARE REVIEWS

A new method for software reviews is now implemented starting in this issue. Each review includes a chart stating our opinion on just how much the program utilizes the ATARI's advanced capabilities and the value of the game.

The five categories include CONCEPT, ORIGINALITY, CHALLENGE, SKILL, and GRAPHICS/SOUND.

CONCEPT: How good is the overall concept on which the game is based.

ORIGINALITY: How original is the game based on other games of a similar nature (10 would indicate a completely original game).

CHALLENGE: How much of a challenge does the game provide.

SKILL: How well does the game adjust to the skill of the player.

GRAPHICS: How well does the game utilize the machine's capabilities.

N.A.: Not applicable to this program.

ABOUT THE COVER...

The design for the cover was created as follows: the original artwork was drawn black on white, then a negative was shot and reduced to the size of the final cover. The negative was placed on a light table and rephotographed with a standard 35mm SLR camera loaded with black and white film. The background elements of the negative were masked off and the foreground exposed (this was done to make the foreground brighter). Then the entire negative was exposed to reveal the background. Finally, the background was masked off again to reveal only the man, television, computer, disk drive and disks. A mask of posterboard with needle holes punched in it was placed over the foreground elements. A crossbar filter was placed over the camera lens, and then this was exposed as the third stage of the shot, to impart "starburst" pinpoints of light over the foreground elements. All of these exposures were "piled up" on the same frame of film in the camera. The film was developed, printed, and voila! Here is the cover to issue #5 of A.N.A.L.O.G.!

READER COMMENT...

Dear Sir:

I am writing to let you know how much I appreciate your fine publication. As an Atari owner of only a few months, I find it very useful. It is especially good to be able to read evaluations of software on the market. But everything is great so keep up the good work.

I do have a couple of questions that perhaps you could answer. First of all, do you happen to know of any user groups in the area around Minneapolis or St. Paul?

The second question concerns the program "Download Terminal" which appeared in issue #2. I just cannot get it to run. The program seems to be exactly what I want and so it is very disappointing not to be able to run it.

Perhaps one of the authors could give me some ideas on the problems I am encountering. First let me say that I have checked the listing several times. It is correct. I always get the error, "850 INTERFACE NOT BOOTTED". Upon examining the program, I discovered the error was in line 30 of the second part, "D:TERMINAL". Whenever #2 port was opened to "R" an error would appear, (error 130 — non-existent device). I discovered this by removing the trap 180. There was no way to get around this problem, so I called Atari. They said the reason that I could not access the 850 interface was that I needed DOS.2.OS. I have DOS.2.S. So after a week, I received the new DOS.

Guess what? It still doesn't work. Maybe you could tell me if I am doing something wrong. My system seems to work fine with TELELINK when I log onto Source. Any comments would be greatly appreciated. One question that was never answered in the instructions was at what point

do you put the telephone on the modem? I never got to do that since I thought the program had to be run first. Maybe that is the problem. Thank you for your time.

Sincerely,

Roger L. Felton
West St. Paul, MN

Download Terminal works fine and is bug-free — the problem you are encountering still appears to be the booting process. You may have DOS II, but do you have the AUTORUN.SYS file on the disk that contains the "booter" for the RS-232 handler? That handler checks to see if the interface module is present and powered on. Without the Autorun file you won't be able to use the interface module. —LP

Dear ANALOG,

Do you know if there is a way to change that ominous "READY" prompt? I'm sort of sick of my computer saying the same thing over and over again. There has to be a way to PEEK and POKE a "WHAT'S UP?" or a "COME ON, DO SOMETHING!" into my machine. I'm sure a lot of people out there would love to get some variation in their ready prompts once in a while.

Good luck & thanks,
David Gaertner

It would be a simple matter to change the "Ready" prompt in Basic, provided that Basic were resident in RAM. But since Basic is stored on ROM chips, you can Peek the memory locations of Basic, but it is impossible to Poke to Basic. You will just have to wait for Microsoft Basic to come out for the Atari. Since this Basic will be shipped on disk and RAM resident, you will be able to Poke to it all you want, changing the Ready prompt or even the spelling of the commands! —CB

Dear A.N.A.L.O.G.,

Here in Oklahoma City we are very fortunate to have several computer stores. Some have been kind enough to offer their establishments for computer users' groups. High Technology is just one computer store who does just that. They have offered their help in several different areas with businesses of this nature who help individual groups in organizing and providing a place to hold meetings and help strengthen the groups and the community where they are located.

That is why I am taking this time to write to you to inform others of the cooperation and support we have received in establishing a computer users' group. And to say thank you for providing your magazine, with all the information, and interesting articles, not to mention the fantastic programs you've been so kind in sharing with us.

I would like to ask you at this time to please mention our users' group in your magazine, as we are very new and need the support. We are very interested in contacting other users' groups and learning more about them. We would like to hear from anyone interested in contacting us.

Sincerely,
Rick Wails

Dear Editor,

Please inform your readers about a free COMPUTER BULLETIN BOARD in Jacksonville, Florida. The name of it is the SEB BBS and is supported by SEB COMPUTER. The hours are: Sun-Wed, 6 p.m.-8 a.m. and Thu-Sat, 9 p.m.-8 a.m.

The access number is 904-743-7050 and the sysop is Sam Bateh. Sam Bateh
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Jacksonville, FL 32211

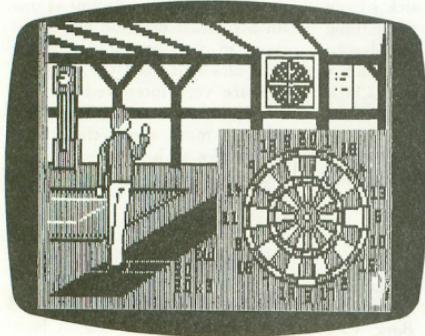


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Darts - Spectacular graphics, animation, and sound make this THE program to demonstrate your Atari computer. A challenging game of coordination for 1 or 2 players with 10 difficulty levels. Machine language, requires 16K and a joystick for each player. Cassette CS 7011 \$14.95



Tilt - Try to roll and keep the balls into four corner and one center holes in this simulated hand held maze. For 1 or 2 players, with 9 skill levels and 9 speeds. 8K, joysticks, Cassette CS 7013 \$11.95

Pool - Practice, 8 Ball, and Tournament Pool. Outstanding graphics and sound effects. Real skill is needed to make angles and combinations. You control angle and force behind shot, balls accelerate and rebound realistically. 16K, machine language, requires joystick(s). Cassette CS 7010 \$14.95

Billiards - Three-ball pocket billiards with features similar to Pool above. 16K, machine language, requires joystick(s). Cassette CS 7012 \$14.95

Snooker - This thoroughly British variation of pool uses 15 red balls and six colored balls. Not available on cassette.

Dominoes - Excellent graphics and a tough opponent are found in draw dominoes for one player against the computer. Two options, repeating draw or alternating draws. Basic, 16K. Cassette CS 7007 \$11.95

Cribbage - Single player against the computer. Twice around the board (121 points) to win, deal alternates. After pegging, dealer shows and scores first. Basic, 16K. Cassette CS 7008 \$11.95

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Pool, Snooker, and Billiards 16K 1 disk CS 7509 \$24.95

Dominoes and Cribbage 32K 1 disk CS 7507 \$19.95

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Dear Mike,

I have a question concerning a problem with my Atari to address to your "Bugs & Bytes" column. I know of at least one other Atari owner in my area whose machine suffers from a similar problem, so perhaps there are others who could benefit from an answer to this question.

It deals with what I believe to be a hardware problem — but I could be wrong. Since I know next to nothing about the innards of computer-kind, all I can do is describe what happens when the problems occurs. Hopefully, you might be able to get some diagnostic insight through a description of the symptoms.

First of all, I have an Atari 800 with 32K of RAM. The problem seems to occur while running a program, but does not happen every time, except as described later. There seems to be no way to predict when it will happen, nor what makes it go away (which it always does eventually — so far). What happens is this: in the middle of a game, a band of what seems to be electrical interference about $\frac{1}{4}$ " wide appears at the bottom of the screen and extends all the way across it. It then travels rapidly to the top of the screen, accompanied by a loud, buzzing noise from the TV, and disappears, to be followed immediately by another, identical band. One cycle takes about 3 seconds to traverse the screen. This continues unabated for as long as the computer is on.

The program is not affected by this disturbance, but the buzzing is so loud that it becomes necessary to turn the sound off in order to continue playing the game or whatever. This, of course, distracts from the enjoyment of many of the Atari games. If you happen to be using a one-text game, such as an Adventure, there is no buzzing while the computer is waiting for a user input (although the interference cycle continues, but as soon as the com-

puter begins placing words or graphics on the screen, the buzzing recommences). This interference is most obvious when the screen is colored something other than the standard blue, although once it starts, it is always present.

Turning the computer off and then back on will not eliminate the problem, and the condition normally continues for a number of days. Then one day, for some reason, when the computer is turned on, the interference is gone and doesn't return for some weeks usually. Now, that's a real bug!

Also, it seems to happen regardless of the type of cartridge that is in the machine — even no cartridge at all — as with Adams' Adventures.

On the suggestion of my local Atari dealer, I have tried pulling out the memory modules and reseating them, but to no avail.

A friend of mine has the same problem (or a close approximation thereof) and has tried replacing the chips inside the machine, as well as talking to Atari "experts" over the phone, but none of those things worked either.

Do you have any suggestions?
Thanks,
Bob deWitt

What you describe is not a bug, but a hardware problem in your computer. From your description it sounds like a fault in your ATARI 800 power supply. If you haven't already done so, the computer (and power supply in specific) should be checked out by an authorized ATARI repair center. —LP

To the Readers,

Two months is too long to wait for your publication. I know it won't be long before you're forced to go monthly! I foresee Atari Computers and owners increasing in such numbers that your subscription department will have to double in no time. After all Atari has hit on a winning combination with a com-

puter that's fun and can keep up with all the competition in number crunching at the same time, and can save you enough money so you can invest in a printer or disc drive or a box full of software.

On page 14 of the Basic Reference Manual you find that you can depress Control key and #2 key and you'll hear the buzzer; alright next time you are loading a program from cassette and everybody is complaining about listening to the data loading into the computer just depress CTRL 2 and turn down the volume on the TV. When your program is finished loading the internal buzzer will sound like a little alarm clock and you'll know that everything is ready to go. How simple can you get!!! I suppose you can use this method anytime the computer is busy working out equations or running some time consuming basic programs. You can use the WSC/CTRL/2 within a print statement in your programs if you want a little buzz every now and then, make several in a row and you'll get a lot of buzz!

Well, enough on that. Someone more learned than me should write in and give us beginners some really fancy uses of this little buzzer, after all Atari must have put it there to be used often. I'm just glad they didn't make it buzz every time an ERROR is made. Sincerely yours,
Douglas H. Arnold
Hanceville, AL

Dear Editor:

I just got a note from someone with a copy of a recent issue in which it stated that we are no longer producing Conversational Italian. Not true! We're cranking them out.

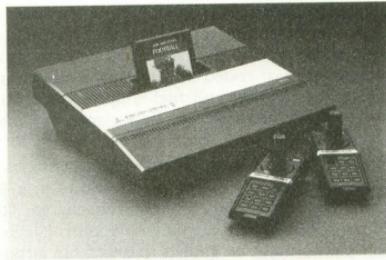
Hope you have a good New Year.

J. Peter Nelson
Public Relations Manager
Computer Division, ATARI

ATARI NEWS

NEW VIDEO GAME TO STOMP THE COMPETITION FLAT

When I saw the commercials this past Holiday season, with the competition 'knocking' ATARI's VCS, I knew ATARI wouldn't take this lightly. Well, their new game system is a lightyear ahead of the four-and-a-half year old VCS. The graphics & sound rival home computer capability, and later, an add on feature will give the game voice/speech ability. The console is a futuristic-style cabinet with storage areas for the hand held controllers. The game also automatically switches from TV to game; you never have to flip a switch on the television set. Also, when the game is shut off, there is no static/noise emitted from the TV. The hand helds combine joysticks, paddles, and keyboard controllers into one unit. The joysticks move in 8 directions to control both direction and speed of the objects on the screen. The integrated keyboard consists of 12 keys and can accept overlays if required. Release is scheduled for late this year along with over 10 game cartridges including Asteroids, Space Invaders, Galaxian, and several advanced sports games. \$349.95 will be the retail price.



NEW PRICES

With the increased production of ATARI 800's comes a reduced list price. The old cost of \$1080.00 has now become \$899.00. On the other hand, increased cost of parts has raised the price of The Entertainer™ kit to \$109.95, and the Educator™ to \$165.95.

Also most of the individual software prices have gone up an average of five dollars.

NEW PACKAGING

The 800 Computer, 810 Disk Drive, and 410 Program Recorder now come in attractive silver/full color packaging. At the same time, the instruction manuals follow the same silver and full color scheme to appeal to the average consumer. These are similar

to the 400 packaging theme of last year (and are very nice).

And if you haven't received it yet, ATARI has produced a 'third party' software/hardware catalog of additional products for your computer. Those who mailed in their warranty cards should have received them by now.

WINTER CONSUMER ELECTRONICS SHOW — Las Vegas

The biggest event in the consumer electronics industry saw the announcements and demos of many new ATARI products. Several new 400/800 software pieces, new VCS cartridges, and a totally new cartridge/game system. Check the VCS Update column for information on that product line.

Our main interest here, of course, is what is new for the ATARI 400 & 800 Computers during the first half of this year. Three new games: *Caverns Of Mars*™ to be released in April, *PacMan** scheduled for May, and *Centipede*™ in June. *Caverns Of Mars* will be available on diskette only and retail for \$39.95, with the typically excellent ATARI packaging. Though originally released through the ATARI Program Exchange, the game will be shipped under the ATARI label this spring.

PacMan & *Centipede* (to be reviewed next issue) are VERY close to the arcade versions of the same name. Both are cartridge based and have a minimum memory requirement of only 8K. List price is \$44.95 each.

The **ATARI BOOKKEEPER** is an accounting package that generates professional style reports applicable to accounts receivable & payable, balance sheets, and profit & loss statements. The system is capable of handling up to 1000 transactions a month and 350 general ledger accounts. The **BOOKKEEPER** System requires 48K of memory, BASIC cartridge, an 810 disk drive, and 850 interface module with printer. The package consists of four diskettes; one a sample data diskette allowing you to familiarize yourself with the program.

The **HOME FILING MANAGER**™ allows the user to create, edit, store, retrieve, & print data in 'index style' fashion. Search routines can be located via alphabetical or reverse alphabetical order, and by an item's title or specific word it contains.

Other items of interest include the release of a numeric keypad later this year. This add-on unit is a calculator style laid out keyboard allowing the user to enter in numeric data much faster than is possible on a "QWERTY" style keyboard ("QWERTY" is the standard typewriter key layout). □

*PacMan is a trademark of Namco-America, Inc.

NEW PRODUCTS...

HI-RES GRAPHICS FOR ATARI 400/800 COMPUTERS

VERSA COMPUTING

ANNOUNCES GRAPHICS COMPOSER

Newbury Park, CA — Versa Computing, Inc. announces the release of **Graphics Composer**, the complete joystick/paddle graphics software package for ATARI 400/800 Computers.

With **Graphics Composer**, you use paddles or joystick to draw a picture on hi-res screen Mode 8 or 7. Then use color fill-in, color brushes and add Text to complete your graphic designs. **Save your graphics to disk or cassette.**

Graphics Composer allows easy creation of **PLAYER/MISSILE** shapes which may be used in other programs. The **GEOMETRIC FIGURES** program lets the user define circles, triangles, polygons, parallelograms, and even trigonometric curves!

Loading routines are provided so that pictures can be used in other programs or traded with friends.

Graphics Composer is available on cassette or disk for only \$39.95, and requires 32K RAM. Call Versa Computing at (805) 498-1956, or ask your local computer retailer for **Graphics Composer**. □

BYTM SYSTEMS, INC.

389 FIFTH AVE (SUITE 400)
NEW YORK, NY 10016

BYTM Systems, Inc. announces the introduction of a new TV/Monitor stand for ATARI 400/800 and APPLE II consoles.

The stand is made of clear polished high-impact acrylic. It securely holds a TV/Monitor up to 15 inches (diagonal) in screen size. Its open design allows maximum air flow around the console and provides easy access to top, sides and rear for cable or ROM cartridge insertion.

The use of the stand reduces workspace crowding while raising the TV/Monitor to eye level.

For ATARI 400/800 owners with ATARI 810 Disk Drives, it also provides a simple means of minimizing the potential problem identified by ATARI that:

Placing the ATARI 810 Disk Drive within 12 inches of a television set or monitor causes alteration of the data. Use the disk drive a minimum of 12 inches from the TV or monitor. The **CLEAR STAND** raised the TV/Monitor 10 inches above the table and makes leaving a diagonal of 12 inches from the disk drive an easy problem to solve.

CLEAR STAND is available for \$59.95 from BYTM Systems, Inc., 389 Fifth Avenue (Suite 400), New York, NY 10016. Dealer inquiries are invited. □

AIR TRAFFIC CONTROLLER BEATS SPACE INVADERS!

Are personal computer owners planning to take control of the nation's air traffic? A computer program which simulates the responsibilities of an air traffic controller is outselling other programs, including the popular arcade games. The game, called **Air Traffic Controller**, was written by David Manning, a former air traffic controller.

Creative Computing Software, of Morris Plains, NJ, has noted a substantial increase in sales of the simulation since the beginning of the PATCO strike. The program, available for six different home computers, has long been a best seller, but now outsells all other programs in the Creative Computing line.

Like the air traffic controller's job, the simulation demands steady nerves under pressure and the ability to analyze complex situations quickly under pressure.

The player's goal is to get all of the aircraft to their destination before the end of his shift. The computer screen shows a radar display of aircraft positions in the control area; coded information giving aircraft heading, destination and fuel supply; and navaids where aircraft can circle or be assigned automatic approaches.

In **Air Traffic Controller** the player assumes responsibility for the safety of air traffic in a 400 square mile sector. During one shift in charge of this airspace, 26 aircraft come under his control. Jets and prop planes must be guided to and from airports, navigational beacons and entry/exit fixes. The aircraft enter the airspace at various altitudes and headings, and they enter whether the controller is ready or not.

The controller alters the altitudes and headings of the various aircraft by typing commands on the keyboard of the computer.

An advanced version allows more aircraft, introduces fuel limitations, and has four additional area maps, each with different challenges. No two games in either version are ever alike.

Air Traffic Controller is available for the Atari personal computer. The basic version sells for \$11.95 on cassette and the advanced version is \$19.95 on disk.

Creative Computing Software, 39 E. Hanover Avenue, Morris Plains, NH 07950. (201) 540-0445. □



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TIMEBOMB Meet the challenge of this fast moving animated race against time, enemy aircraft and enemy bombs as you attempt to disarm timebombs set to explode ammunition depots. Avoid aircraft of varying sizes and speeds — and their bombs. Choose one of ten Day or Night Missions. Use from one to four Joysticks. Any number can play; top players listed on scoreboard. \$14.95 cassette; \$19.95 disk

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WORDGAMES This package is jam-packed with hours of fun and challenge. Wordgames contains GUESSIT, WORDJUMBLE and POSSIBLE. GUESSIT, a deductive alphabetic reasoning game for 1 or 2 players can also be used for teaching or learning dictionary look-up skills. Comes with 60 word vocabulary. WORDJUMBLE is a multiple word descrambling puzzle with play-on-word hints and mystery answers. Comes with 20 puzzles. Instructions show how to substitute your own words and clues. Use POSSIBLE as a word game tool to assist creating or playing word or letter scrambling games by showing all combinations of letters you supply. If you like word games you will love this package. 16K cassette \$14.95; 24K disk \$19.95

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PROGRAMMING AIDS PACKAGE I Is four utility programs to help increase programming efficiency and learn more about your computer. RENUMBER handles references and even variables. Generates Diagnostic Tables for programming error detection. PROGRAM DECODER, DECIMAL TO BCD and BCD TO DECIMAL programs give you a practical way of studying internal program representation and ATARI number-conversion procedures. Comes with comprehensive users manual. 16K cassette \$14.95, 24K disk \$19.95

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Fantasy for your ATARI

Ali Baba and the forty thieves

By Stuart Smith



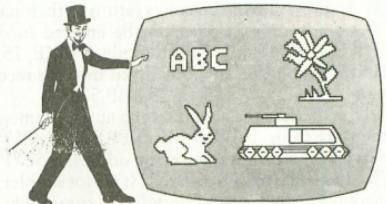
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By Chris Hull



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MORE ON PEEK'S AND POKE'S

BY GEORGE SMITH

A lot of novice programmers don't use poke statements except for the obvious ones like POKE 752,1 for the cursor or POKE 82,3:POKE 83,37 for the margins, but pokes are a lot more powerful than just for screen displays.

One company that recognized this fact is Santa Cruz Software. Their Master Memory Map booklet (15 pages) explains the use of many locations including some that Atari doesn't even mention. The cost is a reasonable \$5.95, and down right cheap if you plan to do some serious programming.

One of my favorite pokes (because I'm lazy) is POKE 580,1. I use an auto boot disk and if I'm loosing in one of the computer-versus-human games, I "accidentally" depress the system reset key. This causes the computer to believe the keyboard unit was just turned on and sends the disk to find the menu, no more typing RUN "D:MENU" wow, rough life.

Also, people believe Graphics mode 8 is strictly one color, two luminescence. If you know the right poke statements anyone can sweet-talk the Atari into believing it's in Graphics mode 7. (see Analog No. 3, p. 32 for details) Even the clock is accessible using Poke 18, 19 and 20.

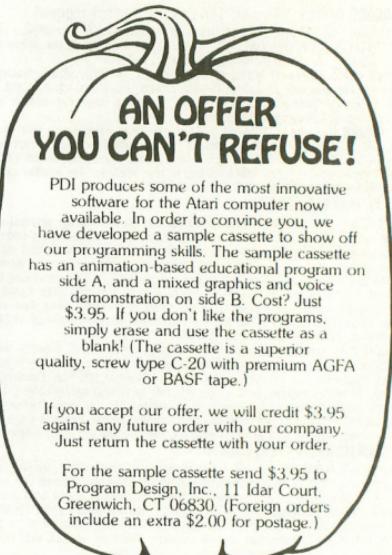
The one super great thing about pokes is that they are not permanent. As soon as the Atari is powered down the values of the pokes return to their natural (default) settings. Pokes can be entered in direct (POKE 755,4) or indirect mode (POKE 755,0). Hope I didn't lose anybody. Even the tape recorder motor has a poke address (54018,52).

Now Peek is the actual setting at the moment for the Poke value, in other words PRINT.PEEK (752) will give you the value of the address 752. PEEK 752,1 is equal to POKE 752,1. It is a lot simpler than it sounds. Atari gave a minor list of commonly used Pokes in the Basic Reference Manual Appendix I (use the decimal location). Also, in the new Atari Connection Vol. 1, Number 2 p. 22 there is a short routine for disabling the break key. □

Queue, Inc. announces the May publication of two new educational software catalogues for the 1981 - 1982 school year: *Queue Catalogue IVA* covering Apple, Atari and Compucolor; and *Queue Catalogue IVB* covering Pet and TRS-80.

The catalogues carry the educational software offerings of over 70 publishers, listed by computer, subject area, and grade level. All software can be ordered directly from Queue. The two catalogues sell for \$8.95 each. Write Monica Kantrowitz, President, Queue, Inc., 5 Chapel Hill Drive, Fairfield, CT 06432.

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For further information contact Michael Zabinski, Ph.D. (Professor, Fairfield University) at P.O. Box 624, Orange, Connecticut, 06477, or call 203-795-3049.

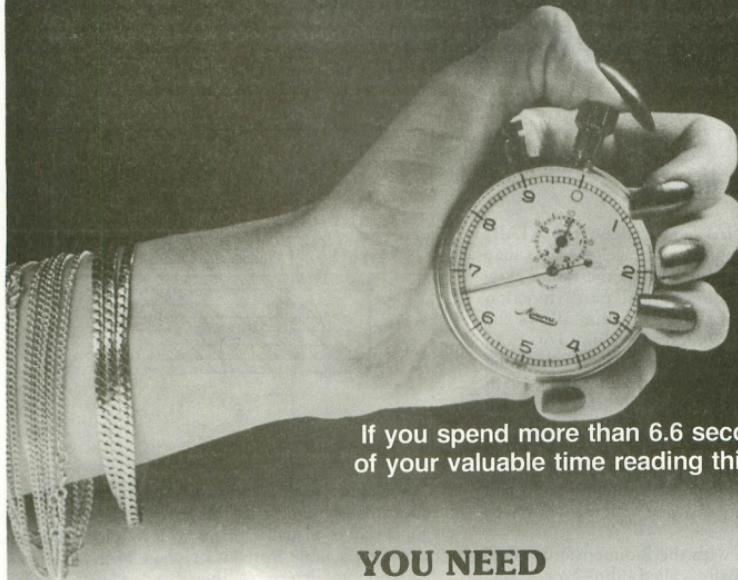
ATARI ONE-LINER:

10 P=PEEK(764):SOUND 0, P, 10, 10:
SOUND 1,P=20, 12, 6: GOTO 10

This small "One-Liner" demonstrates a very useful memory location. The peek does not return the ASCII number for the key you press. It returns on an internal code number.

TRY IT!!! □

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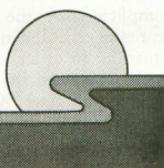
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3-DIMENSIONAL GRAPHS MADE FAST AND EASY

BY TOM HUDSON

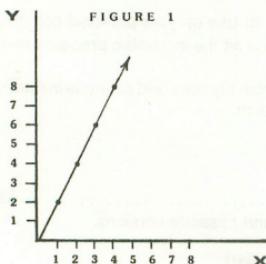
PROGRAM REQUIRES 16K

In this issue of ANALOG, I review the ATARI GRAPH-IT (TM) graphics package. As you may recall, I was somewhat irritated by the rather slow nature of the "three-dimensional plot" function provided in the package. This function allows the user to generate "3D" graphs from any equation. Now, I'm not one to complain about something without offering some sort of viable alternative, so in this article I will introduce a 3-D graph program which is easy to use and will produce graphs very quickly.

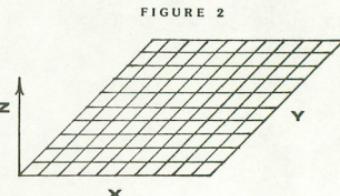
By now, many readers are probably asking, "What in the world is a 3-D graph?" which is not a bad question at this point, and one which I will try to answer.

We are all familiar with the 2-dimensional (flat) graph. They are usually called "line" or "bar" graphs. Figure 1 is a line graph of the equation $Y=2*X$. When X is one, Y is two times one, or two. When X is four, Y is two times four, or eight, and so on.

FIGURE 1

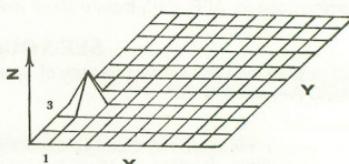


In a 3-dimensional graph, things are a little more complicated. As the name implies, we are trying to represent a 3-dimensional form, derived from an equation. In order to represent any 3-dimensional object, we need three coordinates. We will label these coordinates X (width), Y (depth), and Z (height).



We start with a grid marked with X and Y coordinates, then we lay this grid flat, as in figure 2 (a good way to visualize this is to lay a piece of graph paper on a table in front of you). Next we use an equation to determine the 'Z' coordinate. The Z value tells how high off the table each point on the grid is. The Z coordinate is always derived from the X and Y values. For example, in the equation $Z = (X+Y)*3$, when we are at the coordinates $X=1$ and $Y=3$, Z would equal 12 (4 times 3). On our graph, this would be represented as a small peak in the middle of the grid (figure 3), telling us that where $X=1$ and $Y=3$, the Z value is 12. When this process is repeated for each point on the grid, we have a graph of the equation. 3-dimensional graphs are useful for visualizing how an equation will act with varying X and Y data.

FIGURE 3



Accompanying this article is a program listing. It is a simple but effective 3-dimensional graph generation program. It is NOT meant as a replacement for the GRAPH-IT 3D plot program but rather an enhancement.

Let's say you want a 3-D plot of an equation. You don't know what it will look like, but you'd like to get some idea before you wait an hour for GRAPH-IT to process it. With this program, you can "preview" a 3-D graph, then if you want a detailed copy, you can run it through the GRAPH-IT package. An equation requiring 70 minutes on the GRAPH-IT program can be processed by this program in five. Of course, the GRAPH-IT version is much smoother and will do such things as automatic scaling, but if you need to have the output quickly, this program can do it.

LINE#

FUNCTION

80 Set up the arrays needed to store the plot points.

120 Turn off the Direct Memory Access. This speeds up the calculations. (See ANALOG issue #2, UNLEASH THE POWER OF ATARI'S CPU)

160 Set the screen limits for the graphics clipping routine (See lines 600-720)

210-230 This is a FOR-NEXT loop for calculating the Z value for each point on the grid. Line 220 is where your equation should be placed. Line 220 in the listing is the equation that was used for the illustration above. Simply type any equation, starting with Z=. The program will do the rest.

270-300 After all the Z values have been calculated, this section changes them to plot coordinates so that they can be put on the screen.

340 This line turns the screen Direct Memory Access on again.

380 This line draws the 'zero reference' outline. This is simply the outline of the grid before the Z coordinates were calculated. It lets you know where zero is, relative to the rest of the points on the grid.

420-430 This section actually draws the grid on the screen using the data in the GX and GY arrays. It uses the graphics clipping routine (lines 600-720). The clipping routine will let the program continue drawing even if the graph goes off the screen.

470-500 These lines draw the vertical lines from the baseline to the corners of the graph.

540 This line loops the program forever. Hit the break key to stop the program.

600-720 This is a modified graphics clipping routine (See ANALOG #2, A GRAPHICS CLIPPING ROUTINE). It is modified to

only clip lines that extend beyond the top and bottom of the screen, not the sides. To use, simply set up X1, Y1, X2 and Y2 then GOSUB 600. This is the same function as PLOT X1, Y1: DRAWTO X2, Y2.

You can try any equation you like in line 220, just set Z to the result. Included below are a few interesting equations for you to try, along with the time required to generate the graphs. Simply replace line 220 with one of these equations. Happy graphing! □

```

10 REM 3-D GRAPH PROGRAM
20 REM Copyright (c) 1981
30 REM by A.N.A.L.O.G. 400/800 Mag.
40 REM WRITTEN BY TOM HUDSON
50 REM ****
60 REM
70 GRAPHICS 24:SETCOLOR 2,0,0:COLOR 1
80 DIM GX(21,11),GY(21,11)
90 REM
100 REM *** DMA OFF ***
110 REM
120 POKE 559,0
130 REM
140 REM *** SET CLIPPING LIMITS ***
150 REM
160 XR=319:XL=0:YT=0:YB=191
170 REM
180 REM *** YOUR FORMULA GOES ***
190 REM *** INSIDE THIS LOOP ***
200 REM
210 FOR X=1 TO 21:FOR Y=1 TO 11
220 Z=(X+Y)*3
230 GY(X,Y)=Z:NEXT Y:NEXT X
240 REM
250 REM *** CALC. SCREEN COORDS. ***
260 REM
270 FOR X=1 TO 21:FOR Y=1 TO 11
280 GX(X,Y)=(X-1)*10+(Y-1)*10
290 GY(X,Y)=180-(Y-1)*10-GY(X,Y)
300 NEXT Y:NEXT X
310 REM
320 REM *** DMA ON AGAIN ***
330 REM
340 POKE 559,34
350 REM
360 REM *** DRAW BASELINE ***
370 REM
380 PLOT 0,180:DRAWTO 200,180:DRAWTO 3
00,80:DRAWTO 100,80:DRAWTO 0,180
390 REM
400 REM *** PLOT THE GRAPH ***
410 REM
420 FOR X=1 TO 21:FOR Y=2 TO 11:X1=GX(X,Y-1):Y1=GY(X,Y-1):X2=GX(X,Y):Y2=GY(X,Y):GOSUB 600:NEXT Y:NEXT X
430 FOR Y=1 TO 11:FOR X=2 TO 21:X1=GX(X-1,Y):Y1=GY(X-1,Y):X2=GX(X,Y):Y2=GY(X,Y):GOSUB 600:NEXT X:NEXT Y
440 REM
450 REM *** DRAW VERTICAL LINES ***
460 REM
470 X1=0:Y1=180:X2=GX(1,1):Y2=GY(1,1):GOSUB 600
480 X1=200:Y1=180:X2=GX(21,1):Y2=GY(21,1):GOSUB 600

```

```

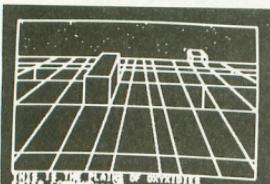
490 X1=300:Y1=80:X2=GX(21,11):Y2=GY(21
,11):GOSUB 600
500 X1=100:Y1=80:X2=GX(1,11):Y2=GY(1,1
):GOSUB 600
510 REM
520 REM *** LOOP FOREVER ***
530 REM
540 GOTO 540
550 REM
560 REM ****
570 REM * GRAPHICS CLIP ROUTINE *
580 REM ****
590 REM
600 T1=0:T2=0:B1=0:B2=0:IF Y1<YT THEN
T1=1:GOTO 620
610 IF Y1>YB THEN B1=1
620 IF Y2<YT THEN T2=1:GOTO 640
630 IF Y2>YB THEN B2=1
640 IF T1+T2=2 OR B1+B2=2 THEN RETURN
650 X3=X1:Y3=Y1:X4=X2:Y4=Y2:GOSUB 690
660 T1=T2:B1=B2:X1=XW:Y1=YW:X3=X2:Y3=Y
2:X4=X1:Y4=Y1:GOSUB 690
670 IF Y1<YT OR Y1>YB OR YW<YT OR YW>Y
B THEN RETURN
680 PLOT X1,Y1:DRAWTO XW,YW:RETURN
690 IF T1+B1=0 THEN XW=X3:YW=Y3:RETURN

700 IF T1 THEN YW=YT: XW=X3+(X4-X3)*(YT
-Y3)/(Y4-Y3):X3=XW:Y3=YW:RETURN
710 IF B1 THEN YW=YB: XW=X3+(X4-X3)*(YB
-Y3)/(Y4-Y3):X3=XW:Y3=YW:RETURN
720 RETURN.

```

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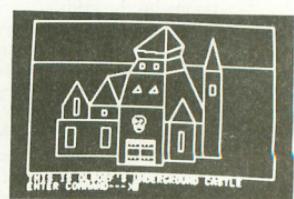


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GAME REVIEW:**"SHOOTING GALLERY"**

Review by Tony Messina

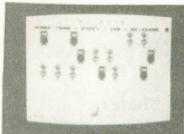
Being a lover of all types of Arcade games, I couldn't resist the opportunity to review SHOOTING GALLERY, one of the first offerings from the ANALOG 400/800 software group. I was skeptical at first, after all, what could this game have that was really exciting? I figured I would be bored after playing the game several times and place it in my box of unused software (along with all the other programs that sounded good in the advertisements but turned out to be bombs). Upon receipt of the package, I loaded SHOOTING GALLERY and played...I played it again...I'M STILL PLAYING!! Please allow me to describe this program in detail in order to clarify my excitement.

THE GAME

SHOOTING GALLERY turns your ATARI into a carnival of fun. The documentation is well written and is more than adequate in discussing how to load and operate the game. There are seven types of targets presented to you to try your skill. Rabbits, owls, ducks, pipes, a bull's eye, stars and a walking bear (more on the bear later). The targets move on three levels in different directions. The top level (worth 60 pts. when hit) moves from left to right, the middle level (40 pts.) moves from right to left, and the lower level (20 pts.) from left to right. The point scores indicated above are for the animal type targets. The Bull's eye and stars, although not worth any points for scoring, provide additional bullets with which to continue the game. The Bull's eye is worth 5 extra bullets and stars are worth 10 extra bullets when you hit them. The pipes move from right to left at the top of the screen and are worth the value indicated on the screen. This value decreases by ten each time you take a shot. The gun, used to shoot these targets, is controlled with a joystick. There is no need to worry about crooked barrels or bent sights with this gun.

THE TARGET ANTICS

Remember the ducks I told you about? Well, they travel in straight, erect military posture until they get to the bottom row. At this point, they take off and fly! Wings flapping to and fro, back and forth, getting lower and lower. I won't reveal what happens when they get too low, but it is advisable to shoot them as soon as possible. And now the bear. The bear is worth 50 points. You will not see him, however, until you clear the screen of all targets. Pipes are considered targets so you must shoot all of them as well. When the screen is clear you receive 50 points for any bullets remaining. The bear then wanders onto the screen, walking slowly. Now is



your chance to go BIG GAME hunting! Hit the bear as many times as possible scoring 50 points for each hit. You have unlimited shots when shooting at the bear, so keep shooting until he runs off the screen. Don't be fooled at his initial slow walk, the bear can really move out quickly after a number of hits (I would too!!!). When the bear disappears, a new screen full of animals and pipes appear for you to shoot. The game ends when you run out of bullets. In addition to all the action on the screen a calliope play in the background, providing music for the parade of animals. The longer you play the higher the pitch of the tune goes. It also speeds up in rhythm.

THE VERDICT

There is only one thing that I didn't enjoy about SHOOTING GALLERY and that is the long wait for it to load. The program is only available on tape but I hope it will soon be available on disk.* Other than this slight problem, the game is fun to play!! It is a simple concept but there is a subtle strategy that must be used if you want a high score. The graphics, colors and sound are combined very well in this game. Animation is excellent as well as being entertaining. This is not only my opinion but that of others. I called in the local neighborhood crew for the critical test. This included the kids, parents, and fellow workers. Everyone, without exception, was glued to the screen. Laughter, excitement and just plain fun filled the room. The only problem we had was trying to keep everyone from grabbing the joystick when a player was done. The game is well worth the \$21.95 price and should be part of everyone's software library. Congratulations are in order for Phil Mork, the program author, and ANALOG software, the distributors.

SHOOTING GALLERY RATING SCALE**Analog Software: Shooting Gallery**

1 - 10 (Unsatisfactory - Ideal)	
Concept	9
Originality	8
Challenge	9
Skill	9
Graphics	10
Sound	10
Overall Rating	9.2

* Now available on diskette

GAME REVIEW: JAWBREAKER

Review by Phil Shafer

Hold on to your hats, folks! We now have a bona-fide winner to tell you about!! Till now, we ATARI owners were only able to enjoy the really super graphics and sound-effects our systems are capable of when people from ATARI had created one of their fine machine-language games. Not any more... there's a new game out called "JAWBREAKER" that will make every game-playing ATARI owner able to show off this computer's power.

First the data:

Program Name: JAWBREAKER

Author's Name: John Harris

Available from: OnLine Systems, 36576 Mudge

Ranch Road, Coarsegold, CA 93614

Phone Number: (209) 683-6858

Price (diskette only): \$29.95 + \$1 for shipping & handling

Now to describe the game... If you are familiar with the game "PacMan" (R) then you will immediately see a striking resemblance between that game and JAWBREAKER. In fact, some aficionados of PacMan have even said that they believe JAWBREAKER is better! You use a joystick to control the movement of a "chomping" set of teeth through a maze. As you move, you can travel over evenly spaced dots that are worth 10 points apiece. You can also go over bonus objects (such as a heart or a sailboat), if these appear, and get up to 500 more points for these. Sounds sorta dull so far, huh? Well, if this were all there was to the game, it would get to be dull in a hurry.

The catch is, there are these four rapidly-moving, rolling, tumbling, and spinning "life savers" (circles with happy faces inside them) that exit from their centrally located starting box and move around that maze looking for you. And when they find you, you won't look the same as you used to. (To completely describe what happens would rob you of some of the fine sense of humor the author has used in crafting this clever game). You can, however, get revenge on these nasty candies — there are four rotating circles which can be used (once each) to turn those happy-faced critters into blue, sad faces for a short time... and while they are in that state, YOU can chase THEM! When you catch up with them, they are also worth up to 800 points. Just be careful not to let them revert back to their original colors while you're too near them, because when this happens, they'll start chasing you again.

The author has done some other nice things in his implementation that also enhance the fun of this game even more. There's some well-done music at

the start of the game (and also when you press the RESET key); a "wraparound" tunnel in the maze that lets you travel through it faster than those pesky candies; some other creative sound effects (such as a distinctive "gulp" when you go over the bonus items). If you can survive through several complete cleanings of all the 10-point dots with your teeth still intact, you get a bonus set of teeth. I've intentionally left out one of the funniest parts — just watch what happens each time you get all the dots off the maze... a laugh is guaranteed. It is this reviewer's opinion that this is the best arcade-type game yet implemented for the ATARI. I MOST highly recommend it! (On a scale of 1 to 10, I would give it an 11!

Note — the diskette is non-copyable... the store has indicated a 90-day free replacement for damaged media; after that, \$5 gets you a new disk. □



Our High Quality Software Is More Than A Stroke Of Genius... It's A Work Of Art.

□ PM EDITOR: by Dennis Zander (Atari, 16K)

Create your own fast action graphics game for the Atari 400 or 800 using its plasma missile graphics to fire at your enemies. The targets you create can be moved or changed (for animation) at machine language speed. All this is done with string variables (POS(Y)=SH1P4). This program is designed to permit creative use of the plasma pens of the screen. All string data and their immediates, then put in the demo game included in the program. Instructions for use in your own game are included. PM EDITOR was used to create the animated game ENCONTRANT at QUESTAR IV. RINGS OF THE EMPIRE and ENCONTRANT at QUESTAR IV. PRICE \$29.95 cassette \$33.95 diskette

□ ROCKET RAIDERS: by Dennis Zander (Atari, 24K)

Defend your colony against the alien hordes, rockets, lasers, and the dreaded "stealth saucer" as aliens attempt to penetrate your protective force field. Precise target sighting allows you to fire at the enemy using magazine-loaded missiles to help protect your colony and its vital structures.

PRICE \$19.95 cassette \$23.95 diskette

□ INTRUDER ALERT: by Dennis Zander (Atari, 16K)

This is a fast paced action game in which you must escape from the "Dreadstar" with the secret plans. The droids are after you and you must find and enter your ship in order to escape. If you fail to escape you are doomed. PRICE \$16.95 cassette \$20.95 diskette

□ THE RINGS OF THE EMPIRE: by Dennis Zander (Atari, 16K)

The Empire has developed a series of battle stations protected by one or more rings of energy. You must destroy these weapons by attacking them in Y-wing fighter armadas. You must also defend your own base station from the rings and destroy the station. The Empire develops a new station with more protective rings. PRICE \$16.95 cassette \$20.95 diskette

□ FOREST FIRE: by Richard Petersen (Atari, 24K)

Using excellent color graphics, your Atari is turned into a fire scanner to help you direct operations to contain a forest fire. You must communicate for wind, weather and terrain. Non-producing valuable property can result in startling penalties. Life-like variables make FOREST FIRE a very suspenseful and challenging simulation. PRICE \$16.95 cassette \$20.95 diskette

□ STUD POKER: by Jerry White (Atari, 16K)

This is the classic gambler's card game. You will find the computer to be a wily opponent, occasionally bluffing to cheat. STUD POKER employs all of the Atari's sound, color and graphics capabilities.

PRICE \$14.95 cassette \$18.95 diskette

□ ALPHA FIGHTER: by Douglas McFarland (Atari, 16K)

Consisting of two different programs, ALPHA FIGHTER requires you to destroy alien invaders or you become more successful. The games get harder and harder. PRICE \$14.95 cassette \$18.95 diskette

□ GIANT SLALOM: by Dennis Zander (Atari, 16K)

Bring the Winter Olympics to your computer anytime of the year! Use the joystick to guide your skier's path down a giant slalom course consisting of open and closed gates. Choose from three levels of difficulty. Take advantage or compete against from two to eight additional skiers.

PRICE \$14.95 cassette \$18.95 diskette

□ HODGE PODGE: by Marsha Meredit

(Apple 48K, Applesoft or Integer BASIC) This captivating program is a multi-level learning device for children from 18 months to 6 years. HODGE PODGE consists of many cartoons, animations and songs which appear when any key on the computer is depressed. A must for any family containing young children and an Apple computer.

PRICE \$19.95 diskette

□ SPACE TRAP: by Edward Schneider (Atari, 16K)

A fleet of Athanian spacecraft is entering the Galaxy through a recently opened Black Hole. It is your mission to enter the Black Hole and delay the attacking forces long enough to allow the hole to close, trapping all those inside forever!

PRICE \$14.95 cassette \$18.95 diskette

□ TYPE-N-TALK*:

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TEACHER'S PET (Atari, 24K, North Star)

\$16.95 / \$20.95

BRIDGE 2.0 (Atari, 24K, North Star)

\$19.95 / \$23.95

NONIMOS JIGSAW (Atari, 24K)

\$17.95 / \$21.95

Please specify "TNT" version when ordering programs.

□ CRANSTON MANOR ADVENTURE: by Larry Ledden (Atari, North Star and CP/M)

You must enter mysterious Cranston Manor and attempt to collect as many treasures as possible. This exciting program will provide you with many hours (days?) of adventure. The program may be interrupted at will and your status saved onto the diskette.

PRICE \$21.95 diskette

□ BLOCKADE: by Edward Schneider (Atari, 16K)

Many games library includes a Blockade program, and this is one of the best. Choose from three levels of difficulty and play against another person or by yourself against the clock.

PRICE \$14.95 cassette \$18.95 diskette

□ TEACHER'S PET: by Arthur Walsh (Atari, Apple, TRS-80, PET, North Star and CP/M (MBASIC) systems)

This is an introduction to computers as well as a learning tool for the younger student (ages 3-12). The game provides accounting practice, letter word recognition and three levels of math skills.

PRICE \$14.95 cassette \$18.95 diskette

□ FORM LETTER SYSTEM: (Atari, North Star and Apple)

This is the ideal program for creating personalized form letters! FLS employs a simple-to-use text editor for producing full function form letters. Text can be stored in a separate file and is automatically inserted into your form letter along with a personalized salutation. Both letter files and address files are compatible with ARTWORX MAIL LIST 3.0 and TEXT EDITOR programs.

PRICE \$39.95 diskette

□ HEARTS 1.5: by Arthur Walsh (Atari, North Star and TRS-80, PET, North Star and CP/M (MBASIC) systems)

You are pitted against two computer opponents in this popular card game. The program employs a hard-to-beat playing algorithm which creates quite a challenge for even the advanced player.

PRICE \$15.95 cassette \$19.95 diskette

□ THE NONIMOS JIGSAW PUZZLE:

(C Mims/B Brownies (Atari, 24K, TRS-80, and Apple) We quote "A brain teaser supreme... the concept of NOMIMOS JIGSAW is brilliant... this video jigsaw game is so clever and completely original that only the most creative and artistic computer games can hope to charm us!" - ELECTRONIC GAMES MAGAZINE.

PRICE \$17.95 cassette (also available for TRS-80 color computer) \$21.95 diskette

□ MAIL LIST 3.0: (Atari, Apple and North Star)

The very popular MAIL LIST 2.2 has now been upgraded. Version 3.0 offers enhanced editing capabilities and a completely new mail management system. This program is so popular, MAIL LIST is unique in its ability to store a maximum number of addresses on one diskette (typically between 10,000 and 25000 names!). It can be easily read by any program using zip codes. They can be written to a printer or to another file for complete file management. The program produces a 5 or 9 digit zip address label and will sort by zip code. It can merge multiple address files and names are easily merged and MAIL LIST will even find and delete duplicate entries! The address files created with MAIL LIST are completely compatible with ARTWORX FORM LETTER SYSTEM.

PRICE \$49.95 diskette

□ THE VAULTS OF ZURICH: by Felix and Ted Herlihy (Atari, 24K, PET)

Zurich is the banking capital of the world. The rich and powerful deposit their wealth in its famed impregnable vaults. But you, as a master thief, have dared to undertake the robbery of the century. You will journey through a maze of corridors and rooms, enter the most sophisticated security system in the world. Your goal is to reach the Chairman's Chamber to steal the most treasured possession of all - THE OPEC OIL DEEDS!

PRICE \$21.95 cassette \$21.95 diskette

□ BRIDGE 2.0 by Arthur Walsh (Atari, 24K, Apple, TRS-80, PET, North Star and CP/M (MBASIC) systems)

BRIDGE 2.0 by Creative Computing BRIDGE 2.0 is the only program that allows you to both bid for the contract and play out the hand (on defense or offense). Interesting hands may be replayed using the "duplicate" bridge program. BRIDGE 2.0 is really an ideal way to learn how to play bridge or to get into a game when no other (human) players are available.

PRICE \$17.95 cassette \$21.95 diskette

□ ENCONTRANT AT QUESTAR IV: by Douglas McFarland (Atari, 24K)

As heirloom of Rikar starship, you must defend Questar Sector IV from the dreaded Zentarians. Using your plasma beam, hyperspace engines and wits to avoid Zentarian mines and death phases, you struggle to stay alive. The BASIC/Assembly level program has over 100 full player missions, strength and real time action. PRICE \$23.95 cassette \$27.95 diskette

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IS THERE A LASER DISK IN YOUR FUTURE?.....

By Bill Latino

What's this, a general interest article appearing in ANALOG? One about a device not yet successfully interfaced to any personal computers — let alone the ATARI? Bear with me if you will, for the laser disc, though in its infancy as a consumer entertainment device, promises to become one of the most powerful and versatile peripherals at our disposal. Perhaps a lofty vision for a device conceived as merely a sort of fancy 'record player' for television.

Consider a few of the laser disc's attributes — it's nearly impervious to dust, scratches, fingerprints, and media wear (try playing frisbee with your floppy or Winchester media . . .), it has a storage capacity of 10" bits per disc (a few megabucks worth of floppy or Winny media — a blank laser disc costs only 10 bucks), the laser disc can store 54,000 frames of random access video information (yes, that's 54,000 screens full of text, high-res. graphics, broadcast resolution pictures, or what have you) with a worst-case access time of 5 seconds, and, best of all, the cost for all this technology is a mere 750 bucks.

The fly in the ointment? Actually there's two — first, the laser disc is a read only device and second, no one has come out yet with a device and the software necessary to interface a laser with a microcomputer. However, both problems are being attacked with vigor. Although the word is that the second obstacle is much nearer to being resolved than the first, it's reassuring to note that the 'Big Boys' have set only a two year timetable on developing a read/write laser disc. But even assuming the worst — that it takes a couple years just to implement and market an interface, it shouldn't be too difficult to imagine the scenario following.

It's a Saturday morning early in November of 1983, as you sit in front of your 640K ATARI 1200 you debate whether to put the final touches on the sales forecast you've been slaving over the past week or brush up on your pre-flight training. Logic wins out, after all it is Saturday and you do have your first flight lesson this Tuesday. So you connect up the special cockpit module you borrowed from your instructor, turn on your Sony 6 foot holographic projection T.V., ATARI 1250 Video Disc Interface module, Pioneer laser disc player, and bring up your computer. In only minutes you're airborne and into your first steep bank. Once again you can't help but marvel at the realism you're enjoying — although you have to admit that it isn't always enjoyable — memories of last week's practice session are all too vivid . . . your poor attempt at recovery from a stall, the shuddering of the hydraulics felt through the control module, the fear and nausea, and finally the

crash simulation itself. You blush at the memory of the involuntary scream . . . and still wonder how the pilot who filmed that sequence ever pulled out. Of course the crash itself was just depicted in high resolution graphics, but you recall being just a few hundred feet above the ground before the film gave way to graphics.

Anyway, this week you'll do better. Just as you're about to practice a similar stall however, your wife comes rushing in with the new Sears Catalog and the pronouncement that she just has to order a new dress for that wedding coming up next week. You concede defeat, knowing the futility of argument in such cases. Before surrendering your chair you pull the flight simulator disc and obligingly ready the CAT Modem for that potentially expensive marriage to the telephone receiver. With practiced ease she slips into the chair, takes the Catalog from its jacket and places the disc into the player. Seconds later life size models are competing for her attention. Go ahead, admit it — competing for yours too! In a few minutes the decision is made, the code entered into the system, the order is acknowledged, billed to MasterCard, and a ship date is provided.

The damage done, you prepare to go back to the task at hand when you are advised by your daughter that she simply must use the encyclopedia to research a subject for her science class. Without waiting for an answer she gains the chair, removes the latest copy of Encyclopedia Britannica from the reference shelf, slips off its jacket, places the platter on the player, deftly locates her subject, lists to the printer the three pages of interest, and surrenders the chair all before you can voice your objection.

At least your son is not home so there's no chance of his demanding the console to play his latest interactive Adventure Game, filmed entirely on location at several famous European medieval castles, and one infamous Hollywood studio.

A phonecall interrupts your return to flight practice — it's your best friend Phil — wants to know if you've heard of the new Pioneer laser disc drive. Seems it has record capabilities as well as play and costs only a few bucks more than the unit you're using now . . . fear not, you can always watch Jaws IV on your obsolete play only machine!

Lest you think the above scene unlikely, it may be interesting to note that Martin Duhms, formerly Vice President of Marketing at Lexidata, has formed New Media Graphics, a systems house devoted to developing and marketing laser disc based micro systems.

Then there's Project Aspen, a joint Army/M.I.T. simulation project melding laser disc technology with computers. Seems a film crew went to Aspen, Colo., drove down every street, making all possible turns and filming the entire sequence. The film was subsequently transferred to laser discs and the upshot is that the videodisc was interfaced to a computer, allowing a simulated trip down any street in Aspen by joystick control. The intelligence implications of the above are rather obvious.

Of course you've probably heard of Readers Digest's acquisition of a controlling interest in one of the major computer timeshare networks. I assure you this has nothing to do with selling magazines as we now know them. On a similar note, it has been admitted by at least two newsweekly magazines that they are investigating the possibility of eventually going to a videodisc format — people just don't seem to have much time for reading these days.

Concerning holographic projection, Sony, Panasonic and JVC all assure us they've units in the works. I've yet to see Sony not come through.

Laser disc/computer marriage? I'd bet my Atari on it! □



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EASTERN FRONT

by Chris Crawford

Distributed by the ATARI Program Exchange

Review by Jerry White

Do you like WAR games? Do you like games that pit your mind against a computer program opponent? If your answer is "Yes" to these two questions, treat yourself to Eastern Front.

Chris Crawford put eight months into this World War II simulation and the results are truly magnificent. The program uses a technique called fine scrolling to display the battle fields. Fine scrolling permits the viewer to scan an area as if he or she were in an airplane, looking down through binoculars. A joystick is used not only to direct the battle, but to scroll the screen in all directions. At any given time, you are viewing one-ninth of the battlefield.

The map is detailed and colorful. Mountains, trees, rivers, and seas are accurately placed throughout the terrain. The game begins in the summer of 1941. The trees are green and the rivers and seas are blue. As the seasons change, the ground gets muddy brown then turns white with the snows of winter. Rivers freeze early in the far north and later in the south. The game board is truly a sight to behold.

The game itself is easy to play but very difficult to master. The day it arrived in my mailbox, I spent many hours getting my tail whipped by the Russian Army. It is truly a game of strategy and skill. This is not an arcade shoot 'em up game although the sound of machine guns and graphics are present. This is a game of skill.

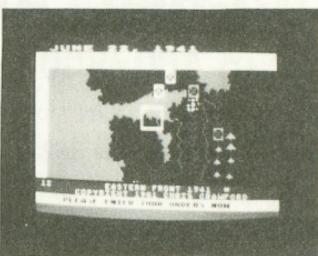
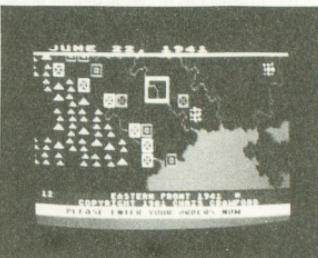
It comes with 13 pages of well written documentation including a map. Without the map I would never have found Moscow. Now if only my troops could get there. They will if I have to stay up all night. It's a bit frustrating but downright addictive. The documentation also provides insight to the actual war as Germany invaded Russia and the program does a nice job of emulating history.

Somehow this machine language program is supposed to fit into 16K in the cassette version but requires 32K on disk. I bought the disk version which is used to boot-up and automatically runs as an AUTORUN.SYS file. The game takes about two hours to play rushing it or around three hours if you give it proper thought. I never really like any game that took this long to complete but Easter Front 1941 is an exception.

You may have noticed that I don't write bad reviews. I refuse to take the time to review average or bad software. I do feel that is worthwhile to inform the public about software that is worth its price. I paid \$29.95 plus shipping for this package and I certainly got my money's worth. On a scale of 1 to

10, this is 9.3. Sorry Chris, I think there should have been something added at "The End". No program is perfect, but this one is about as close as you can get.

□

**Eastern Front: Rating**

1 - 10 (Unsatisfactory - Ideal)	
Concept	10
Originality	10
Challenge	10
Skill	7
Graphics	10
Sound	9
Overall Rating	9.3

SOFTWARE REVIEW:**"FILEMANAGER 800"**

by Tony Messina

FILEMANAGER 800**\$84.00****Synapse Software****820 Coventry Road****Kensington, CA 94707****Application: Data Base Management****System Requirements: ATARI 400/800 40K with Disk Drive and Printer**

Only recently has there been a proliferation of serious software released for the ATARI 800. The quality of this software has ranged from fair to excellent. FILEMANAGER 800 falls into the excellent category.

As the name implies, FILEMANAGER 800 is a file management system which allows the creation of a data-base suited to the users individual needs. BIG DEAL!!! Atari's MAIL LIST, CCA DATA MANAGEMENT SYSTEM and a host of others also perform the same function. OH...Dear Reader...I said the same thing as you...but, upon utilizing this amazing program, I tossed the others aside!! Explanations are in order.

DOCUMENTATION

The 94 page document which accompanies the package is concise, well written and provides instructions via example. All features of the program are covered in detail. You shold be able to get the skeleton of your data-base up and running within 30 minutes.

THE PROGRAM

I won't get bogged down in the details of creating your data-base. I will, however, discuss the important features of the program. FILEMANAGER 800 consists of two programs, FILEMANAGER and FILE MAINTENANCE.

FILEMANAGER

FILEMANAGER allows you the luxury of creating your file, entering fields for each record within your file and manipulating your records to generate lists or mail labels. Upon booting in the program a nice BIG main menu appears on the screen. Options available are as follows:

- 1) LOAD FILE
- 2) REVIEW FORM
- 3) CREATE FORM
- 4) RE-INDEX
- 5) FORMAT DISK
- 6) FILEMAINT
- 7) SAVE/END

LOAD FILE loads a previously created file (pretty clever, huh?). REVIEW FORM allows you to examine the field names, character lengths of each

field, current number of records in the file, maximum records allowed, current INDEX and the maximum file restriction. Restrictions on the number of records allowed in a particular file are based on two factors, amount of memory available or disk space available. An average of 600 records can be held in memory with a 48K system. CREATE FORM allows you to create the data fields that each record will have. A maximum of 20 fields are allowed and each field can have up to 100 characters. This is possible by allowing multiple-page records, where a page consists of 255 characters. Up to 9 pages are possible for each record. The software will do the paging automatically. Creating the form is as simple as designating a field name and entering the character length allowed for that field. After specifying your fields and lengths, hit START. You will be asked for the INDEX. You can select any field to be the INDEX as long as it is on the first page of your record. The INDEX field indicates which field your data will be sorted on. Sorting is automatic. If you choose last name, for example, all records will be sorted on that field. Each time you enter a new record, it will placed in the proper order automatically. Usually the first 5 characters of a field are sufficient for sorting purposes. You may, however, specify the number of significant characters for sorting purposes. Any number from 1 to 24 may be selected. The more characters you select, the fewer records allowed in memory. Hitting START again will return you to the MAIN menu.

The RE-INDEX option lets you re-specify your INDEX. Again, you may only specify an INDEX which resides on the first page of your record. The FORMAT DISK option is self-explanatory. FILEMAINT will be discussed a bit later. SAVE/END should be selected when you are finished using FILEMANAGER 800. It saves your form and INDEX to the disk. If you fail to select this option when finished, there is no problem. Upon subsequent use of the program you will be prompted to specify the INDEX. NO DATA WILL BE LOST!! You should end all sessions with this option.

Once a form is created you will want to enter data. Depression of the SELECT key will call up the RECORD menu. Options available here are:

- 1) ENTER RECORD
- 2) SEARCH
- 3) LIST
- 4) LABELS
- 5) REVIEW INDEX

Selecting ENTER RECORD will call up your form on the screen. Entering data is as simple as

filling in the blanks. Hitting START will save that record to the disk and clear the form for the next entry. Hitting SELECT will take you back to the RECORD menu.

The SEARCH functions has many options. Searching on the INDEX field is the fastest (Boy is it FAST!!). If the INDEX was LAST NAME and I wanted JONES, I would enter JONES in the last name field and all JONES would appear one record at a time on the screen. The cursor always positions itself on the INDEX field when entering the search function. Delimiters are also available. You can search for all JONES, all except JONES, all after JONES or all up to JONES. In addition, up to four sub-field searches can be made providing maximum flexibility on manipulating and displaying files. A character scan feature allows you to scan for specific characters within any field. I maintain a roster of musicians for our local union. Many members play multiple instruments. I have a field called instruments which contains all instruments which an individual plays. The character scan feature saved the day for me. The President of our local called me up one day and said "I need a list of all Drummers in the Local right away!!". Using the character scan for "DRUMS" I had the list within minutes. I cannot say how much time and trouble this feature alone has saved. Delimiters are also available on the character scan again providing maximum flexibility. Output can be directed to a printer or to the screen. Another option allows you to view data on the screen and the print it if desired. Deletion and updating of files is also done by the SEARCH function. Everything is incredibly simple and quick.

The LIST function allows the creation of lists according to your specifications. It allows title headers and provides automatic field headings. Up to 132 columns may be output to the printer along with printer control codes. Lists can be created in any format you specify and are simple to manipulate. The output produced is very professional. This area of the program could use some improvement (see DRAWBACKS) but is more than adequate for most applications.

The LABELS option allows you to create mailing labels for output to the screen or printer. Screen output is used to check your format prior to actual output to the printer. I've saved many labels with this feature. All the options allowed in the SEARCH function are applicable for the LABEL function. Another option allowed is the insertion of commas between fields when the labels are output.

The REVIEW INDEX option prints a brief listing of all records in memory based on the INDEX field. This allows a quick-scan capability of your INDEX field and is helpful in verifying which records are in memory.

FILE MAINTENANCE

The program as it stands is excellent. The FILE MAINTENANCE program just adds icing to the cake. If you've ever gone through the experience of creating a custom data-base for someone, entering 600 records and giving the output to your client only to have him say "Gee this is fantastic!!... OH... I forgot... we need the social security numbers listed also", you know the frustration other file systems present. After strangling your client you would proceed to re-create the data-base and include the SCAN field all the time praying your client didn't forget something else. Then you would re-key all 600 records. ARRARRGGGG!! If you had FILEMANAGER 800 you would call up FILEMAINT, add a new SSAN field and have the utility create a new data-base from the old one. It's magic!! It's fantastic!! THANK YOU. THANK YOU, SYNAPSE!! The utility allows you to create new fields, lengthen, shorten or delete old fields. It then takes your old data-base and updates it with your new masterpiece. Of course you still have to enter any new data, but it's much better than starting from scratch. This utility is a life saver.. BELIEVE ME!! You can also combine small files into larger ones. The menu which appears allows the options of copying a file, deleting a file, renaming a file, reading the current disk Directory, formatting disks or going back to the FILEMANAGER program. Once again, everything is clear, easy to understand and simple to use.

SOME DRAWBACKS

All programs are not perfect. FILEMANAGER 800 is no exception. Although I feel it is better than any system yet created for the ATARI, it still could use some additional "nice things". There are currently no provisions for computed fields, page totals or column totals. A data base program should have these. FILEMANAGER 800 does not. Mass Updates and Deletion of Records is another feature which FILEMANAGER 800 needs. Creation of sub-files is an important function which needs to be added. This would allow you to search a main file for certain records and save all of these in another file. The LIST and LABEL features, although adequate, could use several refinements. User specifiable blanks preceding the data output would be nice. This would move the data in from the left edge of the page and allow the output to be placed in a three ring notebook. Currently, a three-hole punch takes out some data. You can bypass this by specifying a dummy field containing 15-20 blanks and preceding your output with the dummy field. It is a bit messy and a pain to use as each record must have the dummy field. Another nice feature would be page breaks. During the output of long lists, data

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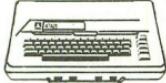
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sometimes gets printed on the tear line. This presents a problem when copying the list on a XEROX. The top and bottom data is sometimes chopped off!!! The present alternative to page breaks is watching the output, pausing the program when the tear line approaches, and manually advancing the paper.

CONCLUSIONS

Although I have a long list of things I feel the program should have, I must state the FILEMANAGER 800 is the most flexible and powerful file management system I have seen for the ATARI. A unique feature is the DATA-LOCK key packed with every program. It plugs into joystick port #1 and prevents all the nosey folks from accessing your program and data files. The program is designed with the user in mind. Error messages and prompts are extensive thus preventing that dreaded worry of wiping out your disk full of data. There is no way you can destroy data files unless it is intentional.

HOT FLASH!!!

A call to SYNPASE prior to publishing this article has revealed new developments. Having spoken with the program authors (Ken Grant and Ihor Wolosenko) I've found that a new version of FILEMANAGER 800 is in the works. ALL of the drawbacks mentioned earlier are being incorporated. Computed fields, page and column totals, mass updates and deletions of records, creation of subfiles, right hand justification, user defined blanks preceding data fields and a possible page break feature!!! Whew... These additions will certainly put FILEMANAGER 800 FAR ahead of all other data-base systems. In addition, Ihor told me of a new sister program for FILEMANAGER 800 to be titled REPORT MANAGER 800. It will include complete 80 column format control in the generation of any reports utilizing data-bases created with FILEMANAGER 800. Other features will include saving of report formats for later use and subsorts of report data. Release of both the FILEMANAGER 800 updated version and REPORT MANAGER 800 are scheduled for the Spring of 1982 (or sooner if Ihor and Ken can crank it out). All I can say is DON'T WAIT!! FILEMANAGER 800 is available NOW!! Registered owners will receive updates for a mere 20% of the new version cost. The folks at SYNPASE are a dedicated and professional group who stand behind their product 1000%. After a month of use and 20 data-bases later I am overjoyed with FILEMANAGER 800. I'm confident you will be also. It has saved me more in time and trouble than I paid. ☺

SOFTWARE REVIEW:**FANTASYLAND 2041**
by CRYSTAL COMPUTER**Review by Craig Patchett**

By now, most of you have probably seen the advertising for "Fantasyland". If not, you are missing out on one of the most interesting programs available for the Atari. Fantasyland is loosely based on the popular movies "Westworld" and "Futureworld", in which wealthy vacationers are able to live out their fantasies in special worlds created for their enjoyment. In the case of Fantasyland there are six such worlds, or lands: Congoland, Arabian Adventure, King Arthur, Olympus, Captain Nemo, and Dante's Inferno. These lands have been carefully constructed in the outbacks of Australia and now, in 2041 A.D., are considered to make up the ultimate resort, known to the world as "Fantasyland".

For those wealthy enough to enter Fantasyland (a three million dollar entrance fee is requested up front), there are many sleepless nights ahead. For in order to leave Fantasyland, you must find your way through all six lands, rescue Guinevere (or Lancelot, "according to your taste") from the clutches of the Underworld, and return to the Hall of Heroes, from whence the odyssey begins. Unfortunately, within each land are those that are programmed to see that you do not succeed. In order to defeat their programming, you must destroy them. In order to carry out their programming, they must destroy you. In essence, therefore, you will either succeed in rescuing Guinevere (or Lancelot), or you will have paid for the most expensive funeral ever.

If this sounds like something you might be interested in doing, but without the investment and the risk, then you're going to love Fantasyland, the program. Occupying around 400,000 bytes (not 500,000 as the ads claim) on three double-sided disks, Fantasyland is perhaps the most ambitious Atari program to date. Each disk side contains the data for one land, including over 40,000 bytes of graphics data alone. This data is in map form, however, rather than picture form. In other words, what you see on your screen as you play Fantasyland is a hi-res map of the particular land you are in. This map includes trees, swamps, mountains, and other terrain that must be negotiated as well as characters and creatures that are bent on destroying you. Needless to say, you yourself are also represented on this map. Using the joystick, you are able to move yourself around the screen, and thereby around the map. When you attempt to move off the edge of the screen, however, the map starts scrolling. For example, if you attempt to move off the top of the screen, the map will scroll down, while you stay at

the top of the screen. In this way, the screen acts as a window on a map that is really as large as SIXTEEN screens! Not only that, but each land is made up of four such maps; two high by two wide (when you cross over onto another map, the computer loads it into memory from disk — very quickly). Therefore, the map of each land is as large as sixty-four screens. You can easily imagine how time consuming it is to explore each land.

As if exploring alone wouldn't be enough, there are also many obstacles that must be overcome in order to successfully complete your odyssey. To aid you in this task, you are able to carry various items with you on your journey. Some of these items may be purchased in the Hall of Heroes, the starting point of Fantasyland. Warriors, for example, are necessary to do battle with the enemies you will come across. There are different types of warriors for each land, and each warrior has different abilities for attacking and defending. Each warrior is also able to carry a specific amount of weight, and you may also buy men and/or horses for the sole purpose of carrying things. In order to carry things with you, you MUST have enough men. If the weight of your baggage is more than your men can carry, then you will not be able to move. In this case, you must drop some of your baggage before you will be able to continue. Depending on where you drop things, you may pick them up again later on.

The most important thing that you must carry with you is rations. Without rations, your men will quickly starve, and you will eventually die. Unfortunately, you are only able to carry a limited amount of rations, which will eventually run out. The more men you have with you, the sooner your rations will run out. The less men you have, the worse you will fare in battle. Luckily, there are places within each land where you may trade, and pick up extra rations. That is, of course, if you can find them in time. Once you have left the Hall of Heroes, these trading posts are the only places where you will be able to buy anything, so it is extremely worthwhile to find them as soon as you can.

There is one cheap and easy way to get supplies without having to trade. Scattered across each land are treasures. All you have to do to claim them is walk over to them and pick them up. They vary from gold pieces, which you will need in order to trade (you start off with 5,000 gold pieces), to magical items that are essential to your success, to worthless pieces of junk (you'll have to determine what's worthless and what's not), to extremely valuable

treasures (that are, unfortunately, also extremely heavy). Some parts of some lands may be important just for the treasures they contain. Treasures will not appear in the same place every time, however, and may not still be there if you go back for them later.

Apart from the terrain, the trading posts, the treasures, and other "special" features, each land has an impassable wall that surrounds it, and an entrance and an exit. The entrance to Congoland is through the Hall of Heroes. The entrance to Arabian Adventure is through Congoland and so forth. With the exception of the Hall of Heroes, passing from one land to the next is not a simple task. There is usually magic needed and you must be properly equipped in order to be successful. Finding the entrance is often a task in itself, and may require several trips back to the trading post for extra rations. Going back to the previous land is relatively simple, however, again with the exception of the Hall of Heroes. You must have Guinevere before you are able to return to the Hall, at which point the game is over, and you have won.

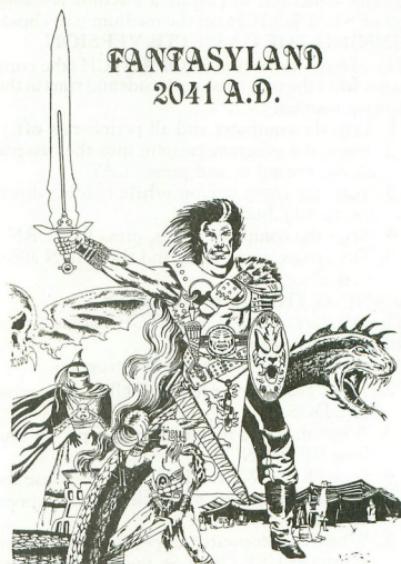
"Winning" is not dependent on making it back successfully. Upon completion you will be given a score, based on how quickly you completed your odyssey, how many treasures you secured, and how many enemies you destroyed. Thus, even though you may have discovered the tactics necessary to succeed, Fantasyland will not become another "solved puzzle" that sits on a bookshelf gathering dust. In fact, some lands are such that you may successfully pass through them one time and not the next.

I have so far spent somewhere close to seventy-five hours playing Fantasyland, and have not succeeded in winning yet, although I did make it all the way to Dante's Inferno and had Guinevere in sight. Despite having spent so much time without success, the game has still been a lot of fun. Just making it from one land to the next brings a feeling of success, while at the same time you know that even more challenge lies ahead. Having spent so much time also, however, I have come to realize the faults of the game, however few. Perhaps the most aggravating thing about Fantasyland is the time it takes to drop or to use something. In either case, you must go through an itemized list of what you are carrying before you are able to specify what you want to drop/use. As you get further on into the game, and are carrying more and more things (rations are item number 154), going through the list can take more time than you care for. A simple machine language routine could, and should, have taken care of this problem. Another problem is that if, in the Hall of Heroes, you attempt to buy more of something than you have money for, the program will inform you of your mistake and then not give you another chance to buy that particular item. I lost one game immediately when I attempted to buy more rations

than I had money for, thereby losing a chance to buy them at all, and consequently starving. Again, this could easily have been remedied. Other than the occasional spelling errors ("your dead") which should hopefully have been corrected by this time, these few problems are the only complaints I have with Fantasyland, and are consequently very minor.

This review has only skimmed Fantasyland and has purposely left out any details about the different lands, other than what their names suggest. To attempt to cover the game in any more detail would mean writing a small book, which Crystal has already done in the manual that accompanies Fantasyland (39 pages). I will therefore end this review at this stage with a simple point scale break-down of some significant information. I feel that, even at the \$59.95 list price, and despite a few problems, Fantasyland 2041 is a must for the Atari adventurer. □

FANTASYLAND 2041 A.D.



Fantasyland 2041: Rating

1 - 10 (Unsatisfactory - Ideal)
Concept 9
Originality 8
Challenge 7
Skill 7
Graphics 6
Sound 6
Overall Rating 7.2

STOPWATCH

by Craig Patchett

As you probably already know, the ATARI has a built-in, real-time clock (i.e. it keeps track of time while it's turned on). But what good is such a clock if you can't see it? STOPWATCH utilizes this clock in putting a real-time stopwatch on your screen, that works **independently** of BASIC!

CREATING A COPY OF STOPWATCH

Type and run one of the following programs, depending on whether you want a cassette or disk version. Be careful typing in the data, and make sure you save a copy of the program in case you find out later you made a mistake typing it in. Each of the programs when run will create a machine language copy of STOPWATCH on the medium you chose.

RUNNING THE CASSETTE VERSION

The cassette version of STOPWATCH (the copy you got from the previous step) loads and runs in the following manner.

1. Turn the computer and all peripherals off.
2. Insert the program cassette into the cassette player, rewind it, and press PLAY.
3. Turn the computer on **while** holding down the START button.
4. After the computer beeps, press RETURN.
5. The program will load; and then RUN automatically.

RUNNING THE DISK VERSION

The disk version of STOPWATCH loads and runs in the following manner.

1. Boot the disk containing the program.
2. Type "DOS" and press RETURN (you must have DOS II)
3. When the DOS menu appears, type "L" and press RETURN.
4. Type "STOPWATCH, OBJ" in response to the computer's request for a filename and press RETURN.
5. When the stopwatch appears on the screen and the "BUSY" light on the disk drive goes out, press SYSTEM RESET.

USING STOPWATCH

You should now have a running stopwatch in the top right-hand corner of your screen. If you don't make sure you followed the instructions correctly, and that you typed in the original BASIC program correctly.

Once you get the stopwatch working, you have the following options.

1. Ignore it (treat it as if it wasn't there)
2. Press START. This will stop the stopwatch if it was running, and start it if it wasn't.

3. If it's stopped, press SELECT. This will reset the stopwatch to 0:00:00.
4. Press SELECT. This will disengage the stopwatch if it was engaged, and engage it if it wasn't.

If STOPWATCH is disengaged, the ATARI will treat it just the same as if it were engaged **except** it will stop updating it on the screen. The best way to explain this is for you to try it yourself.

5. Press SYSTEM RESET. It has no effect on the stopwatch.

LIMITATIONS

STOPWATCH has the following **minor** limitations:

1. The ATARI will treat the stopwatch as if you had typed it there yourself. For example, position the cursor on the same line as the stopwatch and press RETURN. If this type of thing gets to be a problem, disengage it using the OPTION button.
2. If you try to use STOPWATCH in conjunction with other machine language routines or with the interface Module, you may run into problems. STOPWATCH uses almost all of page six in memory.
3. STOPWATCH will **not** work with OS/A= or BASIC A=
4. STOPWATCH will only count up to 9 hrs, 59 mins, 59 secs. If this is a problem, get some sleep instead!

Most of these limitations could be corrected by you (yes you) if you so desire and have the ability, but at the cost of having to use extra memory and probably having to relocate.

If you like, you can set STOPWATCH by changing the values of locations 1537 to 1541. Do this using POKE (experiment).

HOW IT WORKS

Below is an extensively commented source listing of the disk version of STOPWATCH, as well as the changes, necessary for the cassette version. Note that the run address is \$60A hex = 1546 decimal.

The trick that lets the ATARI act as though the stopwatch isn't there is called vertical blank (VBLANK for short). Briefly, vertical blank is the time during which the electron beam that draws the screen is returning from the bottom of the screen to the top for another pass. Some of this time is available to the machine language programmer and is independent of regular processor time.

If you want to learn more about VBLANK, study the source listing and consult the Operating System User's Manual, which can be purchased from ATARI (part number CO16555).

Hopefully the source listing will provide an informative introduction to machine language for all you novices out there. Enjoy! □

```

100 REM STOPWATCH
110 REM By Craig Patchett
120 REM (c) 1981 ANALOG Magazine
130 REM
140 REM (Cassette Version)
150 REM
160 REM
200 DIM PROG$(245)
210 FOR LOOP=1 TO 245:READ BYTE:PROG$(LOOP,LOOP)=CHR$(BYTE):NEXT LOOP
220 OPEN #1,8,128,"C":PRINT #1;PROG$:
CLOSE #1
999 END
1000 DATA 0,2,225,5,10,6,169,60,141,2,
211,169,2,133,9,169,0,141,68,2,165,12,
133,2,165
1010 DATA 13,133,3,108,12,0,0,0,0,0,0,
0,60,0,1,1,169,29,141,34,2,169,6,141,3
5
1020 DATA 2,169,0,133,10,169,160,133,1
1,96,165,88,133,203,165,89,133,204,165
,87,240,10,173,148,2
1030 DATA 133,203,173,149,2,133,204,16
9,8,141,31,208,173,7,6,240,12,173,31,2
08,201,7,208,55,169
1040 DATA 0,141,7,6,173,31,208,201,7,2
40,43,201,3,208,6,238,8,6,238,7,6,201,
6,208,6
1050 DATA 238,9,6,238,7,6,201,5,208,19
,173,9,6,41,1,208,12,169,0,162,6,202,1
57,0,6
1060 DATA 224,0,208,248,173,9,6,41,1,2
40,37,206,6,6,208,32,169,60,141,6,6,16
2,5,216,24
1070 DATA 254,0,6,138,41,1,10,10,105,6
,221,0,6,208,8,169,0,157,0,6,202,208,2
33,173,8
1080 DATA 6,41,1,240,37,160,31,216,162
,1,224,1,240,14,169,154,145,203,200,18
9,0,6,105,144,145
1090 DATA 203,200,232,24,189,0,6,105,1
44,145,203,200,232,224,6,208,228,76,95
,228 ●

```

Do these modifications to the source code for running the cassette version

```

; Initialize All the Vectors (Cassette Version)
;-----+
SYSRES LDA #CLOCK&255 tell the ATARI where we want it to go
;-----+
STA VBLK1
LDA #VBLCK/256
STA VBLK1+1
LDA #0 tell the ATARI where we want it to go
STA DOSVEC
LDA #RAO
STA DOSVEC+1
SYSRES RTS end of initialization

```

```

100 REM STOPWATCH
110 REM By Craig Patchett
120 REM (c) 1981 ANALOG Magazine
130 REM
140 REM (Disk Version)
150 REM
160 REM

```

```

200 OPEN #1,B,0,"D:STOPWTCH.OBJ"
210 FOR LOOP=1 TO 239:READ DATA:PUT #1
,DATA:NEXT LOOP
220 CLOSE #1
999 END
1000 DATA 255,255,0,6,226,6,0,0,0,0,
0,60,0,1,1,165,12,141,29,6,165,13,141,
30
1010 DATA 6,169,28,133,12,169,6,133,13
,32,41,6,169,42,141,34,2,169,6,141,35,
2,96,165,88
1020 DATA 133,203,165,89,133,204,165,8
7,240,10,173,148,2,133,203,173,149,2,1
33,204,169,8,141,31,208
1030 DATA 173,7,6,240,12,173,31,208,20
1,7,208,55,169,0,141,7,6,173,31,208,20
1,7,240,43,201
1040 DATA 3,208,6,238,8,6,238,7,6,201,
6,208,6,238,9,6,238,7,6,201,5,208,19,1
73,9
1050 DATA 6,41,1,208,12,169,0,162,6,20
2,157,0,6,224,0,208,248,173,9,6,41,1,2
40,37,206
1060 DATA 6,6,208,32,169,60,141,6,6,16
2,5,216,24,254,0,6,138,41,1,10,10,105,
6,221,0
1070 DATA 6,208,8,169,0,157,0,6,202,20
8,233,173,8,6,41,1,240,37,160,31,216,1
62,1,224,1
1080 DATA 240,14,169,154,145,203,200,1
89,0,6,105,144,145,203,200,232,24,189,
0,6,105,144,145,203,200
1090 DATA 232,224,6,208,228,76,95,228,
226,2,227,2,10,6 ●

```

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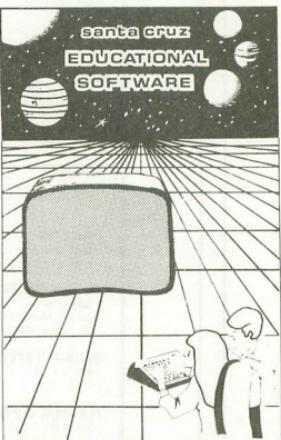
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By the time you read this all computers (400/800) being produced should have the fasted GTIA chips included. ATARI service may upgrade older computers - call and ask if it's easy to do yourself! We have one and the improvements that graphics modes 9, 10, and 11 offer are great! To help you figure out what to do with the new modes a new Tricky Tutorial will be offered in March on Modes 9 to 11. Either give us a call or write around that time.

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Player Missile Graphics: A Step Beyond

by Robert LaFerla

Most Arcade games and the popular ATARI games use a special type of "Action Graphics". Our ATARI also has this type of graphics. Unlike regular graphics, player-missiles move smoothly across the screen and are not accomplished by using the ATARI BASIC graphic commands. This type of graphics is called "Player-Missile Graphics". Star Raiders for instance, uses Player-Missile Graphics (PMG) for the Zylon ships and starbases. Many other games use PMG; such as Space Invaders, Pac-Man, Missile Command and of course, Defender.

Before you skip to my program on the other page, read this so you know what's going on. There are two parts to PMG: the player, an object eight bits or dots wide and up to 128 dots long, and the missile, which is a small player. There is one missile associated with each player. Since we have 4 players, (that's the limit if you use missiles, more on that later) then we have 4 missiles. Each missile takes on the same color as the player it is associated with and is independent of that player. The missile is smaller than the player and it is less detailed than the player.

The main purpose of PMG is that it can move an object smoothly over a background (regular graphics or text) without disturbing the background because it is independent of the graphics. The reason why it is smooth is because you have to design the object beforehand and place it somewhere in memory. Since it is always the same picture (unless you change it for animation or whatever), all that needs to be changed is the horizontal and/or vertical position.

First of all, let me get you started. First pick a graphics mode for your background. You 8K users should use graphics 1, 2, or 3 because they use the least amount of memory. You must have at least 24K or more to use Graphics 8, 9, 10, and 11 with PMG. Also, take into consideration that to safely put your PMG in memory you must allow at least 4 pages* of memory free for **double line resolution**. That is equivalent to a graphics 7 dot, which will be the size of the dot in every one of your players or missiles. You can get single line resolution by allowing 8 pages of memory. This is equivalent to a graphics 8 dot. (See Table 1.1)

Before we actually start to work on making a PMG program, we must design the players and missiles beforehand. First, if you plan to design games or programs that use PMG, go down to your local

stationary store and buy a very large pad of 1 cm by 1 cm graph paper. If you want to see what the PMG would look like on the screen get a smaller size $\frac{1}{4}$ cm by $\frac{1}{4}$ cm. Using the graph paper will enable you to design the PMG bit-by-bit.

First, to start drawing in PMG let's draw a player, because it is the simplest to draw and will give you some experience in drawing bit maps. Remember how I said that a player was 8 bits or dots wide? On your graph paper find eight consecutive columns and number from left to right like this (128, 64, 32, 16, 8, 4, 2, 1). Notice that going from left to right the numbers decrease by half and also note that all these numbers, when added together, add up to 255. Each dot in your player must be within the eight column grid. The length of your player is determined on how long you want your player to be (128 is the maximum you can have on the screen at once.) Each dot in your player takes up a full block on the grid. Now draw your picture within the grid. (See Table 1.2)

Once you have finished drawing a picture, there is still the problem of feeding the computer the information about the design of the player. What we do to find how to put the picture in the computer is to go to the first row of the picture and add up the dots that are in each column. Say that there is a dot under column 128 and there is one dot under column 16 and another dot under column 1 you would get the sum of those numbers to find the value of the line, in this case 145. Do this to every line in your player, put the result to the side in order. You see, the computer handles these graphics like a stack of numbers piled one on each other. Notice that since these numbers are less than or equal to 255 then they can be poked into memory.

Here comes the tricky part. If you want double line resolution you must put aside 512 bytes of memory for the vertical movement of your player. If you want single line resolution, you must put aside 1,024 bytes of memory, the equivalent of one K of memory. I will explain what to do with these numbers later on. Since the computer relocates this stack one scan line vertically you must place one or two zeros at the top and bottom of your player. This will allow your player not to stretch across the screen, but move vertically.

Okay, we now know that we can safely put our

PMG in memory and how to draw players. So everyone can enjoy this article, I will suppose that I have an 8K machine (How did I lose 40K???) so you 8K users can join in on the fun. First, I will use Graphics 2 so I can conserve memory.

10 GRAPHICS 2

Now I still want single line resolution, so my display looks nice. That means I must put aside 16 pages of memory for my use.

20 I=PEEK (106)

Now we must store it in PMBASE, a register (location) so our ATARI knows where we put our players and missiles.

30 POKE, 54279, 1

Next let us tell the Antic Chip it can take enough memory for graphics mode and PMG that it needs. This is called Direct Memory Access — DMA. If you want double line resolution your number is 46. If you want single line then your number is 62. We want single line!

40 POKE 559,62

Now we come to the next step, a location called GRACTL (53277). I believe it stands for Graphics Control. This is what to poke or store at GRACTL.

If you want to use:

1 Missiles DMA

2 Players DMA

3 Players and Missiles

We want to use both players and missiles for the fun of it.

50 POKE 53277,3

This location tells the graphic chip in your computer, the CTIA (if you have bought your computer after January 1st the chip is the GTIA, a more sophisticated chip) to accept PMG.

Now we come to color. Since we cannot use the COLOR command or SETCOLOR, we have to use registers. In ATARI BASIC, if you say COLOR 1, the color is set to Gold or whatever, then by using SETCOLOR you can change it. SETCOLOR 1, 10, 14 would change color 1 to another color. Actually BASIC use of the color command is not actually in the hardware, but the SETCOLOR command is in the hardware. The color is always set to zero (black), and Setcolor can change it. Here are the equivalent POKEs.

SETCOLOR Register 1, Hue 10, Luminance 14 (POKE Register + 708, HUE * 16 + Luminance)

Now PMG colors are below that. Pretend instead of the register being added to the first location let the player be substituted and change 708 to 704 (the PMG SETCOLOR). Remember the missile takes on the same color as the player.

(POKE Player # + 704, HUE * 16 + Luminance) (See chart for HUE numbers and colors)

Now back to our program. We want a white player

0.

60 POKE 704, 14

Remember SETCOLOR Player 0 + 704, 0, 14. This program will use only one player, just to demonstrate player missile graphics.

That means that we have to find the place in memory to store our player, the chess king on Table 1.2. Do this:

70 PMBASE=I*256

This finds the starting address of the players. Now let's find the starting address of the player we want, PLAYERO. We want single line resolution, so we add 1024 to the PMBASE. We now set up the X and Y locations of the player and the vertical and horizontal positions of the chess piece.

80 PLAYER=PMBASE+1024:X=100:Y=100

We must erase all previous PMG in memory or at least the spot we are using. If you do not do this, when you RERUN the program you will see multiple images. Speaking of images, if you use high-res GRAPHICS and you do not allocate enough memory for your players you will find some unnecessary screen display.

85 FOR A=PLAYERO TO PLAYER0+256: POKE A,0:NEXT A

Now "Read" player from data statements.

85 L=14

90 FOR A=PLAYER0+Y TO PLAYER0+Y+L: READ B:POKE A,B:NEXT A

Now line 90 draws the player at the Y or vertical coordinate. Line 100 will set the X or horizontal coordinate.

100 POKE 53248,X

Location 53248 is Player0's movement horizontally. Now we come to size. In PMG you can have three different sizes: small, medium, or large and two different resolutions: single and double line. We want our king to be medium.

110 POKE 53245,1

Small=0

Medium=1

Large=3

Data for PLAYERO, the king:

120 DATA, 0,0,16,56,16,214,254,124,56,56,
56,124,254,0,0,0

Although this program does not use collision detection, I will still explain them. Collisions occur when two players touch each other, a missile touches a player, a player makes contact with a background object, or a missile hits a background object.

(See memory map for registers).

If there is a collision and you PEEK at your specific register, the computer will respond with a number. The number depends on what you are looking for. For example, if you are looking for a collision between PLAYERO and COLOR 1, your result will be 1, COLOR 2 will be 2, etc. The same thing goes for other players only it will refer to the player number.

Now we have to add joystick movement to the program.

```

130 C=STICK (0)
131 IF = 15 THEN 130
132 POKE 77,0: REM ATTRACT MODE OFF
133 IF C=11 THEN X=X : POKE 53248,X
134 IF C=7 THEN X=X+1: POKE 53248,X
135 IF C=13 THEN FOR D=L TO 0 STEP -1:
POKE PLAYER0+Y+D, PEEK PLAYER0+Y+D
+D):NEXT D:Y=Y+1
136 IF C=14 THEN FOR D=0 TO L:POKE
PLAYER0-1+Y+D, PEEK(PLAYER0+Y+D):
NEXT D:Y=Y-1
137 GOTO 130

```

That's it for now. Look over the charts and tables I have prepared for your use and happy programming! □

Table 1.2
Missile Bit Map

Player	128	64	32	16	8	4	2	1	Value
1									0
2									0
3									16
4									56
5									16
6									214
7									254
8									124
9									56
10									56
11									56
12									124
13									254
14									0
15									0

Table 1.1

Graphics Mode	Bytes Used	Pages Used	*	Mem. Colors Req.
0[40×24]Text	993	4	4	2 8K+
1[20×24]Text	513	3	4	5 8K+
2[20×12]Text	261	2	4	5 8K+
3[40×24]Gr.	273	2	4	4 8K+
4[80×48]Gr.	537	3	4	2 8K+
5[80×48]Gr.	1017	4	4	4 8K+
6[160×96]Gr.	2025	8	8	2 16K+
7[160×96]Gr.	3945	16	16	4 16K+
8[320×192]Gr.	7900	31	32	½ 24K+
9[80×192]Gr.	7900	31	32	16 24K+
10[80×192]Gr.	7900	31	32	16 24K+
11[80×192]Gr.	7900	31	32	16 24K+

* = Closest multiple of four (4). You must use this number, which is the number of pages that will compensate for the mode; the Display List.

Choose only one of the following:

- Double line resolution: Add a "4" to the number of pages; [*]
- Single line resolution: Add a "8" to the number of pages; [*]

Scratch Pad

1	128	64	32	16	8	4	2	1
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Table 1.3
Players' and Missiles' Positions
in Memory

Double Line Resolution

Player #	# to add to starting address*
0	512
1	640
2	768
3	896
4**	1024

**can be missiles' starting address

*starting address is where you locate your PMG.
Ex. I=PEEK(106)-8:PM=256*I B=PM+152

Single Line Resolution

Player #	# to add to starting address
0	1024
1	1280
2	1536
3	1795
4**	2048

Memory Locations needed for PMG

LABEL	Hexa-decimal	Decimal	Explanation
HPOSP0	D000	53248	(W) Horizontal position of Player0
M0PF	D000	53248	(R) Missile0 to Playfield Collision
HPOSP1	D001	53249	(W) Horizontal Position of Player1
M1PF	D001	53249	(R) Missile1 to Playfield Collision
HPOS2	D002	53250	(W) Horizontal Position Player2
M2PF	D002	53250	(R) Missile2 to Playfield Collision
HPOSP3	D003	53251	(W) Horizontal Position of Player3
M3PF	D003	53251	(R) Missile3 to Playfield Collision
HPOSM0	D004	53252	(W) Horizontal Position of Missile0
P0PF	D004	53252	(R) Player0 to Playfield Collisions
HPOSM1	D005	53253	(W) Horizontal Position of Missile1
P1PF	D005	53253	(R) Player 1 to Playfield Collisions
HPOSM2	D006	53254	(W) Horizontal Position of Missile2
P2PF	D006	53254	(R) Player2 to Playfield Collisions
HPOSM3	D007	53255	(W) Horizontal Position of Missile3
P3PF	D007	53255	(R) Player 3 to Playfield Collisions
M0PL	D008	53256	(R) Missile0 to Player Collisions
SIZEP0	D008	53256	(W) Size of Player0
M1PL	D009	53257	(R) Missile1 to Player Collisions
SIZEP1	D009	53257	(W) Size of Player1
M2PL	D00A	53258	(R) Missile2 to Player Collisions
SIZEP2	D00A	53258	(W) Size of Player2
M3PL	D00B	53259	(R) Missile3 to Player Collisions
SIZEP3	D00B	53259	(W) Size of Player3
P0PL	D00C	53260	(R) Player0 to Player Collisions

SIZEM	D00C	53260	(W) Sizes for all missiles
GRAFP0	D00D	53261	(W) Graphics for Player0 (shape) [GRACTL must not be used]
P1PL	D00D	53261	(R) Player1 to Player Collisions
GRAFP1	D00E	53262	(W) Graphics for Player1 [GRACTL must not be used]
P2PL	D00E	53262	(R) Player 2 to Player Collisions
GRAFP2	D00F	53263	(W) Graphics for Player2
P3PL	D00F	53263	(R) Player3 to Player Collisions
GRAFP3	D010	53264	(W) Graphics for Player3
GRAFM	D011	53265	(W) Graphics for all missiles (NODMA)
PRIOR	D01B	53275	(W) Priority select
GRACTL	D01D	53277	(W) used with DMACTL
HITCLR	D01E	53278	(W) Clear collision registers
DMACTL	D400	54272	(W) DMA control/Res for Play as/Playfields
SDMCTL	22F	559	(W) DMA enable/disable
PMBASE	D406/7	54278/9	(R/W) Player Missile base address
RAMTOP	6A	106	Top of RAM in pages of memory.
PCOLR0	2C0	704	Color of Player & Missile0
PCOLR1	2C1	705	Color of Player & Missile1
PCOLR2	2C2	706	Color of Player & Missile2
PCOLOR3	2C3	707	Color of Player & Missile3
COLPF3	D019	53273	(W) Color & Lum. of Playfield3 and Player4 (if no missiles are used) •



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VCS UPDATE...

by Lee Pappas

If you owned an ATARI Video Computer System before the purchase of your 400 or 800 Computer, and have hung on to it all these months (or years), well, you are in for a treat! ATARI plans to release a cartridge a month during 1982 — and the titles certainly sound intriguing. Of course, you'll still have Activision to provide you with additional entertainment. If these aren't enough to support your game habit, two new companies are about to provide even more games! APOLLO of Richardson, Texas has recently released "Skeet Shoot" (ATARI & Activision have nothing to fear from the graphics on this first release).

Imagic of Saratoga, California, is currently gearing up for their manufacturing of VCS compatible cartridges.

ATARI titles for '82 are...

- Super Breakout™ January
- Haunted House February
- PacMan* March
- Yar's Revenge™ May
- Defender** June
- Math Gran Prix July
- Bezerk*** August
- Star Raiders™ September

Believe it or not, Star Raiders isn't too bad on this. The Difficulty Switches turn the shields and attack computer on & off. There are no sectors to jump to; the enemy ships just keep coming at you.

In Haunted House you have to find the three lost pieces of the silver urn before using up your 9 lives as you prowl the corridors and rooms of a haunted mansion. Yar's Revenge is an exciting space/action game where you control a 'YAR SCOUT' out to destroy alien craft.

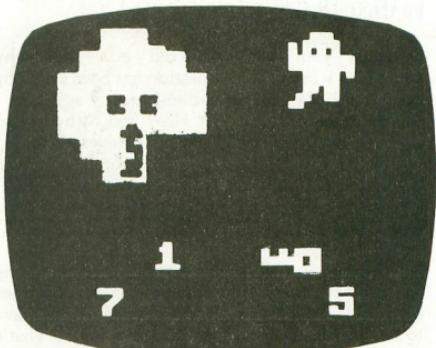
Of course, PacMan, Defender, and Bezerk are all based on the arcade games of the same names. Two new adventure games will be released, part of a series totalling four interrelated games. Each game involves a theme-element: Earth, Fire, Air, or Water. Your goal is to find the secret of the first game, then proceed to the second, etc. However, the games may be played individually if you prefer.

Two games tentatively scheduled for later release are Hot Rox and Fox Bat. □

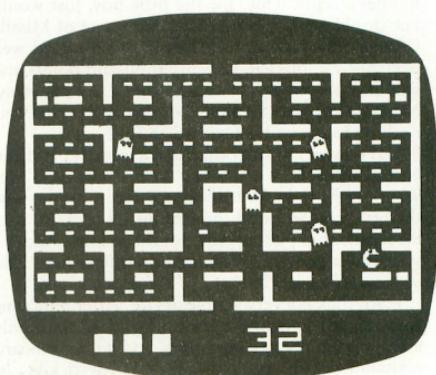
*PacMan is a trademark of Namco-America, Inc.

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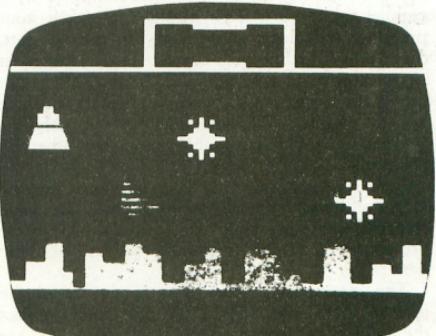


HAUNTED HOUSE Game Program™



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Non-Tutorial IV

by Charles Bachand

"Have you ever wondered how and why something works?" This question has been asked by countless books and magazines, mostly as a lead for them to tell you just How and Why. That question is a little lengthy. "Have you ever wondered why, when you use the BASIC function STICK(O), that it doesn't return nice numbers such as 0=LEFT, 2=RIGHT, etc., but instead gives you weird numbers like 15=NOTHING, 11=LEFT, 7=RIGHT, etc.?"

Now that I've done my "Andy Rooney talking about his ties" imitation, it is time to switch scenes again. "Hey Ma! My joystick is BROKE! You'll have to buy me another one!", the little boy said. "That's the third one that you've broken. You'll just have to wait till I can get to the store next week.", was his mother's reply. This, for the little boy, just would not do. He was very involved in a game of Missile Command (tm) and had already accumulated well over one hundred and twenty thousand points and would probably die of old age by next week anyway. Maybe the Joystick could be repaired? There was nothing to loose. He just had to find out.

Did you ever wonder what is in a Joystick? Did you ever wonder how a Joystick works? Did you ever wonder why they call it a Joystick? Ever wonder how the little boy broke all three of his joysticks or why his mother has put up with him for so long? And did you ever wonder why I am constantly saying "Did you ever wonder"?

A Joystick is a very simple device. After removing four screws and taking the bottom off, one finds only a few plastic parts, some wires, and a circuit board containing push button switches. A Joystick is just five switches and a connecting stick. So where do the funny numbers for up, down, left, and right come from? Well, I am going to tell you all about it. Atari Joysticks are connected into the computer by a parallel input port. This means that when your program reads information from this parallel port, there is one bit for each switch. The lowest most significant bit (we will call it bit "0" since numbering systems using computers start counting with the number "0") senses the upward push on a Joystick. The following table shows the other bit positions.

Now, the nibble or four bit subbyte, is not the value returned by the joystick ports. The value returned is the inverse of the values shown in the previous table. The correct values are shown in the next table.

The inverse bit values you receive from the joystick ports are due to the way the joysticks themselves are wired. The switch contacts are connected to the port lines with pull-up resistors. These resistors apply a constant 5V signal to the

lines forcing the logic to a high level. When you push on the joystick, the switch or switches (in a diagonal position) close and bring the signal from 5V down to 0V , bringing the logic at the port to a low logic level. The bit read from its corresponding switch is changed from a logic 1 to 0. All we need now is a demonstration in machine language.

Enough About Joysticks

MAPWARE, written by Harry C. Koons, is one of the more interesting programs to come out of APX (Atari Program Exchange). Using this program, it is possible to generate maps of any section of the earth. The software is written in BASIC and is distributed on two diskettes. The first disk contains programs to generate maps using different projection methods and a program to display a previously generated and stored map. The second disk contains the coordinate data of every important land feature in the world. This disk contains over 640 blocks of information, which translates to over 80 thousand characters of information. It even generates the U.S. state boundaries. Since the programs are written in BASIC, they tend to be on the slow side, usually taking from ten to twenty minutes to generate a map, but the results are well worth it. I strongly recommend this package to anyone with a 40K system.

Now, what does this program have to do with joysticks, you might be wondering. What can a joystick do to a stationary map? Believe me, these maps won't be stationary for very long!

You've all seen scrolling. It happens every time you enter a line in a BASIC program with a full screen. The lines of text before it all move up when you hit RETURN. This is known as coarse vertical scrolling. Also, coarse horizontal scrolling. You usually see this when editing text, especially when characters are inserted or deleted in the middle of a line. The rest of the text moves sideways. We have all seen this happen. It's really no big deal.

What you may not know is that the ATARI computer has the ability to FINE scroll vertically, and horizontally. Characters and pictures can be moved up and down in increments of one scan line on the television set. They can also be moved left and right in increments of one color clock (the width of a point in graphics mode 6 or 7). All this power is hidden in your machine, and you probably never know it unless you played such games as Atari's SPACE INVADERS (horizontal scrolling) or ANALOG SOFTWARE's Race In Space (vertical scrolling). We, using our map and out joystick are going to do both!

Now, it really does not have to be a map. You can use any picture that was drawn in full screen graphics

mode 8 (GRAPHICS 8=16), as long as a screen dump of the picture has been stored on tape or diskette. The accompanying program will load your picture into RAM in full screen mode 6 (GRAPHICS 6=16) even though the graphics were originally in full screen mode 8. The internal graphic representation between the two modes is the same, one pixel for each bit position in memory. And since graphics mode 6 has half the resolution, both horizontally and vertically, that graphics mode 8 has, you will be able to see only a quarter of the actual picture or map. The program will allow you to scroll the television's screen over the picture while being controlled by the joystick. You will be able to see only 25% of the picture at any one time, but you will be able to choose which 25% to look at. □

BIT	DIRECTION	NIBBLE
0	UP	0001
1	DOWN	0010
2	LEFT	0100
3	RIGHT	1000
	DIRECTION	INVERSE
	CENTER	1111
	UP	1110
	DOWN	1101
	LEFT	1011
	RIGHT	0111
	UP-LF	1010
	UP-RT	0110
	DN-LF	1001
	DN-RT	0101
		5
		DECIMAL

```

100 REM SCROLLING MAPWARE
110 REM DISPLAY PROGRAM
120 REM
130 REM BY CHARLES BACHAND 1982
140 REM
150 REM TO LOAD ANOTHER FILE,
160 REM PUSH SYSTEM RESET AND
170 REM TYPE RUN.
180 REM
190 DIM NAME$(20),MLOAD$(41)
200 DIM SCR$(161),INIT$(130)
210 GRAPHICS 8:POKE 752,1:GOSUB 360
220 PRINT "MAP SCROLL PROGRAM":PRINT*
230 PRINT "MAPWARE FILE NAME ==> ";
240 INPUT NAME$:TRAP 220:?:?:?
250 SETCOLOR 2,0,0:POKE 752,1
260 PRINT "SCROLLING FILE ==> ";NAME$
270 REM
280 REM LOAD GRAPHICS DATA
290 REM
300 CLOSE #1:OPEN #1,4,0,NAME$
310 A=USR(ADR(MLOAD$))
320 IF A>127 THEN 220
330 FOR COUNT=1 TO 500:NEXT COUNT
340 A=USR(ADR(INIT$),ADR(SCR$))
350 GOTO 350
360 REM
370 REM INITIALIZATION ROUTINES
380 REM FOR FINE SCROLLING OF DISPLAY
390 REM
400 REM BINARY DATA LOADER
410 REM
420 PRINT "LOADING ML SUBROUTINES"

```

```

430 FOR COUNT=1 TO 41:READ VALUE
440 MLOAD$(COUNT)=CHR$(VALUE)
450 NEXT COUNT
460 REM
470 REM DISPLAY LIST INITIALIZER
480 REM
490 FOR COUNT=1 TO 130:READ VALUE
500 INIT$(COUNT)=CHR$(VALUE)
510 NEXT COUNT
520 REM
530 REM DISPLAY SCROLL ROUTINE
540 REM
550 FOR COUNT=1 TO 161:READ VALUE
560 SCR$(COUNT)=CHR$(VALUE)
570 NEXT COUNT:POKE 752,0:PRINT
580 RETURN
590 REM DATA FOR MACHINE LANGUAGE
600 REM SUBROUTINES
610 REM
620 REM BINARY LOADER CODE
630 REM
640 DATA 104,162,16,169,7,157,66,3
650 DATA 169,0,157,72,3
660 DATA 169,30,157,73,3,165,88,157
670 DATA 68,3,165,89,157,69,3,32,86
680 DATA 228,189,67,3,133,212
690 DATA 169,0,133,213,96
700 REM
710 REM DISPLAY INITIALIZATION CODE
720 REM
730 DATA 104,169,0,133,179,169,160
740 DATA 133,178,169,112,141,0,6
750 DATA 141,1,6,141,2,6,160,80
760 DATA 166,88,202,202,134,176,165
770 DATA 89,133,177,162,3,169,123
780 DATA 157,0,6,232,165,176,157,0,6
790 DATA 232,165,177,157,0,6,232
800 DATA 165,176,24,105,40,133,176
810 DATA 144,2,230,177,136,208,224
820 DATA 169,91,157,253,5,169,66
830 DATA 157,0,6,173,148,2,157,1,6
840 DATA 173,149,2,157,2,6,169,2
850 DATA 157,3,6,157,4,6,157,5,6
860 DATA 169,65,157,6,6,169,0,157,7,6
870 DATA 141,48,2,169,6,157,8,6
880 DATA 141,49,2,104,170,104,168
890 DATA 169,7,32,92,228,96
900 REM
910 REM FINE SCROLL CODE
920 REM
930 DATA 169,0,133,176,133,177
940 DATA 173,120,2,41,8,208,21
950 DATA 165,178,240,45,198,178
960 DATA 165,178,41,7,141,4,212
970 DATA 201,7,208,32,230,176
980 DATA 208,28,173,120,2,41,4
990 DATA 208,21,165,178,201,160
1000 DATA 240,15,230,178,165,178,41,7
1010 DATA 141,4,212,208,4,198,176
1020 DATA 198,177,173,120,2,41,2
1030 DATA 208,28,165,179,201,228
1040 DATA 240,22,230,179,165,179,41,1
1050 DATA 141,5,212,208,11,165,176,24
1060 DATA 105,40,133,176,144,2
1070 DATA 230,177,173,120,2,41,1
1080 DATA 208,28,165,179,240,24
1090 DATA 198,179,165,179,41,1
1100 DATA 141,5,212,201,1,208,11
1110 DATA 165,176,56,233,40,133,176
1120 DATA 176,2,198,177,160,0,185,4,6
1130 DATA 24,101,176,153,4,6,185,5,6
1140 DATA 101,177,153,5,6,200,200,200
1150 DATA 192,240,208,232,76,98,228
1160 END

```

```

0000 0100 ; .OPT NOEJECT
0110 ; MAPWARE SCROLL PROGRAM
0120 ; MACHINE LANGUAGE ROUTINES
0130 ; BY CHARLES BACHAND 1982
0140 ; NOTE: ALL MACHINE LANGUAGE ROUTINES
0150 ; PRESENTED HERE ARE RELOCATABLE
0160 ; SINCE ALL JUMPS WITHIN THE ROUTINES
0170 ; ARE RELATIVE JUMPS.
0200 ; SYSTEM EQUATES
0210 ; 0600 0190 DISPLAY LIST
0230 LIST == $0600 CONTROL BLOCK OFFSET
0240 ICB1 == $10 GETCHAR == $07
0250 GETCHR == $0058 DISPLAY DATA PTRN
0260 SAVNSC == $005B SPLIT SCREEN PTRN
0270 TXTHSC == $0294 1/O COMMAND BYTE
0280 ICDM == $0342 1/O STATUS BYTE
0290 ICSTA == $0343 1/O BUFFER (LOW)
0300 ICBAL == $0344 1/O BUFFER (HIGH)
0310 ICBAH == $0345 BUFFER LENGTH (LOW)
0320 ICBL == $0348 BUFFER LENGTH (HIGH)
0330 ICBLH == $0349
0340 DLISTL == $02231 DISPLAY LIST PTRN
0350 DLISHT == $02231 JOYSTICK REGISTER
0360 STICK == $02278 HORIZONTAL SCROLL
0370 HSICROL == $0404 VERTICAL SCROLL
0380 VSICROL == $0405
0390 CI0V == $E456 CENTRAL I/O VECTOR
0400 SETV0V == $E45C VBLANK SET VECTOR
0410 XITV0V == $E462 EXIT FOR V-BLANK
0420 BAVSVAL == $0000 RETURNED VALUE ADDR
0430 SIZEL == 7680&8FF SCREEN SIZE (LOW)
0440 SIZEH == 7680/256 SCREEN SIZE (HIGH)
0450 ; 0460 ; *= $00B0
0470 ; 0480 ; PAGE 0 VARIABLE ASSIGNMENTS
0490 ; 00B0 0500 OFEL0 == *+1 SCROLL DATA (LOW)
0510 OFFH1 == *+1 SCROLL DATA (HIGH)
0520 XPOS == *+1 X-COORDINATE DATA
0530 YPOS == *+1 Y-COORDINATE DATA
0540 ; 0550 ; *= $1.000 RELOCATABLE CODE
0560 ; 0570 ; INITIALIZATION ROUTINE TO SET UP NEW
0580 ; DISPLAY LIST, AND INITIALIZE POINTERS
0590 ; 00B1 PLA POP PARAMETER COUNT
00B2 INIT LDA BOTTOM OF SCREEN
00B3 STA YPOS INITIALIZE Y-COORD
00B4 ; 00B5 ; RIGHT EDGE OF SCREEN
00B6 ; 00B7 ; RELOCATABLE CODE
1082 1220 ; *$2000
1230 ; FAST MAP LOADING CODE
1240 ; READS IN 7680 BYTES FROM DEVICE #1
1250 ; TO SCREEN MEMORY VERY QUICKLY!
1260 ; 1280 ; POP PARAMETER COUNT
1290 LOAD PLA
1300 LDX #TOCB1
1310 LDA #GETCHR
1320 STA IC0V, X
1330 STA #SIZEL
1340 STA ICBLH, X
1350 STA ICBLH, X
1360 STA ICBLH, X
1370 STA ICBLH, X
1380 STA ICBLH, X
1390 STA ICBLH, X
1400 STA ICBLH, X
1410 JSR CIOV
1420 STA ICSTA, X
1430 STA BAVSVAL
1440 STA #0
1450 STA BAVSVAL+1
1460 RTS
1470 ; *$3000
1480 ; 2029 ; VERTICAL BLANK SCROLL ROUTINE
1490 ; 1500 ; 1510 ; 1520 ; 1530 ; 1540 ; 1550 ; 1560 ; 1570 ; 1580 ; 1590 ; 1600 ; 1610 ; 1620 ; 1630 ; 1640 ; 1650 ; 1660 ; 1670 ; 1680 ; 1690 ; 1700 ; 1710 ; 1720 ; 1730 ; 1740 ; 1750 ; 1760 ; 1770 ; 1780 ; 1790 ; 1800 ; 1810 ; 1820 ; 1830 ; 1840 ; 1850 ; 1860 ; 1870 ; 1880 ; 1890 ; 1900 ; 1910 ; 1920 ; 1930 ; 1940 ; 1950 ; 1960 ; 1970 ; 1980 ; 1990 ; 2000 ; 2010 ; 2020 ; 2030 ; 2040 ; 2050 ; 2060 ; 2070 ; 2080 ; 2090 ; 2100 ; 2110 ; 2120 ; 2130 ; 2140 ; 2150 ; 2160 ; 2170 ; 2180 ; 2190 ; 2200 ; 2210 ; 2220 ; 2230 ; 2240 ; 2250 ; 2260 ; 2270 ; 2280 ; 2290 ; 2300 ; 2310 ; 2320 ; 2330 ; 2340 ; 2350 ; 2360 ; 2370 ; 2380 ; 2390 ; 2400 ; 2410 ; 2420 ; 2430 ; 2440 ; 2450 ; 2460 ; 2470 ; 2480 ; 2490 ; 2500 ; 2510 ; 2520 ; 2530 ; 2540 ; 2550 ; 2560 ; 2570 ; 2580 ; 2590 ; 2600 ; 2610 ; 2620 ; 2630 ; 2640 ; 2650 ; 2660 ; 2670 ; 2680 ; 2690 ; 2700 ; 2710 ; 2720 ; 2730 ; 2740 ; 2750 ; 2760 ; 2770 ; 2780 ; 2790 ; 2800 ; 2810 ; 2820 ; 2830 ; 2840 ; 2850 ; 2860 ; 2870 ; 2880 ; 2890 ; 2900 ; 2910 ; 2920 ; 2930 ; 2940 ; 2950 ; 2960 ; 2970 ; 2980 ; 2990 ; 3000 ; 3010 ; 3020 ; 3030 ; 3040 ; 3050 ; 3060 ; 3070 ; 3080 ; 3090 ; 3100 ; 3110 ; 3120 ; 3130 ; 3140 ; 3150 ; 3160 ; 3170 ; 3180 ; 3190 ; 3200 ; 3210 ; 3220 ; 3230 ; 3240 ; 3250 ; 3260 ; 3270 ; 3280 ; 3290 ; 3300 ; 3310 ; 3320 ; 3330 ; 3340 ; 3350 ; 3360 ; 3370 ; 3380 ; 3390 ; 3400 ; 3410 ; 3420 ; 3430 ; 3440 ; 3450 ; 3460 ; 3470 ; 3480 ; 3490 ; 3500 ; 3510 ; 3520 ; 3530 ; 3540 ; 3550 ; 3560 ; 3570 ; 3580 ; 3590 ; 3600 ; 3610 ; 3620 ; 3630 ; 3640 ; 3650 ; 3660 ; 3670 ; 3680 ; 3690 ; 3700 ; 3710 ; 3720 ; 3730 ; 3740 ; 3750 ; 3760 ; 3770 ; 3780 ; 3790 ; 3800 ; 3810 ; 3820 ; 3830 ; 3840 ; 3850 ; 3860 ; 3870 ; 3880 ; 3890 ; 3891 ; 3892 ; 3893 ; 3894 ; 3895 ; 3896 ; 3897 ; 3898 ; 3899 ; 3900 ; 3901 ; 3902 ; 3903 ; 3904 ; 3905 ; 3906 ; 3907 ; 3908 ; 3909 ; 3910 ; 3911 ; 3912 ; 3913 ; 3914 ; 3915 ; 3916 ; 3917 ; 3918 ; 3919 ; 3920 ; 3921 ; 3922 ; 3923 ; 3924 ; 3925 ; 3926 ; 3927 ; 3928 ; 3929 ; 3930 ; 3931 ; 3932 ; 3933 ; 3934 ; 3935 ; 3936 ; 3937 ; 3938 ; 3939 ; 3940 ; 3941 ; 3942 ; 3943 ; 3944 ; 3945 ; 3946 ; 3947 ; 3948 ; 3949 ; 3950 ; 3951 ; 3952 ; 3953 ; 3954 ; 3955 ; 3956 ; 3957 ; 3958 ; 3959 ; 3960 ; 3961 ; 3962 ; 3963 ; 3964 ; 3965 ; 3966 ; 3967 ; 3968 ; 3969 ; 3970 ; 3971 ; 3972 ; 3973 ; 3974 ; 3975 ; 3976 ; 3977 ; 3978 ; 3979 ; 3980 ; 3981 ; 3982 ; 3983 ; 3984 ; 3985 ; 3986 ; 3987 ; 3988 ; 3989 ; 3990 ; 3991 ; 3992 ; 3993 ; 3994 ; 3995 ; 3996 ; 3997 ; 3998 ; 3999 ; 399A ; 399B ; 399C ; 399D ; 399E ; 399F ; 399G ; 399H ; 399I ; 399J ; 399K ; 399L ; 399M ; 399N ; 399O ; 399P ; 399Q ; 399R ; 399S ; 399T ; 399U ; 399V ; 399W ; 399X ; 399Y ; 399Z ; 399A1 ; 399B1 ; 399C1 ; 399D1 ; 399E1 ; 399F1 ; 399G1 ; 399H1 ; 399I1 ; 399J1 ; 399K1 ; 399L1 ; 399M1 ; 399N1 ; 399O1 ; 399P1 ; 399Q1 ; 399R1 ; 399S1 ; 399T1 ; 399U1 ; 399V1 ; 399W1 ; 399X1 ; 399Y1 ; 399Z1 ; 399A2 ; 399B2 ; 399C2 ; 399D2 ; 399E2 ; 399F2 ; 399G2 ; 399H2 ; 399I2 ; 399J2 ; 399K2 ; 399L2 ; 399M2 ; 399N2 ; 399O2 ; 399P2 ; 399Q2 ; 399R2 ; 399S2 ; 399T2 ; 399U2 ; 399V2 ; 399W2 ; 399X2 ; 399Y2 ; 399Z2 ; 399A3 ; 399B3 ; 399C3 ; 399D3 ; 399E3 ; 399F3 ; 399G3 ; 399H3 ; 399I3 ; 399J3 ; 399K3 ; 399L3 ; 399M3 ; 399N3 ; 399O3 ; 399P3 ; 399Q3 ; 399R3 ; 399S3 ; 399T3 ; 399U3 ; 399V3 ; 399W3 ; 399X3 ; 399Y3 ; 399Z3 ; 399A4 ; 399B4 ; 399C4 ; 399D4 ; 399E4 ; 399F4 ; 399G4 ; 399H4 ; 399I4 ; 399J4 ; 399K4 ; 399L4 ; 399M4 ; 399N4 ; 399O4 ; 399P4 ; 399Q4 ; 399R4 ; 399S4 ; 399T4 ; 399U4 ; 399V4 ; 399W4 ; 399X4 ; 399Y4 ; 399Z4 ; 399A5 ; 399B5 ; 399C5 ; 399D5 ; 399E5 ; 399F5 ; 399G5 ; 399H5 ; 399I5 ; 399J5 ; 399K5 ; 399L5 ; 399M5 ; 399N5 ; 399O5 ; 399P5 ; 399Q5 ; 399R5 ; 399S5 ; 399T5 ; 399U5 ; 399V5 ; 399W5 ; 399X5 ; 399Y5 ; 399Z5 ; 399A6 ; 399B6 ; 399C6 ; 399D6 ; 399E6 ; 399F6 ; 399G6 ; 399H6 ; 399I6 ; 399J6 ; 399K6 ; 399L6 ; 399M6 ; 399N6 ; 399O6 ; 399P6 ; 399Q6 ; 399R6 ; 399S6 ; 399T6 ; 399U6 ; 399V6 ; 399W6 ; 399X6 ; 399Y6 ; 399Z6 ; 399A7 ; 399B7 ; 399C7 ; 399D7 ; 399E7 ; 399F7 ; 399G7 ; 399H7 ; 399I7 ; 399J7 ; 399K7 ; 399L7 ; 399M7 ; 399N7 ; 399O7 ; 399P7 ; 399Q7 ; 399R7 ; 399S7 ; 399T7 ; 399U7 ; 399V7 ; 399W7 ; 399X7 ; 399Y7 ; 399Z7 ; 399A8 ; 399B8 ; 399C8 ; 399D8 ; 399E8 ; 399F8 ; 399G8 ; 399H8 ; 399I8 ; 399J8 ; 399K8 ; 399L8 ; 399M8 ; 399N8 ; 399O8 ; 399P8 ; 399Q8 ; 399R8 ; 399S8 ; 399T8 ; 399U8 ; 399V8 ; 399W8 ; 399X8 ; 399Y8 ; 399Z8 ; 399A9 ; 399B9 ; 399C9 ; 399D9 ; 399E9 ; 399F9 ; 399G9 ; 399H9 ; 399I9 ; 399J9 ; 399K9 ; 399L9 ; 399M9 ; 399N9 ; 399O9 ; 399P9 ; 399Q9 ; 399R9 ; 399S9 ; 399T9 ; 399U9 ; 399V9 ; 399W9 ; 399X9 ; 399Y9 ; 399Z9 ; 399AA ; 399BA ; 399CA ; 399DA ; 399EA ; 399FA ; 399GA ; 399HA ; 399IA ; 399JA ; 399KA ; 399LA ; 399MA ; 399NA ; 399OA ; 399PA ; 399QA ; 399RA ; 399SA ; 399TA ; 399UA ; 399VA ; 399WA ; 399XA ; 399YA ; 399ZA ; 399AA1 ; 399BA1 ; 399CA1 ; 399DA1 ; 399EA1 ; 399FA1 ; 399GA1 ; 399HA1 ; 399IA1 ; 399JA1 ; 399KA1 ; 399LA1 ; 399MA1 ; 399NA1 ; 399OA1 ; 399PA1 ; 399QA1 ; 399RA1 ; 399SA1 ; 399TA1 ; 399UA1 ; 399VA1 ; 399WA1 ; 399XA1 ; 399YA1 ; 399ZA1 ; 399AA2 ; 399BA2 ; 399CA2 ; 399DA2 ; 399EA2 ; 399FA2 ; 399GA2 ; 399HA2 ; 399IA2 ; 399JA2 ; 399KA2 ; 399LA2 ; 399MA2 ; 399NA2 ; 399OA2 ; 399PA2 ; 399QA2 ; 399RA2 ; 399SA2 ; 399TA2 ; 399UA2 ; 399VA2 ; 399WA2 ; 399XA2 ; 399YA2 ; 399ZA2 ; 399AA3 ; 399BA3 ; 399CA3 ; 399DA3 ; 399EA3 ; 399FA3 ; 399GA3 ; 399HA3 ; 399IA3 ; 399JA3 ; 399KA3 ; 399LA3 ; 399MA3 ; 399NA3 ; 399OA3 ; 399PA3 ; 399QA3 ; 399RA3 ; 399SA3 ; 399TA3 ; 399UA3 ; 399VA3 ; 399WA3 ; 399XA3 ; 399YA3 ; 399ZA3 ; 399AA4 ; 399BA4 ; 399CA4 ; 399DA4 ; 399EA4 ; 399FA4 ; 399GA4 ; 399HA4 ; 399IA4 ; 399JA4 ; 399KA4 ; 399LA4 ; 399MA4 ; 399NA4 ; 399OA4 ; 399PA4 ; 399QA4 ; 399RA4 ; 399SA4 ; 399TA4 ; 399UA4 ; 399VA4 ; 399WA4 ; 399XA4 ; 399YA4 ; 399ZA4 ; 399AA5 ; 399BA5 ; 399CA5 ; 399DA5 ; 399EA5 ; 399FA5 ; 399GA5 ; 399HA5 ; 399IA5 ; 399JA5 ; 399KA5 ; 399LA5 ; 399MA5 ; 399NA5 ; 399OA5 ; 399PA5 ; 399QA5 ; 399RA5 ; 399SA5 ; 399TA5 ; 399UA5 ; 399VA5 ; 399WA5 ; 399XA5 ; 399YA5 ; 399ZA5 ; 399AA6 ; 399BA6 ; 399CA6 ; 399DA6 ; 399EA6 ; 399FA6 ; 399GA6 ; 399HA6 ; 399IA6 ; 399JA6 ; 399KA6 ; 399LA6 ; 399MA6 ; 399NA6 ; 399OA6 ; 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399UA10 ; 399VA10 ; 399WA10 ; 399XA10 ; 399YA10 ; 399ZA10 ; 399AA11 ; 399BA11 ; 399CA11 ; 399DA11 ; 399EA11 ; 399FA11 ; 399GA11 ; 399HA11 ; 399IA11 ; 399JA11 ; 399KA11 ; 399LA11 ; 399MA11 ; 399NA11 ; 399OA11 ; 399PA11 ; 399QA11 ; 399RA11 ; 399SA11 ; 399TA11 ; 399UA11 ; 399VA11 ; 399WA11 ; 399XA11 ; 399YA11 ; 399ZA11 ; 399AA12 ; 399BA12 ; 399CA12 ; 399DA12 ; 399EA12 ; 399FA12 ; 399GA12 ; 399HA12 ; 399IA12 ; 399JA12 ; 399KA12 ; 399LA12 ; 399MA12 ; 399NA12 ; 399OA12 ; 399PA12 ; 399QA12 ; 399RA12 ; 399SA12 ; 399TA12 ; 399UA12 ; 399VA12 ; 399WA12 ; 399XA12 ; 399YA12 ; 399ZA12 ; 399AA13 ; 399BA13 ; 399CA13 ; 399DA13 ; 399EA13 ; 399FA13 ; 399GA13 ; 399HA13 ; 399IA13 ; 399JA13 ; 399KA13 ; 399LA13 ; 399MA13 ; 399NA13 ; 399OA13 ; 399PA13 ; 399QA13 ; 399RA13 ; 399SA13 ; 399TA13 ; 399UA13 ; 399VA13 ; 399WA13 ; 399XA13 ; 399YA13 ; 399ZA13 ; 399AA14 ; 399BA14 ; 399CA14 ; 399DA14 ; 399EA14 ; 399FA14 ; 399GA14 ; 399HA14 ; 399IA14 ; 399JA14 ; 399KA14 ; 399LA14 ; 399MA14 ; 399NA14 ; 399OA14 ; 399PA14 ; 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399MA18 ; 399NA18 ; 399OA18 ; 399PA18 ; 399QA18 ; 399RA18 ; 399SA18 ; 399TA18 ; 399UA18 ; 399VA18 ; 399WA18 ; 399XA18 ; 399YA18 ; 399ZA18 ; 399AA19 ; 399BA19 ; 399CA19 ; 399DA19 ; 399EA19 ; 399FA19 ; 399GA19 ; 399HA19 ; 399IA19 ; 399JA19 ; 399KA19 ; 399LA19 ; 399MA19 ; 399NA19 ; 399OA19 ; 399PA19 ; 399QA19 ; 399RA19 ; 399SA19 ; 399TA19 ; 399UA19 ; 399VA19 ; 399WA19 ; 399XA19 ; 399YA19 ; 399ZA19 ; 399AA20 ; 399BA20 ; 399CA20 ; 399DA20 ; 399EA20 ; 399FA20 ; 399GA20 ; 399HA20 ; 399IA20 ; 399JA20 ; 399KA20 ; 399LA20 ; 399MA20 ; 399NA20 ; 399OA20 ; 399PA20 ; 399QA20 ; 399RA20 ; 399SA20 ; 399TA20 ; 399UA20 ; 399VA20 ; 399WA20 ; 399XA20 ; 399YA20 ; 399ZA20 ; 399AA21 ; 399BA21 ; 399CA21 ; 399DA21 ; 399EA21 ; 399FA21 ; 399GA21 ; 399HA21 ; 399IA21 ; 399JA21 ; 399KA21 ; 399LA21 ; 399MA21 ; 399NA21 ; 399OA21 ; 399PA21 ; 399QA21 ; 399RA21 ; 399SA21 ; 399TA21 ; 399UA21 ; 399VA21 ; 399WA21 ; 399XA21 ; 399YA21 ; 399ZA21 ; 399AA22 ; 399BA22 ; 399CA22 ; 399DA22 ; 399EA22 ; 399FA22 ; 399GA22 ; 399HA22 ; 399IA22 ; 399JA22 ; 399KA22 ; 399LA22 ; 399MA22 ; 399NA22 ; 399OA22 ; 399PA22 ; 399QA22 ; 399RA22 ; 399SA22 ; 399TA22 ; 399UA22 ; 399VA22 ; 399WA22 ; 399XA22 ; 399YA22 ; 399ZA22 ; 399AA23 ; 399BA23 ; 399CA23 ; 399DA23 ; 399EA23 ; 399FA23 ; 399GA23 ; 399HA23 ; 399IA23 ; 399JA23 ; 399KA23 ; 399LA23 ; 399MA23 ; 399NA23 ; 399OA23 ; 399PA23 ; 399QA23 ; 399RA23 ; 399SA23 ; 399TA23 ; 399UA23 ; 399VA23 ; 399WA23 ; 399XA23 ; 399YA23 ; 399ZA23 ; 399AA24 ; 399BA24 ; 399CA24 ; 399DA24 ; 399EA24 ; 399FA24 ; 399GA24 ; 399HA24 ; 399IA24 ; 399JA24 ; 399KA24 ; 399LA24 ; 399MA24 ; 399NA24 ; 399OA24 ; 399PA24 ; 399QA24 ; 399RA24 ; 399SA24 ; 399TA24 ; 399UA24 ; 399VA24 ; 399WA24 ; 399XA24 ; 399YA24 ; 399ZA24 ; 399AA25 ; 399BA25 ; 399CA25 ; 399DA25 ; 399EA25 ; 399FA25 ; 399GA25 ; 399HA25 ; 399IA25 ; 399JA25 ; 399KA25 ; 399LA25 ; 399MA25 ; 399NA25 ; 399OA25 ; 399PA25 ; 399QA25 ; 399RA25 ; 399SA25 ; 399TA25 ; 399UA25 ; 399VA25 ; 399WA25 ; 399XA25 ; 399YA25 ; 399ZA25 ; 399AA26 ; 399BA26 ; 399CA26 ; 399DA26 ; 399EA26 ; 399FA26 ; 399GA26 ; 399HA26 ; 399IA26 ; 399JA26 ; 399KA26 ; 399LA26 ; 399MA26 ; 399NA26 ; 399OA26 ; 399PA26 ; 399QA26 ; 399RA26 ; 399SA26 ; 399TA26 ; 399UA26 ; 399VA26 ; 399WA26 ; 399XA26 ; 399YA26 ; 399ZA26 ; 399AA27 ; 399BA27 ; 399CA27 ; 399DA27 ; 399EA27 ; 399FA27 ; 399GA27 ; 399HA27 ; 399IA27 ; 399JA27 ; 399KA27 ; 399LA27 ; 399MA27 ; 399NA27 ; 399OA27 ; 399PA27 ; 399QA27 ; 399RA27 ; 399SA27 ; 399TA27 ; 399UA27 ; 399VA27 ; 399WA27 ; 399XA27 ; 399YA27 ; 399ZA27 ; 399AA28 ; 399BA28 ; 399CA28 ; 399DA28 ; 399EA28 ; 399FA28 ; 399GA28 ; 399HA28 ; 399IA28 ; 399JA28 ; 399KA28 ; 399LA28 ; 399MA28 ; 399NA28 ; 399OA28 ; 399PA28 ; 399QA28 ; 399RA28 ; 399SA28 ; 399TA28 ; 399UA28 ; 399VA28 ; 399WA28 ; 399XA28 ; 399YA28 ; 399ZA28 ; 399AA29 ; 399BA29 ; 399CA29 ; 399DA29 ; 399EA29 ; 399FA29 ; 399GA29 ; 399HA29 ; 399IA29 ; 399JA29 ; 399KA29 ; 399LA29 ; 399MA29 ; 399NA29 ; 399OA29 ; 399PA29 ; 399QA29 ; 399RA29 ; 399SA29 ; 399TA29 ; 399UA29 ; 399VA29 ; 399WA29 ; 399XA29 ; 399YA29 ; 399ZA29 ; 399AA30 ; 399BA30 ; 399CA30 ; 399DA30 ; 399EA30 ; 399FA30 ; 399GA30 ; 399HA30 ; 399IA30 ; 399JA30 ; 399KA30 ; 399LA30 ; 399MA30 ; 399NA30 ; 399OA30 ; 399PA30 ; 399QA30 ; 399RA30 ; 399SA30 ; 399TA30 ; 399UA30 ; 399VA30 ; 399WA30 ; 399XA30 ; 399YA30 ; 399ZA30 ; 399AA31 ; 399BA31 ; 399CA31 ; 399DA31 ; 399EA31 ; 399FA31 ; 399GA31 ; 399HA31 ; 399IA31 ; 399JA31 ; 399KA31 ; 399LA31 ; 399MA31 ; 399NA31 ; 399OA31 ; 399PA31 ; 399QA31 ; 399RA31 ; 399SA31 ; 399TA31 ; 399UA31 ; 399VA31 ; 399WA31 ; 399XA31 ; 399YA31 ; 399ZA31 ; 399AA32 ; 399BA32 ; 399CA32 ; 399DA32 ; 399EA32 ; 399FA32 ; 399GA32 ; 399HA32 ; 399IA32 ; 399JA32 ; 399KA32 ; 399LA32 ; 399MA32 ; 399NA32 ; 399OA32 ; 399PA32 ; 399QA32 ; 399RA32 ; 399SA32 ; 399TA32 ; 399UA32 ; 399VA32 ; 399WA32 ; 399XA32 ; 399YA32 ; 399ZA32 ; 399AA33 ; 399BA33 ; 399CA33 ; 399DA33 ; 399EA33 ; 399FA33 ; 399GA33 ; 399HA33 ; 399IA33 ; 399JA33 ; 399KA33 ; 399LA33 ; 399MA33 ; 399NA33 ; 399OA33 ; 399PA33 ; 399QA33 ; 399RA33 ; 399SA33 ; 399TA33 ; 399UA33 ; 399VA33 ; 399WA33 ; 399XA33 ; 399YA33 ; 399ZA33 ; 399AA34 ; 399BA34 ; 399CA34 ; 399DA34 ; 399EA34 ; 399FA34 ; 399GA34 ; 399HA34 ; 399IA34 ; 399JA34 ; 399KA34 ; 399LA34 ; 399MA34 ; 399NA34 ; 399OA34 ; 399PA34 ; 399QA34 ; 399RA34 ; 399SA34 ; 399TA34 ; 399UA34 ; 399VA34 ; 399WA34 ; 399XA34 ; 399YA34 ; 399ZA34 ; 399AA35 ; 399BA35 ; 399CA35 ; 399DA35 ; 399EA35 ; 399FA35 ; 399GA35 ; 399HA35 ; 399IA35 ; 399JA35 ; 399KA35 ; 399LA35 ; 399MA35 ; 399NA35 ; 399OA35 ; 399PA35 ; 399QA35 ; 399RA35 ; 399SA35 ; 399TA35 ; 399UA35 ; 399VA35 ; 399WA35 ; 399XA35 ; 399YA35 ; 399ZA35 ; 399AA36 ; 399BA36 ; 399CA36 ; 399DA36 ; 399EA36 ; 399FA36 ; 399GA36 ; 399HA36 ; 399IA36 ; 399
```

1007	85B2	0640	INITIALIZE X-CORD	3033 2907 1770	OVERFLOW?	#7
1009	A970	0650	SKIP 8 LINES	3035 BD04D4 1780	FINE SCROLL	STA HSCROL
100B	8D0066	0660	LIST	3038 D004 1790	NO, TRY UP.	BNE CKHUP
100E	8D0106	0670	LIST+1	303A F004 1800	OFFSET FOR SCROLL	DEC OFFFL0
1011	B0206	0680	STA LIST+2	303C C6B1 1810	OFFSET FOR SCROLL	DEC OFFFL1
1014	A505	0690	LDY \$80	303E AD7B02 1830	CHECK STICK	LDA STICK
1016	A65B	0700	LDX \$A9W	3040 2902 1840	DOWN BIT FOR UP?	AND \$02
1018	CA	0710	DEX	3043 D01C 1850	NO, TRY DOWN.	BNE CKHDN
1019	CA	0720	DE	3045 A5B3 1860	GET Y-CORD	LDA YPOS
101A	B6B0	0730	STX \$A9W	3047 C9E4 1870	AT TOP EDGE?	CMP #228
101C	A559	0740	LDA \$A9W	3049 F016 1870	YES, TRY DOWN.	BNE CKHDN
101E	B5B1	0750	STA OFFH1	304B E6B3 1890	INCREMENT Y-CORD	INC YPOS
1020	A203	0760	LDX #3	304D A5B3 1900	GET Y-CORD	LDA YPOS
1022	A97B	0770	ILoop	304F 2901 1910	OVERFLOW CONDITION?	AND #01
1024	9D0006	0780	STA LIST, X	3051 0002 1920	FINE SCROLL	STA VSCROL
1027	EB	0790	INX	3054 D00B 1930	NO, TRY DOWN.	BNE CKHDN
1028	A5B0	0800	LDX	3056 A5B0 1940	GET OFFSET (LOW)	DEC OFFFL0
102A	9D0005	0810	LDA OFFL0	3058 1B 1950	CLEAR CARRY BIT	CLC
102D	EB	0820	STA LIST, X	3059 6928 1960	BYTES IN MODE 8 LINE	ADC #40
102E	A5B1	0830	INX	305D 65B0 1970	NEW OFFSET (LOW)	STA OFFFL0
1030	9D0006	0840	LDX	305F 9002 1980	VALUE > 255?	BCC CKHDN
1033	EB	0850	INX	1990	YES, OFFSET (HIGH)	INC OFFFL1
1034	A5B0	0860	LDX	2000	CHECK STICK	CHECK STICK
1036	1B	0870	CLC	3061 AD7B02 2010	UP BIT FOR DOWN?	LDA CHKDN
1037	6928	0880	ADC #40	3064 2901 2020	NO, CHANGE DISPLAY.	AND #01
1039	B5B0	0890	STA OFFL0	3066 D01C 2030	BOTTOM EDGE?	BNE CKHDN
103B	9D0002	0900	BCC INIT2	3068 A5B3 2040	YES, CHANGE DISPLAY.	LDA YPOS
103D	E6B1	0910	INC OFFH1	306A F01B 2050	DECREMENT Y-CORD.	DEC YPOS
103F	BB	0920	INIT2	306C C4B3 2060	GET Y-CORD	CMP #01
1040	D0E0	0930	DEY	306E A5B3 2070	AND SCROLL BITS	AND YPOS
1042	AP5B	0940	BNE TLOOP	3070 2901 2080	FINE SCROLL	STA VSCROL
1044	9D0F05	0950	LDA #8B	3072 BD05D0 2090	OVERFLOW?	CMP #01
1047	AP42	0960	STA LIST,-3, X	3075 C901 2100	NO, CHANGE DISPLAY.	BNE CKHDL
1049	9D0006	0970	LDA #82	3077 D00B 2110	GET OFFSET (LOW)	DEC OFFFL0
104C	AD9402	0980	STA LIST, X	3079 A5B0 2120	SET CARRY FOR SUBTRACT	SEC
104F	9D0106	0990	LDA TXMSCL+1	307B 3B 2130	BYTES IN MODE 8 LINE	STA OFFL0
1052	AD9502	1000	STA LIST, X	307E E928 2140	NEW OFFSET (LOW)	STA OFFL0
1055	9D0206	1010	LDA LIST+2, X	307E B5B0 2150	VALUE > 255?	BCS CHGDL
1058	AP02	1020	LDA #802	3080 B002 2160	YES, OFFSET (HIGH)	DEC OFFFL1
105A	9D0306	1030	STA LIST,-3, X	3082 C6B1 2180	ZERO Y INDEX	STA LIST+4, Y
105D	9D0406	1040	LDA #804	3084 A000 2190	CLEAR CARRY FOR ADD	CLC
1060	9D0506	1050	STA LIST,+4, X	3086 B90406 2200	ADD OFFSET (LOW)	ADC #40
1063	6941	1060	LDA #841	3089 1B 2210	NEW LOAD ADR (LO)	STA LIST+4, Y
1065	9D0606	1070	STA LIST,+5, X	308B 65B0 2220	POINT TO NEXT BYTE	STA LIST+5, Y
1068	AP00	1080	LDA #805	308C 990406 2230	ADD OFFSET (LOW)	ADC #40
106A	9D0706	1090	STA LIST,+7, X	308E B90506 2240	POINT TO NEXT BYTE	STA LIST+5, Y
106D	8D3002	1100	LDA #81D	3090 65B1 2250	LOAD ADR (HIGH)	STA LIST+5, Y
1070	A906	1110	STA LIST+8, X	3094 990506 2260	ADD OFFSET (HIGH)	ADC #40
1072	9D0806	1120	LDA #81E	3097 C8 2270	POINT TO NEXT BYTE	STA LIST+5, Y
1075	BD3102	1130	LDA LISTH	3099 CB 2280	POINT TO NEXT BYTE	STA LIST+5, Y
1078	6B	1140	PLA	3099 CB 2290	END OF DISPLAY LIST?	CPY #240
1079	AA	1150	PLA	3099 CB 2300	NO, SOME MORE.	BNE CG1
107A	6B	1160	PLA	3099 CB 2320	VERTICAL BLANK EXIT	XITVBV
107B	A8	1170	TAY	309C COFO 2330	.END ●	
107C	A907	1180	LDA #807	309C DOEB 2340		
107E	205CE4	1190	SETVBLK	309E 4C62E4 2350		
1081	60	1200	RTS	309E		
1210						

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Atari Display List

by Craig Patchett

This article will attempt to explain enough about the ATARI display list so that you will be able to design your own custom graphics modes. Even if you are not interested in such applications, the information provided should give you some interesting insights into the operation of your machine.

In order to understand anything that your ATARI does to your television screen, it's important to understand what your television does to your television screen. To create an image on the screen, the television sends out an electron beam that scans the screen from left to right and top to bottom, much like you would scan a page while reading. When this beam hits the phosphor that coats the inside of the screen surface, the phosphor glows. The television regulates how strong the beam is, which in turn determines how bright the phosphor glows (a colour television is slightly more complex, with three different coloured phosphors and three beams, but one beam is sufficient for our purposes). The problem is that the phosphor will only glow for a fraction of a second after the beam hits it. This means that the beam must move very quickly and constantly redraw the screen in order for an image to be retained. It is for this reason that graphics information must be stored in a computer's memory, as well as on the screen (if you're interested, the screen is redrawn every sixtieth of a second). Now for the important stuff. Each line the electron beam scans on its way from top to bottom is called a scan line (makes sense, right?). As far as the ATARI is concerned, 262 such scan lines make up the screen. Of these 262 lines, however, only 192 are completely visible, and thus are the only ones used (these 192 make up the "box" you see in GRAPHICS 0). It is possible, however, to use more than 192 scan lines, as we will see later.

The information presented so far has only explained the operation of your television set. What about that of your computer? How does it go about relaying its data to the screen? After all, you certainly don't have to worry about updating the screen sixty times a second yourself. The unsung hero responsible for doing this dirty work is a little chip called ANTIC. Like the 6502 (the big chip), ANTIC is a microprocessor, which means that if you give it a program, it will give you results. The difference between the 6502 and ANTIC is that the 6502 gives you numbers, while ANTIC gives you graphics.

The program for ANTIC, believe it or not, is called the "display list". Like any program, the display list consists of a series of commands, or instructions. These instructions tell ANTIC exactly what to do with the screen. Luckily for us, ANTIC has only three basic kinds of instructions that we need be concerned with. Before I go over them, let me explain the difference between two similar terms:

A scan line is as high as the electron beam.

A mode line may be from one to sixteen lines high, depending on the type of mode. For example, a GRAPHICS 0 mode line is eight scan lines high, while a GRAPHICS 2 mode line is sixteen, and a GRAPHICS 8 is one.

With these differences in mind, let's take our first look at the ANTIC instructions:

MOD n — make the next line a graphics mode n line (the n does not always correspond to a BASIC graphics mode).

BLK n — make the next n scan lines blank (i.e. turn off the electron beam for n scan lines).

JVB addr — jump to addr and wait for the end of the next vertical blank (vertical blank is the time during which the electron beam returns from the bottom of the screen to the top after it has finished drawing the screen. Thus it occurs every sixtieth of a second).

Before we go into any detail on these instructions, let's take a look at what a typical display list would look like:

BEGIN BLK 8 *we first skip 24 scan lines, due to the aforementioned problem
BLK 8 of some lines not being entirely visible.*

MOD 2 *next, we want 24 mode 0 lines*

MOD 2

"

"

"

MOD 2

JVB BEGIN *finally, we want to go back to the beginning of our list and wait until it's time to start redrawing the screen.*

As you can see, the principle behind the display list is relatively simple. Keeping this in mind, let's take a look at some of the finer details.

You may be wondering what numbers in the MOD instruction correspond to the different BASIC graphics modes. ANTIC recognizes a total of fourteen graphics modes, nine of which are directly accessible from BASIC. The following chart will give the pertinent information for each of the fourteen. I won't go into detail on any of the new modes in this article, but will rather leave them for you to play with after the article is over:

Mode Number	Basic Mode	Type	Colors	Scan lines per mode	Characters per line
2	0	TEXT	2	8	40
3	NONE	TEXT	2	10	40
4	NONE	TEXT	4	8	40
5	NONE	TEXT	4	16	40
6	1	TEXT	5	8	20
7	2	TEXT	5	16	20
8	3	GRAPHICS	4	8	40
9	4	GRAPHICS	2	4	80
10	5	GRAPHICS	4	4	80
11	6	GRAPHICS	2	2	160
12	NONE	GRAPHICS	2	1	160
13	7	GRAPHICS	4	2	160
14	NONE	GRAPHICS	4	1	160
15	8	GRAPHICS	2	1	320

(Chart 1)

When we go to put the display list into memory, we will represent the MOD n instruction with the **mode number**. Thus MOD 2 would translate to a 2.

Representation of the other two ANTIC instructions in memory is just as simple. The BLK n is represented by the number $16*(n-1)$. Thus BLK 8 would translate to a $16*(8-1) = 16*7 = 112$. Finally, the JVB addr instruction is represented by three numbers, or bytes as they are more commonly referred to. The first byte tells ANTIC that this instruction is jump, and is always **65**. The second and third bytes tell ANTIC the address to jump to. They are the "low byte" and "high byte" of the actual address, in that order (the high byte of addr = INT(addr/256) and the low byte = addr-256*(the high byte). So 2561, for example, would have high byte = 10, low byte = 1).

Finally (ok, so I lied before), there is a special kind of MOD instruction, called LMS, that tells ANTIC where in memory the graphics information is stored (LMS stands for Load Memory Scan). Usually there is only one LMS instruction in a display list, and it takes the place of the first MOD instruction. You could, however, use as many of them as you like (keeping in mind that each one takes the place of a MOD), and thus have different pieces of the graphics memory in different places. For our purposes, however, one will almost always suffice. In any case, a LMS instruction, like a jump, consists of three bytes. The first byte is just the **mode number** of the MOD that is being replaced, plus **sixty-four** (i.e. a

MOD 2 LMS would translate to a $2+64 = 66$). Like the jump instruction, the second and third bytes represent the **low and high bytes** of the address, where this time the address is that of the beginning of the graphics memory area.

Now that we (hopefully) have all our numbers straight, let's take another look at our sample display list. We'll assume that the display list begins at memory location 25824, and graphics memory begins at memory location 25888 (these numbers are just examples. We'll see how to get the real numbers, easily, later on):

	OLD	NEW
BEGIN	BLK 8	112
	BLK 8	112
	BLK 8	112
	MOD 2 (LMS)	66
		32
		11 (11*256+32=25888)
	MOD 2	2
	"	"
	"	"
	"	"
	MOD 2	2
	JVB BEGIN	65
		224
		10 (10*256+224=25824)

We're now ready to begin custom designing our own graphics mode. The good news is that we don't have to do a lot of work setting up the display list — we'll just make some changes to one that BASIC sets up for us. This means not having to worry about figuring out addresses. The bad news is that we **do** have to do some work in deciding exactly what our graphics mode will look like. The main thing is to make sure that our custom mode uses no more than 192 lines (we can use less if we like, but the screen will look smaller than usual). Use Chart 1 to determine how many scan lines your custom mode will use. For example, if we want to mix BASIC modes 0, 1, 2, and 7, and we decide that we want three lines of mode 0, four of mode 1, and two of mode 2, then we have a total of $3*8 + 4*8 + 2*16 = 88$ scan lines so far. That leaves us with $192-88 = 104$ scan lines for mode 7, so we can have $104/2 = 52$ lines of mode 7.

Surprise! That's all it takes to **design** our custom mode. Putting it into the ATARI is **almost** as easy. The first step is to get BASIC to set up a graphics mode (i.e. display list and graphics memory) that we can use to make changes to. We do this with a GRAPHICS n+16, where n is the BASIC graphics mode that uses the most memory/screen of all the modes we are mixing. The chart summarizes the different memory/screen requirements:

ANTIC MODE	BASIC MODE	MEMORY/SCREEN (BYTES)
2	0	960
3	NONE	760
4	NONE	960
5	NONE	480
6	1	480
7	2	240
8	3	240
9	4	480
10	5	960
11	6	1920
12	NONE	3840
13	7	3840
14	NONE	7680
15	8	7680

(Chart 2)

So, for example, out of BASIC modes 0, 2, and 7, 7 has the largest memory/screen requirement so we would use a GRAPHICS 23 to start things off (note that if we were using ANTIC mode 12 instead of BASIC mode 7, we would still use a GRAPHICS 23).

Now BASIC has set up a display list and graphics memory area for us. We must go in and modify the display list. But how do we know where the display list is? It just so happens (I can afford to be smug about this) that memory locations 560 and 561 point to it. They hold the low and high bytes of the address of the beginning of the display list. We'll use a variable $DISPLAY=PEEK(560)+256*PEEK(561)$ to hold that address. So we know that locations DISPLAY, DISPLAY+1, and DISPLAY+2 hold BLK 8 instructions (check for yourself by PEEKing them). For our example, DISPLAY+3 holds a MOD 13 LMS instruction (remember, ANTIC mode 13 = BASIC mode 7). But we want the first line to be a MOD 2 (or BASIC mode 0) LMS instruction, so we have to change it. A simple POKE DISPLAY+3,66 takes care of this (remember, again, that MOD 2 LMS = 66), since BASIC already took care of the LMS address at locations DISPLAY+4, DISPLAY+5 when it set the display list up. Our program so far, then, looks like this:

```
100 GRAPHICS 23
110 DISPLAY=PEEK(560)+256*PEEK
  (561)
120 POKE DISPLAY+3,66
```

We want two more mode 0 lines, so we add:

```
130 POKE DISPLAY+2,2:POKE DIS-
  PLAY+7,2
```

Next we want four lines of mode 1:

```
140 POKE DISPLAY+8,6:POKE DIS-
  PLAY+9,6:POKE DISPLAY+10,6:
  POKE DISPLAY+11,6
```

And two more lines of mode two:

```
150 POKE DISPLAY+12,7:POKE DIS-
  PLAY+13,7
```

Finally, we want fifty-two lines of mode 7. But we set up a mode 7 display list when we did our GRAPHICS 23, so we don't have to change anything for our mode 7 lines. We do, however, have to reposition the JVB instruction. Since we have a total of sixty-one MOD instructions (3+4+2+52) plus three BLK instructions plus two more bytes for the LMS address, our JVB has to begin at memory location $DISPLAY+(61+3+2) = DISPLAY+66$. Remembering that locations 560 and 561 already hold the low and high bytes for the address of the beginning of the display list, we can simply do the following (remember that JVB = 65):

```
160 POKE DISPLAY+66,65:POKE DIS-
  PLAY+67,PEEK(560):POKE DIS-
  PLAY+68,PEEK(561)
```

So as not to confuse ANTIC while we are making our changes, we'll turn it off while we make them, and then turn it back on after we're done:

```
115 POKE 559,0
170 POKE 559,34
```

And, believe it or not, we now have a custom designed graphics mode (before you run the program, put in 1000 GOTO 1000, since the ATARI thinks that it's in a full screen mode and will go back to GRAPHICS 0 if you don't)! If you want to get rid of the blue band in the mode 0 lines, use a SETCOLOR 2,0,0 instruction.

Now that we have our custom mode, what do we do with it (keep those thoughts to yourself)? Remember that the ATARI still thinks it has a GRAPHICS 7 mode set up, so any time we try to POSITION, PRINT, PLOT, or DRAWTO, it will assume we want to do it in a GRAPHICS 7 environment. Getting around this problem is the "tough" part of custom modes, so take a deep breath, relax, and read on.

The problem that we have to overcome is largely due to the fact that different modes use different amounts of memory per mode line. The following chart lists the differences:

ANTIC MODE	BASIC MODE	BYTES PER MODE LINE
2	0	40
3	NONE	40
4	NONE	40
5	NONE	40
6	1	20
7	2	20
8	3	10
9	4	10
10	5	20
11	6	20
12	NONE	20
13	7	40
14	NONE	40
15	8	40

(Chart 3)

Before I continue, let me clear up one possible misconception you might have. ANTIC only takes care of displaying the graphics memory on the screen (i.e. controlling what it looks like). ANTIC does not handle any changes that are to be made to the graphics memory. With this in mind, you can see that the ATARI, with the exception of ANTIC, is completely oblivious to what our custom mode looks like. It still thinks it is dealing with a GRAPHICS 7 screen, and thus we will run into difficulties when we try to make changes to the text mode areas in our custom mode. Also, because of the difference in memory requirements of the different mode lines, trying to access the GRAPHICS 7 area will also give us problems. This is because the ATARI expects each line to be forty bytes long (the length of a GRAPHICS 7 line). Since we have a combination of forties and twenties in the text area, if we try and PLOT to the GRAPHICS 7 area, it will not PLOT where we want it to (try it). Also keep in mind that even if all the text mode lines were forty bytes/line, we would still run into problems (can you see why? Hint — PLOT X,Y will plot in the correct column, but not the correct row). As you can see, this is all very confusing. Don't worry too much if you don't completely understand. Luckily, the solution is relatively simple.

First of all, it's very easy to trick the ATARI into thinking that it's in a different mode. Memory location 87 holds the number of the correct BASIC mode. So if we want to make the ATARI believe that it's in another mode, we just POKE 87 with a new BASIC mode number. If we're dealing with an ANTIC mode that doesn't have a corresponding BASIC mode, then we use the closest BASIC mode in terms of type and bytes per mode line (BASIC 0 for ANTIC 3, 4, and 5, BASIC 6 for ANTIC 12, and BASIC 7 for ANTIC 14).

Now all we have to do is make it so that we can ignore whatever comes before the particular mode that we're interested in (what?). As we mentioned before, even after we straighten out the ATARI with respect to what mode we're using, it will still be confused as to where exactly that mode is on the screen, and therefore in memory (remember, it'll assume that the same mode takes up the whole screen). So how are we going to get around this? We'll fool the ATARI (again — and you always thought it was intelligent) into thinking that the top of the graphics mode area that we want to use is really the top of the screen. That way, the top left-hand corner of each mode area can be treated as position 0,0. Perhaps an easier way to think of this is to visualize each different mode area as being a separate, and smaller, screen. When we access one of these screens, we won't pay any attention to the others.

In order to pull this off, we have to know the address in graphics memory of each mode area, or

"screen". Memory locations 88 and 89 are used by the ATARI to point to the beginning of graphics memory (88 holds the low byte, 89 the high). So we have a way of determining the address of the beginning of the first screen. We also know how much memory each screen takes up (remember, we know how many bytes per mode line there are). Thus we can figure out the addresses of the beginning of the other mode areas. Perhaps the best thing to do here is use our example:

180 SCREEN=PEEK+256*PEEK(89)

SCREEN

SCREEN=120

SCREEN=200

SCREEN=240

GR.0: 3 lines at 40 bytes/line = 120 bytes

GR.1: 4 lines at 20 bytes/line = 80 bytes

GR.2: 2 lines at 20 bytes/line = 40 bytes

GR.7

So we use:

190 SCREEN1=SCREEN+120:SCREEN2=SCREEN1+80:SCREEN7=SCREEN2+40

Ok, we now have the addresses we need. How do we tell them to the ATARI? Surprise (don't you just love these surprises!) — locations 88 and 89 will do the trick, since they only specify where the ATARI thinks screen memory begins, not where it actually does (the LMS in the display list tells where it really begins). So, remembering that we first have to convert our addresses to low and high byte, let's do something to our example screen:

200 POKE 87,0:PRINT "LINE 1":PRINT "LINE 2":PRINT "LINE 3"

210 HI=INT(SCREEN1/256):LO=SCREEN1-HI*256:POKE 88,LO:POKE 89,HI

220 POKE 87,1:POSITION 0,0:PRINT #6;"LINE 1":PRINT #6;"LINE 2":PRINT #6;"LINE 3":PRINT #6;"LINE 4"

230 HI=INT(SCREEN2/256):LO=SCREEN2-HI*256:POKE 88,LO:POKE 89,HI

240 POKE 87,2:POSITION 0,0:PRINT #6;"LINE 1":PRINT #6;"LINE 2"

250 HI=INT(SCREEN7/256):LO=SCREEN7-HI*256:POKE 88,LO:POKE 89,HI

260 POKE 87,7:COLOR 2:PLOT 0,0:DRAWTO 51,51

And there you have it! One genuine custom graphics mode in use.

Hopefully, if you've managed to read all the way through to here, you understand the display list and

how the ATARI handles the screen at least a little better than you did when you started. Chances are that you're a little discouraged about the apparent complexity of designing a custom mode, especially with regard to accessing the different mode areas. The only thing I can suggest if this is the case is that you practice. Like anything new you learn, the more you put it to use, the easier it becomes. And in this case, the possible results are more than worth the effort.

MORE(!!)

Yes, there is one more thing. If you're going to use ANTIC modes 14 or 15, you may run into a problem. This problem is due to a minor limitation of ANTIC in that it has "difficulties" with large screen memories (specifically, screen memory can't cross a 4K boundary, if that makes any sense to you). In ANTIC modes 14 and 15, screen memory becomes large enough to cause problems. ANTIC's way around the problem is to have another LMS instruction halfway through the display list. All this does is keep ANTIC happy. There is no difference in the way the screen looks, and screen memory is still

in one big chunk. The only time something goes wrong is when you attempt to make changes. And, unfortunately, there is no easy way around it. If you find yourself in this type of situation, you must take the following steps:

1. Find the second LMS in the display list.
2. Determine the address that it starts loading from (if you use a variable called LMS to point to the memory location of the second LMS instruction, then $ADDRESS=PEEK(LMS+1)+256*PEEK(LMS+2)$).
3. If your screen memory does not end before this address, find the mode line that uses the address, and make the MOD instruction for that line an LMS instead (remember that the LMS will take up three bytes instead of one, and don't forget to include the address).

In other words, it's a pain in the you-know-what, but hopefully you'll never encounter it — I seldom do. In the meantime, enjoy yourself and practice, practice, practice. □

7 ATARI PRODUCTS



THE MONKEY WRENCH

The Monkey Wrench is a machine language ROM cartridge which extends the operating capability of the ATARI 800 computer. The Monkey Wrench provides 9 new BASIC commands. They are:

- Auto Line Numbering
- Delete Line Numbers
- Renumber
- Curly brace Change
- Change Margins
- Memory Test
- Hex Conversion
- Dec Hex Conversion
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810 Diskette and Manual — \$169.95

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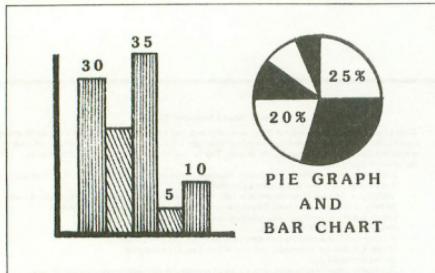


SOFTWARE REVIEW: ATARI GRAPH-IT PACKAGE

TOM HUDSON

One of the Atari's greatest assets is its ability to display beautiful color graphics. We have all seen graphics put to use in games such as Star Raiders and other entertainment programs, but one of the best uses of color graphics is the display of information in a form which can be easily interpreted. Atari has recently introduced GRAPH-IT, an advanced graphics package, for this very purpose.

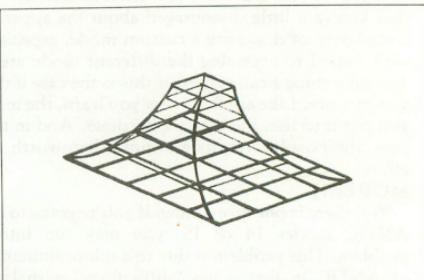
GRAPH-IT is a set of programs which allow the easy generation of bar charts, pie graphs, two-dimension X,Y plots, two-dimension polar plots and three-dimension X,Y,Z plots. The package requires a minimum of 16K memory, the BASIC cartridge and a 410 recorder. An optional accessory is a joystick, which is not used for drawing, but allows the user to determine the slope of a line at a particular point on the screen.



The bar chart program is relatively straightforward. Users have the ability to display up to three sets of data at once, with titles and column labels (such as JAN, FEB, MAR, etc.). Users may have up to 32 such columns on the screen at once, or as few as one. After giving the title and column labels, the data is entered. All entries are nicely prompted by the computer and edited to make sure the user didn't type in any letters by mistake. After all the data values have been entered, the computer generates the chart, scaling it so that it fits properly on the screen.

The pie graph program is also straightforward, allowing the user to generate a pie graph with up to 12 "slices". Each slice can have a three-letter label.

Next are the two- and three-dimension plot programs. These programs use high-resolution graphics modes to draw fine-lined graphs of complex mathematical functions. The ability to draw these functions in a graphic form is very important when trying to find correlations between several variables. In addition, it sometimes is necessary to know the slope at certain points on such a plot. Fortunately, these programs will allow the user to use a joystick controller to determine the slope (and other



information) of a line on the graph. The user simply moves a cursor around on the screen with the stick, and when the desired point is located, the button is pressed. Since these programs are written in BASIC, users may use any function available in BASIC within their function (such as SQR, SIN, COS, etc.). This is an excellent feature, especially since the user can type functions into the program like any other input. The program also allows the user to go back and edit the function if it is incorrect. The amazing flexibility of this part of the GRAPH-IT package (including automatic scaling of the plot) is nice to see in a world of mediocre programs.

The GRAPH-IT package comes with a 15-page manual packed with color illustrations and hints on using graphic displays to their best advantage. This manual is typical of Atari's high quality documentation.

In reviewing GRAPH-IT, this reviewer has only a few small gripes with the package. First, the user has no choice in the colors that are used for the bar charts and pie graphs. This is no great problem, but such a feature would be nice. Second, since the programs are supplied on cassette, there are no provisions to use data files from disk, which necessitates typing in data each time a graph is generated. For most applications, this would not make such a difference. Third, and probably the most important, the program is written in BASIC, which can be terribly slow. The only time this becomes a factor is when the program is generating complicated three-dimensional plots. Some can take several hours if the functions are highly complicated. It makes one wonder why the package was not written in machine language instead of BASIC. Of course, even with the wait, it's faster than doing all those calculations by hand!

In conclusion, the Atari GRAPH-IT graphics package is an excellent way to present data in an easy-to-understand form, with the computer doing all the hard work. And isn't that what computers are for, anyway? □



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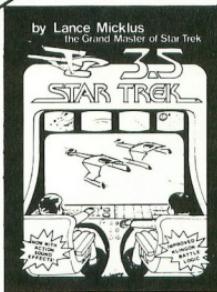
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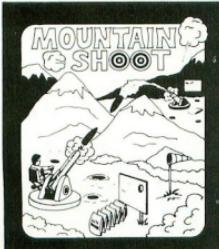


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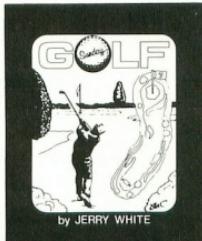
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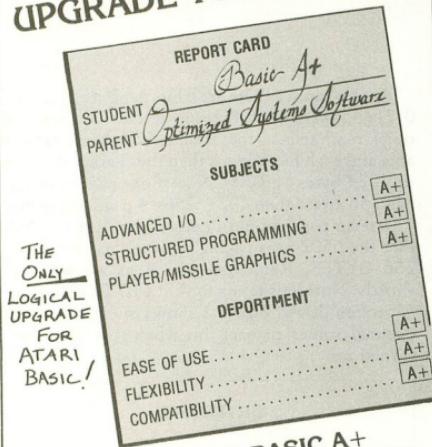
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CREATE YOUR OWN CUSTOM CHARACTERS/GRAPHICS

by Tony Messina

One of the nicest features available on ATARI computer is the custom character generation capability. The method for creating your own graphics by altering the character set is relatively easy. Once the **method** is known, you can create professional looking programs and really WOW them at user group meetings. The purpose of this article then is to give the bare facts on how to change the existing character set and then provide a demonstration program utilizing an altered set. I know you're saying "There has to be a catch!!" Well... The only difficult portion of the operation is deciding which characters or graphics you want to create and then converting these shapes to numbers the computer will understand. ARRRRRGGGG!! the cries of anguish!! Converting numbers... I knew there was a hitch!! As Robert Stack would say (who's he?) "Don't worry... We've got you covered!!" Just follow me as I discuss the method to greater graphics.

THE METHOD

The method can be summed up in one sentence... (feel free to take notes)... Take the existing character set, move it to a place where you can access it, overlay the old character information with your new information and then tell the computer where the new character set is located. That's all there is to it. In conclusion, I hope I have provided you with... (ONLY KIDDING!!!). There is just a little bit (no pun intended) more information required to accomplish these tasks so let's dive in and start creating!!

BACKGROUND INFO

Each letter or graphics character consists of little pixels arranged in an 8x8 grid. To make the character appear the pixels are turned on or off. The letter A for example looks like figure one in its pixel form.

FIGURE 1

(BITS)								1 B
7	6	5	4	3	2	1	0	
X	X							2 Y
X	X	X	X					3 T
X	X		X	X				4 E
X	X			X	X			5 S
X	X	X	X	X	X			6
X	X		X	X				7
								8

As you can see there are 8 bits per Byte (numbered 0-7) and there are 8 Bytes for each character. Some quick math tells us that if there 128 characters available and each has 8 bytes then the character set takes up 1024 bytes of ROM. Now if one page of memory has 256 bytes then $1024/256=4$ pages of memory. The term page shouldn't scare you, just remember that the 6502 uses paging and each page consists of 256 BYTES. Remember the 4 as we will use it shortly. Now let's take a look at 1 BYTE to see how it is broken down. Figure 2 shows one BYTE and the decimal values of each bit when that bit is set or turned on.

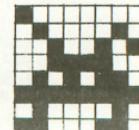
FIGURE 2

7	6	5	4	3	2	1	0
!128!	64!	32!	16!	8!	4!	2!	1!

The decimal value for each BYTE is obtained by adding the values of all the "SET BITS" together. If all BITS were set, then the value for that BYTE would be $128+64+32+16+8+4+2+1$ or 255 decimal. If bits 0, 1, and 2 were set then the value would be $4+2+1$ or 7 decimal. I hope I haven't got you lost yet. I know this may seem trivial to some of you pros but for others this may be new. Anyway, armed with this information, we will now create a character and determine the values for each BYTE. When creating characters, I use graph paper broken into 8x8 squares. If LEE is nice he will include a piece in this magazine so you can copy it. If you're into GREEK or CRYLLIC, go ahead and create those characters. I never was so I'll show you how to make a little invader character. I took the graph paper and filled in the BITS I wanted to set to produce my invader. He looks like figure 3.

FIGURE 3

BITS							
7	6	5	4	3	2	1	0
X							
	X						
		X					
			X				
				X			
					X		
						X	
							X



CALCULATIONS

	VALUE
128	128
64+2	66
32+4+1	37
32+16+8+4	60
64+16+4+2	86
128+64+32+16+8+4+2+1	255
64+2	66
128+64+4+2	198

There we have a little invader and the calculations that go behind making him appear. Go ahead and create more characters if you wish. Up to this point I've gone into a fair amount of detail on what makes up a character. What do we do with them after they are created? Go take a break, enjoy your favorite beverage. When you return, I'll demonstrate the method of putting your characters into the computer.

AFTER THE BREAK READING

Well, now we have our characters ready and are ready to alter the existing set. If you remember from the first part of THE METHOD, we have to move the existing character set to a safe place in RAM. OH... almost forgot... WE have to know how the existing character set is stored, i.e. the order that the characters have in memory. After all how can we change existing characters if we don't know how they are stored? If we look at the ATASCII CHARACTER SET (Appendix C) we can see the ATASCII values of all the characters available. This, unfortunately, is not the way they are stored in memory. For this information we have to look at Page 55 of the Basic Reference manual Table 9.6. Now what? Decide which characters you want to substitute and find their ATASCII value in Appendix C. Use the following conversion to find the memory location of the characters you have chosen.

- 1) If ATASCII VALUE= 0-31 then MEM=(A.VALUE+64)*8+DLIST
- 2) If ATASCII VALUE=32-95 then MEM=(A.VALUE+32)*8+DLIST
- 3) If ATASCII VALUE=96-127 then MEM=A.VALUE*8+DLIST

DLIST=Start location of character set

We multiply by 8 because there are 8 bytes for each character. OK!! Enough talk, time for an example. I've created an invaders character set for a demo. If you follow along with listing 1, I'll go through each step of THE METHOD. HERE WE GO!!!

STEP 1

Take the existing character set and move it to a place in memory where we can access it.

To do this we must protect some memory so that BASIC will not interfere with our character set. Line 120 does this for us. Remember way back we said we needed 4 pages of memory? Well this is where it

comes in. Location 106 is used by the operating system to determine how many pages of memory are available for use by BASIC. We can always reduce this number and fool the operating system. That's what line 120 does. I've reduced the number in location 106 by 5 pages (just to be safe). Executing the graphics statement causes the operating system to partially reinitialize but now we have 5 pages of memory for our use!!

Line 135 determines the decimal starting address of where we will transfer the old character set from ROM. We saved 5 pages but want to leave a safety buffer for our 4 page character set hence the +1.

Now let's move the ROM set to our saved area. This is done in line 140. The ROM set starts at location 56344. The move loop takes the ROM set and pokes it into our save area starting at DLIST (calculated in line 135).

STEP 2

Overlay the old character information with your new character information.

Lines 200-285 contain the DATA statements for each invader I created. The first number in each statement, however is the ATASCII VALUE of the character I want the DATA substituted for. I want to substitute 16 characters so LINE 150 sets up a loop for this. LINE 155 reads the ATASCII VALUE and LINE 160 determines the offset in memory value where I will store the information that follows. I decided to replace the first 16 graphic characters (CNTRL Comma-0) with my invaders. This would still leave me with all the letters for text use. LINE 160 then is the conversion routine I mentioned previously (The one for ATASCII VALUES 0-31. LINE 165 overlays my new data by reading each number and poking it into the appropriate memory location.

STEP 3

Tell the computer where the new character set is located. I cheated in the DEMO. LINE 136 POKEs location 756 with the location of DLIST/256. I did this so that you could see the characters being overlaid when you run the DEMO. Location 756 is the HIGH ORDER BYTE pointer, thus we divide DLIST by 256. The rest of the DEMO deals with moving the characters around on the screen and producing the marching noise of the invaders.

FINAL NOTES

When you run the demo you'll notice that I used Graphics Mode 1. The invaders show up better. LINE 175 creates the Graphics Mode 1 screen. Notice also, that we RE-POKE location 756 with DLIST/256+2. If you look at TABLE 9.7 on page 56 of the BASIC REF. Manual, you'll see why. Our characters fall under the conversion 3 category so we must Poke 756 with DLIST/256+2. WHAT!!! OK, in the table you see POKE 756,226. To the left you see POKE 756,224. 224+2=226 RIGHT? Well, those numbers refer to the existing character set. Our

character set resides at DLIST/256 and we want to use conversion 3 numbers so we must add 2 to our calculation. Whew... Another point which needs to be mentioned. Whenever you execute a graphics statement, you must reset location 756 to point to your character set since the operating system resets 756 to point to the ROM character set and not your new one. In addition, if you hit SYSTEM RESET, you will have to RE-RUN the program. Again, the operating system resets ALL of the pointers to include wiping out our save area. That's about it for this lesson. I hope I have given you all some ideas for using character sets that you create. I used my characters in strings to move them. Using PUT can be another method. Anyway, type in the DEMO and follow it through. Create your own sets of characters and use them in your programs. I'm sure many of you can improve on the DEMO and it is encouraged. Have fun. GO WILD!!! and if you have any questions or ideas send them in. □

```

150 FOR COUNT=1 TO 16
155 READ OLD
160 PLACE=(OLD+64)*8
165 FOR CHANGE=0 TO 7:READ NUMBER:POKE
PLACE+DLIST+CHANGE,NUMBER:NEXT CHANGE

170 NEXT COUNT:IT=1:FOR COUNT=1 TO 150
0:NEXT COUNT
175 LINE=4:GRAPHICS 1:POKE 756,DLIST/2
56+2
180 POKE 708,250:POKE 709,36:POKE 710,
176:POKE 712,0
185 ? #6;" MOVEMENT SAMPLE"
190 POSITION 0,17: ? #6;" -- "
195 POSITION 0,19: ? #6;" ■ ■
■ "
200 POKE 752,1: ? :?"*Analog 400/800 D
emo by Tony Messina":RETURN
210 DATA 0,0,0,0,0,0,0,0
215 DATA 1,24,90,219,255,66,68,72,144
220 DATA 2,24,126,219,255,130,66,34,17
225 DATA 3,60,126,243,243,255,66,69,99
230 DATA 4,60,126,207,207,255,66,66,19
8
235 DATA 5,24,60,86,255,66,36,66,129
240 DATA 6,24,60,106,255,66,129,90,36
245 DATA 7,129,165,90,24,24,24,36,195
250 DATA 8,0,90,189,153,36,66,36,0
255 DATA 9,60,126,219,165,153,90,90,0
260 DATA 10,60,126,219,165,153,165,165
,0
265 DATA 11,128,66,37,60,86,255,66,198
270 DATA 12,1,66,164,60,106,255,66,231
275 DATA 13,126,255,255,255,255,255,19
5,195
280 DATA 14,24,24,24,60,60,60,126,255
285 DATA 15,60,126,255,153,255,126,60,
195.

```

CONTROL CHARACTERS

A \$ =		G \$ =	
B \$ =		H \$ =	
C \$ =		I \$ =	
D \$ =		J \$ =	
E \$ =		K \$ =	
F \$ =		L \$ =	

Mailing List

BY GARRY J. PATTON

This program is written to take advantage of the NOTE and POINT capabilities of the Atari. It is relatively fast and requires the 810 disk drive with DOS II and 16K if only 75 records are desired. On a single diskette 750 records can be accessed if needed. This requires 24K. The program is versatile and can be used for any home use for maintaining that list of important addresses. One of my "gripes" about current commercial mailing list programs (besides shelling out \$25-\$35) is the time required to get at an address quickly. By the time the machine is powered up, the program loaded, and the list searched, as much as two to three minutes have gone by. That seems a little excessive. This program stores all addresses on the diskette and can access them quickly. It doesn't require loading in the program and then loading in the data file. It also doesn't search every file — only until it finds the appropriate address. It then stops and prints the name.

For most of us 50-100 names are all that are required to keep up our Christmas list. However, if you have an exhaustive list (who does at 20¢ a letter), up to 750 addresses can be stored on a single diskette if desired. As the number of addresses on file increase, the initial start increases; thus, the advantage of quickly finding that missing address is decreased. So only create the number of files that you think you will need. Presently the program is set for 100 names.

Because of its uniform file structure, this program can easily be adapted to search for any major field and to sort by each field. However, these "niceties" are not generally required by most of us. In order to keep RAM to a minimum, these "extras" were not included.

The program has several error protecting features; thus, it shouldn't crash for you. If you encounter an error, just type GOTO MENU and try again. The TRAP command is an excellent tool to prevent those unwanted crashes. When writing a program, this command can help keep your program out of trouble.

The heart of this program is the FILE\$. The Atari has excellent string handling capabilities which are used to our advantage in this program. Each subset of the FILE\$ is a major field. As mentioned above, each of these fields could easily be searched for individually and sorted or manipulated as desired with only the addition of a short additional subroutine.

The FILE\$ is structured such:
 FILE\$(1,15) = LAST NAME
 FILE\$(16,25) = FIRST NAME
 FILE\$(26,49) = STREET ADDRESS
 FILE\$(50,69) = CITY
 FILE\$(70,71) = STATE
 FILE\$(72,81) = ZIP
 FILE\$(82,95) = PHONE
 FILE\$(96,116) = EXTRA

A datafile called MAILDATA.FIL is created to store each record. An error trapping routine alerts you if the datafile is not on your diskette, and then it asks if you want to create one. Be sure you have enough sectors left on your diskette before creating the datafile. (It requires .94 SECTORS for each record. Thus, if you want 100 records, have 94 SECTORS left.) The number of records created is controlled by line 87. Set the FOR/NEXT loop to the number desired if you want different than 100 records. (CAUTION! Be sure then that lines 13, 87, 352, 604, and 2501 all match! These lines all have references to the number of records.) If you want more or less records, be sure to change the appropriate lines.

Each record's position in the datafile is stored in two arrays named SECTOR and BYTE. The reason for the need for increased memory for more records is that these arrays must be DIM'ed for the proper amount. This requires memory. The more records created (say 750 instead of 100) the more memory you will need. Remember too that your start-up time will increase because at initialization each record must be counted and its location stored in the appropriate array.

Okay! Now on to the program:

lines 10-30

initializes the program, opens the screen editor, the keys, and MAILDATA.FIL

lines 74-89

if MAILDATA.FIL is not located on the diskette, you are given the choice of creating the file or ending. 100 records are created with a dummy FILE\$ of +'s. Each record's position is NOTED and stored in the arrays SECTOR and BYTE for future reference. POKE 559,0 turns off ANTIC (the screen goes blank because ANTIC controls the

screen updating). With ANTIC off 6502 can go merrily about its way doing the task at hand without interruptions from ANTIC. This can save up to 30% of the time required for completion. POKE 559,34 turns ANTIC back on. MAILDATA.FIL is now created and ready to receive your entries.

lines 100-354

This is the meat of the program. With the appropriate prompts each field of FILE\$ is created here. A short subroutine at 1000-1010 causes the cursor position to flash, advances the cursor, and assigns the ATASCII value of the key struck to the variable XX. If the delete key (126) is struck, the flag Q is set; then the entire field is erased, and you start again. If the return key (155) is struck, this terminates the entry to the field.

Each field is assigned a discrete length and is protected to that length. If you go over, an error message routine at 700-708 tells you of your error, and you start again. If the field you enter is less than the prescribed length, the field is padded with blanks until it equals the proper length.

EDIT is a flag that says you've come here from some other subroutine in the program and allows return to that area. Flags allow one to give a program versatility and to reduce RAM usage as an area of your program can be used for several purposes. This reduces repetition. You'll find flags used throughout this program to direct you in and out of various areas smoothly depending on your needs.

You'll note that this program is "with the times" and allows for the new ZIP+four postal wonder or nine digit zip code. If you know your Zip+four, go ahead and use it. If not it will be here soon. Space is reserved for the additional + four. So you can add it later.

Line 344 allows you to change your mind before the record is

committed to the disk. If you keep the file, the next free space is POINTED to by the SECTOR/BYTE arrays, and your file is now stored for your future use.

This is the main MENU giving you your choice of options to operate the program. Each choice sends you to the appropriate subroutine to complete your task as requested.

At initialization if MAILDATA.FIL is available on the disk, each record is looked at to determine each record's position, to determine the number of names on file to date, and to create the SECTOR/BYTE arrays for future use.

lines 500-570

lines 600-610

lines 2000-2504

This subroutine allows you to search for a wanted name. You can search by last name or first and last names. Using last name only allows faster execution time because less manipulations are required, but if you have ten Smith's, the first and last names will be needed to return the correct one. Otherwise, the first Smith encountered will be printed. Lines 2390-2410 look at the console keys and allow you to page through the datafile record by record. This is a nice convenience that will allow you to occasionally page through your listings and find outdated files or the names of "ex-friends" whose names you don't want any longer.

lines 4000-4055

This subroutine is used for the printer. You can print out one record at a time or you can chose to print out all of the addresses you have stored on file. You will be asked how many lines you want between records (1-9). This will allow for labels to be printed to cut down the drudgery of addressing all those Christmas cards.

Well, there you have it. It was fun writing this program. (Not quite as fun debugging it, but that's the price you pay if you want to write!) The Atari is truly an amazing machine. It never ceases to astonish me. As more and more programs become available, I'm sure my amazement will only increase. Now it's off to try to get my wife to talk to me again! □

```

1 REM *** MAILING LIST PROGRAM ***
2 REM *** by ***
3 REM *** GARRY PATTON ***
4 REM *** PO BOX 137 ***
5 REM *** ROMULUS, NY 14541+0137 ***
6 REM
7 REM
10 DIM FILE$(116),LN$(16),FN$(11),ST$(5)
15,PHONE$(15),C$(21),STATE$(3),ZIP$(1
1),EXTRA$(22),TAB$(39)
13 DIM SECTOR(100),BYTE(100):TAB$=""
14
20 OPEN #3,4,0,"S":"OPEN #1,4,0,"K":"Z
14=MENU$=500:EDIT=0
30 TRAP 75:OPEN #2,12,0,"D:MAILDATA.FI
L":TRAP 40000:RN=0:GOTO 600
75 ? CHR$(253):? :" MAILDATA.FIL IS N
OT ON THIS DISK":POKE 752,1:?"DO YOU
WANT TO CREATE MAILDATA.FIL"
76 ? "(Y or N)"
78 GET #1,K:IF K>78 THEN IF K>89 THE
N 75
81 IF K=78 THEN END
82 TRAP 95:CLOSE #2:OPEN #2,8,0,"D:MAI
L DATA.FIL"
83 POKE 559,0:FILE$="":FOR ZZ=1 TO 116
:FILE$(ZZ,ZZ)="":NEXT ZZ:FOR ZZ=1 TO
100:NOTE #2,S,B
89 SECTOR(ZZ)=S:BYTE(ZZ)=B:?:#2:FILE$:
NEXT ZZ:POKE 559,34:CLOSE #2:OPEN #2,1
2,0,"D:MAILDATA.FIL":GOTO MENU
95 POKE 559,34:? CHR$(253):? ?:?" ERR
OR!":END
100 REM CREATE FILE$
110 FILE$="":? "
112 0=0:LN$="":X=2:Y=4:POSITION X,Y?:"
"LAST NAME":FOR ZZ=14 TO 28:POSITION
ZZ,Y?:"-":NEXT ZZ
114 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 112
115 IF XX=155 THEN 130
119 LN$(LEN(LN$)+1)=CHR$(XX):IF LEN(LN
$)>15 THEN GOSUB 700:GOTO 112
126 GOTO 114
130 IF LEN(LN$)<15 THEN LN$(LEN(LN$)+1
)="":GOTO 130
136 IF EDIT THEN RETURN
140 FILE$(LEN(FILE$)+1)=LN$
150 0=0:FN$="":Y=5:POSITION X,Y?:"FIR
ST NAME":FOR ZZ=14 TO 23:POSITION ZZ
,Y?:"-":NEXT ZZ
154 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 150
156 IF XX=155 THEN 162
158 FN$(LEN(FN$)+1)=CHR$(XX):IF LEN(FN
$)>10 THEN GOSUB 700:GOTO 150
161 GOTO 154
162 IF LEN(FN$)<10 THEN FN$(LEN(FN$)+1
)="":GOTO 162
166 IF EDIT THEN RETURN
170 FILE$(LEN(FILE$)+1)=FN$
176 0=0:ST$="":Y=6:POSITION X,Y?:"STR
EET":FOR ZZ=14 TO 37:POSITION ZZ,Y?:
"-":NEXT ZZ
180 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 176
184 IF XX=155 THEN 194
188 ST$(LEN(ST$)+1)=CHR$(XX):IF LEN(ST
$)>24 THEN GOSUB 700:GOTO 176
192 GOTO 180
194 IF LEN(ST$)<24 THEN ST$(LEN(ST$)+1
)="":GOTO 194
196 IF EDIT THEN RETURN
200 FILE$(LEN(FILE$)+1)=ST$
204 0=0:C$="":Y=7:POSITION X,Y?:"CITY
":FOR ZZ=14 TO 33:POSITION ZZ,Y?:"-
":NEXT ZZ
208 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 204
216 IF XX=155 THEN 224
218 C$(LEN(C$)+1)=CHR$(XX):IF LEN(C$)>
20 THEN GOSUB 700:GOTO 204
220 GOTO 208
224 IF LEN(C$)<20 THEN C$(LEN(C$)+1)="
":GOTO 224
226 IF EDIT THEN RETURN
230 FILE$(LEN(FILE$)+1)=C$
234 0=0:STATE$="":Y=8:POSITION X,Y?:"
STATE":POSITION Z,Y?:"-"
236 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 234
242 IF XX=155 THEN 250
243 STATE$(LEN(STATE$)+1)=CHR$(XX):IF
244 GOTO 236
250 IF LEN(STATE$)<>2 THEN ? CHR$(253)
:POSITION X,Y?: TAB$=GOTO 234
256 IF EDIT THEN RETURN
260 FILE$(LEN(FILE$)+1)=STATE$
264 0=0:ZIP$="":Y=9:POSITION X,Y?:"ZI
P":POSITION Z,Y?:"-----"
266 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 264
270 IF XX=155 THEN 274
271 ZIP$(LEN(ZIP$)+1)=CHR$(XX):IF LEN(
ZIP$)>10 THEN GOSUB 700:GOTO 264
273 GOTO 266
274 IF LEN(ZIP$)<10 THEN ZIP$(LEN(ZIP$)
+1)="":GOTO 274
275 IF EDIT THEN RETURN
276 FILE$(LEN(FILE$)+1)=ZIP$
280 0=1:Y=10:POSITION X,Y?:"PHONE: "
:PHONE$="(-) --- ----":POSITION Z,Y?:
PHONE$"
282 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 280
284 IF XX=155 THEN 294
287 IF Q=4 THEN PHONE$(0,0)=CHR$(XX):O
=6:GOTO 282
288 IF Q=9 THEN PHONE$(0,0)=CHR$(XX):O
=10:GOTO 282
292 PHONE$(0,0)=CHR$(XX):IF Q<14 THEN
282
294 IF LEN(PHONE$)<14 THEN PHONE$="(-
) --- ----"
300 IF EDIT THEN RETURN
304 FILE$(LEN(FILE$)+1)=PHONE$"
310 0=0:EXTRA$="":Y=11:POSITION X,Y?:
"EXTRA":FOR ZZ=14 TO 34:POSITION ZZ,Y
?:"-":NEXT ZZ
314 POSITION Z+0,Y:GET #3,W:GOSUB 1000
:IF Q=1 THEN Q=0:GOTO 310
318 IF XX=155 THEN 332
322 EXTRA$(LEN(EXTRA$)+1)=CHR$(XX):IF
LEN(EXTRA$)>21 THEN GOSUB 700:GOTO 310

```

```

328 GOTO 314
332 IF LEN(EXTRA$)<21 THEN EXTRA$(LEN(EXTRA$)+1)="":GOTO 332
334 IF EDIT THEN RETURN
336 FILE$(LEN(FILE$)+1)=EXTRA$
340 IF LEN(FILE$)<>116 THEN ? CHR$(253):? :"ERROR IN FILE$!":FOR DELAY=1 TO 500:NEXT DELAY:GOTO 100
344 POSITION 3,15:? "File as shown (Y or N)":POSITION 3,16:? "N cancels this printing.":GET #1,K
346 IF K<>78 THEN IF K<>89 THEN 344
348 IF K=78 THEN ? "":GOTO MENU
352 RN=RN+1:IF RN>100 THEN ? CHR$(253):GOTO 400
353 POINT #2,SECTOR(RN),BYTE(RN):PRINT #2,FILE$:GOTO MENU
354 PRINT #2,FILE$:GOTO MENU
400 ? ":"POSITION 4,10:? "I'm sorry, but MAILDATA.FIL is full!":FOR D=1 TO 500:NEXT D:GOTO MENU
500 ? ":"POSITION 7,3:? "CHOOSE APPROPRIATE NUMBER":POSITION 12,0:? "RECORDS ON FILE ";RN
510 POSITION 4,5:? "1 Add New Name":POSITION 4,6:? "2 Edit Name":POSITION 4,7:? "3 Delete Name"
520 POSITION 4,8:POKE 752,1:? "4 Print Name":GET #1,K
530 IF K<>49 THEN IF K<>50 THEN IF K<>51 THEN IF K<>52 THEN 500
532 IF K=51 THEN 4000
534 IF K=49 THEN 100
536 IF K=50 THEN 3000
540 POSITION 4,12:? "WILL YOU BE USING PRINTER (Y or N)":GET #1,KK
541 IF KK=78 THEN 2000
542 POSITION 4,14:? "WILL YOU LPRINT A LL OR SOME (A or S)":GET #1,KKK
543 IF KKK=65 THEN GOTO 5000
570 GOTO 2000
600 REM COUNT RECORDS ON FILE
604 TRAP 95:POKE 559,0:FOR NR=1 TO 100 :NOTE #2,S,B:SECTOR(NR)=S:BYTE(NR)=B
606 INPUT #2,FILE$:IF FILE$(1,5)<>"+++" THEN RN=RN+1
610 NEXT NR:POKE 559,34:TRAP 40000:GOT O MENU
700 ? CHR$(253)
704 FOR ZZ=1 TO 4:POSITION X,Y:? TAB$:FOR D=1 TO 30:NEXT D:POSITION X,Y:? "ITEM TOO LONG! STAY WITHIN -S!"
708 FOR D=1 TO 100:NEXT D:NEXT ZZ:POSITION X,Y:? TAB$:RETURN
1000 POSITION Z+0,Y:? CHR$(W)
1004 IF PEEK(764)=255 THEN POSITION Z+0,Y:? "":GOTO 1000
1006 GET #1,XX:IF XX=126 THEN Q=1:RETU RN
1010 POSITION Z+0,Y:? CHR$(XX):POKE 76,4,255:O=0+1:RETURN
2000 REM PRINT NAME
2010 ? ":"POSITION 3,5:? "DO YOU WANT TO SEARCH FOR":POSITION 10,7:? "1 Last name only"
2020 POSITION 10,8:? "2 Last name and first name"

```

```

2030 GET #1,K:IF K<>49 THEN IF K<>50 T HEN 2000
2040 POSITION 3,12:? "LAST NAME: ";:IN PUT LN$
2050 IF LEN(LN$)>15 THEN ? CHR$(253):P OSITION 3,12:? TAB$:POSITION 3,12:? "NAME TOO LONG!":FOR D=1 TO 500:NEXT D
2051 IF LEN(LN$)>15 THEN POSITION 3,12:? TAB$:GOTO 2040
2070 IF K=49 THEN FN$="":GOTO 2200
2080 POSITION 3,14:? "FIRST NAME: ";:IN PUT FN$
2090 IF LEN(FN$)>10 THEN ? CHR$(253):P OSITION 3,14:? TAB$:POSITION 3,14:? "NAME TOO LONG!":FOR D=1 TO 500:NEXT D
2091 IF LEN(FN$)>10 THEN POSITION 3,14:? TAB$:GOTO 2080
2200 FOR P=1 TO RN:POINT #2,SECTOR(P),BYTE(P):INPUT #2,FILE$
2210 IF FILE$(1,LEN(LN$))=LN$ AND K=49 THEN POP :GOTO 2300
2220 IF FILE$(1,LEN(LN$))=LN$ AND FILE $(16,15+LEN(FN$))=FN$ THEN POP :GOTO 2 300
2225 NEXT P
2230 ? ":"POSITION 3,10:? "I'm sorry but I do not find":? :? " ";FN$;" "
;LN$
2240 FOR D=1 TO 500:NEXT D:GOTO MENU
2300 ? ":"POSITION 12,0:? "RECORD NUMBER":P
2305 POSITION 2,4:? "LAST NAME: ":POSI TION 14,4:? FILE$(1,15)
2310 POSITION 2,5:? "FIRST NAME: ":POSI TION 14,5:? FILE$(16,25)
2320 POSITION 2,6:? "STREET: ":POSI TION 14,6:? FILE$(26,49)
2330 POSITION 2,7:? "CITY: ":POSI TION 14,7:? FILE$(50,69)
2340 POSITION 2,8:? "STATE: ":POSI TION 14,8:? FILE$(70,71)
2350 POSITION 2,9:? "ZIP: ":POSI TION 14,9:? FILE$(72,81)
2360 POSITION 2,10:? "PHONE: ":POSI TION 14,10:? FILE$(82,95)
2370 POSITION 2,11:? "EXTRA: ":POSI TION 14,11:? FILE$(96,116)
2372 IF KK=89 THEN KK=0:GOSUB 4500
2374 IF EDIT THEN RETURN
2378 POKE 53279,8
2380 POSITION 4,20:? "Press OPTION to page forward":POSITION 4,21:? "Press Select to page back"
2384 POSITION 4,22:POKE 752,1:? "Press START to return to menu"
2390 IF PEEK(53279)=5 THEN P=P-1:GOSUB 2500:GOTO 2300
2400 IF PEEK(53279)=3 THEN P=P+1:GOSUB 2500:GOTO 2300
2410 IF PEEK(53279)=6 THEN GOTO MENU
2420 GOTO 2390
2500 IF P<1 THEN P=1
2501 IF P>100 THEN P=100
2504 POINT #2,SECTOR(P),BYTE(P):INPUT #2,FILE$:RETURN
3000 REM EDIT

```

```

3010 EDIT=1:GOSUB 2000
3020 POSITION 10,13:?"To EDIT Choose
one":POSITION 4,15:?"1 LAST"
3030 POSITION 20,15:?"2 FIRST":POSITION
4,16:?"3 STREET":POSITION 20,16:?
"4 CITY"
3040 POSITION 4,17:?"5 STATE":POSITION
20,17:?"6 ZIP":POSITION 4,18:?"7 P
HONE":POSITION 20,18:?"8 EXTRA"
3050 POSITION 4,21:?"S SAVE as shown"
:POSITION 4,20:?"E EXIT"
3055 GET #1,K:IF K=83 THEN 3200
3060 IF K=49 THEN GOSUB 112:FILE$(1,15
)=LN$:GOTO 3020
3065 IF K=50 THEN GOSUB 150:FILE$(16,2
5)=FN$:GOTO 3020
3070 IF K=51 THEN GOSUB 176:FILE$(26,4
9)=ST$:GOTO 3020
3075 IF K=52 THEN GOSUB 204:FILE$(50,6
9)=C$:GOTO 3020
3080 IF K=53 THEN GOSUB 234:FILE$(70,7
1)=STATE$:GOTO 3020
3085 IF K=54 THEN GOSUB 264:FILE$(72,8
1)=ZIP$:GOTO 3020
3090 IF K=55 THEN GOSUB 280:FILE$(82,9
5)=PHONE$:GOTO 3020
3095 IF K=56 THEN GOSUB 310:FILE$(96,1
16)=EXTRA$:GOTO 3020
3097 IF K=69 THEN EDIT=0:GOTO MENU
3110 GOTO 3055
3200 POINT #2,SECTOR(P),BYTE(P):FOR D=
1 TO 50:NEXT D:PRINT #2:FILE$=
3230 EDIT=0:GOTO MENU
4000 REM DELETE NAME
4010 EDIT=1:GOSUB 2000
4020 POSITION 4,15:?"Do you want to DE
LETED this file  
(Y or N)?"
4030 GET #1,K:IF K<>78 THEN IF K<>89 T
HEN 4020
4040 IF K=78 THEN EDIT=0:POSITION 4,18
:?"F1le NOT deleted":FOR D=1 TO 500:N
EXT D:GOTO MENU
4050 POINT #2,SECTOR(RN),BYTE(RN):INPU
T #2:FILE$:POINT #2,SECTOR(P),BYTE(P):P
RINT #2:FILE$=
4055 FOR ZZ=1 TO 116:FILE$(ZZ,ZZ)="+":N
EXT ZZ:POINT #2,SECTOR(RN),BYTE(RN):P
RINT #2:FILE$:RN=RN-1:EDIT=0:GOTO MENU
4500 T=0:FOR ZZ=16 TO 25:IF FILE$(ZZ,Z
Z)<>" " THEN T=T+1
4510 NEXT ZZ
4530 TT=0:FOR ZZ=50 TO 69:IF FILE$(ZZ,Z
Z)<>" " THEN TT=TT+1
4540 NEXT ZZ:LPRINT FILE$(16,15+T);"
";FILE$(1,15):LPRINT FILE$(26,49)
4570 LPRINT FILE$(50,49+TT);";";FILE$(
70,71);";FILE$(72,81):RETURN
5000 POSITION 4,16:?"HOW MANY LINES B
ETWEEN ADDRESSES":POSITION 4,17:?"(1-
9)":GET #1,K:IF K<49 OR K>57 THEN 5000
5005 KKKK=K-48
5010 FOR ZZ=1 TO RN:POINT #2,SECTOR(ZZ
),BYTE(ZZ):INPUT #2:FILE$=
5012 T=0:FOR QQ=16 TO 25:IF FILE$(QQ,Q
Q)<>" " THEN T=T+1
5013 NEXT QQ

```

```

5014 TT=0:FOR QQ=50 TO 69:IF FILE$(QQ,
QQ)<>" " THEN TT=TT+1
5015 NEXT QQ
5020 LPRINT FILE$(16,15+T);";";FILE$(1
,15):LPRINT FILE$(26,49)
5030 LPRINT FILE$(50,49+TT);";";FILE$(
70,71);";FILE$(72,81)
5040 FOR ZZZ=1 TO KKKK:LPRINT :NEXT ZZ
5050 NEXT ZZ:KK=0:KKK=0:KKKK=0:GOTO ME
NU ●

```

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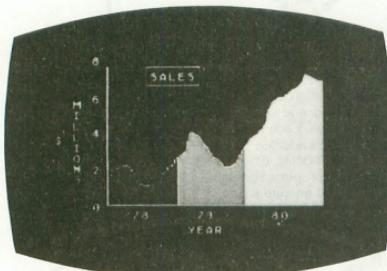
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SOFTWARE REVIEW

DYNACOMP TEXT EDITOR

Dynacomp Inc.
1427 Monroe Ave.
Rochester, NY 14618

by Bill Latino

I regret that I am unable to thoroughly review this program. Failure to accomplish this task is not from lack of interest in same — I stayed up until three in the morning trying to get the program to function properly. Success was not my reward!

While unable to coax DYNACOMP's offering into consistent, crash-free operation, I did become conversant enough with it to offer a few observations:

1. The documentation for the ATARI translation is incomplete.

2. Not all inconsistencies between the well discussed NORTH STAR version and the ATARI version are defined.

3. The ATARI program contains neither the "notes" nor the "comments" file intrinsic to the NORTH STAR program. This is a false economy which can be ill afforded in light of the superficial documentation supplied with this version.

4. The utility of this program is questionable in view of the inherent screen editing capabilities of the ATARI — capabilities which cannot be used within this program (once a line has been entered) without causing format problems. Actually, for many simple tasks, one can edit quicker by employing a simple driver routine composed of nothing more exotic than a series of line numbers suffixed by a lineprint command and quotation marks (1000 LP. "...1100LP." ...etc.). Use would simply require listing about 20 lines, tabbing twice to place the cursor on the second quotation mark, and entering up to 80 characters (about 2.3 screen lines) before hitting "return." One can change, delete, append, or otherwise manipulate the text either before or after entering the line. The DYNACOMP program is rather unwieldy by comparison, requiring extensive handling of files and multiple saves to disk before final edited copy can be output to the printer.

5. While TEXT EDITOR will allow setting a maximum right margin, it does NOT right justify (straighten the right margin) as claimed, nor does it have any provision for adjusting the left margin. Additionally, there is no control over printer operation other than LPRINT and carriage return. □

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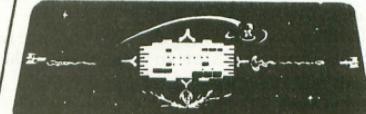
Our contest is simple. A.N.A.L.O.G. is looking for top quality programs for use in our magazine, and as you can see many of the programs and articles in our pages are submitted by our readers. Hopefully you'll agree that the programs in our pages are as good as if not better than many on the market. Our aim is to help support the Atari computers by making available top quality programs and tutorials for a reasonable price (the cost of a subscription). So in order to get more of our readers involved in our efforts, we have decided to add a bonus to the contributor fee. The author of the best or most informative program, tutorial or article we use through March 1982 will receive an Atari 810 Disk Drive, in addition to his or her royalty payment. You will be the judge. In issue #9, we will publish a questionnaire which hopefully will be filled out and returned to us, and will determine the winner.

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SOFTWARE REVIEW:

ASTEROIDS* CONTROLLER

by Rick Rowland

Well, after waiting too long for Asteroids to come out, it finally showed up and I had to almost fight to get a copy. The only disappointment was while I had to use a joystick and after all that practice at the quarter machines.

So after a short while, I decided it was time to do some converting. First, the joystick came apart with four screws. (Don't lose the small spring). This had been done before to mount a fire button on top of the stick for playing Star Raiders. Inside are five contact switches, one for the fire button and four positions (12, 3, 6 and 9 o'clock). Each contact has one separate wire leading to it and one common wire leading to the remaining terminals.

After a short while with an Ohm meter the terminals on the joystick ports were decoded as follows:

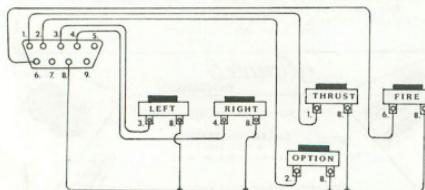
From the top left #1 was the forward position, #2 was the rear position, #3 was left, #4 was right, and #5 was unused. From the bottom left #6 was the fire button, #7 was unused, #8 was the common, and #9 was unused.

After obtaining this information it was time for a trip to the electronic and computer stores. There I found a plug and connectors for the joystick port, some 6 strand wire, a box and five very large momentary push buttons.

After installing the buttons in the box ala arcade games, it was a few minutes with a soldering gun hooking the wires per the diagram. Asteroids was now just like the arcade game without the quarters. Where was this for Space Invaders? (This works well on Space Invaders and who knows what other applications.)

Well, this was so easy, now all I need is a large ball type controller and it's on to mastering the high scores on Missile Command! □

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TRICK TUTORIALS
Santa Cruz Software

by Jerry White

Atari owners are a very lucky group of people. We not only have magazines like ANALOG, and the cooperative folks at Atari as sources of information, we also have companies like The Code Works (IRIDIS), and Santa Cruz Software. Many are familiar with The Code Works but few have heard of Santa Cruz. If you are into learning more about "How to do it" using Atari Basic, look into the Tricky Tutorials from this new and exciting source.

Santa Cruz has six Tricky Tutorial Packages. Each consists of a group of demonstration programs written in Atari Basic along with well written documentation. The amazing thing is that each is sold for only \$14.95 on cassette or diskette. If you have an Atari 810 Disk Drive, note that the disk version costs no more than the cassettes.

The six packages cover Display Lists, Horizontal/Vertical Scrolling, Page Flipping, Basics of Animation, Player Missile Graphics, and Sounds. They are useful to the beginner as well as the experienced programmer. This is made possible by the way each subject is presented. Although the beginner may get lost while trying to learn using documentation alone, the programs demonstrate the subject and provide ready to use routines. You really don't have to understand WHY to adapt these routines into your own programs.

For example, I have always had trouble understanding the modified display list. Through trial and error, I could create my own mixed screen modes, but I found it to be a very frustrating and time consuming task. Using tricky tutorial #1, and Edit type program, (program #10 in that package), makes even trial and error easy. DATA statements containing display list data are edited right on the screen. The resulting screen display is easily reviewed and altered until the desired result is achieved. The DATA may then be LISTed to disk or cassette, then ENTERed into your own Basic program. I love it.

The documentation is written in a very friendly style. This style makes for easier reading than the common dry manual. I did notice occasional errors in spelling, but this will bother only the English teacher. The important thing is the wealth of information supplied for the incredibly low price of \$14.95. □

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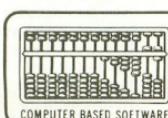
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