# START™

THE ST QUARTERLY

U.S.A. $14.95 CANADA $19.95

**Disk Enclosed**

Winter 1986 Volume 1, Number 3

**FEATURES:**

**Buyer's Guide:**
*Choose From Over 300 ST Products*

*The START Interview:*
**Jack Tramiel**

**Paint Like A Pro**
*With DEGAS or NEO*

*Bill Wilkinson Rates*
**ST Programming Languages**

**Hot Sounds**
*Unleash the Power of Your Sound Chip*

**Personal Pascal Tutorial:**
*Create an Address Book, Autodialer and Labelmaker*

64

0 74470 19724 9

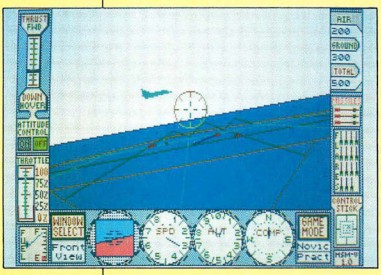
## One of the World's Most Popular Games on the Macintosh

# NOW AVAILABLE ON ATARI ST!

# HARRIER STRIKE MISSION

There's this island off the coast somewhere...the enemy's headquarters. Your weapon? The Harrier Jump Jet, one of the world's most sophisticated technological marvels, which combines the ability to take off and land vertically like a helicopter with the speed and punch of the latest in modern jet armament. Your mission, should you decide to accept it, is to pilot your Harrier from the deck of an aircraft carrier, take out enemy aircraft, locate and destroy enemy headquarters and fuel depot, and safely land back on the deck.

Simple, isn't it? Hardly! Facing you will be some of the world's nastiest enemy fighter planes launching heat seeking missiles. The good news is that you have three Sidewinder missiles, two 30mm Aden cannon pods and the ability to maneuver like no other jet in history! The bad news? You have only one plane to fight off five enemy aircraft.




Now wipe that sweat off your brow, don your helmet and gloves, strap yourself into your seat and GOOD LUCK! 'Nuff said, it's CLOBBERIN' time! Harrier Strike Mission—a 3-Dimensional Flight Combat Simulator for your Atari ST. The first in a series of new projective 3-D simulations from MILES COMPUTING, Inc.

FROM MILES Computing

*Miles ahead of the pack.*

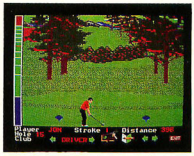
**Miles Computing, Inc.**

7741 Alabama Avenue, Suite 2
Canoga Park, CA 91304 • (818) 341-1411

CIRCLE 031 ON READER SERVICE CARD

# Now, nothing can keep you from your appointed rounds.

Laugh at the weather. Putt in the middle of the night. Tell your secretary to hold all calls. With Accolade's MEAN 18, all the excitement and challenge of real golf is right on your computer.



MEAN 18 delivers the kind of realism and playability you've come to expect from Accolade. This is golf the way it was meant to be enjoyed... without spending your day decoding the instruction manual. You can hit a bucket of balls at the driving range, play from the pro or regulation tees, even ask your caddy to suggest your clubs.

Once you've mastered MEAN 18, there's the challenge of playing on three of the world's legendary golf courses, all capable of bringing any touring pro to his knees. With The Course Architect, you can even design your own grueling course complete with menacing bunkers and greens on the edge of an ocean.

**Available for IBM, Atari ST and Amiga systems.**

Accolade, 20833 Stevens Creek Boulevard, Cupertino, California 95014. Telephone 408-446-5757.

# Mean 18.

CIRCLE 079 ON READER SERVICE CARD

# MARK WILLIAMS C. AN ENLIGHTENING DEVELOPMENT FOR ATARI ST USERS.

If you've tried your hand at developing applications on the Atari ST, you know the problem. Programming tools aren't only hard to come by, they're hard to use. One might even say primitive. But now for some enlightening news: you can have all the power, portability and versatility of the C language from a leader in professional C programming tools, Mark Williams.

## BRING YOUR PROGRAMMING UP TO SPEED.

The Mark Williams C compiler produces fast, dense code and supports the complete Kernighan & Ritchie industry standard C. You'll have access to GEM's AES and VDI libraries for programs using graphics, icons and the Atari mouse. And Mark Williams C lets you take advantage of the full 16 megabytes in Atari's 68000 microprocessor.

## STREAMLINE DEVELOPMENT WITH POWER UTILITIES.

Mark Williams C is loaded with everything you'll need for professional development. Bring the power of the UNIX environment to your Atari ST with our Microshell Command Processor including pipes, I/O redirection and more. Edit your program with the highly acclaimed MicroEMACS full screen editor. Accelerate and simplify compiling with *make* which finds and recompiles only those modules affected by your changes. Then, when you're ready for debugging, call on our db Symbolic Debugger with single step, breakpoint and stack traceback functions. Over 40 commands, including a linker and assembler, provide a total development package for your Atari ST.

### Features

C compiler
- Complete Kernighan & Ritchie C plus extensions
- Up to eight register variables
- Full access to AES and VDI libraries for programs using graphics, icons and mouse
- Complete UNIX-compatible libraries allow easy portability to and from UNIX development environment.
- Over 300 Atari-specific routines
- One-step compiling, linking with cc command
- English error messages
- Lint-like error checking

Microshell Command Processor, powerful UNIX style shell includes I/O redirection, pipes, command substitutions

MicroEMACS Full Screen Editor with commented source code included

Make Program Building Discipline

Complete symbolic debugger with single-step, breakpoints and stack traceback

Assembler, linker and archiver

Powerful Utilities Package: egrep, sort, diff, cmp, pr, tail, uniq, wc and more

Over 600 pages of documentation including 120 sample C programs

Not copy protected

**MARK WILLIAMS C FOR THE ATARI ST**
**$179.95**
**60 DAY MONEY BACK GUARANTEE**

## DEPEND ON A NAME WITH A HISTORY OF PERFORMANCE.

Mark Williams C for the Atari ST is part of our growing line of C compilers. A line that includes the C compiler chosen by DEC, Intel, Wang and thousands of professional programmers. Now our Atari C compiler is earning its own reputation:

"Finally a great C compiler that exploits the power of the ST"—Sigmund Hartmann, President, Atari Software Group

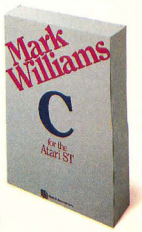
"The all-around best choice for serious software development on the ST."—Douglas Weir of *ANALOG COMPUTING*

## GET WHAT YOUR ATARI ST HAS BEEN WAITING FOR.

Mark Williams C is just what your Atari ST was made for: powerful, professional programming. So now that you can have Mark Williams C for just $179.95, what are you waiting for?

Ask your Atari dealer about Mark Williams C or order today by calling **1-800-MWC-1700.***

*In Illinois call: 312-472-6659




**Mark Williams Company**

1430 West Wrightwood, Chicago, Illinois 60614

© 1986, Mark Williams Company
UNIX is a trademark of Bell Labs.

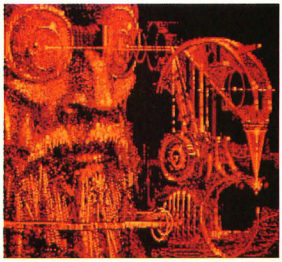
CIRCLE 023 ON READER SERVICE CARD

CONTENTS

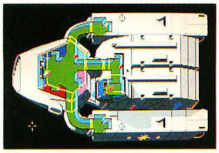
WINTER 1986

START THE ST QUARTERLY

VOLUME 1, NUMBER 3

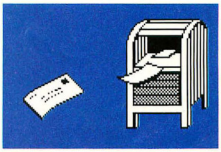


*Creating ST art, step by step . . . . page 24*



*Everything under the sun? . . . . . page 53*

*Jack Tramiel interviewed . . . . . page 36*



*Database in Personal Pascal . . . . . page 41*

## FEATURES:

**Hot Sounds**
*Noise Doodling On Your ST*
*Gary Levenberg & Lee Actor* **14**

**Jack Tramiel: A Candid Discussion**
*Stephen Banker* **36**

**Mail Call**
*Address Book, Auto-Dialer, Label Printer*
*Randy Gordon, D.D.S.* **41**

**START Buyer's Guide**
*300 ST Products*
*Gigi Bisson* **53**

**ST Writer Secrets**
*Word Processing Power Explored*
*Bruce Noonan, M.D.* **86**

**Writing To The Cartridge Slot**
*Sophisticated Hardware Techniques For The Expert*
*G. Stewart Beal* **94**

**Shoestring Development**
*START Picks Packages For Developers*
*Christopher Chabris* **110**

**Getting Around ST BASIC**
*Code the Dragon's Maze*
*David Plotkin* **131**

## DEPARTMENTS:

**Iconographics**
***Art Tips From A Pro***
*Create Your Fantasy With DEGAS*
*Darrel Anderson* **24**

**Chips**
***Supervisor Mode***
*Privileged Classes*
*Jim Dunion* **45**

**Perspectives**
***Tower of Babel***
*Pick a Language, Any Language . . .*
*Bill Wilkinson* **124**

## REVIEWS:

*START Update:*
**Mark Williams C & Menu +**
*Arick Anders* **104**

## SECTIONS:

**Dialog Box** **6**
**Authors** **10**
**Clipboard** **35**
**Disk Instructions** **83**
**Advertising Information** **138**

***Indicates programs included on START Disk. See order card if you did not buy Disk Version.***

*Winter 1986, Volume 1 Number 3.* ***START, The ST Quarterly*** *(ISSN #0889-6216), is published four times per year by Antic Publishing, Inc., 524 Second St., San Francisco, CA 94107. Application to mail at second-class rates is pending at San Francisco, CA and at additional mailing offices.*

THE ST QUARTERLY
START™

**PUBLISHER**
James Capparell

**EDITORIAL**
DeWitt Robbeloth, Executive Editor
Jack Powell, Associate Editor
Matt Loveless, Technical Editor
Patrick Bass, Technical Advisor
Heidi Brumbaugh, Editorial Assistant
Jon Randall, Editorial Clerk
Contributing Editors: Christopher Chabris, Tom Hudson, David Small.

**CREATIVE SERVICES**
Marni Tapscott, Art Director
Kyle Houbolt, Design & Production Assistant
Katherine Murphy, Ad Production Coordinator
Contributing Artists: Steve Campbell, Karen Elliott, David Gambale, John Hersey, Mary Rhomberg Lavery, Karen Mercedes McDonald, Julie Polunsky, Jim Warner
Cover Photography: Mark Gottlieb
Scenic: Four by Five

**ADVERTISING SALES**
John Taggart, Director
(Please see Advertising Index, page 138).

**CIRCULATION**
Margot Olmstead, Director
Dixie Nicholas, Subscription Coordinator

**MARKETING**
Jon Loveless, Vice President; Gary Yost, Director; Lisa Wehrer, Retail Sales Manager; Daniel Barrett and Ken Warner, Dealer Sales; Eric Gupton, Customer Service Coordinator; Scot Tumlin, Technical Support; Pamela Grady, Customer Relations.

General Offices, Catalog Customer Service, and Subscription Customer Service:
(415) 957-0886
8 a.m. to 4 p.m. Pacific
START, 524 Second Street,
San Francisco, CA 94107
Credit Card Subscriptions & Catalog Orders:
(800) 443-0100 ext. 133
(Continental U.S. & Hawaii)

Subscriptions: U.S. $59.95 (4 issues with disk).
Foreign subscriptions $84.95 (4 issues with disk).

POSTMASTER:
Please send address change to START,
524 Second Street, San Francisco, CA 94107.

**SUBMISSION INFORMATION**
START welcomes submissions. Please include both hard copy printouts of articles and program listings as well as disk files on ST compatible disks. Media will be returned if self-addressed, stamped mailer is supplied. START assumes no responsibility for unsolicited editorial materials.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.

START is an independent periodical not affiliated in any way with Atari Corp. ATARI is a trademark of the Atari Corp. All references to Atari products are trademarked and should be so noted.

START is a registered trademark of Antic Publishing, Inc.
An Information Technology Company.
Copyright © 1986 by Antic Publishing
All Rights Reserved. Printed in USA.

# DIALOG BOX

## MORE MIDI

I just bought your magazine off the rack. It looks sharp. It sounds smart. I like it.

I am a technician, musician, and self-taught programmer of a Commodore 64. Having flogged that machine into submission, I decided to take a step up. It may seem absurd, but I don't think I was alone when I narrowed my choice to either a Commodore 128 or a 520 ST. Did I want an untried "wave of the future" or a powerful version of an old friend?

My interest in MIDI applications should have decided the issue, but I have yet to see a professional MIDI sequencer available for the only computer with a built in MIDI interface. I assume there will be many out soon, but I still have a hard time explaining to musicians how the ST could be the ultimate MIDI machine when I can't point to any software.

Then I saw your magazine. I bought it. I haven't even bought the machine yet! There, in the first issue, is a simple sequencer with enough to get started expanding. I hate starting projects from scratch, but point me in the right direction, and I can turn out some code.

For some time now I have felt that there was a huge gulf between MIDI coverage in computer magazines and music magazines. Surely I am not the only musician who thinks that "programming" is more than creating patches on a DX. A magazine devoted to the ST is an ideal place to create a forum on the serious business of music applications.

In the meantime, I have a disk and a magazine that have made up my mind. The next time you hear from me, I will actually have a machine to run it on.

**Roy M. Randall**
**Alexandria, Virginia**

*Look for increased coverage of MIDI products and programming in upcoming issues of START. We're interested in hearing from people like Mr. Randall who have an interest in MIDI. Potential authors, this is your chance.*

## COMPUTER ART

After finishing five years of college (three undergraduate, two graduate) as a Broadcast and Design major, I want to work as a computer artist. Already I'm finding the ST limiting, and I eagerly await hardware and software to improve the ST's graphics.

I have a few questions I hope you can answer. Why is the ST limited to displaying only 16 colors at once? Will Tom Hudson ever design a program that lets you paint with all 512 colors? And what is the mysterious "blitter" chip?

**Brian J. Pohl**
**Tulsa, Oklahoma**

*The SHIFTER chip on the ST is designed to display 16 colors simultaneously. It is possible, with clever programming, to change the color palette on every scan line. However, getting more than 16 colors on any individual scan line is virtually impossible and certainly impractical for anything but the most dedicated displays.*

*On the topic of Tom Hudson: Tom's most recent creation, DEGAS Elite from Batteries Included, which is scheduled for release in time for Christmas, does not improve upon the standard of 16 colors at once. But, judging from some of the creations we've seen, this isn't much of a limitation. (In "Degas Art Techniques" this issue, Darrel Anderson presents a preview of DEGAS Elite and a fantastic tutorial on computer art using only, get this, four colors).*

*If you had hoped the blitter chip would add colors to your display, you're out of luck. However, the blitter, which Atari has in prototype, will be a boon to dynamic displays (those that move) because it allows high-speed memory transfers. The speed of moving images to and from the screen will*

*increase markedly, improving drawing, scrolling, and animation, but doing little to increase the number of colors or the resolution of the display. As we understand it, the blitter chip will be available as an upgrade for both the 1040 and the 520.*

## A FEW WORDS ON 1ST WORD

At last (or should I say at laST?), a magazine especially for ST owners! Congratulations on being first.

I am not an experienced ST owner. I am particularly interested in articles that will help me write my own simple programs for useful tasks. Please try to provide some tutorials for us beginners; hopefully one day we'll understand what all this great stuff means.

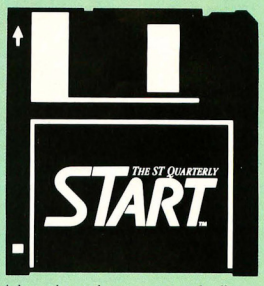
Your premiere issue of START mentioned that 1ST Word will only allow single-spaced documents. I have an updated version of the program that does in fact double-space: under the **Style** menu there is a heading called "Spacing." When you click on this, 1ST Word will double-space all text until you turn it off again.

Suzanne Oliff
Mississauga, Ontario
CANADA

*As START matures you can expect to see more articles directed to the inexperienced user. We at START are dedicated to striking a balance of articles that will satisfy all our readers. Take note that subscribers to START also receive twelve issues of Antic, which includes The ST Resource.*

*We have been barraged with letters about the double-spacing problem of 1ST Word. The latest versions of the program do allow you to double-space your document. However, there is still no easy way to change an already single-spaced document into a double-spaced one. The straightforward method actually requires you to reformat every paragraph! For an interesting solution, read the next letter. . .* ▶

# WHERE'S MY DISK?




START is a magazine with programs on disk. Normally you will find the disk bound into the magazine and selling on the newstands for $14.95.

But some of you ST enthusiasts want to read START first, so we have provided a limited number of copies without disk for $4.00 each.

If this is your situation you can complete your copy of this issue of START by ordering the companion disk direct from us, for $10.95 plus $2.00 shipping and handling. See the order form inserted into this issue.

CIRCLE 004 ON READER SERVICE CARD

FOR YOUR ATARI ST MACINTOSH AND AMIGA

IF YOU MAKE A MISTAKE, YOU'LL HEAR...

# THUNDER!™

"One of the most impressive programs we've seen... If you write, you need THUNDER!"
-ANALOG COMPUTING MAGAZINE

## THE REAL TIME SPELLING CHECKER THAT WORKS WITH:

- Word Processors
- Personal Productivity
- Management Programs
- Telecommunication Programs
- Educational Programs
- Data Base Programs
- Finance Programs
- and many other programs!

ONLY
$39.95* For The ST
$49.95* For The Mac and Amiga
NOT COPY PROTECTED

**THUNDER! is so much more than just a spelling checker! THUNDER! is also a document analyzer and a quick typist abbreviation expander!**

BATTERIES INCLUDED™

BATTERIES INCLUDED, an ITM company, 30 Mural Street, Richmond Hill, Ontario, Canada, L4B 1B5. (416) 881-9941. Customer Information (416) 881-9816. If you can't find this product at your local retailer, you may order it direct from us at the full suggested list price plus $5.00 for postage and handling. For product orders please call 1-800-387-5707 (U.S. only). With all Batteries Included products you can always have the latest version of your program by returning the original disk and $10.00. Write to us for our full color catalog of products for the APPLE, APPLE MACINTOSH, ATARI, ATARI ST, COMMODORE, COMMODORE AMIGA, AND IBM SYSTEMS. (C) 1986 BATTERIES INCLUDED. APPLE, APPLE MACINTOSH, ATARI, ATARI ST, COMMODORE, COMMODORE AMIGA, AND IBM are registered trademarks respectively of APPLE COMPUTERS INC., ATARI CORPORATION, COMMODORE BUSINESS MACHINES INC., AND INTERNATIONAL BUSINESS MACHINES INC.

* ALL PRICES SHOWN ARE IN U.S. DOLLARS. RETAILERS MAY SELL FOR LESS.

CIRCLE 006 ON READERS SERVICE CARD

## DOUBLE-SPACE DRAFTS

I bought my monochrome 1040 ST and the first issue of START on the same day. Low cost, user-friendly word processing was my primary interest in purchasing the Atari. When I finally solved the mysteries of adapting the 1ST Word printer templates to my printer, I turned my attention to finding a quick way of printing double-spaced drafts. Often, I want a double-spaced draft so that I have plenty of room for editing on paper, but I want the final document to be single-spaced. Unfortunately, I found I had to reformat the entire document to change the spacing—an obnoxious and time-consuming process. A little late-night ingenuity led me to the following solution:

1) Load 1ST Word, and, using the **File** menu, open the file containing the patch template for your printer (from inside your PRINTER folder). These templates are designated by .HEX.

2) Under printer characteristics, locate item one, the linefeed command. Add to it a comma and a capital letter A. The line which previously read

1, D, A * Linefeed WITH return

should be modified to read

1, D, A, A * Linefeed WITH return

This will cause two linefeeds to accompany each return, thereby causing all printing to be double-spaced.

3) Use the **File** menu to **Save as. . .** DOUBLE.HEX in your PRINTER folder. Of course, don't modify your original 1ST Word disk; only change a backup.

4) Quit 1ST Word and run (open) the program INSTALL.PRG from your PRINTER folder, selecting the DOUBLE.HEX file at the prompt.

5) When the installation is done, you will have created a new 1ST_PRINT.DOT (for dot-matrix printers) or 1ST_PRINT.DSY (for daisy wheel printers) file inside your PRINTER folder. Copy the files 1ST_PRINT.PRG, 1ST_PRINT.DSY, and 1ST_PRINT.DOT from your PRINTER folder onto a formatted disk. Label the disk "DRAFT PRINTING."

6) When you are preparing your document that will require double-spaced drafts, use the **Layout** option under the **File** menu and choose the following settings:

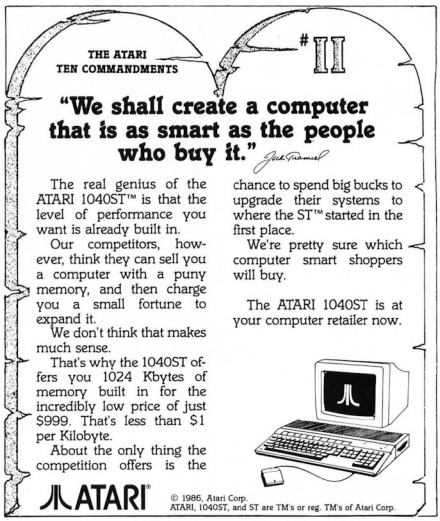
Paper Length = 33 (one-half the normal 66)
TOF Margin = 1
Head Margin = 2
Foot Margin = 2
BOF Margin = 3

This will print 25 lines per page. While you're preparing your layout, you might as well add the date and "draft" to the header or footer.

7) When you are ready to print a double-spaced draft, make sure your DRAFT PRINTING disk is in drive A. If you only have a one drive system you will have to save a copy of your document onto this disk. When you print from the **File** menu, the result will be a correctly formatted, double-spaced version of your document.

8) When you want a final, single-spaced printout, use the **Layout** option again to reset the paper length to 66 and the margins to 1, 3, 4, and 5 respectively, thereby providing a total of 54 lines per page. Return the disk containing the original printer files to drive A. If you have a one drive system, you will have to save a copy of the document onto this disk. You can now print with the **Print** command.

**Thomas J. Harley, Jr.**
**Palo Alto, California** ■



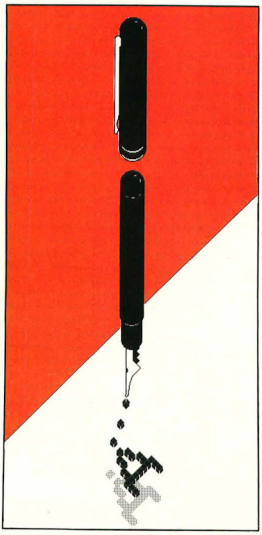
CIRCLE 004 ON READER SERVICE CARD

**Arick Anders**, co-author of last issue's C comparison, develops IBM PC educational products for a company called WICAT in Orem, Utah. Arick has a B.S. degree in Computer Science with a minor in Chemistry from Brigham Young University. He also is a medic with the National Guard. He and his wife, an emergency room nurse at the local hospital, have three children and raise English Angora rabbits.

**Darrel Anderson's** 15 years of professional artistic experience include: technical, architectural and advertising illustration; comics; T-shirt design; and book illustration. Darrel has concentrated on images of the fantastic and the future in original works and limited-edition prints. He was introduced to his first computer, an Atari 800, two years ago to produce screen art for an interactive fiction game. Shortly afterwards, Darrel bought a 520 ST and applied its graphics capabilities to various projects, including the package illustration for an upcoming interactive fiction adaptation of Ray Bradbury's *The Martian Chronicles* (Bantam, NY). Using DEGAS, he designed 33 illustrations for *Best of the New Wave*, a science-fiction anthology from Bluejay Books (NY). In another project, Ray Bradbury's *Fever Dream*, (Armadillo/St Martins Press, NY), he used a CAD-3D model as reference. Darrel was also the winner of the Antic DEGAS art contest. (See Antic, July 1986 for his winning entry.)

**Stephen Banker**, a former columnist for Popular Computing magazine, is a Washington D.C. writer and broadcaster who specializes in the technology of communications. He is also the publisher of *Tapes for Readers*, a series of cassette interviews with such personalities as John Updike, James Michener, Bill Gates, and Ben Rosen. Stephen's first computer was an Epson QX-10 followed by an Apricot xi. "I like beautiful losers." His recent purchase of an Atari ST prompted a friend to remark, "Looks like you're now into ugly winners."

**G. Stewart Beal** is a systems analyst with the Canadian Department of the Environment's National Water Research Institute. He assists in designing scientific, data-acquisition systems, primarily on microcomputers. A recent project involved an IBM PC stationed in the middle of a lake running a high-speed data acquisition system and transferring environmental data samples to another PC on the shore. Stewart programs mostly in C but is exploring Smalltalk. As an amateur radio operator he built several computer/radio projects, including an "OSCAR Talker," which tracks and coordinates the signals of orbitting amateur radio satellites. His radio call letters are: VE3MWM



JOHN HERSEY

**Christopher Chabris** has appeared in all three issues of START and, as of this issue, has become a contributing editor. A student of computer science at Harvard University, he is completing a book on artificial intelligence which will be published in 1987 by Dow Jones-Irwin/Multiscience Press. Christopher is among the top 50 chess players in the United States under 21 years of age, and just won his National Master's rating. Congratulations Chris!

**Jim Dunion** wrote "Of Diagnostics and Debugging" in the premiere issue of START. Jim was a programmer with the Software Development Support Group of the "old" Atari, then later with Alan Kay's research group. He was a founder of Peachtree Software in Atlanta, Georgia, and is presently with The System Works in Redmond, Washington. Jim designed Dunion's Debugging Tool, considered to be the best debugger for the 8-bit Atari, and is now working on an ST version to be called STDDT.

**Randy Gordon, D.D.S.** is an Endodontist, which means he specializes in root canals (shudder). Five years ago, he bought a Sinclair ZX80 in kit form, and stayed up until three AM putting it together. He soon tired of the tiny Sinclair and moved up to an Atari 8-bit computer. When the STs were announced, he was on the list for the first releases. Dr. Gordon also enjoys tennis and likes

to spend time with his family, and especially his daughter. He juggles his appointments at work among five offices and has written a program on his ST to keep track of appointments, collections, and so on. MailCall is his first published program.

**Gary Levenberg** and **Lee Actor** recently started Synthetic Software, a company which will focus on music software for the ST. Gary got involved with computers and music in 1970 at Indiana University, where he was part of a small group which established a computer music system for sound generation, composition and music printing. He received his Masters Degree in Computer Music while studying with Iannis Xenakis. Lee Actor, who has an M.E. in Electrical Engineering, has performed and recorded professionally as a violinist from 1972 to 1978, and has conducted several concerts. He was assistant conductor at MIT and San Jose State University. Lee became involved with Atari when he wrote the Advanced Music System for the Atari Program Exchange. This led to a number of video game projects, including Bally Sente's Hat Trick. While at Bally, he developed the Turbo Music System for in-house music composition and sound design using a Sequential Circuits sound board.

**Bruce Noonan, M.D.** is more than just a persistent advocate of ST Writer. Dr. Noonan is also an ophthalmologist in Edmonds, Washington. He started programming in BASIC at Dartmouth College in the late sixties. After buying an Atari 800 in 1982, he wrote a text-magnifying program for low-vision individuals. Moving up to the ST, Dr. Noonan has just completed a GEM-based program on the ST which calculates intraocular lens powers for implantation in cataract surgery patients.

**David Plotkin** has written countless programs, in both BASIC and ACTION!, for our sister magazine, Antic. In past issues of Antic, he has authored a series of beginner's programming tutorials. An engineer at Chevron USA, David designs and builds oil processing plants and offshore platforms. "That should make me lots of friends, shouldn't it?" David recently had his first professional program, Miniature Golf Plus (for 8-bit Atari's) published by XLENT software. Now, he is busily programming in Personal Pascal and hasn't turned on his 8-bit Atari in months.

**Bill Wilkinson**, to resurrect a cliche, is a man who needs no introduction to the Atari community. For those ST owners joining us from the Apple or Commodore worlds, we add the following: Bill Wilkinson is V.P. of Optimized Systems Software, a company well known for the quality of its products and the depth of its customer support. Bill, himself, is also well known for the quality, depth and friendliness of his personal support to anyone who has met him at users groups or computer shows. Many Atarians were weaned on Bill's "Insight Atari" columns in Compute! magazine. As a programmer, Bill was, to a large extent, responsible for the design of the original Atari DOS and Atari BASIC. ■

CIRCLE 004 ON READER SERVICE CARD

Enhanced for 520 ST – Better Graphics, Sound, Play Action!

# Captain's Log . . . War Date 10.01.44

"Captain's Log, October 1, 1944. 0250 Hours. Fleet submarine USS Hammerhead proceeding Southwest at cruising speed. Our mission: intercept enemy convoy off the coast of Borneo. Disperse and destroy."

Atari 520ST screens shown

"0300 Hours. Two hours until dawn. Radar picks up convoy, escorted by two destroyers. We believe that one of the enemy's valuable oil tankers is part of convoy formation."

"0400 Hours. Lookouts on the bridge. Target identification party reports one tanker, 6,000 tons, troopship of 10,250 tons, with two *Kaibokan*-type escorts. Moving into attack position."

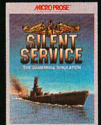
"0500 Hours. Sound General Quarters! Battle stations manned. Preparing for torpedo run. Gauge Panel OK. Periscope OK. Charts and Attack Plot Board OK. All mechanical systems OK."

"0525 Hours. Torpedo rooms report full tubes forward and aft. Battery at full charge for silent running. We hope water temperature will provide thermal barrier to confuse enemy sonar."

"0600 Hours. We are at final attack position. Convoy moving at 10 knots. Target distance decreasing rapidly . . . Crash Dive! Escorts have spotted us and are turning to attack! Rig to run silent."

"0700 Hours. Depth charged for one hour. Some minor damage, but repair parties at work. Destroyer propeller noises receding. We'll come to periscope depth for our return punch."

"0715 Hours. Torpedo tubes 1, 2, 3 fired. Two destroyers hit and sinking. One of the enemy's last tankers coming into 'scope view – an ideal target position. On my mark . . . Fire Tube 4! Fire 5!"




"Superb" raves Scott May in *On Line*, "strategic intensity and heart-pounding action have rarely been merged this successfully." *Analog* calls it flatly "the best submarine simulation so far." *Compute* comments "Silent Service's detail is astonishing." Join the more than 150,000 computer skippers who have volunteered for **Silent Service**, the naval action/tactics simulation – from MicroProse.

Silent Service is available for Commodore 64*128™, Amiga™, Apple II family, Atari XL/XE, Atari ST, IBM PC/PC Jr, and Tandy 1000, at a suggested retail price of $34.95 (Atari ST and Amiga, $39.95).

Commodore, Amiga, Apple, Atari, IBM, and Tandy are registered trademarks of Commodore Electronics, Ltd., Commodore-Amiga Inc., Apple Computer, Inc., International Business Machines Corp., and Tandy Corp., respectively.

Available from your local retailer. If out-of-stock, contact MicroProse directly for further information on our full range of simulation software, and to place Mastercard/Visa orders.

MICRO PROSE
SIMULATION • SOFTWARE

120 Lakefront Drive • Hunt Valley, MD 21030 • (301) 667-1151

CIRCLE 027 ON READER SERVICE CARD

# HOT SOUNDS

## NOISE DOODLING ON YOUR ST

**by Gary Levenberg** **Program by Lee Actor**

KAREN MERCEDES McDONALD

*Open your ears to the amazing possibilities of Near Synthesizer Quality sound with the ST computer. Here's a brief tutorial on electronic sound plus a prototype sound editor you can find in the SOUND.STQ folder on your START disk.*

Sounds computers make include the din of video arcades, the almost human voice of the telephone-number reader at information, the beeps and squeeks of your corner banking machine, and the sophisticated sounds of modern music synthesizers. Your Atari ST computer contains a sound-generator chip that directly drives the speaker in its monitor, or any other acoustic device to which it is properly connected, and it's capable of making a wide range of musical notes and sound effects.

Atari chose the Yamaha YM2149 software-controlled sound generator for their ST computers. Designed originally by General Instruments, this chip has been around for a number of years and, with all the current developments in sound generation, it seems obsolete by comparison. But don't be discouraged; with the help of the ST's high speed microprocessor, our humble sound chip can generate sounds nobody would have dreamed of.

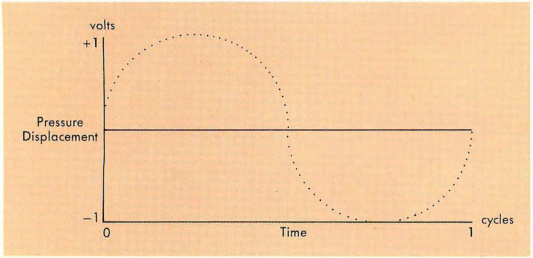
Lee Actor and I are computer and music professionals enthralled by the complexity and excitement of computer sound generation. Currently, we are developing an inexpensive graphic-oriented sound editor called GIST (General Instruments Sound Tool) for the Atari ST which will soon be available. A motivating force in designing GIST is the opportunity to establish NSQ–Near Synthesizer Quality–as a standard on the Atari that can be shared by developers and hobbyists alike. We intend to make entire libraries of sounds available through bulletin boards, users groups, and magazines such as START.

To promote this standard, what we've given you here is NSQ.PRG, a version of GIST minus some of the professional features we intend to include in the final package. With it, you can design and save to disk sounds that are every bit as sophisticated as those created by GIST and begin building your own sound library. We are not, however, able to include the source code, which is, after all, the core of our product. The final product will include source code and drivers for a number of languages. We hope you will enjoy experimenting with this version. Any sounds you create and save now will be compatible later with GIST.

Before we look at what sound really is, let's play around with NSQ.PRG and make some noises with your ST. Several sample sound files, designated by .SND extenders, are included on the START disk. Turn up the volume on your monitor, insert your START disk (for color monitors, select medium resolution), open SOUND.STQ, and double-click on NSQ.PRG. A standard GEM menu bar will appear at the top of the screen. Point the mouse to the **File** drop-down menu and select **Open. . .**

In the item-selector box find SQUARE.SND and load it. As the GEM ▶

FIGURE 1a: Sine Wave




window appears, listen carefully. You'll hear a sound effect as the window zooms open. It also makes a sound when it closes. As far as we know, this is a first: a GEM function accompanied by a sound effect.

To hear the square wave sound you just loaded, click **Sound on** from the **Play** menu. It sounds a bit like an old electric alarm clock. Pretty boring, but the square wave is an important and fundamental sound which we will analyze in some detail later. For now, let's listen to something more interesting. Use the above procedure to load DRWHO.SND and play it. That's more like it! Move your cursor under **Frequency** and click on **Nominal**. Within the alert box, change the number 31 to 100 and press [Return]. Play the sound again to hear the difference.

These procedures work with any of the sounds on your START disk. Feel free to explore and change the parameters in the drop-down menus. You can have three windows open simultaneously, each representing a sound. To close a window, click on the upper-left corner, or select **Close** from the **File** menu. If you have made any changes, an alert box will ask you if you want to save them. It is a good idea to copy the entire SOUND.STQ folder to a blank disk and save your new sounds there. If you want to save them under another file name, choose **Save as. . .** from the **File** menu and a dialog box will let you enter a new name.

Now that you've explored NSQ.PRG and perhaps created some weird sound effects, you may be wondering just what it is that you have been doing. What *are* all those parameters for? What is ADSR, Frequency, LFO?

## SOUND THEORY

Before we can understand *electronic* sound, we should first review sound in general—whether electronic or natural. Any sound you hear can be described as a disturbance, or vibration, in the atmosphere. Our inner ear is sensitive enough to detect the disturbance and convey it to our brain as sound. In physics, sound is treated as a *displacement of pressure* in the air. We can graph this as a function of changes in pressure over a period of time (see *Figure 1a*).

By labeling the horizontal axis **time** and the vertical axis **pressure displacement**, we have a graphic representation of a sound, called a *waveform*. The waveform gives us a picture of the sound which is instrumental in visualizing the underlying physics. Waves can be in many different forms. The waveform in *Figure 1a* is called a *sine* wave.

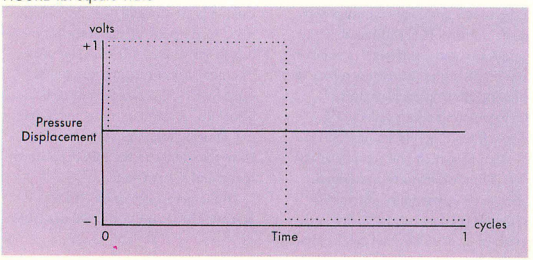
## SINE WAVE

The smooth, rounded curves of the sine wave make it a "perfect" sound, but it is never actually heard in nature. An electronic device called an *oscillator* can generate a sine wave. The oscillator produces a *voltage* that smoothly rises to a maximum value (the *peak* of the sine wave) and then falls to its minimum value (the *trough* of the sine wave). One time through this process of climbing, falling, and returning to the original starting point is called a *cycle*, and the rate at which these cycles occur is called the *frequency*. Frequency is expressed in cycles per second, or Hertz (Hz).

This continuously changing voltage, when amplified and applied to a loudspeaker, moves the diaphragm of the speaker back and forth at the same rate as the voltage driving it. The oscillating speaker creates disturbances which travel through the air to our eardrums. The result is an electronically generated sound we perceive as coming from the speaker. The higher the frequency of the waveform (the more cycles per second), the faster the speaker will vibrate, and the higher the apparent pitch of the sound.

The pure sine wave has none of the

FIGURE 1b: Square Wave



*frequency components* that occur in complex natural sounds like musical instruments or voices. Because it changes smoothly, the sine wave is considered an *analog* sound. It can only be imitated by the *digital* ST computer. Let's look at a waveform that *can* be generated by the ST.

## SQUARE WAVE

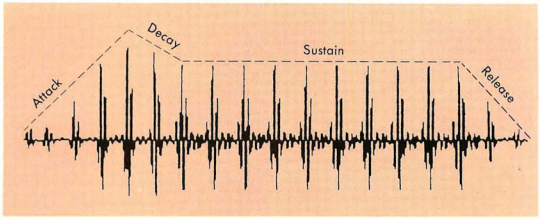
If you were told to draw a sound wave, but could only use straight lines, one obvious wave you could create would be a *square wave* (see *Figure 1b*). This is pretty much the way your computer looks at it; it doesn't know about curves.

The square wave, with its perfectly straight lines, is just as unnatural as the perfectly rounded sine wave. But it's simple to generate digitally, so it is the foundation of all sounds generated by the ST sound chip. Load the SQUARE.SND sound again and play it. The frequency of this sound is already set at 31 which is the lowest it can go. If we could go even lower, the buzzing sound would become a series of distinct clicks as the speaker vibrates back and forth. Whereas the sine wave required a smoothly changing voltage to generate its characteristic curve, the square wave only requires *two* voltages, one for the wave at its peak and one for its trough. Two voltages mean binary, and binary means digital.

## NATURAL SOUND

It's important to realize that both the sine wave and the square wave look artificial and, more importantly, *sound* artificial. What distinguishes them from the natural acoustical sounds we hear every day? Let's look at the waveform of an acoustic sound, such as a horn. Compare *Figure 2* to the static sine and square waves. Immediately, you see that the acoustic sound is irregular, with several peaks and troughs within the basic cycle. This illustration is a only a "snapshot" of the sound; each time the horn is played the waveform will look slightly different. These slight differences are crucial to our hearing this as a "real" or "live" sound.

FIGURE 2: Horn sound with envelope indicated




Examining waveforms reveals the many ridges and troughs that make the sound complex. These are *frequency components*. Sharp edges indicate many frequency components and thus a more complex sound.

## THE ADSR ENVELOPE

Most waveforms have an overall shape—a beginning, middle and an end. This is sometimes called the *ADSR envelope* because the shape of any sound can be broken down into four parts: Attack, Decay, Sustain and Release (ADSR). Many synthesizers have ADSR capability, i.e., they can generate the Attack, Decay, Sustain, and Release. (See *Figure 3.*) The ST sound chip has four control bits labeled Continue, Attack, Alternate, and Hold—but it does not have true ADSR.

When a horn player begins blowing a note, the first part is characteristic of the instrument as it responds to the changing air pressure. Typically the volume rises quickly to a peak. This is the Attack, and is what makes a horn sound like a horn. If you heard the same sound with the first part cut off, it would sound like an organ.

The Attack is usually louder than the rest of the note. It reaches a peak, then Decays back down to the level you will hear for the duration of the note. This level is called the Sustain level. When the note is over, the horn player stops blowing, but the air left in the horn enables the sound to linger for just a short time as it fades away. This is called the Release. The Release is second only to the Attack in your perception of a sound. In contrast with the horn, a square wave has no basic shape and thus when heard without any modification, starts and ends abruptly.

ADSR is an abstract structure that ▶

FIGURE 3: ADSR Envelope

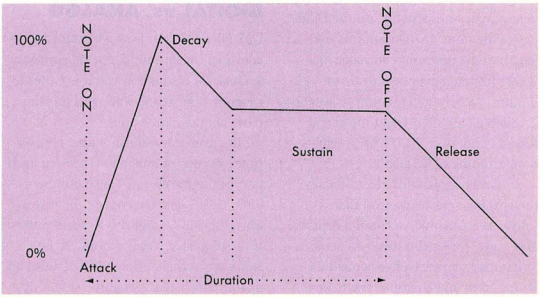


FIGURE 4: ST Sound Chip diagram

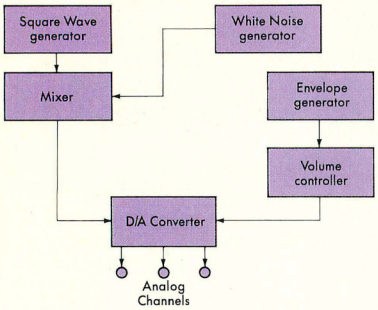
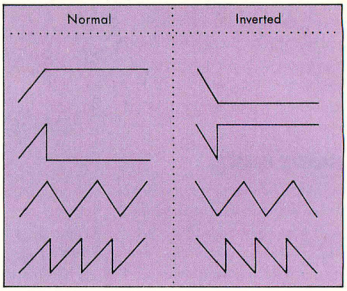



FIGURE 6: Envelope generator Shapes




has been applied to sound for purposes of analysis. The horn player has never heard of it—nor has the horn. But for us to be able to manipulate sound electronically, we must place a structure on it. An electronic ADSR follows a prescribed pattern: When the note is begun it is called a NOTE ON. The NOTE ON initiates the Attack phase of the sound, during which the volume of the sound goes from zero to its maximum value. This value is the actual or *nominal* volume of the sound. The Decay portion follows immediately after the attack as the volume decreases. The Decay time is the period it takes to reach the Sustain level.

It is important to realize that Sustain is a level, not a time. It is the volume of the tone after the decay. The time is indeterminate and depends on the *Duration* of the note. The Duration is the length of the note and can range anywhere from a few milliseconds to minutes. When the Duration is over, it is called a NOTE OFF. But the actual sound is not over; NOTE OFF signals the beginning of Release.

In designing sounds electronically, the goal is to create a sound that is "alive," i.e., dynamic, not static. A pure sine wave—or square wave—is static. What distinguishes a live acoustic sound from an electronic one is how it changes over time. A horn is a constantly changing sound, as is the ocean or rain. If you add dynamic control through the use of envelopes and other devices, the electronic sound has a much better chance of sounding like what we want. *Dynamic control* is the ability to modify the sound *as it is happening.*

Digital sound generation relies heavily upon envelope control, which is one of the techniques used in NSQ.PRG to enable Near Synthesizer Quality. It allows you to "shape" a waveform which, in the case of the ST, is the only way you can make a square wave sound like so many different sounds. The envelope is a means to dynamic control of electronic sounds.

## DIGITAL vs. ANALOG

Let's take a look at how we create and control a digital sound. For this purpose we will use a square wave; it is easier to generate than a sine wave and it is the basic sound source on the ST.

To create a waveform with a computer, we use numbers to represent each part of the waveform. These numbers, often called *samples*, encode the waveform digitally. A digital waveform differs from an analog waveform much the same way a digital watch differs from an analog watch. Time changes smoothly and continuously in an analog watch as the second-hand sweeps across the face, whereas the seconds pulse by one at a time in a digital timepiece. Similarly, a digital waveform has discrete points where the shape of the waveform changes.

A square wave is a simple digital pattern. We can use the number 1 to represent the highest possible positive displacement of pressure, and -1 to represent the lowest (a negative displacement). But a digital waveform is not enough because an acoustic speaker needs an analog voltage to operate. The samples can be converted to voltages using a device called a *Digital-to-Analog Converter (DAC).* Thus, in order to create a digital square wave, the sound chip alternately sends out 1's and then -1's to the DAC, which is in turn connected to an amplifier and speaker which produce the sound.

One *cycle* of the square wave is the point at which the waveform begins to repeat itself. Therefore, the rate at which each sample is sent to the DAC (the *sampling rate*) determines the *frequency* of the square wave. If, for example, it takes 100 samples to represent one cycle of the square wave (fifty 1's followed by fifty -1's), a sampling rate of 1000 samples per second will generate a square wave with a frequency of 10

cycles per second, or ten Hertz (Hz). The formula is: Frequency equals Sampling Rate divided by Number of Samples in One Cycle:

**Frequency = 1000 / 100 = 10 Hz**

In the case of a single square wave, its frequency will be perceived as pitch: the higher the frequency, the higher the perceived sound. A frequency of 262 Hz, for example, is middle C on a piano. The lowest note on a piano is about 27.5 Hz. It is difficult to hear tones below that, and it takes a very good loudspeaker to produce them. At the other end of the spectrum, few people can hear frequencies above 15 KHz to 20 KHz (KiloHertz = 1000 Hz). The range of the ST sound chip is 31 Hz to 125 KHz! You will probably not use frequencies much above 4 KHz (4192 Hz is the highest note on a piano). The lowest frequency you will probably use will be about 50 Hz. The speaker is unable to effectively reproduce sounds below that.

The volume of a digital square wave is set by the actual value of the samples. Each sample is multiplied by a constant number (the *volume* parameter in NSQ.PRG) and the resulting output of the DAC is a larger voltage. The larger the voltage, the greater displacement of pressure and the louder the sound. The ST sound chip allows four bits of audio-level control of the DAC, which means zero equals no sound and 15 is the loudest.

Some of the same limitations found in digital graphics are found in digital sound. If you draw a diagonal line on a low-resolution graphic screen, you get what is referred to as a "stair-step" effect—a line of jagged pixels. The higher the resolution, the smoother the line appears. The same is true with digital sound; the higher the resolution, the smoother the sound. The *amplitude resolution* of digital sound is determined by the number of volume levels. With the 15 levels available on the ST, you can hear a "stair-step" effect as the volume of a sound is gradually increased. Load in STAIRSTP.SND to hear this effect. If you change the volume more rapidly, this is not noticeable.

## THE ST SOUND CHIP

We want to get the best possible sound from our ST. Now that we have a better understanding of sound, let's take a closer look at the ST sound chip. We can't improve it until we understand it. [See also *"ST Sound," Antic, Nov. 85.*]

The ST sound chip consists of a square wave generator with frequency control, volume control, and an envelope control for each of three channels, or **voices** (see *Figure 4*). The frequency range extends over eight octaves and the volume of the sound can be any of 16 levels. Three independent square waves (the voices) can be played simultaneously, each with its own frequency and amplitude.

The sound chip also has a noise generator (see *Figure 5*) which generates pseudo-random numbers (not statistically perfect) that are sent as samples to the DAC. This waveform has many frequency components, yet, unlike the square wave, they are happening at random times. This irregular sound is called *white noise* because, like the color white that contains all colors, it contains many frequencies combining together to form a distinguishable but rough sound.

To hear the noise generator at work, select **New** on the **File** menu. (This will create a default window that just happens to contain a square wave.) Turn off the square wave by selecting **Nominal** under **Frequency** and clicking on **Disable**. Then select **Nominal** under **Noise**, click on **Enable** to turn on the noise generator, and give it a number from 1 to 31. The higher the number, the *lower* the frequency components. Just as the frequency of a square wave is increased by generating the waveform more often, the frequency components of the noise are increased by generating the random numbers more frequently.

The noise generator is used to create sounds ranging from a gunshot (try GUNSHOT.SND) to a banging sound (try HAMMER.SND). On each of the three channels on the ST you can use either a square wave, or noise, or mix them together. However, there is one severe limitation: *There is only one noise generator.* If you change the frequency of the noise, it will affect all channels in which it is mixed.

The ST sound chip has one envelope ▶

FIGURE 5: White Noise

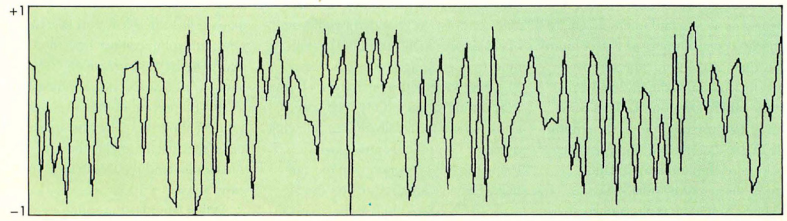


FIGURE 7: NSQ Configuration per Channel

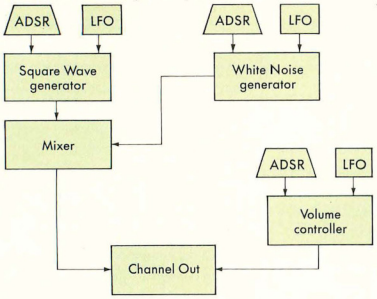
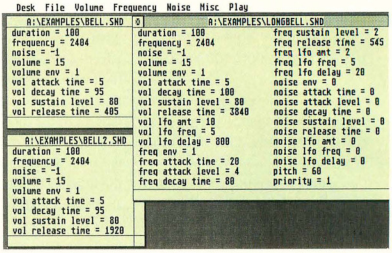



FIGURE 8




generator which governs all three channels. There are eight built-in envelope shapes to choose from (four of which are inverses of the others (see *Figure 6*). The envelopes employ a technique dubbed *amplitude modulation*, or *AM*. This envelope is actually a second waveform which serves to modify, or modulate, the amplitude of the initial square wave.

To help you visualize the AM envelope, imagine a standard square wave at constant frequency of, say, 200 Hz. A 200 Hz square wave goes through a high-low cycle 200 times per second. This initial square wave is called the *carrier wave*. Now, we can use a second waveform to modify the amplitude of the carrier and achieve an overall different sound. The triangle wave is a standard AM envelope on the ST sound chip. The basic shape of a triangle wave resembles (surprise!) a triangle with sharp diagonal lines (see *Figure 6*). Every cycle of a triangle wave, the amplitude begins at zero and *ramps* up (increments at a constant rate) to a maximum value, then, at the same rate, ramps down to zero again (the inverse works just the other way around). This waveform is then used to modify the amplitude of the square wave. To hear what this kind of amplitude modulation sounds like, try AMPMOD.SND.

The ST sound chip has limited envelope features. First, the only way to really shape a sound is to use a portion of one of the built-in envelopes, but there is no way to make a general shape that will work in all cases. For example, if you change the duration of the sound, the rate of the envelope generator must also change. But it gets worse. *There is only one envelope generator.* If you want to make an organ sound on one channel and a bell on another, it isn't possible using the built-in controls.

## NSQ DYNAMIC SOUND

Now that we know the problems, we can examine the solution—and play with the sounds in greater detail. Lee Actor and I developed the NSQ (Near Synthesizer Quality) system after we discovered that, with all its limitations, *the ST sound chip is programmable.* So we took its basic features, letting the chip generate the initial square wave, and built upon, added to, and, in some cases, entirely circumvented the available controls. We've added two flavors of envelopes (ADSR and LFO) to volume, frequency, and noise (see *Figure 7*). These modify the general waveform in real-time (at incredibly high speeds, as the sound is actually made), allowing dynamic control of sound generation. Using the NSQ program, you too can make truly exciting sounds on the ST.

NSQ.PRG does not use the built-in ST envelope generators. The confinement of only a single envelope generator with a very limited set of shapes prompted us to design a system which would allow a higher degree of control. We replaced the single envelope generator with three ADSR envelopes and three LFO's, one apiece for each channel. (LFO's will be explained later. I promise.)

Load BELL.SND and listen to it. This uses an ADSR envelope to generate the distinctive "twang" of a bell. Look at the values for the volume ADSR. They are listed as **Attack time**, **Decay time**, **Sustain level** and **Release time**. All times are in milliseconds (msec—0.001 second, or 1/1000 of a second). The Attack time, 5 msec, is as fast as it can go. It takes 5 msec (almost instantaneous) for the level of the sound to reach full volume, the value designated in **nominal volume**. This is the Attack and sounds no different than the sharp ON of a square wave. What makes this sound like a bell is the Decay and Release. Once full volume is reached, the sound decays to the Sustain level in 100 msec, about 1/10 of a second. The Sustain level is 80 percent of the full volume (a value of about 12). The time it takes to reach the Sustain level is the sum of the Attack time and the Decay time. In this case, 5 msec + 100 msec = 105 msec

When you play the sound by select-

specify an appropriate value for Release. Try your sound with both long and short durations. That is the best way to be sure of what is going to happen.

Consider another way to make the bell sound. Load in BELL3.SND. Move it so you can still see both BELL.SND and BELL2.SND. Its Attack time is the same, but the duration is 500 msec, the Decay is 490 msec, and the Release is 5. Yet, it sounds very similar to BELL.SND. The difference is that this sound is complete when the Duration has elapsed. There is no Release phase. Try playing this note with a duration of 100 msec. It will just stop mid-note after 100 msec. But if you set the Sustain level to 80 and the Release to 405, it will sound more like BELL.SND. You can experiment with the Sustain level to make it sound just like BELL.SND (you could of course change the Decay time, but you can leave the Decay at 500 and adjust the Sustain level instead). This is just to show you the variety of ways you can alter sounds.

Now close BELL3.SND and open LONGBELL.SND (see *Figure 8* again). This is a more complex version of the BELL sounds. First of all, notice that the Release time is longer. Set BELL2.SND to the same Release time (3840 msec). Now compare the two sounds. Notice how much more interesting LONGBELL.SND is. Some of the differences are subtle, but this is a simple example of how intricate you can get.

## LFO

The main enhancement in LONGBELL.SND is the use of the LFO's with both volume and frequency. *LFO* stands for Low Frequency Oscillator and is a type of cyclical AM envelope we use to shape the sound. The LFO's are triangle waves that modify a parameter by repeatedly increasing, then decreasing the parameter value at a specified rate. For example, the volume LFO in LONGBELL.SND modifies the volume by 10 percent. Since volume is 15, it will range over a value from 15 to 15 minus 10 percent of 15, or a range from 15 to 13.5. The maximum LFO frequency is 50 Hz. That means the fastest triangle wave you can have will cycle at 50 times per second. The LFO frequency for LONGBELL.SND is 5 Hz. Therefore, the volume will continuously change its value between 13.5 and 15 at a rate of 5 times every second. The delay rate is how long the LFO waits before its modulation begins.

Frequency LFO works the same way, but it modifies the frequency instead. The example, LONGBELL.SND uses both volume and frequency LFO to give the bell a more realistic quality. Typically, an LFO on volume is called *tremolo* (listen to TREMOLO.SND), and on frequency is called *vibrato* (listen to VIBRATO.SND). An example using both LFO's is EERIEFLY.SND.

LFO's at lower frequencies (under 15 Hz) add a "wobbling" effect to your sounds (like tremolo and vibrato). This is because the changes are happening so slowly that your ear is able to resolve them. LFO's at higher frequencies (from about 15 to 50 Hz) can actually change the basic characteristics of the sound. Load VIBRATO.SND and listen to it. Adjust the frequency LFO to change the frequency and amount to its maximum value. Now play the sound. It sounds nothing like the original sound. You can do the same with TREMOLO.SND, however, the result is not quite as pleasing.

You can get a tremendous variety of sounds just with the frequency LFO.

If you have a synthesizer with a MIDI port, you can use it with this program (NSQ.PRG on your START Disk). MIDI is an acronym for the Musical Instrument Digital Interface standard, a convention of the musical and computer industries that permits electronic instruments and computers to work together. The Atari ST computers have a MIDI interface.

The MIDI keyboard generates sound frequencies that we hear as musical notes. The MIDI standard assigns numbers to each musical note (see *Table A* for a correlation of MIDI pitch numbers and frequencies.) This is the number the keyboard sends to the computer, and that the computer's MIDI interface interprets. The duration is determined by the length of time you hold down the key.

NSQ.PRG will read notes from any MIDI keyboard, for example a Casio CZ-101. If you plug a MIDI cable from the MIDI OUT of your keyboard to the MIDI IN of your ST, pressing keys on the musical keyboard affects the sounds generated by NSQ.PRG. Any sound loaded in the active window will play when a MIDI key is depressed, using the pitch of that key for the frequency of the NSQ.PRG sound. The effect is that you are playing that sound from the keyboard. The ST sound chip has three voices, so up to three MIDI keys can play simultaneously, each adding to the sound you hear. If no windows are open, you will hear no sound.

It is important to understand how the ADSR envelope works to fully appreciate what is happening when you play the keyboard. Pressing a key signals a **Note on** which begins the Attack phase. After the Attack, the sound Decays to the Sustain level where it stays until you release the key, signalling a **Note off** and beginning the Release phase.

For example, listen to DRWHO.SND, EXPLODE.SND, and LASER.SND. This is just a small sampling of the sounds you can make.

Another very important control is the frequency ADSR. It is very similar to the volume ADSR, but the difference is important. When you select any ADSR, one input line is called "Attack level." You can't change this value on the volume ADSR, because the volume Attack always remains at 100 percent. But the frequency ADSR can be varied beyond the limits of your speaker (and probably your hearing). Any positive or negative number (not exceeding five digits) is read as a percent change. A 100 percent change equals one octave, so the value -350 would lower the frequency ADSR by three and and a half octaves.

Similarly, the Sustain level can be over the same range. The Release will always bring the sound back to the original pitch. But if you put in a large enough Release, for example, 65000, and a much shorter volume Release, possibly 100 msec, the original pitch will not be heard. This is the case with the DRWHO sound.

Another use of this type of control is evident in PLUCK.SND. The beginning of the sound appears to have a "plucked" sounding attack. This is made possible with a very short frequency Attack and Decay and a large Attack level. This technique is very useful in many percussive sounds.

The final control to be discussed is the Noise ADSR and LFO. This ADSR acts just like the frequency in that it can go both postive and negative and allows you to adjust the Attack level. Also like frequency, you are shaping the frequency components of the white noise. Choose **New** under **File**. Now turn off the square wave by selecting **Nominal** under **Frequency** and clicking on **Disable**. Now select **Nominal** under **Noise** and click on **Enable** and enter the value of 1. Play the sound. It sounds like steam being released or someone telling you to "Sh-h-h-h." This contains mostly high frequency components. Now change the nominal noise value to 31. It is a much raspier sound. This higher value contains the mostly lower frequencies. This is difficult to hear as pitch. What is important is to remember what each end of the range sounds like.

You can make useful sounds just using noise. Load in SNARE.SND. Experiment with the nominal noise value to hear the difference. To hear examples using the noise LFO, load in NOISELFO.SND. Remember the ADSR on noise does not affect the volume of the noise. The volume is controlled by the volume ADSR and LFO. It will affect both the square wave and the noise. The noise ADSR and LFO alter the frequency components of the noise.

## CONCLUSION

With this much background, you are now on your own. There are other example sounds which make use of all the different controls in a variety of ways. Listen to them and look at how they are made. Do not be afraid to change these sounds. It would be a good idea to use the **Save as** option to change the filename of any sound you modify so that you don't clobber the original sounds. With a little imagination and persistance, you will be able to build a library of sounds in no time at all. ■

## REFERENCE:


- Technology of Computer Music . Max V. Mathews, M.I.T. Press, Cambridge, MA. 1969.
- Musical Applications of Microprocessors . Hal Chamberlain, Hayden Book Company, Inc., Hasbrouck Heights, NJ. 1980.
- Digital Audio Signal Processing, An anthology . John Strawn, ed., William Kaufman, Inc., 1985.



COPY II ST™

**BACKUP PROTECTED SOFTWARE FAST.**

From the team who brought you COPY II PLUS (Apple), COPY II PC (IBM) and COPY II MAC (Macintosh) comes a revolutionary new copy program for the Atari 520 and 1040 ST computers.

- Copies many protected programs—automatically. (We update COPY II ST regularly to handle new protections; you as a registered owner may update at any time for $15 plus $3 s/h.)
- Supports single and double sided drives.
- Includes both a fast sector-based copier and a true bit copy mode for protected disks.

Requires an Atari 520 or 1040 ST computer with one or two drives.

**Call 503/244-5782**, M—F, 8—5 (West Coast time) with your VISA in hand. Or send a check for $39.95 U.S. plus $3 s/h, $8 overseas.

**$39.95**

Central Point Software, Inc.
9700 S.W. Capitol Hwy. #100
Portland, OR 97219

Central Point Software INCORPORATED

*Backup utilities also available for the IBM, Apple II, Macintosh and Commodore 64.*
*This product is provided for the purpose of enabling you to make archival copies only.*

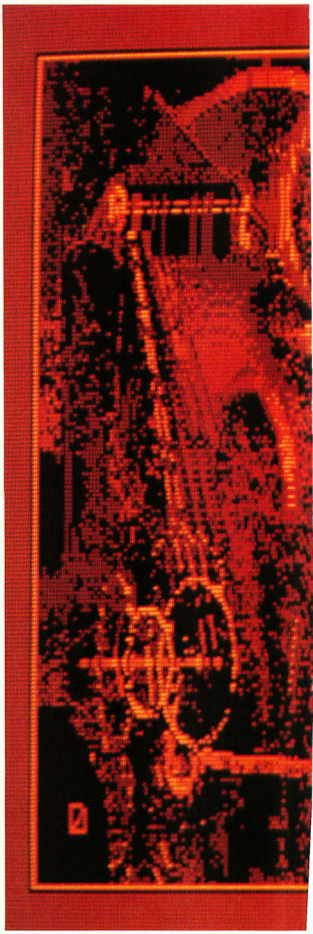
CIRCLE 012 ON READER SERVICE CARD

# Art Tips From a Pro

*Create your Fantasy with DEGAS**

BY DARREL ANDERSON

*Professional graphics artist—and winner of the Antic DEGAS contest—Darrel Anderson reveals his secrets and techniques for using DEGAS. This step-by-step creation of a DEGAS masterpiece includes practical suggestions from a pro as well as tips on how to take advantage of the new features in DEGAS Elite. Your START disk includes the completed picture plus a special "start up" screen, along with custom fills and brushes.* ▸



**Tips may be used with other paint programs.*

PHOTOGRAPHY MARY RHOMBERG LAVERY

# Art Tips...

Michelangelo claimed that the incredible figures he liberated from marble blocks were present in the stone before he began. At first this might seem as helpful as the gag instructions for making a statue of an elephant: Take a big stone and chisel away everything that doesn't look like an elephant. The concept, however, is valid. It implies using the medium – stone, paint, or pixels – as a feedback device to tap the mind's visual library. During the course of this article, we will examine a lot of practical tricks and techniques. As useful as they are, you'll find them far more powerful when used in conjunction with what I call *interactive visualization* .

The creative process is neither as ethereal as some fine artists claim nor as cut and dried as typical how-to-books suggest. Most systematic approaches are good for little more than consistantly producing predictable results. It is foolish to apply rote methods to a medium as flexible as computer graphics. But the wide range of options and capabilities can make working without some kind of direction very disorienting. In this article, we'll examine an approach to thinking and seeing as well as a description of methods and techniques for drawing with the ST. I'll be using DEGAS, the graphics paint program from Batteries Included, but many of the techniques illustrated here may be implemented on other graphics software, such as NeoChrome from Atari and Paint Works from Activision.

I've just received a preliminary version of DEGAS Elite for testing purposes. Its incredible array of enhanced features opens vast new realms of graphic magic. It will require many enjoyable hours of exploration to even begin comprehending Elite's capabilites. That's a task I look forward to. I hope for the opportunity to share my discoveries with you at some future date. For now, the basic tools common to both versions of DEGAS provide an excellent starting point for developing graphic talents and skills.

## *IN THE MIND'S EYE*

We are dealing in illusion. Our ability to identify a small face in a newspaper photo or television picture is due to pattern recognition. Enlarged, such images reveal themselves to be little more than abstract arrangements of dots; it is our mind that blends those dots into a recognizable picture. We see what we want to see, and we are predisposed to see familiar images drawn from the visual libraries we've accumulated in our minds through years of observation. By employing the same mental imaging during the creative process, you'll tap this resource.

I've applied this technique to nearly all imaginable media over the years and the computer lends itself very well to art. In fact, the mutability of computer graphics makes it an ideal visual feedback device. Of course every media has it's limiting factors; with computers, a primary one is resolution. Even the relatively good resolution of the ST series is quite crude. The color pictures in this magazine (transformed by a process called *color separation* into very fine dot patterns in four colors) contain more dots in a square inch than an entire low-resolution DEGAS screen. Clearly, some clever manipulation of the medium is required for good results. Learn to work within the limits of your media and turn them to your advantage.

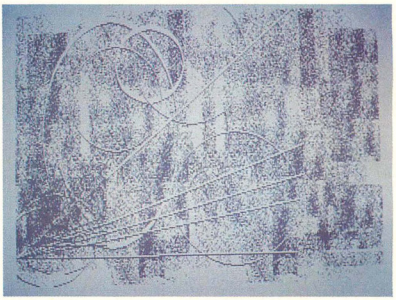


FIGURE 1

Working with limited resolution encourages you to suggest or imply imagery rather than define. In my opinion there is no duller image to look at or to draw, than one that leaves nothing to the imagination. If I attempt to draw every leaf on a tree with DEGAS, I'll soon run out of pixels, but by playing with colors and patterns that suggest "leafness" to my eye, I trigger the same response from the viewer, whose mind fills in the picture with greater accuracy and detail than I ever could. If I do a very good job I might even succeed in suggesting to the mind's eye such intangibiles as motion, heat, or sound.

This non-literal approach involves the viewer. Each person sees a slightly different picture based on their own visual library. This interaction makes every work a collaborative effort, expanding the scope and power of the art. I recommend studying the works of the late 19th and early 20th century impressionist painters: Van Gogh, Monet, Degas, and many others. Their bold, large brush strokes, and palettes of pure, bright colors produced images that are in many ways analogous to low-resolution computer graphics.

Vague or mystical as this may seem, just keep it in mind as we move on to the more practical techniques and tricks. What follows is just one approach to drawing with DEGAS.

## *PALETTE AND TOOLS*

As in any medium, the first step in computer graphics is selecting and organizing your tools. We will be working with DEGAS in the four-color, medium-resolution mode which en-

courages concentration on the fundamentals of drawing, before complicating matters with lots of colors. It also provides a significant increase in resolution over the 16-color mode. As you'll see, we can get a lot more out of four colors than you might think. Additionally, if you're working with a monochrome monitor many of the techniques described here are applicable.

I will assume you've spent some time working with DEGAS and are familiar with most of its tools – have the DEGAS manual handy if you're not. Run DEGAS in the medium-resolution mode and we'll be ready to go. (Those without a START disk should stick with us. Much of this article may be understood without the disk examples.)

Turn the contrast on your monitor way up, and load the PALETTE.PI2 picture from your START disk (inside the DEGASART.STQ folder) and take a look at the color bars on the picture screen. The bar on the left shows the four colors, (numbered 0-3, corresponding to their left-to-right positions on the DEGAS menu), plus six additional shades composed of 50 percent mixes of two colors. The mixed colors were made by using the 50PERCNT.FIL included on your START disk. Load this fill pattern from MAKE FILL and you'll see that it is composed of alternating vertical lines. The tight vertical resolution of medium-resolution mode makes this a very smooth, nearly invisible fill. It can also be combined with the 25PERCNT.FIL to produce additonal color mixes. The smaller boxes on the palette screen represent a variety of 50/25/25 percent and 75/25 percent mixes. Use the DEGAS fat bits (zoom) function to see their composition.

PALLETE.PI2 uses a very subdued palette (7,6,6; 5,4,4; 3,2,2; 1,0,0). To see the true potential of color mixing, change the colors (with SET COLORS) to pure blue (0,0,7), pure red (7,0,0), pure green (0,7,0), and black (0,0,0). Notice the full spectrum of colors now present in the palette. This screen is very helpful in exploring the art of mixing colors with light, an often confusing procedure for those accustomed to mixing pigments. The primary colors of light – from which all others can be mixed – are red, green, and blue. For pigments they are magenta, yellow, and cyan. Combining the three light primaries makes white, while the three pigments yield black.

Experiment with this palette using SET COLORS. Notice how changing the background color (far left color box on the DEGAS menu) dramatically changes the other colors' apparent value (relative darkness), and hue (color). A neutral grey (equal values of red, green, and blue) appears blueish or "cool" against a red background, redish or "warm" when against blue.

Now set the colors to greys (7,7,7; 5,5,5; 3,3,3; 0,0,0). I prefer to start my pictures with these colors or some subtly tinted variation. This leaves subsequent color options open and lets me concentrate on defining the image as a light-and-shade value study. The shorter color bar now shows a transitional, seven-level grey scale composed of solid colors and 50/50 mixes.

The position of the colors on the DEGAS menu pallete is important. While there is no one best arrangement it is important to note that the far left position is the background color. It is transparent when using X-RAY COPY and will always be the color of your screen's border. Maintaining reasonable contrast between far left and right positions keeps the menu readable.

## *SUGGESTIVE CHAOS/ DEVELOPING A GROUND*

In painting, we speak of working from *dark-to-light* or *light-to-dark* . A prepared surface for drawing or painting is referred to as a *ground* . Starting with a medium-value ground allows you to work in both directions. I often work from this *middle ground* . I prefer one that offers some fuel for visual feedback. The amorphous pixels in the box to the right of the color bars on the PALETTE.PI2 screen are the start of such a ground.

There's nothing special about this particular smear of dots. In this case I started with a few square inches of looping AIRBRUSH strokes. By X-RAY COPYing differently sized and shaped sections I gradually expanded the pattern. Allowing the copies to overlap creates variations of the original pattern which are then copied, overlapped etc. With DEGAS Elite you can add further variety by rotating blocks of pixels during this process. Some diversity in the density of the pixels is a good thing. You may open up overly-clogged areas by replacing them with a BLOCK COPY from a less dense area.

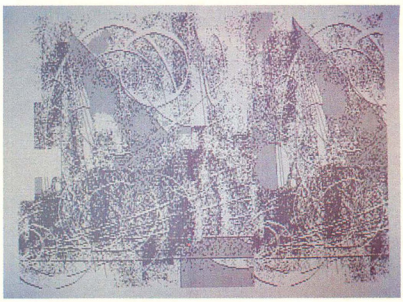


FIGURE 2

This is a satisfactory starting point but there are lots of fun ways to add to it's suggestive power. Start with this or clear the screen and create your own. Stick to one color, preferably one with low contrast against the background. Use the AIRBRUSH and COPY to fill the screen with random pixels. There are countless methods for creating suggestive patterns. Experiment with all of the DEGAS tools; try illogical and unusual ▶

## Art Tips...

applications, but limit it to the background and one low contrast ground color for now. I'm using the second color from the left on the DEGAS menu (5,4,4 in the original PALETTE.PI2; 5,5,5 in the grey palette). We'll refer to this as your *ground color.*

Here are a few tricks to try. Select SET SHADOW from the DEGAS menu. Set the shadow color to your ground color and the distance to 1 (any direction). Return to the menu, click on SHADOW to activate it, then select the background color (far left). Select one of the tools listed below (such as CIRCLE), and an interesting brush. Now try drawing over your random ground with this and various other tools: any wide brush with DRAW for a finger-painting effect, BOX/FRAME/CIRCLE or DISK for 3-D relief effects, AIRBRUSH for seamless blending. Take some time to get the feel of the AIRBRUSH. Try different rates of flow and speeds of hand movement. Good transitional blends can be made by slowly increasing the speed of mouse movement while drawing with the AIRBRUSH. Make multiple COPYs of narrow strips for vibration effects. Use RAYS to imply perspective grids.

With DEGAS Elite, the options for generating suggestive grounds are nearly endless. Stretching, squashing, rotating, or otherwise distorting blocks of pixels will give your ground unusual texture or "grain." STIPPLing with a small BLOCK of random pixels creates fascinating patterns very rapidly.

*Figure 1* shows an early-state ground that we'll now follow through, step by step, to a finished piece. Don't mimic this piece. Experiment, explore, and don't set your mind on any particular image during these early stages. Any sort of garbage serves as a ground; try creating a ground entirely with lines, circles, or frames.

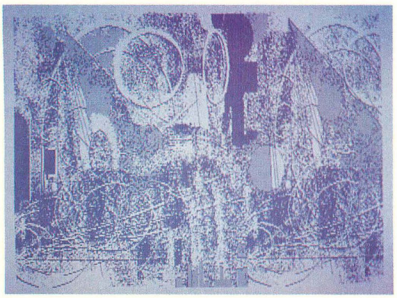


FIGURE 3

While exploring, keep your mind's-eye open for forms and objects suggested by the patterns. Try stepping back from the screen, or changing the value relationships (i.e. use SET COLOR to change the background color to something darker than the ground color, making your image light-on-dark). Take a break and look through any visual reference materials that relate to subjects you like to draw. Put away those materials before you start drawing; nothing kills the mental imaging process faster than copying.

You can influence the type of images by your choice of effects. Use linear, geometric effects for mechanical or architectural grounds; random, rounded patterns to suggest organic forms. Create several different types of grounds—keeping them vague and abstract—and save a few of the more interesting ones on disk. They provide fast starts whenever the creative urge hits.

In *Figure* 2, I'm adding some new elements to the ground. Most notably the 50PERCNT fill is being used (in the ground color) to break up the space and provide a third value (halfway between the ground and background shades). Using FILL and the [Undo] key alternately I test different areas for filling. When a fill leaks into undesired areas I UNDO it and dam up the fill using LINE, DRAW, CIRCLE, etc. Also, in *Figure* 2, I've BLOCK COPIED a large section from the left side of the screen and placed it far right. It looks very interesting to me. Although I've no firm idea of what to do with it, I'm concerned that it might be lost when I start developing an image on the left.

### *CHASING SPECTERS & DEFINING THE FORM*

When I begin to see something worth pursuing, I sneak up on it. I'm often unsure of exactly what I'm seeing. If I see something that suggests an eye for example, I don't kill my options by drawing a line around an area that I think might define the head. Instead, I start "encouraging" the image, experimenting with subtle changes and checking the effect. At this point I may bring in a second color, still keeping the relative value differences small. Using the AIRBRUSH I start defining the form in a general way with light and shade. This is an ongoing feedback process. I'm constantly looking for new clues and pieces of the puzzle. Gradually, as the image begins to take form, I make more definitive moves.

I have established my light source (an imagined location of the light illuminating the elements in a drawing) quite early in this piece. I set the shadow to the lower left when I added circles to the ground. This implies a light source upper-right. This could easily be altered but in this case I stuck with it. The use of light and shade enhances the three dimensional illusion of a drawing.

The simplest form of shading arises when there is one point that is the source of all light. An astronaut floating alone in space provides a good example. The *point-source* of light (the sun) defines his shape with bright highlights, sharp shadow lines, and black shadows. If there are other objects in the area, however, sunlight reflects off of them, providing some lesser illumination to shaded areas, tending to soften the transition from light to shade. On earth we are subject to

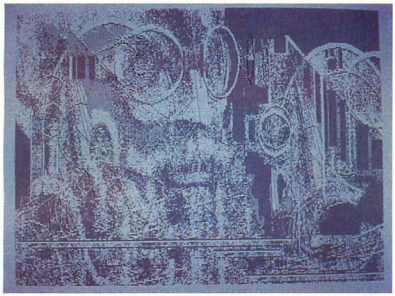


FIGURE 4

lots of reflected light: additional sources (i.e. electric lights), and diffuse sources (emanating from more than one point) like an overcast sky. It's a complicated study. Your best bet is to carefully observe. Photographs, drawings and paintings, and the real world are full of varied examples.

I often work with light and shade when I'm pursuing an image. My mind tends to "see" best in that mode. In some cases an image's outline is more apparent than its three-dimensional form. In any case, the method involves gradually emphasizing those aspects of the drawing that look right and subduing those that distract.

Often, during this process, images other than the particular one I'm chasing, suggest themselves. That's when one of the greatest advantages of computer graphics comes in. In most traditional media the artist is faced with lots of "either/or" decisions. It can be a frustrating dilemma that often freezes the progress of a piece. Once a sculptor chisels away a chunk of stone, there is no turning back.

There are ways around this problem in most media but few have the ease and flexibility of computer graphics. When an option presents itself the first thing I do is save the current picture. Now I'm free to explore this new option—perhaps just making a few visual notes or abandoning the original pursuit in favor of this new one. In any case I'm able to return to the starting point. If the exploration yields a dead-end, nothing has been lost. If it proves interesting there are now two pieces in the works.

DEGAS Elite with its multiple screens offers even greater freedom. By copying a drawing to several workscreens you are able to test options and even cut and paste from one screen to another.

Feel free to make bold decisive moves at any point, but if you're unsure of the results and like what's on the screen at the moment, save it. Don't depend too much on the [Undo] key. Though quite helpful, it has a very short memory. Keep plenty of disks on hand; graphics take up a lot of storage space. If something seems interesting but you don't know why, save it. Another day it may be perfectly clear.

As an image begins to take form on the screen, some of the original ground becomes unnecessary and distracting. DISK, BOX, and POLYGON are good tools for eliminating unwanted areas and cutting out the desired shape. Working with a solid fill pattern, define the outline of the form. Other brushes or the AIRBRUSH can further refine the cutout.

In *Figure 3*, I've begun cutting out a head that's forming on the left side of the screen. I'm using small disks and boxes in the ground color with a solid fill pattern. Intentionally staying outside of what I imagine to be the true outline of the head, I begin roughly defining its form. This helps me to see the image and triggers new visual clues. Returning to the head itself, I further refine the features. This back and forth process continues throughout the development of the piece.

As the image becomes more definite you are likely to discover problems and incongruities. Fortunately, the computer makes certain adjustments easy. If a nose is slightly misplaced you can pick it up and move it; if a figure's waist is too short you can stretch it out. In fact, if you happen to notice a very nose-like area that has unintentionally appeared in the middle of a forehead, grab it and use it. The advantage comes from not having to re-draw a particularly convincing group of pixels. This ability is greatly enhanced in DEGAS Elite by the ability to rotate and distort blocks, allowing you to change an

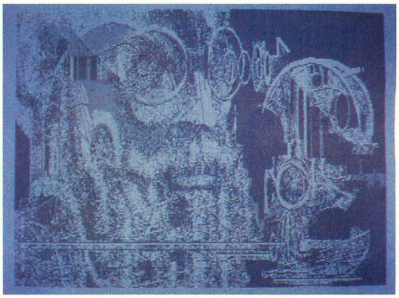


FIGURE 5

area's orientation and size, as well as its location, to suit your needs.

BLOCKCOPY is often the best tool for these adjustments. Its opaque nature keeps the underlying pixels from clogging up the moved area. Sometimes it's necessary to make a number of small incremental moves. This often results in distracting, repetitive patterns or edges. These can be smoothed out using the AIRBRUSH/SHADOW combination (see Developing a Ground, above) or working back and forth in different colors with the AIRBRUSH. With DEGAS Elite try SMEAR or ▶

## Art Tips...

STIPPLE. Sometimes it's possible to patch areas by covering them with a copy of another part of the drawing. The latter can also be used to add on to a form while retaining its textural continuity.

Some of these adjustments are shown in *Figure 4* along with additional cutouts and clarifications. The ellipse representing the left lens of a pair of goggles has been moved slightly to the right, the shape and location of the nose has been altered, the mustache has been lowered and a lower lip added. You will notice in subsequent screens that the "damage" done by these moves and adjustments is often smoothed out. But note, for example, that the underlying circle left over from the lens move is saved and incorporated. Never assume that something is trash simply because you created it accidentally or as a by-product of a particular move. Keep an open mind and avoid automatically cleaning up your piece.

The advantages of limiting the drawing to one or two colors become apparent now. These adjusting, smoothing, and patching procedures are easier when the color mixes and textures are less complex. The drawing remains unified and congruous.

The head on the left definitely reminds me of a favorite fictional character of my imagination, *Captain Nimrod*. That odd thing on the right is taking the form of some kind of scientific instrument. Although I liked its form, it didn't tie in well with the rest of the picture. By moving the object to a lower position I've improved the composition and set up an

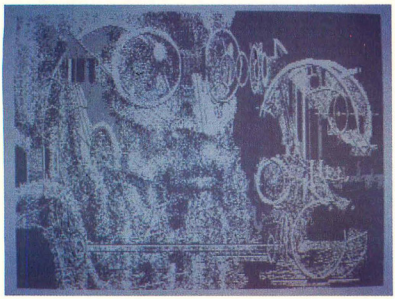


FIGURE 6

opportunity to tie the two main elements of the picture together.

That tie-in is begining to take place in *Figure 5*. In addition to connecting the "scope" to the left goggle lens I've given the mechanism a more three-dimensional form by adding lines that evoke a three-quarters, rather than straight side, view.

Adjustments of composition and interrelation of picture elements reaches a new dimension in DEGAS Elite. The ability to alter the size and shape of any element, or even the entire picture, greatly expands the scope of those adjustments.

On reaching this point in a drawing, it's usually a good time to step back, examine and rethink. Often, I'll see that I've missed a good option at some earlier stage in the drawing. Such alternate paths are not always apparent when you're at the right juncture for taking them. They only become clear after exploration in other directions. In that case the best move is to go back to an earlier version of the work and, armed with this new knowledge, take another shot at it.

**The mutability of computer graphics makes it an ideal visual feedback device.**

In other cases a general overall reworking of the current image is called for. In traditional drawing this is often done by means of a *trace-down*, covering the original with tracing paper and re-drawing. It's also possible to *knock-back* a piece, i.e. use a translucent glaze over an entire painting to fog the image and reduce contrast. In all cases the object is to retain all of the preceding work in a subdued form that allows for refinement and adjustment.

We can use analogous techniques with DEGAS. If you've limited your work to one low contrast color over the background, the image is already knocked back. Re-draw the image with another color (greater value difference) using the original image as a guide. Now eliminate unwanted pixels of the first color by FILLing them with the background color or erasing them with DRAW or AIRBRUSH. It's usually not necessary to eliminate the underlying image entirely. In fact, it often adds to the overall picture. However, if you need to completely rid the screen of the ground color pixels, here's one trick that often saves you from lots of laborious and exacting work.

After completing the redraw, fill all of the background-colored areas with the original ground color, now fill these newly created areas of ground color with the background color. Repeat the procedure as often as necessary to eventually absorb and eliminate all of the ground colored pixels. If you wish to go hunting for the few remaining pixels trapped by the redraw color it's often helpful to flush them out by temporarily changing their color to something loud like bright green. This entire process is wonderfully simplified by the CHANGE feature in DEGAS Elite that turns any background colored brush into a magic eraser that will eliminate only the color you select (just one of many uses for this tool). However

users of either version will find that there are other interesting effects that come from the erosion caused by repeated fills in various colors, especially when used on multi-colored images.

Alternately, after working the image up in a second color, FILL the entire background with the ground color and leave it at that. This will "absorb" the original drawing done in the ground color. Keep in mind that this fill does not change the true background color, the filled area that now surrounds the image is not transparent when using X-RAY COPY. On the other hand you have now freed up the original background color to be changed and used in further development of the piece.

Another approach is to change the background color using SET COLOR. This is useful for knocking back the work or changing the value arrangement and opening up new opportunities for highlighting and shading. I'm nearly ready to make those kind of value/color shifts with this piece. Before I do, there are a few more adjustments I'd like to make.

DEGAS Elite offers other interesting options for setting up a re-work. Among them are two very different ways to blur the image. SMEARing the image with a broad brush scrambles and softens detail and edges; shrinking, redefining, then stretching your image as a BLOCK results in an enlarged pixel effect.

The line between Defining the Form and Finishing & Detailing is more clearly drawn in this article than it is during the actual development of a picture. You'll notice that I've slipped quite a few little detailed touches into this piece already. They often help me to see the image I'm after and provide visual keypoints to aid in the placement and orientation of other elements. On the other hand there are cases where bringing in the above mentioned value/color shifts at an earlier stage provides clarification unattainable by strict adherence to a monochromatic work-up.

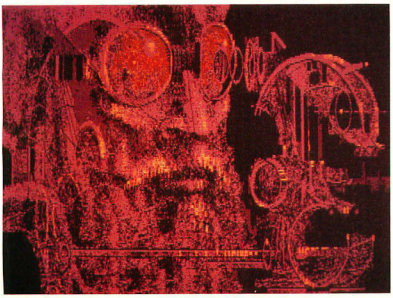


FIGURE 7

## *FINISHING/DETAILING*

All too often, in the course of a painting, I run into a sobering mistake. Upon adding the slick final touches to a difficult fea-

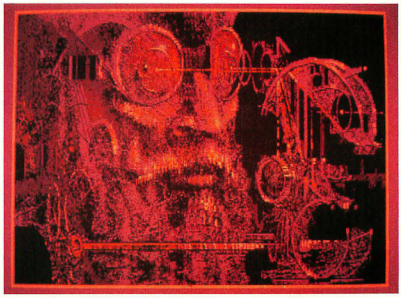


FIGURE 8

ture, say a small face, it suddenly becomes clear that it doesn't relate well with the shoulders and torso. Why didn't I see that earlier? The more vague and unfinished an image, the easier it is for our minds to correct flaws with our mental picture. Once you nail down the form with sharp contrast and definite lines, you're forced to see it for what it is. In traditional media this can spell disaster. While computer graphics allow you to make late changes with greater success, it's still advisable to keep them managable. Look over your image carefully before you start drawing in the rivets.

In *Figure 6* I've made some last minute adjustments before trying my first color/value changes. *Figure 7* shows those changes. The new colors are (left-to-right on the DEGAS menu): 4,2,2; 2,0,0; 7,3,2; 5,2,0. The background color now has a medium-level value (4,2,2) which allows the addition of highlights. Since I'm fairly satisfied with the image drawn with the ground color I've made it the darkest value (2,2,0). The previously unused third position is now the lightest or *highlight* color (7,3,2). With the remaining color I've given myself a mixing shade (5,2,0) that provides good medium-dark, and medium-light values when combined with the darkest and lighest colors respectively.

*Figure 7* and *Figure 8* show the application of these new colors. Notice how I've employed all of the possible color mixes. I imagine the location of my light source to be somewhere above and to the right. Using the two new light colors, I'm enhancing the three-dimensional illusion by highlighting those surface areas that would recieve the most light from such a source. Simultaneously, I'm darkening those surfaces that are hidden or turned away from the imagined light source. Reflected light is implied by the brown/orange mix on Nimrod's right cheek (his right, left side of screen). ▶

## Art Tips...

I'm primarily working with the airbrush at this stage, switching colors and seeking out the light and shadow balance. The 50PERCNT fill is also being used to add color and distinguish forms (e.g., the goggles). The same fill/Undo/dam procedure described in Developing a Ground works here. Some of the most interesting and surprising changes have arisen in my work as the result of runaway fills. If this sort of happy accident occurs the best course is to: (1) Undo it, (2) Save the drawing as it appeared before the fill, and (3) Re-create the "error." This keeps your options open just in case you later decide that it truly was a mistake.

Detailed touches, like those showing up in *Figure 8*, snap a picture into focus. By carefully selecting the right areas to emphasize, you can make everything else fall into place. A variety of tools are used to refine the image: small brushes in POINT mode to spot in highlights and shadows, BOX and DISK to trim edges, and zoom (Function key 1) for minute changes. I've also added a border to the drawing, using FRAME, which helps separate the image from the border area of the monitor display.

Avoid overworking your drawing. If something looks right, don't mess with it. Try to achieve the most with the least; define key points of objects and let your mind's eye fill in the blanks. Try locating the central "hot-spots" of highlights, the deepest recesses of shadow, and work outward from there. Pause and assess the effects frequently.

Included on your START disk are three brush designs I find useful in the latter stages of a drawing. The first is called MINIAIR.BRU, load it by selecting MAKE BRUSH from the

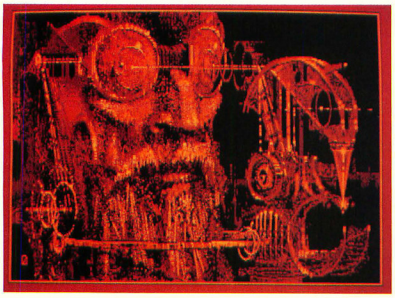


FIGURE 9

DEGAS menu. This brush comes in handy for reaching tight spots where the AIRBRUSH won't fit. Because of its "checkered" design it's useful for mixing colors in areas where working with the 50PERCNT fill is impractical (similar brushes with alternating vertical lines are also handy). Use this brush in the POINT drawing mode for accurate placement and to control the mixing effect. The other two brushes, POINTUP.BRU and POINTDN.BRU, are wedge-shaped sprays designed for tight spots.

I often create special brushes for specific applications. The ribbed effect on the bridge of Nimrod's goggles was created by repeating a special brush pattern. A similar effect—with a different tool—is seen on the grill (lower left portion of the instrument). Block copy was used to repeat a single bar of that grill.

The final picture, *Figure 9*, is included on your START disk (NIMSCOPE.PI2) so that you may load it and examine it in zoom mode to see how the brushes and fills have been used.

Of course this isn't the end. I'll undoubtedly return to this piece and try major and minor variations. Several spinoffs have been initiated in the course of its creation that I'm following up on. With DEGAS Elite I can load this picture into the low-resolution mode and, with some minor loss of detail, have 16 colors to work with. DEGAS users can accomplish the same thing with a graphics conversion program such as Patrick Bass' GRAFCON ST (ANTIC July '86).

The DEGAS/ST combo forms a truly magic medium with limitless possibilities. What I've offered here is only one of many approaches that I use to create images. With DEGAS Elite the potential has taken a quantum leap. While I hope that you find these techniques helpful, I encourage you to incorporate them with new methods that you discover in the course of exploration. ■

### *PRODUCT INFORMATION*

**DEGAS** and **DEGAS Elite**
Batteries Included
30 Mural Street
Richmond Hill, Ontario L4B 1B5, Canada
(416) 881-9941
Telex: 06-986-266

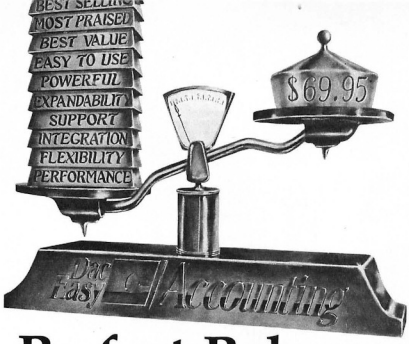
CIRCLE 289 ON READER SERVICE CARD

## *WHERE'S MY DISK?*

START is a magazine with its programs on disk. Normally the disk is bound into the magazine and sells on the newsstands for $14.95.

But some of you ST enthusiasts want to read START first, so we have provided a limited number of copies without disk for $4.00 each.

If this is your situation, you can complete your copy of this issue of START by ordering the companion disk direct from us, for $10.95 plus $2.00 shipping and handling. See the order form inserted into this issue.




# Perfect Balance

Now the scales are in your favor. Dac-Easy Accounting gives you the best price plus tremendous performance. That means value, and the experts agree. Dac-Easy Accounting was recognized by *InfoWorld* as 1985's overall "BEST SOFTWARE VALUE."

No other accounting package can match the explosive user base or the unanimous acclaim from industry experts. Dac is the perfect choice for your first accounting system or for upgrading from a single module system. Either way compare, and you will join over 150,000 people who have computerized with Dac-Easy.

## PERFORMANCE

Accurate information when you need it is what performance is all about. Fast, flexible reports give you what you need to know to manage cash-flow, turn inventory and increase profits . . . Listen to the skeptics-turned-believers.

*"Dac-Easy Accounting is so inexpensive . . . we were skeptical . . . We expected to find a program that couldn't compete on a feature-by-feature basis . . . We were wrong."*
*InfoWorld, 1985*

## EXPANDABILITY

You never have to worry about outgrowing the Dac-Easy Series which offers Atari software products, support, and ten different business forms. All of our products are top performers offered at amazing prices.

Dac-Easy Payroll is designed to solve all your personnel and payroll management problems, outperforming systems costing thousands more. And it can either stand alone or integrate perfectly with Dac-Easy Accounting to form a comprehensive business management program.

Also available are Dac-Easy Forms and Fast Forms which offer the finest selection in continuous, multi-part forms and checks.

## FLEXIBILITY

Dac offers the rare ability to handle either service or product-oriented companies without sacrificing features.

*"Dac-Easy Accounting is everything its designers say it is . . . It is also flexible enough to fulfill the accounting needs of almost any type of business."*
*Journal of Financial Computing, 1985*

## SUPPORT

Subscribe to our toll free support agreement and join the best support program in the industry. Our friendly 12 person support staff are trained to answer your accounting and technical questions. No excuses, and no delays.

Find out for yourself why Dac-Easy is the fastest selling accounting package in history. Call us today!

## FEATURES

**General Ledger**
- Unlimited multi-level accounts with screen inquiry for three years
- Pencil and pen correction option
- Automatic budgeting by department
- Unlimited journals and departments
- Excellent audit trail and flexible financial statements

**Accounts Receivable**
- Open invoice or balance forward per customer for unlimited number of customers
- Multi-sorted mailing labels
- Statements and invoices support automatic finance charges and special comments
- Detailed history for three years for number of invoices, sales, cost, and profits
- Customized aging report
- Automatic sales forecasting

**Accounts Payable**
- Checks handle multiple invoices, unlimited allocations and cash available protection
- Multi-sorted vendor labels and directories
- Customized aging report
- Automatic forecasting of purchases

**Inventory**
- Average, last purchase, and standard costing
- Physical inventory with perpetual comparisons
- Accepts fractional measure such as dozens
- Automatic forecasting of product needs
- Automatic forecast of product sales
- Detailed three-year history for every product
- Automatic pricing, alert and activity reports
- Screen inquiry for on-hand/on-order/sales/cost/profit/turns/GROI/etc.

**Purchase Order**
- Inventory and non-inventory items
- Allows up to 99 lines
- Per line discount in %
- Accepts generic deductions
- Accepts back orders and returns
- Purchase journal

**Billing**
- Service or Inventory invoicing on plain or pre-printed forms with remarks
- Prints sales journal
- Allows return credit memo

**Forecasting**
Unique program that automatically forecasts using your three-year history:
- Revenue and expense accounts
- Vendor purchases
- Customer sales, cost and profit
- Inventory item usage
- Four different forecasting methods

OVER 80 ROUTINES AND 300 REPORTS

## INTEGRATION

Dac-Easy's seven modules work together perfectly. Enter data once and it's posted to the other modules automatically. Also, most modules can be used stand-alone.

### *ALSO AVAILABLE FOR IBM & APPLE II*

Dac-Easy Accounting is also available for the Apple II series. On the IBM compatible machines we have seven software products including Dac-Easy Accounting, Dac-Easy Payroll, Dac-Easy Word II, Dac-Easy Mate, Dac-Easy Port, Dac-Easy Accounting Tutor, and Dac-Easy Payroll Tutor.

CIRCLE 014 ON READER SERVICE CARD

**Minimum hardware requirements**
Atari 520 ST or 1040 ST, one double-sided disk drive, 132 column printer in compressed mode. The Atari 520 ST must have the upgraded memory or the TOS in ROM chips installed in the system.

Dac Easy Accounting

# *Now Available for the Atari ST Series*

**TO ORDER CALL TOLL FREE**
**1-800-992-7779**
**Ask for Operator #436**
**IN TEXAS CALL**
**1-214-458-0038**
**or mail the order form below.**

Mail to:
**dac software, inc.**
4801 Spring Valley Rd
Bldg. 110-B
Dallas, TX 75244

**Yes,** please rush me the following Dac products:

| Product | Qty. | Price | Total |
|---|---|---|---|
| Dac-Easy Accounting | ___ | 69.95 | ___ |
| Dac-Easy Payroll | ___ | 49.95 | ___ |
| Add Shipping Charge | | 7.50 | |
| Texas Residents Add Sales Tax (6⅛%) | | | ___ |
| | | TOTAL | ___ |

☐ Check ☐ Money Order
☐ AMEX ☐ VISA ☐ MASTERCARD

Account # _____
Expires _____
Signature _____
Name _____
Company _____
Address _____
City _____
St. _____ Zip _____
Phone _____
Type of Business _____
No. of Employees _____

**30 Day Money-Back Guarantee**
Dac Software offers an unconditional guarantee on all Dac-Easy products (less shipping charges). There is a $10 restocking fee if the disk seal is broken. This guarantee is available on all products bought directly from Dac Software.

#436

# START

THE ST QUARTERLY

**PREMIERE ISSUE**

**See START Disk Offer Inside**

Hurry Offer Limited!

U.S.A. $4.00
CANADA $4.95

Summer 1986 Volume 1, Number 1

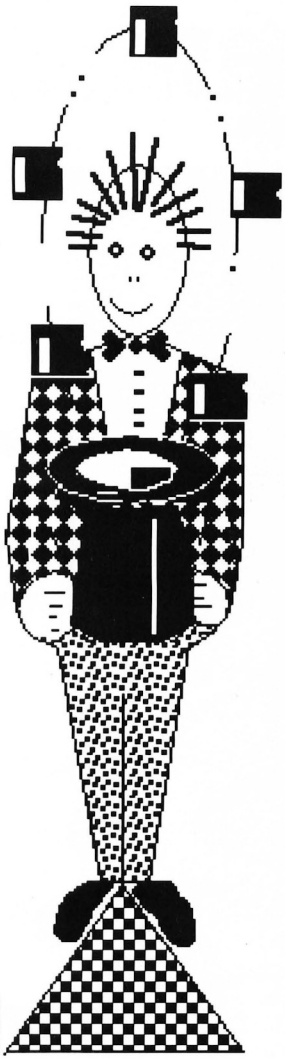
## START NOW

Subscribe to STart, the ST Quarterly now. In addition to 4 issues of STart and four 3½" program disks, you will also receive—FREE—a full year (12 issues) of ANTIC which features the ST Resource every month. To subscribe use the handy order card to the right.

## START AT THE BEGINNING

If you missed a previous issue, there are still copies available. For magazine plus 3½" disk, send $14.95 plus $2.00 shipping to:

STart
524 Second St.
San Francisco,
California 94107



JIM WARNER

# CLIPBOARD

- Periodic cleaning and maintenance of your ST's mouse can keep it working properly. To clean the mouse, turn it upside down and open the ball cover by sliding it with your thumbs in the direction of the arrows. Pull the cover off and turn the mouse over with your hand in place to catch the ball. Inside the ball cavity, you will find three metal rollers. Use a cotton swab and some isopropyl alcohol (tape head cleaner will also work) to gently clean each roller. You can clean the mouse ball with a lint free cloth, but never use alcohol or any other liquid. Remove any dust from the inside of the mouse by gently blowing and replace the ball, snapping the cover back in place. There are a number of inexpensive mouse pads available which, besides being fun to use, help reduce the wear and tear on your mouse.

- For some reason, the programmers at Atari who decided upon the character set for the ST made four characters (codes 28 through 31) that, when used together, draw the face of a man on the screen. This smiling, pipe-smoking man is, I believe, a classic figure that pokes fun at the "organization family man" of the 1950s; his name is Bob, and he is the object of a humorous cult, "the Church of the Sub-Genius." The following program prints Bob's full face in random locations on the screen:

```
10 FULLW 2: CLEARW 2: GOTOXY 3,0
20 PRINT "Attack of the killer Bobs!"
30 FOR D=1 TO 900: NEXT: CLEARW 2
40 X=INT(RND*17)*2: Y=INT(RND*9)*2
50 GOTOXY X,Y
60 PRINT CHR$(28)+CHR$(29);
70 GOTOXY X,Y+1
80 PRINT CHR$(30)+CHR$(31);
90 GOTO 40
```

*—excerpted from* **Understanding Atari ST Basic Programming** *by Tim Knight, SYBEX Computer Books, Berkeley: 1986. Used by permission.*

- Avoid touching the cartridge slot when picking up your computer. The cartridge contacts are exposed and a little too much static electricity could zap the sensitive components in your system. Play it safe: only touch the plastic case.

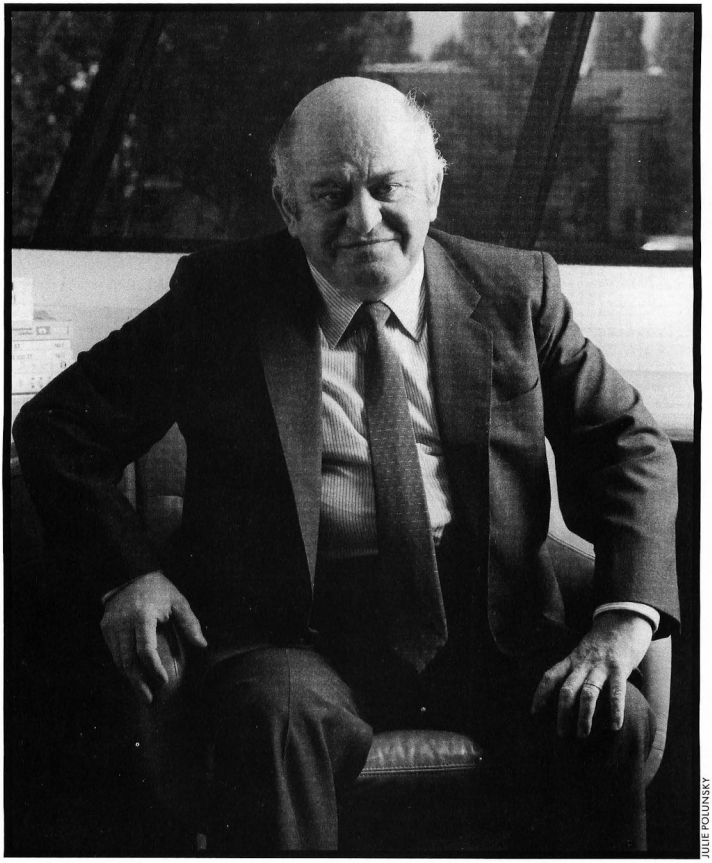
- The MC68000 does not have a PC-relative store instruction to mirror its PC-relative load. To circumvent this, try:

```
lea address,a1
move.w d0,(a1)
```

- Your Atari ST is equipped with a whole range of industry standard I/O (Input/Output) ports. The printer port uses regular IBM PC cables and you can run a printer configured for an IBM without any changes. The serial port is standard RS-232 which means, with the right software and any Hayes-compatible modem, you can be telecommunicating instantly. Also, the joystick/mouse ports on the ST allow you to use any standard Atari or Commodore joystick.

*(**Editor's Note:** Got an ST trick or tip to share? Send it to START, Attention: CLIPBOARD.)*

# JACK TRAMIEL:
## A CANDID DISCUSSION



JULIE POLUNSKY

**By Stephen Banker**

when they go to software people, they flood them with cash.

**SB:** *You also offered cash. You said to software developers, "You need money? I'll give you money." Remember that?*

**JT:** I made that proposal as an investment. That would be going into business with them.

**SB:** *What did you tell your engineers when you began to design the ST?*

**JT:** I asked for a "fifth generation" product—the most advanced microprocessor, the Motorola 68000. That gave us the greatest ease of use along with upwardly compatible features so we could build the kind of 32-bit machines the 68000 chip can support.

**SB:** *The computer industry makes a sharp distinction between home computers and office computers. Did you take that into account?*

**JT:** Absolutely not, because there is no such distinction. The distinction is only to those people who set the price because they believe they can charge more for the office.

**SB:** *Some people think you play rough. In fact, a phrase you yourself have used many times is, "business is war."*

**JT:** I believe that when you start something, you have to win. That's why I compare it to war.

**SB:** *Another quote: "Anybody who sells a product against me I would like to wipe out."*

**JT:** I do not like competition. I like, if I can, to be by myself, to have the market all to myself. I know that's not possible, but it would be nice.

**SB:** *On the other hand, you have also been referred to by somebody who deals with you frequently as a "gentle, misunderstood man."*

**JT:** I really do not believe in image. When I get letters from young people, it gives me a good feeling—a satisfaction that I am giving them what they want.

**SB:** *Given your compassionate side, what did it do to you to cut the Atari staff down from 1200 to 100?*

**JT:** I believe that we live in a country where for hard working people there are always jobs. People should not be sitting around getting pay they don't deserve.

**SB:** *The Wall Street Journal wrote, "Commodore under Jack Tramiel was notorious for announcing products that never made it to retailers' shelves." That's a perception that must create difficulty in dealing with retailers.*

**JT:** The retailers, or anyone else I would have problems with—they do not understand the market, and they must be selling other products than mine, so they like to say what I'm doing is wrong. When you plan a product that normally takes 12 months or longer, better technology can be produced during that time. Then it's important to kill the product before it reaches the market because it's very expensive to kill after it comes out. I am not afraid to announce my intentions, but I'm very careful before I put it on a dealer's shelf. Anyway, I'm not working for The Wall Street Journal. What they say really doesn't interest me.

**SB:** *In April '85 you said you hoped to sell three to five million computers that year. What happened?*

**JT:** The reason we did not reach that number is that we are in a transition period. The users of 8-bit machines are trying to figure out what is the next generation. Is it the 16-bit machine? And when they decide that this really is the product, which I now believe will be sometime in 1987, 20 million 8-bit computers will be replaced and then there will be a real upswing in the marketplace.

**SB:** *What's the next major offering from Atari?*

**JT:** We are working on a very advanced laser printer. And for a product our competitors sell for $6,000, we intend to be way below $2,000.
(Editor's note: *The latest indications show that Atari may actually bring their laser printer to market at a retail price below $1,000.*)

**SB:** *I'm told that you are going to run the printer directly from the computer rather than have a separate chip in the printer, as is the case nowadays.*

**JT:** I am not at liberty to tell you how it's going to work.

**SB:** *But I have had interviews with your designers on this.*

**JT:** I will try to make sure they don't tell you again.

**SB:** *What about CD ROM?*

**JT:** The CD ROM is just a 4-inch disk but it's like a 500 square-foot room full of books. We are getting ready to put the legal libraries of all 50 states on this disk, so when a lawyer wants to know about a certain kind of case, he can get it in a matter of seconds. You can have an encyclopedia on the disk. Or you can go to the Mayo Clinic, in effect, and get the facts on cancer, on heart disease, on whatever it is.

**SB:** *How far away is that?*

**JT:** The technology is done. I'm only waiting for the price to fall under $500.

**SB:** *There's a lot of talk about a new generation of Atari computers using the 68020 microprocessor, which is a full 32-bit chip. When is that going to happen?*

**JT:** Sometime in the beginning of '87.
(Editor's note: *At press time, it seemed certain the 68020 implementation would be in the form of an add-on box for the existing ST line rather than a new generation of computers.*)

**SB:** *Using a UNIX operating system?*

**JT:** It will be one of the operating systems, yes.

**SB:** *What will be the impact of that?*

**JT:** Speed and better graphics—a more advanced machine.

**SB:** *Do you, yourself, use a computer?*

**JT:** Yes, for my stock portfolio. I hook it up to my modem and get all the facts I need.

**SB:** *What are you uncertain about in terms of Atari's development?*

**JT:** Is the market as big as I think it is? And do the Japanese have something up their sleeves?

**SB:** *There are many people with whom you have done business who do not want to deal with you anymore. There were advertising agencies that refused to make a proposal on the Atari account unless you presigned a letter of credit, and, of course, there are quite a few people whom you fired. On the other hand, I hear constantly about your philanthropic activity. Do those parts mesh?*

**JT:** One is business and one is private. Last year I made very little income because most of my investments were in tax-free bonds. I actually had to cash in some things because I enjoy giving money to the right causes. That gives me almost as much pleasure as designing an advanced computer.

**SB:** *What are the right causes?*

**JT:** There are many, but cancer research is something I support. Then there is Army Relief. The United States Army helped me in 1948, and I've been helping them.

**SB:** *During one of the computer shows in Las Vegas, I spotted you at the gaming table, betting $500 dollars on a single card. I was reminded of what people say about survivors – that there's something in their mentality that requires risk.*

**JT:** There are those moments when I get carried away. But I definitely am very careful how I spend my money. I still travel economy class and try to save every nickel I can. I believe in hotdogs and caviar. ■

## WHERE'S MY DISK?

Are you missing the disk that contains this issue's programs? Complete your copy of this issue of START by ordering the companion disk direct from us, for $10.95 plus $2.00 shipping and handling. See the order form.


# Computers Made Easy

*with*

# ALICE: *The Personal Pascal*

ALICE is an amazing, complete environment that makes programming a computer easier to learn and do. Already a well-known name in the IBM-PC world, ALICE now brings easy, interactive programming to the Atari ST.

For **learners**, ALICE has a syntax-directed editor that turns programming into filling in the blanks and makes syntax errors impossible. Over 700 cross-referenced help screens give you the answers you need to write your own programs. ALICE's GEM interface lets you write programs with graphics, menus, and multiple windows without forcing you to learn the complexity of GEM. If you're a novice, our textbook teaches you Pascal programming — using ALICE — from the ground up.

For **experts**, ALICE's fast Pascal interpreter is the most powerful debugging system available. It also has most of the extensions of the popular Turbo Pascal for the IBM-PC — You can get many Turbo Pascal programs to run on your ST! Edit, test and debug with ALICE, then compile at the touch of a button with any Pascal compiler. Even though ALICE is great for learners, it's no toy when it comes to writing and debugging quickly.

Single-Step, Multi-level UNDO, "Motion-Picture" debugging, program semantics shown with colour (or font), symbol completion, full use of the Atari-ST/GEM environment, code hiding, multiple workspaces — the list of features goes on and on. ALICE is yours for $79.95, $20 more if you would like a copy of the ALICE Educator textbook.

Don't just take our word for it — listen to these reviewers of the PC version:

• *"If I needed to learn Pascal all over again, or were going to teach a course in the language, I can't imagine using any program other than ALICE."* — Adam Green, **InfoWorld**

• *"Anyone can use it . . . you can start writing your own programs immediately." " . . . a near perfect tool for business users and students who need to create some short program in a hurry." "ALICE is illustrative of the fact that, with no changes at all in the equipment, the sophistication of what small computers can do continues to increase pretty rapidly."* — Bob Schwabach, **San Francisco Chronicle**

• *"It is about as painless a method of learning Pascal as can be devised short of hypnosis. It works!" "The debug features are easy to use and even a real duffer will find it easy to locate bugs."* — Stan Veit, **Computer Shopper**

• *"ALICE is one of the cleverest products I've encountered in some time." "If you enjoy programming languages, this comes pretty darn close to being as much fun as a video game."* — Gene Wilburn, **Computing Canada**

**ALICE brings to the ST what Turbo Pascal brought to the IBM-PC — Programming made easy.**

Looking Glass Software™

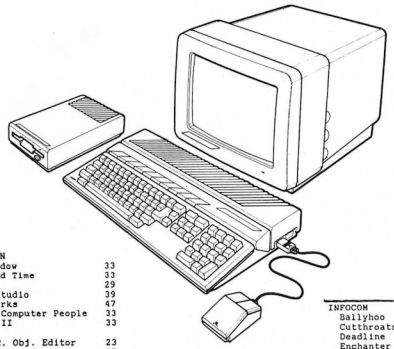
ALICE™ The Personal Pascal

Looking Glass Software Limited, 3 Menno St.,
Waterloo, Ontario N2L 2A4 (519) 884-7473
Call collect if ordering.

CIRCLE 022 ON READER SERVICE CARD

Trademarks: Turbo Pascal — Borland International IBM-PC — IBM, Atari ST — Atari, Inc. ALICE refers to ALICE: The Personal Pascal, a trademark of Graham Software Corp., used with permission.

# THE ATARI 520ST



ATARI 520 ST HARDWARE: CALL

Package #1:

Atari 520 ST Computer & SF 354 Disk Drive

Package #2:

Atari 520 Computer, SF 314 Disk Drive and SM 124 Monochrome Monitor

Package #3:

Atari 520 ST Computer, SF 314 Disk Drive and SM 124 Monochrome Monitor

Package #4:

Atari 520 ST Computer, SF 354 Disk Drive and SC 1224 Color Monitor

Package #5:

Atari 520 ST Computer, SF 314 Disk Drive and SC 1224 Color Monitor

HARDWARE OPTIONS:

| | |
|---|---|
| SF 314 DS/DD Disk Drive | 209 |
| SHD 204 20 MG Hard Disk | Call |

| | |
|---|---|
| ACTIVISION | |
| Mindshadow | 33 |
| Borrowed Time | 33 |
| Hacker | 29 |
| Music Studio | 39 |
| Paintworks | 47 |
| Little Computer People | 33 |
| Hacker II | 33 |
| ANTIC | |
| C.O.L.R. Obj. Editor | 23 |
| Maps & Legends | 27 |
| Macro Assembler | 60 |
| Lattice C | 114 |
| Disk Doctor | 23 |
| A-Calc | 45 |
| Meta Pascal | 75 |
| CAD-3D | 38 |
| A-Ram | 15 |
| A-Seka | 27 |
| GST C Compiler | 60 |
| GST-ASM | 45 |
| Expert Opinion | 75 |
| Flash | 30 |
| Star Struck | 19 |
| Red Alert | 19 |
| ATARI | |
| DB Man | 75 |
| DB Master | 34 |
| Joust | 21 |
| Star Raiders | 21 |
| BATTERIES INCLUDED | |
| Degas | 26 |
| Timelink | 33 |
| Thunder | 26 |
| I/S Talk | 33 |
| I/S Paperclip Elite | Call |
| Homepak | 33 |
| HIPPOPOTAMUS | |
| Hippoword | 59 |
| Hippoconcept | 59 |
| Hipposimple | 33 |
| Hippo Disk Utilities | 33 |
| Hippo Backgammon | 27 |
| Hippo Spell | 27 |
| Hippo Ramdisk | 23 |
| Hippo Computer Almanac | 23 |
| Hippo Jokes & Quotes | 23 |
| Hippo Art I | 27 |
| Hippo Pixel | 27 |
| Hippo Fonts I | 27 |
| Hippo Laser | 47 |
| Hippo Eprom Burner | 119 |
| Hippo Sound Digitizer | 109 |
| Hippo Vision B & W | 109 |

| | |
|---|---|
| MICHTRON | |
| Kissed | 26 |
| DOS Shell | 26 |
| DFT | 33 |
| The Animator | 26 |
| Personal Money Mgr | 33 |
| Utilities | 39 |
| M-Disk | 26 |
| Mudpies | 26 |
| Softspool | 26 |
| Flip Side | 26 |
| Calendar | 19 |
| Mi-Term | 33 |
| Gold Runner | 26 |
| Time Bandits | 26 |
| BBS | 33 |
| Cornerman | 33 |
| Mighty Mail | 33 |
| Lands of Havoc | 13 |
| Cards | 26 |
| Business Tools | 33 |
| Logo | 33 |
| Major Motion | 26 |
| Mission Mouse | 26 |
| ARTWORX | |
| Bridge 4.0 | 19 |
| Compubridge | 19 |
| Maillist | 12 |
| Strip Poker | 25 |
| Peggammon | 12 |
| Hole in One Golf | 19 |
| EPYX | |
| Winter Games | 26 |
| Rogue | 26 |
| Temple of Apshai | 26 |
| World Games | 26 |
| Championship Wrestling | 26 |

| | |
|---|---|
| INFOCOM | |
| Ballyhoo | 26 |
| Cutthroats | 26 |
| Deadline | 33 |
| Enchanter | 26 |
| Hitchhiker's Guide | 26 |
| Infidel | 29 |
| Mind Forever Voyaging | 29 |
| Planetfall | 26 |
| Seastalker | 26 |
| Sorcerer | 29 |
| Spellbreaker | 33 |
| Starcross | 33 |
| Suspect | 29 |
| Suspended | 33 |
| Wishbringer | 26 |
| Witness | 26 |
| Zork I | 26 |
| Zork II | 29 |
| Zork III | 29 |
| PENGUIN/POLARWARE | |
| Crimson Crown | 15 |
| OO-Topos | 15 |
| Sword of Kadash | 15 |
| The Coveted Mirror | 15 |
| Transylvania | 15 |
| SIERRA | |
| Kings Quest II | 33 |
| Ultima II | 39 |
| Winnie the Pooh | 19 |
| Black Cauldron | 26 |
| K/Q Hint Book | 6 |
| B/C Hint Book | 6 |
| Donald Duck | 19 |
| Cash Disbursements | 67 |
| TELARIUM | |
| Amazon | Call |
| Nine Princes in Amber | Call |
| Farenheit 451 | Call |
| Dragonworld | Call |
| TIMEWORKS | |
| Datamanager | 54 |
| Swiftcalc | 54 |
| Wordwriter | 54 |
| S/P Financial Planner | 54 |
| UNISON WORLD | |
| Printmaster | 26 |
| Art Gallery I | 19 |
| Art Gallery II | 19 |

| | |
|---|---|
| X-LENT | |
| Typesetter | 25 |
| Rubber Stamp | 25 |
| Music Box | 32 |
| Megafont | 25 |
| OSS | |
| Personal Pascal | 49 |
| OTHER ST HITS | |
| Action Pak | 32 |
| Alternate Reality | 19 |
| Bratacccus | 33 |
| Copy II | 27 |
| Easy Draw | 106 |
| Final Word | Call |
| Financial Cookbook | 36 |
| Flight Simulator II | Call |
| Fontwriter | 27 |
| Forbidden Quest | 27 |
| Gateway | 34 |
| Hex | 27 |
| Homework Helper | 34 |
| Infinity Machine | 23 |
| Jet | Call |
| LCH-2000 Clock | 33 |
| Leaderboard - Golf | 27 |
| Macro Desk | 27 |
| Macro Manager | 49 |
| Mean 18 | 27 |
| Mercenary | 19 |
| Mindwheel | 29 |
| Modula-2/ST | 59 |
| Pawn | 29 |
| PC Intercom | 84 |
| Phantasie | 27 |
| Silent Service | 26 |
| Soundwave SW-1 | 33 |
| Spiderman | 14 |
| Starglider | 29 |
| ST-Key | 14 |
| ST-Talk | 14 |
| Sundog | 27 |
| The Pawn | 30 |
| Treasure Island | 27 |
| Typing Tutor | 23 |
| UCSD Pascal | 59 |
| Ultima III | 39 |
| Universe II | 47 |
| Zoomracks | 54 |

## To order call TOLL FREE

# 1-800-824-7506

## ORDER LINE ONLY

No extra charge for MasterCard or Visa

## COMPUTER CREATIONS, Inc.

P.O. BOX 493 - DAYTON, OHIO 45459

For information, order inquires, or for Ohio orders (513) 435-6868

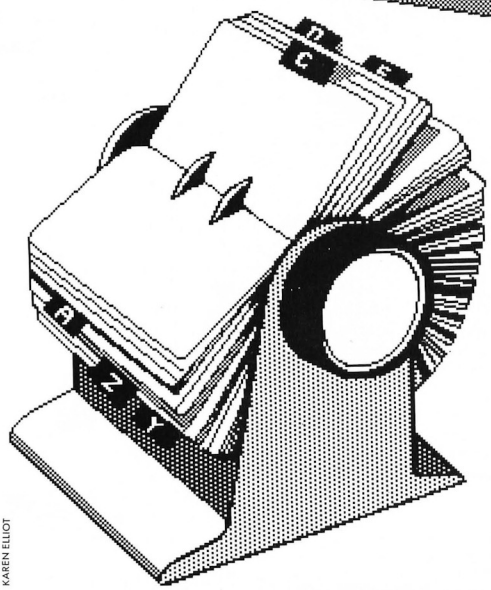
Order lines Open 9:00 a.m. to 8:00 p.m. Mon.-Fri.; 10 a.m. to 4:00 p.m. Sat. (Eastern Standard Time). Minimum $15 per order. C.O.D. (add $3.00). Please specify computer system. Call toll free number to verify prices and availability. Prices and availability are subject to change without notice. We ship C.O.D. to Continental U.S. addresses only! Please include 4% shipping on all Hardware orders (min. $4.00). Software and accessories add $3.00 shipping and handling in continental U.S. Actual freight will be charged outside U.S. to include Canada, Alaska, Hawaii, Puerto Rico and APO. Ohio residents add 6½% sales tax. Canadian orders add 5% shipping, (min. $5.00). All other foreign orders, please add 15% shipping, (min. $10). For immediate delivery send cashier's check, money order or direct bank transfers. Personal and company checks allow 3 weeks to clear. School purchase orders welcome. Due to our low prices, all sales are final. NO CREDITS. All defective returns must have a return authorization number. Please call (513) 435-6868 to obtain an RA# or your return will not be accepted for replacement or repair. FOR YOUR PROTECTION WE CHECK FOR CREDIT CARD FRAUD. We do not bill until we ship.

CIRCLE 013 ON READER SERVICE CARD

# MAIL CALL

## *ADDRESS BOOK, AUTO-DIALER, LABEL PRINTER*

**By Randy Gordon**



KAREN ELLIOT

*Computerize your address book with this full-featured GEM program in Personal Pascal. Mailcall allows you to enter, search, edit, and otherwise manipulate a 175 record mouse-driven database. It also prints mailing labels and even dials your telephone. Find this program on your START disk in the folder labeled MAILCALL.STQ*

# MAIL CALL...

This is the time of year when Andy Rooney fulminates about all those matchbook covers, envelope corners, and scribbles on the wall that collectively make up his personal address book. He could have them all under control with a computer, but he doesn't have room for one in his office. You, of course, are more up to date, and if you want to get your addresses and phone numbers organized on your ST, you'll find Mailcall waiting on the START disk to accept your information.

Mailcall is not just an address book, it's also a telephone dialer if you have a Hayes compatible modem. It will even use your "alternate long-distance carrier" if you don't have AT&T. The program is a GEM-based application that uses windows, mouse commands and keyboard input. It runs in medium or high resolution.

Each Mailcall database holds a maximum of 175 records, so you may not need more than one. Each record consists of the following fields: First Name, Last Name, Title (e.g., Mr. and Mrs.), Address, City, State, Zip Code, Home Phone Number, Work Phone Number, and Extra (one-line scratch pad).

Whenever you run Mailcall, it will try to load two files: MAILCALL.DAT, which holds the database records, and MAILCALL.INF, which contains dialing and printing information. These will load automatically if they are in the same folder as MAILCALL.PRG. If MAILCALL.DAT isn't there, the program creates a new file of that name with zero records. This will be your situation the first time you run the program.

You need at least one valid record to do anything with Mailcall, and valid means some data for both the first and last names. To create a record, pull down the **Main** menu and select the **Add** item, the only active function for a zero-record database. Once you complete one record, all other functions become available. This is a good time to begin building the default database that will load when you run MAILCALL.PRG. Other options at this point are to load a database with a different filename (which you may have in the future), or create a new database with a different filename, as explained below.

The menu bar shows five headings. **Desk** contains any desk accessories you have put there, and any you choose will work with Mailcall. **Main** includes the functions to find records and enter data. **File** controls disk operations. **Select** prints or dials when a record is active in an open window. **Option** sets and saves parameters for printer and modem. All these functions use standard GEM conventions and procedures.

## MAIN FUNCTIONS

**Search** looks for a specific name, either First Name, Last Name, or First and Last name, and disregards capitalization. If no match, the program shows the first record in the file. When it finds a match, it opens a fully active window to display all fields of the record. The title line shows the entire pathname. The up and down arrows in the window frame scroll backwards and forwards through the database, one record at a time. The grey areas on either side of the slider bar scroll ten records at a time.

**Edit** enables you to modify a record in an active window. When the Edit dialog box appears, just click the mouse on the field to be edited and use standard GEM editing keys. The [ESC] key totally clears any selected field. The up and down arrow keys and the [TAB] key move control between the different fields. The [RETURN] key is disabled during data entry. After editing, either save the changes by clicking on OK or cancel. If you make a change, the program will sort all the records and a small window will announce this activity.

**Delete** searches for a specific record, and if found, requests a protective confirmation; just select the appropriate box.

**Add** creates new records. It works much the same way as **Edit**, except you begin with a blank record and it cycles to a new entry each time you finish a record. A click on OK commits the new record to memory. It's handy to just leave the mouse pointer sitting on OK while you work. The program automatically capitalizes the initial letters of First Name, Last Name, Title, City and State (both letters).

**Print Range** is the way to print out multiple records either in report form (all data) or label form (name and address only). The program always sorts alphabetically by last name, and starts and ends printing wherever you specify. To print all the records beginning with a single letter, omit the ending range. You can stop printing at any time by pressing any key.

**Quit** exits from the program. If you made any changes, the program prompts you to save them.

## FILE HANDLING

You can load a database, save the current database, or start a new one. First priority goes to saving any database in memory that has been changed since it was loaded. After the program prompts you to save any changes, **Load New File** checks to see if the new file is a valid database, then loads it. Load uses the standard GEM item selector box and defaults to the currently active drive.

**Save Changes** saves the current file in memory to the same filename and pathname it came from, provided it is a valid database.

**Select** is only active when a specific record is in an open window. Its purpose is to print a single label or record, or to dial a phone number. Set the parameters for this output with the **Option** menus, either **Print** or **Dial**. Both use dialog boxes. **Print** controls the number of spaces to indent from the left margin, the spaces between successive labels, and whether to put the title before the first name (e.g., Dr. John Brown). Click the mouse to make these

selections—a check mark in the box indicates your choice. When all options are correct, save them and exit the box by clicking on OK.

The **Dial** option dialog sets up the modem default settings, enters codes to select a long distance carrier, and chooses the dialing method. The default code ATS7=11DT sets up dialing on a Hayes compatible modem with touch tone phone and gives you an 11-second period to pick up the receiver. If you don't, the modem hangs up. This ringing time is variable from 1 to 255 seconds.

ALDC means "alternate long distance carrier," and refers to your SPRINT or MCI codes. Enter your local access number, followed by two commas, and then your security number. Click on one of the three boxes—ALDC, AT&T, or LOCAL—to select the method of dialing. With ALDC, the modem dials the alternate local access number and code, then the number of the other party. For AT&T, it dials 1 (if specified), then the area code and number of the party. LOCAL ignores the first three digits of the phone number, so you must include the area code for local entries—preferably in the form 123-456-7890. For local numbers that require a leading 1, two solutions are offered: omit the area code, choose AT&T, and opt for adding 1 to that method; or choose LOCAL and enter the number as 123-1-456-7890. The two final options allow you to select Home or Work phone, and whether to dial 1 with AT&T.

Specify all of these parameters, then go to the record of the party you want to call, pull down **Select**, click on **Dial**, and pick up the phone.

The **Save Options** item saves your dialing and printing parameters to a file named MAILCALL.INF. This, you remember, is saved in the same folder as MAILCALL.PRG, so it loads automatically with the program.

## THE PROGRAM

I wrote the program in Personal Pascal from Optimized Systems Software. This language is very easy to use, especially when writing GEM-based programs. Personal Pascal has its own GEM library that is less complete than the one in the Atari Developer's Kit, but much easier to use. I have a 520 ST upgraded to 1 megabyte. I allocate 600K to a RAMdisk and copy all my Personal Pascal files and source code to the RAMdisk. This way I can compile and link a 70K source code in about 40 seconds. This takes some of the drudgery out of programming.

You will find the source code for Mailcall on your START disk in the MAILCALL.STQ folder. If you're interested in programming, the rest of this article describes how it works.

Each record in the database is 154 bytes long. The whole database is stored in memory in a Pascal data type called an *array of records*. Each record consists of a packed array of **char** for each field. Personal Pascal limits arrays to 32K, so the array only holds 175 records.

When you load a database, the number of bytes in the file is divided by 154 to get the number of records. This sets a variable **record_number** which controls the number of records shown and limits the sorting and save functions to active records only.

The source code is long but straightforward. First, it sets the RS-232 port to 300 baud, then tries to load the default files. The program then calls the main loop, **event_loop** which looks for message events and terminates when the "Quit" item is selected. **event_loop** calls another loop, **do_menu**, which constantly checks for menu selections when no window is open and then calls whichever function or procedure is required by a specific menu selection. Each menu function corresponds to a logically named function: **search**, **edit**, **add**, **option_print**, **option_dial**, **option_save**, **p_dialog** (print range), and **my_window** (about program dialog). The three items under the File menu heading are built right into the **do_menu** loop. All functions and procedures are returned to this loop when completed.

Only **search** uses all window functions. It starts by searching for the first and last name. When found, a variable **i** is given a number corresponding to the actual position within the array of the records. The window is opened and a procedure called **print** then prints the field titles to the window. Next a procedure called **show** prints the information within fields. **print** and **show** take into account whether medium or high resolution is in effect. The only difference between high and medium resolution is the vertical positioning. High resolution uses a 16 x 8 pixel font and medium resolution uses an 8 x 8 pixel font.

After the window is printed, the program enters another **event_loop**, which continues until the user clicks on the close box, sending a **wm_closed** message. This loop handles all active menu selections and all window changes, including GEM redraw messages. Whenever there are window changes, GEM sends the new information in an array of integers called **msg** of **message_buffer** type. When the program receives a message that requires action, it looks at **msg** to determine which action to take.

Several events trigger the **wm_redraw** message: whenever a window is topped (brought to the front), or made larger, or when new parts of a window are shown by moving or closing a window or closing a dialog or desk accessory. It is up to the programmer to redraw the window by calling **first_rect**. It returns x-position, y-position, width, and height values. If the values for the width and height do not equal zero, then redrawing is necessary. Next there is a call to **rect_intersect**. This will return the x,y,w,h values of an area that needs to be ▶

redrawn. All that has to be done is to use **set_clip** to confine drawing to this area and to redraw the screen with **print** and **show**. You must repeat this process using **next_rect** instead of **first_rect** until the width and height are 0.

When there are size or position changes, GEM sends a **wm_sized** or **wm_moved** message respectively. The new data which is used in **set_wsize** is returned in **msg**. **set_wsize**, if given a window handle and new x,y,w,h information, will place that window at the new position (x,y) for the specified width and height (w,h). It may or may not generate a redraw message. Scroll arrows, grey areas, and the slider bar pass messages in a similar fashion. The **wm_arrow** message will show all scroll functions except the slider bar which is sent via the **wm_vslid** message. The scroll program determines where to scroll from these messages, and calls **print** and **show** to redraw the screen with the proper record. GEM returns the position of the scroll bar in **msg**, but the programmer must manually move the bar into its new position. This is done with the **wind_set** procedure using **wf_vslide** as the second variable.

**wm_topped** is the message that GEM sends when the user wants to bring a window to the top and activate it. The procedure **bring_to_front** is called with the window handle as its parameter to accomplish this.

**wm_fulled** is sent when the full box is clicked on. The program compares the size of the window with its maximum size returned by **wind_get** using **wf_fullxywh** as the second variable. If they are the same (window is full), then **wind_get** is called with **prevxywh** as the second variable. This returns the window's previous size before being fulled. **set_wsize** can now be called with the values of the window's previous size. If they are not the same, (window is not full) then **set_wsize** is called with the results of **wind_get**, with **wf_fullxywh** as the second variable (maximum size).

Mailcall provides a quick and friendly means of bringing your address book into the computer age. If you find 175 records too constraining, try segmenting your addresses into a number of different databases by category. Also, I encourage enterprising Personal Pascal programmers to customize or expand the program. I find Mailcall extremely useful and I hope it fills a gap in your software library. ■


**ELECTRONIC ONE***

CALL (614) 864-9994 WRITE P.O. BOX 13428 COLUMBUS, OHIO 43213

ATARI ST

520ST COLOR 768.00

- KEYBOARD
- S/S DISK DRIVE
- COLOR MONITOR
- DEGAS
- SOFTWARE

B/W SYSTEM 568.00

DBL SIDED DISK DRIVE . . . 199.99

20 MEG HARD DRIVE (ATARI) . . . . . 718.00

30 MEG HARD DRIVE (SUPRA) . . . . . 788.00

AVATEX 1200 (HAYES) . . . . 119.99

**SOFTWARE**

STAR FLEET I . . . . . 32.99
LEADER BOARD . . . . . 26.99
SUNDOG . . . . . 26.99
SILENT SERVICE . . . . . 26.99
MEAN 18 . . . . . 26.99
WINTER GAMES . . . . . 24.99
ROQUE . . . . . 24.99
PHANTASIE . . . . . 24.99
TIME BANDITS . . . . . 24.99

**SOFTWARE**

GRAPHIC ARTIST . . . . . 119.99
VIP . . . . . 99.99
WORD WRITER ST . . . . . 49.99
DATA MANAGER ST . . . . . 49.99
D B MAN . . . . . 99.99
PERSONAL PASCAL . . . . . 49.99
EASY DRAW . . . . . 99.99
PRINT MASTER . . . . . 26.99
DAC EASY . . . . . 49.99
COPY II . . . . . 26.99
THUNDER . . . . . 26.99
TYPESETTER . . . . . 24.99
HOME ACCOUNTANT . . . . 44.99
ULTIMA III . . . . . 39.99
STRIP POKER . . . . . 24.99
BLACK CAULDRON . . . . . 26.99
LITTLE COMPUTER PEOPLE . . . . . 32.99
KINGS QUEST II . . . . . 32.99
TEMPLE TRILOGY . . . . . 24.99
UNIVERSE II . . . . . 49.99
ST POOL . . . . . 36.99
JOUST . . . . . 19.99

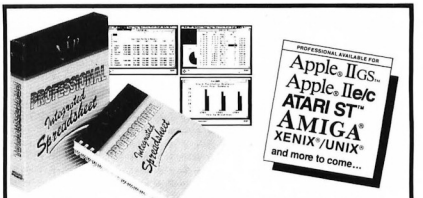
HOW TO ORDER: CASHIER CHECK, MONEY ORDER, MASTERCARD*, or VISA* (Add 4% for charge cards) . . . NO PERSONAL CHECKS . . . NO C.O.D.'s . . . SHIPPED U.P.S. PRICES SUBJECT TO CHANGE.

SHIPPING: Prompt one day shipping on in-stock merchandise. Ohio residents add 5.5% sales tax. Add $3.00 on all orders under $100.00. Add $5.00 on all orders over $100.00.

INTERNATIONAL: Actual freight charge on all orders outside the continental United States including A.P.O.

*CALL OR WRITE FOR FREE CATALOG*

CIRCLE 047 ON READER SERVICE CARD




**VIP Professional**

**The New Generation Spreadsheet**

**Spreadsheet, Database, Graphics and Macros With Total Lotus 1-2-3™ Functionality**

**VIP Professional** Professional was modeled after the powerful, best-selling Lotus 1-2-3. It not only has the same commands and features, you can also type the same keys to do the same things. It can also read and write Lotus files and run all Lotus macros. So you have immediate access to thousands of worksheet models, hundreds of macro applications, tens of books, scores of training courses, shads of user groups, and bulletin board services to help you make the most of Professional, and share data with the rest of the business world.

**Mouse Interface** You may elect to use the keyboard for all commands, but Professional also provides a full-featured mouse interface with icons, Dialogue Boxes, Pull-down Menus, Mouse Ranging, and Scroll Bars. This makes command selection, movement in a sheet, range selection, split/screen use and a score of other functions much more intuitive and easy to use. What were once complex commands with Lotus are now only a mouse-click away.

**1. Spreadsheet** Nothing is left out of this giant 256 column by 8192 row spreadsheet. You get variable column width, split screens, frozen titles, sorting, file combine and extract, copy, move, range naming, local and global cell protection, total printer control, and over 50 special functions to make worksheet creation a snap. And Professional supports up to four megabytes of memory – when you need real power!

**2. Database** Professional includes a powerful data manager to help you arrange, store and analyze information about your home or business. It allows up to 8192 records, with up to 256 fields, and has commands for sorting, data queries and statistical analysis.

**3. Graphics** With Professional's presentation graphics you can give shape to your figures with five different types of graphs - pie chart, bar, stacked-bar, line and XY graphs. With the many options available you can decide your graph just about any way you wish. You can also print presentation-quality graphs with different fonts, sizes - and colors too!

**Macros** Professional features macros for automating repetitive tasks. Macros also allow you to program Professional for doing your accounting, inventory control, even school work.

**Just Minutes to Learn** Professional comes with a user-sensitive handbook for the newcomer. And help is built right into the program. With the handy tutorial you will be able to create your first worksheets in just minutes.

* Features may differ on different versions. Contact your dealer for further details.

SCO Professional UNIX XENIX Multiuser systems contact Santa Cruz Operation (800) 626-UNIX / (408) 425-7222

VIP Professional is a trademark of VIP Technologies Corp. Lotus 1-2-3 is a trademark of Lotus Development Corp. Apple and Macintosh are registered trademarks of Apple Computer Inc. Atari is a registered trademark of Atari Corporation. Amiga Inc. Xenix is a registered trademark of AT&T. XENIX is a trademark of Microsoft Corporation. SCO Professional is a trademark of Santa Cruz Operations Inc.

Copyright 1986 VIP Technologies Corp.
Specifications and availability subject to change without notice.

FOR MORE INFORMATION CALL
**1-416-479-1880**
U.S. ORDERS SHIPPED FROM U.S.

**ISD MARKETING INC.**
20 Steelcase Road, Unit 12
Markham, Ontario, Canada L3R 1B3

CIRCLE 019 ON READER SERVICE CARD

# Supervisor Mode

## Privileged Classes

BY JIM DUNION

*Full control of the 68000 chip requires knowledge of supervisor mode. Jim Dunion of debugger fame explains what it is, how to use it, and why it is important for ST programmers.*

***"I'm in charge here."***

–General Alexander Haig's statement to the press after President Reagan was shot by John Hinckley, Jr.

Exceptional circumstances call for exceptional actions by exceptional people, right? Al Haig certainly thought so, and so did the Motorola engineers who designed the 68000 family of microprocessors. When they built the chip, they included something called the "supervisor mode." To give you an idea of its importance, I quote from the first sentence of Motorola's Programmer's Reference Manual for the 68000:

"The M68000 executes instructions in one of two modes–user mode or supervisor mode."

Whether you know it or not, you're already familiar with user mode. That's what you're in when you run programs on the ST. But what is supervisor mode, and how does it differ from user mode? More importantly: What good is it? Let's take a closer look. ▶

# Supervisor Mode...

## *WHAT IS SUPERVISOR MODE?*

Think of the 68000 in your ST as a commercial airliner on which you can fly either coach or first class. Both classes share a lot of the airplane—wings, engines, etc.,— but passengers flying first class have access to certain privileges that the peasants in coach don't. Now think about the registers in the 68000. Both user mode and supervisor mode have the same eight data registers (D0–D7), the same seven address registers (A0–A6), the same program counter, and the same condition code register. In user mode the programmer also has an address register A7 that is used as a user stack pointer. This is kind of like bathrooms on an aircraft. I mean, you wouldn't want first class passengers to have to use the same bathroom as coach passengers would you? Of course not. So, in supervisor mode there is a special supervisor stack pointer and a supervisor status register. Since the supervisor stack pointer is also called A7, it gets a little confusing. How will the processor know whether an instruction refers to the user stack pointer A7, or the supervisor stack pointer A7? Easy, bit 13 of the system (supervisor) status register—which is called the S bit—signals the processor. When the S bit is a 1, the processor is in supervisor mode and A7 refers to the supervisor stack pointer. When it is a 0, you're back in user mode and A7 is again the lowly user stack pointer. So far this seems simple enough, right? Two different stack pointers, an extra status register and a supervisor-mode bit. So what extra privileges do supervisor-mode passengers get that user mode passengers don't?

**What is supervisor mode, and how does it differ from user mode? More importantly: What good is it?**

## *PRIVILEGED INSTRUCTIONS*

Karl Marx would have disliked the 68000. It seems to embody a lot of the struggle between the proletariat and the bourgeoisie. The privileged class wants to keep those privileges to itself and keep the underprivileged decidedly so. So in the 68000 world there is a simple rule: If you're in supervisor mode you can execute certain instructions that you can't execute while in user mode. Not surprisingly, these are known as privileged instructions. It also shouldn't come as a shock that most of the privileged instructions are ones that would let a lowly user suddenly elevate himself to supervisor status. The privileged instructions are:

AND immediate to Status Register
EOR immediate to Status Register
MOVE to Status Register
MOVE User Stack Pointer
OR immediate to Status Register
RESET
RTE (Return from Exception)
STOP

As you may notice, most of these instructions operate on the status register and could therefore affect the S bit. The others could affect the smoothly running chip of state. (Sorry about that.) We don't want a user-mode program, which could conceivably have a bug in it, doing something that screws up the system and causes it to stop, reset or go off into some weird realm.

## *WHY USE SUPERVISOR MODE?*

To look at what supervisor mode is used for, we first have to talk about exception processing. Exceptions in the 68000 world are nonstandard processing circumstances. In the 6502 world we called such situations interrupts. Exception processing is associated with interrupts, trap instructions, tracing and other exceptional conditions. The exception may be internally generated by an instruction or by an unusual condition which arises during the execution of an instruction (e.g., division by zero). Externally, exceptions can be caused by peripheral interrupts, by bus errors, or by a reset. And here's the kicker. *All* exceptions on the 68000 are processed *in the supervisor mode!* Exception processing occurs in four main steps. In the first step, a copy is made of the status register. As soon as this is done, the S bit is asserted and, bingo, the processor is in the supervisor state. Now it can do anything.

The simple fact is that supervisor mode is used for writing operating systems and other systems software. In the early days of microprocessors there wasn't much of a need for things like supervisor mode. The program running was in total charge of everything that happened in the processor. But a funny thing happened on the way to the ST. As micros became more sophisticated they started resembling large computers more and more. It's quite traditional in large systems to let the operating system handle stuff like I/O and interrupts. The logic here is based on Murphy's Law:

***"If a user program can screw something up, sooner or later it will."***

The best way to avoid OS pollution from user programs is to never give them the opportunity. And once you move from single-user to multi-user systems, you have to consider how

to keep individual users from stepping on each other's toes.

The 68000 is an elegant architecture well suited to multi-user, multi-tasking types of applications. Remember, the 68000 is just one of a family of processors that Motorola supports. There are also an MC68010 and MC68012 which introduce even more elegance and a virtual machine concept. The 68012, for example, has an address space of two gigabytes, but a lot less physical memory is usually present. In a

**You wouldn't want first class passengers to have to use the same bathroom as coach passengers would you?**

virtual memory system, a user program can be written as though it has a large amount of memory available, when in reality only a small amount of memory is physically present. When a reference is made to memory that isn't really there, an exception is generated and the operating system (sometimes known as the supervisor) loads in the proper memory from a secondary storage such as a hard disk. Even on the 68000 the supervisor state can be used by an external memory-management system. Any time the processor makes a memory reference, it classifies the type of reference being made. This is indicated by the three function-code output lines which allow external translation of addresses, control of access, and recognition of special processor states such as "interrupt acknowledge." The encoding of these lines is as follows:

| FC2 | FC1 | FC0 | Address Space |
|---|---|---|---|
| 0 | 0 | 0 | Undefined, reserved |
| 0 | 0 | 1 | User Data |
| 0 | 1 | 0 | User Program |
| 0 | 1 | 1 | Undefined, reserved |
| 1 | 0 | 0 | Undefined, reserved |
| 1 | 0 | 1 | Supervisor Data |
| 1 | 1 | 0 | Supervisor Program |
| 1 | 1 | 1 | Interrupt Acknowledge |

Thus, theoretically, we could have different address spaces for the OS, for OS data, for user programs and for user data. Memory management on the ST isn't implemented like this, but who knows what's coming down the pike?

## *GETTING INTO SUPERVISOR MODE*

Suppose you want to write a piece of system software, or perhaps change what the operating system does. With the OS in ROM this may very well become necessary at some point. The first step is to get into supervisor mode. We know that we can't simply change the S bit in the status register, so what do we do? Rule #1: To get into supervisor mode you have to be doing exception processing. So we have to cause an exception.

```
IntoSup  LEA      Dummy,A1  ;create pointer to Dummy
                            ;instruction label in this
                            ;routine.
         MOVE.L   A1,-(SP)  ;Push this vector onto
                            ;stack
         MOVE.W   #8,-(SP)  ;Now push the exception
                            ;vector we want changed
                            ;onto the stack
         MOVE.W   #5,-(SP)  ;Push value to tell GEM
                            ;we want to change an ex-
                            ;ception vector
         TRAP     #13       ;Call BIOS function
                            ;handler This will result
                            ;in the privilege violation
                            ;vector to point to our
                            ;code.
         MOVE     USP,A0    ;Now try a privileged
                            ;instruction. If it works (a
                            ;harmless instruction),
                            ;then we're already in
                            ;supervisor mode. If it
                            ;fails, a privilege violation
                            ;will cause an exception
                            ;and thus put us in Super-
                            ;visor mode and control
                            ;will be transferred to . . .
Dummy    "your code here"   ;here
```

## *HEADING TOWARDS THE FUTURE*

With the 68000, we could set up an operating system in supervisor mode to multitask any number of auxiliary programs running in user mode. Back on the 6502 we had to resort to tricks like vertical blank interrupts to give us the ability to do multitasking. No more! GEM only does multitasking with installed desk accessories, but just wait. There are already replacement operating systems available that allow multitasking. Micro RTX from Beckemeyer Development Tools, for example, is a multitasking operating system kernel, and 4xFORTH, a FORTH-83 development system supports multitasking. Word is that OS-9, a UNIX-like multitasking operating system, is about ready to be released also. ▶

## Software Discounters of America

S.D of A

**Orders Outside PA—1-800-225-7638**
**PA Orders — 1-800-223-7784**
**Customer Service 412-361-5291**
**Open Saturday**

- **Free Shipping on orders over $100 in continental USA**
- **No surcharge for VISA/MasterCard**
- **Your card is not charged until we ship**

**ABACUS BOOKS**
ST Gem Prog. Ref.
ST Graphics & Sound
ST Internals
ST Logo
ST Machine Language
ST Peeks & Pokes
ST Tricks & Tips
***Call For Low Prices!***
**ABACUS SOFTWARE**
Assem Pro
Forth/MT ..... CALL
PC Board Designer ... FOR
ST Data Trieve ..... LOW
ST Text Pro ..... PRICES
Text Designer
**ACADEMY**
Typing Tutor ..... $23
**ACCESS**
Leader Board Golf ... $25
L.B. Tourn. Disk #1 .. $14
Tenth Frame ..... $25
**ACCOLADE**
Mean 18 Golf ..... $25
**ACTION**
Action Pak ..... $25
Gateway ..... $25
Solo Pak ..... $25
**ACTIVISION**
Borrowed Time ..... $33
Hacker 2 ..... $33
Little Comp. People . $33
Mindshadow ..... $33
Music Studio ..... $39
Paint Works ..... $44
Shanghai ..... $29
Tass Times ..... $29
**ARTWORX**
Bridge 4.0 ..... $19
Compubridge ..... $19
Mail List ..... $14
Strip Poker ..... $25
Thai Boxing ..... $14
**BATTERIES INCLUDED**
D.E.G.A.S. ..... $25
D.E.G.A.S. Elite .... $49
Home Pak ..... $33
I*S Talk ..... $49
Isgur Portfolio System ..... $129
Paperclip Elite ..... $65
Thunder ..... $25
Time Link ..... $33
**CENTRAL POINT**
Copy 2 ..... $25
**DAC**
Dac Easy Accounting $49
Dac Easy Payroll .... $33
***requires double-sided drive & 132 column printer***
**EPYX**
Champ. Wrestling .... $23
Rogue ..... $23
Temple Apshai Trilogy $23
Winter Games ..... $23
World Games ..... $23
**FIREBIRD**
Stargilder ..... $29
The Pawn ..... $29
**F T L**
Dungeonmaster .... $25
R.P.V. ..... $25
Sundog ..... $25
**GAMESTAR**
Champ. Baseball '86 . $29
Champ. Basketball .. $29
**INFOCOM**
A Mind Forever Voyaging ..... $29
Ballyhoo ..... $25
Enchanter ..... $25
Hitchhikers Guide to the Galaxy ..... $25
Leather Goddesses .. $25
Spellbreaker ..... $33
Trinity ..... $25
Wishbringer ..... $25
Zork 1 ..... $25
Zork 2 or 3 ..... $29
**LDW**
Basic Compiler ..... $44
**MEGASOFT**
ST Copy ..... $23
X-Rated Library for Print Master ..... $16
**MICHTRON**
BBS 4.0 ..... $49
Calendar ..... $19
Cards ..... $25
M-Disk ..... $25
Major Motion ..... $25
Mighty Mail ..... $33
Pinball Factory ..... $25
Pro-Football Wizard . $25
Soft Spool ..... $19
Time Bandits ..... $25
Utilities ..... $39
**MICROPROSE**
Gunship ..... Call
Silent Service ..... $25
**MI-GRAPH**
Easy Draw ..... $95
**MILES COMPUTING**
Harrier Strike Mission . $33
**MINDSCAPE**
Balance of Power ... $33
Bratacuss ..... $33
**MONOGRAM**
Dollars & Sense .... Call
**OMNITREND**
Breach ..... $25
Universe 2 ..... $44
**ORIGIN**
Ultima 3 ..... $39
**OSS**
Personal Pascal .... $49
**PCA**
The Graphic Artist . $129
**PENGUIN/POLARWARE**
Crimson Crown ..... $14
Oo-Topos ..... $14
Transylvania ..... $14
**REGENT**
Regent Base ..... $59
**SHELBOURNE**
ST Pool ..... $23
**SIERRA ON LINE**
Black Cauldron ..... $25
Kings Quest 2 ..... $33
Winnie the Pooh ..... $16
**SSI**
Phantasie ..... $25
**SUBLOGIC**
Flight Simulator .... $33
Jet ..... Call
**TDI**
Developer's Modula 2 Call
Modula 2 ..... $49
**TELARIUM**
Amazon ..... $33
Fahrenheit 451 ..... $33
Nine Princes in Amber $33
Perry Mason: Case of the Mandarin Murder .. $33
**TIMEWORKS**
Data Manager ..... $49
Swiftcalc ..... $49
Sylvia Porter's Personal Financial Planner . $49
Word Writer ..... $49
**UNICORN**
Decimal Dungeon ... $25
Fraction Action ..... $25
Math Wizard ..... $25
**UNISON WORLD**
Art Gallery 1 ..... $19
Art Gallery 2 ..... $19
Print Master ..... $25
**XLENT**
Megafont ..... $25
Rubber Stamp ..... $25
Typesetter (New Ver.) $33
Write 90 ..... $19
**ACCESSORIES**
Bulk Disks 3½ ..... Call
Compuserve Starter Kit ..... $19
Disk Case (Holds 30) . $9
Kraft Joystick ..... $9
Supra 20 Meg Hard Disk Drive ..... Call
Supra 300/1200 Baud Modem w/Omega Terminal ..... $139
Wico Boss ..... $12
Wico Bat Handle ..... $17
Wico Black Max ..... $9

**P.O. BOX 111327—DEPT. ST—BLAWNOX, PA 15238**

***Please Read The Following Ordering Terms & Conditions Carefully Before Placing Your Order:** Orders with cashiers check or money order shipped immediately. Personal & Company checks allow 3 weeks clearance. NO C.O.D.'s! **Shipping: Continental U.S.A.**—Orders under $100 add $3; **free shipping on orders over $100. AK, HI, FPO, APO—add $5 on all orders. Canada & Puerto Rico—add $10 on all orders.** Sorry, no other international orders accepted! **PA residents add 6% sales tax on the total amount of order including shipping charges!** Prices subject to change without notice. **REASONS FOR CALLING CUSTOMER SERVICE—412-361-5291 (1)** Status of order or back order **(2)** If any merchandise purchased within 60 days from S.D. of A. is defective, please call for a return authorization number. Defective merchandise will be replaced with the same merchandise only! NO CREDITS! After 60 days please refer to the manufacturers warranty included with the merchandise & return directly to the manufacturer. **Customer service will not accept collect calls or calls on S.D. of A.'s 800# order lines! Hours: M.-Fri.: 9:00-5:30 • Sat.: 10-4 Eastern Time.**

CIRCLE 036 ON READER SERVICE CARD



# MT C-Shell

*Shaping the future of the Atari ST*

| | TOS | OS-9 | MT C-SHELL |
|---|---|---|---|
| Multiuser | | • | • |
| Multitasking | | • | • |
| GEM Compatible | • | | • |
| Unix Compatible Commands | | | • |
| C Shell | | | • |
| Electronic Mail | | | • |
| Aliases/Macros | | | • |
| Command History | | | • |
| TOS File System Compatible | • | | • |
| Structured Shell Programming | | | • |
| I/O Redirection & Pipes | | • | • |
| Job Control | | | • |
| Automatic Job Scheduling | | | • |
| Print Spooler | | • | • |
| Runs TOS Programs | • | | • |
| Runs GEM Programs | • | | • |
| Supports ST Compilers | • | | • |
| Password Security | | • | • |
| Price | N/A | $295.00* | $129.95 |

*For program development the OS/9 BASIC, Pascal, and C language package is an additional $495.

Beckemeyer Development T o o l s 415 452 1129

CIRCLE 008 ON READER SERVICE CARD



ST PROTECTION NOW AVAILABLE!

## Disclone Service Won't Make You Nervous

Technical support, personal service, competitive prices.
Disclone full service quality tested diskette duplication, packaging, documentation production and processing ensures precise duplication, thorough quality control and expedient response to your requirements.
NOclone state of the art hardware based copy protection is true piracy protection for authorized allotments only. Each application is uniquely encrypted. Install routines are coded for nontransferrable hard disk allotments.
Disclone offers a choice of diskettes. Commitment dates are guaranteed. Fast turnover
- up to 1000 in 24 hours, any format.
- up to 10,000 in one week, any format.

disclone

DISCLONE SOFTWARE PRODUCTION SERVICES
1050 North Fifth Street, San Jose, California 95112
(408) 947-1161 **OUTSIDE CA:** 1-800-826-4296

CIRCLE 016 ON READER SERVICE CARD

Antic Presents

# THE CATALOG™ OF WORLD CLASS SOFTWARE

## Delivered directly to you!

# CALL NOW—IT'S FREE!

## 800-443-0100 ext. 133

24 hours-a-day for credit card holders. (Continental USA And Hawaii)

*START*—The ST Quarterly. Get your latest issue of *START*—a power users quarterly with disk. Single copy $14.95. Yearly $59.95

**SOFTWARE THAT FINISHED FIRST AROUND THE WORLD**

**Tom Hudson's CAD 3-D** (ST0214) **$49.95**

**A-CALC by Kuma** (ST0212) **$59.95**

**Flash** (ST0220) **$39.95**

**WORLD CLASS SOFTWARE**

| | |
|---|---|
| Expert Opinion (ST0219) | $99.95 |
| Maps and Legends—The Cartographer (ST0202) | $34.95 |
| A-Seka by Kuma (ST0216) | $34.95 |
| A-RAM by Kuma (ST0215) | $19.95 |
| GST-C (ST0217) | $79.95 |
| GST-ASM (ST0218) | $59.95 |
| MCC Pascal by Metacomco (ST0206) | $99.95 |
| MCC Macro Assembler by Metacomco (ST0205) | $79.95 |
| Lattice C (ST0207) | $149.95 |
| C.O.L.R. Object Editor (ST0201) | $29.95 |
| Red Alert (ST0211) | $29.95 |
| Disk Doctor (ST0223) | $24.95 |
| Star Struck—The Astrologer (ST0222) | $24.95 |
| Mom and Me (ST0204) | $19.95 |
| Murray and Me (ST0203) | $19.95 |
| Ultima I by Sierra (TH9001) | $49.95 |
| Ultima II by Sierra (TH9002) | $49.95 |

**WE WANT TO HEAR FROM YOU TODAY!**

Enclose your check or money order (no cash) with the items you are purchasing clearly listed on a sheet of paper. Please print the title as it appears complete with the (STO #) and price. ADD $3.00 SHIPPING, California residents please include 6.5% sales tax. INCLUDE YOUR NAME, ADDRESS, ZIP CODE, PHONE NUMBER.

**Send your order to:**
THE CATALOG
524 Second St.
San Francisco, CA 94107

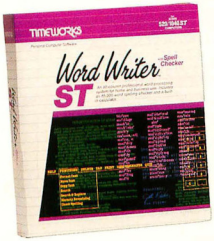
Products from "THE CATALOG" are backed by the "Antic Customer Satisfaction Guarantee".

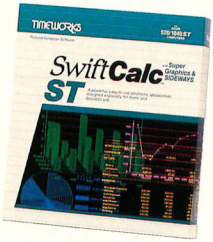
WE ALSO SELL XL/XE SOFTWARE. For more information on all of "THE CATALOG" products write to the address above attention "Customer Service" OR CALL TOLL FREE 800 443-0100 ext. 133 for a FREE 40 page color catalog.

• Retailers—Inquire about our Dealer prices. Call (415) 957-0886.

# IF YOU CAN FIND A BETTER ATARI ST PROGRAM WE'LL BUY IT FOR YOU!*

**Full GEM interfacing, convenient Quick Keys, and many other unique features of our own.**






## WORD WRITER ST with Spell Checker

**A full-featured, professional word processing system for home and business use. You get:**

- **A Continuous Spell Checker** that identifies misspelled words *as you are typing* your document.
- **An additional 85,000 word, built-in Spell Checker** that checks your entire document – at your command!
- **On-Screen** underlining, *italics* and **boldface** – as you write.
- **An Outline Processor** that quickly organizes notes, facts, and ideas in convenient outline format.
- Every other feature you'll need for everyday word processing, plus most of the features found in more expensive programs.

## DATA MANAGER ST with Report Writer

**A complete general information Storage and Retrieval System with report writing, business graphics, and label making capabilities. Plus, you get:**

- **Flexibility** that allows you to modify your data base structure by changing the size or position of fields of information – at any time.
- **A complete Report Writer** that generates customized data reports. You specify the title, location, and sequence of each column.
- **An extensive Business Graphics Package** with pie charts, bar charts, line plots, point plots, hi-lo-close stock price plots, and more.
- **A Label Maker** that prints your important information onto all types of labels.

## SWIFTCALC ST with Sideways

**A state-of-the-art spreadsheet for home and business use. You get:**

- **8192 rows and 256 columns provide up to 2,048,000 cells** (locations) in which to place information.
- **Super Graphics** graphically display and print out business information using pie charts, bar charts, line plots, point plots, hi-lo-close stock price plots, and more.
- **Windows** allow you to work on two sections of your spreadsheet simultaneously.
- **Sideways** lets you print all columns on one continuous sheet . . . *sideways*.
- **Help Screens,** help you use the program – without referring to your manual.
- **Formatting** – Choice of five formats: Decimal (up to 9 places); Graphics; Exponential Notation; $ Sign & Commas.

***You Get Our Liberal Upgrade and Exchange Policy*** – Details are inside every Timeworks package.

**With Timeworks you get more than software. . .**

***You Get Our Customer Technical Support Team*** – free to all registered users.

**With Timeworks you get our Money Back Guarantee***

If you can find anything that works better for you – and it's available – we'll buy it for you. Details inside every Timeworks package.**

TIMEWORKS®

***More power for your dollar***

Timeworks, Inc. 444 Lake Cook Road, Deerfield, Illinois 60015
312-948-9200

**For the Atari 520/1040 Computers.*****

Suggested Retail List Price:
**$79.95 each**

**Available now at your favorite dealer, or call Timeworks.**

**TO ORDER CALL:**
**1-800-535-9497**
These programs are not copy-protected

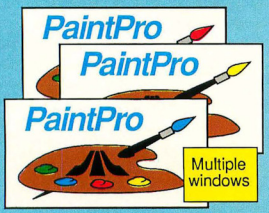
**These Programs INTERFACE with Each Other**

© 1986 **Timeworks**, Inc. All rights reserved.

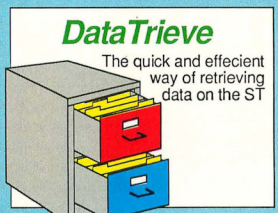
** Offer expires 90 days after date of original purchase.
*** Registered trademark of Atari Corp.

CIRCLE 069 ON READER SERVICE CARD

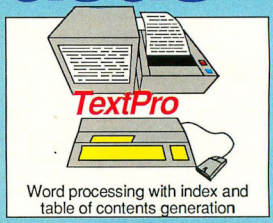
# AA Rated Software
# Atari and Abacus




A GEM™ among ST drawing programs. Very friendly, but very powerful design and painting program. A *must* for everyone's artistic or graphics needs. Use up to **three** windows. Cut & paste between windows. Free-form sketching; lines, circles, ellipses, boxes, text, fill, copy, move, zoom, spray, paint, undo, help. Double-sized picture format. **$49.95**

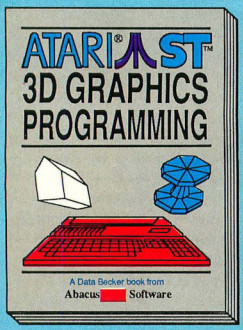



Data management was never this easy. Help screens; lightning-fast operation; tailorable display; user-definable edit masks; up to 64,000 records. Supports multiple files. Includes RAM-disk programs. Complete search, sort and file subsetting. Interfaces to TextPro. Easy printer control. Includes five common database setups. **$49.95**

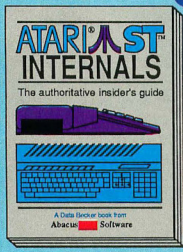



Wordprocessor with professional features and easy-to-use! Full-screen editing with mouse or keyboard shortcuts. High speed input, scrolling and editing; sideways printing; multi-column output; flexible printer installation; automatic index and table of contents; up to 180 chars/line; 30 definable function keys; metafile output; much more. **$49.95**

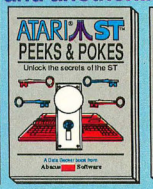
# One good book...
## deserves another...
## and another... and another... and another...



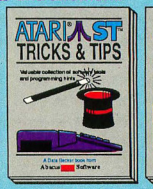

**3D GRAPHICS PROGRAMMING**
FANTASTIC! Rotate about any axis, zoom in or out, and shade 3D objects. All programs written in machine language (and commented) for high speed. Learn the mathematics behind 3D graphics. Hidden line removal, shading. With 3D pattern maker and animator. **$24.95**



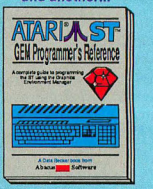

**ST INTERNALS**
Essential and valuable information for the professional programmer and ST novice. Detailed descriptions of the sound and graphics chips, internal hardware, I/O ports, using GEM, system variables, interrupt instructions, error codes. Commented BIOS listing. An indispensible reference for your ST library. 450pp **$19.95**




**ST PEEKS & POKES**
Enhance your programs with the examples found within this book. Explores using different languages BASIC, C, LOGO and machine language, using various interfaces, memory usage, reading and saving from and to disk. 280pp **$16.95**




**ST TRICKS & TIPS**
Fantastic collection of programs and info for the ST. Complete programs include: super-fast RAM disk; time-saving printer spooler; color print hardcopy; plotter output hardcopy; creating accessories. Money saving tricks and tips. 260pp **$19.95**




**GEM Programmer's Ref.**
For serious programmers needing detailed information on GEM. Presented in an easy-to-understand format. All examples in C and assembly language. Covers VDI and AES functions. No serious programer should be without. 410pp **$19.95**

Optional diskettes are available for $14.95 each.

Atari and Atari ST are trademarks of Atari Corp.
GEM is a trademark of Digital Research Inc.

**Phone (616) 241-5510**
**Telex 709-101 • Fax (616) 241-5021**

you can count on **Abacus**

**P.O. Box 7219 Dept. SB Grand Rapids, MI 49510**

Other software and books also available. Call or write for your **free catalog** or the name of your nearest dealer. Or order directly using your credit card. Add $4.00 per order for shipping. Foreign orders add $10.00 per item. 30-day money back guarantee on software. Dealers inquires welcome—over 1500 dealers nationwide.

# THE 1986 ST BUYER'S GUIDE

by Gigi Bisson

*A comprehensive list of software, peripherals and accessories now available for the ST computers.*

**ONE YEAR AGO**, Atari ST computer owners in search of software could choose among a letter processor, a graphic program, two games and a spreadsheet. Programmers could write their software with a choice of the C language in the $300 Atari Developer's Kit, the Logo packaged with the machine, or 4XForth. NO, the software selection for this new machine was not spectacular. It barely existed.

Today, according to Atari Corp. President Sam Tramiel, 1,500 developers worldwide are now creating software for the ST computers. That's a lot of software—some of it still in the alpha stage (industry jargon for barely up and running), some of it already catapulting companies into start-up success stories. A good percentage of Atari's ST market is in Europe, and some fascinating products are emerging from that side of the Atlantic. Already, a few of those titles are being marketed in the U.S. Many companies seeing the growing success of the ST have ported their products, originally designed for other computers, to the STs.

What follows is a list of products that manufacturers have promised will be on dealer shelves in time for the busy Christmas season. If a product has been reviewed in Antic magazine or START, an encapsulated review is given, along with the date of the review. The Catalog bound in this issue offers some additional ST products *not* included in this Buyers Guide.

An asterisk (*) indicates an announced product that we have not seen, but that should be available by January 1987. We have seen final versions of the remaining products, but have not had the opportunity to review them. The numbers in parentheses following product names are *Reader Service Numbers*. Use the bound-in *Reader Service Card* to receive information about that product from the manufacturer at no cost to you.

It took a month to compile this guide. During that time new ST packages arrived in the mail nearly every day, and frantic marketing directors called hoping that we could squeeze "just one more" product into a list that grew like Jack's beanstalk. No doubt, before you read this dozens more will emerge. We think it's safe to say the ST has *arrived*!

## Books

*At last count, Abacus had published 12 ST-specific books. Here are our four favorites:*

### *Atari ST GEM Programmer's Reference (125)*

It's not the only book you'll ever need for ST GEM programming, but this 414-page volume helps fill a large information gap with concise listings and programming examples of GEM function calls and VDI parameters. $19.95. (Antic review, 8/86)

### *Atari ST 3-D Graphics (126)*

It's rare when a computer book even *looks* fascinating, but **ST 3-D Graphics** does. This may be the only book available that teaches three-dimensional computer-aided design in assembler for the ST, describing such techniques as rotation and shading, with illustrations and sample programs. $24.95. A disk containing all the programs in the book is available for $14.95.

### *Atari ST Tricks and Tips (127)*

This collection of programming tools and techniques includes program listings for a RAMdisk and a printer spooler. Learn graphic techniques, GEM VDISYS commands. 260 pages. $19.95.

### *Atari ST Internals (128)*

Written for the user who wants a thorough description of the innards of the ST, this 446-page book details the graphic and sound chips, hardware, centronics and RS-232 ports and GEM. $19.95.

*Abacus Books, P.O. Box 7219, Grand Rapids, MI 49510; (616) 241-5510*

### *The Concise Atari ST 68000 Programmer's Reference Guide (129)*

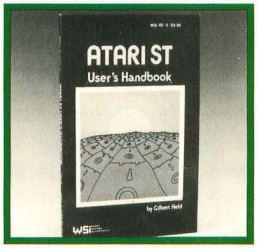
Handy is the word for this Programmer's Reference Guide. Covers the ST hardware, a TOS overview, and ST traps and utilities. Fourteen appendixes show tables and charts of almost everything you want to know and include sections on GEM, TOS, Line-A, System Variables, Configuration registers, and IKBD commands. Also includes a complete section on the 68000 itself, showing instruction breakdowns and programming examples. Price unavailable.

*Glentop Publishers Ltd., Standfast House, Bath Place, High Street Barnet, Herts EN5 5XE.*

### *Atari ST User's Handbook (130)*

This 170-page guide to the ST series of computers discusses peripherals, TOS, graphics, sound, Logo and GEM. $9.95.

*Systems, Inc., 8437 Mayfield Road, Chesterland, OH 44026; (216) 729-2858*




### *Atari ST Logo (131)*

This thick book packed with beginner-level Logo programming tutorials is profusely illustrated with flow charts and photos of programming examples as they appear on the screen. Includes information on how to create simple 3-D pictures in Logo, and tutorials describing how to program an electronic clock and an interactive logic game. $16.95.

*Hayden Book Company, 10 Mulholland Dr., Hasbrouck Heights, NJ 07604; (201) 393-6306*

### *The C Primer (132)*

A revised and updated 303-page version of the original volume by Les Hancock and Morris Krieger. $17.95.

*McGraw-Hill Book Co., 1221 Avenue of the Americas, New York, NY 10020; (212) 512-3493*

### *Atari ST Users Guide (133)*

A bit more than the manual that Atari packed with your ST, this guide tells you how to set up your computer, how to move the mouse, and how to move about the desktop. Some preliminary Logo demonstrations and programming examples. $15.95.

*Osborne McGraw Hill, 2600 Tenth Street, Berkeley, CA 94710; (415) 548-2805*

### *Programmers' Guide to GEM (134)*

This 503-page detailed introduction to GEM for programmers explains the two main components of Digital Research's GEM for IBM and Atari ST—the Application Environment Services (AES), and Virtual Device Interface (VDI)—with clear text and sample program listings. $19.95.

### *Understanding Atari ST BASIC (135)*

You don't need to know BASIC—or any other programming language—to use this book and the BASIC language supplied free with your computer. It starts from the beginning with information about the ST computer, moving around the GEM desktop, and fundamental BA-

GETTING DOWN TO IT. GETTING DOWN TO IT. GETTING DOWN TO IT.

# Business

FOR THE ATARI ST. FOR THE ATARI ST. FOR THE ATARI ST.

NEW!

### *Backup!* by Dave Clemans

When is the last time you backed-up your hard-drive? Would you stake a month's lost labor on it? Probably not. And now you don't have to. *Backup* makes floppy disk backups of your hard-drive quickly and easily.

- Restores files from the back-up after an accident.
- Automatically organizes the entire backup procedure.
- Pull-down menus for easy use.
- Make full or partial backups by use or date.
- Make file or image backups.

**Color and Monochrome . . . . . $39.95**

NEW!

### *Dot Driver* by Timothy Purves

At last, a printer driver that makes Okidata printers and C.Itoh Prowriter printers compatible with your Atari ST! *Dot Driver* processes printer output from any program using GDOS, and prints it on your printer.

**Requires GDOS . . . . . $49.95**

NEW!

### *Laser Driver* by Timothy Purves

This driver makes the Quadram and Hewlett Packard laser printers work with the ST. It processes printer output from any program using GDOS, and prints it on your laser printer. Includes a special screen-dump utility.

**Requires GDOS . . . . . $49.95**

NEW!

### *BBS 2.0* by Timothy Purves

A Bulletin Board Service that's full featured, easy to use, and affordable? Only from MichTron! BBS turns your computer and auto-answer modem into a full-blown electronic mail and message system!

- Easy to set up. Have it running within an hour!
- Maintains up to 1024 messages, limited only by disk space and message size.
- Up to 16 Special Interest Groups (SIGs), each with separate messages, file area, and user access!
- Unique message control format lets you make customized menus, complete with user inputs.
- Multi-user capacity lets the operator and one caller use the BBS at the same time, independently!
- Practically self-maintaining. It takes just a few minutes to update user logs and files.
- Call our BBS for a test run: (313) 332-5452.

**Color and Monochrome . . . . . $79.95**

NEW!

### *Your Financial Future* by William Jenkins

Insight into your finances is vital in planning for the future. With this complete forecaster, you can analyze income and expenses, for a detailed projection of where your budget is headed. Find the strong and weak points, and make your budget more flexible and dependable!

- Detailed projections of your financial situation.
- Change loan conditions to find the best terms!
- Examine one of our times best investments: the IRA!
- Easy to use with pull-down menus and mouse control.

**Color and Monochrome . . . . . $39.95**

## *More Favorites!*

***Business Tools*** - 200 business forms, letters, etc.
**Color and Monochrome . . . . . $49.95**

***Dos Shell*** - Hang up mouse! *Dos Shell* emulates the famous MS-DOS command structure on the ST!
**Color and Monochrome . . . . . $39.95**

***Mighty Mail*** - A complete mailing list manager!
**Color and Monochrome . . . . . $49.95**

Best Seller!

***Cornerman*** - This accessory lets you unclutter your desk: ASCII table, calculator, clock, notepad, phone book/dialer, and more!
**Color and Monochrome . . . . .$49.95**

Best Seller!

***M-Disk*** - This RAM-disk emulator gives you the software equivalent of a hardware disk drive! Fast, durable, incredibly usefull!
**Color and Monochrome . . . . .$39.95**

*All reasonably priced, with more coming every day. Ask for our latest catalog!*

Dealer inquiries welcome • Visa and Mastercard accepted • Add $3.00 shipping and handling to each order.

**MichTron**

*576 S. Telegraph, Pontiac, MI 48053*
*Orders and Information (313) 334-5700*

CIRCLE 026 ON READER SERVICE CARD

SIC programming concepts such as loops and arrays; then moves on to ST graphics, sound, music and text programming. $17.95.
*Sybex Computer Books, 2344 Sixth Street, Berkeley, CA 94710; (415) 848-8233*

## Clocks

### Timekeeper (136)

This $49.95 real-time clock-calendar plugs into the cartridge port on the 520 ST or 1040 ST computers. This is the first cartridge we've seen with a feed-through cartridge slot that allows it to remain installed while using other cartridges. Powered by a 3-volt lithium battery, it displays time, date, alarm.
*Navarone Industries, 21109 Longeway Road, Suite C, Sonora, CA 95370; (209) 533-8349 or (800) 624-6545*

### eSTe (137)

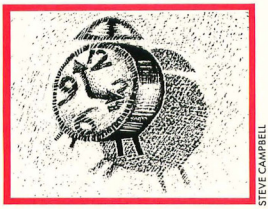
The **eSTe** clock with battery backup comes inside an ST cartridge and is supported with exceptionally good software. $49.95.
*Big Foot Systems, 2708 E. Lake St., Suite 207, Minneapolis, MN 55046; (612) 722-9515*

### Logikhron (138)

Even when your ST is turned off, the battery-operated **LCM-200 Logikhron Clock** cartridge continues to keep time. Software included. $49.95.
*Shanner International, 453 Ravendale Dr., Mountain View, CA 94043; (800) 423-8673*

### Z-Time (139)

This clock isn't a cartridge – it's a chip. Disassemble your ST, pull out one ROM chip and put this chip in. Pop the ROM on top and you have a clock that doesn't hog a cartridge slot. Includes software on disk. $47.50.
*No Solder Required, 351 Massachusets Ave., Cambridge, MA 02139; (617) 547-2408*



STEVE CAMPBELL

### Smart Watch * (140)

To install this clock, remove your number one ROM chip, plug in the **Smart Watch**, and pop the ROM back in the computer. Powered by a lithium battery with a life span of 10 years. Software included. $59.95 for 520 ST version, $69.95 for 1040 ST.
*Michigan Software, 43345 Grand River, Novi, MI 48050; (313) 348-4477*

# COMMUNICATIONS

## Modems

(Editor's note: *Any Hayes-compatible modem with an RS-232 cable will work with the ST computers. Listed here are modems made specifically for the ST.*

### Volks VM520 Modem (141)

This 300/1200 variable-baud-rate, direct-connect ST modem features auto-dial, auto-answer, built-in speaker and a five-year, limited warranty. Fully Hayes-compatible, it includes the ST Talk telecommunications program. $199.99. (Antic review 10/86)
*Anchor Automation, 6913 Valjean Avenue, Van Nuys, CA 94106; (818) 997-7758*

### Supra 300 Baud Modem (142) 300/1200 Baud Modem (143)

Both Supra modems include the Megaterm modem program and plug directly into the ST computer. The 300/1200-baud model sells for $199.95, the 300-baud-rate modem is $59.95.
*Supra Corp., 1133 Commercial Way, Albany, OR 97321; (503) 967-9075*

## Telecommunications Software

### ST-Term (144)

With a six-line status window, variable 300-9600 baud speeds, programmable passwords, ATASCII and VT-252 terminal emulation including the keypad, ANSI emulation compatible with IBM PC ANSI.SYS, connect-time billing calculator, message editor, 24K capture buffer, autodialer and macros, **ST-Term** is a lot of program for $29.95. (Antic review 4/86)

### FoReM ST (145)

Set up your own bulletin-board system with **FoReM ST** and your ST computer. Includes many of ST Term's features, plus space for 10,000 user passwords. Supports electronic mail and controls user access with restrictions on call time, the number of calls, downloads or messages sent and read. Supports Xmodem, Amodem and Kermit file transfer protocols. $99.95.
*Commnet Systems, 7348 Green Oak Terrace, Lanham, MD 20706; (301) 552-2517*

### *Michtron BBS, $79.95 (146) Miterm, $49.95 (147)*

*Michtron, 576 Telegraph, Pontiac, MI 48053; (313) 334-5700*

### *1ST Base BBS * (148)*

Design your own bulletin-board system with 16 file-transfer and message-base areas, on-line games, a "Never-ending story" option, a file section with commands such as browse and locate, message editor, help files. Supports XModem protocol and Hayes-compatible modems. $50.

*1ST Base Software, 48 Amherst Crescent, Nepean, Ontario, K2J 1V9 Canada. BBS# (613) 231-3411*

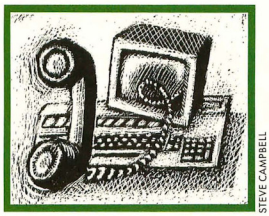
### *I*S Talk (149)*

GEM-based communications program with: over 400K capacity, editing capabilities, a 50,000-word spelling checker, multiple file-transfer protocols, input/output filtering, automatic logon, instant replays of online session commands, macros, and a message-compose window where messages up to 200 characters long may be stored. Replay feature makes it possible for experienced users to program **I*S Talk** as an almost completely automated tool for less experienced users. This could save a great deal of training time in a business environment. 425K capture buffer. Adjusts for baud rates up to 9600. $79.95 (Antic review 11/86)

*Batteries Included, 30 Mural ST., Richmond Hill, Ontario Canada L4B 1B5; (416) 881-9816*

### *Intellicom (150)*

Tap any online service, transfer binary and text files with many protocols. Simple menu structure includes Help file.



STEVE CAMPBELL

Construct automatic logon macros for your frequent calls. User can define the function keys to suit. $69.95.

*Computer Toolbox, 1325 E. Main St., Waterbury, CT 06705; (203) 597-0273*

### *Chat (151)*

This reliable, inexpensive 300/1200-baud telecommunications package supports XMODEM and Capture/Upload protocols, XON/XOFF protocols for transferrring ASCII files, variable delay rates. Hayes-compatible phone directory stores and autodials up to 24 numbers. $19.95 (Antic review 1/86)

*SST Systems, P.O. Box 2315, Titusville, FL 32781; (305) 269-0063*

### *PC Intercomm (152)*

This telecommunications program offers VT 100 or VT 252 terminal emulation, transmission speeds up to 19,200 bps, several file-transfer protocols, autodial phone directory, margin bell, two kinds of cursors—a fancy array of bells and whistles for those willing to pay the price. $124. (Antic review, 2/86)

### *Habacom (153)*

GEM-based telecommunications program supports XModem, Kermit, Atari Binary and CompuServe B protocol. Automatic logon routine, screen buffer, password protection, macros. Emulates VT series, CRT, ANSI and TTY terminals. Baud rates from 50 to 19,200. $49.95.

*Haba Systems, 6711 Valjean Ave., Van Nuys, CA 94106-5889; (818) 989-5822*

### *ST-TALK (154)*

Simple to learn and easy to use, this program lets you access bulletin boards, online services, and other computers. Has built-in Help and Phone Directory. $17.95.

*Quantum Micro Systems, Inc., P.O. Box 179, Liverpool, NY 13088; (315) 451-7747*

## Online Services

### *CompuServe (155)*

Belong to the second largest online information service in the nation. Communicate with 200,000 computer users, including over 2,000 Atari computer enthusiasts. Join countless special interest groups including the SIG ATARI 16-bit Forum, an online users group where ST owners gather to share rumors and thousands of free, downloadable public-domain programs. $35 sign-up fee includes a manual, subscription to Online Today magazine and a 24-hour toll-free number to call for help. From then on, it's $6.25/hour in the evening, $12.50/hour prime time.

***CompuServe, To subscribe, call (800) 848-8199. Ohio residents (614) 457-0802.***

### *GEnie (156)*

GEnie's out of the bottle and making new friends. Part of the General Electric Information Services, it offers news, research information, online communication, email, and entertainment. Signup costs $18.00, and nonprime-time rates

are $5 per hour at either 300 or 1200 baud. Although they're the newcomer on the block, we think they're someone to watch.

*General Electric, (800) 638-9636*

## Databases

### The Manager (158)

This extremely powerful database can handle complex applications such as a complete business accounting system. It sorts files, links databases, redesigns databases already containing information and utilizes the ST's color, but with five disks and 400 pages of documentation, it is complicated to learn. The package contains a database/file manipulation language somewhat similar, but not compatible with, dBase II. The IBM PC version costs $695, making this ST version a comparative steal at $149. (Antic review, 9/86)

*BMB Compuscience Canada, Ltd., 500 Steeles Ave., Milton, Ontario L9T 3P7; (416) 826-2516*

### DataManager ST * (159) Swiftcalc ST * (160)

**Datamanager** is an information storage and retrieval system with report writer for $89.95. The Swiftcalc ST spreadsheet lets you print all columns in the most logical direction—sideways—so everything fits neatly on one continuous sheet of paper. $89.95.

*Timeworks, Inc., 444 Lake Cook Rd., Deerfield, IL 60015; (312) 948-9200*

### DataTrieve * (161)

Easy-to-use file-management system features drop-down menus, includes a RAMdisk for high-speed operation, and can access four files simultaneously. $49.95.

*Abacus Software, P.O. Box 7219, Grand Rapids, MI 49510; (616) 241-5510*

### Regent Base (171)

This relational database responds to simple English commands and the GEM interface is used extensively, with windows, drop-down menus and mouse. The completely machine-language program uses all available memory, has 15 printer drivers and can sort three fields simultaneously. Not dBase II/III compatible. $99.95. See The Catalog in this issue. The **Regent Base Business Template I** is $49.95.

*Regent Software 7131 Owensmouth, Suite 45A, Canoga Park, CA 91303; (818) 882-2800*

### Habaview (162)

This GEM-based filing system and database manager features user-definable "Views": visually rearrange information in any order with the click of the mouse and save Views to disk. $74.95.

*Haba Systems, 6711 Valjean Ave., Van Nuys, CA 91406; (818) 989-5822*

### DB-One * (163)

This file manager is compatible with dBase III—the most popular microcomputer database program. Includes mailing list, labeling, checkbook and inventory. $99.

*Oxxi, Inc., 3428 Falcon Ave., Long Beach, CA 92807; (213) 427-2080 or (800) 453-4900*

### Zoomracks (164) Zoomracks II * (165)

Using a time-card metaphor, **Zoomracks** simulates a series of racks with cards upon which huge amounts of information are stored. One simply "zooms" in and out of details contained on the cards. However, this database has no mathematical capabilities. $79.95. (Antic review, 6/86) **Zoomracks II** has a calculator, mail-merge and report formatting. Data can be imported from other programs including DEGAS. Current owners of Zoomracks can upgrade for $79.95—otherwise it's $149.95.

*Quickview Systems, 146 Main Street, Suite 404, Los Altos, CA 94022; (415) 965-0327*

### dBMan (166)

Versasoft **dBMan** (short for dataBaseManager) is compatible with the most widely used IBM database, dBase III. This true relational database can access records in up to ten different files at once, making it easy to transfer information between files. Experienced dBase III users will feel right at home, but novices will need some time to learn the large repertoire of commands. $149.95. (Antic review, 8/86)

*Atari Corp., 1196 Borregas Ave, Sunnyvale, CA 94086; (408) 745-2000*

### Trimbase, $129 (167)

*Talent Computer Systems, Curran Bldg., 101 St. James Rd., Glasgow G4 0NS; 041-552-2128*

### A-Filer (168)

GEM-based database. $49.95.

### A-Report (169)

Report generator, $49.95.
*Megasoft, Ltd. Box 1080, Battleground, WA 98604; (206) 687-7176*

### ST Base, $39.95., (170)

*Solution Technologies, 11145 Rotherick Drive, Alpharetta, GA 30201; (404) 971-4302*

### DB Master One (172)

This GEM-based database was given away with ST systems last Christmas, but it's certainly worth paying money for. You can begin filing information with this ST version of Stoneware's simple Apple II and Macintosh database the very first time you use it. $49.95. (Antic review, 6/86)
*Atari Corp., 1196 Borregas Ave, Sunnyvale, CA 94086; (408) 745-2000*

### HippoSimple (173)

Geared to the home user, this database promised ease of use, but the version we reviewed (1.0) seemed to be rushed to market too quickly to fulfill that promise. $49.95. (Antic review, 3/86)
*Hippopotamus Software, 985 University Ave., Suite 12, Los Gatos, CA 95030; (408) 395-3190*

### ST-FILE * (174)

Using the GEM interface, create custom record-entry forms to organize any information-oriented task. Handles many different data types—text, numbers, money, time, etc. Has macro command language. $39.95.
*Quantum Microsystems, Inc., P.O. Box 179, Liverpool, NY 13088; (315) 451-7747*

## Desk Accessories

### Helpmate * (175)

We interrupt this spreadsheet to announce—you have an appointment. This "SideKick"-style desk accessory has a neat gimmick—an alarm appointment calendar. At the date and time of an appointment, any GEM-based program will be interrupted and an alarm will sound before a message announces the meeting. $29.95.
*Royal Software, 2160 West 11th Ave., Eugene, OR 97402; (503) 683-5361*

### Rhythm (176)

A drop-down calculator with a twist, **Rhythm** combines the features of a programmable calculator with the basic attributes of a 10-cell spreadsheet. And it's available from the desktop at any time. $39.95. (Antic review, 7/86)
*Softechnics, c/o Apex Resources, 17 St. Mary's Court, Brookline, MA 12146; (617) 232-9686*

### Cornerman (177)

This "SideKick"-style desktop accessory does a little of everything and does it well. Eight functions include a calculator, notepad capable of holding 37,767 messages (all stamped with the date and time), Hayes Smartmodem-compatible phonebook with autodialer, ASCII table, 15-square puzzle and real-time clock. $49.95. Uses 240K of memory, so TOS on ROM is required. See The Catalog in this issue. (Antic review, 11/86)
*MichTron, 576 Telegraph, Pontiac, Michigan 48053; (313) 334-7500*

### SideCar * (178)

Another "SideKick" clone, this desktop organizer includes calculator, calendar, notepad, address book, ASCII table and "mini ST DOS," a program that lets you perform DOS commands such as "copy," "delete," and "rename" without returning to the ST desktop. $49.95.
*Migraph, (206) 838-4677*

### ST-Key (179)

This GEM desk accessory creates 20 macros that can be accessed with the ST function keys from within any application. $19.95.
*Shanner International, 453 Ravendale Dr., Mountain View, CA 94043; (800) 423-8673*

### Back-Pack (180)

Nine useful and well-designed functions on a cartridge. Includes: scientific calculator, two clocks, diary, notepad, typewriter, printer buffer, RAMdisk, and address book. $69.95.
*Computer Concepts, FREEPOST, Hemel Hempstead, Herts HP2 4BR, England; (0442) 63937*

## Educational

### Typing Tutor + Word Invaders (181)

**Typing Tutor** teaches touch typing, then **Word Invaders** tests skills by blasting words as they fall out of the sky in a "Space Invaders" style shoot'em-up. 100,000 copies of this program have sold in versions for other computers. $34.95.
*Academy Software, P.O. Box 6277, San Rafael, CA 94107; (415) 499-0850*

### Señor Tutor * (182)

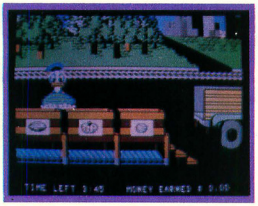
El Español es fácil when **Señor Tutor** turns your computer into a talking Spanish teacher. Incorporating a software-based speech synthesizer,

**Señor Tutor** teaches conversational Spanish lessons like Greetings and Phrases, Around the House, Know Your Body and A Trip to the Market. $49.95.
*Finally Software, 4000 MacArthur Blvd., Suite 3000, Newport Beach, CA 92663; (714) 854-4434*

### Winnie the Pooh (183) Donald's Playground * (184) Wiztype * (185)

**Winnie the Pooh in the Hundred Acre Wood** is the only ST graphic text adventure game for children. Though it's not really an educational program, this simple but challenging, cleverly illustrated game will exercise writing and logical thinking skills in kids age 7 and up. $24.95. (Antic review, 8/86)

Teach your kids the fundamentals of capitalism with **Donald Duck's Playground**. Kids from ages 7 to 11 help Donald work at McDuck Airlines and Amquack railroad in order to earn




money, purchase equipment and build a playground. Huey, Duey and Louie are on hand to play in the full-color animated playground with music and elaborate sound effects. *Family Computing* magazine gave this the 1986 Outstanding Educational Software Award. $24.95.

This entertaining typing tutor features the Wizard of Id cartoon characters. **Wiztype** challenges all ten fingers to zap the Spirit with animated pictures and sound. Or race with Bung the jester from line to line as you learn to type fastfastfast—up to 120 words per minute. $24.95.
*Sierra Online, P.O. Box 485, Coarsegold, CA 93614; (209) 683-6858*

### Ted Bear's Rainy Day Games (186)

Introduce your kids to a lovable new playmate. **Ted Bear** brings to life the classic card games of Concentration, Old Maid and Go Fish with his winsome ways. This software allows the curious user to see how the program was constructed and customize it. Ages 4 and up. $34.95.
*Baudville, 1001 Medical Park Drive, S.E. Grand Rapids, MI 49506; (616) 957-3036.*

### Homework Helper Math Word Problems (187)

Highly acclaimed Spinnaker Software has converted their first educational program in the Homework Helper series to the ST. These programs utilize role-playing simulations to help kids in grades 7-12 understand and solve math word problems. $49.95.
*Spinnaker Software, One Kendall Square, Cambridge, MA 02139; (617) 494-1200*

### Word for Word (188)

Scrabble-like crossword game for one to four players uses GEM and has a 20,000-word vocabulary. $39.95. (Antic review, 4/86)
*Bay View Software, 177 Webster Street, Suite A-295, Monterey, CA 93940; (408) 373-4011*

### Earthspace (189)

The Earth's living ecology, biosphere, DNA, and man's impact on the environment are covered in this educational slideshow suitable for fifth and sixth-grade level life science classes. The graphics, created with Batteries Included's DEGAS, are beautiful, but the program only works on double-sided disk drives. $29.95.
*Digital Reality, 362 West Broadway, New York, NY 10013; no listed phone.*

### Linkword * (190)

Learn a foreign language in just ten hours with the **Linkword** Language Series. By linking foreign words to accoustically similar English words and imagery (e.g., Spanish for "cow" is "vaca" – imagine a cow with a vacuum cleaner) you'll learn a 400-word vocabulary and conversational grammar. Each language comes with an audio tape so you can hear the correct pronunciation of the words. Available in French, Spanish, German, Italian, Russian, Dutch, Greek or Portugese. $29.95.
*Artworx, 150 North St., Fairport, NY 14450; (800) 828-6573*

### Math Wizard * (191) Decimal Dungeon * (192) Fraction Action * (193)

All these combine arithmetic practice with an adventure game scenario. **Math Wizard** requires a color monitor; the others work with either. $39.95 each.
*Unicorn Software, 2950 E. Flamingo Rd. #B, Las Vegas, NV 89121; (707) 737-8862*

## Entertainment

### Silent Service (194)

You can almost smell the diesel oil and feel the deck rolling beneath your feet as this realistic historical submarine simulation captures the thrill and danger of captaining a WWII submarine in

the South Pacific. Microprose's first Atari ST product is definitely not a direct port of the Atari 8-bit version. The sounds of the sea, engine, enemy ships are so realistic they have been compared to studio recordings. $39.95. See The Catalog in this issue.

*Microprose, 120 Lakefront Drive, Hunt Valley, MD 21030; (301) 667-1151*

### Dr. Xes * (195)

Searching for the meaning of life? Talk to **Dr. Xes**—and your computer talks back. This advanced version of Dr. Joseph Weizenbaum's classic "artificial intelligence" program, ELIZA, utilizes a software-based speech synthesizer, color graphics, and all of the ST's memory. Promises to be a hit at parties and, better yet, unlimited gestalt therapy sessions with Dr. Xes are only $49.95.

*Finally Software, 4000 McArthur Blvd., Suite 3000, Newport Beach, CA 92663; (714) 851-6464*

### ST Star Raiders (196) Joust * (197)

The original Star Raiders was the game that gave people a reason to run out and buy an 8-bit Atari computer. Although **ST Star Raiders** might not provoke the same reaction in a new generation of Atari ST users, this dizzying, high-speed astral shoot'em-up is destined to set new arcade game standards.

For a mere 120 quarters you can buy your very own copy of one of the classic arcade games that catapulted Atari Corp. to profitability in the early '80s. Joust midair aboard a majestic flying ostrich in **Joust**. This conversion by The Rugby Circle is even faster, smoother and more finely detailed than the dedicated arcade machine version. **Battlezone** and **Centipede**, created by the world's biggest software house, the Hungarian firm of Andromeda Software, will follow. $29.95 each.

*Atari Corp., 1196 Borregas Ave, Sunnyvale, CA 94086; (408) 745-2000*

### Time Bandit (198)

Travel through time into 16 different lands from ancient Egypt to the old West and beyond. Graphics are superb and animation abounds in an arcade game that may someday qualify as a true ST classic. $39.95. See The Catalog in this issue. (Antic review, 10/86)

*Michtron, 576 S. Telegraph, Pontiac, MI 48053; (313) 334-5700*

### Cards (201)

Cards plays a superior game of blackjack, and also throws in cribbage, and three kinds of solitaire. Select and move cards with the mouse as you gamble with the fastest dealer around—your ST computer. $39.95. See The Catalog in this issue. (Antic review, 9/86)

*Michtron, 576 South Telegraph, Pontiac, MI 48035; (313) 334-5700*

### Desert Transport Simulator * (199)

"Drive a transporter tanker truck through a post-World War II wasteland to a newly-discovered uncontaminated waterhole" says the product announcement for the first game from the folks who brought you the Graphic Artist. $54.95.

*Progressive Computer Applications, 2002 McAuliffe Drive, Rockville, MD 20851; (301) 340-8398*

### Mean 18 (200)

Up to four players can golf on the famous fairways of St. Andrews, Augusta National and Pebble Beach in this realistic golf simulator. A "golfcourse architect" feature lets players move sand traps around, relocate the pin, or design a whole course. $44.95.

*Accolade, 20833 Stevens Creek Blvd. B-E, Cupertino, CA 95014; (408) 446-5757*

### Autoduel * (202)

Drive the freeways of the future where the right of way goes to the biggest gun. A fast-paced strategy game by Lord British and Chuckles. Based on the award winning Car Wars board game by Steve Jackson.

### Exodus—Ultima III * (203)

The world of Ultima III is a living tapestry—complete and beautiful—maybe the best fantasy game in computing. By Lord British, a veritable JRR Tolkien of the keyboard.

*Origin Systems, Inc., 340 Harvey Road, Manchester NH 03103; (603) 644-3360*

### Harrier Strike Mission * (204)

Take off from an aircraft carrier, fight enemy aircraft, bomb ground installa-

tions and try to get back safely. $44.95
*Miles Computing, Inc., 7741 Alabama Ave., Suite 2, Canoga Park, CA 91304; (818) 341-1411*

### Video Vegas * (205)

Try the slots, Keno, blackjack and poker with **Video Vegas**. $34.95.
*Baudville, 1001 Medical Park Drive, S.E., Grand Rapids, MI 94506; (616) 957-3036*

### Hippo Backgammon (207)

Simulates a backgammon board in color with pips that actually slide across the board. Offers a choice of two programmable robot opponents—both play a pretty mean game. $39.95. (Antic review, 8/86)
*Hippopotamus Software, 985 University Ave., Los Gatos, CA 95030; (408) 395-3190*

### Diablo * (208)

Diablo doesn't compare to anything you have ever played—well, maybe Marble Madness. This untraditional arcade-style maze game is based upon Diablotin, a European game consisting of tracks, a panel and a ball. $29.95.
*Classic Image Software, 510 Rhode Island Ave. Cherry Hill, NJ 08002; (609) 667-2526*

### Rack Your Brains ST-POOL * $39.95 (209)

*Shelbourne Software, 7221 Rising Sun Ave., Suite 191, Philadelphia, PA; 19111 (215) 725-5644*

### Strip Poker (210)

Settle in for a sizzling evening of Strip Poker as you pit your poker playing skills against Suzy and Melissa. The more you win, the more layers of clothing these heavy-chested women take off. (Data disks of equally over-developed men are available separately.) $39.95.

### Bridge 4.0 (211)

Mouse-driven, bridge-playing program keeps track of the score and even informs you of illegal bids. $29.95.

### Compubridge (212)

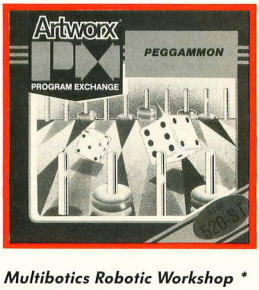
Sharpen your bridge skills with ten bridge tutorials and eight computer-generated quizzes. $17.95.

### Hole-in-One Golf * (213)

Welcome to the Fairport Country Club where you have total control over club selection, strength of swing, hook or slice. And if you don't like the course, change it with the Course Creator. $29.95.

### Peggammon * (214)

A different approach to backgammon places the pips on three-dimensional pegs. $17.95.
*Artworx Software, 150 N. Main St., Fairport, NY; (800) 828-6573.*




### Multibotics Robotic Workshop * (216)

This complete electronic instrument kit includes an interface unit, D.C. motors, gears, sensors, components, software and instructions for 50 projects such as oscilloscopes, cars, cranes, and sound digitizers. $129.95.
*Access Software, No. A 2561 S. 1560 West, Woods Cross, UT 84087; (801) 298-9077.*

### Flight Simulator II

Sublogic's flight simulators for microcomputers are state of the art. This mouse-controlled ST version features a smooth zoom, a multi-player mode, and multiple viewpoint windows. You can fly a prop plane or a Learjet—or dogfight in a simulation World War I craft. The detail, full color, and real-time perspective graphics rival all their previous versions. $49.95.
*Sublogic Corporation, 713 Edgebrook Drive, Champaign, IL 61820; (800) 637-4983*

### Leader Board (215)

Levels of play from novice to professional, four different courses, shadows beneath the flying ball, the "thock" as the club meets the ball and the splash as it hits the water, all add to the extreme realism of this golf simulator. $39.95.

### The NeverEnding Story * (218)

Save the world of "Fantasia," in this richly illustrated and highly imaginative graphics-text adventure game. $29.95.
*Datasoft/IntelliCreations, Inc., 19908 Nordhoff Place, Chatsworth, CA 91311; (818) 886-5922*

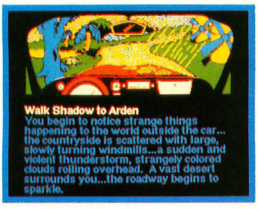
### TechMate * (219)

This computer chess program is rated three times more powerful than Belle's algorithm (once the pinnacle of computerized chess), and was designed specifically for the Atari ST–not just brought over from the 8-bit world. It uses the mouse exclusively for making moves, and requires the RGB color monitor to achieve its excellent visual effects. Play against the computer or human opponent. $49.95.

*Szabo Software, P.O. Box 623, Borrego Springs, CA 92004; No phone listed.*

### Perry Mason: The Case of the Mandarin Murder (220)
### Fahrenheit 451 (221)
### Nine Princes in Amber by Roger Zelazny (222)
### Amazon by Michael Crichton * (223)
### Dragonworld by Preiss and Reaves * (224)

The beautifully packaged Telarium line of interactive fiction software is based on science fiction and mystery novels by famous authors. Instead of turning




the page to find out what happens, you experience the action and participate in the outcome of these graphic adventures. Color monitors only. $44.95 each. (Antic review, 5/86)

### Treasure Island (225)
### The Wizard of Oz * (226)

The Windham Classics line of novels are designed for kids from ages 8-15 who want to learn how to read better while having an adventure. They feature full-color graphics, music, sound and a command called WORDS that lists all appropriate words for each individual scene. $39.95.

*Spinnaker Software, One Kendall Square, Cambridge, MA 02139; (617) 494-1200*

### Mindshadow (227)

You wake up on a deserted beach with a bad case of amnesia. Who are you? Go north, south, east, west and finally to Europe to find the answer in this illustrated adventure game. $49.95.

### Hacker (228)
### Hacker II: The Doomsday Papers (229)

The sequel to Activision's highly successful **Hacker** ($44.95) has a similar save-the-world plot (remarkably close to the 1983 hit movie "Wargames"), but the resemblance ends there. **Hacker II** ($49.95) has incredible graphics–video screens complete with bad reception, video tapes that can be rewound and fast forwarded and "real time" clocks. The balance of world power could be in your hands as a top Russian scientist plots to overthrow the US in this us versus them adventure. (Antic review, 11/86)

### Borrowed Time (230)

It's 1934. You're Sam Harlow, private eye. Nice guy, usually, but someone wants you dead. Think fast. You're living on borrowed time. This illustrated text adventure game uses all of the Atari ST's strengths admirably. $49.95. (Antic review, 6/86)

### Little Computer People Discovery Kit (231)

This program can only be described as a computerized dollhouse. Little people have been discovered living inside your computer. They play the piano, hack on the computer, and open and shut doors. Feed them, pet them, but never, ever forget to water them. . . $44.95.

### GBA Championship Basketball
### GSL Championship Football
### Championship Baseball '86
### Garry Kitchen's Game Maker: The Computer Game Design Kit

These five titles are slated for Winter release.

*Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94039; (415) 960-0410.*

### Rogue (236)

The way to the "Amulet of Yendor" is strewn with trap doors, deadly darts and sleeping gas in **Rogue**, the ST version of the mainframe classic that was once a cult phenomenon in college computer labs. Nice graphics. $39.95.

### Temple of Apshai Trilogy (237)

Seek treasures and slay monsters of the Temple in the ST adaptation of Epyx's classic, 8-bit fantasy/role-playing maze games. $39.95.

### Winter Games (238)

The Atari ST version of the very successful Olympic winter games simulation. $39.95

### World Games * (239)

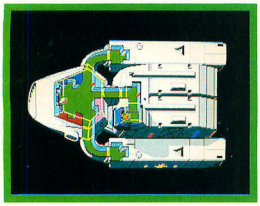
In World Games, up to eight players can be international athletes traveling to Mexico for death-defying cliff diving, Japan for Sumo Wrestling, barrel jumping

in West Germany, slalom skiing in France or weight lifting in the U.S.S.R., in an attempt to set world records. $39.95

*Epyx, 1043 Kiel Court, Sunnyvale, CA 94089; (415) 366-0606*

### Sundog (240)

It all begins as your uncle dies mysteriously, leaving you his spaceship Sundog. Just before he died he accepted a contract to deliver cryogens (frozen colonists, if you will) to a new colony. . . **Sundog: the Frozen Legacy** is an outstanding example of what can be accomplished with the Atari ST. This completely mouse-driven fantasy game combines graphics, action and problem-solving with unusual depth and incredible attention to detail. $39.95. (Antic review, 7/86)



### RPV * (250)

Find yourself in command of vehicles patrolling for hostile craft while skimming the surface of an alien planet. FTL promises that this space simulation will leave Sundog in the dust. $39.95.

### DungeonMaster * (260)

Move ahead, turn, open doors and learn the secrets of the **DungeonMaster** in this illustrated text adventure with beautiful graphic screens that seem to actually bend around a labyrinth of corridors, chambers and twisting stairways. $39.95.

*FTL Games, 60 Lusk Bvd. Suite. C-206, San Diego, CA 92121; (619) 453-5711*

### Brimstone (233)

Sir Gawain, proud Knight of the Round Table has been given his most difficult quest—escape from the chaotic underworld of Ulro with the five Mystical Words, or be trapped for eternity in this electronic novel. $44.95

### Mindwheel (234)

There's only one way to save Earth from self-destruction—a mind-bending telepathic trip back to the beginning of civilization. During this voyage, you must negotiate with four minds: a peace-activist rock star, the dictator, the poet and a gifted scientist. An electronic novel. $44.95

### Essex (235)

A sci-fi, all-text electronic novel in similar format to Brimstone and Mindwheel. Software is packaged with accompanying hardcover book. $44.95.

*Broderbund Software, Inc., 17 Paul Drive, San Rafael, CA 94903-2101; (415) 479-1170.*

### Leather Godesses of Phobos * (262)

Plunge into the seamy side of the solar system in this spoof of 1930's pulp science fiction. Written by Steve Meretzky (a guy who knows his stuff), it begins in a bar in Upper Sandusky, Ohio, where you're snatched by the raunchy Leather Goddesses of Phobos. They want to test you out with indescribably degenerate equipment in preparation for their invasions of Earth, which they plan to turn into their private playground. Luckily, you have the notorious scratch-and-sniff card and 3-D glasses to help crack this mystery. Choose one of three levels: tame (yawn), suggestive (PG-13), and lewd. $44.95.

### Trinity (261)

**Trinity** lies somewhere between Alice in Wonderland and The Twilight Zone, where magic and physics coexist, and every atomic explosion that has ever occurred is inexplicably connected. Eventually, you may reach the New Mexico desert on July 16, 1945, minutes before the world's first atomic explosion, code-named Trinity. You have a choice to make: Trinity puts destiny in your hands and lets you decide what will happen. $44.95.

### Moonmist * (263)

A full moon is rising above the battlemented tower as the surf pounds against the rocks. Is that a ghost, or is the mist playing tricks on your weary eyes? Sounds like a gothic romance to me. Written by Stu Galley (author of Witness) and Jim Lawrence, who wrote several Hardy Boys and Nancy Drew stories, this introductory-level text adventure is designed to appeal to women as well as men. $44.95.

### A Mind Forever Voyaging (264)

Infocom's first 128K game was written by the venerated Steve Meretsky especially for the ST. You wake up in 2031 making the shocking discovery that your life and memories are just electronically implanted delusions. The game introduces the "oops" command: If you type something stupid like "Go norbh," rather than retyping the whole command, a simple "oops north" will correct it. Nifty. $44.95. (Antic review, 4/86)

*Infocom makes the best all-text adventures in the business. In addition to the new titles above, all of the Infocom titles are available for the Atari ST. Many at a price of $39.95 each.*
*Infocom Inc., 125 Cambridge Dr., Cambridge, MA 02140; (617) 492-6000*

### Oo-Topos (267)

This science fiction space-pirate graphic/text adventure has a vocabulary of over 1,000 words and understands multiple-sentence commands. Written by Michael Berlyn (author of Infocom's Suspended, Infidel and Cutthroats) and his wife, Muffy, a former astrology columnist for a sister publication of the National Enquirer. $19.95.

### Transylvania (268)
### Crimson Crown (269)

The king's daughter disappeared mysteriously, so you journey to **Transylvania**. During the search, you are confronted by bats, floating figures, voices from nowhere and an annoying werewolf. Free the Crimson Crown from the vile vampire's hands in **Crimson Crown** (The Further Adventures of Transylvania). Colorful graphics breathe life into these text adventures. (Antic review, 4/86) Also from Polarware: **The Coveted Mirror** and **Sword of Kadash**. Best of all, the prices of all Polarware games have been slashed in half to $19.95.
*PolarWare/Penguin, 2600 Keslinger Rd., PO Box 311, Geneva, IL 60134; (312) 232-1984*

### Ultima II (270)

This extremely popular adventure game by Lord British sits in GEM with full drop-down menus from which you may choose your armor, weapons and make other life-and-death decisions. $59.95. See The Catalog in this issue.

### Space Quest: the Sarien Encounter * (273)

Meet Roger Wilco, sanitation engineer turned space-age swashbuckler as he meets creatures as weird as anything in Star Wars. This animated adventure requires TOS in ROM. $49.95.

### King's Quest II: Romancing the Throne (272)

Keyboard or joystick moves Sir Gawain as he walks, jumps, ducks, swims and climbs through 80 detailed screens. $49.95.

### Grand Master Chess, $39.95, * (274)

*Sierra On Line, Sales Dept., P.O. Box 485, Coarsegold, CA 93614; (209) 683-6858*

### The Pawn (275)

This game is already a classic. The Pawn has gorgeous high-resolution color graphics and a text-handling system that allows one to converse with the game in extremely complicated sentences. It absolutely pushes the ST to the graphic limits. $44.95.

### Starglider * (276)

We know only three things about this game: it's a strategic combat flight simulation created with animated, three-dimensional vector graphics and digitized sound; it costs $44.95; and it's from the makers of the Pawn, so it could be spectacular. . .

### Golden Path * (277)

Seek the true path to wisdom and power through this complex graphic adventure of classic proportion. Through all of life's tribulation you will be aided by the scroll of knowledge and the friendly powers you will meet along the way. $44.95.
*Firebird Licencees, 74 N. Central Ave., Ramsey, NJ 07746; (201) 444-5700*

### Brattacas (278)

Enter the Orwellian world of Kyne as he flees an oppressive government punishing him for a crime he did not commit. But be careful, the colonized asteroid Brattacas is a rough neighborhood to go snooping around in. This adventure game has ambitious (but hard to maneuver) animated graphics. $39.95. (Antic review, 6/86)

### Cinemaware * (279)

Billed as bringing the sociological predictions of media analyst Marshall McLuhan to life, Mindscape has unveiled the first interactive movie software, Cinemaware, to a flurry of hype. This collection of interactive graphic computer games will have movie themes and employ cinematic techniques such as tilts, pans, closeups and 360-degree turns and original soundtracks. $49.95.
*Mindscape, 3444 Dundee Rd., Northbrook, IL 60062; (312) 480-7667*

### Gateway (280)

**Gateway** is not only an exciting text/graphic adventure; it plays the way an ST game should with a built in RAM-disk for faster disk access and GEM interface. If you get stuck, K'rnth—a sort of

mutant offspring of the Cheshire cat—pops up at the click of a mouse to offer help. $39.95. (Antic review, 11/86)
*Action Software, 69 Clementina St., San Francisco, CA 94107. (415) 974-6638.*

### Deep Space (281)

An intersteller graphics adventure encompassing both warfare and exploration wherever your STRIX fighter can take you. Price unavailable.
*Psygnosis Ltd., 1st Floor, Port of Liverpool Bldg., Pier Head, Liverpool L3 1BY, England, (051) 236-8818*

### Pro Football Wizard (282)

Predicts the outcome of NFL football games. $39.95

### 8 Ball (283)

A one or two player pool-shooting game for either monochrome or color monitors. $39.95.

### Gold Runner (284)

Infiltrate enemy gold mines. Test your skill and logical powers. Requires color monitor. $39.95

### Major Motion (285)

Race down the highway destroying enemy spies as you gain new weapons and defenses. Requires color monitor. $39.95

### Mission Mouse (286)

A monochrome game—avoid the prowling cats as you climb to the next level. $39.95.
*Michtron, 576 S. Telegraph, Pontiac MI 48053; (313) 334-5700*

### Universe II (287)

Get jolted out of your space rut with a deep-cover assignment for the galactic government. Role playing and adventure combine to make this game unique. $69.95.
*Omnitrend Software, P.O. Box 3, West Simsbury, CT; (203) 658-6917*

## Graphics

### Paintworks (288)

Unlock the graphic potential of your ST with this easy-to-use program. With color cycling, **Paintworks** can animate objects with a spectrum of flashing colors, making them appear to move. Create musical slideshows by teaming up Paintworks with Activision's compatible Music Studio program. $39.95. (Antic review as N-Vision, 8/86)
*Activision Inc., 2350 Bayshore Parkway, Mountain View, CA 94043. (415) 960-1410*

### DEGAS (289)
### DEGAS Elite (271)

This is the best-selling Atari ST program and no wonder why. **DEGAS** was written for the ST, designed on the ST and unlocks the graphic potential of the ST.

Almost completely mouse controlled, you alternate back and forth between a full-screen menu and a drawing screen with 16 colors, 38 fill patterns and a variety of "brushes," lines and shapes as your drawing tools. Works in all three screen resolutions, color or monochrome. See The Catalog in this issue. $39.95. (Antic review, 2/86) **DEGAS Elite** does DEGAS one better with color cycling animation, multiple screens, and many new features that create computer graphics that do justice to the ST. $79.95.
*Batteries Included, 30 Mural St., Richmond Hill, Ontario L4B 1B5, Canada; (416) 881-9816*

### Colourspace Light Synthesizer (290)

Is it graphics, is it entertainment? Jeff Minter's wild foray into computer-generated post-60s psychedelia creates stroboscopic fireworks and pulsating colors on the ST screen. $29.95.
*Apex Resources, 17 St. Mary's Court, Brookline, MA; (617) 232-9686.*

### PaintPro * (291)

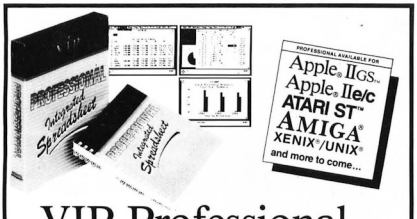
GEM-based painting and drawing program for both color and B&W systems. Make and save double-sized pictures and get hardcopy with most printers. $49.95.
*Abacus Software, 2201 Kalamazoo SE, P.O. Box 7211, Grand Rapids, MI 49510; (616) 241-5510*

### HippoVision Digitizer (292)

Still the only digitizer widely available for the ST, HippoVision creates digitized images using a color or B&W video camera, or captures images off a VCR or television set. Touch up the resulting graphics with DEGAS or NEOchrome and print them out. Black and white high-contrast mode or up to 16 grey levels with color monitors. Includes hardware, software and demo disk. See The Catalog in this issue. $139.95.

### Hippo Art * (293)

A collection of 30 full-color clip-art pictures and icons of cars, flowers, food,




# VIP Professional™

## The New Generation Spreadsheet

## Spreadsheet, Database, Graphics and Macros With Total Lotus 1-2-3™ Functionality

**VIP Professional** Professional was modeled after the powerful, best-selling Lotus 1-2-3. It not only has the same commands and features, you can also type the same keys to do the same things. It can also read and write Lotus files and run all Lotus macros. So you have immediate access to thousands of published models, templates and macros. Plus you can import and export ASCII files, dBASE files and Symphony files. Desktop accessories to help you make the most of Professional, and share data with the rest of the business world.

**Mouse Interface** You may elect to use the keyboard for all commands, but Professional also provides a full-featured mouse interface with Icons, Dialogue Boxes, Pull-down Menus, Mouse Ranging, and Scroll Bars. This makes command selection, movement in a sheet, range selection, split-screen use and a score of other functions much more intuitive and easy to use. What were once complex commands with Lotus are now only a mouse-click away.

**1. Spreadsheet** Nothing is left out of this giant 256 column by 8192 row spreadsheet. You get variable column width, split screens, frozen titles, sorting, file combine and extract, copy, move, range naming, local and global cell protection, total printer control, and over 50 special functions to make worksheet creation a snap. And Professional supports up to four megabytes of memory – when you need real power!

**2. Database** Professional includes a powerful data manager to help you arrange, store and analyze information about your home or business. It allows up to 8192 records, with up to 256 fields, and has commands for sorting, data queries and statistical analysis.

**3. Graphics** With Professional's presentation graphics you can give shape to your figures with five different types of graphs – pie chart, bar, stacked-bar, line and XY graphs. With the many options available you can decorate your graph just about any way you wish. You can also print presentation-quality graphs with different fonts, sizes – and colors too!

**Macros** Professional features macros for automating repetitive tasks. Macros also allow you to program Professional for doing your accounting, inventory control, even school work.

**Just Minutes to Learn** Professional comes with a user-sensitive handbook for the newcomer. And help is built right into the program. With the handy tutorial you will be able to create your first worksheets in just minutes.

* Features may differ on different versions. Contact your dealer for further details.
* ISD Professional UNIX/XENIX Multiuser systems contact Santa Cruz Operation (800) 626-UNIX / (408) 425-7222

VIP Professional is a trademark of VIP Technologies Corp. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. Apple IIGS is a trademark of Apple Corp. Apple and Apple IIe/c are registered trademarks of Apple Computer Inc. Amiga is a registered trademark of Commodore Amiga Inc. Atari ST is a trademark of Atari Corp. UNIX is a registered trademark of AT&T. XENIX is a trademark of Microsoft Corporation. ISD Professional is a trademark of Santa Cruz Operation Inc.
Copyright — 1989 VIP Technologies Corp.
Specifications and availability subject to change without notice.

FOR MORE INFORMATION CALL
**1-416-479-1880**
U.S. ORDERS SHIPPED FROM U.S.

**ISD MARKETING INC.**
20 Steelcase Road, Unit 12
Markham, Ontario, Canada L3R 1B3

CIRCLE 019 ON READER SERVICE CARD

---

MW-550 ATARI ST 24 BIT PARALLEL I/O CARD $79.95

THIS BOARD PLUGS INTO THE ATARI ST CARTRIDGE PORT, AND ALLOWS ONE TO PROGRAM 24 BITS OF INPUT/OUTPUT TTL LEVELS. THIS UNIT CAN BE USED TO READ PARALLEL DATA, AND PROGRAM PARALLEL OUTPUTS FOR SUCH APPLICATIONS AS PROCESS CONTROL, AND STATUS MONITORING.

MW-560 ATARI ST CARTIDGE ADAPTER $14.95

THIS BOARD PLUGS INTO THE ATARI ST CARTRIDGE PORT AND ADAPTS TO A STANDARD .156 SPACING FEMALE CONNECTOR. THIS UNIT CAN BE USED TO CONNECT STANDARD SPACING PROTOTYPE CARDS TO THE ATARI ST.

MW-570 ATARI 16 CHANNEL A/D CONVERTER WITH DIGITAL OUTPUTS $225

THIS UNIT PLUGS IN THE RS-232 SERIAL PORT OF ST, AND PROVIDES EIGHT-BIT RESOLUTION OF 16 ANALOG INPUTS. THIS BOARD CAN ALSO DRIVE 14 OUTPUT CHANNELS WITH SWITCHING CABABILITY UF 300 MILLIAMPS AND 30 VOLTS.

MICRO R&D INC.
3333 S. WADSWORTH
UNIT A-104
LAKEWOOD CO. 80227
303-985-1473

CIRCLE 030 ON READER SERVICE CARD

---

AT LAST

# CHILDREN'S EDUCATIONAL PROGRAMS FOR YOUR ATARI ST

Ages 5-10

1 or 2 players

$39.95

- Addition
- Subtraction
- Multiplication
- Division
- Equations
- Word Problems
- Multiple Activities & Difficulty Levels
- Superb Graphics

## OTHER AVAILABLE TITLES

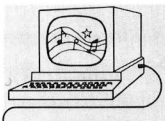
★ READ & RHYME ★ FRACTION ACTION
★ KINDERAMA ★ DECIMAL DUNGEON

UNICORN™ EDUCATIONAL SOFTWARE

2950 E. Flamingo
Greenview Plaza, Suite B
Las Vegas, NV 89121
(702) 737-8862

CIRCLE 041 ON READER SERVICE CARD

---



# Dr. T's MUSIC SOFTWARE

## *THE MOST POWERFUL MIDI MUSIC SOFTWARE IS NOW AVAILABLE FOR THE MOST POWERFUL HOME COMPUTER!*

Dr. T's Music Software is currently developing a complete line of MIDI music software taking FULL advantage of the power and features of the ATARI 520/1040ST computers.

**NOW AVAILABLE . . .**

**KEYBOARD CONTROLLED SEQUENCER** **$195**
Full MIDI parameter/note editing, cut and paste editing, 48 tracks, 126 sequences, 50,000+ notes 520ST, 130,000+ notes 1040ST, MIDI song pointer, and MUCH MORE!

**MIDI RECORDING STUDIO** **$39**
6-Tracks, full cut and paste editing, data compatible with Keyboard Controlled Sequencer, and MORE! Full credit on trade-up to KCS.

**CZ PATCH** **$99**
Graphic display of envelopes, full edit/librarian features, point and click, 240 sounds on the disk!

**COMING SOON . . .**
A full line of sound ecitors, music score printing/editing utilities, algorithmic composition tools, and more! Call or write for details.

***LIMITED ONLY BY YOUR IMAGINATION . . .***

**Dr. T's MUSIC SOFTWARE,** 66 Louise Rd., Chestnut Hill, MA 02167 **(617) 244-6954**

CIRCLE 015 ON READER SERVICE CARD

animals and famous people. Compatible with NEOchrome and Paintworks. Color only. $39.95.
*Hippopotamus Software, 985 University Ave. Suite 12, Los gatos, CA 95030; (408) 395-3190*

### PowerVision (294)

Develop NEOchrome frames into slide presentations with special effects. Also compresses NEO to get 40 pictures per disk. $24.95.
*Power Systems, 43328 S.E. 176th St., North Bend, WA 98045; (206) 888-2828*

### The Animator (295)

Animated pictures created with NEOchrome, DEGAS or Paintworks come to life. Color only. $29.95.
*Michtron, 576 Telegraph, Pontiac, MI 48053; (313) 334-5700*

### ST Coloring Book (296)

*The Dragon Group, Inc., 148 Poca Fork Road, Elkview, WV 25071; (304) 965-5517*

### Printmaster (297)

This clone of Broderbund's phenomenally popular Print Shop graphic program lets you crank out greeting cards, signs, stationery, calendars and banners on most dot-matrix printers. Unlike Print Shop, you can mix different graphics on a page, mix type fonts, and use both upper and lower case letters. $39.99. (Antic review, 7/86)
*Unison World Inc., 2150 Shattuck Ave., Suite 902, Berkeley, CA 94704; (415) 848-6666*

### Typesetter ST (450)
### Rubber Stamp ST (451)
### Megafont (452)

Use DEGAS or NEOchrome to design complete pages of text and graphics for printouts on most popular dot-matrix printers. **Rubber Stamp ST** manipulates your artwork—expand, shrink, flip, rotate, mirror, overlay, and more. Print text files in different fonts and sizes with **Megafont**. Each package costs $39.95. (298)
*XLEnt Software, P.O. Box 5228, Springfield, VA 22150; (703) 644-8881*

### Make It Move * (299)

Your artwork comes to life with this graphic animation program, compatible with all popular ST paint programs. Make business presentation graphics, attention-getting commercial messages for your store or trade-show booth, or animation sequences for home and industrial video recordings—utilizes zooms, fades, rotations and moving fonts. $49.95.
*Avila Associates, 3646 Baker Lane, Lafayette, CA 95459; (415) 284-5982*

### Holiday Clip Art (300)

For those who can't draw, but would like to, a two-disk set of pre-drawn holiday art for displays, greeting cards, etc. $39.95. Color low-resolution or B&W versions compatible with NEOchrome, DEGAS and Paintworks.

### Bitmap Coloring Book * (301)

Collection of digitized 18th century woodcuts. $19.95.
*Bitmap, Box 2376, Westwego, LA 70094; (504) 347-6317*

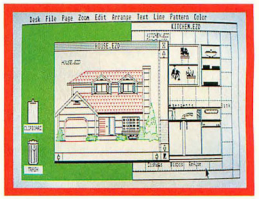
## Computer-Aided Design/Drafting

### PC Board Designer (302)

This drafting program creates a double-sized printed-circuit board design on Epson compatible printers. When reduced on a photocopy machine, the result is an actual-size template suitable for photo-etching. The finished board is limited to 6.3 X 3.95 inches. You'll really appreciate PC Board when you see how easy it is to rotate and rearrange the components on screen. (Antic review, 11/86)
*Abacus Software, 2201 Kalamazoo SE, P.O. Box 7211, Grand Rapids, MI 49510; (616) 241-5510*

### Easy Draw (303)

Though not as sophisticated as a true computer-aided drafting (CAD) program, Easy Draw is suitable for simple




drafting tasks such as mechanical drawings and floor plans. Using objects—geometrical shapes such as arcs, polylines and squares—as visual building blocks; you expand, shrink and stack to build a final drawing on screen. Excellent documentation, ease of use and utilization of GEM make this a

significant ST product. $149.95. (Antic review, 7/86)
*Migraph, 720 South 333rd Street, Suite 201, Federal Way, WA 98003; (206) 838-4677.*

### The Graphic Artist v. 1.5 (304)

Object-oriented CAD graphics, basic word-processing capabilities, rudimentary built-in spreadsheet with bar charts and pie charts, and the ability to mix text and graphics. You can create great onscreen graphics, but the program's real purpose is to print the end results on paper. With a plotter or laser printer, the output is much better than what's on the screen. $199.95. (Antic review, 11/86) Create new fonts for use with The Graphic Artist with optional Font Editor * $79.95.
*Progressive Computer Applications, 2002 McAuliffe Dr., Rockville, MD 20851; (301) 340-8398*

### First CADD * (305)

An entry-level ST version of the very popular Generic CADD, an inexpensive IBM PC computer-aided design and drafting program. Primarily aimed at educators teaching Computer-Aided Drafting, but hoteliers changing room designs, interior designers, real estate agents, retail stores working on display layouts, even quilt designers will find a use for this drafting system designed for easy use. $49.95.
*Generic Software Inc., 8763 148th Ave., N.E., Redmond, WA 98052; (800) 228-3601.*

### CAD 3-D (306)

Tom Hudson, author of DEGAS, created this solid-object modeling program. Create three-dimensional objects by drawing a basic outline. Click on the mouse and watch as the computer visualizes the object, creates a transparent wire-frame, hidden-line, or solid-filled outline with shading and highlights. Overlap objects, rotate them in any direction, and even create animated displays. Retouch the finished image with DEGAS or NEOchrome. See The Catalog in this issue. $49.95.

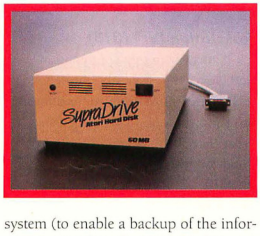
## Hard Disks

### Atari 20 Megabyte Hard Disk (307)

At $799 for 20 million bytes of information storage, the Atari hard disk clearly delivers more "power without the price" than its competitors. According to Atari, this hard disk is based upon the highly regarded Seagate ST225 drive mechanism and Adaptek controller. $799. (Antic review, 10/86)
*Atari Corp., 1196 Borregas Ave, Sunnyvale, CA 94086; (408) 745-2000*

### Supradrive (308)

The **Supradrive** delivers a full line of fast ST hard disks for the ST: 20 Mb for $799, 30 Mb for $999 and a massive 60 Mb for $1,999. A streaming tape backup




system (to enable a backup of the information stored on the hard drive) is planned. (Antic review, 10/86)
*Supra Corp., 1133 Commercial Way, Albany, OR 97321; (503) 967-9075.*

## Home Use & Incidentals

### MicroCookbook * (309)

Put an ST in the kitchen. If you don't mind smearing a little sauce bearnaise all over the mouse, you'll have 150 recipes at your fingertips. Pick the menu, **MicroCookbook** creates a shopping list. Pick an ingredient, MicroCookbook suggests recipes. $49.95.
*FTL Software/Software Heaven, Inc., 6160 Luks Blvd, Suite C206, San Diego, CA; (619) 453-5711*

### Life Organizer * (310)

Spreadsheet, outline processor, labeler, decision maker, typing tutor, filer, metric converter and interest projector on one disk for $34.95.
*Martin Consulting, 94 Macalester Bay, Winnepeg, Manitoba R3T 2X5 Canada; (204) 269-3234*

### Financial Cookbook (311)

This direct ST conversion of the 8-bit home financial software program calculates financial decision-making advice on such topics as mortgages, interest rates and buying a car. $49.95. (Antic review, 9/86)
*Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403; (415) 572-2787*

### Home Aid ST (312)

Address book, budget, appointment calendar, calculator, savings and loan on one disk. $39.95
*SRM Enterprises, P.O. Box 40, USAFA, CO 80840; (303) 472-6624*

### West Ridge Mouse Pads (313) Mousetrak Mousepad (453)

At $9.95 plus $1.50 postage each, West Ridge Mouse Pads make great stocking

stuffers. These pieces of nylon-coated neoprene rubber (the stuff wetsuits are made of) protect the delicate mouse ball from dust, dirt and lumpy desk tops, providing increased traction and a smooth rolling surface. The Mousetrak mousepad ($8.00) is slightly larger and features the same amenities.

*West Ridge Designs, 305 NW 12th Ave., Portland, OR 97209; (503) 248-0053*
*Mousetrak, Inc., 3047 St. Helena Way, St. Helena, CA 94574; (707) 963-8179*

### Analog/Digital Converter Cartridge * (314)

Eight analog-to-digital input channels, two digital-to-analog output channels and four digital control lines, all contained in an L-shaped package which conforms to the contours of the ST and extends only 3/4-inch from the computer housing. Designed as a general purpose interface for scientific instruments, where and whenever electronic signals need to be digitized. $115.

*SP Innovations, Inc., Box 33395, North Royalton, OH 44133; (216) 237-2382*

### STation (315)

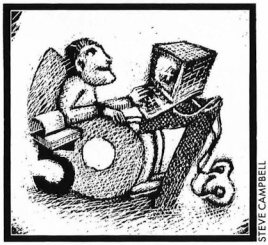
This sleek, "Atari gray"-colored metal cabinet stows away your ugly cables, power supplies and disk drives in style. It is designed primarily for the 520 ST and has room for two disk drives. Now what will you do with all that desk space? $99.99.

*Southern Technologies, Inc., 3208 Beltline, Suite 210, Dallas, TX 75234; (212) 247-7373 or (800) 647-7741*

### Mark 4:22 (316)

Buy this work station for your 800XL/XE and then move up to an ST—it fits all three computers. It's built like a tank—and with reason: BMW & Associates specialized in limousine interiors before they decided to branch out into the computer accessory market and the **Mark 4:22** seems to be made of automobile materials—heavy-duty steel with an ABS-plastic face plate and a smoked-glass modem compartment. Sliding drawer stows away the keyboard when not in use. $109.50.

*BMW & Associates, Inc., 515 Michigan Ave. Troy, OH 45373; (513) 339-8093*



STEVE CAMPBELL

### Workstation * (317)

Fingertip control for all your ST gear. Front panel turns power on or off selectively or all at once, switches from color to B&W monitor, switches drives. Surge protector built-in. $79.99.

*State of the Art Electronics, 4168 North Bend Road, Cincinnati, OH 45211; (513) 385-3312*

### Workstation IV * (318)

Pack it all away in this combination stand, suitcase, power strip and cooling fan. Includes surge protector and master power indicator. $268.

*Port-A-Byte, 1901 Wilson Avenue SW, Grand Rapids, MI 49504; (616) 791-9816*

### ThoughtSpace TS-1A * (319)

Increase the memory of your 520 ST to one megabyte with the TS-1A expansion board. Comes with software and installation instructions for $150, or have it installed for $15 extra.

*Thought Space Development, 2450 Warring St.,No. 21, Berkeley, CA 94704; (415) 845-1415*

### EZ-RAM 520 * (320)

Memory upgrade for your 520 ST. Simple installation and unit comes with required software. $199.

*Terrific Peripherals, Brookline MA 02146; (617) 232-2317*

### RAM Upgrade Board * (321)

Increase the memory of your 520 ST with this one megabyte upgrade board. Minimum soldering, do-it-yourself installation. $174.95.

*Diverse Data Products, Inc., 1805 NE 164th St., North Miami Beach, FL 33162; (305) 940-0458*

### easieST RAM * (265)

Upgrade your 520 ST to a total of one megabyte by simply plugging this board into two existing sockets. The company does not mention any need for soldering. $189.00.

*Aerco, Box 18093, Austin, TX 78760; (512) 451-5874*

### OMNEPROM (322)

The Nexus OMNEPROM is an EPROM burner for the ST. It has 64K of onboard static RAM for testing programs before burning chips. $275.

*Nexus Technical Services, Ltd., 38 Melrose Ave., Reading RG6 2BN; England; 734-664559*

### EPROM Blanks (323)

EPROM cards for the ST, complete with socket and capacitors. Good for prototype cartridges. $15.00 each, plus $3.50 shipping.

*BigFoot Systems, 2708 E. Lake St.—Suite 207, Minneapolis, MN 55406; (612) 722-9515*

# The Price War Is Over We Won!

## *We Will Beat Any Price...Anywhere.*

### Atari ST Hardware

| | |
|---|---|
| Atari 520ST RGB | $785 |
| Atari 520ST Mono | $645 |
| Atari SF354 | $149 |
| Atari SF314 | $208 |
| Atari SM124 | $165 |
| Atari SC1224 | $335 |
| Supra Hard Disk | Call |

### Printers

| | |
|---|---|
| Panasonic | Call |
| Star Micronics | Call |
| Citizen | Call |

### Modems

| | |
|---|---|
| Avatex 1200 | $79.00 |
| QMI 1200ST | $129.00 |
| Atari XM301 | $35.99 |
| Supra MPP 1000E | Call |

### *Specials*

| | |
|---|---|
| Avatex 1200 | |
| PR Conn. Amodem | $149.00 |
| Atariwriter Plus | $24.95 |
| Avatex 1200 | $79.00 |
| Sakata SC100 | $137.00 |
| Teknika MJ-10 | $178.00 |
| Teknika MJ-22 | Call |
| Habawriter | $25.00 |
| Hippo C | $25.00 |
| Hippo Eprom Burner | $99.99 |
| Color Printer | Call |

**Avatex 1200**
**$79.00**

***Hayes Compatible!***
***Everyday Low Price!***

### Atari ST Software

| | |
|---|---|
| Borrowed Time | $29.95 |
| Rogue | $24.95 |
| Final Word | $85.99 |
| Haba Software | Cheap |
| Hacker | $27.95 |
| H & D Base | $65.00 |
| H & D Forth | $35.00 |
| H & D Toolbox | $25.00 |
| PC Intercomm | $74.95 |
| Personal Diskit | Call |
| Sundog | $24.95 |
| VIP Professional | Call |
| Silent Service | $24.00 |
| Flight Simulator | Call |
| Micro C Shell | $33.00 |
| Mindshadow | $29.95 |
| Print Master | $24.95 |
| P.M. Art Gallery | $19.95 |
| Easy Draw | $97.00 |
| Graphic Artist | Call |
| Music Studio | $36.00 |
| 2Key Accounting | $32.99 |
| Home Planetarium | $19.75 |
| Joust | $19.75 |
| CP/M Emulator | $32.99 |
| Temple of Apshai Trilogy | $24.95 |
| Metacomco Pascal | $69.95 |
| Lattice C | $98.00 |
| Andra | Call |
| UCSD Pascal | Call |
| Regent Spell | Call |
| Regent Word | $35.00 |
| Regent Word II | Call |
| Regent Base | Call |
| Meta 68000 Asm | $59.95 |
| Brattacas | $29.95 |
| Degas | $23.95 |
| Personal Pascal | $48.00 |
| ST Talk | $11.00 |
| Zoomracks | $48.99 |
| Modula-2 | $49.95 |
| Personal Prolog | Call |
| Kings Quest II | $32.00 |
| Tos Chips | $24.95 |
| Universe II | $49.00 |
| ST Copy | $18.99 |
| Typing Tutor | $16.75 |
| Spiderman | $12.95 |
| Mouse Mat | $7.49 |
| Ultima II | $37.50 |

### Atari 8-Bit Hardware

| | |
|---|---|
| Atari 130XE | $118.95 |
| Atari 65XE | Call |
| Atari 1050 | $124.50 |
| Indus GT | Call |
| Atari 1027 | $79.00 |

### Accessories

| | |
|---|---|
| US Doubler | $48.00 |
| Rambo XL | $33.00 |
| R-Time Cart | $48.00 |
| Bonus SS DD 5.25 | $6.50 |
| Bonus DS DD 5.25 | $7.00 |
| Paper 1000 Sheets | $11.00 |
| Paper 2500 Sheets | $22.00 |
| Maxell 3.5 | $17.50 |
| Xetec | $39.95 |
| Logo Manuals | $13.50 |

### Interfaces

| | |
|---|---|
| P.R. Connection | $57.00 |
| Supra Microprint | $29.00 |
| Supra 1150 | $39.00 |
| ST Modem Cable | $12.00 |
| Supra Microstuffer | $59.00 |
| U-Print | $48.00 |
| Apeface | $35.00 |
| Atari 850 | $109.00 |
| ST Printer Cable | $12.00 |

**Atari XM301 Modem**
**$35.99**

### Atari 8-Bit Software

| | |
|---|---|
| Action! | $46.00 |
| Basic XE | $46.00 |
| Basic XL | $36.00 |
| Battalion Command | $24.95 |
| Battle of Antietam | $32.00 |
| B/Graph | $24.95 |
| Broadsides | $24.95 |
| Computer Baseball | $24.95 |
| Computer QB | $24.95 |
| Conflict in Nam | $24.95 |
| Crusade in Europe | $24.95 |
| Silent Butler | $19.99 |
| Gemstone Warrior | $22.00 |
| War in Russia | $48.00 |
| Dec. in the Desert | $24.95 |
| Kennedy Approach | $19.50 |
| Solo Flight | $19.50 |
| Learning Phone | Call |
| Syncalc 130XE | $29.95 |
| Paperclip | $34.00 |
| Mac/65 | $46.00 |
| Print Shop | $27.50 |
| Karateka | $18.50 |
| Lode Runner | $22.00 |
| Atariwriter Plus | $24.95 |
| Panzer Grenadier | $34.00 |
| Hacker | $15.75 |
| Space Shuttle | $15.75 |
| Mindshadow | $15.75 |
| Great Am. Rd. Rce | $15.75 |
| F-15 Strike Eagle | $19.95 |
| Silent Service | $19.50 |
| Synfile 130XE | $29.95 |
| Page Designer | $18.00 |
| HomePak | $30.00 |
| OSS Toolkits | $19.50 |
| Printshop Lib. 1/2/3 | $17.00 |
| Chmp. Lode Run | $18.50 |
| Ultima IV | $39.00 |
| Sparta Dos CS | $26.00 |
| Home File Manager | $7.99 |
| Music Painter | $7.99 |
| Star Raiders | $7.99 |

## Black Patch Systems

**ORDERS ONLY: VISA Call TOLL FREE 1-800-ATARI-02 or 301-987-2300 (Toll Call)**

For technical information or order inquiries, call 301-987-0019, or write
Black Patch Systems, P.O. Box 501, Arnold, MD 21012

**HOW TO ORDER:** CASHIER CHECK, MONEY ORDER, MASTERCARD* OR VISA*(ADD 4% FOR CHARGE CARDS) . . . NO PERSONAL CHECKS . . . NO C.O.D.'s . . . SHIPPED U.P.S. . . . ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.
**SHIPPING:** ADD $3.00 ON ALL ORDERS UNDER $100.00 . . . ADD $5.00 ON ALL ORDERS OVER $100.00. ACTUAL FREIGHT CHARGED ON MULTIPLE ORDERS.
**INTERNATIONAL:** ACTUAL FREIGHT CHARGED ON ALL ORDERS OUTSIDE THE CONTINENTAL UNITED STATES INCLUDING A.P.O.
**POLICIES:** NO RETURNS WITHOUT A RETURN AUTHORIZATION . . . NO RETURNS UNLESS DEFECTIVE. ALL DEFECTIVES WILL BE EXCHANGED . . . NO EXCEPTIONS.

***CALL OR WRITE FOR FREE CATALOG • DEALER INQUIRIES INVITED***

CIRCLE 009 ON READER SERVICE CARD

## Midi/Music

### MIDI Studio * (324)

This may be what Audio Light had in mind when they first started working on The Music Studio before Activision whisked it out of their hands, greatly simplified it, and turned it into one of the hottest-selling software packages in the world—and yes, **MIDI Studio** is compatible. Record and play music using 16 channels, a 124-layer song grid for developing rich, full music. A note editor lets you change the value, velocity and duration of each note and select from a palette of 128 "instruments" on a MIDI-compatible synthesizer. It uses the mouse and graphics instead of complex key commands. $99.95.

*Audio Light, Inc., 815 Fairfield Rd., Burlingame, CA 94010; (415) 344-4610*

### Midiplay (325)

Created by Malcolm Cecil, a professional musician who has worked with Stevie Wonder, **MidiPlay** has the capacity to store 200,000 MIDI notes—that's *three hours* of music—in a 1040 ST. This recording/playback system simultaneously supports all 16 channels of MIDI information including key and channel aftertouch, pitch bend, program changes and all 128 MIDI controllers (such as pedals). Midiplay is actually two programs: a beginner-level program that plays three-channel music using the ST's sound chip and presents a visual keyboard on the screen to teach how to read music; and a professional-level program for recording music on any MIDI keyboard or sequencer. Most importantly, Midiplay has "velocity" – the ability to play a softer or louder note depending upon the keyboardist's touch. $49.95. Pre-recorded Musidisks are available in Classics (Bach, Mozart, Chopin) or The Beatles, for $19.95 each.

***Electronic Music Publishing House, Inc., 2210 Wilshire Blvd., Suite 488, Santa Monica, CA 90403; (213) 455-2025***

STEVE CAMPBELL

### Transform XTRACK * (326)

The West German firm of Micro Music, which began in 1984 creating a note editor for the Commodore 64 computer, has recently relocated to the United States under a new name to develop MIDI software for the ST. The **Transform XTRACK** multitrack music recorder and sequencing system is designed for professional music production. Real-time and step input and unlimited number of tracks, uses GEM with mouse, icons and pull-down menus. Click on graphic sliders and curves for quick sound alterations. Built-in sound creator and real-time recorder. Compatible with the Yamaha DX, Roland JX and Casio CZ 101 synthesizers or drum machines. $199.95.

***Beam Team, 6100 Adeline St., Oakland, CA 94608; (415) 658-3208***

### EZ-Track (327)

Hybrid Arts claims this 20-track polyphonic MIDI recorder is as easy to use as a regular tape deck. Plays back up to 64 sessions of music created on any MIDI keyboard or drum machine, copies and mixes tracks, records all 128 MIDI controllers and records music directly from the keyboard in real-time or step-time in tempos ranging from .5 to 480 beats per minute. $65.

### DX Droid (328)

Music magazines and professional keyboardists are very excited about DX Droid, an extremely sophisticated patch librarian and editor created specifically for the ST and the Yamaha DX-7 synthesizer. Consisting of five programs: a patch librarian, numeric editor, graphic editor, automated patch loader and the DROID function, a program that will create completely unique sounds on its own using a combination of Artificial Intelligence and random number generation. The DX Droid takes advantage of the ST's high resolution with clear graphic displays of all of the DX synthesizer's parameters. $179.95. (Antic review, 12/86)

***Hybrid Arts Inc., 11920 W. Olympic Blvd., Los Angeles, CA 90064; (213) 826-3777 or 24-hour BBS # (213) 826-4288***

### MIDI Piano Rolls (329)

They laughed when I sat down at the computer, but when I started to play. . . George Gershwin's Rhapsody in Blue began to pour though my synthesizer and ST. Each Piano Roll disk contains several files of songs which have been directly translated from old player piano rolls. $19.95 per disk.

***Micro W Distributing, 1342B Route 23, Butler, NJ 07405; (201) 838-9027***

### ST Music BOX (330)

Dennis Young and Len Dorfman at XLEnt have created a composition and transposition tool that creates music on either the ST's internal sound chip, or a MIDI synthesizer. The most interesting feature lets you print out sheet music along with lyrics or notes for several voices. $49.95.

*XLEnt Software, P.O. Box 5228, Springfield, VA 22150; (703) 644-8881*

### Soundwave SW-1 (331)

A single-track digital MIDI sequencer that records and displays each note as it is played on a 7-octave keyboard. 15,000-note capability. $49.95.

### Soundwave SW-8 (332)

An 8-track professional MIDI sequencer that includes edit phrases, filters, auto punch-in for track editing, and step-time recording. $179.95.

*Shanner International, 453 Ravendale, Mountain View, CA 94043; (800) 423-8673 or in California: (800) 626-9273*

### The Music Studio (333)

Compose, edit and playback music for up to 15 instruments simultaneously on your ST, or drive a MIDI instrument with this easy but powerful program. $59.95.

*Activision, 2350 Bayshore Parkway, Mountain View, CA 94043; (415) 960-0410*

### Guitar Wizard (206)

Play the guitar on the ST with Guitar Wizard, a simple music program for kids. $39.95.

*Baudville, 1001 Medical Park Dr. SE, Grand Rapids, MI 49506*

## Operating Systems

### OS-9 * (334)

With the OS-9 68000 operating system, ($299 including BASIC, $249 without) up to five STs can be linked to function as a multi-user, multitasking system with the ability to send files from one ST to the other. The UNIX-like operating system can run many C programs designed to run under UNIX or other OS-9 applications such as Lifetree Software's Volkswriter Deluxe 2.2 word-processor.

*TLM Systems West, 4704 W. Jennifer–Suite 105, Fresno, CA 93711.*
*TLM Systems East, 67 Grandview, Pleasantville, NY 10570*

### MT C- Shell (335)

This multitasking operating system creates a UNIX-like multi-user mainframe environment on the ST, allowing the computers to send electronic mail to one another. It runs standard TOS programs. $129.95.

### Micro RTX (336)

The developer suggests that this UNIX-like multitasking operating system for the Atari ST can be used as a printer spooler, or allow a user to run a bulletin board and use the computer for a separate task at the same time. This alternative to GEM can run standard ST programs. $69.95.

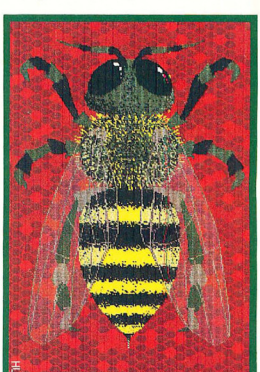
*Beckemeyer Development Tools, 592 Jean St., #304, Oakland, CA 94610; (415) 658-5318*

## Printers

### Okimate 20 Color Printer (338)

What a great idea. One printer, several "Plug 'n Print" interfaces ($99 each) and the Okimate 20 ($169) is compatible with many computers–including the Atari ST. It prints more than 125 shades of beautiful color, creating high-resolution pictures or overhead projection graphics on acetate. Sports several built-in type fonts including fine print and superscript and prints 80 cps in draft mode, 40 in letter quality mode. $268. (Antic review, 10/86)

*Okidata, 532 Fellowship Road, Mt. Laurel, NJ 08054; (609) 235-2600*



### Atari SMM804 Dot Matrix (339)

One of a pair of Atari printers, but especially configured for the ST. Has parallel port, but can connect to 8-bit Atari through interface. Does graphics and is Epson compatible. Has international character sets. $219.

*Atari Corp., 1196 Borregas Ave., Sunnyvale, CA 94088; (408) 745-2000*

### Star NL-10 (341)

Any parallel printer will work with your ST. Star Micronics has a varied line of reasonably-priced and solidly-built printers. The **Star NL-10** is a very capable 9-pin dot-matrix printer with exceptional "near letter quality" mode and fast draft mode. Plugs right in, and is easily configured to the ST with thorough documentation. Does graphics too. $319.

*Star Micronics America, 200 Park Ave., New York, NY 10166; (212) 986-6770*

## Programming Tools

### The Developer's Kit (342)

Over 2,000 Atari GEM Developer's Kits have been sold worldwide. This set of professional programming essentials includes Alcyon C-68K, an early language compiler developed originally by Alcyon, Inc., and used on the Digital Research CP/M-68K operating system; AS68; LO68; LINK68; and an extensive, if cryptic, manual. DRI originally developed most of its GEM applications using Metacomco Lattice C, Version 2.11, and the bindings in the Developer's Kit can be used directly with this compiler. $300.

*Atari Corp., 1196 Borregas Ave., Sunnyvale, CA 94088; (408) 745-2000*

### Micro C-Shell (343)

Based on a command line interpreter written for UNIX machines, this program gives the user a more traditional interface for disk file management. $49.95. (START review, Summer 1986)

### KISSED (344)

Keith's Interactive Self-relocating Screen Editing Debugger is a highly specialized debugging tool – much like the IBM symbolic debugger. This 12K program assumes you know about 68000 registers and debugging an assembly-language program. This is the only stand-alone debugger currently available for the ST. $39.95. (Antic review, 11/86)

### Michtron Utilities (345)

What do you do when an important disk file crashes? This disk utility searches for and retrieves deleted files and lost data, changes file contents and attributes, file names or any individual bytes on disk. Format individual disk tracks and copy individual sectors to repair damaged disks. $59.95.

*Michtron, 576 Telegraph, Pontiac, MI 48053; (313) 334-5700*

## Programming Languages

### Softworks BASIC (348)

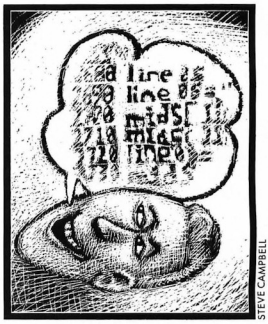
With advanced data structures, superior string manipulaton, and access to programs written in other languages, Softworks BASIC offers considerable speed among its advantages over the ST BASIC provided by Atari. It comes on a single disk and includes extensive GEM support for those knowledgeable enough to use it. This is a compiler BASIC. $79.95. (Antic review, 10/86)

*Softworks Limited, 2944 N Broadway, Chicago, IL 60657; (312) 975-4030*

### LDW BASIC Compiler (349)

This will compile most ST BASIC programs into blazingly fast 68000 machine code that requires no runtime package. Compilation takes quite a while and requires a lot of disk swapping, but this is a serious programming tool. (Antic review, 11/86) $69.95

*Logical Design Works, Inc., 780 Montague Expressway, San Jose, CA 95131; (408) 435-1445*




### Philon Fast/Basic-M (350)

BASIC compiler compatible with Microsoft BASIC. Graphics output is produced by using PEEKs and POKEs into GEM VDI, made possible by using the routines within GEM as if they were Philon Fast/Basic user-defined functions. Includes editor, linker and 260-page manual. Two floppy disk drives required. $129.

### Henry's Fundamental BASIC * (351)

One of the few interpreted BASICs available for the ST. This is an easy-to-use BASIC aimed at the home user. It has a full-screen editor, an extended trig library, and the ability to define your own keywords. A subset of Philon Fast/Basic M, Philon's more sophisticated compiler, it offers full syntax compatibility for only $49.

*Philon, Inc., 641 Avenue of the Americas, New York, NY 10011; (212) 807-0303*

### Fast BASIC (352)

Cartridge-based, interpreted **Fast BASIC** is quick, powerful, accurate, and easy to use. The language features *keyword* support of BIOS and XBIOS calls and makes good use of the GEM interface.

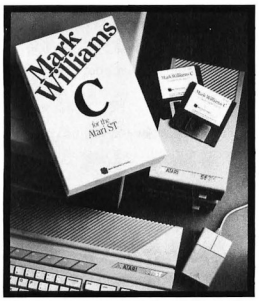
This product provides an extremely enjoyable programming environment. Excellent documentation. $99.95.
***Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts., HP2 6EX England; (044) 263-3933***

### Megamax C (353)

This C has it all: a full Kernigan & Ritchie implemention of the C language, it supports floating point, overlays, recursion, batch processing and batch libraries. Other than Alcyon C, this is the only C that comes with a resource construction set to create GEM objects such as menus, dialog boxes and icons. Also supports and fully documents AES, VDI and GEM routines. $199.95. (Antic review, 9/86) (START review, Fall, 1986)
***Megamax, Inc., PO. Box 851521, Richardson, TX 75085; (214) 987-4931***

### Mark Williams C (354)

A complete implementation of Kernighan and Ritchie C language, plus recent extensions to C implemented under




UNIX. Includes an assembler, loader, archiver, advanced symbolic debugger, C shell, utilities and Micro-EMACS, a full-screen editor. Fully compatible with the Mark Williams C Programming System for MS-DOS, so C programs can easily be ported between the ST and IBM PC. $179.95 (See review in this issue.)
**Let's C**, is an affordable, completely compatible subset of Mark Williams C, with fast dense code and a Micro-EMACS full-screen editor. $75.
**csd**, a C source debugger requires no knowledge of machine architecture or assembler and displays source code on screen while you debug. $75.
***Mark Williams Company, 1430 West Wrightwood, Chicago, IL 60614; (312) 472-6659***

### Cambridge LISP (355)

Metacomco ported over their Amiga LISP and this interpretive compiler, which provides a complete LISP development environment, is now available on the ST. Includes VDI and AES graphics library interface. $199.95.

### MCC Macro Assembler (356)

This companion assembler is specifically designed to complement Lattice C and MCC Pascal. $79.95.

### MCC Pascal (357)

This ISO 7185 standard Pascal compiler has been widely used on the Commodore Amiga and the Sinclair QL. $99.95

### BCPL (358)

A full, standard BCPL language compiler that combines the convenience of a high-level language with the flexibility of an assembler. $149.95.

### Lattice C (359)

This full Kernigan and Ritchie implementation of C is an industry standard. No runtime licenses are required for programs written in Lattice C. See The Catalog in this issue. (See START review, Fall 1986) $149.95.

Each Metacomco langugage allows full, documented access to the libraries and screen editor and provides full interfaces to GEM, VDI and AES functions. All languages also come with MENU+, a menu generator that includes batch mode, history, and organization of working files. It speeds up the computer for any purpose and can be used with all ST software. MENU+ is available separately for $29.95.
***Metacomco, 5353 #E Scotts Valley Dr., Scotts Valley, CA 95066; (408) 438-7201***

### 4xForth (360)

An 83-standard developer's Forth which includes limited multi-tasking capabilities. This very complete package was the first Forth available on the ST. (Antic review, 12/85) $99.95.
***The Dragon Group, 148 Poca Fork Rd., Elkview, WV 25071; (304) 965-5517***

### Multi-forth, $149. (361)

A thorough manual and Mac compatibility distinguish this Forth implementation.
***Creative Solutions, Inc., 4701 Randolph Rd. Suite 12, Rockville, MD 20852; (800) FORTH-OK***

### AC/Fortran (362)

This mainframe-quality, ANSI Fortran 77 compiler has floating-point numbers, linker, library manager and a full-screen source level debugger. Macintosh programs written in Microsoft FORTRAN, a version of AC/FORTRAN, can be easily ported to the ST. The disk-based compiler requires only 48K of RAM, is written in assembler for fast compilation and uses the GEM interface. $195.
***Absoft, 4268 N. Woodward, Royal Oak, MI 48072; (313) 549-7111***

### Mach 2 (337)

Multi-tasking Forth-83 development system and compiler based on a popular Macintosh implementation. Unusual in that it uses the friendly GEM environment as a programming interface. Produces stand-alone applications without license fees. Complete with Motorola assembler and symbolic debugger. The manufacturer will be offering free membership on the GEnie online network to all customers, with a Mach 2 roundtable for customer support. Outstanding documentation. $99.95.

*Palo Alto Shipping, P.O. Box 7430, Menlo Park, CA 94026; (800)44-FORTH*

### UCSD Pascal (363)

An extensive Pascal development system with a hefty 600-page manual along with an additional 100 pages of ST-specific documentation. It combines a Pascal compiler with a group of development tools called the p-System; UCSD Pascal is a dialect of Niklaus Wirth's Pascal modified for ease of use for the novice programmer. $99.

*Pecan Software Systems, 1420 39th St., Brooklyn, NY 11218; (718) 851-3100*

### Pro-Fortran 77 (364)

This full implementation of the ANSI standard Fortran-77 language supports 4- and 8-byte floating point numbers and complex numbers. Follows standard Fortran syntax, so porting your code to a mainframe computer should pose no problems. $149. See The Catalog in this issue. (Antic review, 8/86)

### Pro Pascal (367)

Prospero Pro Pascal, a full ANSI 770 x 3.97 standard Pascal compiler, has 7- and 16-digit precision floating point, separate complilation and 4-byte integers. It features full GEM, AES and

VDI bindings. $149.

*Prospero Software Ltd., 190 Castelnaum, London SW-13 9DH England; 01 741 8531*

### Personal Pascal (368)

The closest thing to a friendly compiler language for the ST, Personal Pascal also includes detailed documentation on how to access and use the GEM VDI and AES commands. (Antic review, 5/86) **Personal PROLOG**, an unusual artificial intelligence language, should be on dealer shelves for the Christmas season. $74.95 each.

*Optimized Systems Software, Inc., 1221B Kentwood Ave., San Jose, CA 95129; (408) 446-3099*

### Modula-2 ST (369)

This relatively new computer language was developed by Niklaus Wirth, the inventor of Pascal. Like Pascal and C, Modula is a block structured, compiled language. Includes compiler and linker as well as a GEM-based program editor. $149. (Antic review, 5/86)

*TDI Software Ltd., 1040 Markison Road, Dallas, TX 75238; (214) 340-4942*

### Expert Opinion (340)

Not really a language, but we could find no other category to place this unusual product. **Expert Opinion** lets you create your own expert systems—part of the brave new world of artificial intelligence. Expert systems are used in the fields of medicine, geology and science, but you could create an expert wine-tasting system, for example. See The Catalog in this issue. $99.95.

## Utilities

### Solapak (370)

Solapak includes Soladisk, a RAMdisk written in assembly language; Solasave, a screen saver that extends a monitor's life; and a printer spooler. It can automatically be installed at boot up, is not copy protected and comes with a limited four month warranty. $39.95.

*Action Software, 69 Clementina St., Dept. SR, San Francisco, CA 94105; (415) 974-6638*

### Action Pak (371)

Action Pak (4 in 1) packs a disk labeler, DEGAS-compatible banner printer, Synfile converter to transfer SynFile+ 8-bit database files into ST database files; and typewrite, a line-at-a-time typewriter that installs as a desk accessory. $39.95.

*Action Software, 69 Clementina St., San Francisco, CA 94105. (415) 974-6638.*

### Soft Spool (372)

A printer buffer program is a must for anyone who does a lot of writing or spreadsheet work on the ST. With Soft Spool, print long documents and while

# ATARI ST

SPECIAL

**ATARI**
20 Meg Had Drive
SHD 204
**$649**

**WINTER SPECIAL!**
**1040 Mono System**
*with*
**SP - 1000 A PRINTER**
**$975**

SPECIAL

**520 ST**
**Color System**
with
**Panasonic 1080 I**
Printer
**$999**

**Panasonic**
Industrial Company

*1080 I..... 199*

## SAVE ON THESE IN STOCK PRINTERS

### SEIKOSHA
SP-1000 A centronics ..... 185
BP 5200 ..... 649
BP 1300 ..... 469
Color kit ..... 119
SP-1000 ribbon ..... 8.50

### OKIDATA
Okimate 20 ST ..... CALL
292 ..... CALL
293 ..... CALL
120 NLQ ..... CALL
182 ..... CALL
192+ ..... CALL
193+ ..... CALL

### EPSON
LX86 ..... 229
FX85 ..... CALL
DX10 ..... CALL
EX800 ..... NEW
EX1000 ..... NEW
HS80 ..... CALL
FX286 ..... 489
LQ800 ..... CALL
LQ1000 ..... CALL

star micronics

*NX-10 ..... 219*

### PANASONIC
1080 I ..... 199
1091 I ..... 269
1092 I ..... CALL
1592 ..... 419
1595 ..... 549
3131 ..... 249
3151 ..... SAVE

### CITIZEN
120-D ..... f79
MSP-10 ..... CALL
MSP-15 ..... CALL
MSP-20 ..... 325
MSP-25 ..... 485
Premier 35 ..... 449
"While they last!"

*LYCO'S WAREHOUSE PROVIDES YOU ACCESS TO THE NATION'S LARGEST INVENTORY!*

### DIABLO
D25 ..... 549
P-32 CQ1 ..... 699
635 ..... 1029
D-80 1F ..... 2395

### STAR MICRONICS
NX10c ..... NEW
LV12-10 (New) ..... 175
NL-10 ..... 259
NX10 ..... 219
NB15 ..... CALL
SG-15 ..... 367
SD-15 ..... 438
SR-10 ..... 469

### JUKI
Juki 6100 ..... CALL
Juki 5510 ..... CALL
Juki 6300 ..... CALL
RS-232 serial board ..... 55

### LEGEND
808 ..... 159
1080 ..... 199
1380 ..... 229
1385 ..... 289

### BROTHER
HR-15XL-P ..... 349
1509 ..... 409

### SILVER REED
EXP 420 P ..... 209
EXP 600 P ..... 489
EXP 800 P ..... 649
EXP 770 ..... 740

### TOSHIBA
321 P/S ..... 479
351 sheet feeder ..... 529
P 341P ..... 669
P 341S ..... 699
P 351+ ..... 999

## SOFTWARE

### TIMEWORKS (ST)
Wordwriter ..... 56.75
Swiftcalc ..... 56.75
Data Manager ..... 56.75
Super Graphix ..... 44.95

### INFOCOM
Leather Goddess ..... 24.75
Moonmist ..... 24.75
Trinity ..... 24.75
Hitchhiker's Guide ..... 24.75

### EPYX
World Games ..... 24.75
Wrestling ..... NEW!

**EASY MAINTENANCE FOR TOP PERFORMANCE! DISK DRIVE CLEANING KIT $8.95**

### MICROPROSE
F-15 ..... 24.75

### ACCESS
Leader Board ..... 24.75
Tournament Disk 1 ..... 15.75

### ACTIVISION
Basketball ..... 28.75
Music Studio ..... 34.75
Hacker ..... 26.75
Little People ..... 29.75
Paintworks ..... 40.75
Hacker II ..... 29.75

*Lyco Computer Marketing & Consultants*

# TOLL FREE 1-800-233-8760

In PA **717-494-1030**
**Customer Service 717-494-1670**

**or send order to**
**Lyco Computer**
**P.O. Box 5088**
**Jersey Shore, PA**
**17740**

**HOURS**
Mon-Thur — 9 AM - 8 PM
Fri — 9 AM - 6 PM
Sat — 10 AM - 6 PM

### RISK FREE POLICY
In stock items shipped within 24 hours of order. No deposit on C.O.D. orders. Free shipping on prepaid cash orders within the continental U.S. Volume discounts available. PA residents add sales tax. APO, FPO, and international orders add $5.00 plus 3% for priority mail service. Advertised prices show 4% discount for cash, add 4% for MasterCard and Visa. Personal checks require 4 weeks clearance before shipping. We do not guarantee compatibility. We only ship factory fresh merchandise. Ask about UPS Blue and Red label shipping. All merchandise carried under manufacturer's warranty. Return restriction applicable. Return authorization required. All items subject to change without notice.

CIRCLE 021 ON READER SERVICE CARD

your printer is clicking away, you may continue writing, or switch to a game. $39.95. (Antic review, 2/86)
*Michtron, 576 S. Telegraph, Pontiac, MI 480563; (313) 334-5700*

### STKey (373)

Lets you program the ST function keys to accept customized commands for your application programs and access them from the desktop. $29.95.
*Solid Applications, Inc., 1333 Moon Drive, Yardley, PA 19067 (215) 736-2449*

### Hippo RAMdisk (374)

Create more available random access memory, allowing your software to boot up and access the drive much faster with this GEM-based RAMdisk. $34.95.
*Hippopotamus Software, 985 University Ave., Suite 12, Los Gatos, CA 95030; (408) 395-3190*

### Squeeg, ver. 3.1 (375)

START uses this file-compression utility to fit more listings and data on your monthly disk. Squeeg squeezes most files 50%–70% of their original size. $24.95.
*Quack Computer Co., 257 Robinson Ave. Bronx, NY 10465; (516) 689-8738*

### Write 90 Degrees (376)

Flips text and VIP professional files sideways so they can be printed down the length of a piece of paper. $29.95.
*XLEnt Software, P.O. Box 5228, Springfield, VA 22152; (703)451-05017*

### Copy II ST (377)

Backup protected software automatically. New versions issued regularly. $39.95.
*Central Point Software, 9700 S.W. Capitol Hwy. #100, Portland, OR 97219; (244-5782)*

### Disclone (378)

Diskette duplication, packaging, and documentation services. Copy protection available. Price varies by order.
*Disclone Software Production Services, 1050 North Fifth St., San Jose, CA 95112; (408) 947-1161*

## Word Processing

### Microsoft Write * (379)

The folks at Atari say this Laserwriter-compatible word processor created by Microsoft looks exactly like the Macintosh version. So simple to use it virtually requires no documentation, this mouse-controlled word processor with hundreds of imaginative fonts, lettering styles and formatting abilities contributed greatly to the early success of the Macintosh computer, and it may well do the same for the ST. $129.
*Microsoft Corp., 16011 NE 36th Way, Box 97017, Redmond, WA 98073-9717; (206)882-8080.*

STEVE CAMPBELL

### 1ST Word (380)

This entry-level GEM-based word processor can simultaneously edit four documents in separate windows. (Antic review, 6/86) (START review, Fall 1986) Free.

### 1ST Word Plus * (381)

All the features of 1ST Word, plus an integrated spelling checker, mail merge facilities, and best of all–the ability to mix graphics produced by other programs such as DEGAS, NEOchrome or digitized photos created with the Hippopotamus Digitizer–into text. 1ST Mail is a mail-merge program designed to integrate with 1ST word. Compatible with DBMaster One among other databases. Atari may not be releasing this, as it competes with MS Write.
*Atari Corp., 1196 Borregas Ave, Sunnyvale, CA 94086; (408) 745-2000*

### HabaWriter (382)

This GEM-based word processor is unique in the ST world for its WYSIWYG display (What You See Is What You Get), and now includes mail merge and spelling checker for $79.95. (Antic review, 3/86) (START review, Fall 1986)
*Haba Systems, 6711 Valjean Ave., Van Nuys, CA 91406; (818) 901-8822*

### FinalWord (384)

An imitation of Perfect Writer for the IBM, **Final Word** is entirely keyboard command-oriented and uses no GEM features. It is powerful, complex, and relatively expensive at $145. (START review, Fall 1986) (Antic review, 4/86)
*Mark of the Unicorn, 222 Third St., Cambridge, MA 02142; (617) 576-2760*

### Regent Word (385)
### Regent Spell (386)
### Regent Word II * (387)

Written by the developers of the easy-to use AtariWriter and AtariWriter Plus word processors, Regent Word is an easy-to-use program with a print preview option which displays document prior to printing, depicting underlining, boldface and italics exactly as they will

appear on paper. Regent Spell is a compatible 30,000 word spelling checker. An additional 30,000 words of your choosing may be added. $49.95 each. The company is pressing to release **Regent Word II**, its fully GEM-based word processor with integrated speller, before Christmas for an expected price of $99.95.

*Regent Software, 7131 Owensmouth Suite 45A, Canoga Park, CA 91303; (818) 882-2800.*

### Let's Write (388)

A collection of programs grouped around Micro EMACS, a command-driven text editor originally designed for programmers. It includes a formatter, a printer controller, a spelling checker and a telecommunications module. Difficult, but powerful, **Let's Write** sells for $79.95. (See review in START, Fall 1986)

*Mark Williams Company, 1430 W. Wrightwood Ave., Chicago, IL 60614; (312) 472-6659*

### Hippo Word * (389)

This is the first ST word processor to claim compatibility with laser printers. It features multi-column editing, a variety of type fonts, 80-column editing, can generate word counts, and can combine picture files created with NEOchrome or DEGAS with text. $89.95.

*Hippopotamus Software, 985 University Ave., Suite 12, Los Gatos, CA 95030.*

### ST TextPro (390)

A GEM-based word processor from Germany, **ST TextPro** permits users to define the function keys and create macros for frequent operations. Boasts multicolumn output, built-in indexing, and Table of Contents capability. $49.95. (START review, Fall 1986)

*Abacus Software, 2201 Kalamazoo SE, PO Box 7211, Grand Rapids, MI 49510 (616) 241-5510*

### PowerWriter * (391)

Multi-lingual word processing system for English, Russian, German and Hebrew. $49.95.

*Power Systems, 43328 S.E. 176th St., North Bend, WA 98045; (206) 888-2828*

### Word Writer ST * (396)

A full-featured professional word processor with interactive spelling checker and 85,000 word dictionary. Shows italics, boldface and underlines on the screen as you work. $89.95.

*Timeworks, Inc., 444 Lake Cook Road, Deerfield, IL 60015; (312) 948-9200*

### Colorwriter * (398)

Colorwriter uses color-keyed symbols to simplify formatting and editing and highlighting text. Take advantage of GEM and use the mouse to rapidly move around documents. Up to four files may be edited simultaneously, or cut and paste between documents. $79.95.

*Shanner International, 453 Ravendale, Mountain View, CA 94043; (800) 423-8673 or in California: (800) 626-9273.*

### Thunder! (400)

A "real-time" spelling checker which checks your spelling as you write (or when you finish, if you prefer). Includes a 50,000 word dictionary, plus most comparative and superlative adjectival forms like "higher" and "highest." 2,000 additional words may be added. Also has a "learn dictionary" in which the program learns that it should replace one particular word with another. Compatible with PaperClip Elite as well as other GEM-based applications such as HabaWriter, Regent Base and 1ST Word. $39.95. (Antic review, 11/86)

*Batteries Included, 30 Mural Street, Richmond Hill, Ontario, CANADA L4B 1B5; (416) 881-9941*

### Talker * (399)
### The Talking Word Processor

Imagine a word processor that talks using computer-generated speech. Imagine the possibilities – proofreading your writing by just sitting back and listening, word processing for the blind or sight impaired, teaching young children how to read or perhaps creating talking store displays and sales presentations. $49.95.

*Finally Software, 400 McArthur Blvd., Suite 3000, Newport Beach, CA 92663; (714) 851-6464*

## Emulation

### Ms. Em. * (401)

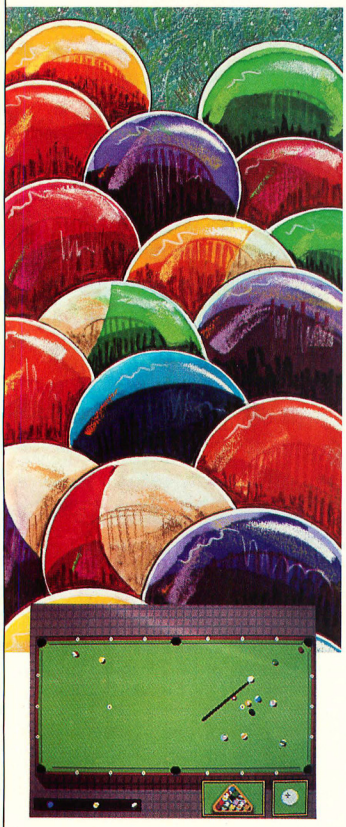
The Ms. Em. IBM simulator cartridge ($150) turns an ST into a 448K IBM compatible computer. Programmer Daniel Rosengarten, who has a patent pending on his invention, says a 520 ST running Ms. Em. (short for MS-DOS emulator) runs at half the speed of an IBM. In "compatible" mode, it runs 70% faster, but uses an additional 32K of memory. A 520 or 1040 ST can read and write to IBM 5 1/4-inch floppy diskettes with a **Microbyte A** ($270) IBM-XT drive or a **Microbyte-B** IBM-AT-compatible drive. $280.

*Paradox Enterprises Inc., 8444 E. 19th St., Tucson, AZ 85710; (602) 721-2023*

### Magic Sac 1 (402)

Invented by START contributing editor David Small, the Magic Sac cartridge allows an Atari ST with monochrome

# RACK YOUR BRAINS



ST-POOL™

*Available for the Atari 520ST or 1040ST; Color monitor required.*

*To order: Contact your Atari ST Dealer or send $34.95 plus $3.50 for shipping and handling to:*

***Shelbourne Software***
*7221 Rising Sun Ave.*
*Suite 191*
*Philadelphia, PA 19111*
***(215) 725-5644***

*(PA residents add 6% sales tax. Visa and MC accepted.)*

*Atari 520ST & 1040ST registered trademarks of Atari Corp. ST-Pool is a registered trademark of Shelbourne Software.*

*Dealer inquiries accepted.*

CIRCLE 111 ON READER SERVICE CARD.




monitor to run software written for the Apple Macintosh computer. All parts come in a sack for simple assembly. It's an eerie sight watching MacPaint appear on the 1040 ST's considerably larger monitor as you zip through window after window—at speeds 20 percent faster than the Mac. Recommended for one megabyte STs. $129.95. **Magic Sac Plus** includes an on-board clock and null-modem cable. $149.95.

***Data Pacific, Inc., 609 East Speer Blvd., Denver CO 80203; (303) 733-8158***

## How To Get Your Product Mentioned:

If your product is not mentioned in the 1986 Buyer's Guide, perhaps you never sent us information about it. To submit a final product for potential review in either *Antic* or *START*, please send two review copies (or one sample of a hardware product) along with a press release, price and anticipated release date to: Product Review, Antic Publishing, 524 Second St., San Francisco, CA 94107. If it is a Beta or demo version, please specify. Of course, your chances of a visual representation increase if you send a color transparency or sharp black and white glossy photograph of your product. ■

# THE 1986 ST BUYER'S GUIDE

# BUSINESS BREAKOUT

*Productivity Products for Office and Home*

**ATARI'S MOTTO**, "Power without the Price," is gaining attention in the business community. Dozens of products aimed at the businessman have appeared during the year. START will begin regular coverage of business applications for the ST in the Spring issue. To get things rolling, we have collected the business items from the Buyer's Guide into this special section. Again, numbers in parentheses following the product name are *Reader Service Numbers* (see the bound-in card).

## Accounting

### DAC Easy Accounting (403)

What better partner for the "Best Hardware Value of 1985" than the product voted "Best Software Value of 1985" by *InfoWorld* magazine? *PC Magazine* called the IBM PC version of this package a "genuinely amazing deal," and that version sells for $69.95. For only $49.95, the Atari ST version includes all seven modules—general ledger, accounts receivable, accounts payable, inventory, purchase order, billing and forecasting. Requires 520 ST with TOS in ROM, 132-column printer. For an extra $19.95, **DAC Tutor** teaches you how to use it.
*DAC Software Inc., 4801 Spring Valley Rd., Building 110 B, Dallas, TX 75244; (214) 458-0038*

### STAccounts * (404)

A European product from Silicon Chip Ltd., the **ST Accounts** accounting program is designed for small to medium-sized businesses and includes stock control, sales, batch invoicing, and order entry. Extensive use of GEM, comprehensive HELP prompts. Monochrome only. $249.95.
*ISD Marketing, 20 Steelcase Rd. W., Unit 12, Markam, Ontario, L3R 1B2, Canada; (416) 479-1990*

### ST One Write: Cash Disbursements (405)

This veteran game company's first entry into the business software arena is modeled after the "One Write" carbon paper and pegboard accounting systems that small businesses have been using for years. The instructions are surprisingly clear, mercifully brief. It makes full use of GEM and windows while producing income statements, vendor address lists, disbursement journal, vendor year-to-date report, balance sheets, income statements, reports and checks. Compatible **Accounts Receivable** and **General Ledger** packages will follow at the same price: $99.95 each.
*Sierra Online Sales Dept., P.O. Box 485, Coarsegold, CA 93614; (209) 683-6858*

### sbt Accounting Software Library * (428)

A modular system of accounting software written in dBase and supplied with source code for customization to your special needs. Modules include: dOrder (sales order processing), $145; dInvoice (billing & inventory) & dStatement (accounts receivable), $210; dPurchase (purchase order), $145; dPayable (accounts payable), $145; dLedger (general ledger), $295; dBackup (menu/backup), $45.
*sbt Corp., Three Harbor Drive, Sausalito, CA 94965; (415) 331-9900*

## Financial Management

### Isgur Portfolio (421)

Designed by Lee Isgur, top Wall Street financial analyst and VP of Paine Webber New York, **Isgur Portfolio System** helps casual or professional investors compile and manage information to make investment decisions. It instantly updates your personal stock portfolio with data from online services such as Dow Jones and CompuServe by using 1*S Talk, a telecommunications program included with the package. See The Catalog in this issue. $199.95.
*Batteries Included, 30 Mural St., Richmond Hill, Ontario, L4B 1B5, Canada; (416) 881-9816.*

## Business/ Productivity

### Business Statistics $145 * (406)
### Decision Analysis Techniques $110 * (407)
### Quality Control $125 * (408)
### Sales and Market Forecasting $145 * (409)
### Exploratory Data Analysis $75 * (410)
### Forecasting and Time-Series $145 * (411)
### Multivariate Analysis $150 * (412)
### Optimization $110 * (413)
### Forecasting Techniques $145 * (414)
### Critical Path Techniques $95 * (427)

This line of statistical and numerical analysis software is aimed at business administrators, statisticians or financial consultants who find that spreadsheets just don't have enough muscle to do serious calculations. **Forecasting and Time Series** uses time-series statistical analysis methods to analyze stock and bond prices. Use **Sales and Market Forecasting** to relate holdings to market share and develop market strategies. Supervise and schedule a project with **Critical Path Techniques**.
*Lionheart, P.O. Box 379, Alburg, VT 05440; (514) 933-4918*

### Small Business Manager (415)

This inventory/invoice program is written in ST BASIC. $99.95.
*Newell Industries, 602 E. Hwy. 78, Wylie, TX 75098; (214) 442-6612*

### Time Link (416)

Keep track of your past, schedule the present and anticipate the future with this electronic desk diary, calendar and

# DISK INSTRUCTIONS

Welcome. All programs and program listings in this issue are on your START disk provided in a special envelope bound into the magazine. If you purchased the $4 nondisk version of START you can still obtain the disk by sending us the bound-in order card or mailing $10.95 plus $2.00 for postage and handling, to START DISK, 524 Second Street, San Francisco, CA 94107. (Be sure to specify the issue of the disk you want.)

Use scissors to open your disk envelope along the outside vertical edge. Place your START disk into drive A and double-click on the disk icon to see its contents. Please refer to your ST owners manual if you are uncertain about proper Desktop procedures.

Your START disk contains six folders. Each folder corresponds to a particular START article. To open a folder and reveal its contents, double-click on the folder's icon. Before running a program, we recommend you read its related article and transfer its files to another disk. Also, it's a good idea to back up your START disk before use.

## COMPRESSED FILES

Some of the files on the START disk are in a compressed format. You can identify them by a "Q" as the second letter of the filename extender (e.g., MAILCALL.PQS). These files are unusable unless first decompressed with the Un-Squeeg program included on your START disk. We chose the Squeeg program from Quack Computer Company as the most efficient compressor of ST files. Only the Un-Squeeg program (the decompressor) has been included on your disk. Please note that this program is owned and copyrighted by the Quack Computer Company and is not to be considered part of the public domain. The latest Squeeg/Un-Squeeg package (version 3.1), which includes the compression program, is available for $24.95 from:

Quack Computer Company
257 Robinson Avenue
Bronx, New York 10465

## DECOMPRESSING

To decompress a file, first transfer both the compressed file and UNSQUEEG.PRG to another disk. When run, the Un-Squeege program will create a second, decompressed file which may be more than twice the size of the compressed one. Un-Squeege will *not* alert you if you run out of disk space, so make sure you have plenty of room on your destination disk.

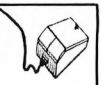
After transfering the files, double-click on UNSQ31.PRG and a file selector box will pop up requesting the file to decompress. Un-Squeege automatically searches for filenames with "Q" as the second letter of the extender. Select a file to decompress and click in the OK box. Un-Squeege responds by asking for a destination path. At this point, it is easiest just to select the default (drive A) by clicking in the OK box. The file will be decompressed and written to disk with the original, unsqueezed filename (e.g., MAILCALL.PQS will be decompressed and written to disk as MAILCALL.PAS).

## THE DISK

- UNSQ31.PRG–Double-click on this to decompress a file.
- README.TXT–Text file of additional information; show to the desktop.
- DEGASART.STQ–**Art Tips from a Pro** folder. Contains two medium-resolution DEGAS pictures and assorted brushes and fills. You need DEGAS or DEGAS Elite to use these files. See your DEGAS manual for instructions. See the Reference at the end of the article for information on this product.
- CARTRIDG.STQ–**Writing to the Cartridge Slot** folder. Contains C source code to drive the cartridge parallel port.
- MAILCALL.STQ–**Mail Call** folder . Double-click on MAILCALL.PRG to run the program. Complete instructions on operating Mailcall are included in this article. MAILCALL.PQS is the compressed Personal Pascal source code. (See instructions on this page to decompress).
- SOUND.STQ–**Hot Sounds** folder. Double-click on NSQ.PRG to run the sound software. Complete operating instructions appear in the article. Sound files are denoted with a .SND extender.
- STBASIC.STQ–**Getting Around ST BASIC** folder. Load BASIC.PRG from your "language" disk supplied with your computer. Then, select **Load** from the drop-down menu and choose DRAGON.BAS from the STBASIC.STQ folder on your START disk. When the program is loaded, run it by choosing **Run** from the drop-down menu.
- STWRITER.STQ–**ST Writer Secrets** folder. Double-click on STWRITER.PRG to run the word processor. QUICKREF.STW is a quick reference sheet that can be printed out from ST-Writer and LONGREF.SQW is a complete reference in compressed format. (See instructions on this page to decompress). CONFIG.TOS and CONFIG.TXT allow you to configure your ST-Writer to work with your printer. (See article for a full explanation). For complete ST-Writer documentation, refer to the sources listed in the README.TXT file. ■

• GEM Based

# TYPESETTER ELITE



- Layout a page of text combined with graphics
- High resolution printouts — even on color systems
- Load custom fonts from Megafont ST
- Near Letter Quality fonts
- Create ICONS or ICONS created with P.M. Interface, Typesetter, and Rubber Stamp
- Load files created with your word processor

© 1986 Len Dorfman and Dennis Young

TYPESETTER ELITE is the updated version of the popular TYPESETTER ST program. TYPESETTER ELITE is a program designed to allow the user to layout a full printed page. TYPESETTER ELITE provides the user with a WHAT-YOU-SEE-IS-WHAT-YOU-GET full page layout. Pictures from D.E.G.A.S. and many other drawing programs can be added with multiple size and styles of text and characters. A TEXT FORMATTER is provided to move ASCII files into TYPESETTER ELITE pages. D.E.G.A.S. like drawing tools are included to add finishing touches. In addition, the user can cut and paste sections of the screen from one location to another. **Write for update info.**

**$49.95 U.S.**

P.O.Box 5228
Springfield, Virginia 22150
(703) 644-8881
Order Number
(703) 569-8881
Customer Service
TELEX 269728 XLENT UR

XLENT Software

XLENT Software (U.K.) LTD.
516 Alum Rock Road
Alum Rock
Birmingham B8 3HX
United Kingdom
(021) 328-3585
TELEX 265871 (MON REF G)

CIRCLE 040 ON READER SERVICE CARD

# 520ST RAM $189 NO SOLDERING

**STAGE 1** ☞ Simply open your computer case and install the ***easie*ST RAM** board into 2 existing sockets of the mother board for **1MegabyteTotal.**

**STAGE 2** ☞ Upgrade to **2.5 Megabytes** by installing 16 additional soon-to-be available 1 Megabit RAM chips. Additional sockets (already provided for) will also be required on the ***easie*ST** board.
**Add $20** if you want us to install the extra RAM sockets at this time.

**STAGE 3** ☞ Upgrade all the way to **4 Megabytes** by removing the original 256K RAMS from the ***easie*ST** board and installing 16 more 1 Megabit parts. This stage will require some soldering on the ***easie*ST** board.

**No soldering or trace cutting is ever required on the Atari board.**
**1 year warranty // UPS ground free // VISA & M/C 5% // C.O.D. $3**

AERCO

Texas residents + 6.125%

Fine micro peripherals since 1979
**Box 18093 Austin, TX 78760**
**(512) 451 5874**

CIRCLE 011 ON READER SERVICE CARD

database for time-related information such as appointments and expenses. See The Catalog in this issue. $49.95.
*Batteries Included, 30 Mural St., Richmond Hill, Ontario, L4B 1B5, Canada ; (416) 881-9816*

### Disk Library (417)

Organized like the card catalog found in public libraries, this file manager references, categorizes and searches disk information at your fingertips. $44.95. (Antic review, 11/86).
*Classic Image Software, 510 Rhode Island Ave., Cherry Hill, NJ 08002; (609) 667-2526*

### Maillist * (418)

This mailing list manager can store, search and categorize up to 4,000 names on floppy disk. Written in BASIC. $17.95.
*Artworx, 150 N. Main St., Fairport, NY 14450; (716) 385-6120*

### Imaginet * (419)

This local area network links up to 63 ST computers to an IBM-compatible host computer and hard disk, allowing the computers to share information, software and peripherals; and communicate with each other at a distance of up to 1,500 feet. The network costs $900 for the first IBM PC, and $500 to adapt each Atari ST.
*BMB Compuscience, 500 Steeles Ave., Milton, Ontario L9T 3P7, Canada; (416) 876-4741.*

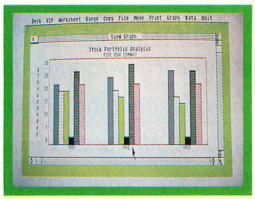
### ST-NET * (420)

An expandable local-area-network lets you share information and peripherals among many Atari ST computers in an office or classroom. You get a connector box for eight computers, all software and cables for first two computers for $149.95.
*Quantum Microsystems, Inc., P.O. Box 179, Liverpool, NY 13088; (315) 451-7747*

## Spreadsheets

### VIP Professional (422)
### VIP GEM * (423)
### Professional Lite * (424)

This Lotus 123 release 2 clone is an integrated package that combines the functions of an 8192-row by 256-column spreadsheet, database and



presentation graphics into one program. Those with working knowledge of Lotus will feel right at home—the command structure is identical. Spreadsheets and templates can be transported from 123 to VIP and vice versa. But novices will find the multitude of commands bewildering. (Antic review, May 1986). $179.95.

The more advanced $249 **VIP GEM** utilizes the ST GEM interface with windows and pull-down menus. It is available as an upgrade to registered owners of the original VIP.

**Professional Lite** is a pared down version that utilizes GEM, weighs the same but costs less: $149.95.
*VIP Technologies, 132 Aero Camino, Santa Barbara, CA 93117; (805) 968-9567*

### EZ Calc (425)
### Help Calc * (426)

**EZ Calc** got high marks from a member of our staff who purchased it to use for his own financial analysis projects. This GEM-based spreadsheet retails for $69.95. **Help Calc** is a set of 11 preprogrammed templates for use with EZ Calc or VIP Professional. $24.95.
*Royal Software, c/o Computer Palace, 2160 W. 11th Ave., Eugene, OR 97402; (800) 452-8013.* ■

**MOVING?....**
New Address
Name
Address
City
State
Zip

**Fill in coupon and mail to:**
**START Subscriptions**
**524 Second Street**
**S.F., CA 94107**

Place current address label here.

# ST WRITER SECRETS

## WORD PROCESSING POWER EXPLORED

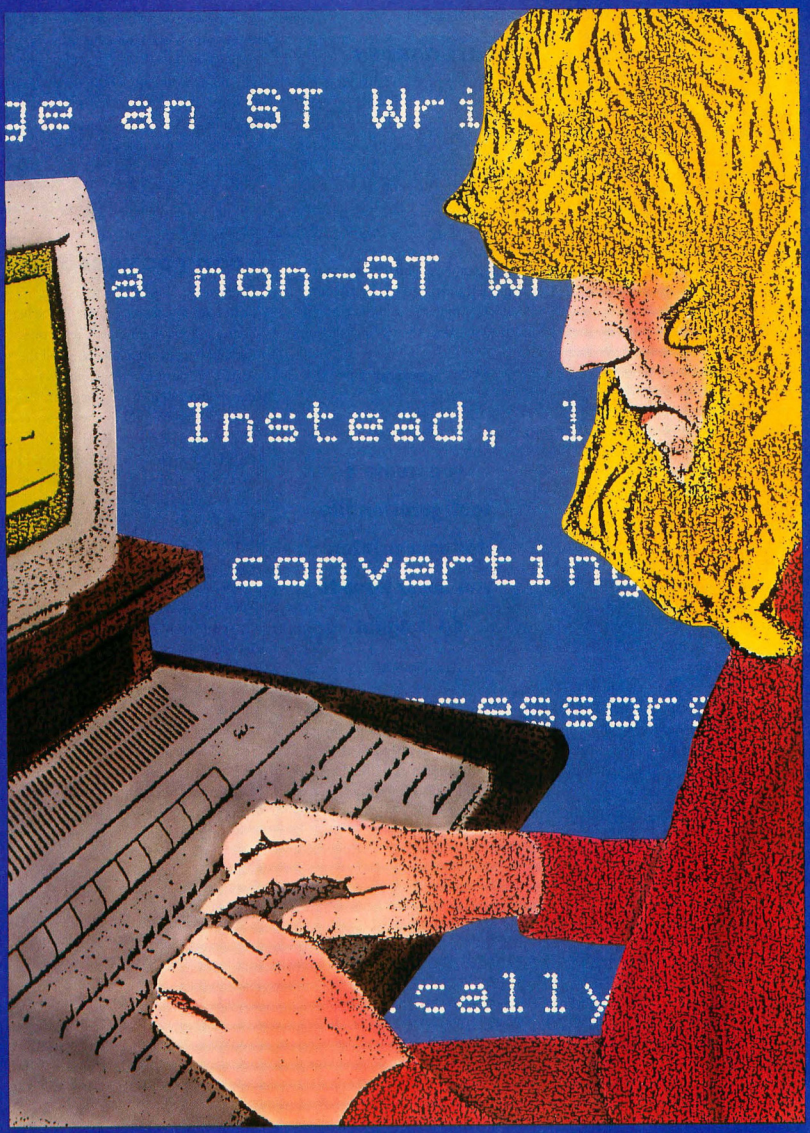
by Bruce D. Noonan, M.D.

*Some people think ST Writer is still the best word processor for the ST. Bruce Noonan certainly does. When the bigwigs at Atari were ready to drop this mouseless text powerhouse, Dr. Noonan refused to let it die. He wrangled the source code from them and has spent the last year fixing bugs and adding features. His latest version, 1.50, is on your START disk in the folder STWRITER.STQ. What follows is a bit of the history of this unusual program and some tips, tricks, and techniques by one who knows.*

Imagine a powerful 8-bit computer with 48 kilobytes of memory—but no word-processing software, and an unfortunate reputation as a "game machine." Sound familiar? For many of us Atari veterans, those days are not so far away. Back around 1980, Atari recognized the need for credible, practical software for their new Atari 800 computer, so they developed the Atari Word Processor. It set you back $100, and came in a large ring binder with two disks, volumes of documentation, and an audio-cassette teaching tape. Compared with today's word processors, the Atari Word Processor was a neanderthal. Each page of processed document required its own disk file, and every time something was edited, the entire document had to be re-formatted before saving and printing.

No wonder Atari owners turned to Letter Perfect, a word processor from LJK. Letter Perfect was respectable and workable, but it used a nonstandard, incompatible disk format and cost $150—high for Atari software, even in those days. Next, Datasoft came out with Text Wizard, which was menu driven and produced Atari-compatible, standard ASCII files. But Text Wizard was hampered by inflexibility in printing. You could not specify a range of pages to print, and multiple copies had to be printed one at a time.

Atari hired the author of Text Wizard, William Robinson, to create AtariWriter and produced an overnight success. Not only was AtariWriter easy to use with only one menu screen, it was among the first Atari word processors to exploit the special features of the newer dot-matrix printers. The main drawback of AtariWriter was its lack of printer drivers, as Atari, Inc. clung to the narrow view that every Atari owner should only use Atari printers. Nevertheless, *Consumer Reports* rated ▶


ge an ST Wri
a non-ST W
Instead, l
convertin
ssor?
.cally

AtariWriter, bundled with the new 800XL and the Atari 1027 printer, as the best word processing system for the price.

But after Jack Tramiel bought Atari from Warner Communications and developed the 16-bit 520 ST, Atari was again faced with the old game-computer reputation. Displaying six-color graphic screens ported over from the 8-bit machines would do little to dispel the myth.

## JACK BE QUICK

The first word processor I saw for the ST was Express, from Mirage Concepts. One look at the old-fashioned, non-mnemonic control codes was enough for me. I wanted AtariWriter on the ST. Lo and behold, the new Atari Corp. was thinking along similar lines. A word processor was needed quickly to bundle with the new STs, Macintosh style.

Atari produced ST Writer remarkably quickly. Assembly language programmer, Dan Oliver, converted the code for the editor portion of the original AtariWriter, while John Feagans planned to adapt the formatter portion of the program in C. (The formatter is that part of a word processor that interprets editor commands and translates them into the proper format for the output device, whether it be the screen, printer, or disk.) Feagans returned from a one-week vacation to find that the only thing needed was his formatter and the package would be ready to go! In just *two short weeks* , ST Writer was born.

And what a word processor it was! It could do multiple pitch printing, double columns, headers, footers, multiple copies, expanded print, underlining, sub/superscripts, justification, block moves, deletes, inserts, search, replace. . . It even received AtariWriter files directly from an 8-bit Atari via an 850 interface and null-modem cable! Best of all, its commands were the familiar mnemonic codes used in AtariWriter.

## NO ROSE GARDEN

As with many products rushed to market, ST Writer was not bug-free. The double-column printing would not work when double spacing with more than 80 columns (as with elite or condensed print). Furthermore, headers and footers couldn't be blocked right, and elongated printing did not center properly.

In September 1985, I spoke with Leonard Tramiel and Sig Hartmann at a Boeing Computer Society meeting in Seattle and asked them when the bugs

**Once you create a configuration file for your printer, you never have to do it again.**

in ST Writer would be fixed. The discouraging answer was that ST Writer was "complete," and besides, it was "free." Undaunted, I called Richard Frick at Atari, and was fortuitously steered toward John Feagans. John was unaware of the block-right header bug. He suggested I contact a couple of interested newsletter editors, Jack Durre, of *Atari Journal* in Miami, and Joe Waters of *Current Notes* in Washington DC.

As I spoke to Joe and Jack, I discovered that ST Writer had even *more* bugs. Among other things, both Joe and Jack needed condensed print in double-column format for their newsletters. I contacted John Feagans and asked if I could examine the ST Writer source code for bugs. In retrospect, this was quite presumptuous of me. I knew BASIC and 6502 assembler, but was only getting started in C, and had virtually no exposure to 68000 assembler. Surprisingly, Sig Hartmann said OK, and I began one of the most time consuming but educational challenges of my life. Eight revisions later. . .I'm still not sure ST Writer rev. 1.50 is complete, but *I love it* and am using it to write this article.

## I DON'T DO WINDOWS

One reason I like ST Writer is that I don't have to take my hands off the keyboard and pet the mouse. I don't miss the GEM environment because all the AtariWriter commands are already deeply ingrained in my cerebrum. Besides, things like multiple windows confuse my simple mind, and I get lost trying to figure which window I should be in, or how I got to the one where I am. To cut and paste between documents with ST Writer, I simply find the block, mark its beginning and end, and delete the block, thereby storing it in the copy buffer. I then load the destination file, place the cursor in the right spot, and press [Undo] to paste the block. Alternatively, I could save the block to disk and merge it to the file wherever I want it. GEM drop-down menus are always getting in the way of my text anyway. Who needs them? (I know many of you disagree, so later I'll let you in on some of the plans for ST Writer 2.0.)

Atari was not enthralled with the idea that their premier ST word processor could not even use GEM, so the mouse-driven 1ST Word was acquired. I don't want to sound like a bigot, but *I can't stand 1ST Word* . The first version lacked multiple spacing, and the current version does not permit variable pitch print. I read about using fixed spaces, variable spaces, reformatting paragraphs, *typing* and *editing* modes (What? You mean they're not the same thing?). And I had a devil of a time trying to figure out why the print option on the drop-down wouldn't appear enabled when I wanted to print something. I

had to learn about yet another mode: *WP mode*. Maybe I'm being too critical, but I'm also lazy. If I could learn to print with ST Writer in just five minutes, why shouldn't all word processors be so simple?

## A BETTER MOUSETRAP

My frustration with First Word and GEM made me want to cage my mouse and improve ST Writer. I poured over the source code and first fixed the block-right header problem. Simple—the code pointed to the wrong array, so I substituted the right one. I next fixed the expanded-print centering. Then the double-column bugs came in swarms. The blanks in the page image were initialized to 10-pitch width. With condensed print the blanks were too large and caused the second column to be shoved to the right. I fixed that only to find that now I overwrote the last line on the first column with blanks (sigh). On and on it went, but along came versions 1.04, 1.05, 1.06, and finally 1.07. I won't describe all the additions and changes in detail, but here is a list of them (in no particular order).

- Search for the printer-configuration file only once at the beginning.
- Outdenting of paragraphs (used in bibliographies).
- A mail-merge function.
- Enable large document size: 198 columns by 112 lines to accommodate wide carriages in condensed print and 14-inch legal sheets at 8 lines/inch.
- Conditional page eject.
- Type-over/Insert toggle.
- Keyboard access to second half of the ST character set.
- Alternate left- and right-blocked headers and footers.
- Enable an unformatted comment insertion in text.
- A "spooler" to print to disk (or RAMdisk) with printer controls embedded in text. Such files can be printed directly from the GEM Desktop.
- Send printer reset code each time a document is to be printed.
- Enable condensed elite text.
- Independent formatting of headers and footers.
- Fix print preview to prevent wrap.
- Insertion of controls to prevent use of odd numbers for vertical margins and spacing.
- Error message if you try to print or spool to a write-protected or unformatted disk.
- A new 432-byte printer-configuration file (accommodating up to eight control codes per function as needed for the new laser printers) and file creation program.

**One of ST Writer's greatest assets is its ability to format double-column text.**

- Elimination of the possibility for proportional print (too slow).
- Elimination of a word-wrap bug on boldfaced or italicized words.

## I SHALL [Return]

One of the drawbacks of ST Writer is that it does not save standard ASCII files which can be printed to the screen from the Desktop. This came about to maintain compatibility with the original AtariWriter. AtariWriter was originally designed so that [Control][M] indicated one of the margins for double-column printing. The [Control][M] key combination generates an ASCII 13, which is nothing special on the old 8-bit Atari's, but is the standard code for carriage returns on the ST and most other microcomputers. (The oddball 8-bit Atari's used ASCII 155 for carriage return.) A compatible ST Writer couldn't use ASCII 13 for its carriage return, so ASCII zero (NULL) was used in its place. Saved ST Writer files thus contain zeros instead of ASCII 13 carriage returns and that is why you get a runaway screen when printing ST Writer files from the GEM Desktop. Recognizing this, the print-to-disk option was added to ST Writer so that such things as README.DOC ASCII files could be created to be read from the GEM Desktop.

What about the "DO RUN RUN" at the beginning of the saved files? Apparently the author saw something similar on a Macintosh, and thought it would be cute. The words hold no significance. It only flags the Index menu function so it recognizes and labels files that are in ST Writer format. Also, while you can merge an ST Writer-saved file into a file currently in memory, merging a non-ST Writer file will mess up your existing document. Instead, load the non-ST Writer file first, save it—thus converting it to ST file format—then merge it. Unlike many word processors, ST Writer has a utility to read and convert practically any type of file. As you may have experienced, it is very *slow*. However, with TOS in ROM and one megabyte of memory, ST Writer can convert and edit larger files than either MINCE or Micro EMACS can handle. One more tip, while we're on the subject: To convert 1ST Word files to ST Writer, save the 1ST Word document in non-WP Mode before loading it into ST Writer. (Later, I'll show you how to get rid of all those extra carriage returns.)

## PRINTER CONFIGURATION

ST Writer comes with a special printer configuration program called CONFIG.TOS. When run, CONFIG.TOS looks on disk for a file named CON- ▶

FIG.TXT, and reads it into memory. CONFIG.TXT is nothing more than a saved ST Writer file containing all necessary printer codes for the user's individual printer. After reading CONFIG.TXT, CONFIG.TOS converts the text into special code and saves it back to disk, creating a file named XYZZX.DAT. The first time [P]rint is selected from the ST Writer menu, ST Writer searches *on the disk it was booted from* for XYZZX.DAT and uses its codes to properly interface with the printer.

Once you create an XYZZX.DAT file for your particular printer, you never need to go through it again. Be sure to make a backup copy—and remember where you put it. The only two files you need on any disk to operate ST Writer are the STWRITER.PRG program itself and XYZZX.DAT.

Some versions of ST Writer will also have a file called XYZZX.TXT. This is nothing more than a backup duplicate of CONFIG.TXT. Since we did not have space on the START disk to include this, be sure to create your own backup before altering CONFIG.TXT.

Before I describe how to edit CONFIG.TXT for your printer, I must tell you ST Writer veterans that, yes, this is a whole new printer configuration system and, no, your earlier XYZZX.DAT file will not work with ver. 1.50. Sorry.

OK, pull up your printer manual, load *a backup copy* of CONFIG.TXT into ST Writer and examine it. What you are looking at is very similar to program source code. Any line of text beginning with an asterisk (*) is a comment for your information only and is ignored by the CONFIG.TOS program. (Editor's note: *The CONFIG.TXT file on your START disk contains the proper codes for a Star Micronics NX-10 printer which is, in most instances, compatible with Epson-compatible printers. If your printer falls into this category, leave everything as is and run CONFIG.TOS to create your XYZZX.DAT file.)*

For the moment, let's skip over the first section of the file and edit a fairly simple example. Look for the comment: * **underline on** (you can use the ST Writer search command [F6]). Following * **underline on** are a list of numbers: 27, 45, 1, 255, 255, 255, etc. Each of these numbers is a printer code *in decimal* representing the command to turn on the underline. The 255's are fillers where there is no printer code number.

Look in your printer manual for the proper codes to turn on the underline. If your printer codes are listed in decimal—sometimes shown as CHR$(27), CHR$(45), CHR$(1)—you're lucky. Printer codes are also often listed in hexadecimal or ASCII form. Hex is indicated by either a preceding dollar sign or by the presence of the letters A through F. The **underline on** codes above would appear in hexadecimal as: $1B, $2D, $01. In ASCII notation **underline on** would be: Esc, -, SOH. Whichever the case, if your printer codes are in hexadecimal you will need to convert them to decimal with a table, and if they are in ASCII, you will need an ASCII chart. Fortunately, one chart in the back of your *ST BASIC Sourcebook* has all of these values. Also, many printer manuals have conversion charts.

**ST Writer can do a limited form of mail merge.**

Go down the line of CONFIG.TXT codes and replace any codes that disagree with those codes in your printer manual. If your printer requires, say, four codes for a function that previously contained three, replace one of the 255's with the fourth code. Likewise, if your printer is one code short, replace the old, extra code number with a 255. It is very important that each function segment in CONFIG.TXT contains *eight* codes, so edit carefully. If you are uncertain about a particular function, leave it alone. Change as little as possible. You can always re-edit and try again.

Go back and look at the top of CONFIG.TXT. A short chart at the top shows the necessary code numbers to use for certain parameters. It is set up for 80-column printers, but if you have at least 132 columns, substitute 8712 for 5280. This number is critical if you want more than 160 columns (condensed elite on an 80-column printer). You *can* get 198 columns (condensed on a 132-column printer) if you use the larger number (8712), but don't try printing more columns than your printer can handle.

The character translation table may appear confusing, but it merely lists the ASCII equivalent of all the characters in the character set, from 0 to 255. Unlike the remainder of CONFIG.TXT, these numbers are in hexadecimal (represented in this case by **0x** ), so if you are not sure what they represent, see a table or the character set in your printer manual. Beyond the standard range of alphanumeric ASCII characters is an extra character set. The ST sees these extra characters as one thing (see again the chart in your *ST BASIC Sourcebook* ), but your individual printer sees them as another (depending on the printer). Many printers have their own special character set. The character translation table in CONFIG.TXT is designed to make the two jibe as much as possible.

Currently, the table is set up for Atari printers. If you don't have an Atari printer, you won't have all the special characters, so you can configure your printer driver to print the characters you *do* have, even if they have a different ASCII number. For example, my Star Micronics NX-10 printer has the paragraph symbol located at **0x14** (decimal 20), but on the ST, that symbol has the value **0xbc** (decimal 188). I found **0xbc** in the table and replaced it with **0x14** .

Now, every time I use the paragraph symbol in text to be printed, it will print as though I were using an Atari printer. Don't bother changing table values below 0x20 because ST Writer uses those for formatting codes, and they will never be sent to your printer.

ST Writer tip: If your printer doesn't support underlining or bold printing, but *does* support back spacing, you can still get these features. Although undocumented, if you use 95 as the first number for **underline on**, followed by the backspace code (usually a decimal 8), the printer will print the underscore, backspace one space, then print a character over the underscore. For bold print, below the section labeled **bold on**, place your printer's back space code. This will print a character twice in the same place.

Up until this article, I had never noticed a certain bug that was brought to my attention by the editors at START. When using [Control][G] [number] [Space] to bold or italicize single words, any word that happened to get printed immediately after a linefeed would not be bolded (or italicized). To correct this, use a hyphen in place of the space after the Control-G-number combination. (Editor's note: *This was one of several minor bugs which Dr. Noonan fixed immediately before press time. To indicate that this version of ST Writer was the final version, he added a zero to the version number, changing it from 1.5 to 1.50. If you have received your latest ST Writer from some other source, be sure to check your version number on the menu screen.* )

Once you have completed editing CONFIG.TXT, save it back to disk under the same name. Return to the GEM Desktop and make sure you have both CONFIG.TOS and the newly edited CONFIG.TXT on the same disk. Click and run CONFIG.TOS. In a short while, it will create a XYZZX.DAT file on your disk. Place this file on the same disk as STWRITER.PRG and you're ready to go. You might create a short ST Writer file which uses all the printer commands you wish to test. This way you can quickly try out the different functions and see how successful your edit has been.

## DOUBLE YOUR PLEASURE

One of ST Writer's greatest assets is its ability to format double-column text. Set [Control][L] and [Control][R] for the left and right margin values of the first (lefthand) column, then use [Control][M] and [Control][N] for left and right margins, respectively, of the second (righthand) column. The minimum value for the left margin of the first column is 1, and the maximum value of the right margin of the second column depends on which printer you are using. For an 80-column printer this would be 80 with pica (10 cpi) print. For condensed elite (20 cpi), this would be 160. Be sure that the first column's right margin doesn't extend past the second column's left margin or there will be trouble. Also, because different pitch characters have different widths, you cannot mix pitch with, say, a 10 cpi word in a column of condensed print, since it will force the column margin to be moved right. Using elongated (double width) print is OK, however.

## NOTHING UP MY SLEEVE

Here are a few tricks to navigate your way through ST Writer. To change drive paths (A:, B:, etc.) before your filename, you can either specify it every time, or choose [I]ndex from the menu and change the path name to the desired drive. ST Writer will remember this and use the new path as the default drive from then on. To access files within folders, type the backslash character (\) before and after the folder name, followed by the file name.

When downloading text files from a bulletin board, or converting 1ST Word files, you get a hard carriage return at the end of every line. Here is a simple procedure to clean up those files. Usually every line of such a file has one carriage return and every paragraph break consists of two. First, replace the pattern at every paragraph break with an unusual character not found in the document. (The vertical bar (|) just below the [Delete] key usually works. If you're unsure, do a search for it first.) Assuming a pattern of two carriage returns at each paragraph, the procedure would be: Press [Shift][F7], at the prompt press [Return] [Return] [Esc], at the second prompt, press [|] [Esc]. Next, globally delete the remaining carriage returns. (In some files, you replace them with no character, and in others, with a space. Look in your document to see if spaces are next to the carriage returns.) Press [Shift][F7]. At the first prompt enter [Return] [Esc], and at the second enter [Esc]. Finally, to restore the paragraph breaks, press [Shift][F7], enter [|] [Esc] at the first prompt, and [Return] [Return] [Esc] at the second. (If you want indented paragraphs, you might also enter a [Control][P] at the second prompt.

The above procedure will work with the majority of downloaded files, but it will mess up charts and tables. If your document has a lot of charts, use a Query Replace ([F7]) instead of a Global Replace ([Shift][F7]). It's slower, but safer.

Experiment with search-and-replace formatting. This is a powerful feature of ST Writer found in few other ST word processors. Version 1.50 of ST Writer also allows keyboard access to the special characters with ASCII values between hex 80 and hex FF. [Alt][X] will let you print them to the screen.

## MAIL MERGE

ST Writer can do a limited form of mail merge. This is handy for creating individualized letters from data lists. Let's say you wanted to send a duplicate mailing to two people, but also wanted to sound more personal than form letters normally allow. You could use ST Writer to create a database as follows:

Mr. John Q. Smith
212 Elm Street ▶

Seattle, WA 98101
Johnny
Mrs. Elizabeth Bean
11323 Eighth Avenue South
Humptulips, WA 98377
Liz

Since the ST Writer merge system uses carriage returns to recognize each data field (such as Name, or Street) it is very important that you create a file with no extra carriage returns between records, or at the beginning of the file. Also, most importantly, the data file that will later be read by ST Writer must be *printed to disk* using a special format. Set the top and bottom margins to zero, the left margin to one, and the number of lines per page to twice the number of lines in your *record* (eight for the above). So the above file should start with: [Control][T][0] [Control][B][0] [Control][L][1] [Control][Y][8]. Now choose [P]rint from the menu, [D]isk from the prompt, and enter a file name.

When you create your letter, use the Form Insert option ([F9] key) where each field item should appear. For example:

> December 4, 1986[Return]
> [Return]
> [F9][Return]
> [F9][Return]
> [F9][Return]
> [Return]
> Dear [F9],[Return]
> [Control][P]It's time again for our annual Garden Club meeting. I certainly am looking forward to seeing you and renewing old acquaintances. . .

Note that each of the lines of data will be used in order, and each line in the address file is terminated with a [Return]. If some of your addresses have four lines, you should make all the addresses with four lines. Use a [Return] without any characters in the fourth line position for three-line addresses. The fifth line with the first name or nickname is optional, but must be consistent from letter to letter.

As you print your letter, you will be asked if you want to get your form insert data from a file (as opposed to typing each entry in by hand). Answer 'Y' and then, when prompted, give the correct file name. If the file does not exist, you will be placed into the manual entry mode. You can terminate the printing at this point by typing [Esc] and recheck the Index to get the correct filename.

**ST Writer on disk may be free but I would pay for a cartridge version!**

You do not have to create your databases with ST Writer. You can use the mail splat from DB Master One, although you lose the flexibility of inserting nicknames in the text of your letter. This is a restriction of the database, not of ST Writer. Any database program which sorts and creates ASCII files will work with ST Writer, however.

## PREVIEW OF COMING ATTRACTIONS

We are currently working on a version of ST Writer that will allow users to specify their preference for GEM or not. By clicking the left mouse button, the user may select GEM, and all GEM functions will be available. Desk accessories will be available from the menu bar, as well as all the normal Menu selections. Our objective is to make ST Writer compatible with Thunder!, the spelling checker from Batteries Included. One potential problem is printing text to the screen with the GEM **v_gtext** function. This is much slower than **Bconout** as is presently used, but **v_gtext** is needed to get clipping. (Clipping "clips" the screen display to within certain parameters – such as a window.) Our fear is that the **v_gtext** function will slow down ST Writer to an annoyance level. One of ST Writer's best features is its speed.

Other plans and dreams include an auto-index feature, or at least a block-alphabetizing routine. How about placing the GEM version on cartridge along with the CONFIG.TXT file? ST Writer on disk may be free, but I would *pay* for a cartridge version! I've thought about graphics merge; it would be very difficult, especially since ST Writer works in three different resolutions. I tried to program several ways of passing user-supplied printer control codes embedded in the text, but found it very difficult indeed. Besides, you could modify the printer configuration file to suit your needs regarding other fonts not supported by ST Writer by sacrificing such things as sub- and super-scripts. Adding additional columns has been suggested, but the programming would be a nightmare, as we would most likely have to rebuild ST Writer from the ground up. And what characters could we use to represent the third or fourth left and right columns? The entire alphabet has been used up for control codes, and I'm not anxious to make ST Writer as complicated as Word Star.

## KEEP THOSE CARDS AND LETTERS COMING

If you like ST Writer and would like to have some other features added, let me or John Feagans know. If there are some other thoughts on how to improve the program, I would love to hear from you. My CompuServe number is 72407,504, or you might write me in care of START. I can't promise that we can or will implement your suggestion, but I'm open to suggestions. On the other hand, you could go out and *pay* for one of the newer word processor programs. . . ■

## EZ–Track

**The 20 Track Polyphonic MIDI Recorder for the ATARI ST.**

With EZ–Track you can make multitrack recordings in real time or step time, save them to disk, then play them back in perfect sync. Professional features include: Real time solo and muting of tracks, quantizing (auto-correction) of timing, instant transposition of entire song and many others. Memory capacity is over 27,000 notes on the 520ST and over 63,000 on the 1040ST.

**Retail Price $65.00**

## CZ–Android

**The patch librarian, editor and sound generator for the CASIO CZ synthesizer series and the ATARI ST.**

CZ–Android has set new standards for MIDI software in the pro music market, yet it is so easy to use with its mouse driven command structure, that first time musicians will be generating and editing sounds right off the bat. The program includes a librarian system that allows over 20,000 sounds to be saved per disk, both numeric and graphic editing of all CZ parameters, plus the amazing Android function that will actually program the synthesizer automatically. Using the Android command lets the user listen to thousands of original sounds and select the best for immediate use or additional graphic editing.

**Retail Price $99.95**

## EZ–Score

**The sheet music scoring program for the ATARI ST.**

This program allows EZ–Track song files to be translated into sheet music on the ST screen. User can add lyrics and chord symbols as well as define the chart format. Most of the popular printers are supported.

**Retail Price $99.95**

## MIDI Cables

MIDI spec. cables in 5 foot length.

**Retail Price $4.95**

For a free copy of our latest catalog and newsletter, call or write us at:

**Hybrid Arts, Inc.**

11920 W. Olympic Blvd., Los Angeles, CA 90064

**Computer: (213) 826-4288 Main Office: (213) 826-3777**

CIRCLE 018 ON READER SERVICE CARD

# WRITING TO THE CARTRIDGE SLOT

## SOPHISTICATED HARDWARE TECHNIQUES FOR THE EXPERT

**by G. Stewart Beal**

*Your cartridge port isn't just for cartridges anymore. ST developer G. Stewart Beal shares a hardware technique—complete with pictures, timing diagram, and schematic—to turn your cartridge port into a high-speed I/O port. So read on and leave the domain of ''Read Only.''*

A crash of static punctuates the warbling tones emanating from the speaker of your amateur radio transceiver and an unsightly streak appears on the otherwise perfect color image received from a fellow Ham 10,000 miles away. The signal fades, and you are left staring at the marred record of an exciting contact you had waited months for, using amateur Slowscan Television. But your disappointment fades as you realize the image can be fixed. You move the mouse and click on the image-processing function button. You apply a median filter to the affected region then click the painter button and pull up fatbits. You quickly color the bad pixels with "transparent" paint, add several inferior low-resolution images received earlier, averaging their good parts over the blemish and—viola!—an almost perfect image to save to disk as a memento of the contact.

You can do this now. Input an image with over 250,000 colors from a TV camera, VCR, or directly off the air; use sophisticated mathematical functions to enhance the subject; title the picture from some 160 fonts; then send the image anywhere by phone, radio or satellite link. It's all done with a small, image-display box called a *Scan Converter* to which your personal computer talks through a parallel port. Together, they make up an exciting tool for communicating ideas.

Bill Montgomery (VE3EC) and I developed the software for this low-cost image-processing system using an IBM PC clone and a Robot Research 1200C color scan converter (R1200C). The scan converter is a 256 pixel by 240 line image-display system with 18 bits per pixel and some local intelligence. The software for the PC (called GEST: a Graphics Environment for Slowscan

Television) permits loading and saving images and fragments, has a painter module with vector and bit-mapped fonts, and permits numerous image-processing operations for filtering, classifying, and feature extraction. When the Atari ST first came out, we immediately realized its price/performance ratio was much more attractive than the PC's. A tempting environment to convert our system to. So, why not try it?

The R1200C needs two unidirectional, eight-bit I/O ports and some additional control and status lines. Ultimately, the approach I took for the ST version was to build something which plugged into the then unused cartridge port, offering ready access to the high-speed transfers required.

## SEARCHING FOR A PORT

Writing the GEST package for the IBM PC consumed a lot of time but the effort provided us with several new image-communication tools. The additional horsepower of the ST's 68000 processor would increase the speed of many of the image-processing operations, such as a low-pass filtering which requires approximately 1.8 million multiplications and divisions. Our main problem with transferring the system from the PC to the ST was the interface. On the PC, we had used straightforward interface cards since the bus is available through plug-in slots on the motherboard. But there are no such general-purpose connections on the ST, so I began investigating its higher speed access points: DMA, parallel printer port, and cartridge slot.

Initially, the printer port seemed attractive. I could build a device which would generate two unidirectional eight-bit ports from the bidirectional one available, but it would require an additional signal to inform the device of the port's current data direction. A user-accessible bit (called GPO, for General Purpose Output) was available on the monitor socket. It could be taken from there or wired across to an unused pin on the DP-25 printer connector inside the ST. But this approach would require either a special cable for the monitor connector or a modification of the ST hardware, both of which might lead to future incompatibilities. Thus, the printer port was rejected as an access point.

The DMA port offered the tempting advantage of simultaneous data transfer and processing. But it looked too scary to tackle since there was little information on the protocol used, and it would require an intelligent device to supervise the transfers to and from the R1200C.

The cartridge port remained to be examined. It looked good. No modification of the machine was needed (the device could be completely removed), and no other cartridges were available at the time, so the socket was free. One major problem with the cartridge interface was the lack of any signal to convey the data direction (read or write). The slot is designed to accomodate "read only" memory devices; the only operation permitted is input. In fact the ST's Memory Management Unit (MMU) generates system exceptions when programs attempt to write to the region of memory occupied by the cartridge.

There seemed to be no simple way to interface an Atari ST. Then I noticed the large number of connections at the cartridge slot: *16 data-bus lines, 15 address lines, 2 data strobes, and 2 ROM-select lines*. Not only were there many signal lines, there were both inputs (the data bus) and outputs (address lines, strobes and selects). The *means* of conveying the information to the interface along the address lines was the only thing holding me back.

## CARTRIDGE THEORY

Consider the way the ST cartridge is meant to operate. The ROMs used in most cartridges store bytes of information organized in a *byte wide* fashion. That is, each access to the ROM returns a full eight bits of information in parallel. Since the Atari ST systems are *word* oriented (they can transfer 16 bits of information in or out at a time) the simplest means of building cartridges is to use pairs of ROMs—one providing the low-order, eight-bit byte, and the other the high-order byte. The 68000 processor, however, also permits access to single bytes of the memory and provides *data strobe signals* to indicate the particular byte desired: the Upper Data Strobe (UDS) and the Lower Data Strobe (LDS). When the processor wants a full 16-bit word, it asserts both signals simultaneously, activating both ROMs of the pair which then present their output data.

To distinguish among the many bytes of data contained in the ROMs, we rely upon each byte's address. Each ROM ▶

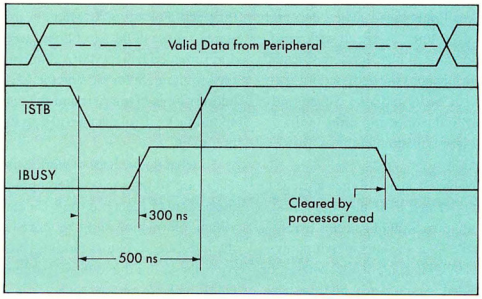



FIGURE 1: Typical 8255 Input Handshake Timing.

| Pin | Signal | Direction | Pin | Signal | Direction |
|---|---|---|---|---|---|
| 1 | Power +5 VDC | to cartridge | 22 | Address 14 | to cartridge |
| 2 | Power +5 VDC | to cartridge | 23 | Address 7 | to cartridge |
| 3 | Data 14 | from cartridge | 24 | Address 9 | to cartridge |
| 4 | Data 15 | from cartridge | 25 | Address 6 | to cartridge |
| 5 | Data 12 | from cartridge | 26 | Address 10 | to cartridge |
| 6 | Data 13 | from cartridge | 27 | Address 5 | to cartridge |
| 7 | Data 10 | from cartridge | 28 | Address 12 | to cartridge |
| 8 | Data 11 | from cartridge | 29 | Address 11 | to cartridge |
| 9 | Data 8 | from cartridge | 30 | Address 4 | to cartridge |
| 10 | Data 9 | from cartridge | 31 | _ROM3 Select | to cartridge |
| 11 | Data 6 | from cartridge | 32 | Address 3 | to cartridge |
| 12 | Data 7 | from cartridge | 33 | _ROM4 Select | to cartridge |
| 13 | Data 4 | from cartridge | 34 | Address 2 | to cartridge |
| 14 | Data 5 | from cartridge | 35 | _Upper Data Strobe | to cartridge |
| 15 | Data 2 | from cartridge | 36 | Address 1 | to cartridge |
| 16 | Data 3 | from cartridge | 37 | _Lower Data Strobe | to cartridge |
| 17 | Data 0 | from cartridge | 38 | Ground | to cartridge |
| 18 | Data 1 | from cartridge | 39 | Ground | to cartridge |
| 19 | Address 13 | to cartridge | 40 | Ground | to cartridge |
| 20 | Address 15 | to cartridge | | | |
| 21 | Address 8 | to cartridge | | | |

FIGURE 2: Cartridge Port Pin Assignments.

has several pins called *address lines* and when these lines are set up with various combinations of high and low voltages, specific locations are accessed for their bytes. The highs and lows correspond directly to the ones and zeros in the binary representation of the address number.

The address space of the cartridge ROMs is located in ST memory from $FA0000 thru $FBFFFF (128K bytes decimal). Since the largest commonly available ROMs contain 32K bytes, four are needed to completely fill this space. Since only 15 address lines are passed to the cartridge, we still need some way to access the full 128K. The cartridge, therefore, is provided with *ROM-select signals* which determine which pair to access. ROM4 is asserted if the desired address falls between $FA0000 and $FAFFFF, while addresses $FB0000 thru $FBFFFF cause ROM3 to be asserted. These ROM select lines, decoded and provided by the MMU, eliminate the requirement for passing the full 23 address lines to the port and the corresponding logic on the cartridge to interpret them.

So what do we have to work with? There are 16 lines to transfer input to the computer (data bus) and 15 lines on which information *might* be moved to the interface for output (address bus). If we make use of the ROM-select lines to tell us when to activate the interface, all the address lines can be used to transfer information. Normally, one doesn't think of a program having control over the address bus since the processor is driving it to fetch the instructions and data. But consider what happens if a request for a specific byte from one of the ROMs in a cartridge is made (the byte at $FB01FE for example). The CPU asserts the address lines to generate $FB01FE, and assert UDS to indicate that a byte from the *even* ROM is desired. The top eight address lines (which convey the *bank* information, $FB) connect to the MMU where it is determined that ROM-select line 3 needs to be asserted. The remaining address lines convey the value $01FE to the cartridge. If we consider these address lines as an outbound data bus, it is apparent that we can write the data value $01FE by reading from address $01FE.

Once I had determined how talk to the scan converter, all that remained was to design and build the interface. I found the design to be simple, but the construction posed a problem because the cartridge connector chosen by Atari had unusual pin spacings: two millimeters, center to center. None of the many catalogs I consulted listed any prototype cards with pre-etched fingers of these dimensions. The solution was to make my own adapter. (A custom connector is no longer needed since prototype cards are now available. See *Reference*.) The details of how I built the connector are presented later in the article for reference. The technique is simple and doesn't require any artwork for the printed circuit connector.

## THE INTERFACE

The unit I designed provides the necessary logic to interact with the signals present on the cartridge port. It also handles data and control to and from the scan converter. There are two eight-bit data pathways, one each for input and output, so the unit is capable of operating in *full duplex* (sending and receiving simultaneously). Synchronizing information for each path is provided by a control line called a *strobe* and a status line called a *busy*. The data sender uses the strobe line to show valid data is being transferred, while the receiver uses the busy line to indicate readiness to accept the data from the sender. Because the strobe signals are ▶

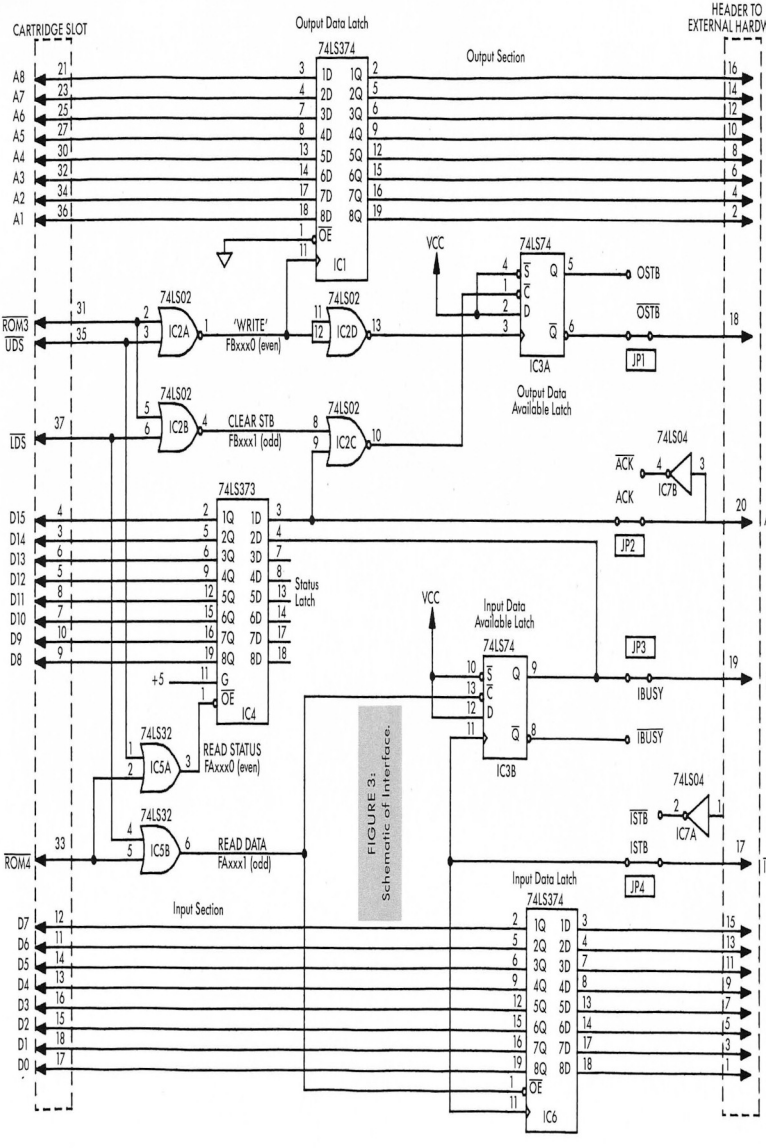



FIGURE 3: Schematic of Interface.

```
/*
        this routine dumps the R1200C image memory to the screen
        buffer array 'scr_buf', switches bank in the R1200C, then
        reloads the image back.
*/
#include "stdio.h"
/*
        define R1200C commands
*/
#define DUMP_RAW 0x8D
#define BANK_INC 0x03
#define LOAD_RAW 0xFD

unsigned char scr_buf[200000];  /* the screen buffer */
main()
{
unsigned char red, green, blue, get1200();
register unsigned char *bp;
register long i;

        flush1200();    /* clear the interface */
        Printf("\nany key to dump screen to buffer");
        bp = scr_buf;
        getchar();          /* wait for the user's signal */
        Printf("\ndumping");

        Put1200(DUMP_RAW);      /* ask R120C for the current image in R,G,B */

        for (i=0l; i<101; i++) {        /* show the first 10 pixels */
                *bp++ = (red = get1200());      /* red */
                *bp++ = (green = get1200());    /* green */
                *bp++ = (blue = get1200());     /* blue */
                Printf("\nR = %d, G = %d, B = %d", red, green, blue);
        }

        for (i=101; i<614401; i++) {
                *bp++ = get1200();      /* red */
                *bp++ = get1200();      /* green */
                *bp++ = get1200();      /* blue */
        }

        Put1200(BANK_INC);      /* go to the next bank in the R1200C */

        Printf("\nany key to re-load screen");
        bp = scr_buf;
        getchar();              /* wait til user is ready to watch */
        Printf("\nloading");

        Put1200(LOAD_RAW);      /* ask R1200C to receive the R,G,B image */
        for (i=0l; i<614401; i++) {
                Put1200(*bp++); /* red */
                Put1200(*bp++); /* green */
                Put1200(*bp++); /* blue */
        }
        Printf("\ndone");
}

/*
        define addresses of the ports on the interface
*/
static unsigned char *rf1200in = 0xFA0001; /* input data read from here */
static unsigned char *rf1200st = 0xFA0000; /* I/O status read from here */
static unsigned char *rf12000u = 0xFB0000; /* data XX written when read from
                                              there + (XX<2)) */
static unsigned char *rf12000c = 0xFB0001; /* output strobe cleared if read */
/*
        define the status bits on the interface
*/
#define INREADY 0x40
#define OUTREADY 0x80

flush1200()     /* routine to clear the interface */
{
register unsigned char c;
        c = *rf1200in;   /* clear the input register and status */
        c = *rf12000c;   /* clear the output strobe */
        return;
}


Put1200(c)      /* routine to send data to the output port */
char c;
{
register unsigned char *cp, cc;
register int ii;

        ii = c * 2;                             /* product bigger than byte */
        cp = rf12000u + (ii & 0x1FE);           /* calculate address */
        while (*rf1200st & OUTREADY);           /* wait til ready */
        cc = *cp;                               /* write the byte */
        return;
}


unsigned char get1200() /* routine to receive data from the input port */
{
        while (!(*rf1200st & INREADY));  /* wait for data available */
        return *rf1200in;                /* get the byte and return it */
}
```

FIGURE 4: Listing of Typical Program Segment.

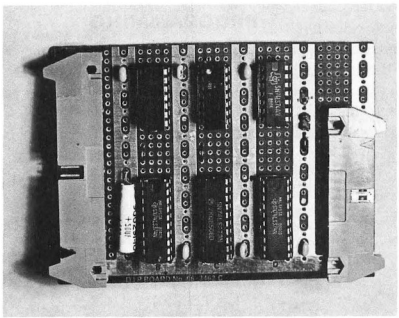


FIGURE 5: Photograph of Component Side of Interface.

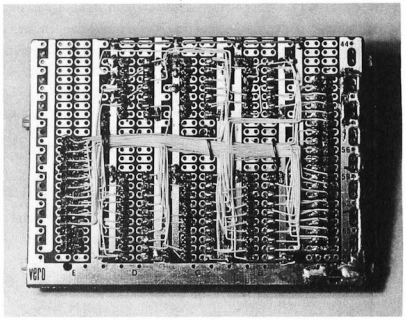


FIGURE 6: Photograph of Wiring Side of Interface.

often short pulses, the input path is provided with a *holding latch* which sustains the signal until it can be detected. Additionally, a status register, readable by the ST, is provided to store information about the strobe and busy lines for each path.

The interface was designed to simulate an 8255-type Programmable Peripheral Interface (PPI) chip operating in strobed input mode (see *Figure 1* ). Data for input to the device is presented on the input lines, then the input strobe line (-ISTB, a low-true signal) is asserted. The PPI then asserts the busy line (IBUSY, high-true), indicating the data has been captured, and clears it when the input register is read by the processor. The complementary output operation must generate the output strobe (-OSTB, low-true) and use the busy line, now called acknowledge (OACK, high-true), to sense readiness in the external hardware.

The design of the scan converter permits only a single pixel (picture element) to be written to the screen each time a horizontal line is scanned. This theoretically permits nearly 50,000 bytes of data to be moved each second (one byte each for red, green and blue times 15,750 scan lines per second), but in practice, only about 20,000 bytes per second are sent or received. This is because a processor in the scan converter is watching the status lines in much the same way as the ST computer is: the latent time between the strobe being set and the processor retrieving the data is totally lost. This consideration should enter into data rate calculations before deciding to use this interface for high speed communication.

## TALKING TO THE OUTSIDE WORLD

There are several operations to be considered in programming the interface to talk to the external hardware. It is always necessary to ensure the readiness of the device to accept input or provide output. The status register fulfills this synchronization requirement. When the scan converter wishes to send the interface a byte of data, it first looks at the busy line to see if the computer can accept the byte. If so, it places the data on its outbound data port and asserts the strobe line. This causes the interface to capture the byte and to set a bit in its status register. The computer periodically polls the status register by reading a location in the cartridge address space. If there is a byte available, it can fetch it from another location. The data input operation, in turn, clears the busy line to the scan converter, indicating the interface can accept another byte.

Output to the interface is slightly more complicated but also relies on a busy line, this time from the scan converter. When the program wants to send a byte, it reads the same status register but examines a different bit to determine the readiness of the scan converter. When it knows that the unit will accept the byte, it prepares to write it to the interface. The byte to be written must be shifted left one bit (since the least significant bit of the address is not provided to or used by the cartridge), yielding an offset value. This value is added to the base address of the interface output port, forming a new address which is also in the cartridge address space. A read is then performed on this address and, magically, the data byte appears on the output and the strobe line is asserted.

## THE HARDWARE

Since the interface plugs into the cartridge port and there is no other use for the memory space occupied, no minor address decoding is performed.

The interface requires only four control signals: read status, read data, write data and clear -OSTB. The signals for input operations (read status and read data) are derived from the -ROM4 line together with -UDS and -LDS at IC5A and IC5B. These signals correspond to reads at byte address $FA0000 (or any even address in the $FAxxxx bank) for status and $FA0001 (or any similar odd ▶

address) for data. Analogously, signals for output (write data and clear -OSTB) come from -ROM3, -UDS and -LDS at IC2A and IC2B. Reads at even addresses in the $FBxxxx bank perform the write operations, while a read at any odd address will clear -OSTB.

$FAxxxx was chosen as the address block for the input section because the ST operating system attempts to read a magic number from the first four bytes of the cartridge ($FA0000–$FA0003) early in the boot procedure. This is done to detect and transfer control to an executable program resident in the cartridge. If the output section was assigned there, spurious data would be written to the external hardware. The added benefit of having the input section at $FAxxxx is that two reads ($FA0001 and $FA0003) will be generated by the boot process which will clear the input data status latch in case turn-on transients in the external hardware caused an apparent data transfer into the input latch.

There is one fly in the ointment, however: The least significant bit (LSB) of the address is not available directly on the bus (see *Figure 2* ). Fortunately, since we only need eight bits, and the cartridge is 16-bit word oriented, the LSB is not required. The interface could have used the UDS and LDS signals to form the least significant bit, but due to other considerations, address bits A8 through A1 were used instead. This requires a one-bit left shift of the data to be written before the address calculation.

The remaining signals can be separated into two groups: D15 through D8, and D7 through D0. These lines make up the data bus, and I split them to emphasize the byte-oriented nature of the interface. The low-order eight bits provide the input data while the high-order bits provide the status of the latches to the computer. (Internally, the 68000 moves data from D15 through D8 to the low end of a register when a byte access to the high byte is requested, so it was unnecessary to multiplex the status and input data latches to the low data bus.)

The -ISTB/IBUSY and -OSTB/OACK signals are handled by d-type latches in the interface (see *Figure 3* ). In the case of the input section, the leading edge of the strobe causes the data on the input lines to be captured and the input data available latch (IC3B) to be set. The state of this latch is passed back to the external hardware as IBUSY and to the status port (IC4) for reading by the processor.

| Chip | | Vcc | GND |
|---|---|---|---|
| IC1,6 | 74LS374 | 20 | 10 |
| IC2 | 74LS02 | 14 | 7 |
| IC3 | 74LS74 | 14 | 7 |
| IC4 | 74LS373 | 20 | 10 |
| IC5 | 74LS32 | 14 | 7 |
| (IC7 | 74LS04 | 14 | 7) |

FIGURE 7: Power Supply Pins

In the output section, the data to be written (present on A8–A1) is captured in the output latch (IC1) on the leading edge of the processor WRITE signal. The trailing edge of this signal (generated by inversion in IC2C) is used to clock the output data available latch (IC3A) to provide -OSTB to the external hardware. The separation in time of these two edges permits the write data to propagate through the output data latch and to become stable before -OSTB is generated.

For the input section, the external hardware should sense IBUSY to ensure the latch is free to accept data. This line is cleared as the ST processor retrieves the input data from the data latch (IC6). The output section functions similarly, except the leading edge transition of OACK (in fact the external hardware's IBUSY) is passed through IC2D and causes -OSTB to be reset. OACK is routed to the status port and its trailing edge signifies the external device is ready to accept more data.

## PROGRAMMING

The simplest way to demonstrate the operation of the hardware is to use BASIC in immediate mode. Some form of an indicator is required to show the operation of the card. A scope is ideal but a logic probe, even without a pulse detector, may be used. The first section to debug is the status circuitry at IC4. The computer may read this at location $FA0000 by issuing the following commands:

```
DEF SEG = &HFA0000
I = PEEK(0)
```

The first command tells BASIC the base address of memory operations (and sets up to do byte-sized rather than word-sized accesses). The second command actually reads the status port (offset zero from the base). Printing **I** will show the state of the input bits on IC4. The number printed will have a bit set for each of the bits in the input port which are high. The number printed will be at least 63 because the low six bits on the port are un-terminated and will assume a high state due to internal biasing on the chip. These lines could be tied low to generate zeros, but I simply ignore them. If, for example, the value of **I** were 255, it would indicate all inputs were high including those from the OACK line and the IBUSY line. This can be verified using the indicator.

The next thing to verify is that the status port indicates the true states of the lines. OACK can be clamped high or low to demonstrate its operation but the IBUSY line may only be set with an appropriate transition on the ISTB line. Assuming the current DEF SEG is &HFA0000, IBUSY is cleared by reading the data input port as follows:

```
I = PEEK(1)
```

To verify the correct operation of the input, various input lines may be tied high and low in known patterns (alternates, pairs, top four, etc.) then the ISTB line can be pulsed. The status port

should indicate the data is now available using a PEEK(0) and the data may be read with a PEEK(1). Following the data read, the IBUSY line should return to its inactive state.

Output operations are slightly more complicated. The base address for operations is set to $FB0000 with the command:

```
DEF SEG = &HFB0000
```

To write a data value of X, issue the command:

```
I = PEEK(2*X)
```

The value returned to I is meaningless. Verify that **I = PEEK(0)** clears all bits in the output port while **I = PEEK(510)** sets them all (510 = 2 * 255). Similar experiments should validate that all bits function individually.

The operation of the output data-available latch and OSTB can be verified by observing that IC3A pin 5 goes high when the PEEK from any even offset is issued and that it goes low again if either the OACK line is toggled or a PEEK from an odd offset is issued.

Once these operations have been demonstrated, the interface may be configured and connected to the external hardware for use.

The commented listing in *Figure 4* illustrates use of the device from the C language and should require no further explanation.

## ASSEMBLY AND TROUBLESHOOTING

The first interface was built on a small piece of Vero-perforated prototype card using point to point soldered wiring with 28-gauge wire-wrap wire. *Figure 5* and *Figure 6* show the front and back of the card. The external hardware is connected to the 26-pin Ansley-ribbon terminator on the left, while the ST bus and power connects to a similar 40-pin connector on the right.

Good construction practice requires bulk decoupling of the five-volt supply using at least a 50-microfarad (ufd) capacitor close to the bus connector. Small 0.1 ufd capacitors are mounted close to each chip (probably an over-kill) for individual decoupling.

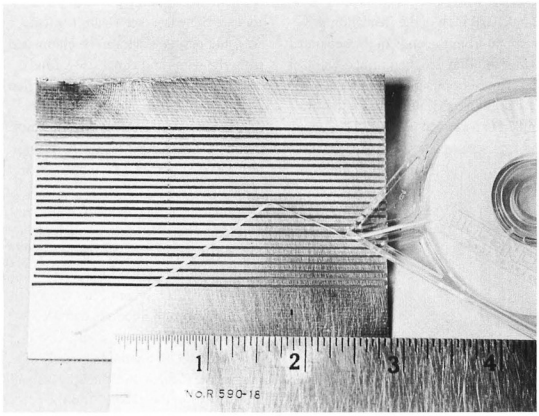



FIGURE 8: Unfinished, Etched Printed Circuit Board for Adapter.

After a careful inspection of the completed board for shorts and missing or incorrect wires, the adapter and board without chips may be plugged into the cartridge slot and the computer powered up. The machine should begin to boot correctly as indicated by the screen being cleared and the disk drive starting. If this has not occurred within a few seconds, the machine should be turned off and the adapter removed. The usual cause of failure at this point may be traced to shorted address or data lines, or a short in the five-volt supply.

Once the machine has been found to run correctly with the unpopulated interface plugged in, a check for +5 volts on the appropriate pins of the IC sockets should be made (see *Figure 7*). If correct voltages are found, the power may be turned off, the chips inserted in the sockets, and the machine powered up again. Failure at this point usually indicates an incorrect wiring connection on the board. Again, once the error has been found and corrected, the machine should be unaware of the interface. (Be sure to turn off the power when inserting or removing the interface or adapter, or connecting external hardware to the card.)

## MAKING A CUSTOM CONNECTOR

There are 40 contacts on the cartridge port, 20 on each side of the edge connector. A blank piece of double-sided printed-circuit-board material, approximately three by five inches in size, was cleaned thoroughly with extra fine steel wool, then washed and dried. (For both sides of the final product to align properly, one of the longer edges of the board should be quite straight and used as a reference.) Both sides are marked at each end with sets of 20 points at 2 mm intervals, starting approximately 1/2 inch from the reference edge. Strips of thin adhesive tape are then placed on each side of the board, positioned carefully using the marks as reference. (The tape I used, the type used by draftsmen and illustrators for graph and chart production, was 1/64 inch wide. Thin, printed-circuit artwork tape could also be used.) Care should be exercised to ensure the tape is straight and tightly ▶

stuck down. Both sides of the board are then lightly but completely sprayed with acrylic enamel and permitted to dry. (A slightly warm oven could be used to hasten the process.) Following drying, remove the tape, exposing the copper beneath.

The board can now be etched in the standard manner, leaving a set of 20 parallel traces in correct alignment on each side of the board (see *Figure 8* ). A section of the board about one inch long is cut off and finished according to the dimensions in *Figure 9* . It is recommended that the copper at the extreme edges, particularly on the narrower section, be removed to prevent peeling and possible electrical interference in the cartridge connector. The bevel shown must be made on the edge to be inserted into the cartridge slot, otherwise it is possible to snag one of the fingers in the cartridge port and push it down into the opening where it will short to the finger on the opposite side. (The short will not disappear when the board is removed, the machine will not operate correctly, and you will have no idea of the cause.)

The semi-finished board should then be cleaned carefully with solvent or steel wool. It is important to remove all traces of the enamel to facilitate soldering to the copper. A piece of 40-conductor ribbon cable, between six and eight inches long, is prepared as follows. After ensuring the ends are cut squarely, a line is drawn across the cable about three quarters of an inch from one end. Carefully, the conductors are separated back to the line. (A sharp knife, scalpel, or scissors can be used to cut back 1/8 inch between conductors, then the wire can be torn back by hand.) 1/8 inch of the insulation is stripped from the ends of the separated wires and they are then tinned with solder. The ribbon is placed on a flat surface and the odd-numbered wires are pulled to a vertical position. (The first wire, usually indicated by a colored stripe on the edge of the ribbon, must be upward.) These conductors will be soldered to the top of the edge connector, the even-numbered ones to the bottom.

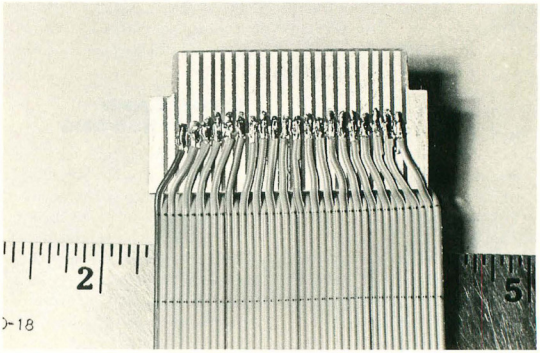



FIGURE 10: Photograph of Ribbon Adapter Assembly.

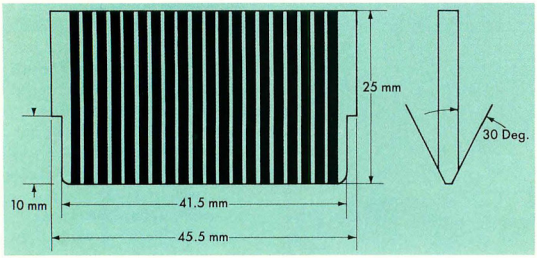



FIGURE 9: Finishing Dimensions for Adapter Card.

The middle two wires in the ribbon for the top surface are soldered to the matching conductors on the board as are those for the bottom, ensuring no slack is left in the wires. Then, alternately, wires on either side of the board are soldered until the outside conductors are done last (see *Figure 10*). This way, all possible slack can be eliminated from the wires and equal stress can be applied to all regions of the board when pulling on the ribbon to remove the connector from the Atari. (Prepare and count carefully! It is most embarrasing to have one wire left over when you are done.)

When the edge connector is finished and inspected, the header matching the one on the interface card can be mounted. It is suggested that this be done after the edge connector is soldered in case the ribbon is damaged and a new start must be made. Conductor #1 should be oriented correctly in the header (usually indicated by a small arrow-head in the plastic) and the connector crimped home using the correct tools or a small vise. The maximum length of about eight inches for the adapter ribbon ensures little effect on the bus signals. Extending it might cause crosstalk among the conductors, leading to irregular operation of the system.

The ribbon should be made as short as possible, remembering that the interface rests on the work surface to the left of the computer console. The builder might consider folding the cable at a right angle to place the interface to the rear of the computer. This will, of course, invert the numbering on the interface connector and care must be taken in wiring and documentation. It is worthwhile to remember that the odd-numbered contacts on the cartridge connector are on the top.

## BLUE-SKY DEPARTMENT

The control signals passed to and received from the external hardware might be either low- or high-true. To accomodate this, two inverters, IC7A and IC7B could be provided to condition the inputs, and either output polarity from the data-available latches (IC3A and IC3B) might be selected as indicated on the schematic by the jumpers JP1 thru JP4. For the implementation done here, the input lines did not require conditioning so IC7 was not required. (Both IC3 and IC6 clock on the rising edge of the strobe pulse, ISTB, but the external hardware provided a low-true pulse. Thus the data and status were not available to the ST until approximately one microsecond after the external device had actually provided it. The inverter IC7A should have been implemented to eliminate this delay, but in the worst case, loading 184K bytes of image data, the aggregate time lost amounts to only two-tenths of a second in a 12-second transfer. For implementations requiring higher rates, these types of considerations should be weighed carefully.)

An additional seven output bits can be made available simply by adding a 74LS374 data latch to the high-order (A15–A9) address bus. The output latches should be clocked together. Should some minor address decoding be required, to implement further input and/or output ports, qualification of -ROM3 and -ROM4 with a high order address bit (A15 typically) can be done using three-input or cascaded two-input gates.

This interface foundation could be the basis of any number of other, real-world sensor/controller combinations. The outputs can be implemented with relays or opto-isolators for controlling external devices, while analog to digital (A/D) converters could be connected to the inputs for medium-speed data acquisition. ■

## REFERENCE:


- *ATARI ST Internals, The Authoritative Insider's Guide* by K. Gerits, L. Englisch and R. Bruckmann, Abacus Software, Grand Rapids, MI


## LIST OF MANUFACTURERS:

- **Cartridge Prototype Board**
  Bigfoot Systems, suite #207
  2708 E Lake Street
  Minneapolis, MN 55406
  (612) 722-9515
  CIRCLE 428 ON READER SERVICE CARD
- **NEXUS OMNEPROM (EPROM development system)**
  NEXUS Technical Services, LTD.
  38 Melrose Avenue
  Reading RG6 2BN
  England
  (0734) 664559
  CIRCLE 429 ON READER SERVICE CARD


# lot of We're looking for a few good ST programmers.

If you are a programmer, a hobbyist, a user, or simply a good writer, and have something to say about the Atari ST, START is the outlet for your ideas. A well-paying outlet, we might add.

We're looking for hot programs, techniques, utilities, reviews, tutorials, and ideas for getting the most from your software. Send your article and programs on disk along with a printed copy, or just send us an outline of your idea. If you want your material returned, please include a self-addressed postage-paid mailer.

**START Editors**
c/o Antic Publishing
524 Second Street
San Francisco, CA 94107

**ST**ART UPDATE:

# MARK WILLIAMS C & MENU+

BY ARICK ANDERS

*Last issue, START published its first comparison of ST C compilers. No sooner did the issue go to press, than another major candidate entered the marketplace: Mark Williams C. How does this new contender measure up? Read on.*

The world of microcomputers is a hectic world at best. New products come out suddenly, announced products never appear, and old products emerge anew with major revisions. In the short time since START reviewed the available C compilers, Mark Williams, a company with an established reputation in the minicomputer world, has adapted its C compiler package for the Atari ST.

The Mark Williams package is different from the previously reviewed compiler packages for a variety of reasons. It is significantly more sophisticated, with the accompanying benefits and drawbacks of that sophistication. Experienced UNIX gurus will appreciate its UNIX-like shell and utilities, while those less familiar may find it cryptic and harsh. The compiler and linker are full-blown C implementations with options straight off a minicomputer. It also has an assembly-level symbolic debugger, a true MAKE utility, the Micro EMACS editor *and* the source code for the Micro EMACS editor.

## *DOCUMENTATION*

The documentation for the Mark Williams package is extensive but contains several omissions and many errors. It actually consists of three manuals bound together: 512 pages are devoted to the overall package, with 25 pages for a MAKE utility and 77 pages going to the Micro EMACS editor. Even without GEM AES/VDI information, the manual is over 600 pages long. Like the Lattice C documentation from Metacomco, this manual is paperback. However, it has a high-quality binding that will withstand normal treatment. (I found that the Lattice C binding was of poor quality and fell apart quickly under normal use.)

Mark Williams has tried a new approach in ST C documentation by putting most of the reference information in the alphabetical format of a lexicon. This portion of the manual occupies 367 pages and is, for the most part, extremely easy to use. Unfortunately, it was in the lexicon I found most of the errors in the documentation. For example, they have omitted some of the implemented BIOS and XBIOS calls, and many of the "types" listed in the function descriptions are erroneous. Structure pointers were often mistakenly referred to as character pointers, and vector addresses were referred to as longs instead of function pointers. More seriously, some of the commands, such as floppy disk commands, listed parameters as char type, when they are, in fact, longs. This type of mistake can wreak havoc with your stack and prove extremely difficult to locate.

Fortunately, while Mark Williams needs to concentrate more on their editing, they have some very good programmers! Laced throughout the lexicon are pages and pages of example programs that demonstrate the various library, BIOS, XBIOS and GEMDOS functions and how to use them. The examples are well written, well commented and show solutions to real world problems.

I was annoyed, however, by the occasional failure to reproduce in the lexicon information appearing in the tutorial sections of the manual. For example, the "history" command is not discussed in the lexicon—at least I was never able to find it. However, it *is* found in the table of contents and in the index. Each section of the manual has its own table of contents and index and both are excellent. I never found myself saying "I remember reading that, but I can't find where."

The section on the MAKE utility, which is written in an almost tutorial format, is clear and most programmers will find it sufficient to allow them to use the utility. A handy example included in the tutorial is the MAKE file for recompiling the Micro EMACS editor from the source code that comes with the package. One problem with the MAKE utility was that the colon in a device specifier, such as "B:\," confuses it. Consequently, you are unable to use device specifiers.

The section of the manual on the Micro EMACS editor is adequate, but the command summary is listed alphabetically. This is a handy format if you want to locate what a particular command does, but it is a pain to work with when you want to find how to skip to the end of the page, or how to do a search and replace.

A real void in the manual is the complete lack of any GEM documentation. Scott Herm, of Mark Williams technical support, suggested they may come out with GEM documentation in the future. As mentioned in the last issue of START, the real blame for insufficient GEM information lies at Atari's feet. Nevertheless, this is no excuse for completely ignoring GEM since it is a significant part of the machine and many languages cover it in some degree.

**From minicomputers to micros, Mark Williams has established a strong reputation. . .**

Most of the problems with Mark Williams' documentation are due to careless editing. It is not uncommon to have two successive sentences repeat the same thought almost verbatim, and information in a function description often fails to ▶

FIGURE 1

**MARK WILLIAMS/ ALCYON C COMPARISON**

| | ALCYON | MARK WILLIAMS |
|---|---|---|
| Price | $300 | $180 |
| Full K&R | yes | yes |
| Number of registers | 8 | 8 |
| Integer size | 16 | 16 |
| Minimum disk size[1] | 455K | 1,135K |
| Minimum drives[2] | 2 | 1+2 |
| GEM documentation | yes | no |
| Index | partial | yes |
| ANSI extensions | partial | partial |
| GEM shell | no | no |

[1]Disk usage includes editors and all library and link files

[2]For practical use, Mark Williams requires at least one double-sided drive.

## Williams C...

match the accompanying example program. However, the actual writing is usually very readable. The material is arranged logically and the lexicon style smoothly bridges the gaps between the novice user and the experienced programmer.

### *USE*

Prior to using the compiler you need to install the product on either a hard disk or a couple of double-sided disks. This is a painless operation, with the computer doing most of the work, but it is time consuming.

(Editor's Note: *At press time, Barry Bowen of the Mark Williams Company assured us that they were shipping version 1.1, which includes an improved manual and an automated install procedure for common system configurations. He also noted that Mark Williams will deliver compiler packages with single-sided diskettes upon request and at no additional charge. START did not receive version 1.1, and we were, therefore, unable to verify these claims.*)

The standard set up, with a double-sided disk, leaves you with a compiler disk and a commands disk. After using the compiler disk for a while I copied the date program over to it from the commands disk. Then I moved the shell program to an AUTO folder and expanded the PATH environmental variable to look in the AUTO folder. This meant I could now boot from the compiler disk keeping my source disk in the B: drive.

After either booting off the above disk, or double-clicking the shell program, you find yourself in a mini UNIX-like environment. The default prompt is a dollar sign. From there you can do a number of things such as change default disks, sort a file, get the difference between two files, get a character/word/line count on a file, compile, link, set the date, run a GEM application, run a TOS application, dump a file in any one of five formats, list a directory or even do a file move. The move is handy if you don't have room on a disk to copy and delete a file. It just changes the directory pointers around. On a cross-device transfer, it copies the file and removes it from the original device.

FIGURE 2

**BENCHMARKS**

| DOODLE: | ALCYON | MARK WILLIAMS |
|---|---|---|
| Floppy compile | 17:50 | 6:38 |
| Floppy link | 5:45 | 3:00 |
| Hard disk compile* | 6:27 | 4:18 |
| Hard disk link* | 2:16 | :44 |
| End code size | 16,705 | 20,201 |
| **DHAMPSTONE:** | | |
| Floppy compile | 5:08 | 3:40 |
| Floppy link | 3:21 | 2:50 |
| Hard disk compile* | 1:56 | 1:28 |
| Hard disk link* | 1:38 | :44 |
| End code size | 18,154 | 20,524 |

*Hard disk comparison times may not accurately reflect compiler differences since last issue's test was done on a well-used, file-packed, 20-megabyte Atari hard disk, and this issue's Mark Williams test was accomplished on a newly formatted, 10-megabyte, Supra hard disk. Floppy compile times will prove a better basis of comparison.

**The compiler and linker are full-blown C implementations with options straight off a minicomputer.**

A handy feature is the ability to use batch files containing any of the shell functions or any executable program that is in one of the directories listed in the PATH environmental variable. Another is the ability to redirect input or output to or from alternate devices/files.

There are three ways to compile a program. You can compile a number of files in one command from the shell program, you can include a compile command in a batch file, or you can use the included MAKE utility. Unlike the Megamax MAKE, which is more of a time-dependent batch compile and link, the Mark Williams utility is a full-blown MAKE with file dependencies specified, including the header file dependencies. As mentioned, the MAKE utility can't handle different devices, but in spite of this, most serious developers will want to use this utility.

The Mark Williams compiler itself is a true minicomputer compiler with so many options you won't remember them all—much less use them. (For example, the -M option will allow you to use alternate programs for the different passes in the compiler.) The compile and link times are comparable to the other traditional multiple-pass compilers, though the times were nowhere near the speed of the Megamax package. (Editor's note: *See* Figure 1-3 *for test results. These charts test the same features as last issue's survey. For purposes of this article, we have also published the results of Alcyon C, from the Atari Developer's Toolkit. See last issue's chart for comparison with Megamax C, Lattice C, and GST C.* ) Like the Megamax package, Mark

Williams offers a disassembler to generate assembly-language code for hand optimization or code inspection. It is enabled via a command-line option on the normal compile command.

The compiler is very strict, combining the normal compile responsibilities with many of the warnings of LINT. It includes options to compile with either strict Kernighan and Ritchie, or Berkeley rules. Nested comments are permitted. Unused registers or variables can be noted if the correct flags are set. A command-line argument can be used to keep the compiler from linking. The compiler will recognize an object file by its ".o" extension and only link it in with the final pass. The linker is the final pass of the compiler and it is much easier to pass the compile command a ".o" file than to mess directly with the linker itself. To compile AES/VDI programs, you add a -VGEM option on the command line.

**The MAKE utility can't handle different devices, but. . .most serious developers will want to use it**

The compiler implements some of the new ANSI standards, including unsigned modifiers, passing, assigning and returning structures, enum types and the void type. However, it does not implement function prototyping. The integer is 16 bits. There are eight registers available, three for addressing and five for data.

The accompaning libraries are the most extensive available on the Atari ST at this time. Among the routines that it includes are three type of sorts, an extensive math library, a random number generator that works, plus the usual UNIX, AES and VDI calls, and C-level access to the Line A calls.

### *EDITOR*

The Micro EMACS editor is a traditional keyboard editor. It is RAM based, meaning it uses any available memory. I tried to use it to write this article, but the word wrap is very kludgy and not particularly useful. However, for editing programs, I felt that it was easier to use than other editors I have tried. It has macro capability, as well as search and replace. The absolute GOTO command means it can be used with a number of compilers that generate line numbers with their errors. You are able to open a number of horizontal, non-GEM windows in the editor which split the screen into two or more windows of one or more files. There is unlimited retrieval from the "kill" buffer, so data can be moved between files easily.

If you don't like a particular feature of the editor, you can change it. Mark Williams includes the source code and the MAKE file for you to rebuild the program yourself. This is a fun little addition that I suspect many programmers will enjoy.

The Mark Williams package is quite usable on a double-sided, two disk-drive system. By the time you read this, the system will also be available on single-sided disks. But, with the amount of disk space the program and commands use, this is not a practical package for any hardware system with less than one double-sided disk drive and an additional single-sided drive. All told, the minimum disk usage is over one megabyte. If you want to play around with the accompanying source code, you will either need to use a lot of disks, or have a hard-disk drive.

### *SUPPORT*

I was not impressed with the support I received from the Mark Williams company. I called several times and the person I talked with regularly had to ask someone else for the answer to my questions. Most of my phone time was spent waiting for them to track down the answer. Since support is only available during Central Daylight Time business hours, this can get expensive.

### *CONCLUSION*

Mark Williams offers a very nice package. The format and organization of its documentation is fantastic. It is unfortunate that it is marred by poor editing. The writing is well done, reasonably clear and the table of contents and index are un- ▶

FIGURE 3

**DHAMPSTONE**

| TIMES: (in seconds) | ALCYON | MARK WILLIAMS |
|---|---|---|
| Strings | 7.87 | 7.55 |
| Integers | 2.03 | 2.22 |
| Longs | .27 | .28 |
| Unsigned | 1.65 | 2.07 |
| Double | .12 | .88 |
| Disk I/O+ | 35.70 | 14.92 |

+Dhampstone creates a test file of 12,987 bytes by assigning a short string buffer and writing it to disk 1,000 times, one byte at a time. (See our last issue for more information on Dhampstone, which was originally published in the February 1986 issue of Computer Language magazine.)

## Williams C...

surpassed. Lack of GEM documentation and a resource construction set is a definite drawback if you are planning on developing just for the Atari. However, with a solid compiler running on systems ranging from VAX to IBM PC, Mark Williams C on the Atari ST offers the professional developer a convenient migration path to a variety of machines at a very reasonable price. ■

**Mark Williams C**
Mark Williams Company
1430 W. Wrightwood
Chicago, IL 60614
(312) 472-6659
$179.95

In last issue's C compiler comparison review, we noted that the Lattice C compiler package had neither a command interpreter, nor a GEM shell. This meant you had to take your hands off the keyboard to double-click the mouse, then type a whole list of command-line options when the Tos-Takes-Parameters dialogue box came up. The net effect was to combine the worst elements of both interfaces.

Since that article, Metacomco has solved these problems with a new program called Menu+, now being released with all of their language products—including Lattice C. Menu+ combines the intuitive, easy-to-use GEM interface with the convenience of a "history" command, normally found only in traditional command interpreters such as the UNIX C-shell. A history command is an instruction that tells the computer to repeat one or more previously entered commands. If you have programs that take a lot of parameters on the command line, as does the Lattice C compiler, and you often repeat the same command sequence, a history command can save a lot of keystrokes.

Menu+ places you in a GEM shell with four menu choices across the top of the screen. In the center of the display is a window with the normal movement and scroll bars. The window will display the last 50 commands you executed since you booted the Menu+ program. To repeat a particular command, you double-click it. Simple. When the command has finished execution, you will be returned to the GEM shell with the last command added to the list. If you consider how many times a developer goes through the "edit, compile, link, test run" cycle, the advantage of this feature becomes obvious.

The four menu choices at the top of the screen are Desk, File, Tools, and Options. Desk contains the usual desk accessories and File is how you specify the default disk directory and the working file. Under Tools are listed the programming executables that you normally work with: editor, compiler, linker, and others. The last menu choice, Options, offers options for the various programs you might want to use, such as "Editor_opts" or "Linker_opts." For example, if you want the GST linker to append a symbol table onto the binary file for debugging purposes, the menu item for Linker_opts would be set to -DEBUG. Then, whenever you ran the linker from the "Tools" menu, the option for debugging would automatically be appended onto the command.

Handy though this is, what really makes this program useful is that the user can modify the last three menu-choice displays and define what they do. Thus, you can define a menu option for whatever language, compiler, utility, or game you want to use, then run it from the shell. Commands can also be combined so that one menu item will execute any series of commands you need. When commands are combined in this way, you can set the sequence to pause, or to continue immediately with the next command. Since linking isn't particularly useful after a faulty compile, the sequence can be set to return to the shell when an error is detected.

Customizing the menus is straightforward. The documentation is a different story. Not only did I find the style confusing, but there is no table of contents or index. Fortunately, it is short (only twenty-six pages) with lots of pictures, and the section headings are in bold print; it is possible to find what you are looking for by flipping through the manual.

Accompanying the program is a utility that will display, print, delete, copy or rename a file. Menu+ also includes five example data files that can be used with the language packages from Metacomco.

While Menu+ can be purchased with the Metacomco editor for $29.95, it is also being shipped with their five language packages: MCC Pascal, MCC Assembler, Lattice C, BCPL, and Lisp.

Menu+ won't be much help to you if your program causes the computer to crash and you have to reboot regularly. It also won't be of much use if you rarely repeat a command sequence. However, if you use the same basic command sequence often, you may find it a very worthwhile utility. Those of you who receive Menu+ bundled with a language package are getting an extra bonus. ■

Metacomco
5353E Scotts Valley Drive
Scotts Valley, CA 95066
(408) 438-7201

# Megamax C

for the

# Atari ST

**Featuring**

• One pass Compile • In-Line Assembly • Smart Linker • Full Access to GEM routines • Register Variable Support • Position Independent Code • and much more...

**System Includes:**

• Full K&R C Compiler (with common extensions)
• Linker • Librarian • Disassembler • C Specific Editor
• Code Improver • Documentation • Graphical Shell

| Benchmark | Compile Time | Execute Time | Size |
|---|---|---|---|
| Sieve | 70 | 2.28 | 5095 |
| "Hello, world" | 63 | N/A | 4691 |

*Times in seconds. Sieve with register variables.

**$199.95** For more information, call or write:

Megamax, Inc
Box 851521
Richardson, TX 75085
**(214) 987-4931**
VISA, MC, COD ACCEPTED

CIRCLE 024 ON READER SERVICE CARD

# ProCopy ST BACKUP UTILITY

You can't backup your software because copy protection locks you out. **ProCopy** is the key!

- Protects against the accidental loss of expensive software
- Works with all Atari STs
- Copies both S/S & D/S disks
- Use with 1 or 2 disk drives
- Not copy protected
- **FREE** shipping and handling
- **TOLL-FREE** telephone number
- Updates are only $12 with return
- Orders shipped same day
- Disk analyze function included

Dealer Inquiries Welcome

VISA MasterCard and C.O.D. orders

**Call (800) 843-1223** **$34.95**

Send check for $34.95 (overseas add $2.00 for air mail) to:

**PROCO PRODUCTS**
P.O. BOX 665, CHEPACHET, RHODE ISLAND 02814 USA
(401) 568-8459

**Available Internationally in Europe and Australasia**

THE MOVING FINGER CO.
Building 2
Shamrock Quay
Southampton, SO1-1QL
England
Tel. 0703-227274

TECH-SOFT COMPUTER WHOLESALE
324 Stirling Highway
Claremont
Western Australia 6010
Tel. 09-385-1885

CIRCLE 033 ON READER SERVICE CARD

# "function_aid"

Patent Pending

- Stop fumbling for your manuals
- Put your Macros in front of you
- Rests on top of your *ST
- Adjust window to suit your light
- When finished, remove & cover keys
- 4 Blank inserts included (2" x 12")
- Designed & made only for the *ST

**$24.95**

*ST is a trademark of Atari Corporation

Compuserve PPN 76410,35

★ **Indispensible for business programs (word processors, telecommunications and data bases) etc.**

★ **Just about any program you use needs function_aid**

★ **If you own an Atari *ST you definitely need this!**

★ **Unconditional 5 year Guarantee**

If you break **function_aid**, return it and we will replace it at no charge to you.

CIRCLE 038 ON READER SERVICE CARD

STATIC ENGINEERING, INC.
P.O. Box 570, Bristol, CT 06010
(203) 879-4671

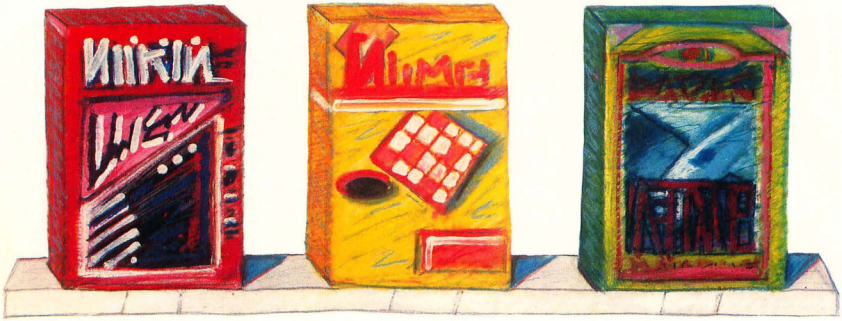
Please send _____ **function_aids(s)** at $24.95 each .... _____
Add a shipping charge of 1.75 each ..... _____
(CT residents add sales tax of 1.50 each) ..... _____
**Overseas add $7.00 shipping charge** ..... _____
TOTAL _____

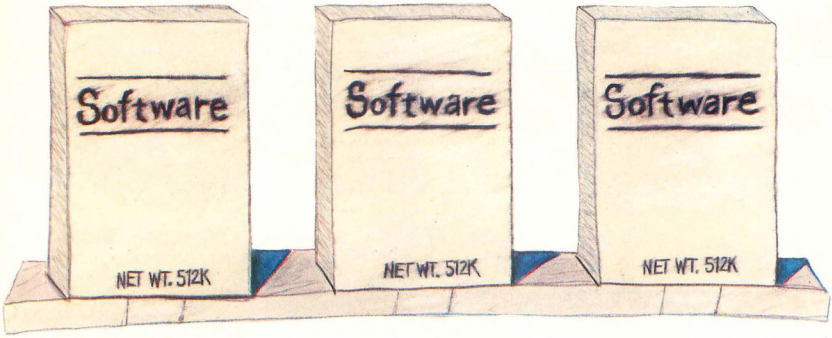
Name _____
Address _____
City _____ State _____ Zip _____

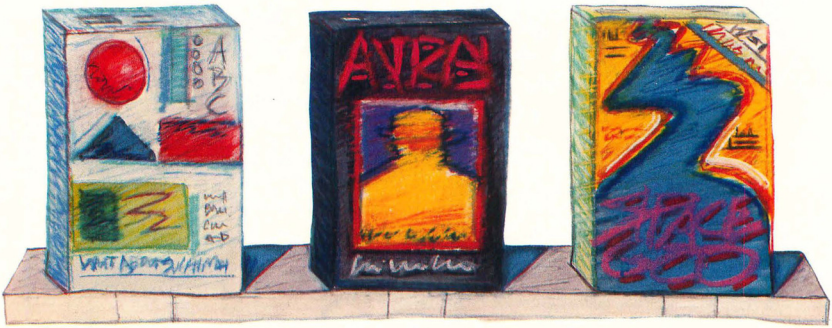
☐ MASTER CARD ☐ VISA ☐ MONEY ORDER

Card No. _____ Expiration Date _____

**Distributors of "function_aid"**




Software
NET WT. 512K
Software
NET WT. 512K
Software
NET WT. 512K


ABC

SAMPLE

# SHOESTRING DEVELOPMENT

## START PICKS PACKAGES FOR DEVELOPERS

by Christopher F. Chabris

*Looking for an alternative to the $300 Atari Developer's Toolkit? You say you want to do some programming but don't have 200 bucks to blow on C? Have we got a deal for you! Christopher Chabris takes a close look at the ST operating system, then rounds up all the tools you'll need to develop ST programs—at bargain basement rates.*

Many ST owners, eager to develop software with the growing number of structured, high-level languages, are dismayed by the high cost of Atari's development kit, or that of the other "professional" packages, such as Megamax C. But affordable software development tools do exist.

I looked over the field and discovered four powerful compiler languages that sell for less than $100, as well as free or inexpensive debuggers, RAMdisks, print spoolers, and other tools you may need in your development effort.

Note that I said "compiler," a language that translates your programs directly into machine language or some similarly compact code before execution. We will cover the following compilers:

- **GST-C**, v. 1.02, GST Holdings Limited
- **Personal Pascal**, v. 1.02, Optimized Systems Software
- **Modula-2/ST**, v. 2.00B, TDI Software Inc.
- **Softworks BASIC**, v. 1.2C, Softworks Limited

It is coincidental that these represent four different languages. I decided to cover packages that use most of the ST's GEM routines. I also decided to avoid Forth, LISP, Prolog, interpreted BASIC, Logo, and any language for which there was not a low-cost compiler available, and in general to stick with mainstream development tools already accepted among professional programmers.

DAVID GAMBALE

### THE 16-BIT TREND

The Atari ST computers exemplify some fundamental trends underlying the evolution of personal computers from glorified game machines into truly useful productivity workstations.

The most obvious trend, the window/icon/mouse interface, was made famous with the Apple Macintosh and affordable with the Atari ST. It is now the *de facto* standard for new microcomputers. Manufacturers from IBM to Sun Microsystems offer graphics-based interfaces for their systems. ▶

## SHOESTRING...

Operating systems are undergoing a similar transformation. Early microcomputers had tiny control programs that did little more than print characters to the screen, read and write disk sectors, and service interrupts. The sophisticated, minicomputer-like operating systems of the ST and its competitors provide not only the traditional services but also memory management, graphics primitives, and, of course, user interaction facilities. The next direction, towards true multitasking environments, is already evident on the ST in background desk accessories like Thunder! and alternative operating systems like the MT C-Shell.

A third trend is the growing use of high-level, block-structured programming languages, and the corresponding movement away from assembly language and BASIC, formerly the languages of choice and necessity for microcomputer programming. Most commercial ST software today is written in the C programming language.

## ANATOMY OF THE ST

The Atari ST is a general-purpose personal computer built around the Motorola MC68000 16/32-bit central processing unit, supported by both off-the-shelf and proprietary chips. The ST's operating system, TOS, consists of several distinct modules that call on each other to perform system housekeeping and user services:

*1. **BIOS:*** Basic Input/Output System. The ST BIOS provides low-level system services such as character I/O with the keyboard, screen, and peripheral ports.

*2. **XBIOS:*** Extended BIOS. The XBIOS provides services similar to those of the BIOS, but oriented towards ST-specific hardware functions such as MIDI-port I/O, disk controller commands, disk sector I/O, and the like. It also includes miscellaneous functions such as system clock maintenance and switching the processor in and out of supervisor mode.

*3. **GEMDOS:*** GEM Disk Operating System, a relatively machine-independent DOS designed by Digital Research Inc. (DRI) to be quite similar to MS-DOS as used on the IBM PC and compatible computers. GEMDOS provides high-level access to the disk file system (opening and closing files, creating and removing subdirectories, etc.) as well as other features not tied exclusively to the ST hardware.

**Your program must actually execute an unimplemented instruction to call the routine!**

*4. **Line-A:*** The lowest level of graphics capability available on the ST short of storing bits directly into screen memory (not a good idea if you want your programs to be compatible with future ST models). Line-A is the underlying set of graphic functions that GEM itself uses to draw on the screen. Reportedly, Line-A routines will access the long-awaited "blitter" chip so that all properly-written software will run without modification or recompilation by the vendor.

*5. **VDI:*** Virtual Device Interface, one of the two main parts of GEM, the Graphics Environment Manager, which was also designed by DRI. VDI, in concept, is intended to provide a set of device-independent graphics functions that an application can use for all of its output regardless of the device on which that output will eventually appear. The idea is that the user can choose whatever output device(s) he wants to use, such as the screen, a printer, or even a camera, and simply direct the program's output to it. Supposedly, the software developer who plays by DRI's (and Atari's) rules need not be concerned with the details of driving all possible devices; the VDI will take care of it. A powerful idea indeed, but as we shall see, it's not yet a reality on the ST.

*6. **GDOS:*** Graphics Device Operating System, the silent partner of the VDI. The GDOS is the portion of GEM that does the hard work behind all the device-independent output magic that the VDI takes credit for—and it is missing from your ST ROM. Why? For one thing, there is not enough room. For another, well, DRI and Atari have been a little slow on this one. GDOS has been a part of the MS-DOS, IBM PC version of GEM since day one, and Atari has been promising it to developers for months, but as of September 1986, only Migraph had obtained it for their Easy-Draw package, and Tom Hudson was using it for DEGAS Elite. As implemented on the ST, GDOS is booted from an AUTO folder as a Terminate-and-Stay-Resident program. GDOS is to come with a set of standard fonts and output device drivers that may be augmented in the future. For more on the subject, read "Tracking the Elusive GDOS: Those Missing Metafiles" in START, Vol.1, #1, Summer 1986.

*7. **AES:*** Application Environment Services, the second main part of GEM, consists of routines for user-interface functions such as drop-down menus, windows, dialog boxes, and the like. AES also coordinates the limited multitasking available to desk accessories. The AES will manage up to six desk accessories. Strictly speaking, desk accessories are independent programs and not part of TOS.

Several items are most certainly *not* in TOS. The GEM Desktop, though stored in ROM along with TOS, is really nothing more than a GEM application. In addition, TOS has no command-line interface (like MS-DOS), although

several are sold as normal ST applications. Also, the only support for arithmetic is that provided by the 68000 instruction set, i.e., the ST has no floating-point math package built into it like the Atari 8-bit OS. And lastly, there is no support for full multitasking. As alternatives to TOS, both OS-9 and the MT C-Shell provide for multitasking several programs (or users).

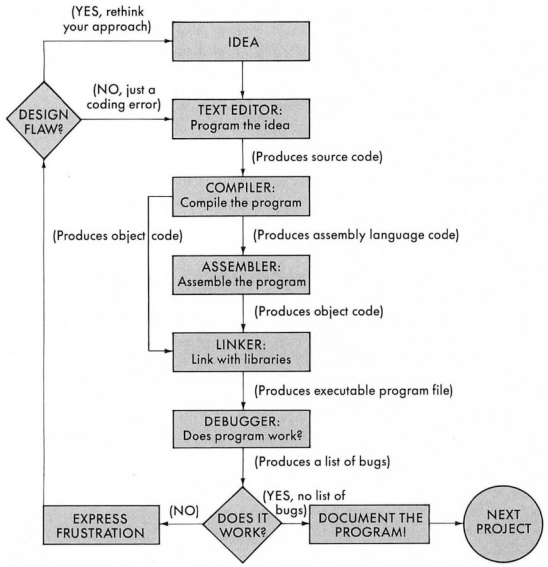
## PROGRAMMING THE ST

There are two fundamental ways of programming the ST: You may create a full-blown GEM application with drop-down menus, multiple output windows, and all the trappings; or a simpler program that ignores GEM VDI and AES, relying instead on the BIOS, XBIOS, and GEMDOS routines for all user interaction. The former type, known as a *GEM Application*, is generally encouraged, especially for commercial products. The latter, referred to as a *TOS Application*, is recognizable by its lack of windows and mouse and, as often as not, its blinking cursor. A TOS application is often preferable when speed is of primary importance and ease-of-use is a secondary goal. Some confusion exists over the terms TOS and GEM as applied to applications. Although TOS is a label for the *whole* ST operating system (including AES and VDI), a TOS application uses only part of the available system (omitting AES and VDI). The TOS application label came about because most TOS applications use a .TOS extender which the OS recognizes as a non-GEM program. This confusion is unfortunate, but we're stuck with it. So when you see further on in this article that a language includes "GEM routines," I mean that it contains all the routines in the TOS operating system, ranging from BIOS to AES.

Applications well-suited to GEM might include word processors, graphics programs, and spreadsheets. The classic, text-based form might be more appropriate for a database management system, a programming language, or a short utility program. In general though, any application can benefit from GEM's features if its programmer is creative enough to use them well.

Desk accessories, by definition, rely on GEM and are only available from within GEM-based programs that implement the Desk menu. Videogames on the ST are seldom GEM programs and often rely exclusively on the Line-A interface to obtain the optimal combination of speed and portability. They are normally written in assembly language (again for speed), so we will not cover the techniques for programming them here. To those interested, I recommend one of the assemblers reviewed in "ST Assemblers: A START Comparison" (START, Vol. 1, #1, Summer 1986) and a reference to the Line-A routines, such as *Atari ST Internals* from Abacus Software.

FIGURE 1 *The Software Development Process*




## THE DEVELOPMENT PROCESS

The software development process on the ST consists of an edit-compile-link-(crash)-debug cycle that continues indefinitely until you, the programmer, are satisfied with its results. The flow chart in *Figure 1* illustrates this process and adds some details. This basic cycle applies, with minor variation, to all four products we will consider. Considerations of procedure, however, are not as important as GEM support and quality of documentation.

Again, we are considering high-level languages only. Most ST developers prefer high-level languages and use assembly language only for optimizing time-critical routines. C is the language of ▶

choice, with Pascal and Modula-2 gaining in popularity. And a compiled BASIC can help old 8-bit hands make the transition to the ST in style.

## INTERFACING WITH TOS

A few words are in order about the method ST software uses to interface itself with TOS, that is, how a user program actually calls the routines that are built into ROM (or loaded with the GDOS patch). The 68000 processor has an instruction called TRAP, which causes a sort of interrupt in the system. There are sixteen different traps, each with its own *service routine* that is automatically invoked by the 68000 when the appropriate trap is used. On the ST, most of the traps are unused by TOS, except for these:

**#01: GEMDOS routines**
**#02: GEM routines (both VDI and AES)**
**#13: BIOS routines**
**#14: XBIOS routines**

The other 12 traps are available for future expansion. Normally, the parameters to GEMDOS, BIOS, and XBIOS routines are passed on the stack and an error code returned in 68000 register D0. However, as usual, there can be exceptions. **TRAP #02** is used differently: all the necessary parameters to the GEM routines are placed in various pre-allocated system global arrays; GEM determines from this data which function is desired and what its parameters are. To further complicate things, the Line-A breaks just about every rule. As with the VDI, you must fill up a parameter array before making the call. Here, however, your program must actually execute an unimplemented instruction to call the routine! Sometimes I feel that the secret objective of the TOS designers was to make life difficult for poor assembly-language programmers!

Fortunately, if you're willing to forego access to Line-A, you can remain entirely within the bounds of your chosen language and forget about all the messy details. All four language packages discussed here come with easy-to-use methods for calling GEM routines. Each compiler presents libraries of short machine language routines called "bindings." These routines set up the parameters in the proper locations and execute the appropriate trap instruction. When you link your object code, these bindings are extracted from their libraries and added into your final output program, just as functions from a floating-point library would be inserted if your code called them. Therefore, you can make whatever GEM calls you want in the same language as the rest of your code. For example, *Figure* 2 shows a call to XBIOS function 19—Verify Disk Sector—coded in both C and assembly language (from *Atari ST Internals*, page 181).

## GST-C

First, we will examine GST-C, an inexpensive C language compiler from the company that brought us 1ST Word. GST-C includes the compiler, a linker (GST-Link), an assembler (GST-ASM), and a superb text editor (GST-Edit), plus various libraries to provide access to GEM routines. An executive program, or "shell," similar to the GEM Desktop, controls the system. It lets the programmer invoke the various components using drop-down menu selections. A log window keeps a record of all the commands issued during the development session. Overall, the package is thoughtfully designed and complemented by a well-written user manual. (For an in-depth evaluation of GST-C, see "Which C for Me?", START, Vol. 1, #2, Fall 1986.)

A demonstration program written in GST-C appears on a separate disk included in the package. Called Fractal Factory, it is a full-fledged GEM application, complete with windows, menus, and mouse control. Besides being fun to play with, it can also be instructive if you buy the complete source code—sold separately for $19.95. While I found the source code interesting, I would have learned much more from it had it included more documentation than the in-line commentary. The Fractal Factory disk also contains a library that is completely undocumented. This is especially disappointing considering that it may implement some techniques for getting around the lack of floating-point arithmetic in GST-C.

That's right, GST-C has no floating-point capability. Nor does it support multidimensional arrays or structures. In short, three serious deficiencies that might restrict your development efforts, since several GEM routines (which are written in C themselves) take structures as input parameters. A brief document on one of the disks explains how you can sometimes circumvent the structure problem with arrays, but no official so-

FIGURE 2

```
In C:
    err=flopver(buffer,filler,dev,sector,track,side,count);

In Assembly Language:
    move.w count,-(sp) ;Push parameters onto system stack
    move.w side,-(sp) ;Note that they are given in the
    move.w track,-(sp) ; reverse of C version order above
    move.w sector,-(sp)
    move.w dev,-(sp)
    clr.l -(sp) ;A longword filler (?)
    move.l buffer,-(sp)
    move.w #19,-(sp) ;Use function number 19
    trap #14 ;XBIOS accessed through trap 14
    add.l #16,sp ;Clean parameters off the stack
```

lutions to the other two problems will be offered earlier than the release of a new version of GST-C. Version 2.00 is currently scheduled to be available in early 1987. Do you want to wait?

Despite its shortcomings GST-C is a viable development system for many applications; witness the fact that GST used it to develop 1ST Word, an application that can hardly be called simple. The programmer who works in GST-C benefits from the popularity of C as a language; far more sample C code exists in the public domain than for any other ST language, including ST BASIC. This also means that if you choose GST-C, you should be able to easily find help from other C programmers.

The real bonus you get with GST-C is its unique "GEM superstructure library" that provides a layer of functions above even the AES to make life easier for programmers who want to use standard GEM graphics windows and text. With nothing special, a program can cause its ordinary standard text output to appear in a complete GEM window that can be moved, resized, closed, etc. The library also takes care of redrawing windows when necessary. It does not provide any assistance with menus or dialog boxes, but it simplifies GEM window management for the uninitiated.

With a comprehensive set of libraries, GST-C offers a high level of access to GEM routines. It is deficient in just a couple of areas: GEMDOS, for which several bindings are absent, and Line-A, for which no support is provided. While the latter is excusable on the grounds that no high-level ST language provides Line-A bindings, the former is not. The UNIX library is also not as good as it could be. Perhaps the libraries can be improved by an update before the new version comes out. In any case, the superstructure library is always there to keep you happy while you wait.

GST-C comes with an excellent manual, which describes the use of the shell program to edit, compile, and assemble programs. Unfortunately, the linker documentation is obscure and will be difficult for beginners to understand. An appendix documents the compiler's code generation sufficiently to interface assembly language routines. A quick reference to all the standard libraries is included, as well as *brief* descriptions of each individual routine. However, no examples are provided in the manual and only one is included on the disks. Despite its ease of use, even the GEM superstructure library could use an example or two. And needless to say, you will need separate documentation for GEM if you intend to go beyond it.

I like the GST-C package, and you should find it adequate for most development needs. It features ease of use, the superstructure library, and the C language itself. The optional Fractal Factory source code may help experienced C programmers having a little trouble with GEM, but others will find the documentation insufficient.

## PERSONAL PASCAL

I reviewed OSS's Personal Pascal in Antic Magazine, Vol. 5, #1, May 1986. Personal Pascal is an extremely clean, well-integrated development system that tops even GST-C in ease of use. From a central "Manager" program, the programmer uses menu selections to invoke the editor (a simple but adequate text-only application that is the weakest link in the product), compiler, linker, and final output program. There is no need for linker control files or complicated option settings; two simple dialog boxes give you control over code generation, libraries, etc.

With the unique PASGEM library of routines supplied with the compiler, OSS has chosen to provide simplified access to GEM routines at the expense of compatibility with outside documentation, which usually follows the C standard. While most of GEM is available through the PASGEM routines, many calls were left out. However, the excellent user's manual fully documents PASGEM by providing not only descriptions of the function of each routine but also examples and discussions of GEM program design.

If you choose Personal Pascal, you can benefit from the experiences of many ST programmers who were befuddled by C and irritated by BASIC. They learned the art of GEM with Personal Pascal and produced scores of high-quality public-domain programs that are usually available with source code. Their efforts include several terminal emulators, a "word processor" desk accessory, a multi-window file browser, an intriguing navigation program, and several graphics utilities. Many are available on CompuServe and from user's groups. I would rate the availability of source examples for Personal Pascal second only to C, but better than BASIC, assembler, and everything else.

OSS's quality after-purchase support for Personal Pascal has so far produced a slew of example programs, documentation enhancements, and tutorial articles available on the OSS BBS (telephone number in *List of Manufacturers*). Among them have been patch programs to fix bugs, manual errata, information on creating desk accessories and making BIOS/XBIOS/GEMDOS calls, and more. However, I must second OSS's recommendation that serious programmers obtain ST technical documentation to supplement the user's manual.

Although the product was first shipped in January of 1986, it has not yet been updated aside from a few minor bug fixes. OSS is planning a major upgrade for late 1986 or early 1987, but is being tight-lipped about the details. Likely improvements would include a GEM-based editor, support of Level One of the ISO Pascal Standard, the ability to include inline assembly-language code, and expanded access to GEM routines. A source-level translator for Turbo ▶

Pascal code would also be a welcome addition.

I think Personal Pascal is the best choice for beginners who are learning their first structured language. C and Modula-2, although more powerful, are more advanced and harder to learn. Beginners will also appreciate what OSS has done to simplify GEM. By fully implementing the standard Pascal language, Personal Pascal provides compatibility with most "generic Pascal" books, and by sticking close to Turbo Pascal, the emerging microcomputer standard, Personal Pascal provides an easy way to port programs into the GEM environment. Overall, Personal Pascal is the cleanest, the smoothest, and the most fun to use of the development systems covered here.

## MODULA-2/ST

Although TDI's Modula-2/ST has also been reviewed in Antic (Vol. 5, #1, May 1986), it has changed significantly since then. An evolving product, Modula-2/ST has recently been revised to version 2.00B and split into two packages, a "regular" version and a "developer's" version. The latter is the same package as the former except for the addition of a toolkit disk of source code and utilities – including a post-mortem symbolic debugger and the Resource Construction Program supplied with Megamax C. At $149.95, the developer's version of Modula-2 leaves the realm of shoestring development, but the addition of both a debugger and a Resource Construction Program make it a more complete developer's package at a lower price than any other available combination.

Modula-2 was designed by Professor Niklaus Wirth, the creator of Pascal, to succeed Pascal and become the language of choice for both applications and system programming. It offers several advantages over Pascal, including increased support for modular programming, support for multitasking within programs, high-level support for low-level machine operations, and a highly elegant and standardized set of libraries to allow for easy porting of applications between operating systems and machines.

On the ST, Modula-2/ST achieves those goals well by providing a host of features and modules that offer all the abilities of Modula-2 and GEM in an easy-to-use system. The entire set of GEM calls is available to Modula-2 programmers, as are the capabilities to directly manipulate memory locations like the low-memory TOS globals. In the developer's version, TDI has included RAMdisk and print spooler source code that demonstrates the suitability of Modula-2/ST to such low-level programming projects. I would recommend it over the other three packages if your interests lie there. With the CODE directive, you can even make Line-A calls by including machine language code in the compiler's output (not assembly language – you must hand assemble, a formidable task in 68000).

**The developer's version of Modula-2/ST leaves the realm of shoestring developement.**

I prefer the Modula-2 language and TDI's implementation of it over both C and Pascal for all types of software development on the ST. However, Modula-2/ST's user interface leaves a lot to be desired. There are two basic ways of using the compiler: either from the GEM Desktop or from within the M2DESK Modula-2 Desktop program. Since it is cumbersome to constantly have to go through the GEM Desktop and File Selector dialog box, most users will choose the Modula-2 Desktop. This clever program presents the main aspects of the system – editor, compiler, and linker – as icons on the left side of the screen.

Modula-2/ST is a great idea that is flawed in its execution. The Modula-2 Desktop only displays modules in one directory path, making it cumbersome for those using multiple folders or drives. Additionally, the compiler and linker options, such as search paths and code generation flags, are set by a desk accessory that is cumbersome to use and should be integrated into the Desktop. Also, the text editor violates some basic GEM conventions, making its use non-intuitive and awkward. Altogether, the system needs work to become as easy to use as either GST-C or Personal Pascal.

The manual makes a valiant effort to document the enormous Modula-2/ST system, and most of the time it succeeds. Unfortunately, its 370 pages lack an index and do not completely document GEM. Since the regular version makes no attempt to go beyond the standard GEM calls, you will need other sources of information. My reaction to Modula-2/ST is mixed: it has enormous potential to become the premier development system for the ST, since it provides all the tools of Atari's kit at half the price. I really like the Modula-2 language and TDI's implementation of it, which is documented well. Unfortunately, I find the system crippled because it's difficult to use.

## SOFTWORKS BASIC

Softworks' ST version of their BASIC compiler appears to have been ported over from the Macintosh, but the necessary ST-specific enhancements have been made to both the software and the documentation. My personal feeling is that compiled BASIC is like interpreted Pascal: a kludgy solution to a problem ▶

Practical Solutions Practical Solutions

**Tired of Switching Cables?**
***Switch To***

# MONITOR MASTER

Special Introductory Price! Only

**$49.99**

VISA MasterCard Plus $3.00 Shipping & Handling

- Switch Between Your MonoChrome (SM124) and Color(RGB or Comp) Monitors At The Flash of a Button.
- Provides Composite Video*Out On a Standard RCA Jack.
- Hook Your ST Into Your Stereo From The Audio Out RCA Jack.
- No Power Supply Is Required.

*Only Available On 520ST's With RF Modulator Built In.

*Practical Solutions 6 N. Tucson Blvd.*
*Tucson, AZ 85716 / Phone 602-884-9612*

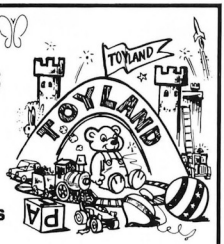
Practical Solutions Practical Solutions

Practical Solutions Practical Solutions Practical Solutions Practical Solutions Practical Solutions Practical Solutions

CIRCLE 034 ON READER SERVICE CARD

**TRANSTECH**
*presents*

***Adventures in Toyland***




**A preschooler's world of discovery lies in your Atari ST.**

***Adventures in Toyland***, created for the 3 to 5 year old, not only helps your child to learn about computers, but also aids in learning the alphabet, numbers and shapes. Give your child the chance to explore the Atari ST at his/her own level . . . . . **$24.95***

***Time-Out for Toddlers***, is just right for the 1 to 3 year old. Young children are fascinated by computers. Instead of just letting your toddler bang on the keys, let Time-Out for Toddlers give him/her a successful and rewarding start . . . . . **$19.95***

**TRANSTECH** TRANSFORMATION TECHNOLOGIES **(619) 283-9328**

P.O. BOX 880668, SAN DIEGO, CA 92108

* CALIFORNIA RESIDENTS ADD 6% SALES TAX

CIRCLE 046 ON READER SERVICE CARD

# STplus™

| HARDWARE | | ENTERTAINMENT | |
|---|---|---|---|
| 1040 ST COLOR | $959.00 | TENTH FRAME | $27.00 |
| MONOCHROME | $799.00 | STARGLIDER | $31.50 |
| 520 ST COLOR | $779.00 | CHESS MSTR | $31.50 |
| MONOCHROME | $639.00 | PSION CHESS | $42.00 |
| 520 1 MEG...ADD | $145.00 | KARATE | $25.20 |
| 20 MB HARDDISK | $639.00 | SPACE STATION | $25.20 |
| 10 MB HARDDISK | $449.00 | ST PROTECTOR | $21.00 |
| 80 MEG HARD... | $1725.00 | DIABLO,JOUST | $21.00 |
| DSDD DRIVE | $239.00 | UNIVERSE TWO | $49.00 |
| EPSON DX-10... | $249.00 | FLIGHT SIMLTR | $35.00 |
| EPSON LX-80... | $239.00 | THAI BOXING | $14.00 |
| 22 CPS LQ PRTR | $349.00 | SUPER HUEY | $27.00 |
| ADD $22 FOR CREDIT | | DUNGEONMSTR | $27.00 |
| CARD ON HARDWARE | | 8-BALL | $21.00 |
| 22% EDUCATIONAL | | TIME BANDITS | $27.00 |
| DISCOUNT ON ATARI | | SUNDOG | $21.00 |

| PROGRAMMING | | TOOLS | |
|---|---|---|---|
| MARK WILLIAMS 'C' | $125 | GST 'C' | $63.00 |
| LATTICE 'C' | $104.95 | MACROASSM | $63.00 |
| MODULA TWO | $56.00 | FORTRAN 77 | $104.95 |
| CAMBRIDGE LISP | $104.95 | MTC SHELL | $90.95 |
| HISOFT DEVPAC | $56.00 | OSS PASCAL | $56.00 |

| WORDPROCESSING | | UTILITIES | |
|---|---|---|---|
| WORDWRITER | $56.00 | CRYSTAL | $17.50 |
| MICROSOFTWRITE | $90.00 | DISK DOC... | $21.00 |
| THUNDER | $27,95 | DISK LIBRARY | $34.95 |
| FONTWRITER | $27.95 | CORNERMAN | $35.00 |
| TEXTPRO | $42.00 | A-COPIER | $27.95 |

| TELECOMMUNICATIONS | | MUSIC | |
|---|---|---|---|
| IS TALK | $34.95 | CZ-PATCH | $69.95 |
| ANSIGRAPH VT102 | $55.97 | MUSIC STUDIO | $42.00 |
| FLASH | $27.95 | MIDI STUDIO | $27.95 |

| BUSINESS | | GRAPHICS | |
|---|---|---|---|
| DB MAN | $104.95 | DEGAS ELITE | $55.95 |
| GEM VIP PROF | $175.95 | GRAPH ARTIST | $140.00 |
| REGENT BASE | $69.95 | PAINT PRO | $35.00 |
| ST ONEWRITE | $69.95 | N-VISION | $27.95 |
| DAC-EASY ACCTS | $52.00 | DIGITIZER | $114.00 |
| EZ CALC | $48.95 | EZ DRAW | $104.95 |
| ZOOMRACKS TWO | $84.00 | HIPPO PIXEL | $27.95 |

*MAGIC SACK PLUS ST INTO A MAC(tm) only $119.95*

CALIFORNIA (800) 874-4789 We ship anywhere!
NATIONAL (800) 433-6222 VISA MC AMEX
LOCAL (415) 849-8717 We love the ST!
**** STplus, P.O. 1197, Berkeley, CA 94701*****

CIRCLE 042 ON READER SERVICE CARD

that could be more cleanly solved by switching languages. Softworks clearly disagrees and has supported their side of the issue well with a good, but not great, BASIC compiler.

Softworks BASIC, as a language, is quite different from ST BASIC: line numbers are optional, Pascal-like record variables are supported, and the commands to access GEM routines look less like mystical incantations and more like their C or Modula-2 equivalents. The language is well-suited to business applications development, with extensive support for both sequential and random access disk file input/output. PRINT USING is supported, as well as many routines for low-level system access, such as VARPTR, TIME, and BYTE-MOVE. Via the familiar ON ERROR GOTO statement, errors may be trapped and dealt with by the program before the user sees them.

The manual solidly describes the language but will be tough sledding for beginners. While it advises readers to examine the plentiful sample programs provided on disk, it recommends no books or other references. Since Softworks' dialect of BASIC is unique, you may have trouble picking it up unless *you have* used TrueBASIC or one of the BASIC implementations on the Macintosh (especially Softworks).

I was pleased to find an appendix entitled "Toolbox Calls for the Atari" that listed all the GEM routines accessible from BASIC programs. The list includes all the BIOS, XBIOS, GEMDOS, VDI, and AES services I could think of, mostly named by the conventions in Atari's documentation. Interestingly, all GEM routines are called with the same BASIC statement, TOOLBOX (an artifact of the Macintosh version terminology), regardless of which trap is used to call them or what they do.

**The TDI debugger lets you unravel the tree of procedure calls that led to the crash.**

*Figure 3* shows the code a program would use to call on the AES's "wait for multiple events" routine. Since the Softworks Compiler uses the standard parameter names, you will be able to use outside documentation of GEM. Such references will be necessary because Softworks' explanation of the GEM calls is limited to terse descriptions.

Interfacing machine language routines with Softworks BASIC programs, either assembled or compiled from other languages, is a fairly easy task. It supports the **XCALL** command, which executes machine language routines with arbitrary arguments.

I found working with Softworks BASIC extremely easy. There are no libraries, linker control files, or anything else to confuse you. Just run the compiler program, type in the name of the source file, and watch it go. However, you pay a price by having to run your compiled programs under a special run-time system. This is a simple process, but many programmers may want to produce completely independent, runnable applications for distribution.

If that is your intention, the Softworks licensing agreement requires that you pay an additional, one-time $25.00 fee for the right to distribute unlimited copies of the BRUN.PRG runtime system along with your program. (Editors note: *Softworks President, Bob Salita, informed us of his intention to make a version of BRUN.PRG available for download on CompuServe and other bulletin boards so that hobbyists could upload compiled programs without worrying about the $25.00 licensing fee.* )

If you want to stick with the BASIC language (admittedly, this is a quite modern dialect of it), Softworks BASIC may be for you. It offers full GEM access and many powerful commands to make development easy. Strangely enough, though, a text editor is not included on the disk. You will have to use 1ST Word, or some other text editor.

## DEBUGGING

Of these four language compilers, only the developer's version of TDI's Modula-2/ST offers a debugger. (And that will set you back and extra $70 over the other packages.) But a debugger can be perhaps the most essential tool after the compiler itself!

The TDI debugger, specifically geared to Modula-2 programs, is called a "post-mortem" debugger because it takes over after the system has crashed. At that point, it analyzes a dump of the ST's memory as it was before the run-time error, and lets you unravel the tree of procedure calls that led to the crash.

But how can you debug your GST-C, Personal Pascal, or Softworks BASIC programs? As of September 1986, I was aware of only three debuggers for the ST: SID68 supplied by Atari in the Developer's Kit, MonST included by HiSoft in their DevPac ST assembler, and KISSED from MichTron, the prolific ST ▶

FIGURE 3

```
TOOLBOX EvntMulti,flags,bclicks,bmask,bstate,m1flags,m1x,
        m1y,m1width,m1height,m2flags,m2x,m2y,m2width,
        m2height,mgpbuff,tlocount,thicount,mox,moy,mobutton,
        mokstate,kreturn,breturn,mwhich
```

# ATARI 520 ST/COLOR GAMES

**FRACTALS:** Generate amazing op-art like images in spectacular colors. Zoom in on the Julia curves by up to 100 million times by pointing and clicking! Travel in this beautiful space and enjoy an inexhaustible family of fractals. A typical fractal (131*161 dots) takes about 10 minutes to generate, but you can make pseudo-fractals in about 10 seconds!

**MAZE:** Develop and test your skills at showing the path through mazes. This program generates random mazes of six different sizes/complexities, and will show you the path if desired.

**TINGO:** You and your opponent alternate placing dots on a checkerboard to get five dots in a row. Play against a friend or the computer. The computer has six different skill levels, and will always respond immediately. A man versus artificial intelligence game!

**BONGO:** Find the hidden symbols/colors as in a battleship game. Test your reasoning/ deductive skills with this laid back teaser! 20 game modes.

**CULTURE** You have to be fast and accurate using the mouse to prevent the Reds from taking over... 36 different game settings to challenge your eye to hand skills!

**PRICING:**

| | |
|---|---|
| 1 Program | $20.- |
| 2 Programs | $35.- |
| 3 Programs | $46.- |
| 4 Programs | $54.- |
| 5 Programs | $60.- |

All of the programs are fully mouse and menu driven, and have a special demonstration mode to show capabilities and to entertain. They are written in Pascal for fast and robust operation. The executable code is supplied a low density floppy disk (3.5/SS/135TPI), and comes with a 3 month warranty. Archival copies allowed.

Order Today the Easy Way - by Mail! Programs not sold in stores!
Atari 520ST is a trademark of Atari Corp.

Please Check the Desired Programs...

( ) FRACTALS
( ) MAZE
( ) TINGO
( ) BONGO
( ) CULTURE

Mail to: Fred Buch
984G Kiely Blvd.
Santa Clara
CA 95051

Name: _____ Amount Enclosed _____

Street: _____ State/Zip: _____

City: _____

CIRCLE 010 ON READER SERVICE CARD

---

It's Here!

NEW

# BASIC COMPILER

only $69.95

For Atari 520/1040 ST

- So easy to use!
- A menu driven GEM application!
- Fully ST BASIC compatible!
- Produces small efficient code!
- Generates a stand alone program!
- Supports GEMSYS and VDISYS calls!
- Has hooks to BIOS!
- No line numbers needed
- Double-precision floating point numbers fully implemented

For the BEST professional BASIC Compiler on the market today send:

personal check (wait 10 days to ship), money order, cashiers check, VISA and M/C, C.O.D. (add $2.00). (California residents add applicable sales tax.)

— Dealers Welcome —

LDW

**Logical Design Works, Inc.**
780 Montague Expwy., Suite 205
San Jose, California 95131
(408) 435-1445
Telex: 294526 LDW UR

CIRCLE 020 ON READER SERVICE CARD

---

ATTN: PASCAL USERS

FOR ATARI 520ST

# MODULA-2

## the successor to Pascal

- FULL interface to GEM DOS, AES and VDI
- Smart linker for greatly reduced code size
- Full Screen Editor linked to compiler locates and identifies all errors.
- True native code implementation (Not UCSD p-Code or M-code)
- Sophisticated multi-pass compiler allows forward references and code optimization
- Desktop automates Edit/Compile/Link cycle
- FileSystem, RealInOut, LongInOut, InOut, Strings, Storage, Terminal
- Streams, MathLib0 and all standard modules
- Directory search paths
- Supports real numbers and transcendental functions ie. sin, cos, tan, arctan, exp, ln, log, power, sqrt
- 3d graphics and multi-tasking demos
- CODE statement for assembly code
- 370-page manual
- Installs on Hard disk and RAM disk
- No royalties or copy protection
- Phone and network customer support provided

Pascal and Modula-2 source code are nearly identical. Modula-2 should be thought of as an enhanced superset of Pascal. Professor Niklaus Wirth (the creator of Pascal) designed Modula-2 to replace Pascal.

**Added features of Modula-2 not found in Pascal**

- CASE has an ELSE and may contain subranges
- Programs may be broken up into Modules for separate compilation
- Machine level interface
  - Bit-wise operators
  - Direct port and Memory access
  - Absolute addressing
  - Interrupt structure
- Dynamic strings that may be any size
- Multi-tasking is supported
- Procedure variables
- Module version control
- Programmer definable scope of objects
- Open array parameters (VAR r: ARRAY OF REALS;)
- Elegant type transfer functions

| Ramdisk Benchmarks (secs) | Compile | Link | Execute | Optomized Size |
|---|---|---|---|---|
| Sieve of Eratosthenes: | 6.2 | 4.3 | 3.5 | 2600 bytes |
| Float | 6.4 | 4.8 | 8.3 | 4844 bytes |
| Calc | 5.5 | 4.2 | 3.3 | 2878 bytes |
| Null program | 5.1 | 3.2 | — | 2370 bytes |

```
MODULE Sieve;
CONST  Size = 8190;
TYPE   FlagRange = [0..Size];
       FlagSet = SET OF FlagRange;
VAR    Flags: FlagSet;
       i, FlagRange;
       Prime, k, Count, Iter: CARDINAL;
BEGIN  (*$S-,$R-,$A+ *)
  FOR Iter:= 1 TO 10 DO
    Count:= 0;
    Flags:= FlagSet(); (* empty set *)
    FOR i:= 0 TO Size DO
      IF (i IN Flags) THEN
        Prime:= (i * 2) + 3; k:= i + Prime;
        WHILE k <= Size DO
          INCL (Flags, k);
          k:= k + Prime;
        END;
        Count:= Count + 1;
      END;
    END;
  END;
END Sieve.
```

```
MODULE Float;
FROM MathLib0 IMPORT sin, ln, exp,
                     sqrt, arctan;
VAR x,y: REAL; i: CARDINAL;
BEGIN (*$T-,$A-,$S-*)
  x:= 1.0;
  FOR i:= 1 TO 1000 DO
    y:= sin (x); y:= ln (x); y:= exp (x);
    y:= sqrt (x); y:= arctan (x);
    x:= x + 0.01;
  END;
END float.
```

```
MODULE calc;
VAR a,b,c: REAL; n, i: CARDINAL;
BEGIN (*$T-,$A-,$S-*)
  n:= 5000;
  a:= 2.71828; b:= 3.14159; c:= 1.0;
  FOR i:= 1 TO n DO
    c:= c*a; c:= c*b; c:= c/a; c:= c/b;
  END;
END calc.
```

**Product History**

The TDI Modula-2 compiler has been running on the Pinnacle supermicro (Aug. '84), Amiga (Jan. '86) and will soon appear on the Macintosh and UNIX in the 4th Qtr. '86.

**Regular Version $79.95 Developer's Version $149.95 Commercial Version $299.95**

The regular version contains all the features listed above. The developer's version supplies an extra diskette containing a symbol file decoder – link and load file disassemblers – a source file cross referencer – symbolic debugger – high level Windows library Modules – Ramdisk and Print Spooler source files – Resource Compiler. The commercial version contains all of the Atari module source files.

**Other Modula-2 Products**

| | | |
|---|---|---|
| Kermit | – Contains full source plus $15 connect time to Compuserve. | $29.95 |
| Examples | – Many Modula-2 example programs to show advanced programming techniques | $24.95 |
| GRID | – Sophisticated multi-key file access method with over 30 procedures to access variable length records. | $49.95 |

TDI SOFTWARE, INC.
10410 Markison Road ■ Dallas, Texas 75238 ■ (214) 340-4942
Telex: 888442 Compuserve Number: 75026,1331

CIRCLE 039 ON READER SERVICE CARD

software publisher. KISSED is the only separately available ST debugger.

KISSED is a tiny, 13K program that will be unobtrusive in your ST's memory. Unlike the TDI debugger, KISSED executes in tandem with the program you want to debug. First you run KISSED, then use a KISSED command to load your program. At this point you can disassemble the code, set breakpoints, trace execution, examine and modify memory, and perform a host of other useful debugging operations. You can switch back and forth between the KISSED window and your program's display screen.

In short, KISSED is excellent for debugging assembly language programs like videogames, and for doing things like memory dumps and searches (great for finding strings). But how useful is it for debugging programs compiled from high-level languages? I found it difficult to get used to debugging high-level code from the machine language. KISSED will disassemble your program into assembly language, but you won't see any of the procedure or variable names you used in the source code; that is, it is not a symbolic debugger. Even so, with practice it is possible to become proficient at using such a tool. Nerves of steel may be necessary, but it is possible.

GST-C would be the easiest language to use with KISSED, as it compiles to assembly language source code, which is then assembled by the included GST-ASM program. Additionally, the GST documentation provides extensive information on register usage and the form of the machine code generated by the compiler. Armed with the assembly language code and the documentation, you should be able to track down some bugs. It's not the ideal, but it's as close as you'll get. Modula-2/ST also offers excellent information on code generation, but since you never see any intermediate source code, you only have your original Modula source to refer to while debugging. Personal Pascal gives even less of the necessary information. And Softworks BASIC offers none whatsoever; in fact, the manual doesn't even say whether a program is compiled into pure machine language or some intermediate code which is then interpreted by the runtime system. Talk about secretive!

**Witness the fact that GST used their C to develop 1ST Word.**

The ST development community desperately needs a standard source-level debugger that can be customized to fit a variety of language compilers. Perhaps Jim Dunion's forthcoming STDDT will fill the bill. Until then, ST programmers will have to debug courageously with primitive tools. One book that helped me is "How to Write Macintosh Software" by Scott Knaster of Apple Computer (no kidding!). It has an extensive discussion of debugging high-level languages. Since the Macintosh also uses the 68000 processor, many of Knaster's suggestions and practical hints apply to the ST. You should also read the articles "Voodoo Computing: The Pragmatic Art of Defensive Programming" by David Small, and "Of Diagnostics and Debugging: Procedures for the 68000" by Jim Dunion, both of which appeared in START, Vol. 1, #1, Summer 1986.

## OTHER TOOLS

The ST programmer's toolbox isn't complete with just a compiler inside. Many utilities are available, both commercially and in the public domain.

- **RAMdisks** are programs that reserve a part of your ST's memory for use as a simulated disk drive. Such a disk is extremely fast, since no moving parts are involved, but also extremely volatile, since no permanent medium receives the data. In software development, RAMdisks are best used as temporary storage areas for intermediate files produced by compilers, such as the assembly language code output by GST-C. You may also want to put copies of frequently run programs on the RAMdisk for faster access. Several RAMdisks are available in the public domain, many are sold (including A-RAM from The Catalog and M-DISK from MichTron), and a few are provided as bonuses with memory upgrade installations. Any of these "poor man's hard disks" will increase your efficiency as long as you are careful to keep backups of all your important files, especially your source code!
- **Print Spoolers** are small programs that reside in memory at all times. Often packaged as desk accessories, they send a file to the printer while the computer works on something else. RAMdisks and print spoolers are plentiful in both the public and commercial domains. MichTron offers Soft Spool and, of course, the developer's version of Modula-2/ST includes full source code to both a RAMdisk and a print spooler. (You must compile them yourself.)
- **Text Editors** are used to edit text. Surprised? The real surprise is the paucity of good text editors available for the ST. The fact is that only GST-C comes with what I would call a good editor (it's actually a modified version of 1ST WORD). The only other good editor I have seen is the public-domain Micro EMACS, a microcomputer implementation of the popular minicomputer EMACS editor. Check out the many versions of it that are floating around and choose the one that suits you best.
- **Command-Line Interfaces** are pro- ▶

# METACOMCO

The quality source for 68000 software

Announces

## CAMBRIDGE LISP

THE SYMBOLIC LANGUAGE FOR ATARI ST

An interpreter/compiler providing a complete LISP development environment for $199.95

also available

| Lattice 'C' | MCC Pascal | Macro Assembler |
|---|---|---|
| $149.95 | $99.95 | $79.95 |
| **APL-Symbolic** | **APL-Keyword** | **Menu +** |
| $245.00 | $149.95 | $29.95 |

Contact your local dealer or call:

TEL: (US) 800-AKA-META (CAL) 800-GET-META

EUR (UK) 44-272-428781

TELEX (UK) 444874 METACO G

Add 6½% tax if CA resident

**Metacomco** CIRCLE 066 ON READER SERVICE CARD

5353 #E Scotts Valley Dr., Scotts Valley, CA 95066

Lattice is a registered trademark of Lattice, Inc.
Atari ST is a registered trademark of Atari, Inc.

# STAccounts™

## Integrated Accounting Package

### For Atari ST Computers

No more spending thousands of dollars on an accounting package! For the price of some accounting packages alone, you can now purchase a full computer system that will satisfy your accounting needs and more. WHY!?

- **STAccounts is fast, powerful, easy to use, and affordable. Fully integrated A/R, A/P, I/C, and G/L.**
- **All printed output/reports can be altered, amended, or entirely reconfigured to your specific needs utilizing the Report Generator.**
- **Easy as a click of a mouse you can change from one module to another.**
- **STAccounts is written totally within Digital Research "GEM" operating system, fully utilising the Graphics and Mouse capabilities of the Atari ST Personal Computer.**

The combination of the STAccounts and the Atari ST Personal Computer will provide you with the solution to all your needs at an affordable price.

**VISIT YOUR ATARI DEALER TODAY AND FIND OUT FOR YOURSELF.**

**PARTIAL LIST OF FEATURES**

**Accounts Receivable (A/R)** – Integrated with A/P, G/L & I/C.
* Account numbers and/or names * Customers' names and addresses * Invoicing/statements * Credit limit * 10 tax rates * Immediate account access * Backorders. REPORTS include Sales Turnover, Aged Receivables, Customer Statements and much more.

**Accounts Payable (A/P)** – Integrated with A/R, G/L and I/C.
* Account numbers and/or names * Suppliers' names & addresses * Remittance advices/statements * Immediate account access * Credit limits. REPORTS include Purchase Turnover, Aged Payables, an Supplier Mailing List.

**Inventory Control (I/C)** – Integrated with A/R, A/P and G/L.
* 10 product groups * Turnover by quantity and value * Alpha supported item lists * Inventory linked to A/P * Editing of invoice information. REPORTS include Inventory Turnover, Price Lists, Inventory Re-order list, and Stock Report.

**General Ledger (G/L)** – Integrated with A/R, A/P, and I/C.
*256 G/L Accounts * Immediate account access * Account details including budgets * Variance percentages for budget against actuals. G/L REPORTS include Profit and Loss Statement, Trial Balance, Balance Sheet and statement of accounts.

**Help**
STAccount provides you with on screen help through the use of TEDDY, a screen icon. If you become uncertain of your actions during the course of running the program, just click the left mouse button on TEDDY and a help screen for that particular section of the system will appear.

**Report Generator**
STAccounts Report Generator is a powerful tool integrated into the system. It will allow you to reconfigure reports using any of the system information. Provided with the system are a number of default reports which can be altered, amended, or entirely reconfigured for your individual company's needs, or create new reports as to your company requirements.

**SYSTEM CONFIGURATION**

STAccounts is designed to be used with either a 520 ST or 1040 ST, 0.5 or 1.0 megabyte drive with monochrome or colour monitor.

STAccounts and TEDDY are trademarks of Slocon Chip Limited.
Atari ST is a trademark of Atari Corporation. Gem is a trademark of Digital Research.
In Europe, STAccounts is available from Slocon Chip Ltd, 82 London Rd., Kingston, Surrey, England
Fax # 01-541-5296, Telephone 01-549-6607

**TO ORDER AND FOR MORE INFORMATION CALL**

**1-416-479-1880**

U.S. ORDERS SHIPPED FROM U.S.
NON U.S. ORDERS SHIPPED FROM CANADA

**ISD MARKETING INC.**
20 Steelcase Road, Unit 12
Markham, Ontario, Canada L3R 1B5

Send in this coupon with your credit card number, money order or check for U.S. $249.95
In Ontario add 7% sales tax

No C.O.D

☐ CHECK ☐ MONEY ORDER
☐ AMEX ☐ VISA ☐ MASTERCARD Expires _____

Account No. _____

Name _____

Company Name _____

Address _____

City _____ State _____ Zip _____

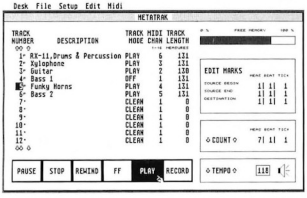
Phone _____

Signature _____

*STAccounts*

CIRCLE 019 ON READER SERVICE CARD

# The Atari ST's first full-function MIDI multi-track recording studio.




- Fast real-time record, playback, overdub
- 16 independent tracks
- 30,000+ notes per song
- Flexible region editing
- Step record for note-by-note entry
- Designed for ease-of-use No commands to memorize Mouse, menu, graphics-oriented Tape recorder-style controls
- Real-time tempo change and track mixing

**Hardware required: Atari ST and MIDI instrument(s)**

**METATRAK** INTRODUCTORY PRICE **$99** (demo disk-*10)

*30-day money back guarantee*

**MIDISOFT** CORPORATION

P.O. BOX 1000
BELLEVUE, WA 98009
(206) 827-0750

CIRCLE 029 ON READER SERVICE CARD

# PUBLIC NOTICE

## GEMINI WILL MATCH ANY ADVERTISED PRICE & GIVE FREE SHIPPING

**ORDERS SHIPPED WITHIN 24 HOURS**
**FULL EXCHANGE ON DEFECTIVES**

*Gemini Enterprises, one of Atari's largest dealers, will match any advertised price and ship FREE in continental U.S. Send certified check or money order, stating publication & page number of item you want price matching on, to —*

## GEMINI ENTERPRISES

692 Milford Road
East Stroudsburg, PA 18301

**(717) 424-2248**

**$5.00 HANDLING CHARGE FOR APO & FPO ADDRESS.**

CIRCLE 017 ON READER SERVICE CARD

grams that implement a "shell" through which you can give GEMDOS commands in a manner similar to MS-DOS. Many experienced users find the GEM Desktop cumbersome and prefer to type commands directly from the keyboard. Usually shell programs offer more functionality than the Desktop, such as wildcard copying and batch processing. Batch processing is especially useful for developers, who can create "script" files containing all the necessary commands to compile and link programs using their development system. (Atari provides a special batch file processor with the developer's kit.) While there are a few public-domain shell programs, the best are commercial. MichTron's DOS SHELL emulates MS-DOS, and MICRO C-Shell from Beckemeyer Development Tools emulates the Berkeley UNIX C-Shell. Beckemeyer also sells MICRO C-Tools, a set of assorted development tools.

- **Make Utilities** are programs patterned after the famous UNIX "make" command, which essentially constructs an executable copy of the program you're developing by automatically assembling, compiling, and linking just those files that have changed since the last time the program was built. There are a few make versions in the public domain, and Beckemeyer sells its MICRO-Make. However, I think the language packages reviewed here are simple enough to use that a make utility is not required.
- **Resource Editors** are programs for creating the "resources" used by a GEM program. Resource files describe the familiar objects you see on the screen, such as drop-down menus, dialog boxes, and the like. While they can be constructed with various AES routines, resources are far easier to define when you can use the mouse to draw them on the screen. A program like Atari's Resource Construction Set (supplied with the Developer's Kit) or the Megamax Resource Construction Program (supplied with the developer's version of Modula-2/ST) will do just that. As of this writing, there were no resource editors in the public domain. A resource editor is primarily a convenience, since there is nothing you cannot do if you don't have one. ■

## REFERENCE:

All four languages reviewed here allow access to most, if not all, of the GEM routines. But, in my opinion, none provide enough information to properly program with those routines. Fortunately, there are now several books in print that do cover the ST in the same depth as Atari's Developer's Kit documentation. Briefly, they are:

- *Programmer's Guide to GEM* (SYBEX, 504 pages) is the best book available on all aspects of the GEM system. It covers both the IBM and ST versions by noting the places where the latter differs from the former. It includes numerous examples in C, all tested on an ST. Among them is a revised "DEMO" program—a complete GEM application for doodling. Obviously, this book will be most useful to GST-C programmers. However, since Modula-2/ST and Softworks BASIC generally follow the C conventions in their GEM libraries, it should be useful for those languages as well. Personal Pascal users may feel that they already have enough GEM documentation in their manual, but they will be able to benefit from the SYBEX book when they start to use the advanced GEM features not covered in the PASGEM library. By the way, since this book pretends GDOS is a part of ST GEM, you will have to wait for its arrival to run some of the examples. The authors say they tested everything on an ST, so they must have used a prerelease version of GDOS.
- *Atari ST Internals* (Abacus, 446 pages) is currently the definitive third-party guide to everything in the ST besides GEM. It covers the hardware architecture, the keyboard, and the BIOS, XBIOS, GEMDOS, and Line-A calls. Also included is a disassembly of the BIOS and a short discussion of 68000 assembly language that should provide just the information a high-level language programmer will need. The first edition is marred by several factual errors (some of which were undoubtedly reproduced from Atari's documentation); a second edition may come out to correct them.
- *Atari ST GEM Programmer's Reference* (Abacus, 414 pages) is a GEM manual that is less tutorial than the SYBEX offering, but completely ST specific. It gives examples of using the Atari Developer's Kit and of calling GEM in both C and assembly language, with several short programs. It summarizes each AES and VDI routine on a separate page, giving the parameters, examples, and known problems. Like the Internals book, this one suffers from errors.
- *Atari ST Tricks and Tips* (Abacus, 260 pages), is a highly useful collection of programs, techniques, and random bits of information that should be of interest to all ST programmers. It includes source code for a RAMdisk, a print spooler, and numerous other utilities. The programs are written in C, assembly language, and occasionaly BASIC, but the techniques discussed are portable across languages to any GEM project. Extremely valuable.

  Abacus Software sells disks separately which contain all the source code presented in their books. Unfortunately, no disk is available for the SYBEX GEM book. Besides the tomes mentioned above,

you might want to get a guide to the 68000 processor and its assembly language, as well as a tutorial introduction to the particular high-level language you are learning to use.

User groups are often the cheapest and best sources of technical information on the ST: most have several ST experts among their membership, and all offer public-domain software disks for small or no fees. I have found that sometimes a high-quality public-domain utility can make the difference between frustrated exhaustion and the completion of a project. User groups can also match you up with owners of commercial products you're thinking of purchasing.

On-line services can also provide megabytes of ST programming assistance. CompuServe seems to be leading the pack right now with an ST Forum as well as an Atari Developer's Forum through which Atari Corp. supports its registered developers (purchasers of the Developer's Kit). Don't be afraid to join a forum and ask questions of general interest, or even to address specific questions to specific individuals you think may be able to help. Most Atari users, whether they subscribe to CompuServe, Delphi, GEnie, BIX, or whatever, are eager to share their expertise with anyone who will ask for it! UNIX users should also know that Usenet has an active net.micro.atari16 newsgroup for ST-related discussions.

I truly believe that you can't go wrong with any of the products (compilers, tools, books, and online services) that we have discussed. The language systems will get the job done one way or another, and the other tools will help you do it. The most important thing to remember is that developing ST software is not simple, so you should not expect to duplicate DEGAS with a weekend's work. However, it is quite possible to write professional-quality ST programs without spending a fortune and still have fun doing it.

## LIST OF MANUFACTURERS

**GST-C** ($79.95)
CIRCLE 435 ON READER SERVICE CARD

**Fractal Factory Source Code** ($19.95)
CIRCLE 436 ON READER SERVICE CARD

GST Holdings Limited
91 High Street
Longstanton, Cambridge
England
Available from:
The Catalog
524 Second Street
San Francisco, CA 94107
(415) 957-0886
Orders: (800) 443-0100, ext. 133

**Personal Pascal** ($74.95)
CIRCLE 368 ON READER SERVICE CARD

Optimized Systems Software, Inc.
1221 B Kentwood Avenue
San Jose, CA 95129
(408) 446-3099
BBS: (408) 446-3451

**Modula-2/ST** ($79.95; $149.95 for developer's version)
CIRCLE 369 ON READER SERVICE CARD

TDI Software, Inc.
10410 Markison Road
Dallas, TX 75238
(214) 340-4942
Telex: 888-442

**Softworks BASIC** ($79.00)
CIRCLE 348 ON READER SERVICE CARD

Softworks Limited
2944 N. Broadway
Chicago, IL 60657
(312) 975-4030

**KISSED** ($39.95)
CIRCLE 437 ON READER SERVICE CARD

**M-DISK** ($39.95)
CIRCLE 438 ON READER SERVICE CARD

**SOFT-SPOOL** ($49.95)
CIRCLE 439 ON READER SERVICE CARD

**DOS SHELL** ($39.95)
CIRCLE 440 ON READER SERVICE CARD

MichTron Inc.
576 S. Telegraph
Pontiac, MI 48053
(313) 334-5700
BBS: (313) 332-5452

**MT C-Shell** ($129.95)
CIRCLE 441 ON READER SERVICE CARD

**MICRO C-Shell** ($49.95)
CIRCLE 442 ON READER SERVICE CARD

**MICRO C-Tools** ($24.95)
CIRCLE 443 ON READER SERVICE CARD

**MICRO Make** ($34.95)
CIRCLE 444 ON READER SERVICE CARD

Beckemeyer Development Tools
592 Jean Street #304
Oakland, CA 94610
(415) 658-5318

*Atari ST Internals* by Klaus Gerits, Lothar Englisch, and Rolf Bruckmann (December 1985) ($19.95)
CIRCLE 128 ON READER SERVICE CARD

*Atari ST GEM Programmer's Reference* by Norbert Szczepanowski and Bernd Gunther (January 1986) ($19.95)
CIRCLE 125 ON READER SERVICE CARD

*Atari ST Tricks & Tips* by Rolf Bruckmann, Lothar Englisch, Jorg Walkowiak, and Klaus Gerits (March 1986) ($19.95)
CIRCLE 127 ON READER SERVICE CARD

Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
(616) 241-5510
Telex: 709-101

*Programmer's Guide to GEM* by Phillip Balma and William Fitler ($19.95 + $2.00 postage and handling)
CIRCLE 134 ON READER SERVICE CARD

SYBEX Computer Books
2344 Sixth Street
Berkeley, CA 94710
(415) 848-8233
Telex: 336311
Orders: (800) 227-2346

# Tower of Babel

*Pick a Language, Any Language...*

BY BILL WILKINSON

***Bill Wilkinson, renowned Atari guru and computer language maven, opines over ADA, BASIC, COBAL, Forth, Fortran, assembly, and much much more. Looking for a language? Ask the man who speaks in tongues.***

For those of us who have been accustomed to the Atari 8-bit world, the array of computer languages already available for the Atari ST computers is staggering. With promises of *even more* languages soon, how can you decide which one to use?

In this article I will tell you what I think are the advantages and disadvantages of some of the available ST languages. Note carefully that I said ". . . what *I* think. . ." Almost every programmer has a favorite language, and thinks that every other language is either fascist, anarchistic, unstructured, strait-jacketed, backwards, sluggish, or stupid, depending on which language is being described by which fanatic.

When the editors of START asked me to write this article I hesitated. After all, I am associated with Optimized Systems Software (OSS), producers of one of the more prominent languages for the ST (Personal Pascal), and soon to offer perhaps the most esoteric language (Personal Prolog). I feared that any effort I might make would be viewed by some as a conflict of interest.

Another telling point—I have not used all the languages available, so how can I judge them? Truthfully, I can't. So some of what you read here will be the result of many, many conversations with other programmers or of my own experiences with similar languages on other computers.

Through all of this, then, remember that I am *trying* to be fair and impartial. If you aren't convinced by the time I'm done that you should try our OSS products, I will know that I have managed to hide their true perfection well enough.

## *BY THE NUMBERS*

In the chart accompanying this article (see *Figure 1*), I have listed fifteen computer languages and rated them in several categories (the best rating is a "1"). As I wrote this, some of the languages were not yet available for Atari ST computers, but at least one or two versions of each should make its appearance within the next year or so. I rated each language based on my estimates, and I must warn you that sometimes these are very subjective judgments. I have at least a minimal knowledge of the syntax and workings of each of these languages, but I certainly cannot claim to be a proficient programmer in each.

Some thoughts on the rankings themselves: My ratings are designed for beginner to intermediate programmers (six months to two or three years experience in a given language). In the hands of an expert any of these products might score higher, but expert programmers usually have their own favorite language, so this chart is not for them. Also, after I made this chart, I showed it to some other programmers. They convinced me to change a handful of rankings, but by and large they agreed that my rankings are all within one (1) of theirs. Plus or minus one, then, may be considered as my acceptable margin of error in this table.

Every language received a ranking for its relative speed, flexibility, and maintainability. Although these are based on my own personal subjective criteria, I would like to think that most professional programmers–except for the one-language fanatics–will accept them as reasonable (within my "acceptable margin of error").

- Speed–This does not refer to speed of compilation or program development; it is an estimate of the typical running time of a program written in that language. Languages with roughly equal run times get the same score. Generally, a language needs to be three or four times as fast as its competitors to get a better ranking. This is because variations in the efficiencies of the compilers (or interpreters) among manufacturers can often produce differences as great as this. Unlike the other categories, Speed refers only to language implementations for ST computers.

- Flexibility–Some languages clearly have one main purpose. COBOL is an excellent example; it really is not much good for anything other than business applications. Other languages are touted as general purpose. Obviously assembly language is the most flexible. Since all other languages eventually get reduced to its level, you can do anything with assembly that any other language can do. Watch out for the trap: Just because something is possible doesn't mean it is easy. I couldn't even begin to want to write typical LISP programs in assembly.

- Maintainability–If you are the typical home hacker, this category may not be important to you. In a commercial environment, though, there is often nothing more important. After all, when your programming guru decides to chuck it all to grow grass in Mendocino, how do you fix his programs when you find bugs? (And I guarantee you will find bugs.) To me, even as an individual, maintainability is a consideration. I have often had the horrible experience of trying to figure out what a particular BASIC program does, three or four years after I wrote it.

A final note on maintainability: Any language can be written in a maintainable fashion. If nothing else, you can write a book to go along with the program, detailing line by line what each statement is doing. But some languages encourage self-documenting code and others discourage it. My rankings are based on my observations of code actually written and in use. If you do a better job, congratulations.

Sidelight: I strongly considered including an ease-of-use category, but I reluctantly left it out. The problem is that ease-of-use is often not a feature of a language but rather of a particular implementation (i.e., brand name) of that language. For example, I rate Atari 8-bit BASIC very easy to use, but ST BASIC gets only moderate marks. *Caveat emptor,* then, on this category. Take a good look at the actual product before buying, if possible. Read reviews, and don't be afraid to ask questions.

## *LUCKY SEVEN*

After those three universal categories, I have rated each language for its appropriateness in each of seven categories. If a given language has no number in one of these columns, then

**No one language is good for all purposes.**

I think it is totally unsuitable for the purposes of this category.

Note that all these categories are somewhat an extension of the "flexibility" criterion. Presumably a flexible language should be usable for all seven tasks. But remember my caveat about assembly language: Just because you *can* do something in a particular language does not mean you would want to. Again, a brief description of each category follows:

- Beginners–This almost substitutes for the missing ▶

## Babel...

"ease-of-use" category, but to rank high here a language must be both easy to use and easy to understand. I surprised even myself by giving Prolog almost a top rating here, considering how much I struggled when I first encountered it. I now blame that on the lack of appropriate tutorial material. So let that serve as a warning. My ratings here assume that you are either taking a class from a competent instructor or you are learning from a good, available tutorial book.

- Fun–A most subjective category, it produced the greatest arguments from my fellow programmers. Sometimes I like to try out programming concepts just for the heck of it. How many of you remember my writing a BASIC interpreter in–of all things–BASIC? When I experiment I usually want an instant-response environment, so BASIC often wins. But for some more specialized concepts, I find it better to hack around in other languages. Hence this category and these rankings. The only way I'd consider an assembler or macro assembler fun is if their environment is good (e.g., integral editor and debugger). My personal choice for an ideal fun language would be a really good Pascal interpreter with a compatible optimizing compiler.

- Business–Is the language suitable for typical business applications, such as inventory control, general ledger, etc.? Can it be used for general-purpose database programming? I am constantly amazed at the number of business programs written in BASIC, even though it lacks most of the rudimentary tools I would want for such a purpose (indexed file access, user-definable variable types, highly structured I/O, just for starters).

- Scientific–Could I design a bridge with this language? Fortran has been the leader in this field for a long time, but there are signs that other languages may actually have more to offer. I think the reason Fortran is so accepted for scientific work is the incredible library of scientific functions that always accompanies it. But those functions are being written for other languages as well, especially those showing an asterisk in this column.

- Action Games–This is a catch-all category. Among other things, it implies the ability to do superior graphics. On the ST, a good rating here means that the language has structures to access the system's built-in graphics as well as high speed operations to move things around fast. Note that I have not allowed the use of assembly language subroutines in languages such as BASIC! If you constantly must resort to things outside a language, the language is deficient. Try another language. I do not preclude the use of libraries written in assembly language, but they should be included in the language package. The individual programmer should not have to write them. The asterisk on Forth in this column indicates that a compiled version of the language will rank at least one place higher.

- Artificial Intelligence–Once a very specialized category, it is becoming more and more popular. How easily can you tell your computer to "MOVE the blue pyramid on top of the red box"? The current crop of artificial intelligence languages are often rated as very slow, but this may be an illusion. How many lines of C code would it take you to make your computer perform that "MOVE" of a couple of sentences back? Maybe 10 or 20 times as many as a LISP or Prolog program, I would bet. Note that the "AI" languages are also good for some programs traditionally thought of as business applications, such as modeling and simulations. But this part of the AI field is in its infancy, so I haven't counted it too heavily.

- Systems Software–This is a pretty broad category. Operating systems, DOS utilities, computer languages, and more all fall here. Some languages perform adequately in all systems areas; others are limited to two or three tasks. Then, too, there is systems-software theory, where we investigate new ways of writing these products. Generally, the artificial-intelligence languages (denoted by an asterisk in this column) do well here. LISP, for example, has been used to write many more specialized languages, most of which you've never heard of. And the Japanese are using variations of Prolog to test operating system design theory in their multi-processor computers. (These languages fall down sharply, though, when we are talking about working systems–they are just too slow.) Anyway, I would bet that more practical, working systems software has been written in assembly, C, and Pascal then all other languages put together.

Don't expect me to try to justify each of the rankings I have given. Instead, I intend to concentrate on the best strengths (or worst weaknesses) of each language. Again, remember that I am not a professional in each of these languages, so expect more discussion of my favorites than of the others. But I promise to be opinionated even where I am ignorant.

### *BASIC*

As a computer professional I am supposed to sneer and make nasty remarks about this language, but I must confess, BASIC has always been one of my favorites. Truthfully, it is not the language itself that is so appealing; rather, it is the BASIC environment that is fun to use. The whole idea of "instant programming" appeals to me. Imagine being able to modify a program almost as it runs! Got an error? Fix it and continue the operation. I also like to perform many programming quickies without writing a program at all! This is thanks to BASIC's ability to accept statements in "direct" mode, i.e., without line numbers as in conventional BASICs.

While I do not intend to comment on the quality of most available languages, I feel I must make a few statements about BASIC. Alas! The original ST BASIC from Atari is almost a joke. Imagine a language that can't even do five-digit arithmetic correctly. (Don't believe me? Try **PRINT 257*257**

sometime.) There are a few BASIC compilers available, but I view a BASIC compiler almost as an anachronism. If I want a compiled language, I will use a good one – not one as limited as BASIC! And BASIC is limited, despite what the diehards may tell you. Even though some BASICs have managed to add procedures with local variables, record-oriented I/O, etc., none of them has overcome the fundamental limitation of BASIC: lack of user-definable variable types.

Anyway, what I really want for the ST is a reasonably fast, interpreted BASIC with at least a reasonable complement of structured programming statements. It must both work within and program for the GEM environment. Atari has stated that they will be producing a new BASIC "real soon," and other companies are announcing interpreters even as I write this. So maybe, just maybe, I will be satisfied in the next few months, at the most. (Editor's note: *See the sidebar to David Plotkin's article this issue for news of a new interpreted BASIC.*)

And what about you? Well, the majority of computer owners never learn to program. And if they do dabble at it, they tend to try the languages which come free with the computer. If you fit in this category, I suggest you use Logo instead of the original ST BASIC. I may change this recommendation if and when Atari produces their new BASIC, but the current version is too buggy, too inaccurate, and too clumsy to bother with.

If you intend to spend some serious time learning to program, think hard before investing too much time in ST BASIC. If you already know some BASIC, then dabble away. But a serious application in ST BASIC? Anything business related? Forget it. Do remember, though, that these remarks are directed towards ST BASIC. Other BASICs may be more than adequate for many, many applications. ▶

FIGURE 1

| Language Name | Speed Factor | Flexi-bility | Maintain-ability | Good for Beginners | Fun Time | Business Applic's | Science Applic's | Action Games | Artificial Intelligence | Systems |
|---|---|---|---|---|---|---|---|---|---|---|
| **Interpreters** | | | | | | | | | | |
| BASIC | 5 | 3 | 5 | 1 | 1 | 3 | 4 | – | 5 | – |
| Logo | 5 | 4 | 4 | 1 | 1 | – | – | – | 2 | – |
| Prolog | 6 | 3 | 3 | 2 | 2 | – | – | – | 1 | 1* |
| LISP | 6 | 2 | 6 | 4 | 2 | – | – | – | 1 | 1* |
| DB2** | 5 | 6 | 4 | – | – | 2 | – | – | – | – |
| DB3** | 4 | 2 | 2 | 5 | 3 | 1 | – | – | – | – |
| **Compilers** | | | | | | | | | | |
| Pascal | 2 | 2 | 2 | 2 | 2 | 2 | 3* | 3 | 3 | 3 |
| Modula-2 | 2 | 2 | 2 | 3 | 3 | 2 | 3* | 3 | 3 | 2 |
| C | 2 | 1 | 3 | 3 | 4 | 3 | 3* | 2 | 4 | 1 |
| Fortran | 2 | 4 | 4 | 3 | – | 5 | 1 | 5 | 5 | 5 |
| Ada | 2 | 1 | 1 | – | 4 | 1 | 2 | 4 | 3 | 2 |
| COBOL | 4 | 6 | 1 | 2 | – | 1 | – | – | – | – |
| **Other** | | | | | | | | | | |
| Forth | 3 | 2 | 7 | 3 | 3 | – | – | 4* | 5 | 4 |
| Assembler | 1 | 1 | 4 | – | 6* | 7 | – | 1 | – | 1 |
| Macro-assembler | 1 | 1 | 3 | – | 5* | 6 | – | 1 | – | 1 |

*See text for explanation.

**DB2 and DB3 refer respectively to languages similar to dBase II and dBase III, products of Ashton Tate. Some such programs are available for the ST and more are expected.

## Babel...

### *LOGO*

This language was provided free with early units of the ST computers, so you may already be familiar with it. My 9-year-old can claim two years of experience with Atari Logo for the 8-bit machines. It's a fun language. You can make things move across the screen, draw pictures, and do most everything a 7-year-old would want to do. At 9, he's beginning to get bored with it.

Is that a commentary on Logo's capabilities? Not at all. A full-blown Logo can even be a reasonable artificial intelligence tool, and Logo for the ST is close to being full-blown (8-bit Logo is not). But to use these advanced capabilities requires advanced concepts, which are generally beyond the scope of Logo tutorials. Catch-22, right?

Still, learning the fundamentals of Logo may be one of the easiest and best introductions to computer programming possible. Don't expect to write many serious applications using Logo, but using the advanced functions will make the language useful for what I called "fun" programming.

### *PROLOG*

When I first encountered Prolog, I thought it was bizarre and almost impossible to learn. Now that I have written a tutorial on the language, I have completely changed my mind. I have been able to teach Prolog to people who find BASIC cryptic! It is remarkably easy to learn the concepts of Prolog–perhaps even easier than learning Logo.

The neat part about Prolog is that it is also very powerful. True, finding the source of its real power takes experimentation and work, just as with Logo. But the end results are almost always worth it. Programs tend to be much simpler and much shorter than their equivalents written in a more "standard" language. See the discussions of the rankings for "Systems" and "Artificial Intelligence" for some pertinent comments.

Just a fair warning: If you already know an "algorithmic" language (e.g., C, Pascal, Fortran, BASIC, etc.), you may need to readjust your thinking before tackling Prolog. Generally, things that are easy in Prolog are difficult in those languages, and vice versa. Don't fall into the trap I did, be sure to learn from a good tutorial book. I am just egotistical and proud enough to say that the one by Mike Fitch and me is very good. But I will tell you of other good ones if you insist.

### *LISP*

What can anyone say about LISP? It has been the darling of the artificial intelligence community for so long that it is required for computer science majors. Unfortunately, there is more than one *de facto* standard for the language itself. Xlisp, C-Lisp, InterLisp, and more all compete in this market. This isn't as bad as it sounds, though. Look how many dialects of BASIC there are; the various LISPs are no more different from each other.

What about a LISP for a beginner? Only in a classroom situation, I think. Already have some experience with other languages? Then you might try tackling it with a good tutorial. LISP can even be a good "fun" environment, especially if you like to investigate languages and systems processes of several kinds. And a LISP in a real GEM environment could be quite powerful.

### *DB2 AND DB3*

As the footnote to the rankings table shows, these are my appelations for various languages which are more or less compatible with Ashton-Tate's dBase II and dBase III. Until something better comes along for the ST, if you want to write database applications, these are the ones to use. DB3 is the successor to DB2, and it answers many of my objections to the latter, such as lack of subroutines, limited number of variables, only two files accessible simultaneously, and more.

**You can do anything with assembly language that any other language can do.**

In a class environment with the right instructor, DB3 might even be a viable first computer language, though I think one really needs to have learned a more conventional language first. The DB2 environment was designed for machines which are tiny by ST standards, so it suffers in comparison. I would choose DB2 only if I had several dBase II programs that I wanted to move over to the ST.

### *PASCAL*

Perhaps the greatest advantage of Pascal is that it is so standardized. Consider the fact that the programmers at Omnitrend managed to take over 1.5 million bytes of Pascal source code from an IBM PC, transport it to a certain Pascal on the ST, and get the game Universe II translated in a few weeks. To me, that is incredible portability.

There is a vast body of literature written about Pascal. Almost all schools, from junior college to the most prestigious universities, teach Pascal as a standard language. It is the only language that high school students may use to qualify for advanced college placement via the college board exams. The

list goes on. (Besides, almost a half million Turbo Pascal owners can't be completely wrong, can they? And Turbo Pascal isn't even particularly powerful as Pascals go.)

Does this mean that Pascal is perfect? Of course not. No language is. Many C programmers sneer at Pascal as being too limiting—they claim that it restricts their freedom of programming. Pascal, like BASIC, does such nice things for you as checking to be sure you didn't try to store something into the 233rd element of a 40-element array. (In C, and indeed in many loose languages, no such checks are performed. If you want to wipe out memory, go do it. Most modern Pascals will allow you to turn off the checks if you really must, so you can wipe yourself out with Pascal, as well.)

I maintain that Pascal can be an ideal beginner's language. It may even be better to learn Pascal before BASIC, especially if you have access to a local class or a good tutorial book. Does this mean that Pascal is not for professionals? Ask the ones who wrote Universe II about that. Overall, Pascal is a nice, safe choice for many, many people. Including me, of course.

### *MODULA-2*

Almost everything I said about Pascal applies equally well to Modula-2. Since both owe their existence in part to a single person (Niklaus Wirth), this is not surprising. Wirth designed Modula-2 to alleviate some of the problems associated with the original Pascal. In particular, Modula-2 is designed to be written in "modules" and then linked together. Since the original Pascal compilers insisted on compiling an entire program at once, this should give Modula-2 an enormous advantage, especially on memory-limited microcomputers.

Unfortunately for Modula-2, by the time it appeared, most Pascal compilers already supported many of its features, including (you guessed it) modular compilation. The result is that my rankings show it virtually dead even with Pascal. It loses a bit for beginners for just one reason: It is newer, so fewer tutorials are available and fewer schools teach it. Feel just a little bit adventuresome? This might be a reasonable choice.

### *C*

If Pascal and Modula-2 are too limiting, then C is an anarchist's dream. There are no holds barred when using C. Want to twiddle the bits in a hardware register? C makes it easy. Want to chuck the system I/O library and write your own? Since C has no built-in I/O, it is a natural choice for this!

I used to be a C hacker. I still like the language, but I think that I have grown out of the hacker stage and am ready to admit that the most important aspect of a program is not how fast it runs. Thanks to a unique macro preprocessor, C source code can be as maintainable as any other language. And when I write some C code, I like to think that any competent programmer could maintain it. Unfortunately, this same flexibility can lead to totally unreadable code. If you use C, it is your choice.

Some C fanatics claim that C compilers inherently generate better code than other languages (usually they are pointing the finger at Pascal or Modula-2). This is nonsense. What is really happening is that almost none of the compilers for microcomputers do very good code optimization. There is economic justification for this: Would you pay three to ten times the price for a compiler which generated 50 percent better code? Probably not. Yet a good optimizing compiler is much, much more expensive to write. A really good optimizing compiler replaces the need for writing torturous C code. Even with this help, C compilers aren't necessarily much (if any) faster than other languages, as my table reflects. (As a specific example, the highly touted Megamax C runs the "Dhrystone" benchmark only a couple of percent faster than does Personal Pascal.)

Bickering aside, C is a good, general purpose language. Since it was used to write major portions of the ST's operating system, it already has an "in" of sorts. But for beginners? I don't think so. The lack of bounds checking (see the Pascal discussion) is so often disastrous, that it can be pure frustration. On the IBM PC, several interactive C interpreters (with bounds checking) have become available. When one appears for the ST, consider learning C with it.

### *ADA*

What can I say about a language that isn't even available? Well, if you want to win government contracts, learn Pascal or Modula-2 or C and wait for the first Ada compilers. But don't hold your breath. Ada is a fantastically complicated language, and it takes a while to certify a compiler to government standards. When the first full compilers appear, expect them to cost about as much as your computer. Also expect a 20-megabyte hard disk to be a minimum storage requirement.

Ada is undeniably powerful. You can not only define your own variable types, you can even define your own operators to work on those types. Want to find the number of days between two dates where you have specified the record format of a date? Just define the proper kind of "—" (minus) operator. No way is this a beginner's language!

### *COBOL*

COBOL is an acronym for COmmon Business Oriented Language. And if you want to write industry-standard business applications, if you want portability between your ST and your mainframe at work, and if you love to write self-documenting code, buy COBOL! What other language lets you write code that is as readable as this: "Add Price of Object to Sales-tax Giving Subtotal."

## Babel...

And, since COBOL is taught in virtually every vocational school and junior college in the country, it's even a pretty good choice for beginners. (Look how many companies advertise on TV that they can turn any high school graduate into a programmer. Guess what language they teach?) More commercially successful programs have been, and still are, written in COBOL than in any other language; so, if you are looking for a job in programming, you have to at least think about this language. Just be forewarned that thousands of others have got the same idea.

### *FORTH*

Forth is an enigma of sorts. The language itself is a little strange to those of us who think algebraically, but it is fairly consistent and not too difficult to learn. The reason that I am hesitant to recommend Forth any more strongly is because of its environment. It was originally designed to be both language and operating system on 8,000 byte computers, and the Fig Forth standard shows this. ("Fig" should be "FIG" since it as an acronym for "Forth Interest Group," but the Fig'rs want it this way.)

Programs edited by "screens," with each screen limited to 1024 bytes? Come on now! I've got 520,000 bytes to play with here. Why should I be limited to this kind of obsolete environment? Worse, disk I/O is supposed to take place via screens, also. Forget the operating system, just give me 20,000 numbered screens on my hard disk. Ludicrous! I think the Forth Interest Group has done more to hinder the development of this language than anyone has done to enhance it.

Now that I have all the Forth fanatics up in arms, let me retreat just a little. Luckily, the better Forths don't stick to the Fig standard. Most of them use the Fig version as a kind of internal starting place and then build better structures on top of that. Such things as file I/O, GEM-based program editing, and much more contribute to make Forth a more viable language.

As to capabilities, Forth is no slouch. Thanks to its unique "threaded" design, it interprets Forth as fast as compiled programs in some other languages run (COBOL, as a specific example). And Forth compilers are sometimes available to improve performance even more.

Unfortunately, I don't think that Forth can be said to be the best at anything of importance. It used to win on compactness of code, but advanced processors and large memory sizes have dulled that issue. It gets fair marks for beginners because of its semi-interactive nature. Some versions of it might even get a better mark here. Perhaps the most telling point is the paucity of commercial products written in Forth. If Forth is as good as the fanatics claim, why don't more developers use it? (Yes, yes, I know of some significant exceptions – H&D's dBase II clone, for example – but the statement still stands.) I think I could like the right version of Forth. Let me know if you find one.

### *ASSEMBLER AND MACRO ASSEMBLER*

When it comes right down to it, there are some things that you just can't do as well in any higher-level language as you can do in assembler. Let's face it, no matter how good a compiler is, it can't possibly produce code which runs faster than assembler (equal to, perhaps, but not faster – by definition). But on the ST, about the only applications which I think can justify the extra work of assembly language are high-speed graphics programs. In other words, games. (Okay, okay. . .maybe 3-D drawing programs and the like. . .but how many of you are going to write one of those? How many want to write a game? I rest my case.)

Now I happen to really like assembler. If I had to be confined to two languages, I might choose a really good BASIC (for all my quick and dirty stuff) and a good macro assembler (for everything else). It's gotta be a macro assembler, though. As complex as the interface to GEM is, I would get tired awfully quickly if I had to code each call in "longhand." A powerful macro assembler can make writing some programs almost as easy as using a high-level language. (What the heck. . .one more dig: I'll bet I could write a set of macros to duplicate 90 percent of the common Forth functions.) Besides, a program written using lots of macros can be very self-documenting.

Sigh. Unfortunately, so far, I haven't seen the macro assembler for the ST. If you are familiar with MAC/65 for the 8-bit Ataris, you will begin to see what I want. I need more powerful macros than MAC/65 gives (because of the complex GEM interface) and a GEM-based editor, and. . .but the idea is right. Editor, macro assembler, debugger which doesn't affect my program's screen or keyboard I/O, DOS commands – it's just not there yet. And my "fun" rankings reflect that. I would move a system such as I have described up at least one place in this category.

A warning: Beginners, stay away from assembly language! On the 8-bit machines, you could possibly start with assembler if you had a good tutorial (of which there were none for Atari, unfortunately). On the ST? I don't think so, unless you are willing to limit yourself to piddly little programs. You have to understand GEM as it is practiced in one of the higher level languages before you tackle it at the assembly language level.

### *WRAPPING UP*

Am I really done? Hard to believe! If you are thoroughly confused, maybe I have succeeded. If nothing else, I would like you to read reviews, check with your local users group, and get better educated generally. Try to stay away from the fanatics. If a person doesn't program regularly in at least two languages, be suspicious of any advice. No one language is good for all purposes. ■

# GETTING AROUND ST BASIC

## CODE THE DRAGON'S MAZE

**by David Plotkin**

*ST BASIC may be slow. It may be clumsy. It may have more windows than a Victorian greenhouse. But it's FREE! So, rather than look a gift horse in the mouse, let's see what we can do with this mightily maligned language. David Plotkin offers some tips, tricks and techniques for getting around in ST BASIC. Included on your START disk is the Dragon's Maze, an example game. You'll find the fire breather in the DRAGON.STQ folder.*

# GETTING AROUND...

I bought my Atari ST to program it. At the time, there was little else you could do. The current flood of software had yet to appear; there were no spreadsheets, no games, and only one rather limited word processor. But ST BASIC was included with the machine at no extra cost. A freebie. It seemed logical to take advantage of it.

BASIC is the most popular computer language ever developed, so it is reasonable to expect many want to use it for their programming efforts. ST BASIC is similar to the many versions of Microsoft BASIC available on other computers, and this means those familiar with Atari 8-bit BASIC will have to adapt to a whole new dialect. Chief differences include disk I/O and string handling. Plus, you're sure to miss the great screen editor built into the old Ataris. But those familiar with Microsoft BASIC (which includes most of the remainder of the microcomputer world) could be testing out their first program in short order.

This article is meant to give you an idea of what using ST BASIC is like. Along the way, I will point out some of its problems and suggest tricks and techniques to solve—or at least circumvent—a few of them. Even if you didn't buy your ST to program, eventually you may want to try this most creative of computer pursuits. This article is for you too.

To hear tell, ST BASIC is not a good language. People complain about the bugs, arithmetic errors, cluttering windows, clumsy GEM support (what there is of it) and missing features. These complaints have some merit, but recently it has gotten as fashionable to trash ST BASIC as it was to complain about the food at the school cafeteria. Actually, most of the time the cafeteria served satisfactory meals, just as ST BASIC can satisfy many of the tasks usually expected of BASIC. These include such things as mortgage calculations, simple utilities, and simple graphics. ST BASIC introduces menus and windows to assist your programming efforts, and includes powerful debugging commands, like TRACE and FOLLOW, to isolate suspected sections of code. As an engineer, many of the uses I have for a home computer can be well filled by ST BASIC.

## WE DO WINDOWS

The most frequent complaint I hear about ST BASIC is the way it uses windows. Many programmers think that windows don't belong in the programming environment. They prefer the single, full screen for entering and editing code, which is then replaced by the output screen when they run the program. Many computers, including the 8-bit Ataris, operate in just this fashion.

Multiple windows can be useful. For example, seeing your code on the screen as you watch your output helps in debugging. The problem is ST BASIC has too many windows: the Command window, for entering commands; the List window, to list the program; the Edit window, to alter and enter the program; and the Output window, where the running program appears. You can't really see all these windows on the screen at once, so the screen constantly rearranges as active windows move in front of dormant windows. GEM is fairly fast, but all this window juggling quickly bogs things down.

You can do two things to minimize the clumsiness of ST BASIC's windows. First, expand the List and Edit windows to the full width of the screen. This lets you see more of each line. I also expand the Edit window to full screen depth so I can see more lines. Second, use the Edit window as much as possible. You can enter code in the Command window, but you can't edit it once you have pressed [Return]. You must move to the Edit window (by using the EDIT command) to correct any mistakes. The Edit window is perfectly happy to accept new lines, and you can edit there immediately. You can even type over the line number, creating a new line identical to the old one (except for the line number) without affecting the old line.

**ST BASIC saves screens very nicely.**

By specifying a beginning line number with the EDIT command (e.g., EDIT 3050), you may easily move between the Command window and the specified portions of your code in the Edit window. In most cases, only part of your program will be placed within the editor buffer, but more of it is there than meets the eye (or window frame). Use the vertical scroll bars to view portions of your text beyond the frame of the Edit window. Although the Command window may be hidden by the Edit window, you can flip back to the Command window by pressing [Return] and then any key except a number key. The Edit window can even replace the List window, since issuing the EDIT command with a line number lists all lines following, up to the capacity of the edit window buffer.

After writing a program, minimize screen clutter by expanding the Output window to the full size of the screen. The FULLW 2 command will accomplish this. Hiding the window borders and title is trickier. The BASIC FILL command will not cover up the borders. To do that you need GEM VDI calls (see *REFERENCE* for articles on using GEM's VDI and AES with ST BASIC). The VDI line drawing routines can cover up the borders but several events will cause the borders and title to show through again. INPUT

always causes them to show, so get any information you need from the user before you hide the borders. Execute a PRINT statement before you hide the borders because the first PRINT statement will also cause them to show. And warn the user not to click the mouse in the border areas of the window. This too will expose the borders, and I don't know any way to prevent it.

If you don't want to hide the borders of your Output window, how about changing its title? After all, "Output" is not a very imaginative name for your program's window. To change the window title, you must use a call to AES as follows:

```
3510 Poke Systab+24,1 'hide the window
3520 a#=gb 'get globals address
3530 gintin=Peek(a#+8) 'AES Int_in array
3540 Poke gintin,Peek(Systab+8) 'Output window handle
3550 Poke gintin+2,2 'change the window title
3560 s#=gintin+4 'double address for long Poke
3570 Poke s#,varptr(Title$) 'title of the window
3580 GemSys(105) 'wind_set AES call
3590 Poke systab+24,0 'show the window
```

Your window title (**Title$** in the above example) can contain up to 40 characters (so you don't overflow the title line in low-resolution mode). I suggest you call the routine again to change the window title back to "Output" when you are done.

Another nice feature would be to save a screen for future use. That way, if you drew over the screen or were providing an Undo feature in a graphics program, you could restore the screen. ST BASIC handles this very nicely. To save your Output screen, use the RESET command, which stores the screen in a buffer. To retrieve the buffer to the screen, use **OPENW 2**. Note that this only works if the BUF GRAPHICS is enabled in the menus.

## EDITING YOUR MASTERPIECE

The Edit mode in ST BASIC has some problems. Whenever you change a line in the Edit window, the ST redraws that line in a form I call "ghost" text. This tells you that the change is not yet incorporated in the program, and won't be until (and unless) you press [Return] on the ghost line, whereupon the line returns to normal text. As you get more experienced, this ghost text becomes less useful and more annoying. Ghost text is hard to read: Plus signs become arrows, and many letters are indistinguishable from one another. To disable "ghost" mode, enter **POKE Systab+2,0** in the Command window.

Typing long lines in the Edit window reveals other difficulties. For one thing, the physical size of the edit window, even when fully open, will not display all the characters when a line exceeds the right boundary of the window. To see these characters, you have to scroll horizontally. The WIDTH statement, which could have been used to regulate this, does not operate in Edit or Command mode. If I have a lot of long lines to edit, I leave BASIC and edit the program in a word processor like 1ST Word.

## THE WAYS AROUND

ST BASIC is missing some features, and other included features don't work properly. For many of these, however, satisfactory alternative methods get the job done.

INKEY$, a command common to many BASICs, enables the computer to check the keyboard for a key press. Unlike INPUT, the computer does not stop and wait for a key and/or a [Return]. It reads the keyboard "on the fly," as shown here:

```
10 A$=Inkey$:If A$=" " Then Goto 10 'no key pressed
20 Print A$
```

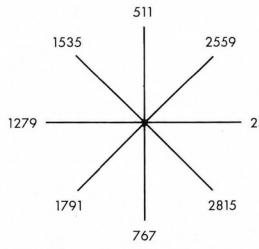
Many games and utilities written in Microsoft BASIC use INKEY$ to read arrow keys as a substitute for a joystick. But INKEY$, as implemented in ST BASIC, doesn't work. If you type in the short program segment above and run it, it will never exit; INKEY$ fails to detect the key press. To get out of this program, pull down the Run menu with your mouse and click on Break, then click on Stop. The reasons for this bug are involved and of no great importance. The best alternative is to use the INP function. INP gets input from a variety of devices. To get a keystroke, use the following:

```
10 A=INP(2):IF A=0 THEN Goto 10 '2 for the keyboard
20 Print Chr$(A)
```

This works just as well as INKEY$ should. For your reference, the key codes returned by the arrow keys are: Up arrow–200; Left arrow–203; Right arrow–205; Down arrow–208.

ST BASIC does not support the mouse or the joystick. For the mouse, you can use a VDI call, but I don't know of any ▶

FIGURE 1



## GETTING AROUND...

VDI call for the joystick. A memory location that is affected by the joystick, address $FFFC02, can be used in a joystick read routine as follows:

```
3470 Poke &HFFFC02,&H0012 'turn off the mouse
3480 Poke &HFFFC02,&H0014 'turn on the joystick
3485 Joystick=Peek(&HFFFC02)
```

This method is not foolproof. For one thing, a negative value in this location means the fire button is pressed. But the address starts out with a negative number until the first time you move the stick. After that, the joystick location reads 255 when you aren't pressing on the stick or pushing the button. Also, pressing keyboard keys affects this location, sometimes returning a negative number. So keep your hands off the keyboard if you are reading the joystick button. The values in the joystick location correspond to the joystick directions as shown in *Figure 1*.

I find it strange that ST BASIC doesn't have any commands to change the color palette. You are stuck with the default colors from BASIC, unless you fall back on VDI. The following code shows how to set any of the color registers to one of the 512 colors available:

```
1160 Poke Contrl,14:Poke Contrl+2,0
1165 Poke Contrl+6,4:Poke Intin,2 'set up. Intin contains
the color register (2)
1170 Poke Intin+2,0:Poke Intin+4,800: Poke Intin+6,0
'put in the color values of R,G,and B
1180 VdiSys(1) 'set register 2 to green
```

# ALTERNATIVES

As of September 1986, Atari was preparing to release a new, improved ST BASIC. Sources at Atari told START that the new version would be faster, more accurate, and would include new commands to access the BIOS, XBIOS, and GEMDOS. They also said that although there would be some changes in the editor, the multiple-window interface would remain essentially the same. Like the original ST BASIC, the new implementation will be bundled free with new STs. LOGO, NeoChrome, and 1ST Word, however, will no longer be included in the package.

But if ST BASIC—old or new—can't handle all your needs, you might consider some of the other BASICs which are beginning to appear. Essentially, there are two types: compilers and interpreters.

Compiler BASICs require you first to write the source code with some form of editor, and then run it through the compiler program which turns out executable, stand-alone object code. The disadvantage of compilers is that the production of a runnable program is time consuming and complicated. The big advantage is that the end program is independent of the BASIC. Also, compiled BASIC programs run faster than interpreted ones.

An interpreted BASIC interprets each line as the program is run. Just write your program and run it. The advantage is instant gratification; you can try things out and see the results immediately. The disadvantage is that your program is usually tied to whatever dialect of BASIC you are using. If you want to send your program to friends, they will all need the same BASIC to be able to run it. Also, interpreted BASICs are usually very slow. ST BASIC is an interpreted BASIC. The following BASICs are divided by type. The first BASICs to arrive were compiler types. In general, they are not designed for the beginning programmer or hobbyist. Some of them are as complicated to use as Alcyon C. Interpreted BASICs have been much slower to arrive. As of September 1986, only *one* interpreted BASIC was available, apart from ST BASIC.

### THE COMPILERS

**Softworks BASIC**—A compiled BASIC, you use a word processor (not included) to write your source code. Softworks BASIC has GEM support in the form of "Toolbox" commands but, apart from a list, the slim, 90-page documentation contains no information at all on how to use the GEM commands. No graphics support is offered except via GEM. (See review in Antic, October 1986.)

Softworks Limited
2944 N. Broadway
Chicago, IL 60657
(312) 975-4030
$79
CIRCLE 348 ON READER SERVICE CARD

**LDW BASIC**—Also a compiler, but for ST BASIC code. The program itself is slow and disk hungry, but it does generate very fast 68000 machine code. LDW BASIC offers some minor enhancements (no line numbers, longer arrays), with more promised in future revisions. (See review in Antic, November 1986.)

Logic Design Works
780 Montague Expressway, Ste. 205

When you try the SOUND command, you will notice that only channel 1 is audible. Sounds played through channels 2 and 3 don't make any noise. To enable all three voices, you must issue the **WAVE 7** command.

The DEFINT function has a well hidden bug. As designed, DEFINT should define as integers any variables which begin with the letters following the DEFINT command:

**10 Defint A-C,X 'defines all variables starting with A,B,C,X as integers.**

The advantage to using integer arithmetic is speed; your program runs faster. However, a problem arises while debugging programs using DEFINT defined variables. Suppose you break into the program and use the Command window to PRINT out the values of variables. Any variable that begins with a letter specified in the DEFINT will print out as 0, unless it is an array, in which case the array elements are equal to -4096! This does not affect the program during its run, but such behavior makes debugging much more difficult. To get around this, you can either accept a slower running speed until the program is debugged (whereupon you can add the DEFINT), or declare each variable as an integer explicitly using the % symbol next to the variable name.

At first encounter, ST BASIC's FILL routine doesn't seem to work right. This is an easy one. The manual has reversed the parameters in the COLOR statement which pertain to the fill style and type. For example, to choose the fill pattern 2,24, use the statement **COLOR n,n,n,24,2** (the three n's represent any valid parameters). When you are finished filling, remem- ▶

San Jose, CA 95131
(408) 435-1445
CIRCLE 349 ON READER SERVICE CARD

**Philon BASIC**—This compiler comes on four disks and does not include a text editor so, again, you have to use a word processor. It includes virtually no graphics support and no GEM support.

Philon
641 Avenue of the Americas
New York, NY 10011
(212) 807-0303
$129
CIRCLE 350 ON READER SERVICE CARD

## THE INTERPRETERS

**Henry's Fundamental BASIC**— Eagerly awaited as the first real alternative to ST BASIC, this interpreted BASIC was "accidentally" released for review last April and was filled with bugs. Contacted recently, a company spokesman stated that the persons responsible for the premature release are no longer with the company. The completed product is expected before the end of the year.

Philon
641 Avenue of the Americas
New York, NY 10011
(212) 807-0303
$49
CIRCLE 351 ON READER SERVICE CARD

**Fast ST BASIC**— Without a doubt, the hottest BASIC we've seen for the ST. This interpreted BASIC comes *on a cartridge* and is extremely fast. START received a prerelease version just before press time and our first impression was very positive. Fast ST BASIC is from England and was designed specifically for the ST. It includes special commands to access GEM. For example **DRAWMENU** will install a user-defined menu bar. The package includes the cartridge, a 400-page spiral-bound manual, and a disk packed with sample programs (including such tempting goodies as a software-driven artificial speech module). In September, Fast ST BASIC was released in England at a price of £79 (approximately $120). No American distributor had yet been chosen.

Computer Concepts
Gaddesden Place
Hemel Hempstead
Hertfordshire HP2 6EX
England
CIRCLE 352 ON READER SERVICE CARD

**MemSoft ST BASIC**—We found this interpreted BASIC from France mentioned in several user's newsletters. The company plans to release the software free and charge for the documentation. At press time we had received no further information from the company.

MemSoft
3, rue Meyerbeer
06000 Nice, France

ber to set the fill style and type back to 1,1 so that future solid fills work correctly.

In ST BASIC, when a running program attempts to open and read a text file, the first character of the file is lost. To solve the problem, begin the file with an innocuous character, such as a carriage return, that won't be missed when it gets lost.

## NO WAYS AROUND

Some limitations of ST BASIC are beyond my abilities to solve. For one thing, the floating-point calculations are inaccurate. So be wary of calculations, such as Square Root, Log, and Trig, which depend on the floating-point routines. An inaccurate floating-point result may cause a perfectly good equation to generate an error. We'll have to wait for Atari to fix this one.

Your ST can keep track of the time and date for stamping files. You can enter the time/date using the Control Panel, or have it done automatically by one of the clock cartridges now available. So far, though, I haven't been able to figure out how to access the system clock using BASIC. The clock function is at the GEMDOS level (meaning that it is buried deeper than even AES/VDI) so it may not be available to BASIC.

Finally, it would be nice to have easier access to the VDI and AES functions. These are the GEM routines which create windows, read the mouse, and perform all the special graphics effects which, after all, are the main reason most people bought the ST. The current GEM support is via the function call number, requiring not only that you know (or can find out) the number of the call you want to use, but also know what parameters you'll need and how to use the call. This information is available (see *REFERENCE*) but can be hard to dig out, since it is not in your BASIC manual. Also, since you can't build and use resource files in ST BASIC, menus and dialog boxes are not accessible. Messages from GEM are also not available, so anything that depends on receiving messages is not possible. Message-based items include such things as reading the menu selections and manipulating the windows.

## THE DRAGON'S MAZE

The program DRAGON.BAS is on your START disk primarily to demonstrate many of the techniques discussed in this article. The original concept of the game came from Terry Pack of San Leandro Computer Club. Get your ST BASIC going, then load and run DRAGON.BAS.

The Dragon's Maze is a one person game where you control a red dot which starts out at the entrance to a maze. The dragon, represented by a green dot, starts out at the exit of the maze. The dragon will move each time you do, and the object of the game is to get by the dragon and exit the maze. You may guide your character either with the arrow keys or by a joystick plugged into port 0. The program will prompt you for the method of control you prefer.

You also choose whether the maze will be visible while you are playing the game. It will always be visible while it is being drawn, so you can study it. I must warn you that the game doesn't pose much of a challenge if the maze is visible. The visible maze was included primarily for children and to let you see how the game works. The maze will be different each time you play the game, though, so the hidden maze is quite a challenge. The parts of the maze become visible as you bump into walls—so you can see where you have been, but not where you are going. The game plays best in low resolution mode, although it will work in medium resolution. Note that when you reach the exit, you must move right to actually exit the maze before the game will realize you have reached the exit. Good luck, and watch out for the dragon! ■

## REFERENCE:

*BOOKS*

- *Understanding Atari ST BASIC Programming*, SYBEX Inc. ($17.95). Perhaps the best of the books on ST BASIC at this point. A professional-looking, thorough examination of the language with plenty of example programs.
- *ST BASIC Training Guide*, Abacus Books ($16.95). A well written guide to using the ST BASIC commands, including GEM. Does not address the more advanced commands, such as WAVE.
- *ST Trick and Tips*, Abacus Books ($16.95). The first section expands on some of the more advanced BASIC commands. This book is laced with typos, so be careful.
- *ST GEM Programmer's Reference Guide*, Abacus Books ($19.95). This and the following book are currently the only thorough source of GEM information outside of the Atari Development Package. You will have to translate the GEM information presented here to ST BASIC for your use. Almost all VDI and AES routines are described in this book.
- *Elementary ST BASIC*, Compute! Books ($14.95). A tutorial and reference guide to ST BASIC. Includes complete descriptions of all ST BASIC commands. $14.95
- *First Book of the Atari ST*, Compute! Books ($16.95). Numerous programs written in ST BASIC, plus tutorials on using GEM from BASIC.
- *ST Programmer's Guide*, Compute Books ($16.95). A large section of this book is devoted to explanations of ST BASIC commands and how to use them.

*PERIODICALS*

- Antic Magazine: *ST BASIC Disk I/O*, May 1986; *Control GEM with ST BASIC*, April 1986; *ST BASIC VDI Calls*, May 1986.
- Compute! Magazine: *Adding System Power to ST BASIC*,

April and May, 1986; *ST Hints and Tips*, June 1986; *ST Outlook*, a series beginning September 1986.

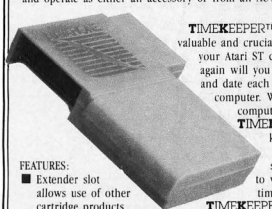
- Analog Magazine: *GEMSYS()*, April 1986

## LIST OF MANUFACTURERS:

- Abacus Software
  P.O. Box 7211
  Grand Rapids, MI 49510
  (616) 241-5510
- Analog Magazine
  P.O. Box 23
  Worcester, MA 01603
  (617) 892-3488
- Antic Publishing
  524 Second Street
  San Francisco, CA 94107
  (415) 957-0886
- Compute! Publications
  P.O. Box 5406
  Greensboro, NC 27403
  (919) 275-9809
- SYBEX Computer Books
  2344 Sixth Street
  Berkeley, CA 94710
  (415) 848-8233


# CLOCK CALENDAR
## For ATARI ST

The Navarone TIMEKEEPER™ module plugs into the cartridge port on the Atari 520/1040 ST computers. A non-copy protected program disk is supplied that contains all the programs needed to install the TIMEKEEPER™ and operate as either an accessory or from an AUTO folder.



TIMEKEEPER™ is no doubt the most valuable and crucial add-on component of your Atari ST computer system. Never again will you have to enter the time and date each time you turn on your computer. When you turn off your computer (or even unplug the TIMEKEEPER™ module), it keeps on ticking, maintaining accurate time so you won't ever have to worry about setting the time and date again. With TIMEKEEPER,™ you get an automatic record of time and date of every file you create or update, right in the directory.

FEATURES:
- Extender slot allows use of other cartridge products.
- Alarm software provided.
- Removable battery (no need to un-solder to replace batteries.)
- Clock display window.

The TIMEKEEPER™ comes complete, ready to use, no assembly required. You don't have to take your computer apart to use it.

**TO ORDER: Contact your local dealer or call:**
**800-654-2821** *in California*
**PRICE: $49.95** **800-624-6545** *Nationwide*

**NAVARONE INDUSTRIES, INC.**
21109 LONGEWAY ROAD, SUITE C
SONORA, CA 95370 • (209) 533-8549
**TLX:WWI 650-230-9046**

NAVARONE

CIRCLE 032 ON READER SERVICE CARD



# MICROTYME
*A DIVISION OF MICRO PERIPHERALS, INC.*
**P.O. BOX 369**
ATARI® **KETTERING, OHIO 45409** ATARI®

**HARDWARE - ACCS.**

| | |
|---|---|
| **ST's Color or Mono** | CALL |
| ST Monitor Cables | CALL |
| SF 314 Double Sided Drive | CALL |
| Supra 20, 30, 60 Meg Hard Disks | CALL |
| SHD 204 20 Megabyte Hard Disk | CALL |
| SC 1224 RGB Color Monitor | CALL |
| ST - COVERS, Heavy Grade Vinyl | 8 |
| ST - MOUSE MAT | 10 |
| ST - 6' Printer Cable | 19 |
| ST - Modem Cable (to Hayes, etc.) | 17 |
| ST - Monitor Stand, Swivel & Tilt | 15 |
| Disk File for 3.5" disks (holds 40) | 9 |
| Power Strip, 6 outlet (15 amp Surge) | 15 |
| Deluxe Power Strip w/Spike & Surge | 24 |
| **PANASONIC PRINTERS** | **CALL** |
| **EPSON PRINTERS** | **CALL** |
| **STAR PRINTERS** | **CALL** |
| **CITIZEN PRINTERS** | **CALL** |
| HABA 1200 (Hayes Compatible) | 119 |
| VOLKSMODEM VM 520 | 149 |
| AVATEX Smart 1200 bps **Special** | 99 |
| AVATEX 1200 H.C. | 149 |
| **PRINTER PAPER**, Micro-Fine perfs, 20 lb. | |
| 500 sheets, Pure White Bond | 8 |
| 1000 sheets, same as above | 14 |

**ST SOFTWARE**

**ATARI**

| | |
|---|---|
| 1st Word | 32 |
| DB Master One | 33 |
| Joust | 19 |
| Star Raiders | 19 |

**ABACUS**

| | |
|---|---|
| Text Pro | 33 |
| Paint Pro | 33 |
| File Pro | 33 |
| PC Board Designer | CALL |

**ACCESS**

| | |
|---|---|
| Leader Board | 26 |
| Tournament Disks | ea 14 |

**ACCOLADE**

| | |
|---|---|
| Mean 18 | 33 |
| Hardball | CALL |

**ACTIVISION**

| | |
|---|---|
| Hacker | 29 |
| Hacker II | 33 |
| Little Computer People | 31 |
| Paintworks | 46 |

**ANTIC**

| | |
|---|---|
| A-CALC | 45 |
| CAD-3D | 36 |
| Flash | 29 |
| Expert Opinion | 72 |

**ARTWORX**

| | |
|---|---|
| Strip Poker | 26 |
| Bridge 4.0 | 20 |
| Peggammon | 12 |

**BATTERIES INCLUDED**

| | |
|---|---|
| B-Graph Elite | CALL |
| D.E.G.A.S. Elite | CALL |
| IS Talk | 51 |
| Paperclip Elite | CALL |
| Thunder | 26 |
| Time Link | 32 |

**ELECTRONIC ARTS**

| | |
|---|---|
| Chessmaster 2000 | 31 |
| Sky Fox | 29 |
| Ultima III | 39 |
| Ultima IV | CALL |

**EPYX**

| | |
|---|---|
| Summer Games | 26 |
| Winter Games | 26 |
| Super Cycle | 26 |
| Championship Wrestling | 26 |
| World Games | 26 |
| Rogue | 26 |
| Temple of Apshai | 26 |

**INFOCOM**

| | |
|---|---|
| All Titles | CALL |

**MICHTRON**

| | |
|---|---|
| Business Tools | 26 |
| Cornerman | 32 |
| DDS Shell | 32 |
| M-Disk | 26 |
| Mighty Mail | 26 |
| Soft Spool | 26 |
| Personal Money Manager | 32 |
| Utilities | 39 |
| Time Bandits | 26 |
| Major Motion | 26 |

**FIREBIRD**

| | |
|---|---|
| Starglider | 29 |
| The Pawn | 29 |

**REGENT**

| | |
|---|---|
| Regent Base | 67 |
| Regent Word II | 67 |

**SIERRA-ON-LINE**

| | |
|---|---|
| ST ONE WRITE | |
| • Cash Disbursements | 66 |
| • Accounts Receivable | 66 |
| • Accounts Payable | 66 |
| Ultima II | 39 |
| Kings Quest I, II or III | ea 33 |
| Space Quest | 33 |

**TIMEWORKS**

| | |
|---|---|
| Data Manager ST | 52 |
| Swift Calc ST | 52 |
| Word Writer ST | 52 |

**UNICORN**

| | |
|---|---|
| Math Wizard | 26 |
| Fraction Action | 26 |
| Decimal Dungeon | 26 |

**UNISON WORLD**

| | |
|---|---|
| Print Master | 26 |
| Art Gallery I, II or III | ea 19 |

**ST LANGUAGES**

| | |
|---|---|
| MODULA 2 | 54 |
| • Developer's Kit | 99 |
| MARK WILLIAMS C | 119 |
| LATTICE C | 109 |
| GST-ASM | 45 |

**Prices Are Per Box of 10** **DISKETTES**

| No. of Boxes | 3.5" MICRO-FLOPPIES SONY/MAXELL SS/DD | SONY/MAXELL DS/DD | VERBATIM SS/DD |
|---|---|---|---|
| 2-5 | 15.00 | 23.00 | 14.00 |
| 6-10 | 14.00 | 22.00 | 13.00 |

**TO ORDER, CALL TOLL FREE**
**1-800-255-5835**
**M-F 9 am-9 pm • EST • SAT 10 am-4 pm**
**Ohio Residents, Order Status or Tech. Info Call (513) 294-6236**
VISA MasterCard

**TERMS AND CONDITIONS**
• NO EXTRA CHARGES FOR CREDIT CARDS! • We do not bill until we ship • Minimum order $20 • C.O.D. to continental U.S. only, add $3 • Ohio residents add 6% sales tax • Please allow 3 weeks for personal or company checks to clear • Shipping/Handling: (Call for Quote) Hardware, minimum $4, Software and most accessories, minimum $3. • Overnight shipment available at extra charge • We ship to Alaska, Hawaii, Puerto Rico (UPS Blue Label Only), APO, and FPO • Canadian orders, actual shipping plus 5%, minimum $5. • All defective products require a return authorization number to be accepted for repair or replacement • No free trials or credit • Returns subject to 15% restocking charge • Due to changing market conditions, call toll free for latest price and availability of product FOR YOUR PROTECTION, WE CHECK ALL CREDIT CARD ORDERS FOR FRAUD

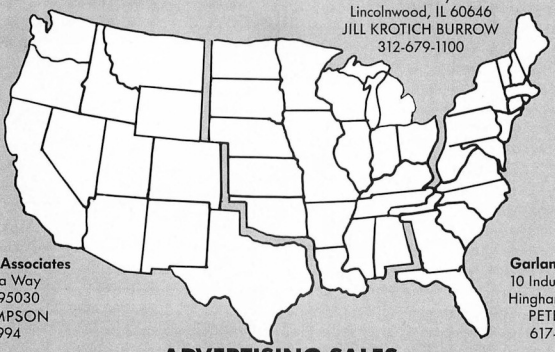
CIRCLE 028 ON READER SERVICE CARD

## ADVERTISERS LIST

Be sure to mention START when contacting these advertisers—all of whom support the Atari ST Computer.


| | READER SERVICE NO. | PAGE NO. |
|---|---|---|
| ABACUS | 001 | 52 |
| ACCOLADE | 079 | 3 |
| ACTIVISION | 005 | 139 |
| AERCO | 011 | 84 |
| ARTWORX | 002 | 13 |
| ATARI | 004 | 7,9,11 |
| BATTERIES INCLUDED | 007 | 140 |
| BECKMEYER DEVELOPMENT | 008 | 49 |
| BLACK PATCH SYSTEMS | 009 | 71 |
| BUCH, FRED | 010 | 119 |
| CENTRAL POINT | 012 | 23 |
| COMPUTER CREATIONS | 013 | 40 |
| DAC SOFTWARE | 014 | 33 |
| DISCLONE | 016 | 49 |
| DR. T'S | 015 | 67 |
| ELECTRONIC ONE | 047 | 44 |
| GEMINI SOFTWARE | 017 | 121 |
| HYBRID ARTS | 018 | 93 |
| I.S.D. MARKETING | 019 | 44,48, 67,121 |
| LOGICAL DESIGN | 020 | 119 |
| LOOKING GLASS | 022 | 39 |
| LYCO COMPUTER | 021 | 77 |
| MARK WILLIAMS | 023 | 4 |
| MEGAMAX | 024 | 109 |
| METACOMCO | 066 | 121 |
| MICHTRON | 026 | 55 |
| MICRO R & D | 030 | 67 |
| MICROPROSE | 027 | 12 |
| MICROTYME | 028 | 137 |
| MIDISOFT | 029 | 121 |
| MILES COMPUTING | 031 | 2 |
| NAVARONE | 032 | 137 |
| PRACTICAL SOLUTIONS | 034 | 117 |
| PROCO PRODUCTS | 033 | 109 |
| S & S WHOLESALERS | 035 | 13 |
| SHELBOURNE | 111 | 80 |
| SOFTWARE DISCOUNTERS | 036 | 49 |
| SOFTWERKS | 043 | 48 |
| ST PLUS | 042 | 117 |
| STart | | 34 |
| STATIC ENGINEERING | 038 | 109 |
| TDI | 039 | 119 |
| THOUGHTSPACE | 045 | 13 |
| TIMEWORKS | 069 | 51 |
| TRANSTECH | 046 | 117 |
| UNICORN | 041 | 67 |
| XLENT | 040 | 84 |


This list is provided as a courtesy to our advertisers. START does not guarantee accuracy or comprehensiveness.



**The Pattis Group**
4761 W. Touhy Ave.
Lincolnwood, IL 60646
JILL KROTICH BURROW
312-679-1100

**Phoebe Thompson Associates**
15640 Gardenia Way
Los Gatos, CA 95030
PHOEBE THOMPSON
408-356-4994

**Garland Associates**
10 Industrial Park Rd.
Hingham, MA 02043
PETER HARDY
617-749-5852

## ADVERTISING SALES

**Advertising Sales Director**
John Taggart
**Antic Magazine**
524 Second St.
San Francisco, CA 94107
(415) 957-0886

**Address all advertising materials to:**
KATHERINE MURPHY
Advertising Production Coordinator
**Antic Magazine**
524 Second Street
San Francisco, CA 94107

# Your Ticket To The Best In Sports

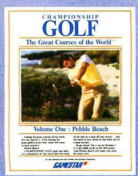
When was the last time you had the chance to attend a championship sporting event–or better yet, play in one? Gamestar's series of outstanding sports simulations gives you that chance. Make the playoffs. Play in the final round at Pebble Beach. Fight the heavyweight champ for the title.

Every Gamestar simulation is as real as the sport itself, from gameplay to strategy to graphics. So winning the championship won't be easy. If it was, it wouldn't be worth it.

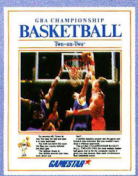
For the very best in sports–the excitement, the challenge, even the championship–Gamestar is your ticket.

Ask your retailer about our HOT HOLIDAY OFFERS worth $245.

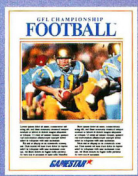
GAMESTAR



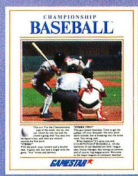

Available for IBM PC, PCjr and Tandy 1000, Commodore Amiga, and compatible computer systems. Coming soon for Apple II, Atari ST and compatible computer systems.



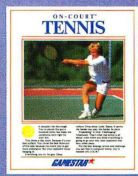

Available for Apple II, IBM PC, PCjr, and Tandy 1000, Commodore 64, 128, and Amiga. Atari ST, and compatible computer systems.



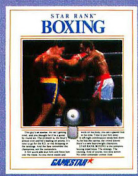

Available for Apple II, IBM PC, PCjr, and Tandy 1000, Commodore 64, 128, and Amiga. Atari ST, and compatible computer systems.




Available for Apple II, IBM PC, PCjr, and Tandy 1000, Commodore 64, 128, and Amiga. Atari ST, and compatible computer systems.




Available for Commodore 64 and 128 computer systems.




Available for Commodore 64 and 128 computer systems.

Gamestar is a trademark of Activision, Inc. Commodore 64, 128 and Amiga are trademarks of Commodore Electronics Limited. IBM is a trademark of International Business Machines Corporation. Tandy is a trademark of Tandy Corporation. Atari and ST are trademarks of Atari Corp. Apple is a trademark of Apple Computer. Activision is the registered trademark of Activision, Inc. © 1986 Activision, Inc.

*"IF YOU WANT*

# *THE BEST GRAPHICS PACKAGE FOR THE ATARI ST,*

***GET DEGAS!"*** — JACK POWELL, ASSOCIATE EDITOR, ANTIC MAGAZINE

## New! D·E·G·A·S Elite

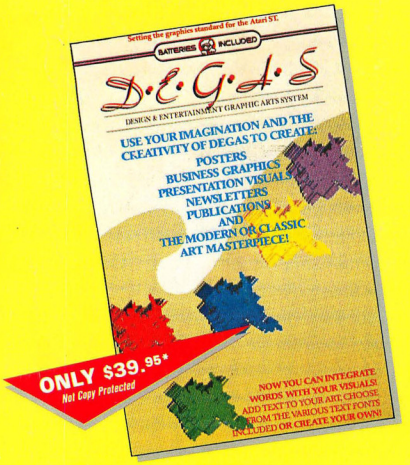
DESIGN & ENTERTAINMENT GRAPHIC ARTS SYSTEM

### *For Those Who Want Advanced Features*

*The professional ST graphics package. All the powerful design features that made DEGAS a critical success. Plus, fantastic new capabilities. Now you can create high-quality production artwork for business reports, ads, displays, newsletters and corporate communications.*

### *ADVANCED FEATURES:*

- *Up to 8 MULTIPLE WORK SCREENS let you work on several pictures simultaneously*
- *CUT and PASTE between pictures in different screens*
- *BLOCK SAVE entire pictures or portions of pictures to disk — create your own CLIP ART reference files*
- *SCALE, FLIP and ROTATE whole pictures or portions*
- *GRID SNAP aligns your picture elements with expert precision, for ultra-clean layouts*
- *Automatically generates COLOR SHIFT between any two colors*
- *COLOR CYCLING creates movement and virtual animation*
- *Incredible new advanced features including; color animation, block move, text size and font style, color fill patterns, new drawing capabilities, stretch, rotate and much, much, more!*
- *Works with PaperClip Elite word-processor to provide a virtual desktop publishing system*




### *DEGAS: Design and Entertainment Graphic Arts System*

*"allows you to take full advantage of your ST's stunning graphics capability, to produce nearly anything you can imagine ... created specifically for the ST, sure to become an ST standard."*

— ANALOG MAGAZINE

*Produce business graphics, posters, newsletters, cartoons — even original works of art. DEGAS makes it easy to exercise your imagination.*

### *DEGAS KEY FEATURES:*

- *DRAW by moving the ST mouse — it's your paintbrush, with 15 built-in brush patterns*
- *more than 500 colors to choose from*
- *one command FILLS any outline with a pattern — includes 60 pre-designed patterns, from grids to dots to solid color*
- *total flexibility: create and store your own custom brush patterns, colors, fill patterns and more*
- *powerful TEXT capability lets you combine words and pictures*
- *choose the ideal letter size and weight from the built-in DEGAS TEXT FONT — or design your own font*
- *draw an accurate LINE, CIRCLE, DISK, BOX or FRAME by simply setting two points — DEGAS does the rest automatically*
- *RAYS and K-LINE draw a series of connected lines*
- *MAGNIFY any picture or portion*
- *MOVE or COPY any figure, anywhere on the screen*
- *advanced graphic design tools include MIRROR, SHADOW and AIRBRUSH*
- *one command saves your DEGAS creations to disk*
- *works in all three Atari ST resolution modes*

*"Overall Performance: Excellent • Graphics Quality: Excellent • Ease of Use: Easy Value: Excellent • Documentation: Excellent • Error Handling: Excellent •"* — FAMILY COMPUTING

## *DEGAS and DEGAS Elite.*

## *For Atari ST's. Compatible with most popular dot matrix and color printers.*

BATTERIES INCLUDED

**• BATTERIES INCLUDED, an ITM company, 30 Mural Street, Richmond Hill, Ontario, Canada, L4B 1B5. (416) 881-9941, Customer Information (416) 881-9818**

**• If you can't find this product at your local retailer, you may order it direct from us at the full suggested list price plus $5.00 for postage and handling. For product orders please call 1-800-387-5707 (U.S. only). • With all Batteries Included products you can have the latest version update of your program by returning the original disk and $10.00.**

**• Write to us for our full color catalog of products for the APPLE, APPLE MACINTOSH, ATARI, ATARI ST, COMMODORE, COMMODORE AMIGA, and IBM SYSTEMS.**

©1986 Batteries Included. APPLE, APPLE MACINTOSH, ATARI, ATARI ST, COMMODORE, COMMODORE AMIGA, AND IBM are registered trademarks respectively of APPLE COMPUTERS INC., ATARI CORPORATION, COMMODORE BUSINESS MACHINES INC., AND INTERNATIONAL BUSINESS MACHINES INC. *ALL PRICES SHOWN ARE IN U.S. DOLLARS. RETAILERS MAY SELL FOR LESS!

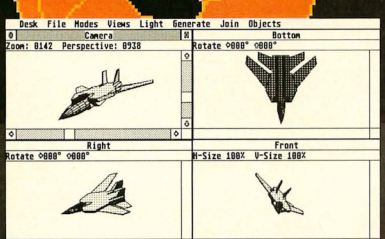
You can upgrade the original Degas to the new Degas Elite by returning your disk and $40.00 (U.S.) to Batteries Included.

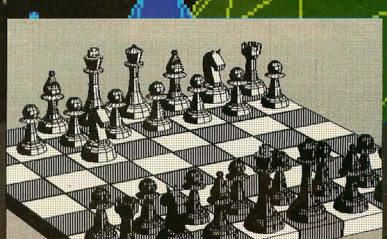
Integral Solutions

CIRCLE 007 ON READER SERVICE CARD

# THE CATALOG™

QUALITY ST SOFTWARE



BEST SELLER

*The author of DEGAS™ enters a new dimension.*

## Tom Hudson's CAD-3D™

**A full, three-dimensional modeling station for your ST. Solid modeling, with shading from three adjustable light sources, plus wireframe and hidden surface dimensional sculpting—*you name it.* All your 3-D graphics fantasies have been poured into the power and speed of the ST's 68000. So step on the gas and take off!**

From starships to solar systems, skyscrapers to your front stoop. Create and animate views of your own 3-D objects. And no keyboarding here—CAD-3D is entirely GEM-based. It's got to be seen to be believed.

**DESIGNERS:** You now have power at your fingertips that was previously available only on systems costing $30,000 or more. *Visualize ideas instantly*—speeds up design process.

**DOODLERS:** Easy to learn, easy to use. *Create the ultimate in dimensional scenes.* Then detail them with any ST paint program.

CAD-3D features include:

- ☐ Works with monochrome or color monitor. Monochrome mode gives 16 levels of shading, color gives choice of 1 color/14 shades or 2 colors/7 shades each.
- ☐ View objects in see-thru or hidden wireframe form or *solid form with true light shading.* Change object form with one mouse click.
- ☐ Three independent user-defined light sources plus ambient lighting.
- ☐ Built-in 3D primitives (cubes, spheres, toroids, wedges).

continued on next page

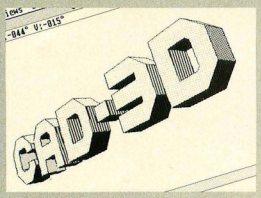
☐ *Automatic* JOINER creates more complex objects:
ADD objects together
SUBTRACT one object from another
AND objects (retains only the intersection)
STAMP one object on another
☐ Create radially symmetrical objects or expand 2D shapes into 3D shapes with one mouse click.
☐ *Animation capability*—"record" view sequences for viewing with separate display program (included).
☐ Spin and Extrude functions allow even the novice 3D experimenter to create a wide variety of beautiful shapes (includes 'Snap To' grid).
☐ Independent scaling and rotation of objects or groups of objects.
☐ "Camera View" includes zoom lens and variable perspective.
☐ GEM user interface allows use of four views at once, or one large view. Four-view mode is user-definable.
☐ Save completed images in DEGAS, Neochrome or COLR Object Editor format.
☐ Print your objects with a graphics printer.
☐ Detailed illustrated user manual.
☐ Sample complex objects included, featuring Ian Chadwick's *STONEHENGE* (circa 1100 BC).

**Requires TOS in ROM**
**ST0214** **$49.95**

DEGAS™ Batteries Included

## *INCREASE YOUR DESIGNING POWER WITH CAD-3D ACCESSORY DISKS!*

## FONTS, PRIMITIVES, HINTS AND TIPS: *NEW!*




☐ Create logos, signs, 3D letterheads and more with 3D fonts. Includes upper and lower case alphabet, numbers, and symbols.
☐ Useful 3D 'primitives'—these building blocks speed up the design of large-scale models.
☐ Sample models and a file of Tom Hudson and Ian Chadwick's hints and tips on how to make complete digital scenes with CAD-3D.

**AVAILABLE OCTOBER 1ST**
**ST0224** **$24.95**

**See pg. ST-16 for Tom's CAD-3D Collection I. Only $12.00!**

## PLOTTER AND PRINTER DRIVERS: *NEW!*

☐ Plot your 3D drawings on a high-resolution pen plotter for a truly professional look! Supports Hewlett-Packard (and HP compatible) plotters. Also includes custom printer drivers for all popular dot-matrix printers.

**AVAILABLE OCTOBER 1ST**
**ST0225** **$24.95**

## *A Full Function Relational DataBase*

# REGENT BASE™ *NEW!*

*by Regent Software*

You don't need to be a dBase III programmer to use this database. Perfect for the small business owner or for personal productivity and it's GEM-based.

**REGENT BASE**'s procedural language makes it a natural for handling any small business need. Modules are available for Invoicing, Accounts Receivable, Checkbook Balancing, General Ledger, and more.

This relational data base is written specifically for the Atari ST. Don't settle for simple clones of IBM products. **REGENT BASE** is easy to use and state-of-the-art!
Unique to **REGENT BASE** is the use of B+Tree Indexes. Multiple fields within a **REGENT BASE** table may be indexed for quicker access. Use the Bridge program to move and merge other database information. Sort, file, mail-merge, select up-graded word processing functions, unlimited records and indexes per table.

**REGENT BASE** runs efficiently on hard or floppy drive systems and supports 15 printer types.

**Recommended—**
**1 Megabyte RAM**
**TH9003** **$99.95**

TOLL FREE
Credit card holders, call toll-free, 24 hours-a-day
VISA 800-443-0100, ext. 133 (Continental U.S. and Hawaii)
MasterCard
ORDERS ONLY!

Pure telecommunications power...Realized.

BEST SELLER

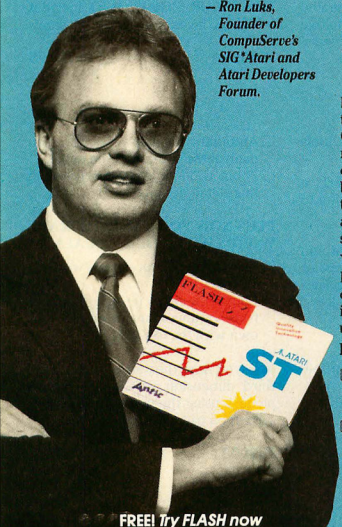
# FLASH™

**Version 1.1**

*by Joe Chiazzese and Alan Page*

*"FLASH is my #1 choice on the Atari ST."*

*— Ron Luks, Founder of CompuServe's SIG*Atari and Atari Developers Forum.*




Want to take telecommunications to the outer limits of your imagination? All you need is **FLASH** and a modem to get you there. We wanted the *ultimate* in telecommunications for the Atari ST. And it had to be affordable.

## We couldn't wait. We built it. ...Plus, it's GEM-powered.

Now you can have the automation features and VT100 terminal emulation of Crosstalk™ on the IBM and the intuitive mouse/window interface of Smartcom™ on the Mac. Plus, the built-in GEM-based word processor is integrated with the capture buffer—to give you a scrollable, editable history of every online session.

You can have all of it *now*, for under $40. Plus, we'll give you $15 of CompuServe connect time ***FREE!*** (Effectively bringing the cost of the software down to under $25!)

### FLASH features include:

- ☐ Built-in GEM mini *word processor* (features block move, undo, search, merge files, and more)
- ☐ Review your online session. Scroll through it at high speed—edit it, print it, transmit all or part of it, save all or part of it to disk. Huge capture buffer automatically adjusts to fill available RAM.
- ☐ Create "script" files that automate *any* operation—log-ons, file transfers, "broadcasting," email collection, etc. (69 powerful commands)
- ☐ Execute a complete online session with *one* mouse-click from the desktop.
- ☐ ANSI VT100 and VT52 cursor and keypad editing emulation (full 24 line×80 character smooth scrolling display).
- ☐ CompuServe Vidtex high-resolution graphics terminal emulation. Save Vidtex graphics as DEGAS files and use them as *clip art!*
- ☐ Supports Xmodem (CRC & Checksum), DC2/DC4, and ASCII TEXT file transfer protocols.
- ☐ Ultra-reliable. **FLASH** features *bullet-proof* file transfers to and from CompuServe (and other packet-network online services) at speeds up to 9600 baud.
- ☐ Extensive DOS functions at your fingertips. Two clocks: built-in real-time system clock and elapsed timer.
- ☐ Unlimited banks of twenty programmable function keys, which can be linked to script programs on disk.
- ☐ Translation tables can independently filter any incoming or outgoing characters.
- ☐ Detailed 50-page user manual by Ian Chadwick, including complete reference guide.

**ST0220** — Crosstalk™ Microstuf — **$39.95** — Smartcom™ Hayes

***FREE! Try FLASH now and get $15.00 of CompuServe access time, FREE.***

***Order now and you'll receive a CompuServe Intro-Pak; your free introductory subscription to the CompuServe Information Service with a 46-page CompuServe mini-manual. Plus $15.00 worth of CompuServe access time, free.***

***This offer is valid for everybody, including current CompuServe subscribers.***

**FREE OFFER!** Here's what you have access to on CompuServe as soon as you receive your copy of **FLASH:**

- **ATARI 16-BIT FORUM:** The best ST PD software, support, and gossip.
- **ATARI DEVELOPERS FORUM:** Official Atari support, and talk of the trade.
- **ANTIC ONLINE:** Hot news, special articles never released in print.
- **VIDTEX GRAPHICS:** Hundreds of pictures. Everything from Hollywood stars to the FBI's most wanted. Outrageous stuff—*the ultimate clip art library!*

# KERMIT SERVER & REMOTE CONTROL ACCESSORY

NEW!

Adds the Kermit file transfer protocol to **FLASH.** Plus, you can now call your computer from anywhere in the world and have control over: disk directory, send/receive Xmodem, send/receive Kermit, Kermit server, and upload/download text files. Your system is secured with real password protection. *Perfect for sales, business, and school.* Now you can use your ST from your office or while you're on the road.

**AVAILABLE OCTOBER 1ST**

**ST0226** — **$24.95**

Requires FLASH

*INTEGRATED FINANCIAL SOFTWARE FROM* BATTERIES INCLUDED

# THE ISGUR PORTFOLIO™

ANTIC AWARD

**THE ISGUR PORTFOLIO** is three programs in one: Portfolio manager, telecommunications, and calendar/memo pad. Receive Dow Jones stock quotes, CompuServe, The Source, and InfoGlobe financial information, automatically. Consolidate multiple stock portfolios. Hands on managment of stocks, bonds, options, commodities, mutual funds—your key to financial success.

**THE ISGUR PORTFOLIO** is PC magazine's "EDITOR's Choice." The integrated GEM-based system provides intuitive access to your data and unlimited versatility. A complete financial management package for the professional and individual investor.

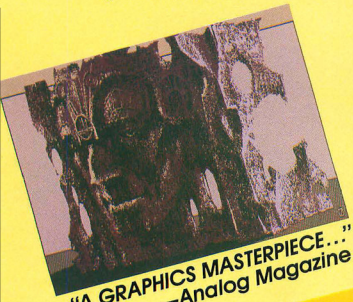
A real value for your investment. Plus, **THE ISGUR PORTFOLIO** includes **I•S TALK.** Invest in your future…today.

**TH9009** **$199.95**

# D.E.G.A.S.™

BEST SELLER

*by Tom Hudson*




**DEGAS** features all the artistic tools that you may need including:

- ☐ Unique dual-screen GEM interface makes **DEGAS** intuitive and fun to use.
- ☐ Works in any resolution.
- ☐ Numerous functions to create and draw lines, rays, circles, boxes, or frames. Create perfectly straight lines or beautiful circles automatically.

**PLUS ADVANCED GRAPHIC DESIGN FEATURES:**

- ☐ An airbrush effect that lets you control the "paint flow."
- ☐ Automatic "Fill" function. Fill any outline instantly.
- ☐ Create "Fill" patterns.
- ☐ Instant Mirror Image, in any direction.
- ☐ Automatic Shadow or Border, you control the width and the angle.
- ☐ Zoom window lets you work with fine-detail designs.

**PLUS NOW YOU CAN INTEGRATE WORDS WITH YOUR VISUALS.**

- ☐ Use the Text feature to add words to your art.
- ☐ Choose the character weight and size from various fonts, or create your own with the font editor.

Now you have the power to reach the third dimension with your **DEGAS** pictures using the powerful **CAD 3-D** system on page ST-1.

**TH9008** **$39.95**

*A spelling checker that is lightening fast!*

# THUNDER™

**THUNDER** gives you a powerful spelling checker accessible from within your favorite application program. Your accuracy will skyrocket, so the time spent proofing will plummet.

It's so simple. Here's how it works. Example: you're happily writing away and you make a "mstake" and BEEP (**THUNDER** picks up the error with lightning-fast speed). Now **THUNDER** will display a list of similarly spelled words (stake, mistake, etc.)

Compatible with Paperclip Elite, Homepak, BTS, other Batteries Included products, 1st Word, GST-Edit, DB Master One, as well as FLASH on page ST-3, A-CALC on page ST-5, and many more GEM software titles.

**TH9011** **$39.95**

# TIMELINK™

*Take A Second For Time Management*

**TIMELINK** is a great GEM-based scheduling and time-keeping tool for home and business. Your day, week, month and year appointments are only a mouse-click away. Useful for messages, reminders and much more. There are many incredible uses for the handy elegant, time-saving tool.

**TH9010** **$49.95**

TOLL FREE

Credit card holders, call toll-free, 24 hours-a-day
800-443-0100, ext. 133 (Continental U.S. and Hawaii)

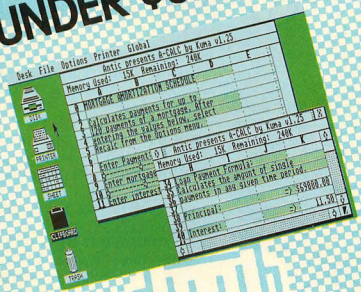
ORDERS ONLY!

# A-CALC™ by Kuma

BEST SELLER

## A FULLY GEM-BASED SPREADSHEET FOR UNDER $60.

**The first mouse-driven spreadsheet for the Atari ST computer system. A-CALC's GEM interface is exceptional. For example, load a spreadsheet simply by dragging the disk icon over the sheet icon. Imagine how *easy* it is to merge a file from disk by dragging the disk icon into the appropriate cell.**




### Version 1.50

*by Kuma Systems, Ltd., U.K.*

A-CALC's dozens of features include:

- ☐ Primarily mouse/icon driven. Keyboard or ten-key calculation entry.
- ☐ Math functions include all standard algebraic and trignometric functions for performing financial and statistical analysis.
- ☐ Up to five windows can be open at once.
- ☐ Spreadsheet capacity of 256 columns × 512 rows (128,000 cells).
- ☐ Cells, blocks, rows, and columns can be copied, moved, saved, printed or deleted with the mouse.
- ☐ Special WIDE-VIEW function permits half-size text display to let the user see more of the sheet at one time, in color or monochrome.
- ☐ SEARCH for the location of any text string in the sheet. GOTO command jumps to any cell.
- ☐ Clipboard for temporary storage of block, row or column of cells which can be transferred to another spreadsheet.
- ☐ Powerful printer formatting commands. Comes with an easy-to-use GEM-based printer installation program for any parallel or serial printer. Customize your spreadsheet with the following:
  - headers/footers
  - horizontal/vertical dividers
  - selectable form feeds
  - selectable page break
  - send printer-specific control codes
  - character translation
  - loading and saving printer configuration files
- ☐ Includes on-disk spreadsheet examples.
- ☐ Worksheets are compatible with all popular word processing software. Plus, A-CALC is .DIF compatible with other spreadsheets.
- ☐ "Sparse matrix" spreadsheet design *maximizes available memory.* Create extra-large spreadsheets with RAM to spare.
- ☐ Cells can be protected from tampering —locally or globally.
- ☐ First-ever use of "Dynamic icons" makes operation totally intuitive.
- ☐ Includes illustrated manual.

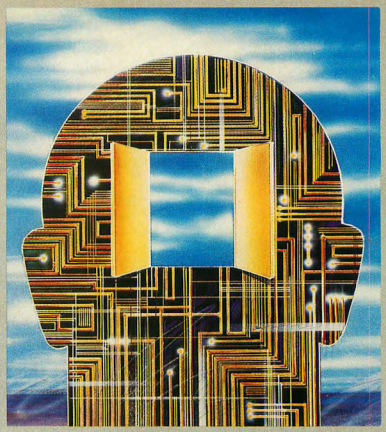
**ST0212** **$59.95**

**A-CHART,** THE solution for presentation-quality graphics, will be available in early October. Check for availability with your local retailer.

## *ARTIFICIAL INTELLIGENCE*

***"That's right! Expert Systems, the artificial intelligence tool for business, industry, and problem-solving. The latest in knowledge engineering."***

# EXPERT OPINION™



Fifth-generation. Artificial intelligence. Now, with **EXPERT OPINION,** you can be creative in this growing new field...without having to learn a complicated language like Prolog or Lisp.

### Be The First...

**EXPERT OPINION** is the *first* general-purpose expert system creation package for the Atari ST. Expert systems are collections of natural language rules that you create, database-style. Your "knowledge bases" can be about any subject. **EXPERT OPINION** will give you new insight and advice about your expertise. And, because **EXPERT OPINION** uses the GEM interface, the system is remarkably simple to use. Currently, expert systems are used in the fields of medicine, computer science, economics, and geology.

YOU CAN BUILD YOUR OWN KNOWLEDGE BASE WITH THE INCLUDED MANUAL AND SUGGESTED SUPPLEMENTARY READING MATERIAL.

### Mainframe Power In Your ST...

Once you've built your knowledge base, **EXPERT OPINION** is easy-to-use because it's based on a powerful natural language interface, so you can give your input—and get your answers in plain English. Plus, it is the only expert system presently available for micro-computers which can clearly explain why a particular question is being asked (it backtracks up to 10 levels).

**EXPERT OPINION**'s "inference engine" solves problems three ways:

- ☐ **DEDUCTION**—Use this mode if you have some initial data about the problem (also known as Forward Chaining).
- ☐ **VERIFICATION OF A HYPOTHESIS**—Your computer asks you questions about your hypothesis (also known as Backward Chaining).
- ☐ **EXPERTISE** (totally new technique)—A combination of the above, for situations where you have no initial data about the problem, and no hypothesis (Mixed Chaining Mode).

**EXPERT OPINION** features:

- ☐ Dictionary linked to each knowledge base.
- ☐ Unlimited number of knowledge bases.
- ☐ BaseManager has powerful tools for creating and editing knowledge bases.
- ☐ Illustrated manual includes tutorial and tips by Christopher F. Chabris, Glossary, Bibliography, and more.
- ☐ GEM-driven interface, on-line [Help], and user-friendly command structure make **EXPERT OPINION** simple to use.

**FREE BONUS!**
Comes with example knowledge bases on disk to get you started.

**ST0219** **$99.95**

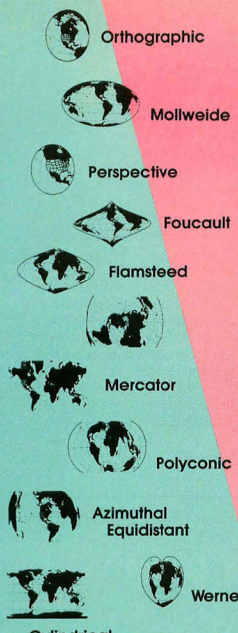
WARNING: This is a sophisticated computer science tool requiring study to use it effectively. We recommend the following books to help you use the program to its fullest:
THE COGNITIVE COMPUTER, Addison Wesley 1984
EXPERT SYSTEMS, Wiley Press 1985
INTRODUCTION TO ARTIFICIAL INTELLIGENCE,
Addison Wesley 1985

***THE CATALOG WANTS YOU! PUBLISHING OFFER.***

*A New Opportunity.*

*We're looking for people to create useful knowledge bases using EXPERT OPINION. If you're an expert on a subject (any subject), get EXPERT OPINION—write a knowledge base. . . And if it's very good, and has broad appeal, we'll publish it for you in this catalog. Write to me, Catalog Product Manager, for more details (my address is on the back page). Give me your expert opinions. I'll try to help you publish some of your knowledge bases on a commercial basis.*

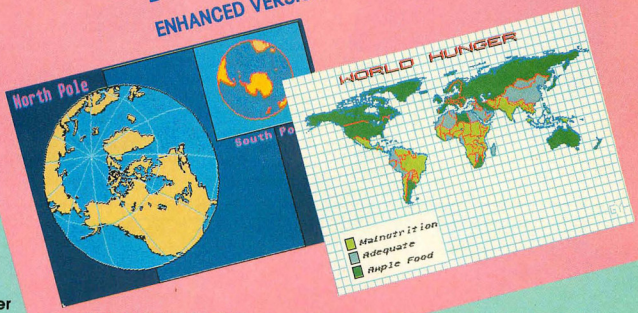
TOLL FREE
Credit card holders, call toll-free, 24 hours-a-day
VISA 800-443-0100, ext. 133 (Continental U.S. and Hawaii)
ORDERS ONLY!




*Now you can customize MAPS AND LEGENDS to plot any coordinates you want!*

# MAPS AND LEGENDS™ The Cartographer

## ENHANCED VERSION 2.0




*by Harry Koons and David Chenette*

Put yourself anywhere in the world — even your own hometown. And now view that land mass from any altitude—in full perspective!

### Unlimited Versatility

The *new* OVERLAY feature in version 2.0 gives you total flexibility and professional power. Now, *plot your own maps in scale on top of the built-in world map database.* Or use the new DATAMAP disks to add the boundaries of the nations of the world, historical maps, and more.

### Tap Your ST's Speed...

Using advanced CAD system algorithms, MAPS and LEGENDS takes less than a minute to do what used to take hours for computers—and weeks by hand. It features ultra-fast drawing of world maps from one of 11 perspectives, three resolutions, up to 16 colors.

**ENTIRELY GEM-BASED FEATURES INCLUDE:**

- ☐ OVERLAY option for plotting your own maps, flight plans, routes, city locations, etc.
- ☐ BUILT-IN DRAWING TOOLS
  - Multiple Pattern Fills, Pen sizes, Text sizes, Fonts
- ☐ MULTI-FONT DESK ACCESSORY
  - Comes with extra fonts for customized legends
- ☐ AUTO-LOCATE MODE
  - Reads geographic coordinates from map, and distance and bearing from any point on the Earth—just by pointing with your mouse!
- ☐ DEGAS and Neo compatible. Use your maps as basic elements in the most popular ST graphics packages.
- ☐ Works with color and monochrome systems.
- ☐ Built-in topic-based [Help] system.

NOTE: With the new overlay enhancement, MAPS and LEGENDS has become one of the *best* cartographers tools in history. We added this capability to the system after a request for it from a navigational flight officer. He told us that he and the other flight officers at his base were using MAPS and LEGENDS and ST's to draw their flight plans, and that they needed to be able to accurately plot their routes. We liked the idea so much that now anyone can build custom map databases out of simple coordinate lists. And arguably the best thing about version 2.0 is the price...still $34.95.

**ST0202** **$34.95**

## *INTRODUCING DATAMAPS*

## DATAMAP COLLECTION I: *NEW!*

**NATIONAL POLITICAL BOUNDARIES**
Europe, Latin America, S. America, Asia, Africa

**PROVINCIAL AND STATE BOUNDARIES**
Australia, Canada, China, U.S.S.R. (the SSR's)

**HISTORICAL MAPS**
Pre World War I Europe, Pre World War II Europe, Original 13 U.S. colonies, and more...

**Requires Maps and Legend 2.0**
**ST0227** **$24.95**

*Exciting World War II Submarine Action in the South Pacific!*

NEW!

# SILENT SERVICE™

*By MicroProse*

**0400 hours, Tuesday, August 12, 1942...BATTLE STATIONS!! BATTLE STATIONS!! Enemy convoy identified on radar!!**

**SILENT SERVICE,** The Submarine Simulation, brings exciting action, great strategy, detailed graphics and an ultra-realistic simulation of World War II U.S. submarine action in the South Pacific.

**SILENT SERVICE**'s outstanding features include: all the critical battle stations, engine room, conning tower and ship's bridge; challenging and realistic combat versus single ships and heavily escorted convoys; and an infinite variety of situations using complete maps and charts for the entire Southwest Pacific and a sophisticated and realistic attack plotting system.

**SILENT SERVICE** provides a wide selection of historic scenarios. From hit-and-run attacks to patrol missions that bring challenge and fun to both the first time player and the experienced submarine veteran.

As captain, you select a quiet patrol sector in the Marianas Islands, or choose the dangerous waters off the coast of Japan. Is the submerged daylight periscope attack best, or do you charge in on the surface at night using only radar bearings as your guide? These and many more decisions will determine your place among the elite ranks of the **SILENT SERVICE.**

**TH9016** **$39.95**

---

*GET ORGANIZED AND HAVE FUN WITH MICHTRON*

NEW!

## CORNERMAN

### Eliminate the desk battlefield and make organizing easy!

What Sidekick did for the IBM, **CORNERMAN** does better for your Atari ST. This utility gives you a host of useful desk-top tools in one simple, neat package. With everything from a built-in clock, notepad, phone book and ASCII table, to a full function calculator, a cluttered desk is a thing of the past. And as a desktop accessory, **CORNERMAN** is available nearly anywhere within GEM.

**CORNERMAN** doesn't interfere with other programs and comes complete with security. HIRE THE PERFECT RIGHT HAND PERSON TODAY—HIRE **CORNERMAN.**

One megabyte RAM recommended.

**TH9013** **$49.95**

## CARDS

**CARD** games for the entire family and serious strategy card player. Beat the dealer in Blackjack, skunk your opponent in Cribbage, play out the aces in Solitaire and win at Klondike and Poker Squares. Incredible graphics.

**TH9015** **$39.95**

## TIME BANDIT

### Now you're organized—so take a break and have some fun.

The arcade adventure takes you to the world of the biggest, fastest, most detailed game ever designed for a home computer. You're the bandit rogue travelling through time and space. The quest always beckons: recover the Great Artifacts and break the Gates of Time! Features: 16 unique arcade lands, 3,000 screens, realistic detail, three text adventures, unique dual-player mode. Uses color monitor.

**TH9014** **$39.95**

**MichTron**

TOLL FREE

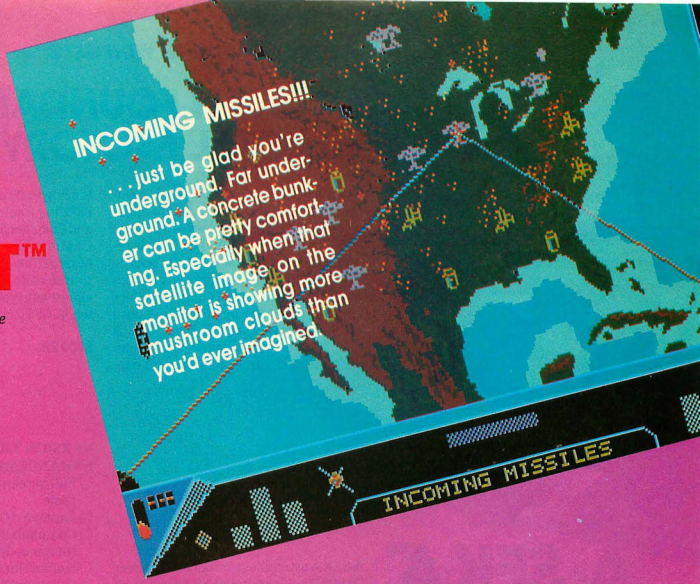
**Credit card holders, call toll-free, 24 hours-a-day**

VISA **800-443-0100, ext. 133** (Continental U.S. and Hawaii) MasterCard

ORDERS ONLY!

# RED ALERT™

*Written by Stanley Crane and Daniel Matejka*




But you have some options. A few. Strategically-placed Ground-Based Lasers and Antiballistic Missile Silos are the backbone of your defense. Your last space-based Particle Beam Weapon is available, but you must allocate your resources wisely to use it.

**Your cities are under attack.** It's up to you to try and destroy the Russian ICBM's and MIRV's—plus the missiles launched from nuclear subs. RED ALERT features real-time animation, on-screen help, auto-demo mode, color/monochrome compatibility, three selectable levels of play, PLUS a unique construction set which lets you customize North America with the cities that you want to protect, and the positions of the Ground-Based Lasers and Antiballistic Missile Silos.

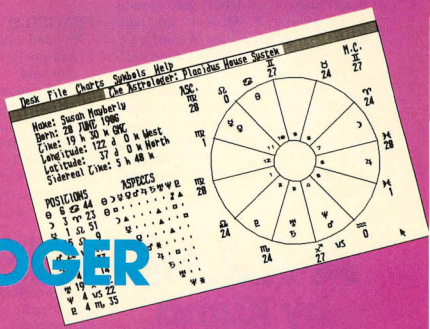
NOTE: RED ALERT is an addicting game, but it's also a thought-provoking version of an SDI (Strategic Defense Initiative) nightmare scenario. (RED ALERT was developed by the authors of DB Master.)

**ST0223** **$24.95**

*The Perfect Addition To Your Family Album!*

# STAR STRUCK™ —THE ASTROLOGER

*By Harry Koons*



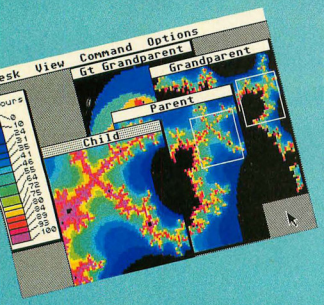

Now your ST can *instantly* generate accurate natal charts for you, your family, and friends—the way an astrologer would do it. Entirely GEM-based, STAR STRUCK creates charts using formulas for the nine most popular house systems used throughout history (Placidus, Morinus, Equal Spaced, Porphory, and five more). On-screen help windows and reference documentation show you exactly what all of the astrological icons mean.

**Excellent Graphics, Custom Fonts...**
STAR STRUCK includes the Font Loader desk accessory and fonts (gothic, roman, etc.) to give your charts that authentic look. All astrological aspects are displayed in graphic form. U.S. and world maps are built into the program. Locate your birthplace with the mouse or key-in the exact coordinates. Charts can be printed out or saved to disk in DEGAS format. Compatible with color and monochrome monitors.

**ST0222** **$24.95**

# GSTC APPLICATION FOUNDATION I FRACTAL FACTORY™

NEW!




Discover how to do graphics programming! Learn how to write a GEM application! Learn by example with the source code for FRACTAL FACTORY. This remarkable disk contains *all* the source code, batch files, linker files, and graphics and math libraries for a unique graphics application written by the GST in-house programmers. FRACTAL FACTORY is the ultimate fractal-maker, using multiple windows, variable zoom, and contouring to display many generations of dazzling fractals at once. Monochrome and Color versions illustrate how to write GEM graphics applications for both types of monitors. The FRACTAL FACTORY source code can be the *foundation* for almost any type of GEM application written in GSTC.

**ST0228** **$19.95**

***Sixty Eight K Assembler, Editor, Debugger combo for under $35.00!***

# A-SEKA™ by Kuma

## Version 1.6

*By Andelos Systems/Kuma, UK*

Sometimes you just need to get that code running faster. A high-level language application needs a burst of energy. Or maybe it's arcade action—high end stuff. A-SEKA does it *fast*, because it is all in RAM. All of it: The Assembler, Editor and Monitor/Debugger. Those who know how can create exciting codes mighty fast. And if you're learning Assembly, you won't ever have to wait for your latest attempt to go through the assemble and link process.

A-SEKA assembles source codes at over 30,000 lines per minute! And since it can assemble and link simultaneously, you can *run your code instantly.* Of course, A-SEKA is also a macro assembler and uses standard Motorola mnemonics. But what really sets it apart is its powerful machine language monitor, disassembler and symbolic debugger.

**FEATURES:**

- ☐ Symbol table access.
- ☐ Arithmetic operations. Input in any base.
- ☐ Disassembles 16 lines at a time.
- ☐ Motorola mnemonics.
- ☐ Single step. Trace.
- ☐ Multiple breakpoints. Memory inspect and modify.
- ☐ Line assembler.
- ☐ Examine registers.

**VERSION 1.6 ENHANCEMENTS:**

- ☐ Full-screen editor, including cut & paste
- ☐ Expanded GEM AES and VDI libraries
- ☐ Compatibility with other assembler source code
- ☐ Support for GEM subdirectories, additional pseudo-op's for printer and Line A control
- ☐ Step command now skips trap and Line A OS calls

**ST0216** **$34.95**

NOTE: We're carrying both the SEKA and GST-ASM assemblers because they are complimentary—each is designed to meet the needs of a different type of programming. SEKA is a low-level assembler that is most useful for programmers who like to work entirely at the machine level or want ultra-fast response time. GST-ASM is really a professional developers tool—its extra GEM features and GEM environment make it the perfect assembler to use with any high-level language.

# A-RAM™ by Kuma

*By Roddy Pratt, UK*

Can your RAMdisk partition any size disk emulator you want?

- ☐ A-RAM can.

Can it work with TOS in ROM?

- ☐ A-RAM can.

Can your RAMdisk accelerate your floppy write speed by turning off the verify mode?

- ☐ A-RAM can.

Can you have multiple RAMdisks present at the same time?

- ☐ You guessed it. A-RAM can.

A RAMdisk is an area of memory set aside as a buffer that responds to most of the available disk commands—only much faster. Everybody needs a great RAMdisk, and A-RAM is powerful, simple and flexible enough for *every* application.

**ST0215** **$19.95**

TOLL FREE

Credit card holders, call toll-free, 24 hours-a-day
800-443-0100, ext. 133 (Continental U.S. and Hawaii)

ORDERS ONLY!

*FINALLY! GEM DEVELOPMENT AND LEARNING TOOLS AT A SUPER VALUE!*

# GSTC™ Compiler

**Version 1.3**

## Here is the compiler that 1ST WORD was written in.

Do you want to write GEM-based programs for the Atari ST? With GSTC you can—without spending hundreds of dollars on expensive compilers. Now you can add windows, dialogs, and all the GEM forms to any program — it's *easy* with GSTC. Use your mouse and pull-down menus to write C programs within a desktop menu-driven "shell" environment. GSTC allows compile-assemble-link and assemble-link operations to be batched, avoiding tedious and error-prone command line entry. And it all fits on one single-sided disk. No excessive disk swaps.

At the heart of the GSTC package is the remarkable *GEM Superstructure Library.* This enables the beginner to write GEM applications software at once, without the complex learning curve associated with GEM AES and VDI. Open a fully-functioning window with one call. GSTC is fast—providing compile and linkage turn-around times speedy enough for the most impatient hacker!

**GSTC features include:**

- ☐ GEM Text Editor (GST EDIT)
- ☐ Linker (GST LINK)
- ☐ C Compiler
- ☐ GEM "shell"
- ☐ 68000 Assembler
- ☐ GEM Superstructure Library
- ☐ GEM bindings, (Standard Unix, GEM VDI, GEM AES, GEM XBIOS, TOS)
- ☐ Comprehensive printed user manual

**Version 1.3 enhancements**

- ☐ All 40 GEM XBIOS routines, with documentation
- ☐ All 12 GEM BIOS routines, with documentation
- ☐ Hints and Tips on using pointers to simulate structures
- ☐ FRACTAL FACTORY object code

**TH9018** **$79.95**

NOTE: We searched all over the world to find the best introductory C compiler. When we discovered that GSTC was used to write 1ST WORD, we decided that it was just what we were looking for. This compiler is very powerful and remarkably easy to use. But at present, it doesn't have structures or a floating point library. To help you here, our version 1.3 of the GSTC documentation includes information about how to simulate structures with pointers, and the FRACTAL FACTORY disk has a math library on it. If you're writing a program that uses very serious math, you may need to look at Lattice C. But for most applications, GSTC will do the job.

# GST-ASM™

## A high-level Macro Assembler with an unbeatable combination of price, performance, and features.

Elegance and sophistication... GST-ASM

GST-ASM is a Motorola-compatible 68000 macro assembler designed to work with high-level languages (C, Pascal, Fortran, etc.). Now, assembly language programming is truly accessible to all ST users. And because GST-ASM uses the GST GEM interface and text editor, it's a joy for beginner and advanced programmers alike.

**Includes Macro Tools and more!**

GST-ASM has high-powered macro facilities, for extremely fast throughput. Plus, extended macro functions include several 'pseudo-functions' such as .LEN and .INSTR (which can be used in string substitutions). A large toolkit of useful macros is included for conditionals, loops, stack handling, and subroutines.

**GST-ASM features include:**

- ☐ GEM text editor (GST EDIT)
- ☐ GEM "shell" operating environment
- ☐ Unique, high level instruction macro library (IF, WHILE, REPEAT, CASE, etc.)
- ☐ Supports conditional assembly
- ☐ Creates cross-reference listings
- ☐ Symbol table
- ☐ Supports Include files
- ☐ Generates relocatable code
- ☐ Produces object code compatible with: Lattice C, Pascal, Fortran, Modula 2, etc.
- ☐ Comprehensive printed user manual, including thorough documentation of all assembler error messages.

**TH9017** **$59.95**

# FREE WITH GSTC & GST-ASM! GST EDIT and GST LINK

**GST-EDIT** is a GEM-based screen editor that is to programming, what 1ST WORD is to word processing. Features up to four independent windows, cut & paste, search & replace, plus is 100% integrated with GSTC and GST-ASM.

**GST LINK** is the same linker that comes with Lattice C. It is an extremely flexible linker that is relocatable, supports SID symbols, symbol tables, link maps, batch control files, and more.

*The standard for the 68000.*

# LATTICE C™

*By Metacomco*

- ☐ Full Kernighan and Ritchie implementation
- ☐ Powerful data types (pointers, arrays, structures, unions)
- ☐ Separate and conditional compilation
- ☐ Macros
- ☐ LATTICE design
- ☐ True native code compiler
- ☐ Comprehensive error handling, including warning messages
- ☐ Full floating point arithmetic
- ☐ Optimized to produce fast, compact code
- ☐ No runtime licenses required
- ☐ All C language features are supported, including:

**PRE-PROCESSOR COMMANDS:** #include, #define, #undef, #if, #ifdef, #ifndef, #else, #endif, #line.
**STORAGE CLASSES:** extern, static, auto, register, typedef.
**TYPE DECLARATORS:** int, char, short, unsigned, long, float, double, struct, union.
**OBJECT MODIFIERS:**, ", [ ], ( ). Declarations may be arbitrarily complex.
**INITIALIZERS:** Full range of expressions accepted.
**STATEMENT TYPES:** All are supported, including labels and goto.

- ☐ LINK 68 and GST LINK compatibility.

**GEM Libraries**

- ☐ Complete interface to GEM VDI and AES functions and to library of Unix and utility functions, allowing all the features of the Atari ST—icons, windows, graphics, etc.—to be used. The graphics libraries are also included in source code form.
- ☐ 270-page manual

**EDITOR LINKER MENU+**

**TH9007** **$149.95**

# MCC PASCAL™

*By Metacomco*

## ISO Pascal Compiler

This Pascal compiler has been widely used on the Commodore Amiga and the Sinclair QL. It is a fast and powerful implementation that conforms *fully* to the exacting ISO 7185 standard. **MCC PASCAL** is the ideal Pascal for all users, whether new to Pascal or experienced programmers.

- ☐ FAST, SINGLE-PASS COMPILATION. **MCC PASCAL** compilation is straightforward and fast—ideal in education or program development.
- ☐ COMPATIBLE—COMPLETE IMPLEMENTATION OF ISO 7185. Compatibility with the International Standards Organization's definition of ISO Pascal.
- ☐ 32-BIT INTEGERS AND 32-BIT IEEE FLOATING POINT.
- ☐ COMPREHENSIVE ERROR HANDLING. The compiler recognizes over 150 different errors, and the runtime system provides over 30 different English error messages.
- ☐ 215-PAGE MANUAL.

**EDITOR LINKER MENU+**

**TH9006** **$99.95**

***"For an environment that's superb for development, I vote for Metacomco."***

*Anita Sinclair, Magnetic Scrolls, UK*
*(developers of THE PAWN)*

# MCC MACRO ASSEMBLER

*By Metacomco*

The MCC MACRO ASSEMBLER is the companion assembler for Lattice C and MCC Pascal. This full-specification assembler was specifically designed to complement those languages. Features include: linker, editor, GEM libraries, macros, Menu+ and 100-page manual.

**TH9005** **$79.95**

# FREE WITH EACH METACOMCO LANGUAGE SCREEN EDITOR, LINKER, MENU+

- ☐ **EDITOR** features include: Horizontal and vertical scrolling, file merging, cut & paste, search & replace, macros.
- ☐ **LINKER** features include: Relocatable, optional SID debugger symbols, auto run-time relocation.
- ☐ **MENU+** is a remarkable new menu-driven GEM environment designed to speed up your program development cycle (EDIT, COMPILE, LINK, RUN). You can now specify a number of TOOLS (for example, any editor, compiler, debugger, etc.) together with the options for each of these tools. And MENU+ remembers all the little things that you do during a programming session—so you don't have to.

***Technical questions? Talk with a Metacomco System Software Engineer: Call (408) 438-7201.***

RENAME files singly or batch

CREATE and DELETE folders

MOVE files in and out of subdirectories or to other disks

TEXT FILE FORMAT and PRINT using headers, footers, and page numbers

COPY files

FORMAT disks

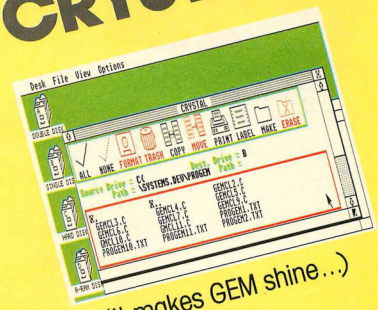
DISK LABELS printed automatically

DELETE files

NEW!

ADD A WORLD OF DOS ICONS TO ALL OF YOUR GEM PROGRAMS.

# CRYSTAL™




(It makes GEM shine...)

*By Jim Thompson*

These are the DOS Icons Digital Research forgot when they wrote GEM. It's too bad Atari didn't put **CRYSTAL** into the TOS ROM's, because for less than 30K of code, **CRYSTAL** gives TOS the most powerful features of MS-DOS. Plus, you never lose the look and feel of GEM. And since **CRYSTAL** is a desk accessory, it's always available.

In fact, these eight icons will eliminate all the frustration you feel from not having powerful DOS functions available from within your favorite GEM program (or the desktop).

Of course, **CRYSTAL** is compatible with all monitors, all disk drives, and all printers.

Make your personal version of GEM shine—for $24.95.

**ST0229** **$24.95**

---

*Use the language that professionals use from Prospero—the language specialist*

# PRO FORTRAN–77 NEW!

**PRO FORTRAN–77** compiles up to 10,000 lines and utilizes over 1,000 identifiers. Pro Fortran–77 is a full implementation of ANSI (American National Standards Institute) Fortran 77 with no omissions and many useful extensions.

**PRO FORTRAN–77** gives programmers a secure base on which to build.

Package includes: compiler, linker, run-time libraries, librarian, X-ref program, sample programs and 200 page manual.

Fortran is the most widely used language by universities, scientists and professional programmers. Take advantage of Fortran power combined with the wealth of information and subroutines that have been developed over the past 25 years. There is software for everything from particle physics to mechanical engineering.

Ideal for Atari software developers, schools and colleges, computer science students, training institutions and great for solving technical problems.

Fortran should be in every ST programmers library.

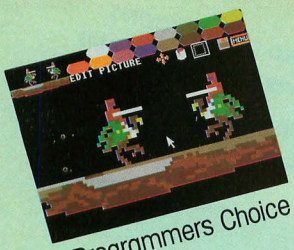
**TH9012** **$149.95**

TOLL FREE

**Credit card holders, call toll-free, 24 hours-a-day**

VISA **800-443-0100, ext. 133** (Continental U.S. and Hawaii)

MasterCard ORDERS ONLY!




The Programmers Choice

*A bit-map 'raster cutter' for ST program designers using the 16-color mode.*

# C.O.L.R. Object Editor

*by The Rugby Circle*

NOW, the first all purpose graphics design programming package is available for the ST. An essential time-saving tool developed for creating software sprites and bit-mapped game objects.

Your original art or favorite low-resolution picture from any ST paint program can be sketched or modified. Invert, twist or copy your objects. The zoom editing feature gives your picture that professional look. Your object is stored on disk in a compatible format allowing you to access your work from the programming language of your choice.

Store up to 20 objects in memory at once and instantly access four rainbow paint palettes from RAM.

**C.O.L.R. OBJECT EDITOR** includes object motion examples. This is the only graphics programming tool of its kind for the professional and hobbyist programmer.

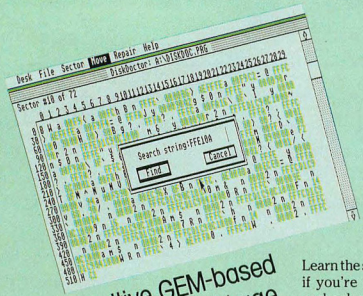
See the November 1985 issue of ANTIC for more information on **C.O.L.R. OBJECT EDITOR.**

**COLOR ONLY**

**ST0201** **$29.95**

# DISK DOCTOR

*by Dan Matejka*




Intuitive GEM-based disk utility package.

Learn the secrets of ST disk structure, and if you're adventurous, try some "disk archeology." Recover deleted files *automatically* and repair damaged files and disks.

☐ Make quick modifications to *any* ST single or double-sided floppy or hard disk.

☐ Use **DISK DOCTOR** to *customize* program menus and messages.

☐ Search for character strings or go to any sector instantly. Quickly edit full sectors on-screen using your mouse or cursor keys. Get directory history, file attributes, and more.

**DISK DOCTOR** is perfect for the casual user who just wants to repair a file, OR the *serious programmer* who wants to discover what's really going on. Includes on-disk Help and thorough technical reference information.

**COLOR / MONOCHROME**

**ST0211** **$29.95**

TOLL FREE

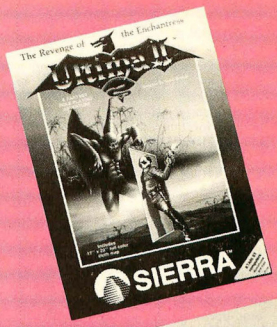
**Credit card holders, call toll-free, 24 hours-a-day**
VISA **800-443-0100, ext. 133** (Continental U.S. and Hawaii)

ORDERS ONLY!

# ULTIMA II

*By Sierra*

A Consistent Alter Ego Best Seller

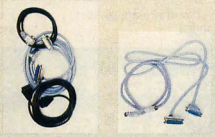



**ULTIMA II.** One of the most popular fantasy role-playing games ever, **ULTIMA II** still claims a place on the bestselling charts. Second in the series this multiple disk epic that lets you create your own super-powered alter ego to perform brave and daring feats in your honor. Together, step through time doors to ages past, present and future. Explore the far reaches of the galaxy. Battle fierce monsters and cunning brigands. Finally, face the all-powerful enchantress Minax, in a duel unequaled in the annals of time. A colorful cloth map helps guide the player through the Ultima universe.

Plan on spending a couple weeks unravelling the ribald adventure.

**TH9002** **$59.95**

# HARD TO FIND CABLES $19.95



**THE CATALOG** has premium quality shielded cables with gold contacts.

What makes these cables so special? They have the unique non-standard Atari connectors and provide the length that can free-up your workstation of awkward peripheral arrangements.

**520 ST**
6′ ST Micro floppy disk drive cable (SF354 and SF314 drives)
**PH0003 $19.95**
6′ ST to printer cable
**PH0001 $19.95**
5′ ST to modem cable
**PH0002 $19.95**

**800/XL/XE**
10′ Atari standard peripheral cable (Serial/SIO connector)
**PH0006 $19.95**
5′ 850 Interface to printer cable
**PH0004 $19.95**
5′ 850 Interface to modem cable
**PH0005 $19.95**

# HIPPOVISION VIDEO DIGITIZER

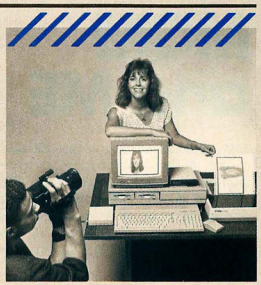
Create digitized Degas and NEOchrome-compatible picture files using any high quality composite video input (e.g. color or b&w camera, VCR, TV, etc.…). Fast software updates the ST's screen 10 times per second, while the hardware frame-grabber snaps pictures in 1/60 of a second. Animation mode allows automatic sequential frame digitization. Black and white high contrast mode or up to 16 grey levels with color monitors. 320H × 250V resolution. NTSC, PAL, and SECAM compatible. Includes hardware interface, software, demos and instructions.

Perfect for artists, game designers, and video aficionados.

**In single color mode:** It snaps the picture in a single video frame (1/60th of a second). No blurring of the picture occurs in this mode. Animate a sequence of pictures (up to a total of 50 pictures with a 512K machine, about 100 for a 1024K machine).

**THE SPECS**

- ☐ 256 × 256 × 9 bit resolution (3 bits per color).
- ☐ Standard NTSC 1 volt peak-to-peak composite sync signal.
- ☐ Software color "voting" system picks optimum 16-color ST palette according to image.



HIPPOPOTAMUS SOFTWARE, INC.

- ☐ Hardware plugs into printer port for high speed data transfer rate.

**PH0007** **$139.95**

# ST PUBLIC DOMAIN LIBRARY

## S/Terminal plus SOURCE!

Get on-line and transfer files with S/Terminal, a full-featured terminal program written in 68000 assembly language. S/Terminal features Xmodem, Xon/Xoff, 300/1200/2400 baud support (and more, up to 19.2K baud), and on-line help screen. ALL SOURCE CODE IS INCLUDED, in addition to object code. This disk also includes several C source and object graphic examples, plus five LOGO demos.

**PD0057** **$12.00**

## ST DOODLE plus SOURCE

The perfect GEM learning tool. PD paint program written in "C", including object and source files for you to explore. Works in all three resolution modes. Demonstrates GEM drop-down menus, windows, scroll bars, color selection, fill algorithm, three brush sizes. Comes with NEOVERT—converts your pictures from NEO to DOODLE format. Learn how GEM and the ST work . . . without any typing!

**PD0058** **$12.00**

## DEGAS COMPETITION COLOR WINNERS

The top eight color entries from Batteries Included's DEGAS art competition. Includes a slide-show viewing program—DEGAS is not required.

**PD0077** **$12.00**

## ST FRACTALS plus SOURCE!

Features MANDLEZOOM by Harry Koons. Uses Mandelbrot algorithm to draw fractals in GEM windows in any resolution. Then zoom in with 2×, 4×, 8×, or 16× magnification. Change fractal iteration values and rescale fractals to enhance their color. Then save your fractal picture to disk. Includes all "C" source and object files. PLUS, a half dozen other fractal programs that use different algorithms and display techniques (some also with source code).

**PD0068** **$12.00**

## DEGAS COMPETITION HI-RES WINNERS

The top eight monochrome entries from Batteries Included's DEGAS art competition. Includes a slide-show viewing program—DEGAS is not required.

**PD0076** **$12.00**

## CAD-3D COLLECTION I *NEW!*

The first collection of complex objects created by Tom Hudson with CAD-3D. Includes: MONITOR (Atari SM124 monitor), ALPHOM (Alpha when viewed from one angle, Omega when viewed from another!), STARSHIP (Starship Enterprise), SHUTTLE (Executive Space Shuttle), OUTLET (exploded view of electrical wall outlet), HELMET (16th century Japanese battle helmet), and more! (requires CAD-3D ST0214)

**PD0085** **$12.00**

## ST BASIC/LOGO SAMPLER

BASIC: Includes MIDIREC.BAS—a simple MIDI sequencer and sample song files, BG.BAS—backgammon, Fractals in BASIC, Biorythm's, and more. LOGO: Nearly a dozen useful routines including complex graphics. Plus two bonus desk accessories.

**PD0078** **$12.00**

## SOLID SOURCE CODE

Features Jim Luczak's VDI SAMPLER and C PRIMER, which demonstrates C programming techniques and the use of VDI functions and their C BINDINGS. BICALC, a desk accessory Binary-Hexadecimal-Decimal calculator. Plus two very fast versions of LIFE, written in Assembler. All source and object code is included and is well commented. And more!

**PD0079** **$12.00**

## XLISP *NEW!*

Interested in artificial intelligence? XLISP is a version of LISP that has an object oriented extension capability. It allows you to experiment with AI algorithms and structures as well as object oriented programming. Applications written on the ST can be ported to other computers since versions of XLISP are also running under UNIX, VAX/VMS, MD-DOS, CP/M-86, CP/M-68, and Macintosh. XLISP comes with SOURCE CODE (in C) and is extensible.

**PD0084** **$12.00**

*An Electronic Jewish Mother*
*Created by a Former Playboy Cartoonist!*

*Written by Yakov Kirschen and Just For You, Inc.*

# MOM and ME

Just think. Your own computerized Jewish mother—on-screen in an overstuffed chair; knitting, cajoling, dispensing advice, and offering you encouragement—or making you feel guilty, of course. She'll speak to you by name and brag about you to your friends.

**ST0204** **$19.95**

**monochrome/color**

# MURRAY and ME

Some people don't want a Jewish mother. How 'bout a Jewish uncle? The London Times called MURRAY "the first in a new generation of Biotoons"—computerized, interactive cartoon characters. MURRAY is always ready to cheer you up when you're feeling blue.

**ST0203** **$19.95**

**monochrome/color**

# Special Note To ST Dealers

When it comes to Atari 16 bit products, ***THE CATALOG*** is the best resource available for state-of-the art software. Every effort has been made to contact ST dealers nationwide with a copy of ***THE CATALOG*** that features the latest in ST products. If you were overlooked, it was not intentional, and we hope you will call us for free product information and dealer discounts. Be one of the first to stock your shelves with ST products from Antic, Batteries Included, Regent, Hippopotamus, GST, Kuma ...and the list continues.

Many of our customers call us looking for the nearest dealer of ST products. If you would like to be on our referral list please let us know. We're here to help you service the many ST owners...and the list is growing!

TOLL FREE

**Credit card holders, call toll-free, 24 hours-a-day**

VISA **800-443-0100, ext. 133** (Continental U.S. and Hawaii)

ORDERS ONLY!