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Washington Apple Pi



Volume 2

February 1980

Number 2

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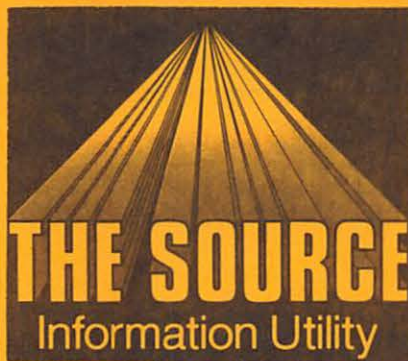


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EDITORIAL

We've done it. I believe we have reached "critical mass" and our user group is going to make it. We are up to 142 paid members and we seem to be growing at the rate of 10 percent per month. Word is getting out and I for one am getting many calls from persons expressing interest in joining. Bob Peck (our able Treasurer) says his phone has been ringing off the hook. I haven't checked with Dave Morganstein but I bet his has also. I believe the reasons are threefold:
1. Our meetings have improved thanks to the good efforts of Sue Eickmeyer;
2. Our software library is a winner (we sold 150 floppies at our last meeting); and
3. Our newsletter is coming on strong, thanks to you our contributing membership.

With this surge in membership comes new needs and responsibilities. First on the list is a new meeting place. No, we don't want to leave GWU. we need a larger room! Last meeting's attendance overflowed into the aisles and outside the room into the hallway. We are working on that problem.

Second, we need more volunteers to serve as alternates to our overworked officers and committee chairmen. Many people had to wait in line up to 25 minutes to make their purchases at our last meeting. Dave certainly can use some help in duplicating the disks of the month. If interested, call us. Our numbers are listed in the front of the newsletter.

Also, we must begin thinking seriously of setting up subgroups with meetings scheduled apart from the monthly meeting. Many are interested in scientific applications (see Hersch Pilloff's comments elsewhere in this issue). Others are interested in medicine and pharmacology. We've got a volunteer for a games SIG. Paul Sand would probably organize a software/hardware evaluation SIG. Animation sounds like a winner too. I don't need to tell you this. You are all aware of interesting applications. All it takes is one individual to take the initiative in each area. How about organizing your interest(s) into a SIG Group?

Remember - we are not the small group of thirty or forty that we were last Spring. Think about what's needed for our present status and let us hear your suggestions.

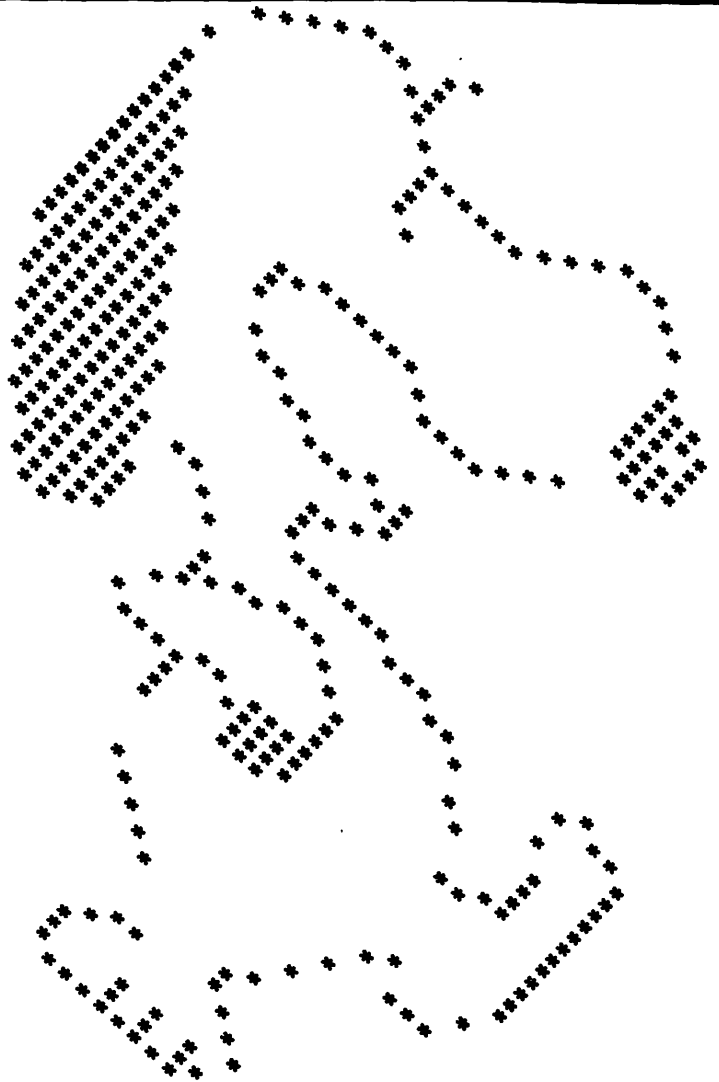
EVENT QUEUE

Washington Apple Pi meets on the 4th Saturday of each month. The next meeting is Saturday, February 23, at 9:30 AM at George Washington University School of Engineering, Tompkins Hall (room 206), 23rd and H Streets, N.W. A presentation on Lo-Res Graphics will be given by Gerald Eskelund of NOVAPPLE.

NOVAPPLE will meet at 7:30 PM on February 28 at Computerland of Tysons Corner and on March 13 at Computers Plus in Franconia. Looking ahead, a special meeting is being planned for March 27 at Computerland of Tysons Corner, when a representative of Mountain Hardware will talk on their peripherals.

The first annual meeting of INTERNATIONAL APPLE CORE will be held on Thursday, March 13, 1980 at the Civic Auditorium, Civic Center, San Francisco, CA. APPLE TALKS will be given on the next three days at the West Coast Computer Faire, as follows:

Steve Wozniak	Founder of APPLE
John Draper	Forth Language
Charlie Kellner	Graphics & Pascal
J. D. Esenburg	Graphics & Pascal
Bill Atkinson	Pascal
Wendell Sanders	Hardware
Phil Roybal	Marketing
Craig Vaughn	SOURCE
Wes Thomas	SOURCE



MINUTES

The January 26 meeting of Washington Apple Pi was called to order at 9:30 AM by President John Moon. A list of materials available in the AP Notes was distributed to members. There was a call for help in the distribution of bulk newsletters to various computer stores. All members were requested to fill out the new membership application form (as of December 1979), even if they have already paid their dues. This will facilitate our compiling a list of members (with addresses and/or phone numbers) for distribution to other members. We cannot include members on the list who have not given us their consent.

Gerald Eskelund of NOVAPPLE announced that a representative of Mountain Hardware will give a talk at their meeting on the 4th Thursday in March. This will be held at 7:30 PM at Computerland of Tysons Corner. David Morganstein, our Librarian, said that we now have nine disks available for sale. Bob Peck, our Treasurer, said that members wishing to purchase a disk drive could do so at 10 to 15 percent off regular price through a club bulk purchase. The discount would also apply to most other items, such as modems.

The program was turned over to our Program Chairperson, Sue Eickmeyer. There was a panel discussion of various text editors for the APPLE. The panel consisted of: Mark Crosby, EasyWriter; Fred Sharp, Charles Mann Master Text Processor; John Moon, AP.TYPE (Call -A.P.P.L.E.); Joe Lewis, APPLE PIE; Howard Richoux, TED; Jim Manley, Muse's Super Text; and Tom Woteki, PASCAL.

Sue announced that at our next meeting Gerald Eskelund would present a program on Lo-Res Graphics. The meeting was then adjourned to the hands-on computer session, and to the selling of library disks.

There were approximately 85 attendees at this meeting.

NOVAPPLE MINUTES

The meeting of January 24, 1980, was called to order by the Vice President, as the President's wife had a baby girl.

A Constitution and set of By-laws were presented to the members in attendance. The members were requested to review the proposed handout for discussion at the next meeting. A vote will take place at the next meeting at Computerland on February 8. A call was made for new members. If you have not paid your dues please do so by the end of February at the latest. The program for the next meeting at Computers Plus will be a discussion of PILOT. This is a language often used for education programs to teach children to program. A great program is planned for the March 27 meeting at Computerland. Mountain Hardware will present a demonstration of their hardware peripherals. A new tutorial is planned in the near future on Applesoft.

The program for the evening was presented by Kim Woodward. He introduced the attendees to Sweet 16.

ANOTHER OPINION

by HERSCH PILLOFF

I am writing to express my opinion that the exchange of technical information at the Apple Pi meetings has been very disappointing, and to propose some suggestions for improvement. This situation is all the more vexing because it is obvious that there are many members who, even if they are not experts, are sufficiently familiar with specific subjects to provide a valuable source of information. The problem is that we have not been able to take advantage of this assembled talent during the meeting itself, with the result that what is probably the most valuable resource of the club has been wasted in the sense that an opportunity has been missed.

I am proposing the following suggestions as one way to improve this situation:

1. Following the close of the regular meeting activities, a semi-formal discussion session would be scheduled.
2. This session would address "technical" questions and issues in the following order:
 - A. Questions submitted in advance and published in the Newsletter.
 - B. Questions submitted in writing prior to the meeting but not included in the Newsletter.
 - C. Open discussion.

At the risk of belaboring the obvious, it is important that members contribute questions for inclusion in the Newsletter. The likelihood of having a question answered will be much greater if the members can think about it prior to the meeting, and those who have something to contribute are more likely to remain for the discussion if at least the first part of the agenda is publicized. In order to get this started I have put together the following list of questions:

1. What problems, if any, exist in using a separate terminal with the APPLE?
2. What experiences have members had with Micro Net?
3. Ideas for plotting more than 280 individual horizontal points on the IDS 440?
4. Contributed Fast Fourier Transform Programs?
5. User evaluation of EPROM Boards?
6. What are the differences between the Mountain Hardware ROMPLUS+ and the California Computer System Prom Module?
7. How can multiple characters, e.g. underlining or slash-thru, be printed on the IDS 440?
8. New utility programs?
9. Novel applications?

Most assuredly, none of these questions are profound, and some have obviously been forced in order to flush out the list. The point is that your questions and participation are needed. No one should be intimidated by a concern that their questions might be perceived as either trivial or of no interest to the group.

A PAGE FROM THE STACK

LIBRARIAN'S CORNER - Dave Morganstein

Well, interest in the Library is pretty keen, judging from the last meeting. This cannot continue, however, without a fresh supply of contributions. I know that just about everyone has keyed in a program of his own or from some publication. Just bring it in at the meeting and we'll add it to our supply.

We are up to nine volumes now. Hopefully, there will be a few more by the next meeting. Volumes 1, 2 and 8 are utilities. Volumes 3 through 7 are games. Volume 9 is an educational disk. A math/science disk is in the works. Music and graphics could add two more to bring us up to a dozen.

This go around I'll summarize disks 2, 5 and 6.

DISK 2 - UTILITIES

SWEET 16 DISASSEMBLER - If anyone is into machine code, he should try the 16-bit dream machine hidden in his APPLE. This integer program will disassemble your object code and yield the Sweet-16 opcodes.

DISK TRANSFER - From Call-A.P.P.L.E Vol. 2 No. 2 (Feb 1979), use this to do disk-to-disk transfers of Integer, Applesoft or Binary programs.

DEBUGGING AID (APPLESOFT) - From the March 79 issue of the Apple Corps of Austin, Texas. Lets you list pieces of a program for use in editing.

FIND TEXT - Token and Program Trace - Both are valuable integer programs written by Alan Hill. They both work by appending an integer program. "Find" searches the program for a specified text string or Basic token. The trace program is described in MICRO, March 1979.

MASTER CATALOG - This is also an Alan Hill program. It creates a text file containing the data from catalogs. I have modified it for a 48K system and for use with the Autostart ROM.

TED (TEXT EDITOR/ASSEMBLER) - One of the first "free" ones around. Unfortunately the documentation is a bit sketchy. Hopefully this issue contains a summary of commands.

DOS UTILITY # 1 - Want to change "CATALOG" to "XNGUPLE", then this program is for you!! Seriously, it lets you change DOS commands. Listing it is very instructive.

CODES FOR 6502 - Useful for the novice machine language programmer.

PASSWORD KEY - Put this in your Boot-Up and prevent access to disk files without knowledge of the secret password (POOPSIE).

MULTI-DISK CAT - Use this with FILE CABINET II to construct a data base of your program names. The basic difference between this and MASTER CATALOG is that this uses a multi-field file and sorts (slowly) in Basic, while the A. Hill program saves each entry as a single string but uses Ampersort for quick sorting.

FILE CABINET II - An improved (?) version of APPLE's free data base management program.

DISK 5 - GAMES

BLACK BOX - Good Lo-Res color brain challenger. Shoot X-Rays into a black box and locate the atoms based on

reflection/absorption of the rays.

SHOOT OUT - Cowboys of all ages will wear out your paddle buttons on this one.

HUNT THE WUMPUS - One of the original micro games in Basic. Find the wumpus before it eats you.

BEGINNER MATH - For the younger APPLE fanatics.

SPELLING BEE - Keep interest in your computer buzzing...Hmmm.

APPLESTAND - Great for teaching youngsters the tough life of a capitalist.

LEGACY/TAKE IT - Two quick-moving thought games.

LORES FOOTBALL - The Superbowl may be behind us, but you armchair quarterbacks needn't wait a whole year for more...

TOGNAZZINI CHESS - It may be called that, but it's hard to beat Bruce T. at his opening gambit.

NIGHTMARE GAMEPACK - My son loves Tiger Trouble, one of four games included in this group.

SIMPLE SIMON - Test your memory with this melodious memorizer.

BRAIN BUSTERS - Vol. 1 by Paul Kayne. A series of quick brainteasers for the mathematically inclined. Example: What are the last three digits of the number 7⁹⁹⁹⁹?

CRYPTOGRAM - A delightful substitution code program. It poses a quotation and you decode it.

DISK 6 - GAMES (What, more games?)

TRADER - Ply the distant stars, buying and selling galactic necessities. Make your fortune and buy more APPLE-stuff.

DEATH STAR - Play against another or against the APPLE. Maneuver your craft to shoot down the tube of the Death Star. (Rewarding display if you do!!!)

SPACE ADVENTURE - See if you can zap the invading saucer more often than he zaps you.

HI-RES BREAKOUT - As the name implies.

INTERACTIVE BASEBALL - A good Hi-Res baseball game. Watch out for the curves.

INSPECTOR CLEW-SO - Published in Creative Computing, this is an intricate version of the old favorite, Clue. Guess who did it, what room and when by asking questions of the suspect. The murderer randomly lies!

ROLE-PLAYING STARWARS - A text fantasy play game.

TREK 79 - Also in text, but cute...

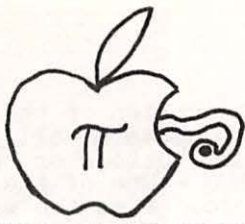
PIT 2 - I got this one from San Francisco in trade for some of our software. Can you get out?

I'll close with a "Keep those tracks and sectors coming". Uncle David wants you!! (At least, he wants your programs...)

"NAME STATES", An educational game on Volume 9 of the Washington Apple Pi Library, has two spelling errors in the list of state names kept in its tables. Corrections should be made as follows:

On program line 1000, DELAWARE is misspelled.

On program line 1030, MONTANA is misspelled.



A WORM'S EYE VIEW OF OUR MEMBERSHIP

by Bernie Urban

Did you ever wonder about your "fellow" APPLE users? I did. So, I've studied the membership forms submitted to Washington Apple Pi and I've come up with some interesting facts. I had some preconceived notions about our membership. Some of these have been confirmed but there are a few surprises.

First, for the purists and practicing statisticians in our midst, let me say this is not a very scientific analysis. It is based on the imperfect and in many cases incomplete information gleaned from the applications forms. Many did not fill in their occupations and I'm sure (?) that there must be more than eleven Federal Government employees. I also placed some individuals into two or more categories depending on their responses, e.g. an Air Force employee was counted as being in a computer-related profession and working for the U.S. Government. Some of you may find yourselves improperly categorized. That's because I shoehorned your responses into some general category or other, like operations research. I think it would be most interesting to do this analysis again and for all INTERNATIONAL APPLE CORPS members. We should also do a better survey of members' areas of interest.

The categories are ordered by most members to least.

COMPUTER-RELATED OCCUPATIONS	42
Systems Analysts	17
Programmers	9
Managers-Computer Sytems	5
Systems Engineers	3
Computer Sales	3
Computer Consultants	2
Software Developers	2
Computer Sciences	1
BUSINESS	20
Lawyers	4
Consultants	3
Sales	3
Accountants	2
T.V. Broadcasting	2
Managers	2
Telephone Installation/Repair	2
Welding/Iron Working	1
Stocks/Speculation	1
SCIENCES	17
Physicists	7
Operations Research	4
Mathematics/Statisticians	2
Physchologists	2
Chemists	1
Economists	1
HEALTH/MEDICAL	13
Physicians	5
Pharmacists	2
Teaching	2
Administration	1
Surgeons	1
Pathology	1
Health/Physics	1

ENGINEERING	13
General	5
Electronics	4
Electrical	3
Communications	1
FEDERAL GOVERNMENT	11
Non-Military	8
Military	3
TEACHING	8
Professors	3
Educational Planners	2
Specialists	2
Teachers	1
STUDENTS	9

I was surprised at the number of members who are in the Health/Medical field. Sounds like we need a SIG here. Any volunteers? I was disappointed at the poor showing of the teaching profession. However, it only takes a few pioneering individuals to lead the way.....

Five members confess to being employed by IBM. I count seven women in our group and one of them is an iron worker/welder. Five members are retired (but not to their rocking chairs, obviously). We have at least two members who are employed in the TV industry. We also have three corporation memberships.

How about that?

Here is a list of the expressed areas of interest.

- Scientific/medical
- Computational physics
- Mathematics/statistics
- Education
- Games
- Remote sensing
- Music synthesizing
- Interactive design
- Graphics, lo and hi res
- Ham radio
- Animation
- Income tax and business simulation
- Stock and portfolio analysis
- Ancient inscriptions
- Programming languages and standards
- Software and hardware evaluation

Everything but the kitchen sink. We certainly are a multi-disciplined bunch, complete with broad ranging interests. One question is left unresolved. How many green apples are there? How about those of you under 16 identifying yourselves and starting your own SIG?

Classifieds

FOR SALE: Communications Interface Card, \$175; and NOVATION Modem Model 3102a, \$175. George Hinds 585 0979.

Classified ads accepted from members 50 words or less at no charge provided the material is obviously non-commercial. Submit your classified at least 30 days in advance attention CLASSIFIED ADS, PO Box 34511, Washington, DC 20034.

BITS AND BYTES FROM ALL OVER

by Mark Crosby

DISK SYSTEM FOR APPLE PASCAL

The Corvus disk system for Apple Pascal, designated the Model 11AP, is 100% compatible in all respects with Apple Pascal. All of the following will run without modification: Apple Pascal disk operating system, the earlier Apple 3.2 disk operating system, any applications designed to run on the 280-block Apple floppy disks, and many new applications too large for Apple floppies.

To provide complete control over the data base with a high degree of operating flexibility and speed, Corvus has incorporated a new utility called dynamic volume management. This allows the ten-million byte data base to be used as a single large block or to be broken into any number of smaller blocks with the same management flexibility.

\$5,350. Corvus Systems, 900 S. Winchester, Suite #4, San Jose, CA 95128 (408) 246-0461.

1802 SIMULATOR

Cosapple is an 1802 simulator and debug package designed to run on the Apple II. It enables the Apple to run programs coded in 1802 machine language and can be used as a development aid. \$20. Dann McCreary, Box 16435-C, San Diego, CA 92116 (714) 281-5758.

COMPUTER ASSISTED INSTRUCTION SOFTWARE

Computer Chemistry for the Apple II is a series of 15 CAI high school chemistry programs in BASIC. The Apple Grade Book program records any type of student grade along with the type of grade and/or the date on a separate file for each class. \$19.50 each. J&S Software, 140 Reid Ave., Port Washington, NY 11050.

SINGLE DISK SORT

A new version of the Datacope Single Disk Sort, a machine language disk-file sorting program for Apple II and Apple II Plus, organizes a text file into any alphabetized or numerical order at high speed. \$49.95. Datacope, P.O. Box 55053, Hillcrest Station, Little Rock, AR 72205.

COMPUTERFEST AND HAMBOREE

The Greater Baltimore Hamboree and Computerfest will be held Sunday, March 30, 1980 at the Maryland State Fairgrounds at Timonium. Personal and business computer exhibits along with dealers and hobbyists will fill the Exhibition Hall. Acres of space are available outside for tailgate sales and swaps. Many door prizes will be awarded throughout the day with hundreds of dollars in cash prizes given away at the grand drawing. Doors will open at 8:00 a.m. Admission is \$3. For more information and reservations (to sell things) write to Joseph A. Lochte Jr., 2136 Pine Valley Dr., Timonium, MD 21093 (301) 426-8255.

TELECOMMUNICATIONS & EDUCATION FOR THE DEAF

The Amateur Radio Research and Development Corporation (AMRAD) - an amateur radio and personal computing club in the Metro area - has been awarded a federal grant for research in applying personal computers to telecommunications and education for the deaf. The grant is administered by the Bureau of Education for the Handicapped, U.S. Office of Education, Department of Health, Education and Welfare. Interested individuals may contact AMRAD, 1524 Springvale Avenue, McLean, VA 22101.

APPLE EDUCATION FOUNDATION AWARDS 15 GRANTS

The Apple Education Foundation announced the award of fifteen grants for development projects in education and training using microcomputers. The grants, recently made to educational developers throughout the country, promise to have a significant impact on teaching materials in the United States and in other countries. Totaling almost \$100,000, the grants provide twenty-two microcomputer systems and support equipment for development projects in classrooms ranging from preschool through college, and including special education, health, and adult education studies.

Apple Computer, Inc. provided the foundation's initial funding and contributed most of the equipment awarded under the grant program. All twenty-two computers awarded as part of the new grants are Apple II personal computer systems.

S.I.G. FOR THE SUPER INTELLIGENT

A new special interest group has been formed within American Mensa. The group, The Apple Cart, is primarily for owners of Apple Computers. It publishes a newsletter and operates a software exchange for its members. Annual dues are \$4 for Mensa members and \$6 for those who are not members of Mensa. For more information send a self-addressed stamped envelope to C. Brandon Gresham, Jr., National Coordinator, The Apple Cart, 23 Van Buren Street, Dayton, Ohio 45402.

CAI & VIDEOTAPED TEACHING

Computer Assisted Instruction (CAI) and Videotaped Teaching can be easily combined to give all the didactic power of CAI integrated with samples, moving, colorful visual materials plus speech, music and sounds effects. Using the recently announced CAVRI System, CAI may be inserted into already existing videotapes.

A package consisting of all the materials required to integrate an Apple II and any video player/recorder having remote pause capabilities and two audio channels is available from Computer Assisted Video Recorded Instruction Systems, 26 Trumbull Street, New Haven, Connecticut 06511.

DOUBLE-SIDED FULL-SIZED DISK SUBSYSTEM

The system, known as Bison Products AP8x2, features a Remex drive housed in a disk cabinet. The disk controller resides in Apple's peripheral slot #7. AP8x2 is compatible with DOS 3.2 and comes with software utilities to quickly copy between

contd.

drives.

The system will be available at the Computer Faire (on the West coast in March). Shortly thereafter the subsystem will be available through a national dealer program.

For additional information, contact: Carl Dick, Distributor, Box Q, Sherman Oaks, CA 91423; (213) 349-2365.

10 RUMOR = RND (1) * 32767
20 PRINT RUMOR;

As the heading indicates, here are some rumors:

Apple is working on a new model which may be called the Apple III. It is rumored that it will not use the 6502 microprocessor and will operate at twice the clock speed of the present Apple II (which should be around 4MHz). With all of the (visually) amazing graphics that have been introduced by other manufacturers of microcomputers, we suspect that Apple will include enhancements to the high resolution graphics presently available. Anyone for 16 colors in HI-RES?

Other rumored features include a full feature keyboard and an 80 character screen width.

Also expected is an announcement that Apple will introduce a Pascal machine. It is rumored that it will be a completely reengineered, single language Pascal system. No doubt Apple will target its sales of this machine in the college and university area.

WASHINGTON APPLE PI LIBRARY DISKS

NO.	VOL	TYPE	PROGRAM
0	001		FREE SECTORS = 84 (21K)
1	001	I	HELLO
2	001	I	IMPROVED CATALOG
3	001	I	DISK AIDE DOC.
4	001	I	DISK AIDE
5	001	B	DISK AIDE MAC.
6	001	B	DISK MAP
7	001	I	TONY'S SUBROUTINE PAK
8	001	I	LOCK DISK
9	001	I	DISK PROGRAM ELIMINATOR
10	001	I	SUPERCATALOG.DOC
11	001	B	SUPERCATALOG.O
12	001	I	DISC SPEED INFO
13	001	I	DISC SPEED TEST
14	001	B	DSPEED.OBJ
15	001	I	L O O P
16	001	I	SLOW MEM TEST
17	001	I	FAST MEM TEST
18	001	I	MEMORY SPY
19	001	I	CAT. TO MENU
20	001	B	SYMBOL TABLE XREF
21	001	B	LINE # XREF
22	001	I	STOP LIST DOC
23	001	B	STOP LIST
24	001	I	SPLIT CATALOG
25	001	I	FREE SECTORS
26	001	B	OKIDATA.OBJ
27	001	I	B/BSTAT
28	002		FREE SECTORS = 209 (52.25K)
29	002	I	HELLO
30	002	I	SWEET 16 DISASSEMBLER
31	002	I	DISK TRANSFER
32	002	A	DEBUGGING AID
33	002	B	B.FIND
34	002	I	FIND TEXT-TOKEN
35	002	B	B.TRACE
36	002	I	PROGRAM TRACE

NO.	VOL	TYPE	PROGRAM
37	002	A	MASTER CATALOG 48K
38	002	B	B.MAS.CAT.48K
39	002	I	TED II SAVE/RETRIEVE
40	002	I	TED START
41	002	I	TED3
42	002	B	TED.DISK
43	002	I	BASIC TED PRINTER
44	002	A	DOS UTILITY #1
45	002	I	CODES FOR 6502
46	002	I	PASSWORD KEY
47	003		FREE SECTORS = 1 (.25K)
48	003	I	INTRO
49	003	I	TOWERS OF HANOI
50	003	I	TENNIS
51	003	I	ROULETTE
52	003	I	MIDWAY
53	003	I	COLOR TEXT
54	003	I	MERRY CHRISTMAS
55	003	I	BAGELS
56	003	I	DRIP
57	003	I	DIGITAL CLOCK
58	003	I	POKER
59	003	I	KENO
60	003	I	SEA CHASE
61	003	I	NIGHTMARE #6
62	003	I	SLOT MACHINE #2
63	003	I	COLOR WORM
64	003	I	XMAS TREE
65	003	I	MASTERMIND
66	003	I	KALEIDOSCOPE
67	003	I	MOUSE MAZE
68	003	I	SANDYS FOLLY
69	003	I	SAUCER WAR
70	003	I	THE MAZE
71	003	I	BLACKJACK
72	003	I	SHOOTING STARS #2
73	003	I	A TRILLION STORIES
74	003	I	POET
75	003	I	GARYS QUICKY
76	003	I	COLOR LIFE
77	003	I	AWARI
78	003	I	SEVENS
79	003	I	OTHELLO
80	003	I	MAD-LIB
81	003	I	BIORHYTHM
82	003	I	BANANAS
83	003	I	ANDROMEDA STRAIN
84	003	I	CRAPS
85	003	I	SQUARES
86	004		FREE SECTORS = 37 (9.25K)
87	004	I	HELLO
88	004	A	PRO FOOTBALL
89	004	I	ATOM 20
90	004	A	CIVIL WAR
91	004	A	LEM
92	004	I	DR. Z
93	004	I	RED GNIK
94	004	A	DEEPSPACE
95	004	A	ADVENTURE
96	004	A	ELIZA
97	004	I	QUEST
98	004	A	STOCK MARKET
99	004	I	STARSHIP ATTACK
100	005		FREE SECTORS = 10 (2.5K)
101	005	I	HELLO
102	005	I	BLACK BOX
103	005	I	SHOOT OUT
104	005	A	HUNT THE WUMPUS
105	005	I	BEGINNER MATH
106	005	I	SPELLING BEE
107	005	I	APPLESTAND
108	005	I	LEGACY/TAKE IT
109	005	I	LO RES FOOTBALL
110	005	I	TOGNAZZINI CHESS
111	005	I	NIGHTMARE GAMEPAK
112	005	I	SIMPLE SIMON
113	005	I	BRAIN BUSTERS
114	005	I	CRYPTOGRAM
115	006		FREE SECTORS = 37 (9.25K)
116	006	I	HELLO
117	006	A	TRADER
118	006	I	DEATH STAR
119	006	B	SPACE ADVENTURE
120	006	I	HI-RES BREAKOUT

NO.	VOL	TYPE	PROGRAM
121	006	B	HI RES BREAKOUT.MC
122	006	I	INTERACTIVE BASEBALL
123	006	A	INSPECTOR CLEW-SO
124	006	A	ROLE-PLAYING STARWARS
125	006	A	TREK 79
126	006	I	PIT 2
127	007		FREE SECTORS = 106 (26.5K)
128	007	I	HELLO
129	007	I	SPELUNKER
130	007	I	CHESS
131	007	B	CH 800.FFF
132	007	A	SPACEMAZE
133	007	A	KINGDOM
134	007	A	STARLANES
135	007	A	FUR TRADER
136	007	I	BATTLESHIP 2
137	007	I	OREGON TRAIL
138	008		FREE SECTORS = 253 (63.25K)
139	008	I	HELLO
140	008	B	PRINT IDS 440
141	008	B	HI-RES BDUMP
142	008	A	IDS 440 HI-RES SCREEN DUMP
143	008	B	AMPER.OBJ PLUS (NEW)
144	008	A	AMPERSORT DEMO
145	008	B	PAGE LIST
146	008	B	AUTO NUMBER
147	008	A	PIMS
148	008	I	COPY/DUAL CONTROLLER
149	008	I	TED II+
150	008	B	LINE# REF
151	008	B	SYMBOL XREF
152	008	B	REN/APPEND
153	008	B	PACK&LOAD
154	008	B	RELOCATE
155	008	B	TAPE VERIFY
156	008	B	LAZARUS
157	008	B	HIRES
158	008	I	SHAPE GENERATOR
159	008	B	COPY.OBJ
160	008	B	SINGLE DRIVE COPY
161	009		FREE SECTORS = 86 (21.5K)
162	009	I	APPLE HELLO
163	009	I	TYPING PRACTICE
164	009	I	QUIZBUILD
165	009	I	MORSE TRAINER
166	009	A	MORSE CW
167	009	I	FLASH CODE
168	009	I	FLASH CARD
169	009	A	NAME STATES
170	009	A	STATES/CAPITALS
171	009	I	COLOR MATH
172	009	I	MATH TUTOR
173	009	A	ECHOCARDIOGRAPH
174	009	I	INTGER INSTRUCTION SET
175	009	A	TITRATION
176	009	I	TOP DOWN PROGRAMMING
177	009	I	CONVENTIONS
178	009	I	SIMULATION-6502
179	009	A	NORTHERN CONSTELLATIONS

NEW PRODUCT RELEASE

The following new product release came to us just at press time from ARESKO of Columbia, Md. No endorsement of the product is implied. We are reprinting it here only for your information.

NEW PRODUCT: Light Pen
 SYSTEM: 16K APPLE II
 PACKAGE: Two C-10 tapes, 48-page book,
 Light Pen
 PRICE: \$24.95

Columbia, MD - ARESKO, Inc. announces "off-the-shelf" availability of the new Lipson Light Pen, a versatile tool for many educational, scientific and recreational uses. The pen is packaged with twelve BASIC programs on cassette tape, a 48-page manual, all the necessary cable, and a connector to PDL(0) on the APPLE II.

The demonstration programs (six in Integer BASIC, six in Applesoft) are designed to be incorporated into programs designed by the user. The manual is intended to instruct the user in the methods of detecting and measuring light. All the demonstration programs are listed in the manual, along with tutorial comments and suggestions for programs to be designed by the user.

The pen utilizes a cadmium selenide cell for light detection, rather than the phototransistor used by other pens on the market, thereby enabling the user to detect and measure varying intensities of light. Hi-res graphics, sound, and color are implemented in the demonstration programs, and the user is encouraged to incorporate the demo routines into programs of his/her own design.

The RAINBOW, which is ARESKO'S user Newsletter for APPLE owners, prints a monthly column by Neil Lipson, the inventor of the pen. Lipson's column will contain new software listings, program updates, and correspondences with light pen users.

The Lipson Light Pen is available exclusively from ARESKO FOR \$24.95. Orders and dealer inquiries should be sent to ARESKO, Inc., PO Box 1142, Columbia MD, 21044, or call (301) 730-5186.

INT	FP	TEXT	MACH	TOTAL
113	28	0	30	171



INTERFACING THE QUICK PRINTER II TO THE APPLE II

BY

JIM KELLY

Did you know you can get a printer for your Apple for \$219? Radio Shack sells the Quick Printer II for that. It's made for the TRS-80, of course, but it has an RS-232 interface. There are a few minor drawbacks. The paper is only about 2½ inches wide and the character width is 32, but it's hard copy, by golly! The listings accompanying this article were done on one.

There is an excellent evaluation of the QP II in the November 1979, Creative Computing. This article will cover only how to connect it to an Apple. Figure 1 shows the interface circuit. All of the components shown can be purchased at Radio Shack or any other electronic component store. The transistors can be those shown, or equivalents.

The circuit is basically the RS-232 interface from the "Red Book" Apple Reference Manual, with some additional circuitry to carry the QP II handshaking signal.

It's not practical to mount all of this on a D.I.P. header. Instead, I cut a piece of PERF-BOARD to 2½" by 2½". It cuts easily by scoring both sides with a sharp knife and straight-edge and then snapping it over a counter top edge. Build the circuit on the PERF-BOARD. Run cables to the D.I.N. Connector and the D.I.P. header. You can strip off wires from the cable that comes with the printer for this. The D.I.P. header goes to the Apple game paddle connector. The D.I.N. plug goes to the Quick Printer II.

For the +12V, -12V and ground connections use 22G solid wire. Leave 3½" pieces running from the board and strip ½" off each. Now push the board into a peripheral slot. Slot 7 is the most convenient. Then push the bare ends of the wires between the peripheral connector contacts and the board. Check that no other parts of the circuit are touching the contacts. Be sure you have the right connections before you turn the computer on. Ground is the top (back of the computer) contact on the left side of the board. The +12V is the bottom contact on the left and the -12V is the eighth contact from the top, also on the left side. It's best to color code the wires, so you'll be sure of where they go.

After you've double checked the circuit and connections turn on the Apple. Be sure the switches on the side of the printer are set to "SI" and "ON LINE". Then turn on the printer. (The printer ignores the SI switch once it's on.) You should get a "PRINTER READY" printout. Next, enter the machine language program shown in Listing 1 from the monitor. The program is adapted from one by Chuck Carpenter in The Best of Micro, Vol. 1. It is also shown disassembled as Listing 2.

To enable the printer, enter "370G". The printer should do a line feed, but no printout. Now enter "370L". The printer should start listing the program. The QP II operates at 600 baud. If you get occasional garbage letters, try changing location 03AE by a couple of bits. This number controls the baud rate.

If the computer hangs up (no cursor-no printout-no nothing) it's probably because the handshake signal is not present. Check your circuits and connections carefully. Then turn the printer off and on to reset it. An improper handshake signal will also cause the loss of the first part of each line, but this is unusual since it requires a constant +5V on the handshake line.

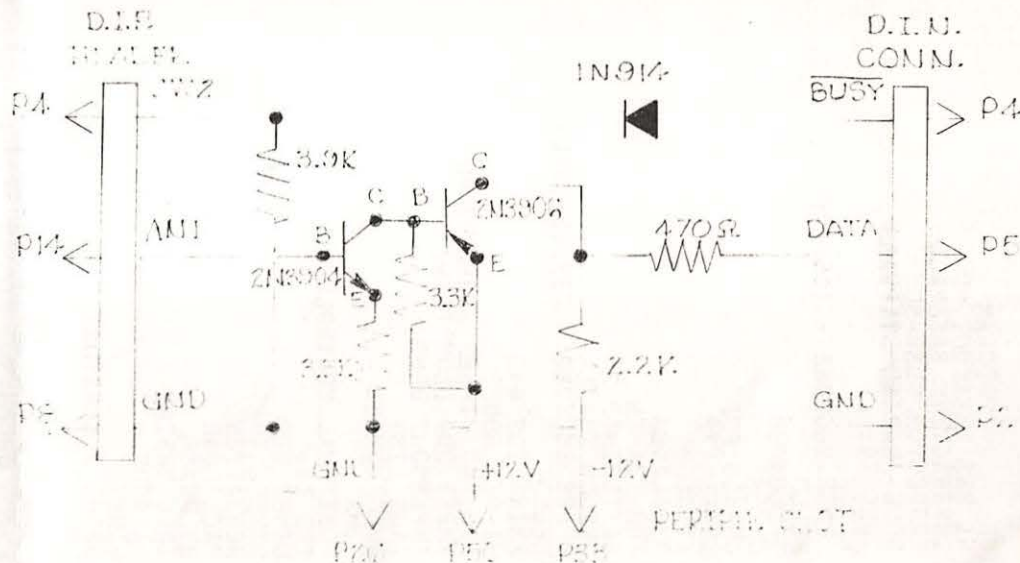
If all is well, save the print routine on tape or disk and you're in business. Some suggestions and caveats:

1. The procedures for using the printer are as follows:

LOAD FROM MONITOR - 370.3C1R

	<u>PRINTER ENABLE</u>	<u>PRINTER DISABLE</u>
FROM MONITOR	370G	383G
FROM BASIC	CALL 880	CALL 899

2. You'll get better looking printouts and waste less paper if you do a "POKE 33, 32" before doing a "LIST".
3. The printer cannot process the Apple "TAB", "VTAB" or "HTAB". Programs which use tabs extensively, such as CHECKBOOK will have to be modified to get decent looking printout.
4. Read the Quick Printer II Manual carefully. There are some non-standard characters, notably for the Applesoft prompt and the Basic power symbol. Also it does not print until it receives a carriage return or it's buffers are full so that it will lag what's on the screen.



LISTING 1

contd.

QUICK PRINTER II ROUTINE

*****BY JIM KELLY*****

*370LLL

```
0370- A5 36 LDA $36
0372- 0D C0 03 STA $03C0
0375- A5 37 LDA $37
0377- 0D C1 03 STA $03C1
037A- A9 0E LDA #$0E
037C- 05 36 STA $36
037E- A9 03 LDA #$03
0380- 05 37 STA $37
0382- 60 RTS
0383- AD C0 03 LDA $03C0
0386- 05 36 STA $36
0388- AD C1 03 LDA $03C1
038B- 05 37 STA $37
038D- 60 RTS
038E- 04 35 STY $35
0390- 48 PHA
0391- 2C 63 C0 BIT $C063
0394- 10 FB BPL $0391
0396- 20 9F 03 JSR $039F
0399- 60 PLA
039A- A4 35 LDY $35
039C- 4C F0 FD JMP $F0FD
039F- A0 0B LDY #$0B
03A1- 18 CLC
03A2- 48 PHA
03A3- D0 05 BCS $03AA
03A5- AD 5B C0 LDA $C05B
03A8- 90 03 BCC $03AD
03AA- AD 5A C0 LDA $C05A
03AB- A9 27 LDA #$27
03AF- 48 PHA
03B0- A9 20 LDA #$20
03B2- 4A LSR
03B3- 90 FD BCC $03B2
03B5- 68 PLA
03B6- E9 01 SBC #$01
03B8- D0 F5 BNE $03AF
03BA- 68 PLA
03BB- 6A ROR
03BC- 88 DEY
03BD- D0 E3 BNE $03A2
03BF- 60 RTS
03C0- F0 FD BEQ $03BF
```

*370.3C1

```
0370- A5 36 0D C0 03 A5 37 0B
0378- C1 03 A9 0E 05 36 A9 03
0380- 05 37 60 AD C0 03 05 36
0388- AD C1 03 05 37 60 04 35
0390- 48 2C 63 C0 10 FB 20 9F
0398- 03 60 A4 35 4C F0 FD A0
03A0- 0B 18 48 D0 05 AD 5B C0
03A8- 90 03 AD 5A C0 A9 27 48
03B0- A9 20 4A 90 FD 68 E9 01
03B8- D0 F5 68 6A 88 D0 E3 60
03C0- F0 FD
```

IN SEARCH OF A "PERFECT" ASSEMBLER

(A product review of sorts)

by Bruce F. Field

Anyone who trys writing programs in assembly language for the APPLE quickly becomes frustrated with the "mini-assembler" in the Monitor. Although fine for writing very short programs or patching larger ones, it has several shortcomings. No labels are allowed! All operands (the part after the mnemonic for the op code) must be in hex, labels or arithmetic operations are not permitted! No comments may be inserted in the source listing, in fact the source code does not even exist! Enough! Certainly a programmer can work around these handicaps but why should he or she have to? Better assemblers exist (or so I was convinced initially) that make it much easier, even fun (no, on second thought, not fun) to program in assembly language. This is the story of one man's search for the "perfect" assembler.

It was a cold blistry day in June when ...

Actually my resolve to obtain a better assembler came over a year ago, shortly after using APPLE's mini-assembler. My first stop was to my friendly (?) local computer store. They apparently had just what I wanted, or so the salesman assured me; an assembler on cassette tape by Powersoft, Inc. A sharp cookie would probably have noticed the meager documentation which consisted of two pages neatly folded and hidden behind the cassette tape, all blister packaged on a cardboard backing. What I really wanted however was a disk based assembler, but the salesman was confident that the program could be used with a disk. So, I plunked down my \$24.95 and went home to try it out. (Aha, you're probably already ahead of me.) First "suprise", no way is this thing going to work with a disk. Second suprise, the folks at Powersoft mean what they say when they call this an assembler, there is no text editor included. The text editor is a separate program which sells for an additional \$24.95. NOWHERE on the outside of the package was there a description of the assembler or the proviso that their text editor (which they call a File Editor) is absolutely necessary for use with the assembler. I refused to buy the text editor mostly because the programs were cassette based, but also because I was extremely irritated by the lack of a product description, when it was obviously important, and their poor documentation.

Also the idea of loading and running the editor, changing text, loading and running the assembler, finding a mistake and then starting all over again, did not appeal to me.

My search continued. Devouring ads in computer magazines began to absorb nearly 100% of my time. But calls and letters to firms advertising APPLE software did not turn up any leads. Questioning friends, acquaintances, random people in the street (I was desparate) produced strange looks but no assemblers. Finally one day I spotted an ad for an ARESCO Assembler/Editor sold by ARESCO, an outfit in Columbia MD. contd.

Once burned, twice shy, etc. I decided a phone call for more detail was in order. The fellow on the phone (one of the owners of the business) who seemed to know what he was talking about said yes it runs with a disk, a text editor is part of the program, and a 60 page manual is included. He also explained that the program as it comes is a one-pass assembler, but, with the patches listed in the manual, can be used as a two-pass assembler.

The difference between a one-pass and multiple-pass assembler is important. A one-pass assembler cannot resolve forward references. What this means is, for example, suppose somewhere in your code you have an instruction `JMP LABEL` where `LABEL` is defined further down in your code. The one-pass assembler does not yet know where `LABEL` is so it just stores away the symbol `LABEL` until it finds out later where it is and then can go back and fix the machine code in memory. But the listing of the source code with the assembled machine code is printed out with `LABEL` undefined. A two-pass assembler goes through and finds out where all the labels are first, then prints the assembled listing. Thus for accurate listings a two (or more) pass assembler is desirable.

Well this assembler is just what I had been patiently (?) waiting for. Whipping out my credit card I immediately placed an order and within a week I had a copy in my hot little hands. Here at last was an assembler that had most of the features I considered important. An editor is part of the program and it is a typical line oriented editor. All lines must have a line number, lines are corrected or replaced by retyping the entire line, and lines can be re-numbered. The source code may be listed starting at any line number and continuing until any key is pressed. Also a find command is available to search the entire source code for specified strings. Now, what I consider to be the most annoying fault, there is no cursor! Have you ever tried backspacing several spaces to correct an error with no cursor? You quickly forget where you are, so you type a character just to see where it appears. There is also no right-arrow with this editor as there normally is with the APPLE so you have to type everything in again from that point in the line.

The assembler once modified for two-pass operation is not bad. One bothersome point however is that the assembled source listing is displayed on the screen rather rapidly and cannot be stopped from scrolling off-screen. When there are errors (which there are more often than not) the error messages are scrolled off-screen sometimes before you can read them. There is an option to list only errors, but with a lot of errors the same problem exists. The manual lists 22 possible error messages and fully describes the error condition involved. Overall the manual is quite good, with no mistakes that I found. It did include a complete list of the 6502 instructions with the standard mnemonics and a short section on addressing modes which is essential for the novice and useful for the experienced programmer.

One other annoying characteristic of this assembler occurs because it was originally written for cassette tape. To load and store source code on the disk requires interrogating the editor to determine the source buffer limits, exiting to the monitor, and then storing the source using a `BSAVE`

command. Similarly, loading the source in requires poking symbol table pointers into memory and then `BLOAD`ing the source. Also after the assembler finishes the first pass it exits to the Monitor and a `3782G` command must be given to perform the second pass. All in all this is not a bad assembler, but it is more difficult to use than it need be.

My craving for an assembler was now partially appeased but I continued to peruse the ads in magazines. About this time several assemblers began to appear on the market. The one I am now using, by S-C Software, I heard about from a friend and had a chance to examine the instruction manual in detail before purchasing it. This is a two-pass assembler, it interfaces well with the disk; all DOS commands can be executed from the assembler, and source can be loaded or saved with only simple `LOAD` or `SAVE` commands. The assembled listing can be stopped or started at any time and in the disk version any error stops the listing. The program contains a printer driver routine, using the game I/O port, for a Practical Automation `DMTP-6uP` printer (I think this will also work with the Paper Tiger) and a source listing of the printer routine is included for user modification for other printers. If you have a printer interface card a `PR#n` will activate the printer.

The manual is complete and well written. The editor is similar to the Applesoft editor; escape key sequences work and lines may be renumbered. Also a find command is included for string searches and the assembler supports `SWEET-16` op-codes. One other handy feature is the ability to assemble code at a target address different from the specified program origin. An explanation is in order. Most small assemblers assemble the machine code directly into memory where it will eventually reside (as specified by an origin directive in the source code). However if something else is in that part of memory while you are assembling your code (i.e. the assembler itself) you have a problem. The target directive tells the assembler to produce machine code ready to run at the program origin, but store it starting at the target address.

For use with DOS at least a 24K APPLE is needed. One possible conflict can occur; the assembler uses some routines that are in the standard APPLE ROM's and is not compatible with the APPLE II Plus or the Autostart ROM.

Lest you think that I have now found the perfect assembler let me mention two more features that I would like to see available, the ability to handle Macro instructions, and do conditional assemblies. Although I have not conducted an exhaustive evaluation of every assembler for the APPLE, I consider the S-C Assembler II (\$35 for the disk version from S-C Software, PO Box 5537, Richardson, TX 75080) to be the best I have seen.

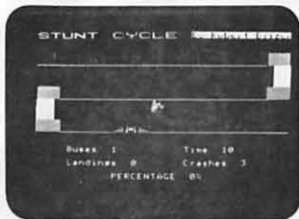
(Editor's Note: Thanks, Bruce. For further information on assemblers see the article by Randy Hyde in the January 1980 issue of Call -A.P.P.L.E., pages 18-23, entitled, "Assembler Maxi-Reviews".)

WHAT IS AN ASSEMBLER?

The microprocessor chip in your computer only understands machine language instruction codes such as `10100101 00000100` (or `A5 04` in hexadecimal), which means to load the accumulator with the contents of memory location 4. A program may consist of hundreds or thousands of these instructions. Because people can't accurately remember the meaning of the instructions in this form, a mnemonic abbreviation is assigned to each instruction as a memory aid. For the above example the mnemonic is `LDA 4`. A programming language in which each machine instruction is replaced by a mnemonic on a one-for-one basis is called an assembly language. To obtain a program in machine language, as required by the microprocessor, the program written in assembly language must be translated; this translation is performed by an assembler program, commonly called an assembler.

NEW APPLE II SOFTWARE

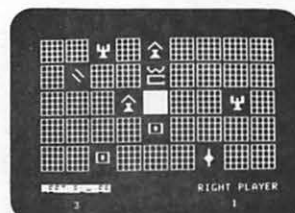
PROGRAMMA Software Program Products



STUNT CYCLE \$15.95



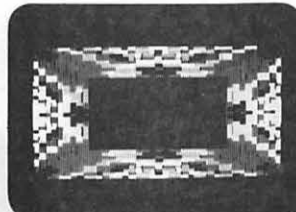
BLITZKRIEG \$15.95



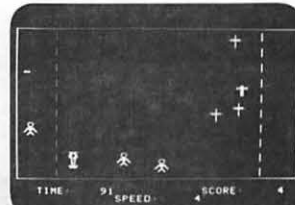
FRUSTRATION \$ 9.95



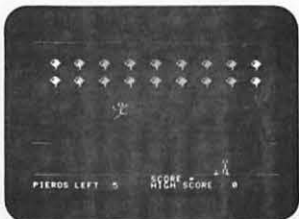
PERPETUAL CALENDAR \$ 9.95



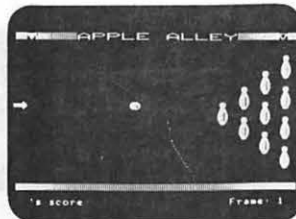
LORES HYPERPAK \$ 6.95



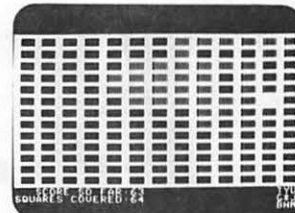
DEATH RACE \$15.95



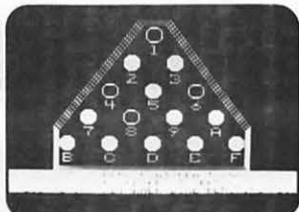
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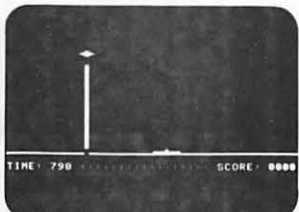
PEG JUMP \$ 9.95



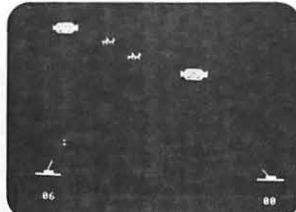
I-CHING \$15.95



WORDWACKEY \$ 6.95



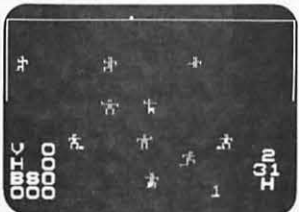
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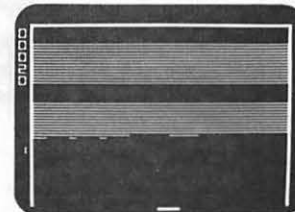
APPLE INVADER \$15.95



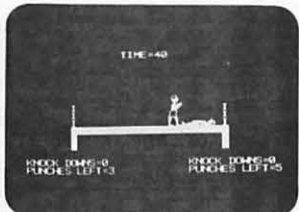
BASEBALL \$15.95

All orders must include 3% postage and handling with a minimum of \$1.00. California residents include 6% sales tax.
VISA MASTERCHARGE

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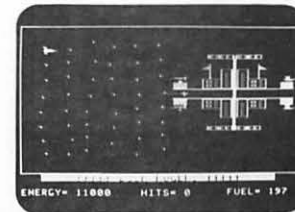
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This is a portion of a newsletter put out by Susan Eickmeyer at her (unnamed) place of work. We are permitted to reprint the unclassified portions.

APPLE II SUBSIG MEETING NOTES FROM DECEMBER

The APPLE II SUBSIG held its second meeting, in December with about a dozen people present. We discussed documentation which is available for the APPLE II, its strengths and weaknesses, and contents. I am including a list of magazines, etc. which pertain to microcomputing in general, and to the APPLE II in particular. If anyone out there can supply me with more such information, I will be more than happy to include it with the next newsletters.

My own observations indicate that magazines are increasingly including articles about the APPLE II, undoubtedly because they recognize both its excellence and its large ownership (I.E. its market potential). Another tendency seems to be a lot more reviews of fascinating (but, alas, EXPENSIVE) hardware for the APPLE II. Frankly, I have mixed feelings about that trend, which would probably disappear if only I had just about 15 grand to spend on such neat little trinkets. In any case, I refuse to let this newsletter be old fashioned, and an article identifying such goodies will be presented later. While I am on the subject, let me say that I with the BIG help of my fiancee, have tried some homebrew hardware projects. We used an ELECTRONICS SYSTEMS serial board to run a VADIC modem, built from a surplus \$15-25 board with good results. I am the first to admit that it is nowhere near as good as say, the D.C. HAYES Micro-Modem, but, it serves its purpose, and does allow me to talk on T.C.A.'s SOURCE. We also have a lower-case chip board (homebrew--under \$15) hooked up to my APPLE II which works on the same principles as the commercially available PAYMAR CHIP (\$50). I really do like the lower case chip, especially when combined with the software package called PROGRAM LINE EDITOR available from CALL A.P.P.L.E.. With this combination you can easily use lower case in programs, any place where you would normally print with upper-case. I also might add that the selection of the lower-case is true ASCII, and is selected or not, dependent on the actual bit pattern received by the character generator chips. Thus, it requires little or no extra software drivers in the program (with the PROGRAM LINE EDITOR, none). Another couple of ideas for homebrew projects include building your own joysticks or game I/O extender. I found the latter to be especially useful, since I like to have my paddles, light-pen, and printer cable all hooked up at once, and am no great fan of removing the cover from the APPLE II to switch them around.

Well, so much for this rambling editorial, and on to bicker and better things. But FIRST, PLEASE! If any of you out there can help me out by sending in your reviews of anything pertaining to the APPLE II, please do so. I am only one person, and don't know everything! I do need help from all of you. Articles of any length, and short program listings are also welcome. THANKS!

PERIODICAL SOURCES FOR THE APPLE II

CALL A.P.P.L.E -- An excellent club newsletter which is devoted entirely to the APPLE II. It is primarily software oriented, contains many software listings, and is generally geared to the person moderately familiar with the APPLE II. It caters to DISK II users, but tries to support cassette based systems, too. It is an often cited source for information, and should be considered a 'priority' in documentation acquisition. Contact: CALL A.P.P.L.E., 8710 Salty Drive, Olympia, Washington 98502

WASHINGTON APPLE PI Newsletter -- Also an excellent newsletter, with the added advantage that it is a local organization, so the authors and contributing 'experts', are only a phone call away, if you need them. This newsletter is relatively young, and is included with membership in the club. Contact: WASHINGTON APPLE PI P.O. BOX 34511, Washington, D.C. 20034

RECREATIONAL COMPUTING (Available in the N.S.A. Library) - is a good magazine devoted to all microcomputers. Most program listings are in BASIC. Articles are aimed at the programmer at a beginning to moderately advanced level. Most issues have at least one article for the APPLE II, as well as easily translatable programs. Published 6 times yearly. Contact: RECREATIONAL COMPUTING, PEOPLES COMPUTER COMPANY, 1263 El Camino Real, BOX E, Menlo Park, CA 94025

DR. DOBBS JOURNAL OF COMPUTER CALISTHENICS AND ORTHODONTIA - A more sophisticated magazine, also published by PEOPLES COMPUTER COMPANY (address above) which usually, but not always has articles dealing with the APPLE II. It is also available in the N.S.A. Library. Check it out!

BYTE - (Available in the N.S.A. Library) A well known magazine, catering to the homebrew fanatic. Often contains articles dealing with the APPLE II plus a lot of good, solid informational articles applicable to any microcomputer. It is a commonly cited source of information. Even if you don't subscribe, be sure to have access to it somewhere! Monthly. Contact: BYTE Subscriptions, PO BOX 590, Martinsville, NJ 08836

CREATIVE COMPUTING - A favorite of personal computerists, CREATIVE COMPUTING is a good overall microcomputer magazine with something for just about everyone. It usually has at least one large program listing, in BASIC in each issue. These are usually games. It also has articles on graphics, sound generation, etc. CREATIVE COMPUTING nearly always has at least one article dealing with the APPLE II, and a column called 'The Apple Cart' is a regular feature. I would classify this magazine as recommended reading. For subscriptions, contact: CREATIVE COMPUTING, P.O. BOX 789-M, Morristown, NJ 07960

INTERFACE AGE - A 'supermarket' magazine, with some good articles, worth taking a look at. I don't find that it usually has articles dealing with the APPLE II itself, but has had some good instructional series. The articles are usually quite thorough. Subjects range from microcomputer and CPU chip evaluations to software listings. Often the magazine seems to speak to the business application side of things, so it may be what some of you want. Contact: INTERFACE AGE, BOX 2654, Clinton, Iowa 52735

ONCOMPUTING - A magazine that seems to be designed for people considering a microcomputer purchase, or for beginners in the area. My opinion of the first issues is that it lacks depth, and is too concerned with reviews of hardware etc. Nevertheless, it has a value for those who want to do some comparison shopping. Contact: ONCOMPUTING, 70 MAIN STREET, PETERBOROUGH, nh 03458

KILOBAUD MICROCOMPUTING - A magazine with a more technical flavor. There are a lot of hardware oriented articles, and most of the articles pertain to a specific microcomputer. There is usually an article or two for the APPLE II. The magazine seems 'up' on state-of-the-art technology. Good reading for the 'computer sophisticate'. Contact: MICROCOMPUTING Subscription Dept., PO BOX 997, Farmingdale, NY 11737

MICRO - This is one of those 'must' magazines for APPLE II owners. It deals exclusively with 6502-based microcomputers and contains a wealth of good information, both for hardware and software. It also has an excellent bibliography. If you haven't subscribed, do so. Contact: MICRO, Chelmsford, MA 01824

ALSO CONSULT: THE PERIODICAL GUIDE FOR COMPUTERISTS, which is currently available in the N.S.A. library, for more periodical information.

**** DOCUMENTATION SOURCES FOR THE APPLE II ****

There is a tremendous amount of documentation available for the APPLE II, and this list is not meant to be comprehensive. That which is listed below is merely some of the documentation which this editor has used and found helpful. Additional information on such documentation would be welcomed, and if received, listed in future newsletters. Also, for the present, I am just listing a couple of documents which do not require commercial software.

WOZPAK II - Available from CALL A.P.P.L.E., 6708 39th AVE S.W., Seattle, WA 98136 - Is a set of programs and documentation including TED II ASSEMBLER, Line Number Cross Reference, Renumber APPEND, Pack and Load, Machine Language Relocation notes, High Resolution Graphics and Shapes, Sweet-16 Utilization, Floating Point Routines Star Trek, Integer Basic Subroutine Calls. RECOMMENDED for those with INTEGER BASIC, limited value for APPLESOFT II-only users.

APPLE MONITOR PEELED - Available in local computer stores or from: WILLIAM E. DOUGHERTY, 14349 San Jose Street, Mission Hills, California 91345 write programs using monitor routines. It is an in-depth look at pointers, registers and routines in the monitor, and is well worth the \$10 price, if you plan to use the APPLE II to its full potential.

PROGRAMMING THE 6502 - By Rodney Zaks. This is a good introductory book to 6502 machine language, with clear diagrams and straight forward language. Published by SYBEX, it is available in many computer stores and some bookstores.

6502 ASSEMBLY LANGUAGE PROGRAMMING - By Lance A. Leventhal, is a more advanced assembly language book, with a very thorough discussion of 6502 Machine Language, programming problems and techniques for working with various hardware I/O. It is published by OSBORNE/McGRAW HILL in Berkeley, California, and is available in some computer stores and bookstores.

- U1 - 74LS10 TRIPLE 3-INPUT NAND GATE
- U2 - 2513-002 LOWER CASE CHARACTER GENERATOR
- ONE 14 PIN DIP SOCKET
- TWO 24 PIN DIP SOCKETS
- ONE 24 PIN DIP HEADER
- ONE PERF BOARD (.1" CENTER HOLE SPACING) 1.5" x 1.5"

APPLE II LOWER-CASE CHARACTER GENERATOR

< I have really enjoyed the lower-case chip board that Joe built me, and asked him to write up how to do it. He very kindly did so, and here it is. >

LOWER-CASE LETTERS JOSEPH D. ZAKAR

CONSTRUCTION NOTES

1. The upper case character generator is pulled from the APPLE II board (with EXTREME CARE) to be mounted with U1 and U2 on the perf board in their respective sockets. The DIP header replaces the upper case chip on the APPLE II board. Since the header is not mounted on the perf board, the wires between them better be long enough to mount the board where it will fit (perhaps near the speaker).

2. In addition to the connections shown in FIGURE 1, the following pins of the upper case chip, lower case chip and header must be connected in parallel: Pins 1,4-8,10,12,14-21,24. This means pin 1 of U3 is connected to pin 1 of u2 which is connected to pin 1 of the header. No other interpretations, please!!

3. The 5 volts for U1 and U2 can come from U2 pin 24. GND (Ground) for u1 can come from U2 pin 10.

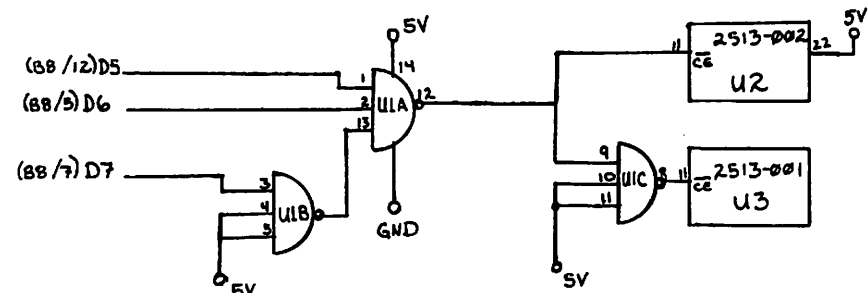
4. Connections to pins 12, 5 and 7 of chip B8 (74LS174) can be made by inserting wire-wrap-type wire into the pin holes and then inserting the chip to hold the wires in place by pressure. This requires some manual dexterity, but can be done.

TECHNICAL NOTES

This is really the same circuit described in Keith Wells article "LOWER CASE FOR THE APPLE II."* His lower case was enabled by D7 and D6 and D5 (100xxxx character patterns, where x can be 1 or 0). This circuit is enabled by D7 and D6 and D5 (011xxxx patterns) which directly corresponds to the lower case ASCII. Logical sleight of hand enabled this circuit to be reduced by one chip. The results are that no driver software is needed and the circuit is evidently compatible with programs utilizing the commercially available 'PAYMAR CHIP'.

The user should be cautioned that the addition of this device will probably VOID any warranty on the APPLE II. Also, please note that the installation of this hardware WILL NOT enable the 'shift key' operation on the APPLE II keyboard. Special drivers will still be required to output lower case to the crt directly from the keyboard.

**** FIGURE 1 ****



*Published in WOZPAK by APPLE PUGETSOUND PROGRAM LIBRARY EXCHANGE, Seattle, Washington

Software Review: Dakin5 Programming Aids Volumes 1 and 2

by: Paul A. Sand
Computerland of Rockville

These two software packages are collections of utilities developed by Dakin5 Corporation, a software house responsible for writing Apple's General Business System (The Controller). They are aimed at the "serious" programmer writing larger than average Applesoft programs. Each package contains seven utility programs on a single disk. Some programs are meant to be incorporated into other programs, and the versions on the disks are demonstrations of their possible use. Others are stand-alone programs that act on the user's existing programs and data files. Each disk, when booted, displays a menu of the programs available on that disk. When finished, each program returns the user to this menu.

The utilities are primarily written in Applesoft with some in machine language. Each has its own hardware requirements: some require a printer, some require two disk drives. Memory requirements given below assume the computer has Applesoft in ROM, but most programs work with the RAM version as well.

In Volume 1 the programs furnished are:

1) The Lister (requires a printer) lists all or part of an Applesoft program utilizing the full width of the printer. It will head the listing with the program name and the current date and time (supplied by the user). If you already have a printer, this won't do much for you that you don't already do for yourself. The heading supplied at the front of each listing may be useful if you want a standard way of labelling your listings and you sometimes forget to do it yourself. Caveat: the actual listing is done using the Applesoft LIST command, so it doesn't do anything fancy such as skipping the perforations in your paper.

2) The Peeker will display or print the contents of selected records in a random-access text file. It seems this would be useful in debugging a program that uses such files. Caveat: it may not work on long record-length (> 200 characters) files, and in some situations it gives the dread <BEEP>EXTRA IGNORED error.

3) The Cruncher (requires 48K) compresses Applesoft programs by removing unreferenced REM statements, eliminating the text of the remark in referenced REMs, and combining as many statements into multi-statement lines as Applesoft and the program logic allow. This results in savings both in RAM and on the disk. For some this may be worth the price of the entire package. How much it compresses any given program depends very much on the style in which it is written. The Cruncher was run on a dozen Applesoft programs from various sources. The maximum compression of 62% was achieved on the RPN calculator program given in Apple Pi in the December 1979 issue. The minimum compression was 1% for the Finance I program distributed by Apple. The average memory savings for the 12 programs tested was approximately 20%. A

programmer using the Cruncher can use remarks freely in his programs and avoid multiple statements per line (both considered to be good programming practice) without having to fret about how much memory he is wasting - he can reclaim the memory at any time by crunching the program.

4) The Text File Copy (requires 2 drives) copies random access text files from one disk to another. This would be handy when copying the entire disk is inconvenient or impossible. It seems to suffer from the same problems as the Peeker, however.

5) The Prompter is a data entry subroutine that allows uniform user input of data. It allows the programmer to specify the following:

- maximum response length
- response type (alphanumeric, numeric with possible minus sign, or unsigned numeric)
- number of decimal places in number
- whether to display commas in result
- whether to fill result with leading zeros
- default string
- whether to terminate input on ESC key

This is a boon for programmers who write programs that require the user to enter data from the keyboard, especially if the user is not the same person as the programmer. It allows certain input mistakes to be caught before they happen; for example, if a numeric input is specified, the Prompter will ignore any characters typed that couldn't be part of a number.

6) The Calculator (requires 48K) is a machine language subroutine for the addition or subtraction of numeric strings with 20-digit accuracy.

7) The Diskette Copy (requires 48K, two drives) is an "intelligent" disk copying utility. It is relatively slow (up to five minutes) because it formats the destination diskette before the copying starts and it reads the destination disk after writing to it for verification.

On volume 2, the selections are:

1) The Screen Printer (requires printer) is a machine language routine that allows the user to print the (textual) contents of the screen at any time the keyboard is active by just typing a control-Z.

2) The Array Editor (requires 48K) allows the creation, modification, display and printing of text files. This is handy for seeing what's in an existing text file or creating and changing EXEC files. The input subroutine only seems to accept letters and digits from the keyboard, and this somewhat limits its usefulness.

3) The Copier (requires 48K, 2 drives) will copy any file from one disk to another. All it needs is the name of the file. This supersedes the text file copy program in volume 1, and appears to have no problems.

4) The Patcher (requires 48K) allows the examination and modification of any sector on a diskette. The sector can be specified "absolutely" by giving a track/sector address, or it can be specified by file name, in which case the program will track down the correct sector by reading the directory. The contents of the sector are displayed in both hexadecimal and

contd.

ASCII mode. Modification of the sector may be done in hexadecimal or character mode, and in character mode one can specify whether the high bit of each byte should be a zero (as in program files) or a one (as in text files).

5) The Line Cross Reference (requires 48K) will print or display a table of where each line in an Applesoft program referenced by a GOSUB or GOTO is referred to. 6) The Variable Cross Reference (requires 48K) will print or display a table showing where each variable in an Applesoft program is referenced. These two utilities are very useful to the programmer who has written a program that is threatening to grow beyond his ability to keep track of all its parts.

7) The Calculator II is a machine language routine for multiplication and division of numeric strings with 20-digit accuracy. It is compatible with the addition/subtraction routine mentioned above.

My overall impression of these two packages is extremely favorable. The documentation is excellent and the programs themselves are very useful. The cost of Volume I is \$39.95; Volume II is \$49.95. They are available from Dakin5 Corporation, PO Box 21187, Denver, Colorado 80221, or from your local computer store. Finally, I would like to acknowledge the help of Andrew Gallant of Booz-Allen and Hamilton in the preparation of this review.

APPLE WRITING

By Phillip Wright NOVAPPLE

APPLE PI has asked for contributors and has said that it isn't important for he or she to be an expert computerist, in which case I certainly qualify. The product I will be discussing is a new text editor from APPLE called APPLE WRITER. It may be useful to write a review of a computer tool from the perspective of a beginner. So let's see how it works out.

First let's look at the two types of text editors---the line oriented editor and the screen editor. The APPLE WRITER is a screen oriented editor which means that words in the text may be inserted, deleted, or moved around in sentences or blocks. Text may also be scrolled backwards or forward and is in no way constrained by line sized segments.

My only previous experience in using text editing software was with a piece of software called "CIDER SQUEEZER 3.1" which is available free from the APPLE CORPS. It was written to facilitate the creation of articles for their publication, "THE CIDER PRESS". This software is what is called a line oriented text editor. If you make an error in entering text you must change from entry mode to editing mode and go back through the text which you have entered until you come to the line where the error had been made. You then take note of the line number in question, and go on until you come to the end of all the text you have entered. The editor then asks which line you want to change. You enter the line number and the editor displays the line in error along with the request that you reenter the line correctly. The line is then entered and you are given the opportunity to edit another line. Needless to say I found this process awkward, tedious and time consuming.

The APPLE WRITER being a screen oriented editor is an entirely different animal being much more flexible and easier to use. You might say to yourself if you are new to the world of computers, "Why on earth would I need one?" I can only

answer, "If you are a person who has a perfectly organized mind, who creates an outline before he commits his thoughts to paper, who spells perfectly and who has never wished that he could change the sequence of his sentences or paragraphs then you are indeed a fortunate person". I am none of the above and as a consequence find the text editor quite liberating.

I'd like to divide this review into four basic sections:

1. Learning to use the APPLE WRITER.
2. A discussion of it's features.
3. My impresions of the APPLE WRITER after using it for several weeks
4. Hardware requirements

LEARNING THE APPLE WRITER

My first evening was profitably spent in reading the manual. One of the most appealing aspects of the APPLE is its wealth of well written documentation. The manual for the APPLE WRITER is no exception and I found it to be simple, humorous and to the point. A nice feature of the APPLE WRITER is a handy tutorial explaining its use. This tutorial is one of the programs found on the APPLE WRITER diskette. I loaded the tutorial into my APPLE and spent a fruitful hour or so in learning the basic features of APPLE WRITER. Having studied the manual and absorbed the tutorial I found myself using APPLE WRITER rather slowly and with some errors but with a growing sense of pleasure.

When you start using the editor your first impression is of a bewildering profusion of Esc's and control characters. It seems awkward to switch back and forth from cursor control, to text editing, to case change, all by using the Esc key. You find yourself looking first to the manual then to the Apple and back again. At first you try simple things like deleting characters and words. Soon you find yourself moving and deleting words or whole blocks of words. After a while it becomes fun just to find ways to use the flexibility thats built into the APPLE WRITER.

APPLE WRITER FEATURES

The APPLE WRITER can perform the following functions:

* TEXT EDITING

Modes

- Text mode
- Cursor control mode
- Case change mode
- Deletion and retrieval
- Control functions

* PRINTING

- Print new document
- Print constants
- Format specifications
- Page heading
- Starting and stopping the printer

Text-imbedded printer commands

- Format
- Justify modes

TEXT EDITING PROGRAM

MODES

When using the APPLE WRITER, the Esc key is in effect the mode control key. It allows you to switch from cursor control, to text entry, to case change.

When you begin to edit you will see a flashing square cursor. This indicates that the editor is

contd.

in text entry mode. If you make an error in text entry you can simply back-arrow over it and replace the incorrect letters with correct ones. Lets say, on the other hand, that you notice an error several lines above your current position. At this point you push the Esc key twice. This gives you a flashing cursor with a plus sign. The plus indicates to you that you are in cursor control mode. In cursor control mode the I key moves the cursor up a line, while the M key moves it down a line. The J key moves the cursor to the left a space, while the K key moves it to the right. The repeat key works in concert with all of the cursor control keys to give some startling results, you can really make that cursor fly. When the Esc key is pushed twice and followed with a control-C, a percent sign is displayed within the flashing cursor. This indicates that you are in case change mode. In case change mode the J and K keys control cursor movement and allow you to move the cursor over text which has already been entered to bulk change this text to upper case.

A single press of the Esc key will capitalize the next letter entered. This comes in handy for capitalizing the first letter of a sentence or the first letter of a name.

DELETION AND RETRIEVAL

When in text mode, as was stated earlier, the back arrow will delete unwanted text, but it has some more interesting functions. Lets say that you have a word or a sentence in your text which you would like to relocate. You simply place the editor in cursor control mode and move the cursor to the right hand limit of the word or sentence. You then place the editor in text mode with a stroke of the space bar and press the back-arrow repeatedly until the entire word or sentence has disappeared. The interesting thing is that the text has not disappeared but has been placed in a 256 character buffer. It is neatly retrievable by pressing the forward arrow. You then place the editor back in cursor control mode and move the cursor to the desired location for the word or sentence and press the forward-arrow until the text has been inserted in the desired location. All of this back and forward arrow movement can be speeded up by the use of the repeat key.

Words can be deleted by moving the cursor to the right side of the word in question and pressing control-W. Sentences or paragraphs can be deleted by moving the cursor to the right of the sentence or paragraph and pressing control-X. Words, sentences and paragraphs can be made to reappear by using the forward-arrow.

CONTROL FUNCTIONS

Control-D Places you in the DOS. Q, return places you back in the editor.

Control-F Tells you how much memory you have left. You cannot exceed the capacity of memory when you are entering or editing text, therefore, you must save very long text files as file segments. These segments can be merged for printing. The approximate capacity of a 48K machine is sixteen pages.

Control-K Allows you to save a segment of a file.

Control-I Allows you to retrieve a file segment from diskette and insert it into a desired location in a text file.

Control-S An extremely powerful function which allows you to search a text file for a specified string and to either automatically or manually replace the string with another string.

Control-Y Allows you to pick up an entire block of text defined by delimiters and move this block of text to a desired location.

MENUS

When you are ready to do some printing you need to get to the editor's menu. This is done by pressing Esc twice and then pressing control-Q. One of the options available on the menu is print. When P is inputted you are turned over to the print program, the other major program in the APPLE WRITER.

As you can see when you enter text on the APPLE, the maximum number of characters you can get on a line is 40. This is kind of inflexible, unless you just happen to need all of your printed output 40 characters wide-----you have a problem! The print program is the answer to that problem. It allows you to format your output in any way that you want. It will make 10 character lines or 132 character lines, or any line length that will fit on your printer. It will make any top or bottom margin size that you want. It lets you decide how many spaces you want between your lines so you can output text double spaced for editing and single spaced for final copy. It will stop printing after a single page in case you are not printing on continuous forms. It will print a page heading on each page, and last but not least it will automatically page number each page for you. This is obviously a pretty handy program.

PRINT MENU

When you select print from the editor's menu you will hear the disk run for a few seconds and then a new menu will appear on the screen. This is the print menu. Each of the functions discussed in the preceding paragraph is controlled by a parameter on the print menu. If you want the right margin at print position 20, you simply select the letter corresponding to the right margin input that letter and then input the desired position for the right margin. This same procedure is followed to change any of the other parameters. After you have set all of the print parameters you are asked to enter a page heading, this is optional. If no heading is desired you press return and are then asked to press return again when you are ready to start printing. If you want to stop printing once it is under way you press Esc.

OTHER MENU OPTIONS.

If you have written a long document as several files you can use an option called continue printing. This lets you print several files as a continuous document.

There is a load function which lets you load a file from the disk and print it without going back to the editor program.

Finally, there is a return to editor function which lets you get back to the editor.

TEXT EMBEDDED PRINTER COMMANDS

Sometimes you may not want the margins that you set up in the print parameters to work all of the time. For example, what if you want to indent a paragraph. Maybe you only want a few lines on a page or would like the printer to go to a new page at a specified place in you document.

Do you want part of your text left justified and you headings centered, or would you like to have both margins perfectly justified or maybe for some peculiar reason you would like your text right justified? As you have probably already guessed as of these things are possible. Not only are they possible they are quite simple. If, for example, you want a heading centered you just enter an ! followed with a cj for center justify. The rest of the commands are equally straight forward.

CRITIQUE

I have now used the APPLE WRITER for about two weeks and have prepared several documents with it. It is an absolutely delightful tool and along with a printer makes the APPLE much, much more than a

contd.

game machine. The APPLE WRITER is the most useful piece of software that I have and that, is quite a compliment. After having used it for awhile I find the frequent use of the Esc key to shift modes mildly annoying but not a major bother. It is one of the prices we pay for having a machine with a non-standard keyboard.

I have noticed the lack of an underline capability, I am uncertain as to how proportionate spacing would be implemented and I have found it difficult to format columnar information.

There are new developments on the horizon which make it seem likely that we will soon see lower case letters on our APPLE screens and do so by using the shift key. I have seen this demonstrated at COMPUTERLAND of Tysons Corner, but not yet, to the best of my knowledge, with APPLE WRITER.

We have had a generous offer from the management of COMPUTERLAND of Tysons Corner to make available for review the two other major pieces of text processing software. If you have found this article interesting, and will let me know, I will undertake to review each in the same manner as APPLE WRITER.

HARDWARE REQUIRED

48K APPLE II or APPLE II PLUS, and at least one disk.

Remote Temperature Measurement With The APPLE

by Bruce F. Field

Measuring the temperature of several remote locations can be done very easily using the APPLE computer. This could be to measure air temperature to monitor the weather, keep track of minimum and maximum values, or sound an alarm if the freezer gets too warm. You could even use it as the world's most expensive fish tank temperature controller! What this article describes is a very simple, inexpensive way to measure temperature at a location some distance from the APPLE.

The game paddle inputs can be used to measure a current or voltage that is related to temperature. First then we need a device to convert temperature to an electrical quantity. For hobbyist applications a diode or the base-emitter junction of a transistor is often used as a sensor. These have the advantage of being readily available and inexpensive. On the other hand, they also must be calibrated, and produce a very small change in voltage for a given temperature change. A better sensor for this application is a thermistor. This device exhibits a relatively large change in resistance with temperature. Thermistors can be purchased already calibrated to an accuracy of 0.2 degrees Celsius. (The name Centigrade is obsolete having been replaced by Celsius in 1948.) One drawback to using a thermistor is that the resistance is not linearly related to the temperature. But, that is no problem when you have a computer available to calculate the temperature.

A calibrated thermistor, YSI #44008 is available from

RJN Sales, Inc.
PO Box 82
Springfield, NJ 07081

for \$6.75 plus \$1.00 for shipping. For quantities of 30 or more the price drops to \$5.85 each plus shipping.

To use this thermistor all you need to do is solder some longer leads to it, and carefully insert the ends (either one) into pin 1 and pin 11 of the game I/O connector. This will allow you to read the resistance of the thermistor by executing a 'PDL 3' command in either Basic. For those of you who prefer a more permanent arrangement, Radio Shack sells a DIP header (#276-1960, \$1.29) that plugs into the game I/O connector and to which the leads can be soldered.

The thermistor has two very fragile leads (#32 wire). When attaching longer wires to these leads, care must be taken not to break the leads. The leads must also be insulated so they do not short to each other; spaghetti insulation is best for this, however a careful job with electrical tape will also work. For a first class sensor the thermistor can be epoxied in a small metal tube to protect it. Of course up to four thermistors can be connected (one to each of the paddle inputs) to monitor more than one temperature.

In order to calculate the temperature from the paddle reading, it is necessary to understand a little bit about how the game paddle circuits work. A game paddle, which is a variable resistor, (or the thermistor, which is a resistor that varies with temperature) is connected between the +5 volt supply and a 0.022 microfarad capacitor. The other side of the capacitor is connected to ground. The resistor charges the capacitor and the length of time it takes for the capacitor to charge up to a certain voltage is what the APPLE measures and returns when PDL is executed. The paddle reading can be expressed as:

$$\text{paddle reading} = KCR$$

where K is a constant, C is the value of the capacitor, and R is the value of the resistor. Each paddle input has its own capacitor, and the values of these capacitors will all be slightly different. Purists will note that there is a 100 ohm resistor on the APPLE board that is connected in series with the paddle inputs. Thus the total resistance in the circuit (R) is actually 100 ohms more than the external resistance. However the 100 ohms is much smaller than the thermistor resistance and can generally be ignored.

As mentioned earlier, the thermistor resistance is not linearly related to temperature. However by using the table supplied with the thermistor which gives the resistance R in terms of temperature, and knowing KC in the above equation, we can calculate the expected paddle readings for different temperatures. For one of the paddle inputs on my APPLE I have calculated the curve shown in Fig. 1. Differences in the capacitors for the different paddle inputs will produce a different curve for each input, however the shape of the curve will always be the same. In order to determine the conversion curve we need only to measure the proportionality constant (KC) of the paddle input. This can be done very easily by temporarily replacing the thermistor with a resistor of approximately 100k that is known with an accuracy of 1%. Once we know what the paddle reading is for 100k we can scale the resistance readings in the thermistor table to convert them to equivalent paddle readings.

To use the APPLE to measure temperature we must get a paddle reading for the thermistor resistance and convert this to temperature. There are several ways to do this conversion. The most elegant way is to fit the conversion curve to a polynomial such as,

$$\text{Temp} = a + bP + cP^2 + dP^3$$

where P is the paddle reading and a, b, c, and d are the coefficients of the polynomial. It is then very simple (at least in Applesoft) to calculate the temperature. The disadvantage of this method is that the entire temperature range cannot be covered by one equation because of the limited numerical precision in Applesoft. However, several polynomials can be used each covering a piece of the range. Another way is to provide a lookup table of values. This can be done either in Applesoft or Integer Basic. An array can be set up that contains paddle readings and equivalent temperatures. A program finds a paddle reading in the table that is closest to the actual reading and then the temperature corresponding to the reading in the table is the temperature. Unless the readings in the table are close however, linear interpolation should be done to find a more accurate temperature.

A few words about the accuracy of the measured temperature. Three significant sources of error are:

1. the calibration of the thermistor
2. the self-heating of the thermistor due to internal power dissipation

contd.

3. the temperature dependence of the paddle timer capacitor in the APPLE

The first error we can do little about, the accuracy of the thermistor with respect to the chart provided is 0.2 degrees Celsius. If more accuracy is needed a more accurate thermistor should be purchased. The accuracy obtained in determining the proportionality constant between the paddle reading and the thermistor resistance will be a function of how accurately the 100k resistor is known, and how carefully it is measured using the paddle input, (i.e. measure it lots of times and take an average).

The self-heating error is reduced by using a 30k thermistor. The worst case occurs when the thermistor is not attached to anything but just in air. In this case the power dissipation in the thermistor will cause an error of no more than 0.2 degrees C. To reduce this error the thermistor can be attached to a small metal plate (approx. 2 cm square) which will act as a heat sink.

The third error source is usually fairly small, however for highest accuracy it should be measured and the paddle readings corrected for any change. If the capacitor in the timer circuit changes between the time the paddle proportionality constant was determined and the temperature measurements are made, that change will produce a proportional error in the temperature reading. The most usual reason for a change in capacitance is that the temperature of the capacitor has changed. But, one of the really neat things that a computer can do is correct for these little problems. If we connect the 100k resistor to one of the paddle inputs (with long enough leads so that it is outside the APPLE) and we connect the thermistor to another paddle input, we can record the temperature dependence of the timer capacitor using the APPLE itself. Place the thermistor near the capacitors and gently warm them using a low wattage light bulb. The output of the paddle input with the 100k resistor would not change if the capacitor were perfect. Recording any change along with the temperature indicated by the thermistor will show what correction should be applied to the readings. The temperature dependence will probably be different for each paddle input, so be sure and find the correction for each input. A plot of the paddle reading versus temperature for one of the paddle inputs of my APPLE is shown in Fig. 2. For a temperature change from 24 to 32 degrees C (a reasonable range for the temperature inside the APPLE) the paddle reading changes only 3 counts, which corresponds to a temperature error of +/- 0.15 degrees C.

Errors due to power supply voltage fluctuations are cancelled in this circuit (to first order) because both the capacitor charging current and the timer voltage reference are proportional to the power supply voltage.

Ignoring the above errors the overall accuracy will probably be about 1 degree C, which is comparable to most home thermometers. If two thermistors are used, one to sense temperature, and one to correct for the temperature dependence of the timer capacitor, accuracies as good as 0.5 degrees C can be obtained.

A final note, the Applesoft manual warns against trying to take successive paddle readings (even of different paddles) too quickly. I have found that for highest accuracy you should wait up to 1/2 second between readings to allow the capacitor on the timer reference pin time to recharge. Also, I have a few accurate 100k resistors I would be happy to loan to anyone interested in calibrating their game paddle inputs.

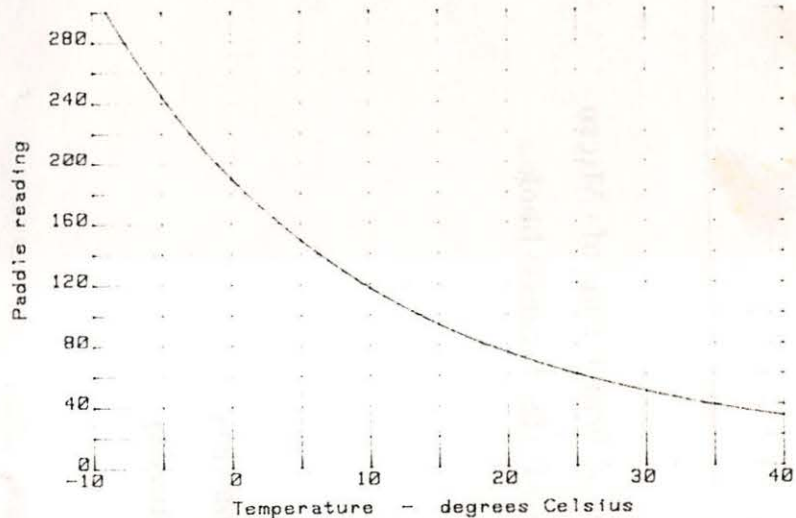


FIG. 1 VALUES RETURNED BY THE PDL FUNCTION VERSUS THE TEMPERATURE OF A THERMISTOR CONNECTED TO THE GAME PADDLE INPUT.

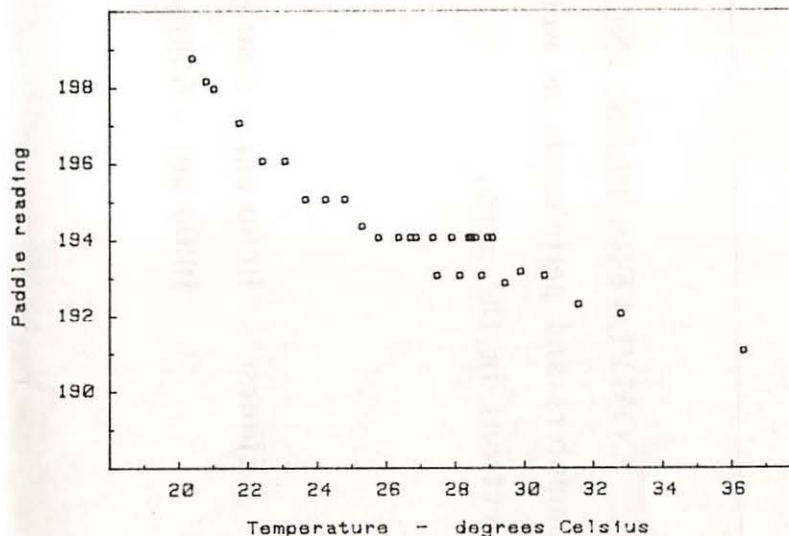


FIG. 2 PADDLE READINGS FOR A FIXED 100K RESISTOR VERSUS THE TEMPERATURE OF THE PADDLE TIMER CAPACITOR.



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