THE TORPET

$2.00

The INDEPENDENT Commodore Users' Magazine

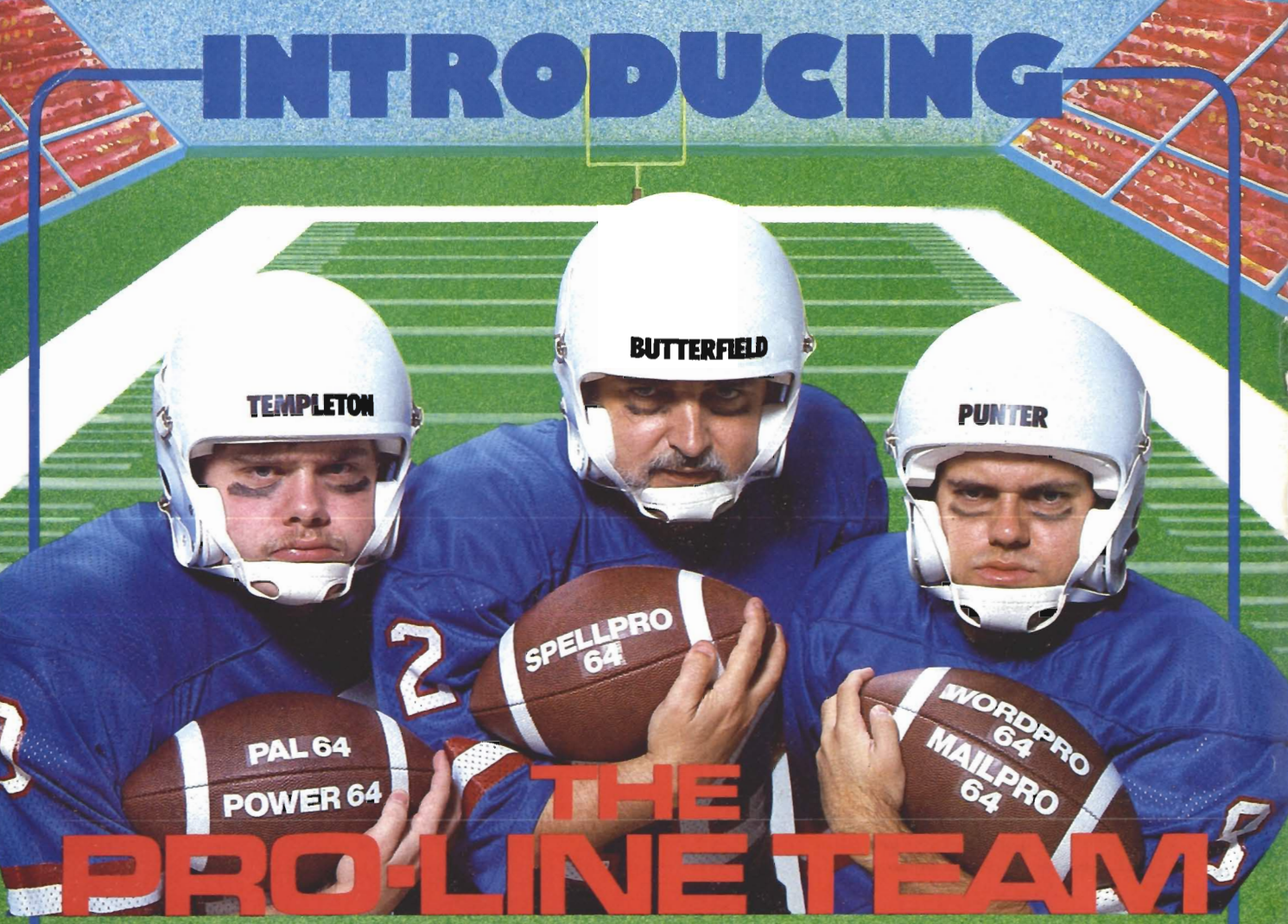
No. 26 JANUARY 1984

For the Commodore 64 and VIC

TORPET'S FAMILY OF THE YEAR

Gord and Marty Campbell with Lori, Bradley and Derick

INTRODUCING



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Letters to the EDITOR

I would like to tell you that I really like the List Me that you now put in The TORPET magazine along with G. W. Walter's article on the 64 -- Torpet, September 83.

Frank Bessler #6848
Stanton, California

I have belonged to TPUG for over a half year now and enjoy reading the TORPET. The October issue (#24) was especially informative and timely for myself as I am considering the purchase of a printer.

My negative comment about the club concerns documentation for the programs on disk/tape. Not living in the T.O. area, I cannot attend the meetings where these programs are introduced. Without instructions, some of the programs cannot be run. I would be most interested in information on the Turtle programs of disk V8 - VIC Feb/83.

J. A. Bach #5571
Kingston, Ontario

After several years of hearing about TPUG being the best of all Commodore user's groups, I have finally decided to join. I am looking forward to all the great articles in TORPET.

Boyd Hammond #11015
Gretna, Louisiana

Six months have passed since I happened to walk into an exhibit at 'Lion Country' and was introduced to the world of computers. My first purchase was a membership subscription to the TPUG. This happened, not because I knew what I was doing, but due to your participating member's persuasiveness. However, I have no regrets for my membership. Each issue of TORPET gives me a few more pointers and hints to get more out of my C64.

Mack Biederman #7729
Woodland Hills, California

I enjoy the magazine very much and would appreciate more articles describing some of your better programs, especially utilities for both C64 and PET 2001 with upgrade BASIC.

Bill Rutherford "3558
Kokomo, Indiana

Just a quick note to say thank you for your fine periodical. And also thank you for not forgetting us PET owners of the world. Your articles are interesting and easy to understand. One question however? Is Commodore still making the 8010 modem? I own a 4032 (Fat Forty) and I can't seem to find one anywhere.

Phillip Loyd #3149
Cherry Point, North Carolina

Thank you for your help. I think your organization provides a terrific service and a very readable newsletter.

John Michell #7568
Calgary, Alberta

It is a real joy to see so many avid users of Commodore computing products and a whole library available to TPUG members.

Danial Plamondon #11819
Ottawa, Ontario

I would like to know why the August, September, and October issues of the TORPET arrived at the newsstand during the 1st week of the month and my copies arrived during the last week of each month three weeks later. I don't believe that's proper and if it's happening to me it's got to be happening to other members as well.

Thanks for the article by Farquharson on RAM. Some people I know wouldn't believe what I tried to explain until they read it in print.

DOUBLE THANKS for the articles on CPM. They served to clarify a few points for me and enlighten some friends of mine.

George Dennis #5868
Van Nuys, California

More On Deal

I have just finished reading the article by Elizabeth Deal on disk drive formats. This was a very informative article. As I read this it reminded me of several problems that I have had with my 1540/1541 disk drive. At the time I didn't think of the format difference.

As Elizabeth writes, the disk will self-destruct in time. Don't I wish I had had backups for all the programs I lost from self-destruct!

The problem started to occur when I got the upgraded ROM for my 1540 disk drive. After checking some of my older disks formated using the 1540 ROM it appears that the 1540 drive is formated the same as the 4040 drives (fills the entire disk with zeros). I would suggest to anyone that has upgraded their disk drive to copy all old disks to new disks formated on the 1541 ROM.

I believe this will save a lot of headaches and frustrations when your disks self-destruct.

Dave Crossett #9588
Deltona, Florida

The article by Elizabeth Deal, "Detecting Disk Format" (TORPET Oct. '83) is very timely, as much commercial software is being set up on 4040 disks, but for use on 1541 drives. If (as in some games) there is a disk write involved somewhere along the way, then watch out!

The solution is to do a 1541 backup (if possible) of every disk. Boring, so save it for a rainy day but don't wait too long.

One minor point. From my reading of the DOS, the sectors in track 1 start"00 01 01" etc., first bytes being different. Heaven knows why! So if you use T=1 S=0 in the little program the result will be different.

Don't forget that 'scratched' files leave all their junk on disks untouched - only the directory track is altered. Sectors may be 'free' but without reference to BAM, you may never know.

Paul Blair
Australia

CONTEST 1984

This contest is going to be a little bit different, and hopefully will provide some fun for the members as they try to beat the rules. The contest prize of a Commodore 64 (or suitable substitution, at the discretion of the judging committee) will be awarded for the BEST 10-LINE BASIC PROGRAM.

The rules are as follows:

1. Use line numbers 0 to 9 only.

2. Program to be written in BASIC and be listable. Compaction, PEEKs and POKEs will be allowed.

3. No machine language - No use of vectors or interrupts - No SYS or USR usage - No calling in of outside programs, overlays etc. - No storing of data outisde of the BASIC 10 lines of the program.

4. Entries must be received in the TPUG office on or before 4:30 p.m., April 1, 1984.

5. Specify on which machines the program will RUN.

The core judging committee consists of Gary Croft, Chris Bennett, Carol Shevlin and Bill Dutfield.

TPUG CONTACTS

*President	Michael Bonnycastle	416/654-2381
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*Westside Chapter	Al Farquharson	519/442-7000
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*Director	Barbara Bennett	416/782-9252
*Director	Gary Croft	416/727-8795
*Director	Bruce Beach	519/925-5376

* TPUG Board of Directors

TPUG Associate Club Chapter Meetings

PET Educators Group (Windsor)
- meets at Windsor Separate School Board Media Centre, 1485 Janette Ave. on the 3rd Wednesday of each month (not July & August) at 7:00 p.m.
Contact John Moore 519-253-8658

London Commodore Users Club
- meets at the University of Western Ontario, in Room 40 of the School of Business Administration on the last Monday of each month at 7:00 p.m.
Contact Dennis Trankner 519-681-5059

Genesee County Area Pet Users Group (Michigan)
- meets at Bentley High School on Belsay Rd. on the 3rd Thursday of each month at 7:00 p.m.
Contact Gordon Hale 313-239-1366

Sacramento Commodore Computer Club (California)
- meets at SMUD Building Auditorium 6201 S St. on the 4th Monday of each month at 7:00 p.m.
Contact Geoff Worstell 916-961-8699

Michigan's Commodore 64 Users Group
- meets at Warren Woods High School in Warren on the 3rd Tuesday of each month at 7:00 p.m.
Contact Chuck Ciesliga 313-773-6302

Edmonton Commodore Users Group
-meets at St. Gabriel School on the 1st Friday of each month at 7:00 p.m.
Contact Bob Kadylo 403-465-3523

Guelph Computer Club
- meets at Co-operators Insurance Assoc. on the 2nd Tuesday of each month at 7:30 p.m.
Contact Brian Grime 519-822-4992

Commodore Users Club of Sudbury
- meets at Lasalle High School in the cafeteria on the last Thursday of each month at 7:00 p.m.
Contact Tim Miner 705-566-3632

Sarnia C64 Users Group
- meets at Lambton College on the first Sunday of each month at 7:30 p.m.
Contact J. C. Hollemans 519-542-4710

TPUG Bulletin Board

416-223-2625

A Password is being instituted so that members only will have access to the Bulletin Board

Current Password is

PEACE

CALENDAR of TPUG EVENTS

1983-1984 Schedule

CENTRAL CHAPTER - Leaside High School, Bayview & Eglinton Aves. at 7:30 p.m. in the auditorium for **PET/CBM/SuperPet**

Wed. Jan. 11 Wed. Apr. 11
Wed. Feb. 8 Wed. May 9
Wed. Mar. 21 Wed. June 13

VIC 20 CHAPTER - York Public library, 1745 Eglinton Ave. W., (just east of Dufferin) at 7:30 p.m. in the auditorium

Tue. Jan. 3 Tue. Apr. 3
Tue. Feb. 7 Tue. May 1
Tue. Mar. 6 Tue. June 5

Commodore 64 CHAPTER - Earl Haig S.S., Kenneth & Princess Aves. (6 blocks north of Sheppard, 2 blocks east of Yonge) at 7:30 p.m. in the auditorium

Mon. Jan. 9 Tue. Apr. 10
Mon. Feb. 27 Thu. May 24
Wed. Mar. 7 Mon. June 25

WESTSIDE CHAPTER - Clarkson Secondary School, Bromsgrove just east of Winston Churchill Blvd. (south of the QEW) at 7:30 p.m. in the Little Theatre for **PET/CBM/VIC 20/Commodore 64**

Tue. Jan. 17 Thu. Apr. 19
Tue. Feb. 21 Thu. May 17
Thu. Mar. 22 Thu. June 21

SuperPET CHAPTER - York University, Petrie Science Building, enter campus from Steeles Ave.--park in Lot D. Meet at 7:30 p.m. in front of Room 340.

Wed. Jan. 18 Wed. Apr. 18
Wed. Feb. 15 Wed. May 16
Wed. Mar. 21 Wed. June 20

MACHINE LANGUAGE CHAPTER (6502) - Call Jim Carswell at 416/531-9909 for additional information.

VIC 20/Commodore 64 Assembler Language and Commu'nications Group - This group has been discontinued until such time as a co-ordinator is found.

COMMUNICATIONS GROUP - York Public Library, 1745 Eglinton Ave. W., (just east of Dufferin) at 7:30 p.m. in the Story Book Room (adjacent to the auditorium).

Wed. Jan. 4 Wed. Apr. 4
Wed. Feb. 1 Wed. May 2
Wed. Mar. 7 Wed. June 6

NEW GROUPS IN THE PLANNING STAGES
- COMAL Group
- Eastside Chapter
- New Owners Group

Are you interested in being involved in any of these groups, either as a participant or an organizer? Are you interested in organizing some other interest group in the Greater Toronto area? Please let the club office know, by mail, phone, or TPUG bulletin board.

EDITORIAL

IN PRAISE OF TPUG

The staff of The TORPET would like to thank all the TPUG members for their excellent support and we wish all the TPUG members and our readers and advertisers a Happy New Year and also a prosperous one. As most of you know **The TORPET** will require an independent subscription after this issue. (See the very special **one time** offer on the back page).

We plan to maintain the 'club spirit' which I think is one of honesty, cooperation and service. We hope to continue to serve our readers the best we know how and we hope you will continue with your support and will write to us with your suggestions. Our thanks to TPUG for being the great club that it is.

TORPET'S FAMILY of the YEAR

Each year **The TORPET** has selected a man of the year. Two years ago it was the TPUG club business manager Chris Bennett, and last year it was TPUG president Michael Bonnycastle. Most of the TPUG directors are completely unremmunerated for their TPUG activities and we certainly wish to recognize all of their contributions. However, this year we have chosen to salute Gord Campbell and his family. Gord is a member of the TPUG board of directors and is Chairman of the Conference committee. The efforts and results that Gord has contributed to the club are well known. The conference each year has become a greater event bringing credit to TPUG.

Gord's great effort could never have been accomplished without the support of his family. All are computer users and Derick has previously been on a TORPET cover himself as winner of the TPUG programming contest. Marty too has been a previous contributor to **The TORPET**. This is truly a family that computes together.

Bruce Beach

THE PRESIDENT'S MESSAGE

This has been a tumultuous year. Our membership has expanded from about 4500 last year at this time to almost 13,000. Our office, newly established last February has grown to roughly seven people to serve you, our members.

One of the significant changes, reported earlier at our annual meeting, is to bring the publication of our club bulletin in house and so this will be the final issue of the TORPET purchased by TPUG and sent to our members. We understand Bruce Beach will continue to publish the TORPET, but independently of TPUG.

TPUG, in the meantime, has been busy preparing to publish our new club bulletin, the 'TPUG Magazine'. It will have a significantly different format, and will include a great deal more news and information on club activities, as well as technical tips, programs, library documentation, and other matters related generally to computing with Commodore equipment. We are looking for assistance in producing upcoming issues. We want your input with ideas and articles as well as letters and questions. We want to know what you want. In general, this is to be a member's magazine, and not a magazine produced by an independent publisher and sold to the club for distribution to its members, as the TORPET has become.

In moving into 1984, I wish to express my personal gratitude to all the directors for the enormous amount of work they have done, and to express my hopes that in the new year they will achieve the success they deserve.

Chris Bennett, our Vice-President, Administration has worked long and hard to make the Club prosper and work well. He is spearheading our efforts to produce the new TPUG Magazine and we are looking forward to this new image.

Gord Campbell, our Vice-President, Publicity is preparing for the Third Annual TPUG Conference, this year to be held at the Constellation Hotel on May 26-27.

We have a new Treasurer, Carol Shevlin who reports that financially, we are in excellent shape, and an increase in dues this year will probably NOT be necessary. John Shepherd, our Secretary, organized our booth at the World of Commodore and during the week we met a very large number of our members.

My thanks also goes to John Easton - in charge of the west end meetings, Mike Hyszka - C64 group, and to Al Farquharson, Gerry Gold and Barb Bennett for their work with, among other issues, the Publishing Committee.

At this time I should mention Mike Donnegan, our director representing the Librarians, together with David and Richard Bradley and Craig Bonner and wish them luck in 1984 in managing that ever increasing library of over 600 disks, or 3000 programs. I would also like to thank Gary Croft for his work as past Secretary.

In addition to the directors, I would like to thank the staff for their unfailing efforts. Doris Bradley and Dale Loucareas who are our permanent 'front office', together with Sandy Waugh, Janet Sherbanowski and recently Linda Stewart who are busy producing the new TPUG Magazine. Look for our first issue in January and let us know what you think.

And so, in this Orwellian year of 1984 I want to wish everyone all the best for a happy, healthy, prosperous year.

MICHAEL BONNYCASTLE

COMMODORE'S 25TH ANNIVERSARY BASH
A GREAT SUCCESS

Jack Tramiel, left, toured the World of Commodore show with the Hon. Ed Lumley, Canada's Minister of Regional Industrial Expansion, centre, and James L. Copland, Commodore Canada's General Sales Manager, right.

Jack Tramiel celebrated Commodore's 25th anniversary with members of his staff and exhibitors from all over the world, plus over 38,000 consumers who came to celebrate too, at the World of Commodore in Toronto.

The World of Commodore, sponsored by Commodore Canada, was held at The International Centre December 8 - 11 to commemorate the company's first quarter-century, during which the company grew from a small typewriter repair shop in downtown Toronto to a billion-dollar, world-wide, vertically integrated personal computer manufacturer. That's really something to celebrate and pay tribute to, and that's what the World of Commodore was all about.

The World of Commodore was officially opened at a cermony held on December 8th. Ed Lumley, Canada's Minister of Regional Industrial Expansion, made a special trip from Ottawa to tour the show with Tramiel and help with the official opening cermonies. Hazel McCallion, Mayor of Mississsauga, was also on hand to take part in the festivities. Everyone reminisced a bit about Commodore's early years and congratulated the company on its rapid advancements in size, character, entrepeneurial excellence and technological innovation in just 25 years.

There were 68 exhibitors at the show

James L. Copland, Commodore Canada's General Sales Manager, right, presents Commodore International Chairman of the Board Irving Gould with a memento of the World of Commodore at the official opening ceremony.

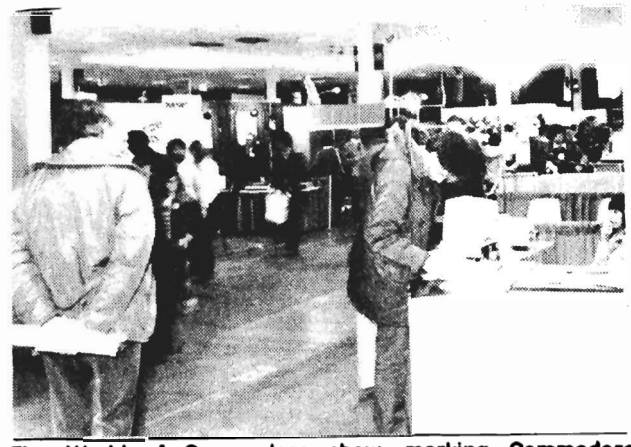
from various locations in 11 U.S. states and England, Sweden and France. All the booths were packed with people interested in looking, learning about and buying the hardware and software these exhibitors had to offer.

And they did have numerous products available, including some old faithfuls and some imaginative new software applications. While there were some great new games on view, the definite trend among exhibitors was to more serious user software - business and educational applications.

For instance, Micro-Simplex from England brought with them a very good small retailer's business accounting package which is compatible with Kingtron cash registers. Another good retail store management package was available at the Desktop Computer booth.

Microvision Software displayed two very interesting software packages they have developed, one for farm management and the other, called VET-PET, for veterinary practice management. A factory management program was available for the C64 from England's Direct Data Marketing which would take care of everything from inventory to scheduling and time management.

The World of Commodore was something of an experiment for some exhibitors in the field of educational software. Selling education to schools is one thing, but they weren't really sure if consumers would be interested in specifically educational programs. For Comm Data Computer House and Information Software, at any rate, the experiment proved to be a whopping success as they found out there is a definite market for direct sales of educational software to consumers. So definite, in fact, that Comm Data was completely sold out their "education test market" products by the second day of the show.



The World of Commodore show, marking Commodore's 25th anniversary, contained exhibitors from 6 provinces, 11 U.S. states, as well as England, Sweden and France. Some 38,200 people attended the show, breaking the 35,000 attendance figure of the Canadian show.

The 10,000 square foot Commodore special presentation area was a walk through memory lane to the present, and even expressed some ideas about what everyday life will be like in the future with the growth in sophistication and availability of personal computer products. Visitors saw Commodore's early typewriters, adding machines, calculators, watches, office furniture (even a stair-climbing wheelchair) as well as the original KIM and PET microcomputers, the more recent models, the one millionth VIC-20 and the newest products for home, business, education and portable use, the "B" Series and the Executive 64.

Many of the people who visited the World of Commodore were interested in the 10 seminars which were presented throughout the show. A two-hour sound-and-light show packed the house with standing room only, as did well-known Jim Butterfield in his demystification presentation when he tore apart a personal computer piece by piece, just to show everyone that there really isn't anything

"special" or scary about the innards of a computer. Other popular seminars explained the functions of word processing and data base management, spreadsheets, the education language LOGO, graphics, voice synthesis and COMAL.

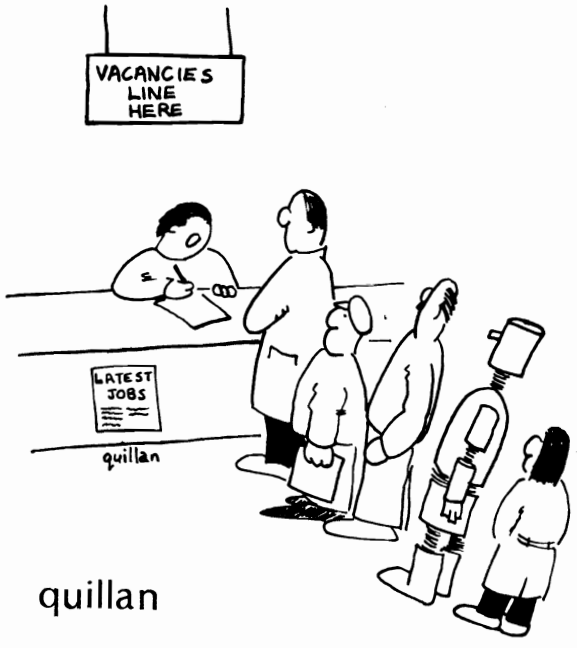
And, if visitors weren't participating in the seminars, they were browsing through the Silent Auction that was managed by Commodore and Toronto radio station CKFM. Items being auctioned included trips for two to Nassau, Montreal and Gray Rocks ski resort, electronics equipment, theatre tickets, limited edition prints, clothing, food and beverages, luggage, furniture and much more. When the bidding was closed on Sunday, more than $17,000 had been raised for Toronto's Hospital for Sick Children and winning bidders went home anticipating the enjoyment they'll receive from their auction items.

The Silent Auction which was held at the World of Commodore show, managed by Commodore and CKFM Radio, raised in excess of $17,000 for Toronto's Hospital For Sick Children by auctioning items such as those pictured here.

Others who went home as winners were the champions of the grand finale of the VIC-A-THON, Canada's biggest computer game competition, sponsored by Commodore and the Variety Club. Held on Sunday at the World of Commodore, 14-year-old Zolton Nyerges emerged as the grand GORF champion, winning a C64 system. Other finalists won prizes such as VIC-20s, bomber jackets and gym bags. Proceeds from pledges competitors collected support the Variety Village for Handicapped Children.

Zolton Nyerges emerged as the grand GORF champion in the VIC-A-THON finals held on December 11 at the World of Commodore show. Proceeds from the VIC-A-THON are going to the Variety Village for handicapped children.

It can't be denied, however, that everyone who attended the World of Commodore went home a winner, because they'd had a chance to view the past, the present, and some ideas for the future of a dynamic company in an exciting industry. This kind of international extravaganza doesn't come along every day, or even every 25 years, and everyone who walked around the World of Commodore left with an appreciation of the fact that they had just witnessed a record of the development of an era.



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ICING ON THE COMMODORE BIRTHDAY CAKE

by BRIAN LUNT — Toronto, ON

The question being asked prior to the World of Commodore Show was simple: Could any personal computer manufacturer muster enough trade and consumer support for a stand alone show?

The number of exhibitors (sixty-eight) failed to reflect Commodore's point of sale strength in the marketplace. Names that were missing included software manufacturers such as HEP and TOTAL both of whom earn considerable revenue from Commodore users.

A refreshingly honest insight came from Allan Reynolds, who handles PR for the manufacturer, "It's difficult to forecast what will happen when you try something different. Hosting this show was in many ways a calculated gamble. We have held four of them in Europe and attendance is about 14,000. For the company it is a question of diverting a few TV spots and newspaper advertisements into a different media and whilst it does not generate immediate hardware sales it does give the software people who support us a chance to improve volume."

Within hours of the show opening an elated Jim Copland was off the hook. The attendance figures speak for us," he said later. "Total attendance was 38,400 which is 3,000 more than the Canadian Computer show drew in November with over 300 exhibitors". Some quick 'off the cuff' calculations reveal why exhibitors enjoyed the show.... assuming a per head spending figure which is constant for both shows then one can also assume a 900% increase in volume average for anyone with a booth in the World of Commodore. On checking out this prognosis I found the Commander Magazine display conspicuous by its absence on the final day and, replacing the missing staff, an eloquent notice saying "sorry, completely sold out".

The TPUG stand had a cheerful Chris Bennett and his merry sales-persons adding over 300 new members plus $$$$$? revenue from a special show disc.

If there was any complaint to be heard then it came from my wallet. Frankly, I had no intention of spending the amount of money which I did but few of us can resist a bargain.

I found Disks at $23 a box and a copy of Compute's newly-released "64 Graphics" being discounted 25%. Looking for trends I observed most exhibitors using the 64 machine and an increasingly large number of software houses writing business programs for it.

Micro-Simplex had a display hooking a stock-sales package to a King cash register and Abraxas, an Australian company, had both Auto Dealer and Auto Repair Shop programmes. Direct Data was demonstrating a triple disc package called Factory Manager. This is a Commodore approved set and covered a wide range of applications including Inventory, scheduling, man hours, product-parts building and product breakdown. The price ($350) seemed far too low for this type of system but the printouts were very impressive.

Laura Dineen, making her first trip north of the border, was delighted with the reception Kaola Technologies was getting with its Kaola Pad and took time for a demonstration. I liked it and it's an impressive way to doodle. Graphics, squares, triangles, blocks and all in pretty colour. Everything was savable to a disc drive but not to a printer. A utility program which solves that issue is arriving in March.

I questioned only two educational houses and both talked of adding consumer sales to existing institutional outlets. Rav MacIntosh at Informatics

COVER STORY

Software explained his view of what he believed was a developing trend.."Combine the explosive growth of home computer sales with the parents' desire to get away from games and you can see the potential."

We saw it but underestimated it. What we brought to the show was completely sold out on opening day." Larry Jones told a similar story on the Comm-Data booth. "It cost a bundle to repack our product," he told me, "but the interest proves our belief in this diversification." Games-nuts had a bonanza with many of the top games being discounted and Remik Software had a busy time selling its 5 new games for the 64 and 7 for the Vic 20. The Slough, England company were making a first direct offering in North America and generating lots of volume for their $14.95 tapes only display. Whizz Kids had a combination that drew plenty of attention. A learning package for the 64 plus four games plus a word processing combination and all for $40.

I never got to see my favourite game but it holds that title simply because of a salesman's description:...BMB offered five bucks off the usual $35 for their new (not so new) Pro-Golf. I was awed when he told me, "It's close to honest of God Golf...It's strategic...It's sophisticated... It's got 18 holes and 14K of Algorithms. I guess they never played that kind of course in the Canadian Open !!"

Staunch supporter of TPUG, 2001 people had a robot wearing the club button.

The robot spent most of its time dodging kids intent on putting leaflets in front of its eyes. I asked Inventor Jack Becker what happened to the elastic band? "Gone with the Do-do bird," said Jack and, pointing to an unmentionable place, he explained how "RANDY ROBOT" (Who thought up that name and advertised he could do everything?) was rejuvenated with a dose of disc drive.

For the man who has everything one could shop at the Tycor stand and buy a top of the line power filter for a mere $25,000! (No I didn't!) One item I purchased was unintentional....I spotted a 1650 Auto Modem on the Microtechnic stand.

"You're third in line to buy it," said President Joe O'Hara. The modem, not yet available in Canada, was not for sale and brought only to demonstrate with and Joe told me that they are still not easily available in the USA. I spent the next 30 minutes getting the lowdown on Joe's latest creation,the Smart 64 terminal +2.

Torpet carried a write-up on this last June and the new version is beautiful. It cost $50 bucks and seems like a purchase I'm going to spend many happy hours with. This latest version gets me in and out of Compuserve and other Boards like Jumpman and it uploads and downloads like a dream. This plus two version has the old goodies plus the ability to take two drives, allows you to name your own files, runs any printer and can support the Video Pak 80. Now a lot of that is above my head but I have a 27 page manual and a lot of faith. I also like its 'Snap-shot' feature which lets me print any screen at any time.

My normal, procedure on Compuserve is to spend 59 minutes of every hour going back to the help section and just one minute doing something. I'm going to start by getting hard copy of the aforesaid 'H' screen and save some money. Nice also is the auto entry that saves me looking up the password and user number (one key stroke for each of them). Joe showed me a new book currently being circulated in the trade called 'The Computer Phone Book'. It seems like an A to Z primer on telecommunicating.

I've never understood how you can pack all those letters into a tiny silicon chip but at least I've now seen it done. Jason Ranheim had an Eprom burner called the Promenade C1 and it stored and loaded faster than a disc drive now does. I still don't understand it but I have learned that it's Jedec and Rom Compatible.

---

a ylimaki

5 1/4 inch DRIVES are fine...except off the first tee in front of the clubhouse.

VIC-20

GOSUB

C64

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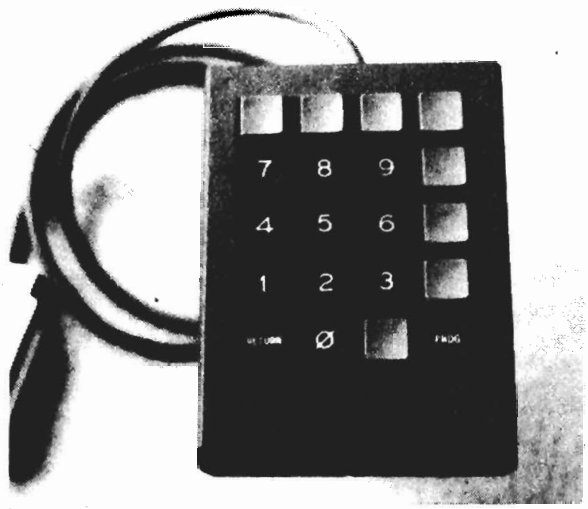

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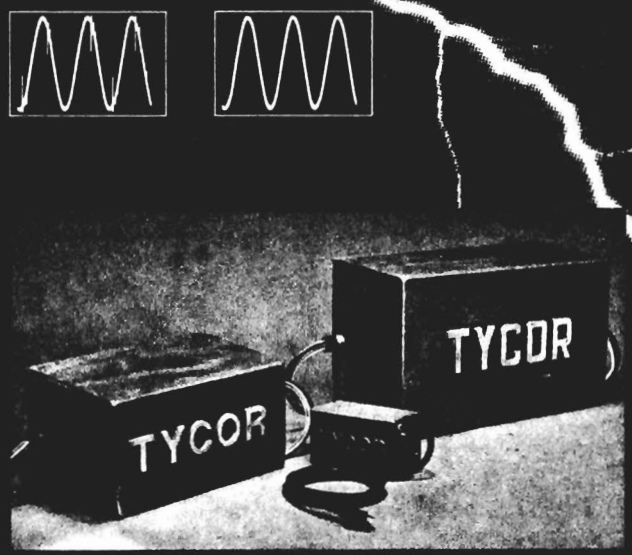

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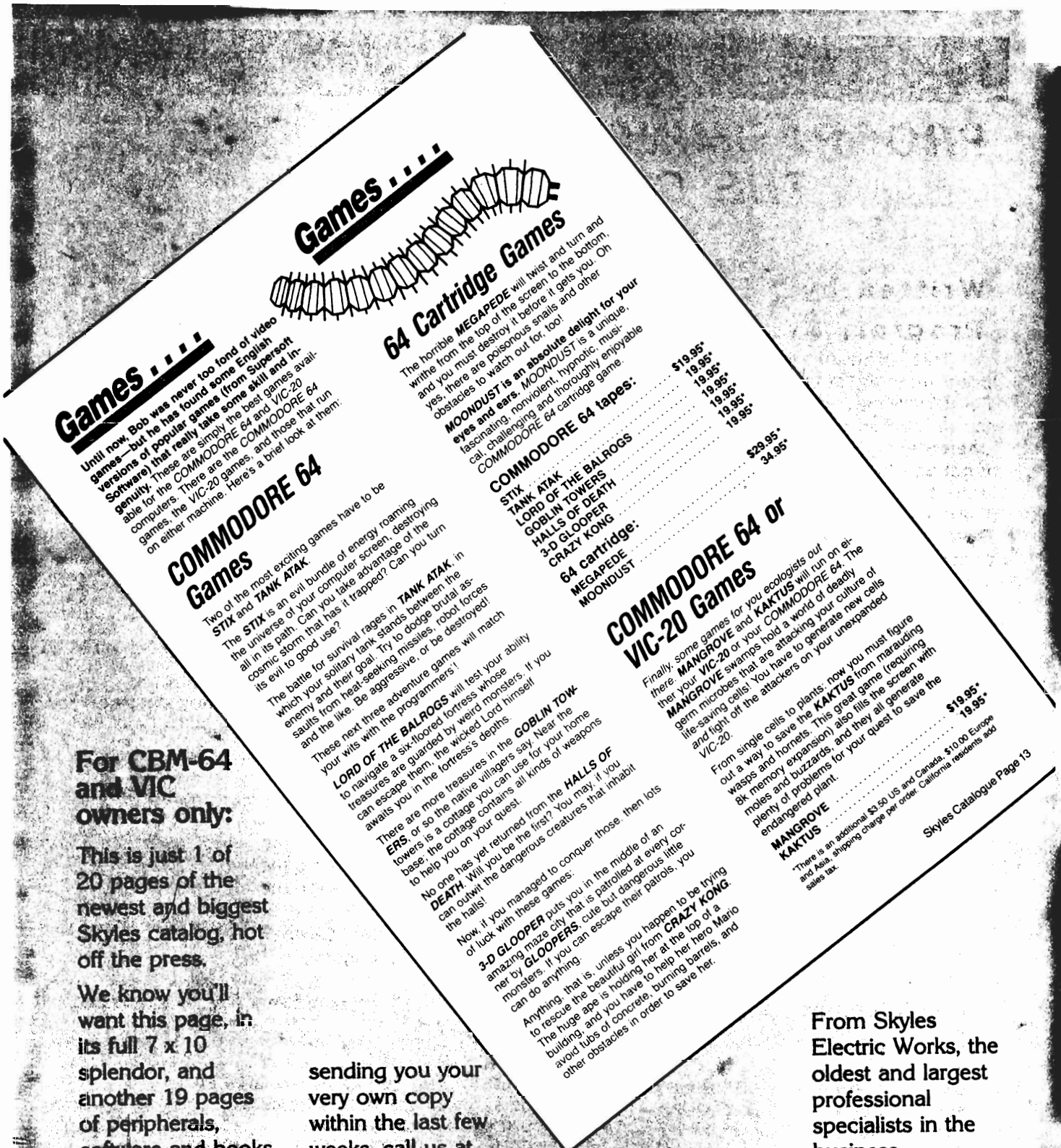

Games . . . .

Until now, Bob was never too fond of video games—but he has found some English versions of popular games (from Supersoft Software) that really take some skill and ingenuity. These are simply the best games available for the *COMMODORE 64* and *VIC-20* computers. There are the *COMMODORE 64* games, the *VIC-20* games, and those that run on either machine. Here's a brief look at them:

COMMODORE 64 Games

Two of the most exciting games have to be ***STIX*** and ***TANK ATAK***.

The ***STIX*** is an evil bundle of energy roaming the universe of your computer screen, destroying all in its path. Can you take advantage of the cosmic storm that has it trapped? Can you turn its evil to good use?

The battle for survival rages in ***TANK ATAK***, in which your solitary tank stands between the enemy and their goal. Try to dodge brutal assaults from heat-seeking missiles, robot forces and the like. Be aggressive, or be destroyed!

These next three adventure games will match your wits with the programmers'!

LORD OF THE BALROGS will test your ability to navigate a six-floored fortress whose treasures are guarded by weird monsters. If you can escape them, the wicked Lord himself awaits you in the fortress's depths.

There are more treasures in the ***GOBLIN TOWERS***, or so the native villagers say. Near the towers is a cottage you can use for your home base; the cottage contains all kinds of weapons to help you on your quest.

No one has yet returned from the ***HALLS OF DEATH***. Will you be the first? You may, if you can outwit the dangerous creatures that inhabit the halls!

Now, if you managed to conquer those, then lots of luck with these games:

3-D GLOOPER puts you in the middle of an amazing maze city that is patrolled at every corner by ***GLOOPERS***, cute but dangerous little monsters. If you can escape their patrols, you can do anything.

Anything, that is, unless you happen to be trying to rescue the beautiful girl from ***CRAZY KONG***. The huge ape is holding her at the top of a building, and you have to help her hero Mario avoid tubs of concrete, burning barrels, and other obstacles in order to save her.

64 Cartridge Games

The horrible ***MEGAPEDE*** will twist and turn and writhe from the top of the screen to the bottom, and you must destroy it before it gets you. Oh yes, there are poisonous snails and other obstacles to watch out for, too!

***MOONDUST* is an absolute delight for your eyes and ears.** *MOONDUST* is a unique, fascinating, nonviolent, hypnotic, musical, challenging and thoroughly enjoyable *COMMODORE 64* cartridge game.

COMMODORE 64 tapes:

STIX	$19.95*
TANK ATAK	19.95*
LORD OF THE BALROGS	19.95*
GOBLIN TOWERS	19.95*
HALLS OF DEATH	19.95*
3-D GLOOPER	19.95*
CRAZY KONG	19.95*

64 cartridge:

MEGAPEDE	$29.95*
MOONDUST	34.95*

COMMODORE 64 or VIC-20 Games

Finally, some games for you ecologists out there. ***MANGROVE*** and ***KAKTUS*** will run on either your ***VIC-20*** or your *COMMODORE 64*. The ***MANGROVE*** swamps hold a world of deadly germ microbes that are attacking your culture of life-saving cells! You have to generate new cells *and* fight off the attackers on your unexpanded *VIC-20*.

From single cells to plants: now you must figure out a way to save the ***KAKTUS*** from marauding wasps and hornets. This great game (requiring 8k memory expansion) also fills the screen with moles and buzzards, and they all generate plenty of problems for your quest to save the endangered plant.

MANGROVE	$19.95*
KAKTUS	19.95*

*There is an additional $3.50 US and Canada, $10.00 Europe and Asia, shipping charge per order. California residents add sales tax.

Skyles Catalogue Page 13

For CBM-64 and VIC owners only:

This is just 1 of 20 pages of the newest and biggest Skyles catalog, hot off the press.

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PROGRAMMING THE COMMODORE 64's FUNCTION KEYS

Written by: Paul Thompson & Ron Radko

Program by: Ron Radko

This program is designed to allow the programming of the FUNCTION keys. Each FUNCTION key may be programmed with up to 10 characters including multiple RETURN characters. The RETURN character(s) will function as a typed carriage return and can be used more than once for each FUNCTION key. e.g. you can type LIST <cr> RUN <cr> * and that FUNCTION key, when pressed, will LIST and then RUN the program in memory.

To program the FUNCTION keys, RUN program 1. There will be a slight pause while the machine language is POKEd into place, and then the computer will prompt you with:

F1=?

You can now program the F1 key with a maximum of 10 characters, and press RETURN. The computer will prompt you with:

F2=?

This cycle will repeat until you have programmed all eight of the FUNCTION keys (or defaulted by pressing RETURN). The program will then NEW itself to give the user full memory capacity.

While this program is totally user transparent, by hitting the RUN STOP/RESTORE keys, you must type:

SYS 12*4096 <cr>

This will restore the FUNCTION keys to their previous values.

* carriage return is a back arrow (<-). <cr> is a carriage return.

Program 1 is the disassembly of the machine language routine and is provided here for the interested assembly language programmers.

Program 2 is what you type in. Save it before you run it (in case it crashes).

PROGRAM 1 — DISASSEMBLED MACHINE CODE

```
2
20:     C000                    .OPT P4,00
30:     C000                    *=   $C000
40:     C000           NOKEYS   =    $C6      ;NO OF KEYS IN BUFFER
50:     C000           INKEY    =    $D7      ;LAST KEY PRESSED
60:     C000           IRQVEC   =    $0314    ;IRQ VECTOR
70:     C000           IRQRTN   =    $EA31    ;NORMAL IRQ ROUTINE
71:     C000           BUFFER   =    $0277    ;BEGINNING OF KEYBOARD BUFFER
80:     C000 78                 SEI
90:     C001 A2 0D              LDX  #<NEWIRQ ;SET THE IRQ ROUTINES
100:    C003 A0 C0              LDY  #>NEWIRQ ;TO START AT THIS
110:    C005 8E 14 03           STX  IRQVEC   ;PROGRAM
120:    C008 8C 15 03           STY  IRQVEC+1
130:    C00B 58                 CLI
140:    C00C 60                 RTS           ;RETURN TO BASIC
150:    C00D 48        NEWIRQ   PHA           ;BEGINNING OF NEW IRQ ROUTINE
```

```
150:  C00E 8A              TXA          ;SAVE ALL REGISTERS
150:  C00F 48              PHA
150:  C010 98              TYA
150:  C011 48              PHA
160:  C012 A5 D7           LDA  INKEY   ;GET THE LAST KEY PRESSED
170:  C014 C9 85           CMP  #133    ;CHECK IF IT IS ONE OF
180:  C016 F0 25           BEQ  F1START ;THE FUNCTION KEYS
190:  C018 C9 89           CMP  #137
200:  C01A F0 38           BEQ  F2START
210:  C01C C9 86           CMP  #134
220:  C01E F0 4B           BEQ  F3START
230:  C020 C9 8A           CMP  #138
235:  C022 F0 5B           BEQ  F4START
240:  C024 C9 87           CMP  #135
250:  C026 F0 6B           BEQ  F5START
260:  C028 C9 8B           CMP  #139
270:  C02A F0 7B           BEQ  F6START
280:  C02C C9 88           CMP  #136
290:  C02E D0 03           BNE  NEXT1
295:  C030 4C BB C0        JMP  F7START
300:  C033 C9 8C    NEXT1  CMP  #140
310:  C035 D0 03           BNE  NEXT2
315:  C037 4C CF C0        JMP  F8START
320:  C03A 4C E2 C0 NEXT2  JMP  MOVEON1 ;IF NOT GO TO END OF ROUTINE
330:  C03D A2 00    F1START LDX #0      ;CLEAR THE X REGISTER
340:  C03F BD EA C0 LOOP1  LDA  F1,X    ;GET FIRST STORED CHARACTER
350:  C042 C9 00           CMP  #0      ;CHECK IF IT IS THE LAST ONE
350:  C044 D0 03           BNE  NEXT3
350:  C046 4C E0 C0        JMP  MOVEON  ;IF SO GOTO TO END
355:  C049 9D 77 02 NEXT3  STA  BUFFER,X ;PUT IT IN THE KEYBOARD BUFFER
360:  C04C E8              INX
360:  C04D E0 0A           CPX  #10     ;CHECK IF THE MAXIMUM
360:  C04F D0 EE           BNE  LOOP1   ;HAS BENN REACHED
365:  C051 4C E0 C0        JMP  MOVEON
370:  C054 A2 00    F2START LDX #0
380:  C056 BD F4 C0 LOOP2  LDA  F2,X    ;SEE ABOVE
390:  C059 C9 00           CMP  #0
390:  C05B D0 03           BNE  NEXT4
390:  C05D 4C E0 C0        JMP  MOVEON
400:  C060 9D 77 02 NEXT4  STA  BUFFER,X
405:  C063 E8              INX
405:  C064 E0 0A           CPX  #10
405:  C066 D0 EE           BNE  LOOP2
410:  C068 4C E0 C0        JMP  MOVEON
420:  C06B A2 00    F3START LDX #0
430:  C06D BD FE C0 LOOP3  LDA  F3,X
440:  C070 C9 00           CMP  #0
440:  C072 F0 6C           BEQ  MOVEON  ;SEE ABOVE
450:  C074 9D 77 02        STA  BUFFER,X
455:  C077 E8              INX
455:  C078 E0 0A           CPX  #10
455:  C07A D0 F1           BNE  LOOP3
460:  C07C 4C E0 C0        JMP  MOVEON
470:  C07F A2 00    F4START LDX #0
480:  C081 BD 08 C1 LOOP4  LDA  F4,X    ;SEE ABOVE
490:  C084 C9 00           CMP  #0
490:  C086 F0 58           BEQ  MOVEON
500:  C088 9D 77 02        STA  BUFFER,X
505:  C08B E8              INX
505:  C08C E0 0A           CPX  #10
```

```
505:   C08E D0 F1            BNE  LOOP4
510:   C090 4C E0 C0         JMP  MOVEON
520:   C093 A2 00    F5START LDX  #0
530:   C095 BD 12 C1 LOOP5   LDA  F5,X     ;SEE ABOVE
540:   C098 C9 00            CMP  #0
540:   C09A F0 44            BEQ  MOVEON
550:   C09C 9D 77 02         STA  BUFFER,X
560:   C09F E8               INX
560:   C0A0 E0 0A            CPX  #10
560:   C0A2 D0 F1            BNE  LOOP5
570:   C0A4 4C E0 C0         JMP  MOVEON
580:   C0A7 A2 00    F6START LDX  #0
590:   C0A9 BD 1C C1 LOOP6   LDA  F6,X     ;SEE ABOVE
600:   C0AC C9 00            CMP  #0
600:   C0AE F0 30            BEQ  MOVEON
610:   C0B0 9D 77 02         STA  BUFFER,X
620:   C0B3 E8               INX
620:   C0B4 E0 0A            CPX  #10
620:   C0B6 D0 F1            BNE  LOOP6
630:   C0B8 4C E0 C0         JMP  MOVEON
640:   C0BB A2 00    F7START LDX  #0
650:   C0BD BD 26 C1 LOOP7   LDA  F7,X     ;SEE ABOVE
660:   C0C0 C9 00            CMP  #0
660:   C0C2 F0 1C            BEQ  MOVEON
670:   C0C4 9D 77 02         STA  BUFFER,X
680:   C0C7 E8               INX
680:   C0C8 E0 0A            CPX  #10
680:   C0CA D0 F1            BNE  LOOP7
690:   C0CC 4C E0 C0         JMP  MOVEON
700:   C0CF A2 00    F8START LDX  #0
710:   C0D1 BD 30 C1 LOOP8   LDA  F8,X     ;SEE ABOVE
720:   C0D4 C9 00            CMP  #0
720:   C0D6 F0 08            BEQ  MOVEON
730:   C0D8 9D 77 02         STA  BUFFER,X
740:   C0DB E8               INX
740:   C0DC E0 0A            CPX  #10
740:   C0DE D0 F1            BNE  LOOP8
1000:  C0E0 86 C6    MOVEON STX  NOKEYS   ;TELL THE MACHINE # OF KEYS IN BUFFE
1010:  C0E2 68        MOVEON1 PLA          ;RESTORE ALL REGISTERS
1010:  C0E3 A8               TAY
1010:  C0E4 68               PLA
1010:  C0E5 AA               TAX
1010:  C0E6 68               PLA
1020:  C0E7 4C 31 EA         JMP  IRQRTN  ;RETURN TO NORMAL IRQ ROUTINES
1030:  C0EA 20 20 20 F1      .ASC "          " ;SPACE FOR THE F1 KEY
1040:  C0F4 20 20 20 F2      .ASC "          " ;SPACE FOR THE F2 KEY
1050:  C0FE 20 20 20 F3      .ASC "          " ;SPACE FOR THE F3 KEY
1060:  C108 20 20 20 F4      .ASC "          " ;SPACE FOR THE F4 KEY
1070:  C112 20 20 20 F5      .ASC "          " ;SPACE FOR THE F5 KEY
1080:  C11C 20 20 20 F6      .ASC "          " ;SPACE FOR THE F6 KEY
1090:  C126 20 20 20 F7      .ASC "          " ;SPACE FOR THE F7 KEY
1095:  C130 20 20 20 F8      .ASC "          " ;SPACE FOR THE F8 KEY
```

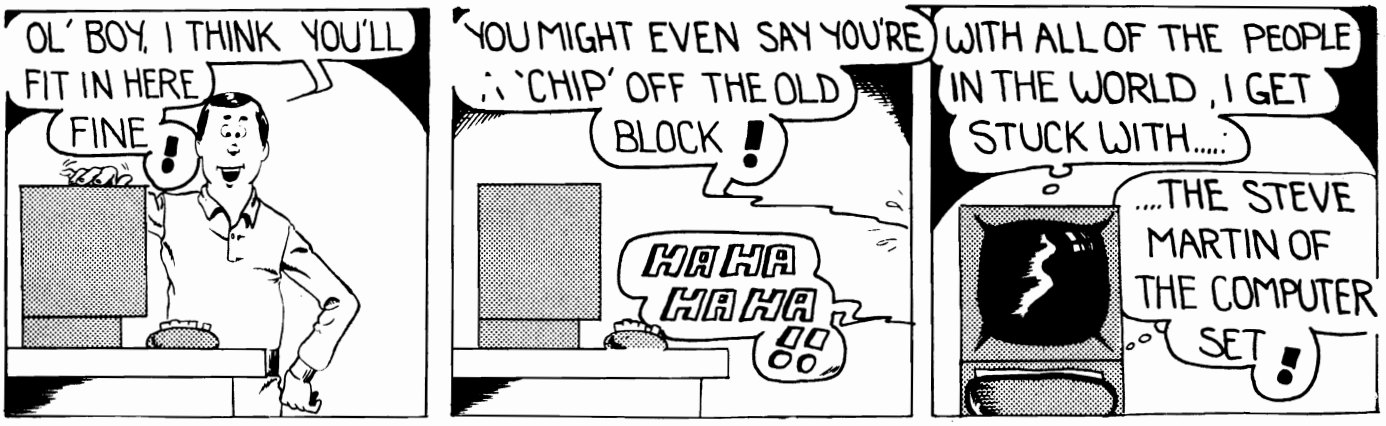
PROGRAM 2 — BASIC LISTING

```
5 FORN=49152TO49385:READA:POKEN,A:NEXT
10 FORN=0TO7
20 PRINT"F"N+1"=";:INPUTF$
30 IF LEN(F$)>10THENX$=LEFT$(X$,10)
40 FORX=1TOLEN(F$)
50 X$=MID$(F$,X,1)
60 IFX$="←"THENX$=CHR$(13)
65 IFX$=""THEN85
70 POKE49385+N*10+X,ASC(X$)
80 NEXT
85 FORR=XTO10:POKE49385+N*10+R,0:NEXT
90 NEXT
100 SYS12*4096
110 NEW
200 DATA 120, 162, 13, 160, 192, 142, 20, 3, 140, 21, 3, 88, 96, 72
201 DATA 138, 72, 152, 72, 165, 215, 201, 133, 240, 37, 201, 137, 240, 56
202 DATA 201, 134, 240, 75, 201, 138, 240, 91, 201, 135, 240, 107, 201,139
203 DATA 240, 123, 201, 136, 208, 3, 76, 187, 192, 201, 140, 208, 3, 76
204 DATA 207, 192, 76, 226, 192, 162, 0, 189, 234, 192, 201, 0, 208, 3
205 DATA 76, 224, 192, 157, 119, 2, 232, 224, 10, 208, 238, 76, 224, 192
206 DATA 162, 0, 189, 244, 192, 201, 0, 208, 3, 76, 224, 192, 157, 119
207 DATA 2, 232, 224, 10, 208, 238, 76, 224, 192, 162, 0, 189, 254, 192
208 DATA 201, 0, 240, 108, 157, 119, 2, 232, 224, 10, 208, 241, 76, 224
209 DATA 192, 162, 0, 189, 8, 193, 201, 0, 240, 88, 157, 119, 2, 232
210 DATA 224, 10, 208, 241, 76, 224, 192, 162, 0, 189, 18, 193, 201, 0
211 DATA 240, 68, 157, 119, 2, 232, 224, 10, 208, 241, 76, 224, 192, 162
212 DATA 0, 189, 28, 193, 201, 0, 240, 48, 157, 119, 2, 232, 224, 10
213 DATA 208, 241, 76, 224, 192, 162, 0, 189, 38, 193, 201, 0, 240, 28
214 DATA 157, 119, 2, 232, 224, 10, 208, 241, 76, 224, 192, 162, 0, 189
215 DATA 48, 193, 201, 0, 240, 8, 157, 119, 2, 232, 224, 10, 208, 241
216 DATA 134, 198, 104, 168, 104, 170, 104, 76, 49, 234

READY.                                                              *
```

Garbyte

by Dan Sloan



REVIEW

BOOK REVIEW....

WORDPRO for COMMODORES

by G.R. Walter — Proton Stn. ON

Available from:

Copp Clark Pitman Ltd.
495 Wellington Street West
Toronto, Ontario
M5V 1E9

Cost is $14.95 (Canadian dollars). The book is spiral bound and has 150+ pages.

WORDPRO for Commodores : A Student Manual was written in an easy-to-read tutorial fashion for the person who knows very little to absolutely nothing about word processing using Professional Software's WORDPRO line of word processors. It is clear and concise in its explanations and gives little examples and exercises for you to type into your computer so that you will get some practice at what you are learning.

It was written with the 8032 (WORDPRO 4+) in mind, but since the other versions of WORDPRO are extremely similar it will prove equally useful to users of the other WORDPRO versions.

WORDPRO for Commodores: A Student Manual has very little new material in it (i.e. commands that haven't been explained elsewhere - like the WORDPRO manual). The reason that you might buy the book is that it takes the material and presents it in an easier to understand form for the computer neophyte.

I give the book a rating of 8.1 out of 10. *

WORD PROCESSOR REVIEW ....

TOTL TEXT

by Rich Westerman — St. Anne IL

TOTL TEXT 2.6, word processor for C-64 & VIC. TOTL Software, Walnut Creek, Ca. $44.95. I'm looking forward to using a lot of different word processors. I'm willing to bet that I won't find a better deal than this one, though. For $45, you get a very powerful piece of software. For instance: compatibility with a wide range of printers, text processor in BASIC (can be easily modified for your special needs), I/O routines in machine language for fast printing, loading, and saving. Easy scrolling up and down through text, columnar tabs, works with 80 columns automatically. Want more? How about full margin control? Block move and block delete? The processor is menu-driven so that even a novice like myself is writing fancy-looking letters within a few minutes. I wasn't happy with the colors on changing formatting and color. Owners of much more expensive word processors have lamented their inability to adjust their software to a more readable color scheme. The only problem I have with it so far, is that sometimes my block-moves have a nasty habit of re-arranging themselves in spite of my instructions.

I recently received a review copy of the new TOTL word processor. It's to be released to registered owners of TOTL TEXT in Oct. The revisions made in this version are significant and make it an even better package than before. A 3rd menu has been added: UTILITY. This menu is a disk handling utility which is intended to be used within the program. Commands include: directory, rename, scratch, validate, and format (new a disk). It's now possible to append files, and global search has been added. Like I said before, recommended.

Like I said at the beginning, this is the only word processor I've worked with, but if I find a better word processor at a lower price, I'll sure be surprised. *

FOR/NEXT WITH: CHIPP!

HI, THIS IS THE FIRST IN A SERIES OF LESSONS ON FOR/NEXT LOOPS!

A FOR/NEXT LOOP CAN BE USED SO MANY WAYS, IT IS DIFFICULT TO EXPLAIN IN JUST ONE LESSON.

THE FOR/NEXT LOOP IS BASICALLY A COUNTER, USED TO CONTROL THE NUMBER OF TIMES A CERTAIN OPERATION IS CARRIED OUT.

1, 2, 3, 4, 5, 6, 7, 8, HO HUM

THIS IS WHAT IT LOOKS LIKE IN A PROGRAM:

```
10 FOR X = 1 TO 10
   [ Operation ● ]
20 NEXT X
```

IN THIS PARTICULAR SITUATION, THE COMPUTER WILL CARRY OUT THE OPERATION TEN TIMES.

CHIPP'S OFFICE

WHEN THE COMPUTER COMES TO LINE 20, (NEXT X) IT ADDS 1 TO X. IF X IS GREATER THAN THE LIMIT GIVEN IN LINE 10, THEN IT WILL STOP REPEATING AND GO ON.

MIKE RICHARDSON

HERE'S AN EXAMPLE LOOP PROGRAM TO TRY:

```
10 FOR X = 1 TO 10
15 PRINT X
20 NEXT X
25 PRINT "END"
```

LOOP

THIS MINI-PROGRAM ILLUSTRATES HOW THE VALUE OF X CHANGES EACH TIME THE LOOP IS EXECUTED.

ALSO, NOTICE HOW ONLY OPERATIONS WITHIN THE LOOP ARE REPEATED. TRY CHANGING LINE 25 TO LINE 17. EXPERIMENT.

CLICK!

NOTE: BY THE WAY, "X" CAN BE ANY VARIABLE YOU WANT TO USE. JUST MAKE SURE THAT THE SAME VARIABLE APPEARS AFTER "NEXT" IN YOUR PROGRAM.

MORE DETAILED EXPLANATIONS LATER. BYE!!

VICAID

by Paul McClay

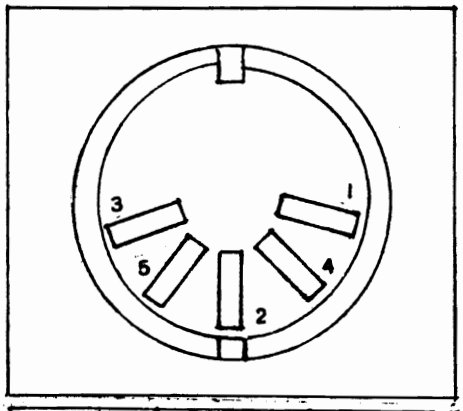
Traverse City MI

I have a VIC-20 and I enjoy using it to play music. Though not exceptional, the VIC's sound generator is quite good and my TV speaker just didn't do it justice. Even with a respectable speaker I would be restricted. What if I wanted to record my latest works? Or experience the sound of some good speakers? I'd be out of luck. What I needed was some way to wrest the VIC's voice from the clutches of the RD modulator and make it avalable to bigger and better things. So I created the VIC Audio Interface Device, or VICAID.

The idea behind VICAID was to divert the audio signal before it got to the RF and leave it free to plug into whatever you had in mind (and in hand). No electronic genius is needed to understand and assemble VICAID. In fact, it's so simple that I refused to believe it would work until it was plugged in and signing away!

If you have the VIC manual or Programmers Reference Guide you may have noticed in the back a bunch of diagrams showing the pinouts for all of the I/O ports. You may also have noticed the one which says "Audio/Video" over it, yes that one, it looks something like this:

figure 1



PIN#	TYPE	NOTE
1	+5V REG	10mA MAX
2	GND	
3	AUDIO	
4	VIDEO LOW	
5	VIDEO HIGH	

All we need be concerned with are pins two and three. Pin two is the ground. This is nothing more than a common point and, if your computer is hooked up right, will eventually wind up in the earth. It is used more or less as an electronic dump. Pin three is the audio signal. This is the VIC's voice and it is this pin that we are after. To get a signal that you can plug into the microphone jack on most audio equipment simply connect the audio signal and the ground to opposte sides of a phono plug (or similar connector). If you were successful, the audio signal would flow in one side of the plug, through the detector in your stereo and down into the ground. Now that's not so hard is it?

VICAID is really nothing more than a box with some wires and a switch in it. The only experience needed to assemble VICAID is a little soldering. If you don't know how to solder find a friend who does and have him/her teach you.

Before you start, read everything through twice. Collect the following:

1 5 pin DIN plug
1 5 pin DIN socket
1 single pole-double throw switch
1 plug (whatever fits your equipment)
some medium fine wire
a box to put it all in
a length of two conductor cable
a length of five conductor cable

If you don't have any five conductor cable you can make some by threading five wires through a piece of tubing, likewise with the two conductor cables. A local Radio Shack should carry some experimenter boxes, you won't need a big one. Make holes for the two cables, the switch and the DIN socket. Attach the switch and the DIN socket to the box. They

should come with screws. Solder each wire of the five conductor cable to a pin on the DIN plug. Feed the cable through the appropriate hole in the box and label each wire by pin number. You can do this by pulling on a wire at one end and watch what moves at the other end. Tie a knot in the cable just inside the box so it won't pull loose.

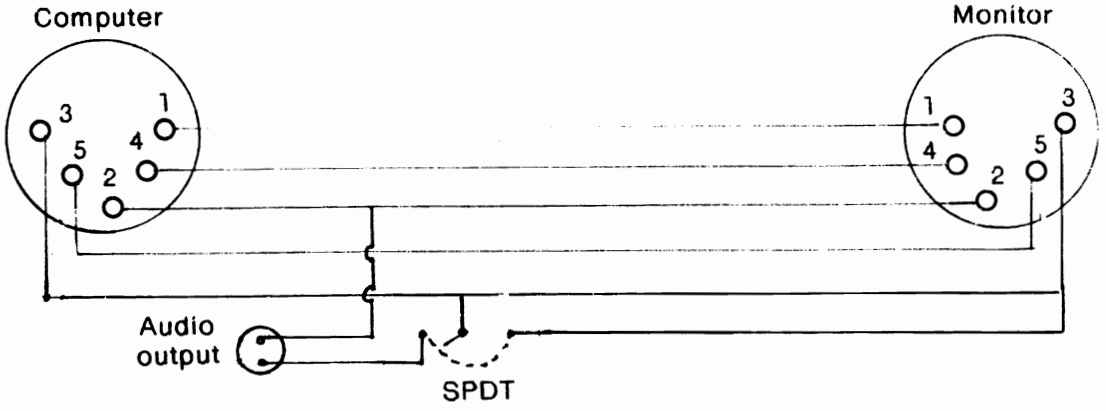
-NOTE- Figure 1 depicts the face of the socket or the back of the plug. For the back of the socket or the face of the plug reverse the diagram. Be careful!

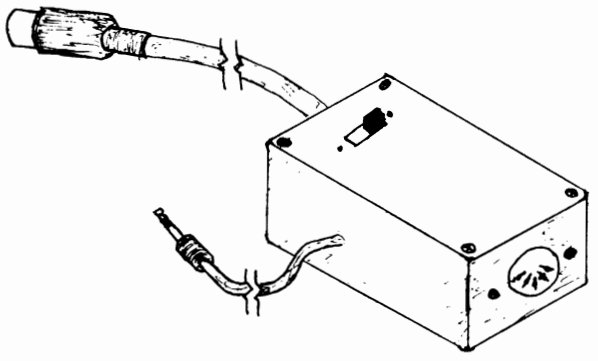
Solder wires one, four and five to the matching terminals on the socket. Double check everything as you go. Solder wire three to the center terminal on the switch (there should be three). Solder one end of a short wire to one of the outside terminals on the switch. Solder the other end to pin three on the socket. Pass the double conductor cable through its hold. Don't forget the knot. Solder one wire to the remaining terminal on the switch. Solder the other wire and wire two of the DIN plugs to pin two on the socket. On the other end of the double conductor, solder one wire to each of the terminals on the plug.

Check everything again. Are there any "bridges" or shorts between any of the terminals or wires? If not then close the box. Congratulations! you have just built a VICAID. Are you sure you did everything right? If you think so, then plug it into the port on the back of your VIC (or C64). If you have a VIC then plug the cable to your TV into the box. Attach the remaining cable to some sort of amplifier and you're ready to go. With the switch in one postion you will get sound as usual from your TV. In the other position your computer's voice is limited only by your imagination.

If you lack the time or inclination to build your own send $15 to:

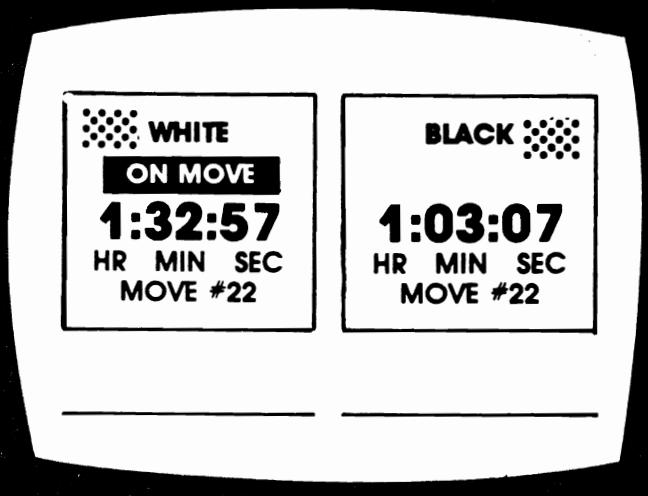
Paul McClay
6330 Peninsula Dr.
Traverse City, Michigan 49684
U.S.A.





*

The clock: As essential to Chess as the doubling cube is to Backgammon.



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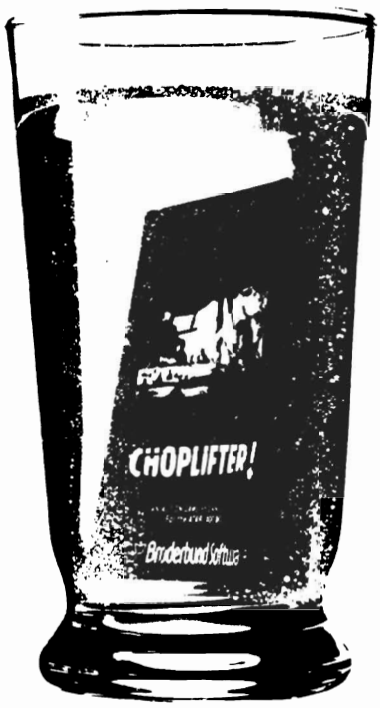

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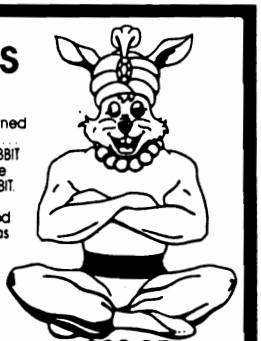

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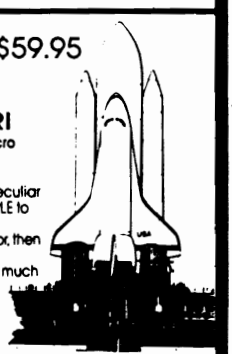

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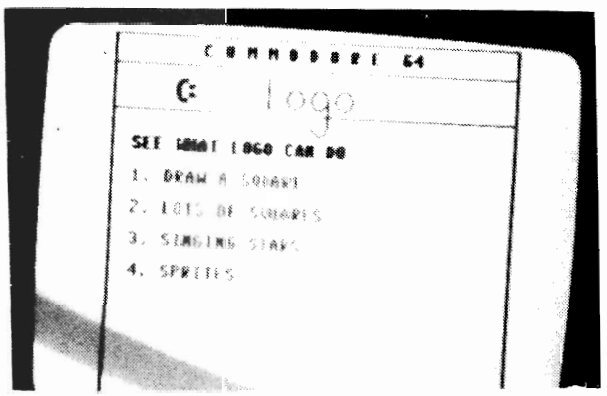
LOGO FOR THE COMMODORE 64: A REVIEW

by Dr. Efraim Halfon
Burlington, ON



Logo, the language developed at the Massachussetts Institute of Technology in the 1970's, is now available also for the Commodore 64. Up to now, it was only available for other microcomputers such as the Apple, Texas Instruments and Radio Shack. Logo is also well-known as turtle graphics, because of its graphics capability which uses a turtle as an indicator of where lines should be drawn. Over the years, Logo has become immensely popular, especially in the school systems, and now several clubs and magazines deal only with Logo (see Table 1 for some names, addresses and references). Logo, however, is not only turtle graphics; it is also mathematics, words and lists analysis, sprites, graphic characters and simple music. The whole 64K of memory are used by Logo with about 14K available to the user for storing the procedures (or programs). Table 2 shows the memory allocation in the "64".

Why is Logo so successful? The main feature of Logo is that the users, often children of age three to 15, can teach the computer, or program one's ideas very easily with turtle graphics. The computer is not used as a driller, where the user is only a passive spectator feeding answers to the computer, but as a tool which is under complete control of the user. Children then can easily learn how to control the computer, and by doing things learn the basics of programming, without being afraid of being mistaken. In Logo, there are no mistakes, only learning through debugging. For example, to move the turtle forward, the command is FORWARD n, where n is a number. FD 100 (the abbreviated form) will move the turtle 100 steps.

The Turtle can be turned right with the command RIGHT 90, where 90 is the number of degrees in a right angle, or LEFT, or BACKWARDS, while writing a line (PENDOWN) or not writing (PENUP). Once these basic commands are learned, the next step is to draw figures, for example, a square. The user defines a procedure, called, for example, TO SQUARE, or TO B2D2, or any other name. Logo then enters edit mode. A program to draw a square would then be:

```
TO SQUARE
FD 100
RT 90
FD 100
RT 90
FD 100
RT 90
FD 100
RT 90
END
```

A shorter way of drawing a square of any size, would be, however:

```
TO SQUARE :N
REPEAT 4 [FD:N RT 90]
END
```

The command REPEAT 4 means to do 4 times the commands in the square parentheses and :N is the length of the square side.

Once defined, the procedure SQUARE is now available to be used in other procedures. For example:

```
TO FLOWER :LEAVES :N
REPEAT LEAVES [SQUARE :N RT
  360/:LEAVES]
END
```

draws a schematic flower with :LEAVES number of schematic square leaves of length :N. With very few combinations of procedures, complex graphic figures can be created. For example, try PENCOLOR 0 FLOWER 90 90 PENCOLOR 1 FLOWER 10 30.

Usual projects include a face, a person, a house, a propeller, a flower, a car, etc. Table 3 shows some other programs, or procedures, for projects with turtle graphics. Incidentally, the name turtle originates from a mechanical device that was developed at MIT when the language was developed. At the time, early 70's, the microcomputers with today's capabilities did not exist, and therefore all commands were transferred to a turtle with wheels which roamed along the floor. This mechanical turtle is still used today in schools and it is particularly useful in the education of retarded children and children unable to control their body fully. By controlling the mechanical turtle via a simplified keyboard, the children can have control on the outside world, sometimes for the first time. Experiments along this line have proven very successful.

MATHEMATICS

Another aspect of Logo is its mathematical ability. Mathematical operations, such as addition or multiplication, can be integrated with turtle graphics to provide a visual relation between numbers and their geometrical meaning. Plotting of curves such as circles, paraboles and hyperboles take only a few commands. Analytical geometry thus becomes much easier to understand through continuous feedback between the user and the computer.

WORDS AND LISTS

Even though Logo is often associated with turtle graphics, its power also lies in its ability to handle words, lists in a manner that the computer responses seem to show intelligence. Seveal computers on the market cannot handle lists and words because of memory limitation. The Commodore 64 with 64K of memory is very apt to handle this part of Logo. Indeed, it would have been a pity if words and lists were left out.

Table 4 shows a simple procedure called FRIENDLY which can be saved and put at the beginning of each program to welcome old and new Logo users.

SPRITES

The Commodore 64 is well-known for its ability to handle eight sprites at a time and for its ability to play music. Logo also incorporates this feature, even if in a limited way because of memory constraints. Each of the eight sprites, 0 to 7, can be defined and moved independently. Sprite 0 is the turtle shape. Logo incorporates a Sprite editor which can be used to design sprites. The Sprite editor is fairly simple to use and, once edited, the sprites can be saved in memory for future use. Animation of sprites can be done by modifying slightly the shape of a sprite and then by displaying them one at a time. Animation, however, limits the number of different available sprites since only eight can be kept in memory. As you can recall, the Commodore 64 in its regular form can store a large number of sprites in memory, even if only eight can be displayed on the screen. Logo uses much of the 64K of memory and therefore a compromise must be made in some applications between animation and a choice of different sprites. However, if in a program execution some delay is allowed, then new sprite shapes can be read from disk. Sprites are also a feature of the Texas Instruments microcomputer, which can handle 32 sprites at a time on the screen. However...the TI microcomputer is no longer produced.

Table 5 shows some commands that can be used with sprites and a small procedure used to stimulate an explosion.

Music: Only one voice can be used at a time to play a tune. Music in Logo,

however, is not used to produce complex and rich (three voices) melodies, as it is possible to do with the standard configuration and direct access to the music chip. The function of music in Logo is to teach music characteristics, such as pitch and tempo. More advanced users can also design their own sound envelope to simulate different instruments. Using Logo, children and other users can learn about notes, relation among notes, composition and musical phrases. Since only few commands are used, such as PLAY and SING, the user's attention can be focused on the music rather than on PEEK's and POKE's. Music in Logo is a special feature of the Commodore 64. As far as I understand, no other microcomputer has the same musical ability.

DOCUMENTATION

When you buy the Logo package from a dealer at $79.95 (Cdn.) or $59.00 (U.S.) but much less from mail order companies, you receive a book, two floppy disks, and, most important, a postcard to Commodore. The postcard can be used to request a backup copy of your Logo floppy disk, if by any chance it gets damaged. Price for replacement is $5.00 U.S. One floppy disk contains Logo and one contains a large number of indispensable Logo routines (back up this disk right away before doing anything else).

These Logo routines contain a large number of demo programs, a number of sprite shapes, and a number of utility procedures which make the life (and programming) of Logo users much easier.

Among these utility programs, you can find procedures to draw with the joystick, to edit sprites, to play music, to play games, to draw pictures, to understand the Logo manual with living color example programs. The development of these routines must have taken a lot of effort and I am quite happy with the results.

The Logo manual is very well-written. The editing was very accurate, and I found only three misprints. Reading is very pleasant, and all commands, primitives in Logo, are clearly and well-explained. The manual is very comprehensive, indeed, much more comprehensive than the manual of the Apple computer, even if the two versions of Logo are very similar. The only unavoidable drawback in appending machine language programs to Logo is that the machine language routines must share space with the sprites. The locations OCOO to ODFF are used by the eight sprites and the locations OC40-ODFF are available for machine language; thus, one or more sprites may be had to be released if this feature is chosen. Table . 2 shows all memory locations within the 64K. BASIC is gone and the operating system has been completely re-written. An assembler procedure is also included in the utility disk to help create fast machine language procedures. Overall, Logo is a very slow language, because of the large amount of preprocessing done to make the language easy to use. Speed, however, is usually not a consideration in Logo applications. The last part of the manual is dedicated to make the system flexible by using several options. The average user will not be concerned with these features at the beginning.

Commodore graphic characters from the keyboard are all available for use. The manual, however, does not emphasize this important aspect. For this purpose, the user can use the procedure STAMFD :D :CHAR, where D is the distance the turtle moves and CHAR is the character which must be stamped. To let the Logo interpreter know that CHAR is, for example, a letter, a " must precede the letter.

Another useful editing command is SHIFT-INST which quotes the following character. For example, SHIFT-INST followed by CTRL-2 (white) will insert the special character for changing the color to white. Thus,

```
TO REV
PRINT "SHIFT-INST CTRL-2 HELLO
   SHIFT-INST CTRL-7
END
```

changes colors during execution and then returns to the default color.

COMMODORE 64 LOGO: GENERAL REMARKS

This version of Logo is based on the one originally developed for the Apple II and produced by Terrapin Inc. This version is better than the one for the Apple since it offers 29% more user memory plus some unique capabilities such as sprites, music and graphic's characters. The graphics screen is in high resolution, with all the 16 foreground and background colors. Care, however, must be taken when choosing the different combinations of colors, since some may not mix well. The Commodore Reference Guide offers some suggestion to the best combinations. Text and graphics can be mixed on the graphics screen. The turtle can go 129 steps up before wrapping around, and 130 steps down before wrapping around the top. The NOWRAP command eliminates the wrap-around capability if so wished. The turtle can go 160 steps to the left and 159 to the right.

The advanced .OPTION command allows the user to control some of the ways the system operates. Most beginner users would not probably use this feature at the beginning, but it may be quite useful in some instances. Among .OPTION primitives, there are DEPOSIT (POKE) and EXAMINE (PEEK) commands to look at particular memory locations, and JOYSTICK which outputs a number that is the sum of the switch values, when the option N=1 is chosen. This mode is documented in the Commodore Programmer's Reference Guide.

The high resolution graphics screen can be changed to DOUBLECOLOR mode that allows two colors per 8x8 pixel region, instead of just one. The resulting colors will be much richer and easier to see, but drawings are less precise because horizontal lines are thicker, i.e., horizontal resolution is reduced to half. Once a program has been run and a picture created, this can be saved on disk with SAVEPICT. Another useful command to use in graphic mode is the SPLITSCREEN command. The bottom lines (the number can be chosen arbitrarily with a maximum of 13) are used to display the commands while the turtle moves on the graphics screen. On the graphics screen, a useful feature to create the illusion of three-dimension is to use sprites to draw, for example, clouds, cars, trees, etc. The lower the number of the sprite the higher the priority of display and, therefore, one can program a cloud moving in front of the sun or a car driving by and in front of a tree or a house.

Many other system primitives are available in Logo. These primitives can be compared with those of other computers on the market (see BYTE issue, August 1982).

In conclusion, the Logo version for the Commodore 64 compares well with others on the market, and, given its words and lists, sprites, music capabilities and its high-resolution graphics, I believe it to be superior to all others. Users of all ages will enjoy its capabilities, the powerful ideas and its framework directed to problem-solving and computer literacy.

ACKNOWLEDGEMENTS

I would like to offer my most sincere and appreciative thanks to Mr. Laurie Fountain of Commodore Canada for his time and assistance. He gave me access to the Commodore Logo and its manual before marketing in Canada, and provided explanations of programming details. Thank you very much.

* * * * * * * * * * * * * * * * * * * *

TABLE 1
References, Books and Magazines for teaching and using Logo

Abelson, H. and A. diSessa. Turtle Geometry, Cambridge, MA: MIT Press (1981)

Beardon, D. One, two, three, my Computer and Me: a Logo funbook for kids, Reston, VA: Reston Publishing Company (1983)

Beardon, D., K. Martin and J. Muller. The Turtle's sourcebook, Reston, VA: Reston Publishing Company (1983)

Burnett, J.D. Logo: an introduction, Morristown, NJ: Creative Computing (1983)

BYTE magazine, Logo issue, August 1982

Goldenberg, E. Special Technology for Special Children, Baltimore: University Park

Press (1979)

Minnesota Educational Computing Consortium (MECC) Apple Logo in the classroom. MECC Distribution Centre, 2520 Broad Dr., St. Paul, MN 55113

Papert, S. Mindstorms: children, computers and powerful ideas. New York: Basic Books (1980)

Thornburg, D. Discovering Apple Logo, Reading, MA: Addison-Wesley (1983)

Watt, D. Learning with Logo/Learning with Commodore Logo, New York: BYTE Books-McGraw Hill (1984, in press)

Young People's Logo Association, 1208 Hillsdale Drive, Richardson, TX 75081. This association is one of the leading groups in educational Logo. The YPLA has members throughout the world. Young people 18 and under can receive their newsletter, Turtle News, at no charge. YPLA asks adults to contribute US $25 per year to receive Turtle News plus the Logo Newsletter, which is oriented towards adults. YPLA also has exchange disks and tapes at US $10 each or at no charge when exchanged for a working program.

The National Logo Exchange, P.O. Box 5341, Charlottesville, Virginia 22905, publishes a non-commercial newsletter monthly from September through May at a subscription price of US $25.

Computer magazine has a regular feature called Friends of the Turtle, with the latest news on Logo.

*** * * * * * * * * * * * * * * * * * ***

TABLE 2
64K Memory Organization in Logo

Location	Use	Size
0000-00FF	Page 0 (Shared)	1/4K
0100-01FF	Stack	1/4K
0200-03FF	Kernel Internal Storage	1/2K
0400-07FF	Text Screen (matrix)	1K
0800-0BFF	Graphics Matrix	1K
0C00-0DFF	8 sprites and machine language	1/2K
0E00-0FFF	Logo internal storage	1/2K
1000-1FFF	Recursion stack	4K
2000-4000	Graphics Screen	8K
4000-AFFF	Logo interpreter	28K
B000-DFFF	Nodespace	12K
E000-EBFF	Typecodes	3K
EC00-FDFF	Text Strings	4-1/2K
FE00-FF00	Input line	1/4K
FF00-FF8F	UNUSED	1/8K
FF90-FFFF	Kernel, 6510 vectors	1/8K

*** * * * * * * * * * * * * * * * * * ***

TABLE 3
Some Graphic Projects in Logo

A simple procedure can draw a windmill using the repeated shape of a rectangle, thus:

```
TO WINDMILL
REPEAT 4 RECT RT 90
END

TO RECT
REPEAT 2 FD 110 RT 90 FD 10 RT 90
END
```

Note that, in this drawing, the turtle starts from the HOME position in the middle of the screen and ends facing forward. All good Logo routines have the turtle face forward at the end of the complete procedure or series of procedures. In ths way, it is easy to add new routines to add to the complexity or detail of the program.

Circles are very easy to draw; in the following procedure, three smaller and smaller circles are plotted.

```
TO CIRCLE
DRAW  ; This primitive command
   clears the graphic screen
REPEAT 360 FD 2 RT 1
REPEAT 360 FD 1 RT 1
REPEAT 180 FD 1 RT 2
END
```

Once the basic commands are learned, one of the most common activities is to draw figures of things known to children, for example, a rabbit:

```
TO RABBIT
HT; hides turtle while drawing
HEAD ; draws head of rabbit
ARCL 7.5 90; arc left
RT 60
BODY ; draws body
END

TO HEAD
EARS
ARCL 6 540
END

TO EARS
EAR
RT 150
EAR
END
```

```
TO EAR
ARCR 30 60
RT 120
ARCR 30 60
```

```
TO BODY
ARCR 20 60
CIRCLEL 3.5
ARCL 20 60
ARCR 1.5 180
ARCR 20 60
LT 60
ARCR 50 30
ARCL 50 30
ARCR 1.5 180
ARCR 50 30
END
```

****

TABLE 4
Handling Words and Lists

The procedures written in graphics mode are not interactive, in the sense that, once they have been started, they do what they were designed to do without continuous feedback to the user. The Logo ability to handle words and lists allows the reader to program procedures for interactive video programs, quiz programs, programs that write and "understand" language, programs that play games, programs that learn. As it is written in the Logo manual, "Logo's facility with words and lists makes it ideal for writing conversational programs, quizzes, programs that teach and even programs that learn: in short, all programs that need to manipulate lists of information."

For example, this procedure, called FRIENDLY, can learn the names of users and greet them as they log in.

```
TO FRIENDLY
MAKE "KNOWN
PRINT WHAT IS YOUR NAME?
GREET REQUEST
END
```

In this procedure, the list KNOWN is initialized to all blanks. As the procedure is executed KNOWN will contain the names of the users. GREET is a procedure shown later, and REQUEST waits for the user to type the RETURN key. FRIENDLY is the main procedure which calls the "intelligent" procedure GREET.

```
TO GREET :PERSON
IF EMPTY ? :PERSON PRINT OH! YOU MUST BE QUITE SHY! PLEASE TELL ME FRIENDLY STOP
IF MEMBER ? :PERSON :KNOWN PR SE GOOD TO SEE YOU AGAIN :PERSON STOP
PR SE NICE TO MEET YOU :PERSON
MAKE "KNOWN LPUT :PERSON :KNOWN
END
```

In procedure GREET, PERSON is the name of the user. If the user is shy and does not give the name, EMPTY returns a true value and the message OH! YOU MUST BE QUITE SHY! PLEASE TELL ME is printed. FRIENDLY is executed again to give the user a second chance. The procedure MEMBER checks whether the user's name is already in the list KNOWN; if it is, the program greets the user with a welcome again message. If this is a new user, the message NICE TO MEET YOU is printed and the new name is added to the KNOWN list. In this procedure, the command STOP has the same function as a RETURN from subroutine, i.e., control is given back to FRIENDLY and other procedures can continue to be executed.

With other commands, the procedure can even be made more "intelligent" and able to answer to some cooperative responses such as:

```
name
my name is name
people call me name
please call me name
name is my name
I am name
```

and to uncooperative responses such as

```
None of your business!
I won't tell you
I do not want to tell
I am not telling you
What's it to you
Go away
```

Thus, words and lists procedures can be very flexible and, from an educational point of view, users can really learn about the structure of the English lan-

guage by programming these "intelligent" procedures.

****

TABLE 5
Recursion and Sprites

Eight sprites are available in the Commodore 64 Logo. These can be displayed simultaneously on the screen as in the following procedure which simulates an explosion with each sprite going in a different direction at once. The following procedure shows several Logo features, including using some sprite shapes that come on the Utility Disk, making all sprites the same shape and same color, or even different colors, loops and other Logo features. The execution is not very fast, the Logo interpreter has to be involved at all times, and machine language routines cannot be included in the program since they use the same memory space as the eight sprites. As mentioned in the text, however, speed is not the essential thing in Logo, but rather the programming effort is. The reader is encouraged to type the program in, store it and then make changes, such as using different shapes for the sprites (the butterflies are really nice), colors, and to try different ways of writing loops. The effort will be both pleasant and interesting.

```
TO EXPLOSION
PU ; pen up
DRAW ; clear screen
NOWRAP
MAKE "TIMES 0
CS BG 3; change background color
READ "SPRITES ; access utility disk
READSHAPES "SHAPES ; copy shapes

FULLSCREEN
BANG
END

TO BANG
MAKE "CURRENT (-1)
LOOP: MAKE "CURRENT :CURRENT + 1
PENCOLOR 0
PENUP
SETXY 0 0
IF :CURRENT =8 GO "RUN
TELL :CURRENT SETSHAPE 3 ; make
   all sprites the same shape
GO "LOOP ; first example of loop,
   similar to BASIC
RUN: TELL 0 SETSHAPE 2 PENCOLOR 1
  WAIT 1000 PENCOLOR 3 SETSHAPE 3
SPREAD
EXPLODE :TIMES
PU MAKE "TIMES 0
BANG
END

TO SPREAD
MAKE "CURRENT 8
LOOP: MAKE "CURRENT :CURRENT - 1
   ; decreasing loop
TELL :CURRENT PENCOLOR 0 ; set
   color of sprite
SETHEADING :CURRENT * 45; direc-
   tion sprite is moving to
PU
FD 25 ; move forward 25 steps
IF :CURRENT =0 STOP ; stop means to
   return to the calling routine
GO "LOOP
END
```

As mentioned above, changes can be made in the procedures by modifying the number in SETSHAPE and the file read by READSHAPES. Note that, in this program, the Turtle, sprite 0, now has the shape of a small ball. To stop execution, the simplest way is to type CONTROL-G. A more elegant way is to include in procedure BANG or SPREAD some lines of code which check whether the user has pushed any key, and then stop the program. This exercise is left to the reader. Also note that the STOP command only stops the procedure it is in, while other procedures continue to execute.

---

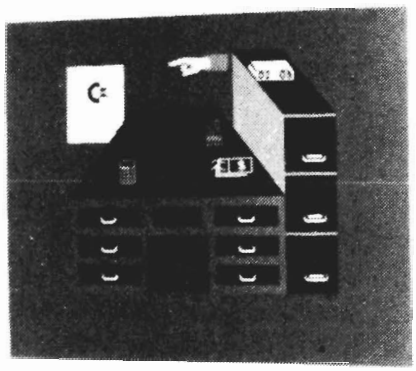
a ylimaki

What's all this nonsense about an APPLE a day? For perfect health take vitamins A, B-6 and C-64.

COMMODORE'S MAGIC DESK

COMMODORE INTRODUCES

MAGIC DESK



THE ULTIMATE FRIENDLY PROGRAM

Commodore Computer's new MAGIC DESK software series is an entirely new direction for home computer software.

MAGIC DESK is unique for the home market. It produces an animated, full-colour desk on your television screen. There is a typewriter, index file, telephone, calculator and financial journal on the desk, and a wastebasket under it. There is also an artist's easel and a vertical filing cabinet with a digital clock on top of it.

To use any feature of the MAGIC DESK, you can use a joystick, trackball or mouse to move a pointing finger to one of the objects on the screen.

The first package in the MAGIC DESK series is called "MAGIC DESK I - Type and File" and comes in plug-in cartridge for the Commodore 64. The cartridge activates the typewriter, index file and related editing and filing features of the animated desk. Future packages will provide calculating and budget capabilities, artistic and educational applications.

MAGIC DESK is a truly multi-national software package because it uses no language instructions. All instructions and menus are pictorial, using symbols which Commodore calls "metaphors".

It doesn't matter if the user speaks English, French, German or any other language, because the metaphors make it easy to use the MAGIC DESK. Computer metaphors, which are pictorial symbols representing specific computer functions, control all aspects of the MAGIC DESK program, from selection of features to individual menu items. International symbols have been used wherever appropriate.

An example of a MAGIC DESK metaphor is the picture of a scrolled sheet of paper which appears at the bottom of the screen when you're using the typewriter. After having typed a page you can move the pointing finger to the scrolled sheet, pick it up and move it to the file cabinet. There are three drawers, with 10 files in each drawer and 10 pages in each file. You can give the files any titles you wish, and move the pages you've typed from one file to another, or copy the pages into several files. All of the pictorial files you see on the screen are linked to a Commodore floppy disk drive, which actually stores the information. You can print out the information on a printer just as easily.

Commodore's Magic Desk software uses pictoral symbols to depict the different business applications the Magic Desk will perform, including word processing, data base management, file storage, calculations and telecommunications.

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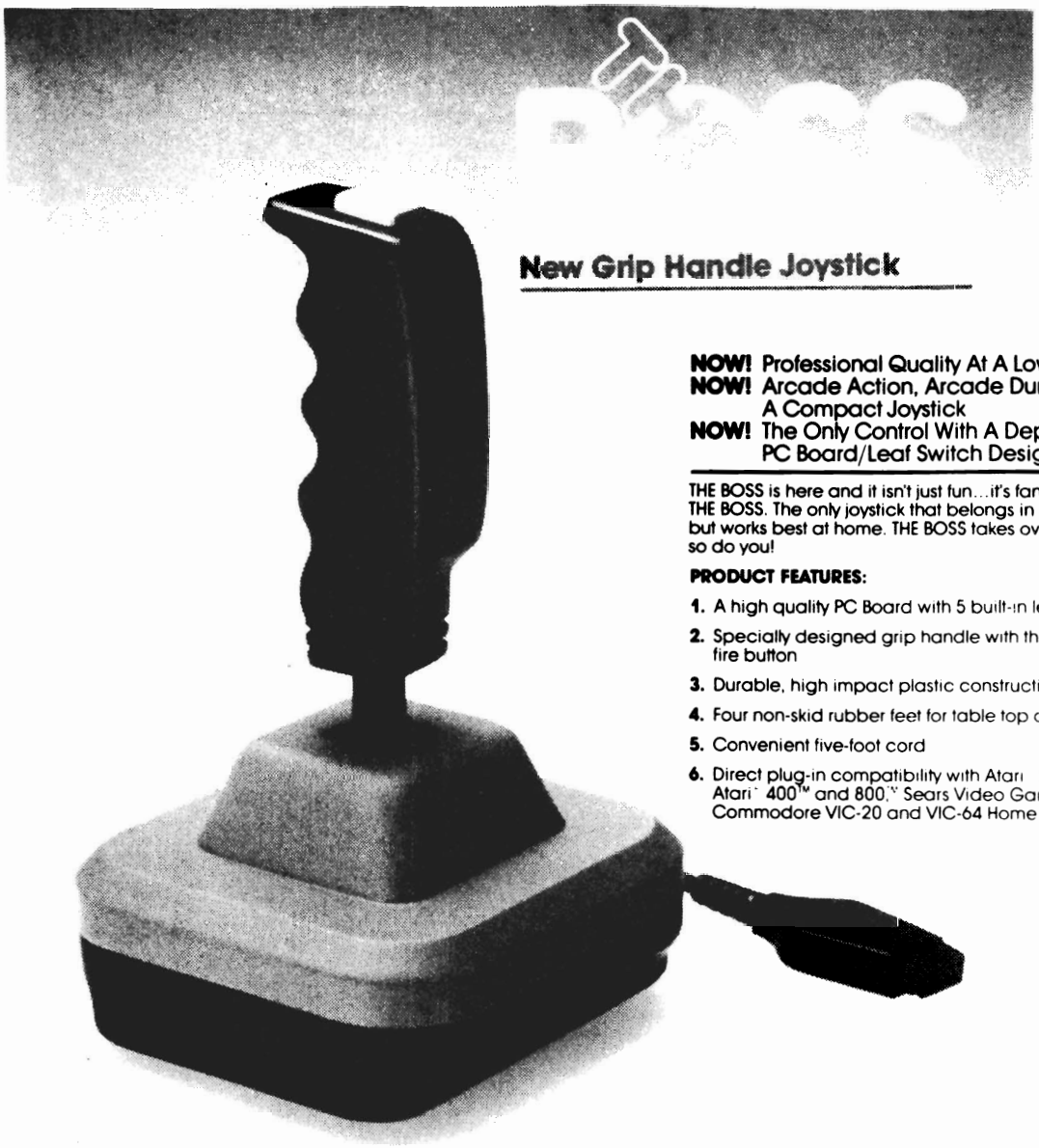

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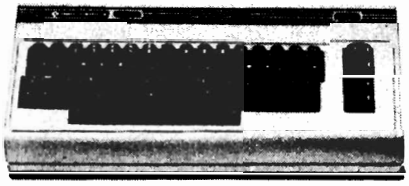

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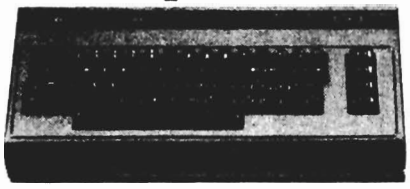

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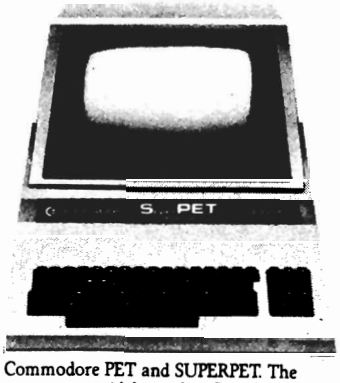

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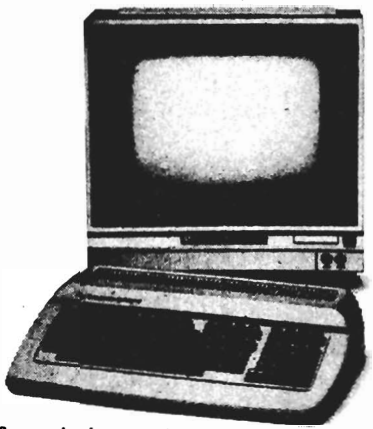

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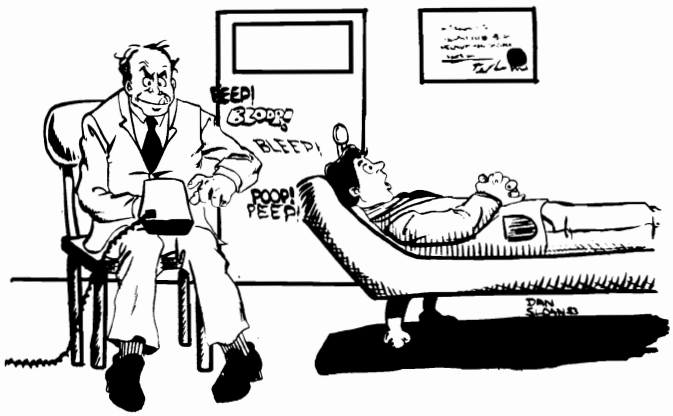
CORRECTIONS

p. 63 Nov/Dec issue
"Wedge-64"
The program is available on TPUG library Nov Monthly Release called (C)T3 or Utilities 1

p. 70 Nov/Dec issue
"Painting"
line 180 should be SQ=SQR etc...



"Doc, people tell me I'm crazy when I say this personal computer trend is getting out of hand. What do you think?"

HARDWARE HACKER

by Hank Mroczkowski Houston, Texas

reprint from CHUG

Checking out the uses for all the VIC EPROMs, I noticed that memory expansion cards are more proliferous and beginning to drop in price. Ancrona Georgia, 3330 Piedmont Rd., Atlanta, Georga 30305, (404)261-7100, is offering a bare board and instructions for $19.95...a bargain! Their populated version at $129.95 isn't. I've got a couple of the bare boards on the way in for evaluation and if they're any good, maybe we can organize a group/dealer purchase. Look for more later.

Additionally, Orchid Micro, Inc., c/o Paul Nilson, P. O. Box 1808, Beaverton, OR 97075, (503)643-6371, is selling a VIC 24K RAM board for $79.95, populated. It doesn't seem like a bad deal but, I haven't any other information on this one.--..so, you're on your own.

Any VIC owner who is thinking of converting to an all-in-one memory card might want to find a buyer for his old 8K memory cartridge. PET owners are looking for them to make a ROM/RAM board for their 4032 or 8032 computer.

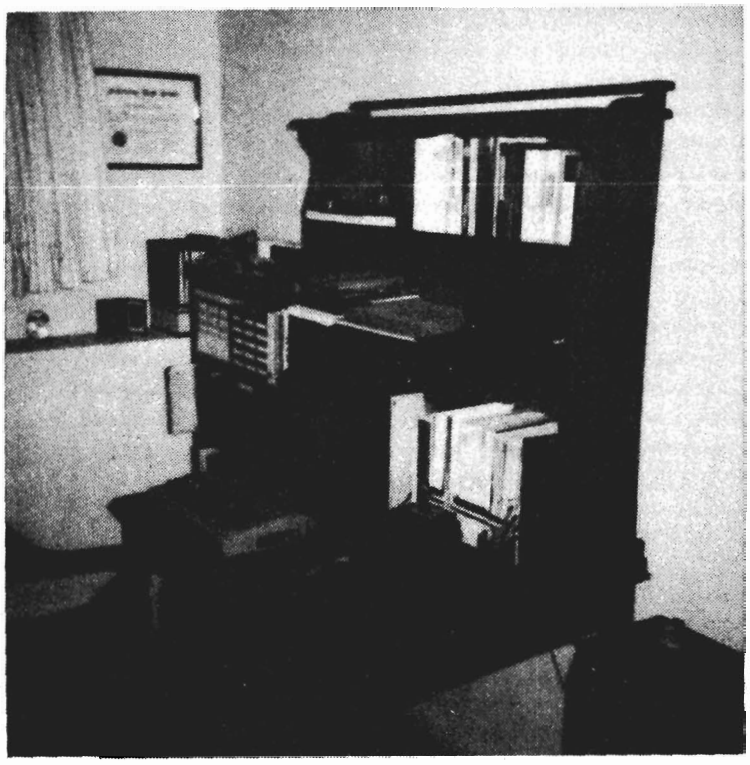
You see, they are modifying the board to plug into the "empty" socket in memory location $A000 or $9000 to eliminate the constant opening, unpluging of ROMs, plugging of ROMs and closing the machine...a real drag! The Skyles, Socket-2-Me is limited to only two ROMs and, with all the programs available, not the ultimate answer. Other devices of the same nature have the same limitation...not enough sockets. The PET answer; put RAM up there and protect it with a "write protect" switch, much like the write-protect slot on the mini-floppy (5.25"). *

USED FURNITURE FOR YOUR COMPUTER

By David H. McLeod — Fredricton N.B.

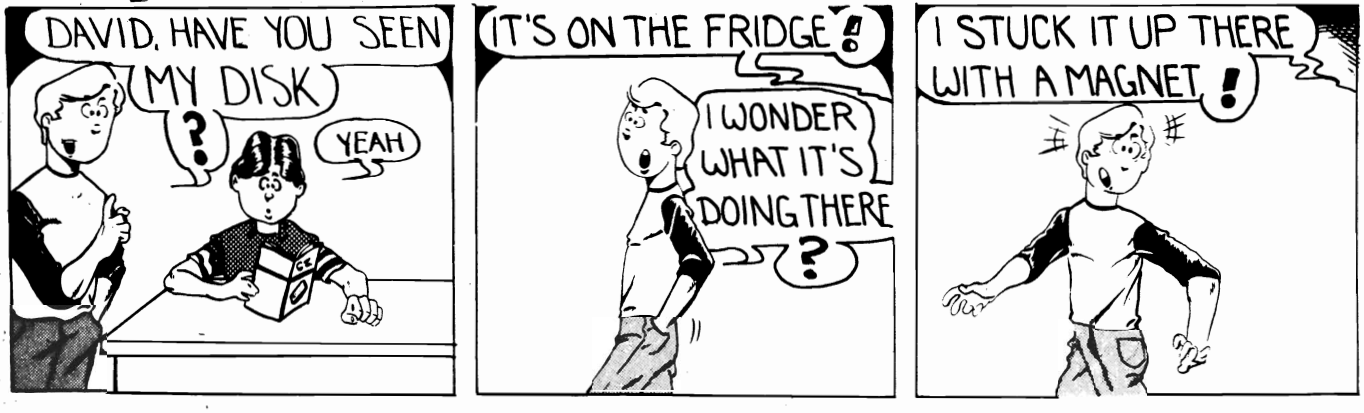
Quality computer desks can be very expensive, and the less expensive desks are often too small or poorly constructed. Why not try something different? This desk was made from a used kitchen table and a headboard from a single bed. Both pieces were in poor shape when purchased (the table had been painted several times and the top was starting to lift off; the headboard had suffered some smoke and water damage).

The paint and varnish were stripped off, then both pieces were stained and varnished. Extensions were added to the bottom sides of the headboard to stabilize it on the table top, and an extra shelf was added for books, tapes, magazines, etc. A little refinishing and repair work was all it took to make an acceptable piece of furniture suitable for any den or study. The total cost was only $40 ($25 for the table, and $15 for the headboard).



Search around, try the yard sales and second-hand shops. A little ingenuity and imagination can save you a lot of money.

Garbyte — by Dan Sloan



PUTTING IT ALL TOGETHER: THE ASSEMBLER

by Larry Goldstein, Bolton, ON

Up till now, we have talked of machine language in terms of switching patterns which can be represented as binary numbers, which in turn can be converted to decimal numbers for somewhat greater convenience. Even this is a pain, however, since it means memorizing or looking up masses of numerical code when writing a program. Since memorizing and looking up are what computers do best, it is only sensible to write a look-up program to do this conversion to machine code. Such a program is called an Assembler as is represented by Jim Butterfield's Supermon and the other members of the same family.

With an assembler, if you want to put a number into the accumulator, instead of looking up the machine code 169(D), you enter the instruction LDA (for LoaD Accumulator). Then, if you want to store this number somewhere in memory, you simply enter STA (STore Accumulator), and let the assembler look up the appropriate code. (These two machine language instructions taken together are equivalent to the BASIC POKE command.) You'll notice one catch: although you don't have to memorize numerical code, you do have to learn a new vocabulary of letter codes. These are three letter groups, and they are abbreviations of their functions, so they are called opcode mnemonics (memory helpers). These instructions comprise Assembly Language.

ADDRESSING

The instruction is only part of a machine (assembly) language command, and it is usually completed by an "address". The machine code 169 tells the microprocessor to load a number into the accumulator, but it doesn't tell what number. So, the complete instruction might be 169 83, or load the number 83 into the accumulator. These two numbers will be stored in two successive memory locations (say 830 and 831). When the program counter comes to 830, the pattern corresponding to 169(D) will be sent to the instruction register and decoded, telling the microprocessor to bring in the number **immediately** following in memory (in location 831) and put it into the accumulator. Since the storage address of this number is immediately after the address of the instruction, this is called immediate addressing. Similar instructions, LDX and LDY, allow us to put numbers in the X-register and the Y-register.

Now, say we want to transfer a value to memory from the accumulator -- perhaps we want to put a heart character (83) on the screen. On the PET/CBM, screen memory starts at 32768 with a memory location for every screen location. In BASIC, POKE 32768,83 will put a heart in the first screen location and POKE 33107,83 will put the heart somewhere else on the screen. In Assembler, we do this by putting the number 83 into the Accumulator (or the X- or Y- register) and then storing it in the appropriate screen memory location. But now the catch. Recall that memory locations are 8 bits (1 byte) each, and can hold numbers only up to 11111111(B) or 255(D). Storing numbers, including addresses, above 255 requires the use of more than a single byte of memory. Addresses above 255 are stored in two parts, allowing the use of 16-bit addresses, so the largest address usable by the 6502 and 6510 is 1111111111111111(B) or 65535(D) (i.e., 64K). The address 33107 translates to 1000000101010011(B), which is stored as the two 8-bit fragments, 10000001 and 01010011 (129(D) and 83(D)). To make matters worse, these are stored in reverse order, 83, 129. So, in order to specify an address, you must (1) convert it to binary notation, (2) break the binary number into two 8-bit fragments, (3) convert each fragment into decimal, (4) store these fragments in reverse order

(called LOBYTE/HIBYTE order). Again, the assembler can help us out, but it usually calls for another compromise from us, the use of the dreaded...

HEXADECIMAL NOTATION

Just as the decimal system is based on powers of 10 and the binary system on powers of 2, so the hexadecimal system is based on powers of 16. The right-most units digit is used to count from 0 to 15, the second digit represents multiples of 16^3 (or 4096). Since we have digits only from 0 to 9 readily available, the values from 10 to 15 are represented by the letters from A to F. It conveniently turns out that a 16-bit binary number can be represented by a 4-hex-digit (hit?) hexadecimal number and, furthermore, two hex-digits correspond to exactly 1 byte. Going back to 33107, it converts to 8153(H) which will be stored (in LOBYTE/HIBYTE order) as 53(H) (or 5x16+3 =83(D)) and 81(H) (or 8x16+1=129(D)). The advantages of using hexadecimal are (1) the ease of dividing large numbers into their 1-byte fragments and (2) the more convenient size with each hex-digit representing 4 bits. Note that the computer does **not** use hexadecimal numbers any more than it uses decimal; the assembler (or machine language monitor) converts hex. values into binary, and these are used. More expensive assemblers will accept decimal addresses and do all the conversions for us, but the Supermon family needs to be fed hexadecimal. By the way, it is usual to show decimal numbers just as is and precede hex. numbers by "$".

To convert from Decimal to Hexadecimal, you can do successive divisions by 4096, 256 and 16, or you can use a look-up table, or BASIC-AID, or this little program:

```
10 HH$="123456789ABCDEF"
20 INPUT "ENTER DECIMAL NUMBER";D
30 IF D<0 or D>65535 THEN PRINT "OUT OF
   RANGE.":GOTO 10
40 PRINT"$";:FOR I=3 TO 0 STEP -1
50 HEX$="0": DIV=16↑I: IF D<DIV THEN 80
60 Z=INT(D/DIV): D=D-Z*DIV
70 HEX$=MID$(HH$,Z,1)
80 PRINT HEX$;:NEXT
90 PRINT:PRINT:PRINT:GOTO 20
```

So far, we have been talking about PET/CBM models. For the unexpanded VIC, the beginning of screen memory is at 7680 or $1E00, and for the C-64 it's 1024 or $0400.

USING THE ASSEMBLER

Now let's make all this work. First load in your monitor/assembler program and RUN it. After a few seconds, you will see a display of the contents of the microprocessor registers, an address to call with a SYS command to get back to the monitor (write it down) and the cursor blinking next to a period. Let's try to put a heart on the screen using the steps outlined above, and let's store the program starting at memory location 830 ($033E). Begin with the instruction to load the value 83 ($53) into the accumulator. It looks like this:

```
.A 033E LDA #$53
 1  2   3    4
1--Assemble
2--at this memory location
3--the instruction. Load the
   Accumulator with....
4--this numerical value (i.e.
   Immediate Mode Addressing)
```

When you press RETURN, the appropriate numeric code is entered in memory locations $033E and $033F, and the next usable location is displayed as:

```
.A 0340
```

Now complete the line as:

```
.A 0340 STA $8150   (CBM/PET)
.A 0340 STA $1E90   (VIC)
.A 0340 STA $0490   (C-64)
```

and press RETURN. In this case, the "address" of the instruction is a memory location, not a numerical datum, and this is indicated by the omission of the # sign. Specifying the actual location in which the value is to be stored (or from which it is to be retrieved) is called Absolute Addressing. The last line of the program is

```
.A 0343RTS
```

which gets us out of machine language (in this case).

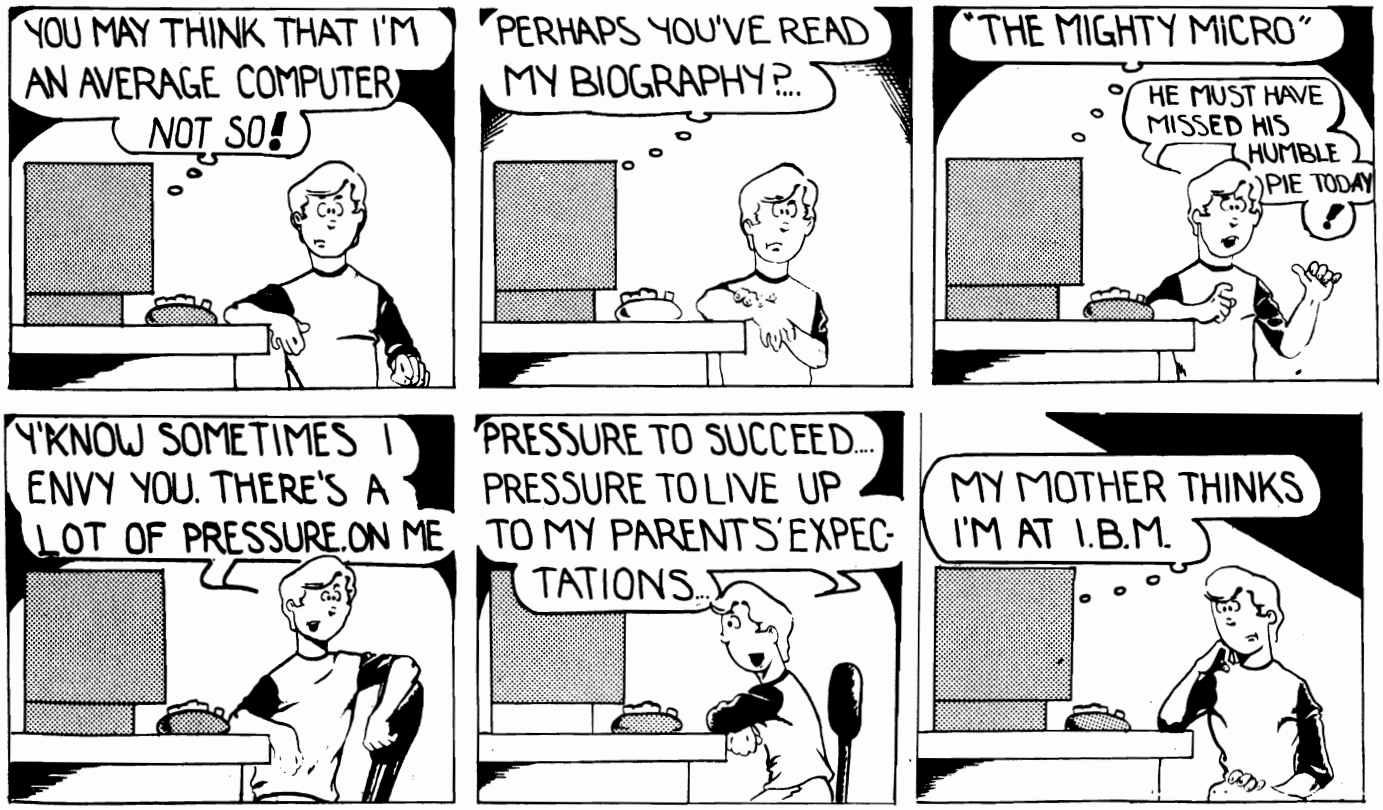
Now type RETURN, X and RETURN to get out of the assembler. To run our tiny program, enter SYS 830 and expect to see a heart appear somewhere on the screen

and the cursor to reappear. You can get back into the assembler by calling the SYS address you noted down earlier, then you can expand the program to put all kinds of symbols all over the screen. Or you could enter values in color memory at $9600 to $97FF (VIC) or $D800 to $DBE7 (64).

Although we can make things happen very quickly by building up long routines of this sort, the programs are needlessly long and inefficient, and the programming and typing are extremely tedious. What we need now is a way to get the program to take care of the repetition itself with something like the FOR...NEXT loop in BASIC. But that's for next time.

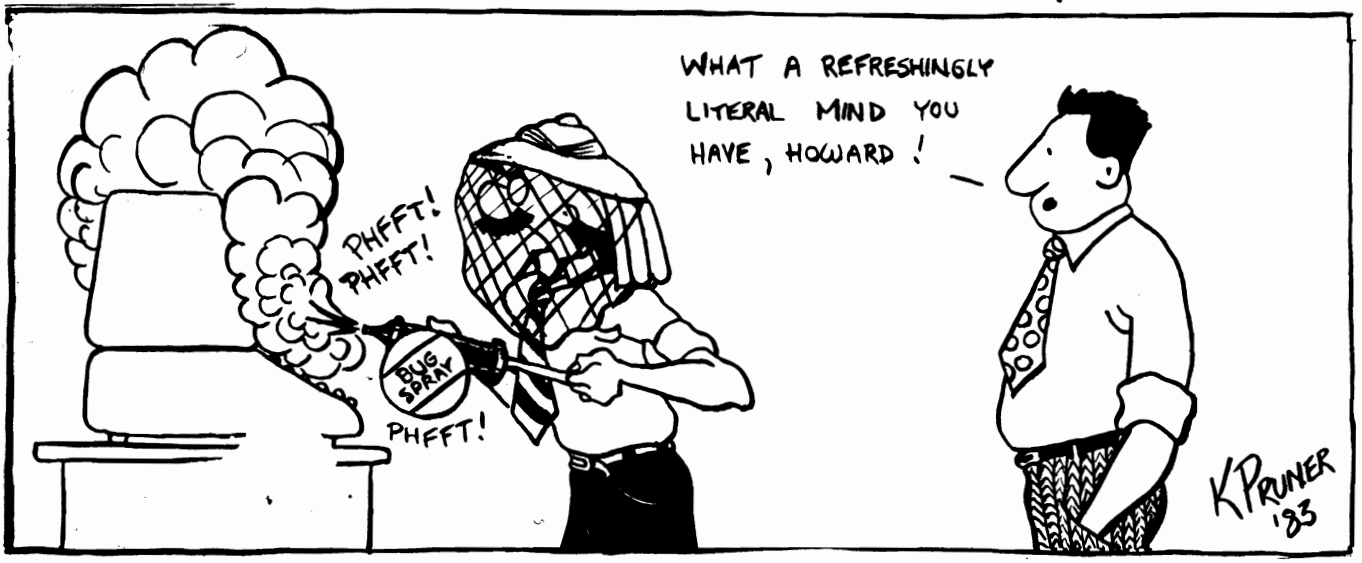
Garbyte

by Dan Sloan



HOWARD

by Karl Pruner



COMMODORE TELECOMMUNICATES

by Robert Kobenter — Victoria, B.C.

All Commodore owners have two worlds available to them. One is contained within their computer room and takes the form of their particular Commodore used as 'their' personal computer. The second world is the era of telecomputing. That era is happening in ever increasing numbers each and every day. It is relatively new (since 1970) and is still in its infancy. Any Commodore owner has an interface to the outside world. Whether you use the GPIB of the 2001 or a VIC/64 serial interface (for us SPETters there is the rs232) you can phone into a schools' host computer or into one of the many Bulletin Boards set up for us to use. A whole new accessable area exists outside of your computer and with a few relatively inexpensive add-ons you can enter the SOURCE <tm> or Compuserve <tm> and yet another world of computing becomes available to you (for a fee of course!).

When you use your VICModem at 300 baud you are configuring your machine to a host computer in which your Commodore is a relatively 'dumb' terminal. With proper software you can use your immensely powerful cursor keys. I have used both the C64 and the SuperPET in a "dumb" terminal mode with a VAX 11/780 minicomputer at the college I attend. The '64 term' software is a very adequate package that introduces you to advanced computings or to information exchange via the telphone lines. C64 owners are lucky in that an excellent product (though skimpy literature) is available for telecom that is the C64 link.

SuperPET owners can obtain (for $15.00 US) John Toebe's Newterm program from ISPUG. This is a very advanced package that I use to upload/download programs from my disks to a Vax. A brief description takes a few pages so I recommend the articles presented in the last 3 issues of the SPET Gazette. An excellent 6502 SPET program for TC appeared in the April 1983 issue of the Micro magazine. For the German members of TPUG a very interesting V.24 package appeared in 'mc magazin' in the September 1983 issue for use with the CP/M BBS used by 'mc' in Munich. Having tried it via very long distance I recommend it! Europeans, due to the non-progressive ways of their PTTs (post offices) have yet to fully recognize the power of telecomputing. The 'mc' bbs is one of the few that I am familiar with. If you know of any others please write me with a description of formats and type (incl. tel. no.). Other BBS's are relatively easy to access. An excellent (though incomplete) article appeared in the September issue of COMPUTING NOW! on page 6. A good introductory article appeared in the May 1983 issue of Computing Now! Consult with your local dealer for any info which he may have on a local network. Also check the TPUG disk library for some good public domain software on telecommunications. Particularily (p)c 3. *

Newsletter published by the SuperPET Users' Group (SPUG): editorial offices at P.O. Box 411, Hatteras, N.C. 27943. Membership applications and inquiries to Mr. Skipski. Enclose a SASE, with all inquiries requiring reply. Membership: $10.00 per year, U.S. in North America, $20.00 overseas and elsewhere.

THE CGRS MICROTECH PEDISK 8 IS GREAT!

PEDISK 877-1 8 INCH DISK DRIVE FOR CBM

by Terry Taller Kanata ON

While much of the world seems to be enthralled with the Commodore 64, there is one company which continues to support the PET/CBM series of computer -- cgrs MICROTECH of Langhorne, Pennsylvania.

The products they produce are numerous, and each one is outstanding in its class. The three which I own are the COMPACK (communications package which includes a communications board with STCP software), the ROMSWITCH, and the PEDISK system. In this review, I will outline the PEDISK 8" system. Essentially, this review is to say that the product is outstanding; more on that later.

The reason I bought this product is an interesting story. When writing a major program for work, I ran out of memory on my CBM 8032. In itself, this was not a major problem; this can be easily overcome by chaining programs from disk. However, I decided to start to look around for memory expansion products. There were basically two choices: the Commodore 64K Ram expansion board and the MADISON Computer Z-RAM board. The Z-RAM board seemed to offer more for the money, mainly by offering the option of CP/M. With a little help from The Information Connection in Ottawa, the Z-RAM board was installed. As one discovers with memory expansion, unless you understand bank switching and assembly language, the memory doesn't just increase -- you have to work with it. It did nicely expand the available memory for VISICALC to BOK.

It was at this point I read a small-print advertisement in MICROCOMPUTING for cgrs MICROTECH'S PEDISK system with a small note about compatibility with standard 8" CP/M using the Z-RAM board. For those of you not aware of it, CP/M standard is 8" floppy disk using single-sided, single-density disks. The fact that CP/M software is available for Apple, Osborne and Heath is due to the fact that the software producer has chosen to produce it in a particular format. One can get all kinds of CP/M software on Commodore format to work with the Z-RAM board, but it is available from limited sources; in Canada, you can get it from the Z-RAM distributors (Computer Workshops) and in the U.S. from Lifeboat Associates in New York City. But you'll pay! All of the sales for CP/M software that one reads in MICROSYSTEMS, INFOWORLD are on 8" format. This seemed to be the answer.

To make a long story short, I ordered the PEDISK 877-1 8" single drive from AB Computers in Colmar, Pennsylvania along with the PEDISK/CPM software. The total cost came to $995 (US) for the drive and controller card and $99 for the software.

The Disk Controller Card

The disk controller card sits in the $e000 rom slot on the CBM board. It consists of the following. A ROM chip which acts as the controller, a space in which to place the existing Commodore chip, and a location in which to place the disk cable. There's nothing to installing the board and the instructions are excellent. What MICROTECH doesn't like to tell you is that they will sell you the controller card by itself (about $400 US) and then you can go buy your drive from some of the discount outlets like JADE.

The Disk Drive

The drive is a standard Siemens 8" drive. It is beautifully configured by MICROTECH. If there is any problem with 8" drives, it is that they are noisy. They are constantly spinning; MICROTECH

provides you with a software technique which can quiet the drive so that it only gears up when it is needed; otherwise, you certainly know that you own an 8" drive. The drive uses both SSSD and SSDD disks. There is certainly no need to spend the extra bucks for double density disks.

The Software

If you order the PEDISK system without the Z-RAM board, then what you have is an alternative to the Commodore disk system. I am not sure that I would recommend this particular approach. It's not that the drive isn't excellent and blows the doors off of Commodore drives; it's just that there is a limited amount of available software on the PEDISK format to use with the Commodore system. There's Moser's MAE, the COPYWRITER word processor, Riley's FLEXFILE, but not much more.

When you want to put the drives into operation, you do a SYS59904 and you get a cgrs MICROTECH greeting; you also lose the top 2K of RAM. If you only have a single PEDISK drive, like I do, then you have to make sure that you have copied over the utility programs which will occupy a couple of sectors of the 77 tracks on the 8" disk. I could go into all of the details of how you can disassemble computer or disk memory, get the directory, etc., but that's not the point of the review.

When you program using files on the PEDISK, you essentially use the same techniques as CBM DOS. You have to open the file, but you place an exclamation mark in front of each statement to tell the machine language program up in high memory that you are talking to PEDISK. For example, you **!open** a file, **!input** a file, **!print** a file, etc. You can use relative files, sequential files, and program files.

I guess the question is "Why use the PEDISK?" For a serious programmer, it has the advantage of speed -- incredible speed. Instead of data travelling over the IEEE bus, it is dumped straight into memory at the rate of 250K bits per second, or 30K bytes per second.

When you buy the PEDISK CP/M software to go with the Z-RAM board, you get an awfully powerful system which, really, doesn't have a lot to do with Commodore. The moment you boot the Z-RAM disk (with a 4040 drive), the following happens: Commodore drives 0 and 1 become CP/M drives A and B; second, the PEDISK becomes drive C. If you are using an 8050 then Commodore drives 0 and 1 are still drives A and B, but the PEDISK becomes drive D, allowing for the installation of another drive. There is software on the disk which allows you to configure a second set of dual drives as device 9. All very good and incredibly powerful.

Right now, for example, I am using NEVADA COBOL and JRT PASCAL compilers on my Commodore system. There have been no hang-ups or problems; everything compiles beautifully. This will also open up a chance to consider DBASE II, WordStar, and all of those other "things" we see in magazines.

Summary

I can't say enough good things about the people at cgrs MICROTECH. Whenever I talk to them on the telephone, they are kind and helpful. In one case, they called me (at their own expense!) to get some information from me. The PEDISK system is great; in fact, on my next trip to the Philadelphia area, I intend to buy their 8 dual disk drive system, since the controller system can address three drives. I have no doubt that, when the time comes, they'll help in making the drives another part of the CP/M system.

Should you buy the PEDISK system? If you are using your computer for software development, then of course, you should. Remember, you can store 250K on the 8 disk and you can easily transfer programs back and forth between PEDISK and Commodore drives. If you are using your computer strictly to take advantage of available software (e.g., text editing, data management, games), then stick with the Commodore drives or Commodore compatible drives. ✱

CAD/CAM SOFTWARE FOR CBM

TAPEPREP: This program runs on Commodore microcomputers and allows preparation editing and punching of N/C program tapes. With this program, users can prepare a new N/C program; edit or add to an existing program; store a program on disk; recall a program; punch a program onto paper tape (ISO or EIA); recall a program from paper tape; print a program for checking; verify a paper tape and more. Options are chosen from a screen menu, selectable by single keystroke.

TOOLPATH: This program is the safe way to verify CNC lathe programs. Students see on a high-resolution CRT exactly how tools move and shape metal as their programs step through. At any point in the program, a section through the billet can be printed in high resolution for further study. Any errors can be observed quickly and corrected, without risking machine damage.

MILLPATH: This program provides a near three-dimensional simulation on an X-Y plotter of how a milling machine will execute CNC programs. Different-colored pens indicate varying depths of cut, working at high speed to any scale. The program asks for the number and diameter of tools to be used, the drawing scale and other parameters. It then reads the part program from paper tape or direct from disk, and steps through the program block by block. Instructions are interpreted just as an actual machine would on the shop floor.

FOR MORE INFORMATION ON MILLPATH, TOOLPATH, TAPEPRET, PLEASE CONTACT:

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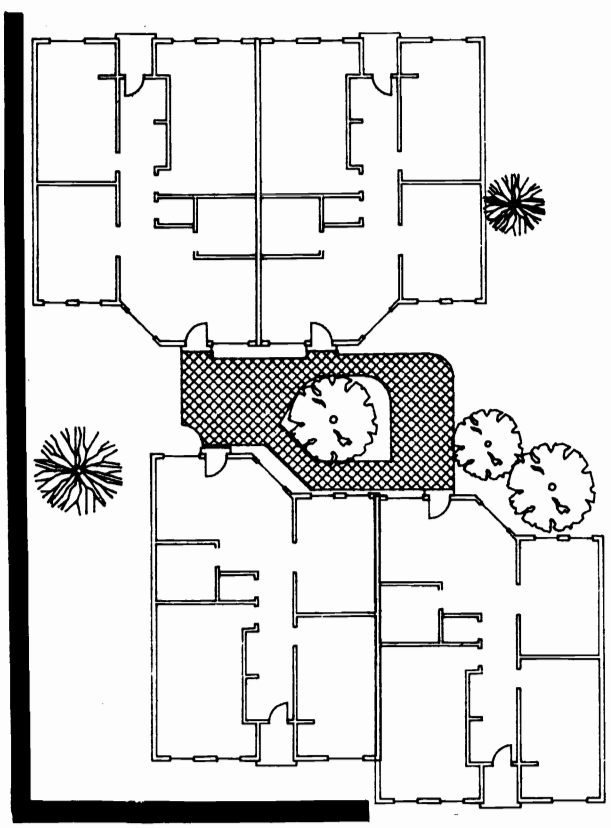

This program is a versatile and powerful computer-aided drafting system designed to run on the Commodore 8032. It provides intelligent drafting eliminating repetitive work.

Details, plan overlays, title blocks, logos and dimensions are stored on file. Drawings or parts of drawings can be stretched, sheared or rotated about a point or axis. They can be edited by the addition or deletion of lines or dimensions. The text can be at any size, automatically centred or italicized.

It can automatically produce drawings combining up to 10 colours and nine line types. It provides fast new drawings because standard parts can be repeated into new configurations. The hatching feature includes hatching of separate or nested shapes. Smooth curves can be fitted through any point and joined tangentially to lines. Automatic scale changing makes it possible to combine metric scales with English equivalents.

No previous knowledge of CAD is necessary. The manual is thorough and provides easy-to-follow tutorials which make computer-aided drafting understandable and easy to use.

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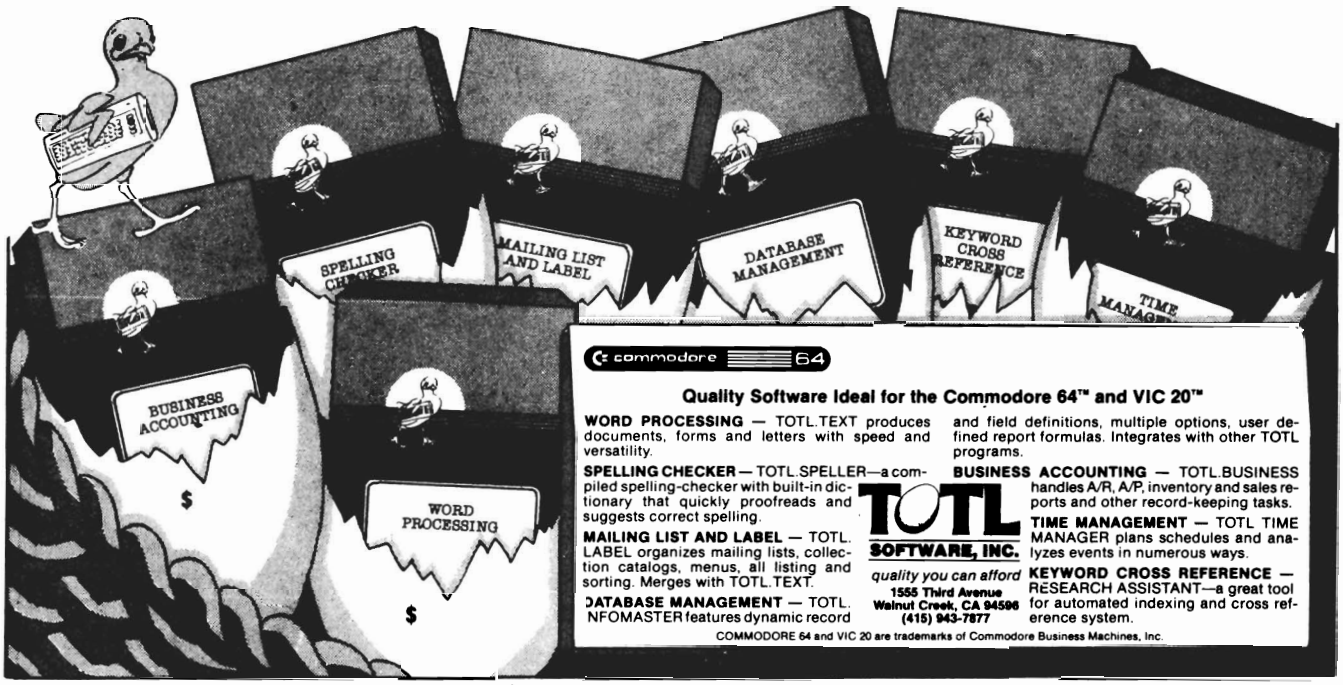

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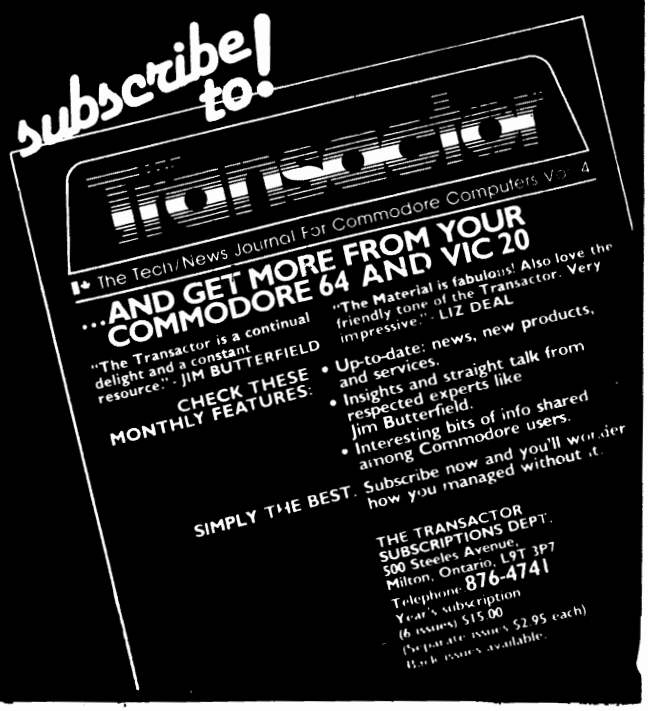

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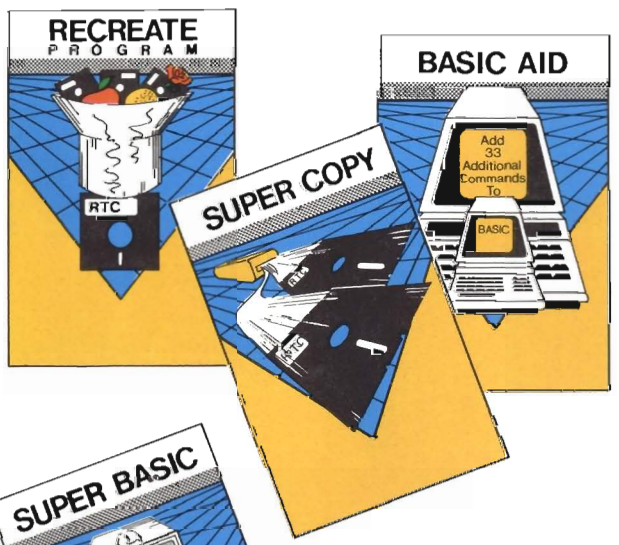

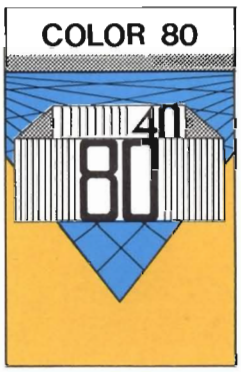

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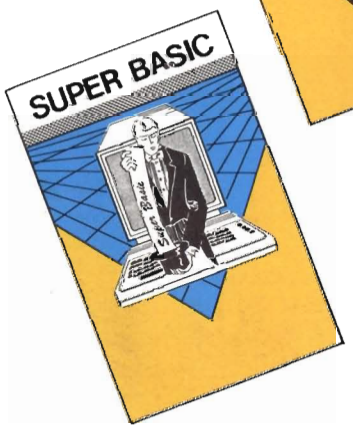

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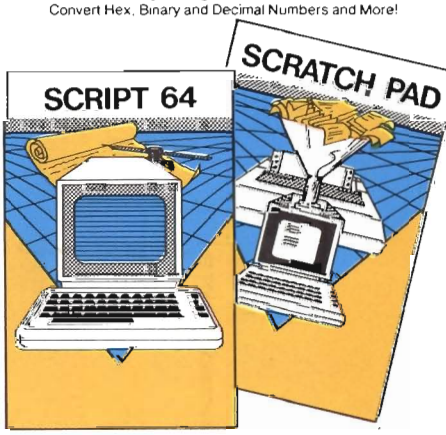

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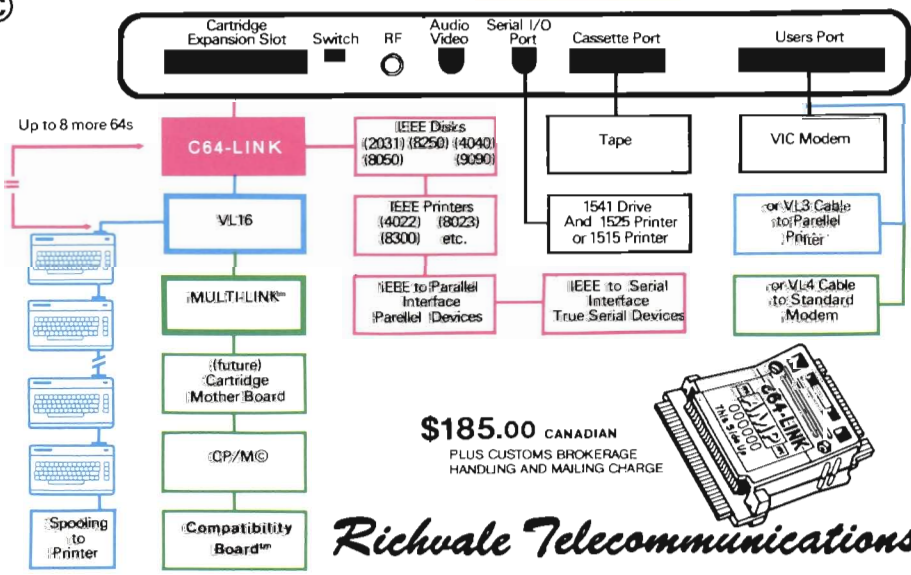

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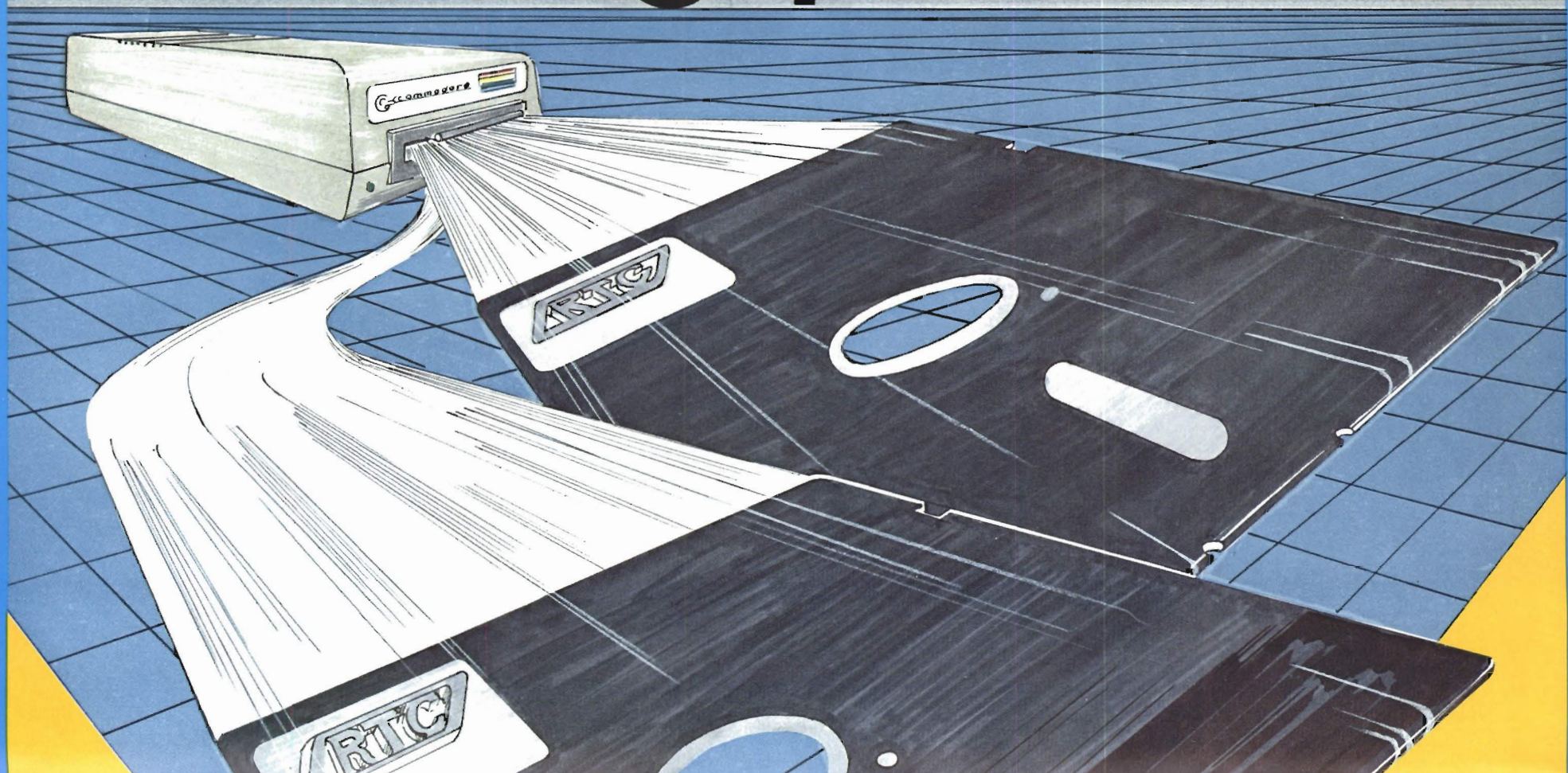

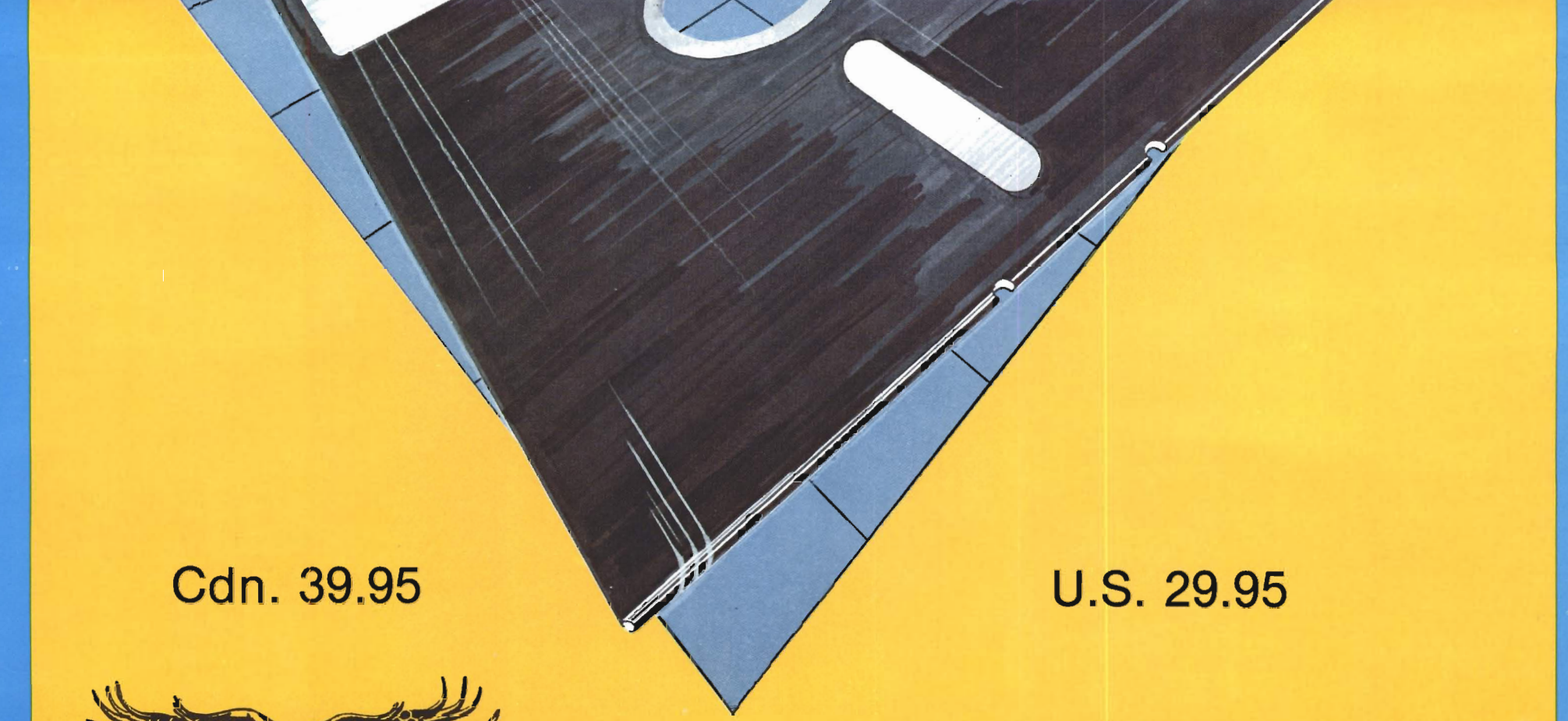

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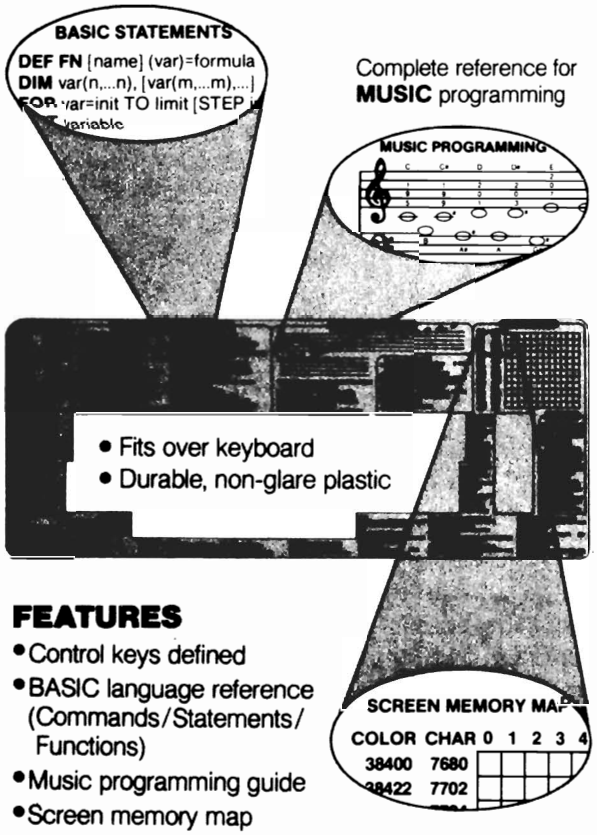

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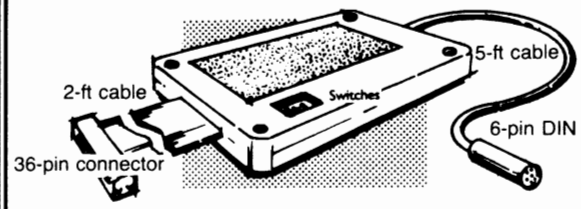

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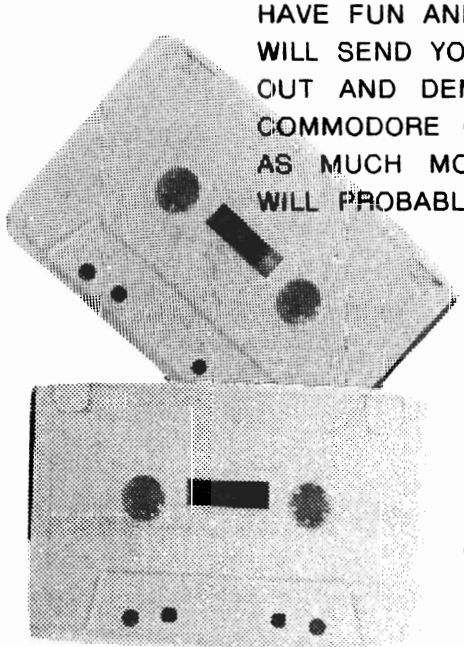

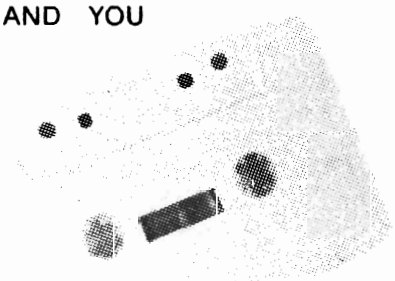

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GAME REVIEWS .....

by Rich Westerman St. Anne IL

QUIZAGON from Counterpoint Software, Minneapolis, Mn. Disk-based trivia game for 'the family'. $39.95 write-protected. 30 day warranty/$5.00 replacement fee after warranty period. This software was probably inspired by the success of the board game 'TRIVIAL PURSUIT'. You must answer questions from each of 4 categories, while moving to strategic positions in order to advance to the 'GRAND QUIZARD' where you can win the game with a correct answer. The honor system is used in 'QUIZAGON'... when asked a question, you are supposed to speak your answer aloud and then the computer will give the correct answer. You must then indicate whether your answer was the correct one. If it was, you get to try answering another. If you were wrong, the next player has a go at it. The documentation is extremely obtuse and confusing. It took me and some friends some time and experimentation to figure out the game's play. The QUIZAGON package includes 2 double-sided disks. The game is on side one, while the remaining sides contain a claimed 6000+ questions in relative files. Support is promised from the game's manufacturers in the form of more disks of questions, in various categories. Seems like a good party game for teens and older.

JUICE by TRONIX, Arcade game for VIC-20 and C64. Write-protected. No stated warranty.

This is a game to stick with, and I can't say that about many arcade games. Machine language speed and smoothness helps to make this enjoyable, but the game's design is the real star here. First of all, the game grids are diagonally drawn on the screen. This makes for some mental adapting when using the joystick - you have to restrain yourself from using the diagonal functions of the joystick - only the up, down, left, and right commands will be read. The 3-D sprite graphics are really impressive, too.

Here's the big picture... your hero, Edison, must hop on each square of the grid in order to advance to the next screen. At all times, however, he must avoid nohms which bounce past on their way to the other side of the grid. Occasionally, Killerwatts appear on the screen and develop an instant dislike for our hero. Killerwatts can't simply be avoided, they must be escaped from. This isn't too hard on the early screens, but on the advanced levels, you're concentrating on hopping on all the squares in the proper order (which wasn't necessary in the early levels) and the Killerwatts can become really aggravating!

Game manipulation is made easy by a menu which allows you to begin at any level and choose which (if any) of the game characters you wish to play with-/against. The top 10 high scorers get to sign in but the scores are not saved to a file, so when the power goes off, there go the high scores. This is no big loss, as far as I'm concerned. (I'd just as soon do without the delay of putting in high scores at all, but I guess a lot of people like to be 'immortalized' on a scoreboard).

A note on the sounds of this software. It's really great to see programs coming out (finally!) that begin to use the 64's SID chip's terrific potential. This game has some of the best sound effects of any game, for any computer! This piece of software really impresses me with its elegance of construction... watching this game go through its paces is really fascinating. Don't try to back this disk up, by the way... the disk's header contains a null string and your 1541 will develop a real headache over this little bit of write protection. RECOMMENDED.

KID GRID Arcade game for C64 from TRONIX. Write-protected. This game came my way at the same time as 'JUICE' and

so it was up against tough competition. Maybe that's why I'm just not too turned on by KID GRID. The game's format is the much-used, complete the grid while avoiding the chasers. The animation and game construction is impressive... the game is all in machine language. As in Juice, an opening menu allows you to choose skill levels and such, and there is the top ten scorers list. If you're a fan of fast-action arcade games you'll probably love this, but if you like to 'stretch out' and exercise more strategy, like I do, it might not be your cup of tea. RECOMMENDED for all you PAC MAN fans.

A TRIO OF GAMES FOR C64 FROM TECH 2 SOFTWARE

#1 **SNAKEMAN** Arcade game. Tape. Write protected. $19.95 machine language. 90 day warranty with proof-of-purchase. (These details apply to all 3 games from TECH 2).

It's really difficult to get excited about still another Pac-Man clone, and that's what we've got here. This is, by the way, the first time I've seen a game LOSE sophistication when going from VIC-20 to C64! My 8 year old and my 6 year old really enjoy it, though, and prefer it over PACAKUDA. As for me, ho-hum...zzzzzzzz

#2 **SKRAMBLE** Well, it's all machine language... continuous horizontal scrolling... real smooth action... nice graphics... demo mode, too. You fly your aircraft over mountains and through tunnels, avoiding rockets and enemy interceptors. You must attack and hit fuel dumps along the way in order to prevent yourself from running out of fuel. (hey, this is an arcade game - it's not supposed to make sense, right?) Only one level of difficulty, and it's pretty rough. There's no facility for entering the game at different places/levels - a negative factor, in my opinion. I've never been able to make it all the way through the caves, so I can't comment on the rest of the game, which consists of flying over and under buildings!! Not my favorite, but I do have to give it high marks for value/price.

#3 **GRIDDER** What we have here is a poor man's KID GRID. Once again, you have to traverse the entire grid, while avoiding pursuers. One difference between GRIDDER & KID GRID is that in this one, you have an unlimited number of 'stuns' with which you can briefly immobilize your pursuers. Another difference is that here you only have 2 'baddies' to worry about - in KID GRID there are 4. The choice of colors for the screens and sprites was not made with the color TV in mind... very poor contrast. One level of difficulty, with multiple screens.

MOONDUST Cartridge, for C64 from CREATIVE SOFTWARE 90 day limited warranty. Here it is, ready or not, the first contemplative arcade game. No time limits, no ricocheting bullets, no screaming jets. Not here. Here, you guide a team of creatures through egg laying and the birth of a new creature. Beautiful hi-res graphics and eerie (but fascinating) semi-random multi voice music, which you control the mood of but not the structure... joystick up or down changes the pitch; right or left alters the kind of chord (i.e. major or minor); and diagonally, which changes both the key and the kind of chord. Sometimes I get so wrapped up in manipulating the music I forget that the joystick is also controlling the screen! The game definitely grows on you. Though the game can be challenging, it is still relaxing. A truly original game. Now, if you'll excuse me, I'll get back to my game. Ommmmmmm... HIGHLY RECOMMENDED.

JAWBREAKER II Arcade game from SIERRAVISION. C64 Disk. Write protected. Joystick or keyboard. $30.00 90 day warranty. $5.00 replacement fee after warranty period if registration card has been sent in. Here's a pleasant, if unexciting variation of Pac Man, geared towards younger players. Instead of a maze, you must maneuver your chomping teeth between 5 horizontal levels, and through constantly moving 'doors'. The ghosts have been replaced by rolling 'happy faces' (jawbreakers), but the food dots, bonuses, and 'power pellets' are the same as Pac Man. A nice touch that always tickles the kids is that if you clear a screen, a toothbrush comes out and gives your teeth a scrub! 9 levels of play. Pause option. ✱

16K EXPANDER FOR PET

by Sheldon H. Dean — Calgary AL

A few months ago, I decided that it was about time that I gave my trusty old 8K PET a memory upgrade. Unfortunately, I could not find any commercially available products that were suitable and also within my budget.

I sat down with pencil and paper and came up with a circuit that provides a 16K expansion at considerably less than any commercial product that I could find.

The circuit was constructed using low-power 2K x 8 static RAM memory chips. It was constructed using point-to-point wire wrap techniques on a Radio Shack 276-175 printed circuit board.

I thought perhaps some hardware hackers in the group might be interested in such a circuit. I will provide a diagram and parts list, plus a brief description to anyone who provides me with a SASE.

Although it has not been tested, I have reason to believe that the circuit could be readily adapted as a VIC-20 memory expansion circuit.

Sheldon H. Dean
Unit #9
5625 Silverdale Dr., N.W.
Calgary, Alberta T3B 4N5

TABLE OF LEAD DESIGNATIONS

PET CONNECTOR J4	FUNCTION
Pin 1	Address 0
Pin 2	Address 1
Pin 3	Address 2
Pin 4	Address 3
Pin 5	Address 4
Pin 6	Address 5
Pin 7	Address 6
Pin 8	Address 7
Pin 9	Address 8
Pin 10	Address 9
Pin 11	Address 10
Pin 12	Address 11
Pin 19	Block Select 4
Pin 20	Block Select 5
Pin 21	Block Select 6
Pin 22	Block Select 7
Pin 29	Phase 2 Clock
Pin 30	Read/Write Enable
Pin 33	Data 0
Pin 34	Data 1
Pin 35	Data 2
Pin 36	Data 3
Pin 37	Data 4
Pin 38	Data 5
Pin 39	Data 6
Pin 40	Data 7
Pin A (top)	Ground

PARTS LIST FOR 16K PET MEMORY EXPANSION

C1, C2, C3, C4 -- .1uF ceramic disc capacitor

R1 -- 10,000 ohm, 1/4W, 5% resistor

U1, U2, U3, U4 -- SY2128 sK x 8 static RAM memory IC or equivalent U5, U6, U7, U8

U9, U10, U11 -- 74LS139 decoder

Miscellaneous -- pc board for breadboarding, such as RS276-175 from Tandy Radio Shack

-- 8 IC sockets (24 pin)
-- 3 IC sockets (16 pin)
-- edge connector for PET such as EDAC 345-080-541-202

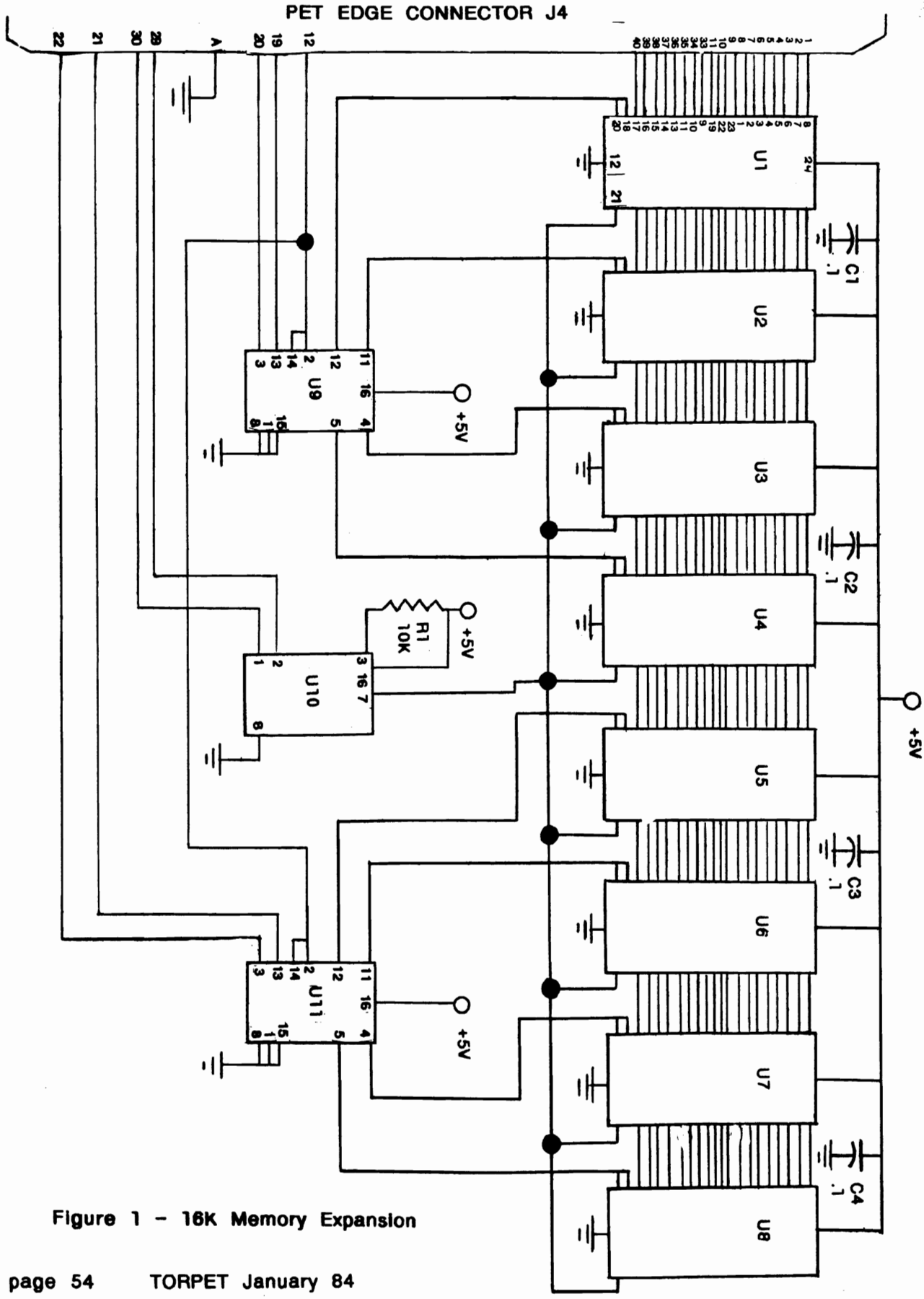

Figure 1 - 16K Memory Expansion

PAPERCLIP UPDATE

for Pet/CBM & C-64

by Ian Wright

Toronto ON

A revised program disk and manual for the PaperClip wordprocessor are now available from Batteries Included at their new address at 186 Queen Street West, Toronto, ON. M5V 1Z1 (1-416-596-1405). The updated versions have been "cleaned up" of a few early bugs, and have also been further enhanced. The latest PET/CBM version can be recognized by its number 2.85, the latest C64 versions are 64c and 64c-80 (the latter for use with the DATA20 80 column card and Batteries Included's Super-80 pac).

For the PET/CBM machines some of the changes have been to de-bug the existing program so that those annoying dropouts into BASIC do not happen anymore. The "Change prtfil" program is now much more explanatory, using screen prompts to walk you through making a PaperClip loader program that is customized for your own printer. Use this program to replace the first program on the PaperClip disk and thereafter when you want to load this custom version you press the shifted RUNSTOP key and away you go.

Your custom printer file is now part of the load. A new prompt has been added into the "Output" variables that asks for the starting page number. The default is page one, but this will allow you to restart output at a specific page rather than sitting through each video output page and pressing the space bar until the requisite page is reached. Similarly, if your printer dies in the middle of a page you can now use CONTROL SHIFT-P to restart at the top of the last page printed. Anyone who has had problems while writing a global file or an exec. file will appreciate this feature. Some BBS'ers will like the command to send a file to disk rather than to the screen or printer because you can format disk-files within PaperClip and have them ready for transmission when you are on-line. There are many new printer support files available on the PaperClip disk, for example those that support the Olivetti and Gemini printers, and this will further simplify tying PaperClip into your wordprocessing system. It will also make using the special features of your printer as simple as it can be.

New formatting commands include "fl" and "fr" which allow setting margins for footers separately from headers and from the text. Also, both header and footer pitch can be set separately from the main text, and "pt" commands can alter the size of these characters. For example, condensed print and double-sized letters can now be controlled for most printers using pitch directives - it works fine with my mx80. Line lengths can now be formatted to 250 lines and the screen will scroll horizontally to let you see each column! Using the "Append" function, an existing file can be re-formatted to this new maximum line length. PaperClip could even be used as a simple spreadsheet via the add/subtract commands, the column manipulation, and this extra width! Disk operating (DOS) commands available from within PaperClip include "Header", "Initialize", "Scratch", "Copy", "Backup", and "Validate", all of which are explained in an addendum to the manual. These commands allow you to manipulate your disk files, although PaperClip still works with tape storage.

The Commodore 64 version in its latest update is called PaperClip64c and has all the above enhancements plus some that are specific to the '64. Since I originally wrote this review, I have had to revise it TWICE because of further enhancements. Batteries Included firmly believe that programs can be improved, and they do listen when users make suggestions for those improvements.

SOFTWARE REVIEW

"Backup 64" and "Backup 64K" are additional programs on the PaperClip64c disk that allow backups of any disk to be made on a single drive (1541 or 2031). The Backup 64K version uses much more memory and you are warned that it may not work with all interfaces - but the regular version will work with all.

A series of soft-loadable character sets is also available directly from this disk while in PaperClip64c. One example of a useful character set is French 64 which is sophistication when going from VIC-20 to UP-AR ROW. The special letters can be seen on the screen by pressing the escape key, but obviously your printer must also support these characters if a hard copy is required. Many European languages require special characters such as the German "umlaut", or English "pound" character. Being able to see these symbols is a useful feature for anyone doing multi-language work. Other character sets such as the "standard" CBM characters can be loaded the same way and I find the shape of these letters much easier to read than the regular C64 letter-shapes.

The latest version of PaperClip64 includes 80-column output to the video screen. Yes, you read this correctly. If you press F8 the PaperClip64c will print 80 columns on your monitor - without additional hardware interfaces or cards! Also in this mode, underlined text appears underlined on the screen rather than in inverse video. The only stipulation is that you need a monitor-quality video because the characters must be compressed into half their width. For writing purposes, however, the ability to write in big letters, and still check and edit 80-column output is the answer to many would-be-writers' prayers.

One of my earlier complaints was that PaperClip would not allow printing a catalogue. This has been corrected - and you can select all or only some of the disk files. You can even "wild-card" search if, like me, you can't remember the exact name. Deleting a phrase is now a one key operation, the search function has been expanded to allow both wider searching and more explicit searches. [The] will search out only the word "the", not other or then. Page numbers can go as high as 65535 for those who wish to re-write an encyclopedia. You can press "R" during output to print the previous page. This means that you can preview a page in video, then send it to printer. Both vertical and horizontal rapid scrolling have been enhanced - the movement is now just a blur!

Earlier versions of PaperClip came with a manual that was in need of an index along with other changes. The latest version of the manual has an eleven-lesson tutorial, a detailed index, much more instruction on how to set up printer interfacing and printer files (for those who own "unusual" systems as well as popular ones), and detailed information on how to install your PaperClip chip or dongle. The chip is used in the PET/CBM and SuperPET versions of PaperClip to provide copy protection, and the dongle (a plastic key that fits in joystick port #1) does the same in the C64 version.

The pages (yes pages!) of command summaries in the manual now give the page reference to find detailed explanations for each command. This allows any user to access seldom used commands quickly. There are now 152 commands available in PaperClip which in my estimation expand this program beyond the level of a basic wordprocessor into the realm of truly professional-capability programs.

Although a beginner can easily be writing with PaperClip within one hour of its purchase, the professional writer will find every possible feature built into this amazing program - and the cost is still under $150.00!

I reviewed the original version of PaperClip in the March-April TORPET. The new versions of PaperClip are available from Batteries Included by either mailing or taking in your existing disk for exchange. There is no charge for this service, and I recommend that you get the appropriate update - ASAP. The first version of PaperClip was very good, the new programs are GREAT! ✱

PRINTING A DISK DIRECTORY WITH PAPERCLIP

by M.J. Winter E. Lansing Mich

Users of PAPERCLIP are almost fanatic in their praise of the program. It adds columns, sorts files, and has many elegant and convenient features. However, there is no provision for printing a directory of the disk being used.

There is a way to get a listing, which is readable, if not precisely in the familiar form. If a dual disk drive is being used, both disks will be listed by this procedure.

1. Hit Control L, for load; respond to "File Name?" with $. The directory will be loaded, along with a lot of strange characters between file names. On my PET, almost all the strange symbols occur in groups of 5 characters beginning and ending with @. Most frequent are @aae@ and @aag@. Printing the directory at this stage results in Fig. 1.

2. Now use the wild card search and replace feature of Paperclip. Hit Control @; reply to the message "Search String?" with @\\\@. Reply to the message "Replace with?" by pressing <return>. The search and replace function will clean most of the garbage from your listing.

3. A final use of insert and delete will put the header on a separate line and, pretty much, arrange the directory in two columns, as in Fig. 2. It's not perfect, but it's not bad.

FIGURE 1

```
aaa@r"MATHFILES        " M1 2A@aa!@  "108ASSIGNSFALL"    PRG
@aas@  "108POLICY"          PRG    @aa$@  "201-1"
PRG    @aa]@  "201-2"               PRG    @aai@   "GIVINGTESTS"
PRG   @aa[@  "TEST1"               PRG    @aaj@  "GRADESHEET"
PRG    @aah@   "GRADEINSTR"          PRG   @aak@  "RECONSIDFORM"
PRG    @aai@   "406ELEM"             PRG   @aay@  "TEST2"
PRG    @aae@   "LOGOCARD1"           PRG   @aa[@  "LOGO1"
PRG    @aaj@  "SUMMER84"             PRG    @aaaBLOCKS FREE.
@@@
```

FIGURE 2

```
"MATHFILES        " M1 2A
"108ASSIGNSFALL"    PRG      "108POLICY"          PRG
"201-1"             PRG      "201-2"              PRG
"GIVINGTESTS"       PRG     "TEST1"              PRG
"GRADESHEET"        PRG       "GRADEINSTR"         PRG
"RECONSIDFORM"      PRG       "406ELEM"            PRG
"TEST2"             PRG   "    "LOGOCARD1"          PRG
"LOGO1"             PRG      "SUMMER84"           PRG
BLOCKS FREE.
```

*

THIS N' THAT

SEASONS GREETINGS

By the time you read this the holiday season will be over, but belated greetings to you all from all of us in the TPUG office. As I think of our members in Canada, the United States and around the world the phrase that comes to mind is - Peace on earth, Goodwill to man - to you and yours wherever you are!

As 1983 drew to a close, so did my first year of association with TPUG. It has been an interesting time. Last January 1st we had less than 4,000 members - this January 1st we had over 13,000! As the year has gone by we have added someone working 2 days a week here, someone working 4 days a week there - and so the staff has grown. Some days it seems like Grand Central Station as we try to handle the mail, the phone calls and the people dropping in. Before TPUG, I had hardly ever been involved in a long distance call - now it is nothing to get a call from California. Over the year I have talked to at least one person on every continent except Asia. Even though the work has never ended, and we're always trying to catch up, it's been fun. Here's hoping you are getting as much out of your association with TPUG as I am.

Here We Go Again!

My last report in the November/December issue was regarding member #11,000. Since then we've passed two milestones: number 12,000 is M. J. Hooks of Houston, Texas; number 13,000 is Ronald Vanwart of Chesterville, Ontario. (I hope he isn't superstitious.)

Associate Club Chapters

We now have 18 computer clubs which have joined up 15 or more members at one time. We don't have meeting information and contact people for all of them yet, but you will find details elsewhere in this issue for those we do know about. New additions to the list are Commodore Users Club of Sudbury and Sarnia C64 Users Group.

New Group Meetings

If you live in the Greater Toronto area and are interested in participating in, or planning a computer interest group of some kind, please let the club office know - 782-8900. If you read the Calendar of TPUG Events, you will see the names of some groups that are in the formative stage.

World of Commodore

Though I didn't have much opportunity to attend the show personally, I did enjoy meeting those of you who happened to be there when I was, and to receive messages from other members whom I missed in person. I hope all of you who attended enjoyed yourself, and are planning to come back to the "airport strip" when we have our conference next May at tthe Constellation Hotel.

Commodore Educational Software

Elsewhere in this issue you will find the one-line documentation for the revised releases in this series. If you read the introductory notes I'm sure you will find that this information will be helpful in choosing appropriate educational programs for your family.

The trials and tribulations regarding this series continue in the TPUG office. We did obtain copies of the 58 disks. Unfortunately, there are still a few disks which are not working for us and we have to obtain replacements. As I write this column on December 20th, we still have not received even one copy of a tape version of this series from our supplier (who shall remain nameless). I know the new upgraded series has been frustrating for those of you who ordered disks or tapes this summer and waited so long for delivery. Believe me, it has been equally frustrating for us in the office! Please accept our apologies - things can only get better. I trust that any order you send as a result of the listings in this magazine will be able to be processed immediately.

New User's Group in British Columbia

On November 14, 1983 the Fort St. John Commodore Users Group was formed. Over 25 interested people showed up for the organizational meeting.

Through an associate TPUG membership the local group has already built a library of close to 300 user programs in the VIC-20 and C64 categories, and more are coming. Tentatively, the group will be meeting monthly at Doctor Kearny Jr. Secondary School on the 2nd Monday of each month.

Any Commdore users from the Ft. St. John area are invited to attend. For more information contact either Keith Newman at 785-8191 (W) or 787-1974 (H) or Len Vanderlinde at 785-5429.

Farewell and Hello

This is the last This and That column I will be writing for TORPET. I have enjoyed my association with Bruce Beach and the TORPET for the past 8 months. Good luck to Bruce, and I'll 'see' you all next month in TPUG Magazine.

DORIS BRADLEY

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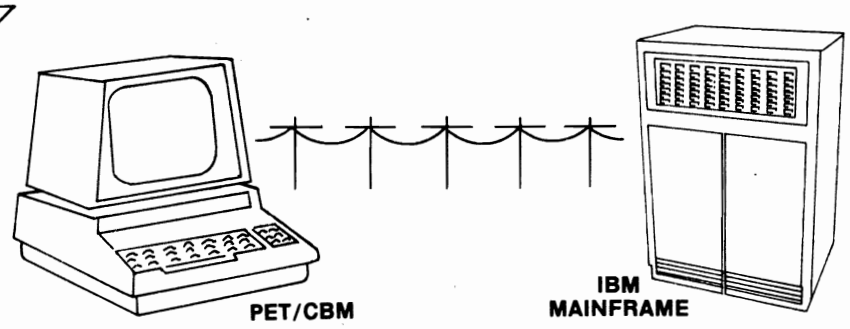

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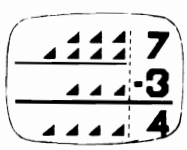

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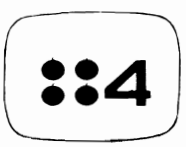

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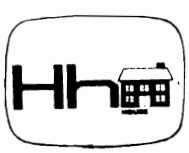

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6502 ASSEMBLY LANGUAGE

Sheridan College is hosting two, two - day workshops on 6502 Assembly Language programming for the Pet, Apple and Atari computers. Participants will study the conceptual foundations of machine language programming, learn the most useful commands in the 6502 instruction set, and write working assembly language sub-routines and programs. All computer time and manuals are provided for this intensive two-day course. The only prerequisite is an elementary knowledge of BASIC programming.

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IV. The 6502 Instruction Set: Tiny Commands for Total Control
V. Assembling and Disassembling: Putting It Together and Taking It Apart
VI. First 6502 Programs: Life in the Fast Lane

The instructor for the course is Kem Luther, Ph.D., a teacher in the Computer Studies Program at Sheridan College. In addition to teaching programming at Sheridan, he has several years' experience in writing and publishing commercial programs for the major micro-computing systems.

The two workshops will be held at the Brampton Campus on January 5-6 and March 12-13, 1984. The fee is $150 for the two days (including lunch). Further information and reservations may be obtained by calling the Sheridan College Conference Centre at :

416 845-9430 416 823-9730 416 632-7081 ext. 336

READER'S PAGE

HELP! WHO'S GOT THE ANSWER? HELP!

I've come across an interesting problem - how to read a sector of a track without hurting other data on the disk when the disk returns a #22 read error.
I can't solve the problem, but in trying to do so I discovered that the Memory-Read command as explained in the 1541 User's Manual does not do what I think the book says it will do. The instructions on p. 37 & 38 plus the program to read the disk controller's memory make it look as if the two "chr$" functions following the "PRINT #file#,"M-R:" are meant to be low byte of address and high byte of address of the location at which you want to look. In my experience, the first "chr$" does give me a certain location. The only location I can be sure of locating is byte 0. The second "chr$" function always determines the number of bytes to be read in succession before coming to a carriage return, "13". Is my computer whacky, the book wrong, or is my understanding fuzzy? Where could I get a hard copy of the disk controller's memory? If someone can shed any light on any of the above, I'll be very grateful!

Dave Snell
Middle Sackville, NB

Anyone know a good book on machine language for the CBM 8032?

Jane Eason
Savannah, Georgia

I own a C-64 with "Easyscript" word processor. I am hooked up to a Gemini 10 printer. Is there any way to change to 96 column (elite mode) while using the Easyscript (other than sending the code before loading the program).

Ira Friedman
190 GreenBeltt Parkway
Holbrook, NY 11741

Are there any members who have programs in Spanish for either the VIC or 64. If so, I would like to get in touch with them.

Dick Paschen
Great Falls Montanta

Do you have any idea where I can get a listing of subroutines (machine language) which I can POKE in and use on my Commodore 64?

Brian Alexander
Brawley, California

I am interested in finding a program similar to Weaver's Aid" for my wife for use on our VIC. Weaver's Aid, which I was unable to obtain was "designed to assist the weaver in developing patterns. Written for four-harness loom. Enter tie-ups, colors, pedaling order. Pattern is displayed using high-resolution graphics."

It seems like it would be a straight forward task to program a simulation such as this (possibly even with the super expander for higher resolution), but it is still beyond my capabilities. Any ideas, leads, etc. would be greatly appreciated.

Bob Hermann
133 Sunnyslope Rd.
Petaluma, CA 94952

Is there a member in Calgary who can help me? In February 1983, I sent a cheque to Strictly Commodore for a subscription to their magazine "Super 64". They promptly cashed my cheque but I have not yet received a single copy. I wrote them 2 letters. Can anyone who lives in Calgary or nearby contact them about my situation. Their address is: Strictly Commodore, 47 Coachwood Place N.W.

Ravi Palepu
81 Benson
Sydney, NS B1S 2M2

I would appreciate any information regarding Okidata ML83A.

Dennis Freeman
Newtown Square, Pennsyvania

Now that Commodore has discontinued the Model 4040 disk drive, is there another model being announced to fill the need for a 5-1/4 inch dual drive with a format compatable with the 1541 drive, or are VIC and 64 users doomed to single drives only and lack of compatability with other Commodore disk drives? Also has there been any reason given for discontinuing the Model 4040?

Robert Swift
530 Bannatyne Ave., Ste. 104
Estevan, SK S4A 2G5

I would like to trade anyone in Ontario some programs for the C64. Send me a list of your stuff and I'll send you a list of my programs or call me.

Arman Nurarif
Phone 416/278-9137 1100 Caven St., #1009
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"PET" PALS WANTED

I would like to correspond with other VIC-20 owners who have expanded their computer to 32K.

Marcus Van Kirk #12069
LaSalle, Michigan

If there is anyone in the Virginia area that would like to trade TPUG tapes or disks for the 64 write me. My objective is to build up my own collection and help others to do the same as cheap as possible.

Newell Randall
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I'm an Acoustic Engineering student and would like to trade and acquire software related to my field.

Paul
Phone 416/691-6243 75 Coalport Dr.
Scarborough, Ontario

I have a request for a SuperPET pal, about 12 years old, who knows how to use computers fairly well from Jodi Ager & Jennifer Woodbeck. Unfortunately I do not have either the appropriate membership number nor the address for Jodi and/or Jennifer. Jodi, please write again with more information.

Doris Bradley

I am trying to return to Australia, but it is a slow process. I have many friends in Australia, but only one of them has any computer background. I would like to correspond with someone working in the computer industry in Australia with a C64. I have been in the computer industry for about 6 years now and am presently a Manufacturing Engineer with a media company.

Theodore G. Lange
5774 Winsteria Dr.
Riverside, CA 92504

COMMODORE
NEW EDITION
EDUCATIONAL SOFTWARE

Thanks to Commodore Canada, and in particular to Frank Winters and Armand Aiello, TPUG has received the 58 disks and the documentation for the updated and enlarged Commodore Educational Software library. These programs will run on the following computers:

Commodore 64
PET 2001 (BASIC 2.0)
PET 4000 (BASIC 2.0 or 4.0)
(9 & 12" screens)
CBM 8032 (after loading & running CBM 4032 V2)

Because of the many changes in this series, we are changing the code we use to indicate this software. You will find that each listing now begins with an "(E)". Thus, (E)BA is the first listing under the heading of Business. You will notice that each listing (**not each program**) is available on 1 disk, but until we have had some experience with the series, we can not predict for sure how many tapes will be required for each listing. For now, please assume that 2 tapes are needed for one listing.

As in the previous series, the programs under any one heading, whether it be English, Mathematics, Science or Technology, are listed alphabetically. This may result in programs for several school levels appearing together in one listing.

You will find that some headings have been modified (e.g. French is now Logics Francais), some have been eliminated (e.g. History), and some have been added (e.g. Language, Logic and Problem Solving, Music, Physical & Health Education). Also, three special listings, designed specificaly for the Commdore 64, have been added. You will find these at the end, listed as (E)D1, (E)D2, and (E)D3.

What follows is the listing of the programs in the "new" Commodore Educational Software library as well as the documentation for these programs, which includes:

Name of Program
Category
Grade Level
PST Vector Analysis
Memory Size
Description

A description of the documentation follows:

PROGRAM TITLE - Most program titles are followed by the designation .40 which indicates that the program runs on PETs, 8032s (after loading and running CBM 4032 V2), and the Commodore 64. Those without that designation **only** run on the 4032 and 8032 models. If the program has another designation (e.g. .41) it would be a more recent update of the original .40 program.

CATEGORY - **D**rill, **G**ame, **S**imulation, **T**utorial, **U**tility, **O**ther.

GRADE LEVEL - **E**arly childhood, **P**rimary, **J**unior, **I**ntermediate, **S**enior, **C**ollege, or **T**rainable mentally retarded.

PST VECTOR ANALYSIS - 3 numeruic digits.

The first digit represents PRESENTATION, and the values are:

0 - Page turning
2 - Input of single alpha/numeric
4 - Alpha/numeric manipulation
6 - Non-interactive graphics
9 - Interactive text/animated graphics

The second digit represents STRUCTURE, and the values are:

0 - Non-progressive
2 - Problem level progression
4 - Branching/remedial
6 - Variations teacher controlled
9 - Variation controlled by student interaction

The third digit represents TRACKING, and the values are:

0 - No marks given (n8o tracking)
2 - Marking for program only
4 - Cumulative marking
6 - Marks compared to class
9 - Marks compared to external standard

MEMORY SIZE - Minimum memory required to run the program.

DESCRIPTION - A short description of each program is given to indicate what the program does. Teacher instructions are included in the program itself where required.

These disks can be ordered from the TPUG office in the normal way ($10 for each 4040 and $12 for each 8050). The tapes are $12 for each listing. If you or your school wishes to purchase the total Commodore Educational Software library, you may do so for $325 (Canadian residents/schools) or $300 U.S. (U.S.A. residents/schools) from:

Aurora Software
P.O. Box 1394
Haileybury, Ontario
P0J 1K0

Attn: Jennifer Godfrey

(E)AA - Administration

Name of Program	Cat	Grade	PST	Mem	Description
ANALYSIS.40	O		000	16k	This program takes a set of marks and calculates median, average, standard dev. and students passing/failing.
ANSWER BOX.40	U	JI	202	16k	This is a universal quiz-making utility program. Answers are stored in data lines; question worksheet required.
DOG.40	S	I	100	32k	User becomes a science teacher facing a student who wants to perform exploratory surgery on a live dog.
EXAM2.40	U	C	000	16k	Teacher enters exam marks with weightings as percents or actual marks; program determines student's final mark.
FIGHT.40	S	I	201	32k	Simulation of a hostile student-teacher confrontation in which the user takes the teacher's role.
GRADES.40	U	C	000	32k	Allows a teacher to order and print out student marks by name and grade.
QUIZFRAMEWORK.40	U	C	000	16k	Enables the teacher to construct a multiple-choice quiz.
READABILITY.40	U		503	32k	This program takes a sample from a text and determines the readability level using standard measures.
SCHOOL-MARM.40	DG	PJ	400	16k	A useful fill-in-the-blanks quiz with hints, designed for teacher adaptation to various subjects and levels.
SEX ED.40	S	I	100	32k	Simulates potential situations faced by a teacher who plans to show a childbirth film in a sex education class.

(E)BA - Business

Name of Program	Cat	Grade	PST	Mem	Description
ACCOUNTING.40	DT	S	502	32k	An excellent tutorial on basic accounting practices.
AMORT'N TABLE.40	U	S	000	16k	Constructs an amortization table from user-input data; useful for a homeowner or for checking student tables.
AMORTIZATION.40	U	IS	300	16k	Program calculates payments and amortization periods for loans, based upon user-input data.
BONDS.40	U	JIS	300	16k	Program calculates present value of bonds, including coupon values, etc.
CALENDAR.40	U		000	16k	Prints out a calendar for any given month and year.
COMMODITY.40	S	I	200	16k	This program simulates the buying and selling of commodities.
COMP TYPING.40	D	I	322	16k	A simple variable-speed typing drill. User types letters printed by computer; mistakes are highlighted at end.
COSTGOODSSOLD.40	DT	IS	320	16k	Tutorial/drill on calculating CGS with 4 types of inventory calculatiions (FIFO, LIFO, Average, etc.).
DATE.40	U		000	16k	Finds a date 'n' days from a given base date; limited application.
DEBIT&CREDIT.40	DS	S	201	16k	Given sample situations, the student must correctly debit and credit accounts.
DEBITCREDIT.40	D	S	201	16k	A program of 10 questions that test a student's accounting skills.
DEPREC&PAYMT.40	U	S	000	16k	User inputs data and the computer calculates depreciation rates and payments.
DEPRECIATION.40	U	S	000	16k	Prints a depreciation schedule using straight line, sum of digits and double declining depreciation methods.
F.I.F.O.40	TU	IS	200	16k	Calculates value of inventory using 'first-in-first-out' method (F.I.F.O.).
GROSS PAY.40	D	I	200	16k	A program designed to drill the student on various simple salary problems.
ICE CREAM.40	GS	JIS	222	16k	Student manages an ice-cream parlour, attempting to maximize employee/customer satisfaction and minimize costs.

(E)BB - Business

Name of Program	Cat	Grade	PST	Mem	Description
INVESTMENTS.40	U	S	300	16k	Calculates regular withdrawals, initial/minimum investment, effective/nominal interest, investment value, etc.
KEYBOARD TEST.40	D	I	311	16k	A program which drills various sections of the PET keyboard as selected by the user.
LEMONADE.40	GS	IS	302	16k	Student operates a lemonade stand for 10 weeks, taking into account costs, price, quantity and other variables.
LIFE TABLES.40	U	IS	200	16k	Calculates life insurance and annuity tables for any given interest rate.
MARKET CRASH.40	S		100	32k	A stock market simulation.
MARKET.40	GS	IS	320	16k	User manages a production company by determining production and advertising budgets and setting retail prices.
MONEY FLOW.40	GS	JI	202	16k	Student traces the flow of money from household to business to government.
MORTGAGE.40	U	S	000	16k	This program produces a mortgage table which would be of use to a homeowner or business student.
OBJECTIVE 1.1.40	DT	IS	302	16k	Program presents a lesson on the Balance Sheet, then tests the student on it.
PORTFOLIO.40	U	IS	300	16k	Program keeps track of stock options and the total value of a portfolio.
SIMP INTEREST.40	D	I	200	16k	Presents a variety of simple interest problems for the student to solve.
STOCK MARKET.40	GS	IS	200	16k	Student buys and sells 5 stocks as the prices randomly fluctuate.
STOCK.40	S	I	000	16k	A simple game that simulates stock market activities.
TYPING DRILL.40	D	JI	200	16k	Designed to drill students on finger reaches and familiarize them with the location of graphics characters.

(E)BC - Business

Name of Program	Cat	Grade	PST	Mem	Description
TYPING.40	T	ISC	292	32k	A very good typing drill with plenty of data for practice, including 700 common words.
WATER II.40	GS	IS	320	16k	A water resource management simulation. Student must manage water supply for a town during a drought.

(E)CA - Computer Science

Name of Program	Cat	Grade	PST	Mem	Description
BASE CONV.40	U	JI	200	32k	Converts decimal, Roman numeral, hexidecimal, binary and BCD numbers one into another.
BINARY.40	U	IS	200	16k	Converts decimals in the range from 0 to 65536 into 16 bit binary numbers.
COMMANDS.40	DT	JI	202	16k	A tutorial and drill on BASIC concepts.
COMP CONCEPT.40	ST	PJ	000	16k	A virtual machine simulation preceded by a short tutorial.
COMP. HISTORY.40	D	I	204	16k	Program quizzes the student on the history of computers.
COMPUTING.40	D	JIS	266	16k	A drill on basic computer knowledge, but adaptable to any subject.
DEMO SORT.40	S	IS	500	16k	Demonstration of a sort called 'selective replacement'.
DISK CMD.40	T	JI	100	16k	A tutorial on Basic 4.
FEATURES QUIZ.40	DT	JI	222	16k	A tutorial and quiz on the basic features of Commodore computers.
HEX DEC.40	U	IS	000	16k	Converts hexidecimals to decimals and vice versa.
HEX DEMO.40	U	SC	300	16k	Converts decimal numbers between 0 and 255 into hexidecimals, showing high and low nybbles.
HYPO ASSEM.40	ST	IS	600	32k	An introduction to assembler language. Runs a virtual machine with a small language set; good practice.
HYPO II.40	SUO	SC		32k	Allows the student to program in simulated machine language and execute programs step by step.
PETUNIA.40	T	JI	100	16k	Allows a schematic of a petunia music box and instructions on how to use it.
PILOT.40	S	JI	400	32k	A simple 'pilot' language interpreter including edit, list, load, save and run commands.

(E)CB - Computer Science

Name of Program	Cat	Grade	PST	Mem	Description
POGO.40	U	JI	800	32k	A version of 'LOGO' using character graphics. Allows definition of 'Macro' (subroutines) in a limited way.
SIMULATION.40	ST	I	000	16k	Simulates a small BASIC program on a virtual machine with simple internal architecture.
TURTLE 1.40	P	JI	900	16k	This program mimics 'LOGO' turtle graphics using PET graphics. Draws in a limited number of directions.

(E)D1 - COMMODORE 64

Name of Program	Cat	Grade	PST	Mem	Description
MC.MASTER CAT.					Disk catalogue program designed to work with 4040 disk drive.
MC.MAKE MASTER					Combines the disk and program name files & into 1 MASTER file.
COMMANDS					Do not load this program. See the following 3 programs.
COM.TEXT DEMO					Demonstrates text manipulation on the C-64 screen.
COM.SORT DEMO					Demonstrates sorting. A no. of student records are displayed & then sorted using different parameters.
COM.HOW FAST					100 random names are created and then sorted.
HR.GRAPHICS PAL					Assembler version of machine language program, HR.GRAPHICS OBJ
HR.GRAPHICS INST					Instructions on how to use the hires package HR.GRAPHIC OBJ.
HR.GRAPHICS OBJ					Allows you to draw on the hires screen and SAVE your screens.
HR.GRAPHICS DEMO					LOADS in the graphics package and demonstrates a hires screen.
HR.GRAPHICS LOAD					LOADS a hires screen.

CONT. (E)D1 - COMMODORE 64....

HR.PICTURE 1	Demo hires screen is LOADed auto matically by HR.GRAPHICS LOAD.
HR.HIRES TO 1525	Print a hires screen to your 1525 printer.
MU.PLAYER PAL	Assembler version of the machine language program, MU.MACHINE OBJ
MU.C64 MUSIC	Instructions & demos for music package.
MU.MACHINE OBJ	Allows you to create & SAVE musi cal pieces with simple commands.
TEXTMASTER	Simple wordprocessing package which allows you to create, edit, SAVE and LOAD documents.
TM.INSTRUCT 1	Detailed instructions--TEXTMASTER
TM.INSTRUCT 2	" " "
TM.INSTRUCT 3	" " "
AN.INSTRUCTIONS	How to use the animation package.
AN.ELLIPSE	Subroutine LOADed automatically by AN.ANIMATION DEM.
AN.WIBBLE	Subroutine LOADed automatically by AN.ANIMATION DEM.
AN.ANIMATION PAL	Assembler version of machine language program AN.ANIMATION OBJ
AN.ANIMATION OBJ	Create and SAVE quarter graphics screens and animate them.
AN.ANIMATION DEM	Load for a demo of some screens created by the animation package.

(E)D2 - COMMODORE 64

Name of Program	Cat	Grade	PST	Mem	Description
MAIN MENU 64					Instructions for Adventure Pack Reading Series
THE GAME.1					Story is displayed for reading, followed by 3 short tests.
CHOCOLATE GOO.2					Story is displayed for reading, followed by 3 short tests.
MONSTER WAVE.2					Story is displayed for reading, followed by 3 short tests.
FIREFIGHT.3					Story is displayed for reading, followed by 3 short tests.
THE HUNTER.1					Story is displayed for reading, followed by 3 short tests.
SNAIL.C64.BOOT					Will load SNAIL.C64 INST and SNAIL.C64 automatically.
SNAIL.C64.INST					Instructions for SNAIL.C64.
SNAIL.C64					Draw simple pictures on the screen by inputing the snail's direction & length of movement.
MASTERMIND					A logic game where you are challenged to break a colour code

(E)D3 - COMMODORE 64

Name of Program	Cat	Grade	PST	Mem	Description
45.64					Class mark management program called MARK MANAGER.
AVERAGE CLASS					Example of an average class
FULL CLASS					Example of a full class
CLASS OF 20					Example of a class of 20
MM.INST.0.PCLIP					Instructions for MARK MANAGER 45.64
MM.INST.1.PCLIP					Instructions for MARK MANAGER 45.64
MM.INST.2.PCLIP					Instructions for MARK MANAGER 45.64
VOWELS AT BEGIN.					Concentration type game called PHONCENTRATION, teaching phonics.
VOWELS AT MID.					Concentration type game called PHONCENTRATION, teaching phonics.
VOWELS AT END					Concentration type game called PHONCENTRATION, teaching phonics.
DOUBLE VOWELS					Concentration type game called PHONCENTRATION, teaching phonics.
CONSONANT BLENDS					Concentration type game called PHONCENTRATION, teaching phonics.
PHONCENTRATION					Concentration type game called PHONCENTRATION, teaching phonics.

(E)EA - English

Name of Program	Cat	Grade	PST	Mem	Description
A JOURNEY.40	DG	JI	400	32k	User enters computer-specified parts of speech which are then arranged into a story, with humourous results.
A OR AN.40	DT	EP	232	16k	Student completes random sentences with 'A' or 'AN'; 2 incorrect answers bring a review of pertinent grammar.
A STORY.40	DGU	PJ	400	16k	Student fills in necessary parts of speech (nouns, verbs, adjectives,etc.) and computer generates a story.
AFFECT EFFECT.40	TD	I	402	16k	Student must choose whether to use 'affect' or 'effect' in order to correctly complete a number of sentences.
ALPHA'ZATION.40	D	PJ	63	16k	A well-written drill on 'N' letter alphabetization for 3-letter words. Good graphic prompts and rewards.
ALPHA.40	D	J	202	16k	Program requires student to alphabetize random lists of 2-9 words.
ALPHABET QUIZ.40	D	P	442	16k	This program tests the student on knowledge of the alphabet and location of library books.
ALPHABET WORM.40	DT	P	222	16k	Teaches students alphabetical order as they make alphabet 'worms'; tallies no. of completed 'worms' at end.
ALPHABET.40	D	P	422	16k	The student inputs the missing letter in an alphabetical series.
ALPHABETIZING.40	T	PJ	773	16k	A well-written tutorial in alphabetization. Has 4 levels of difficulty.
ALPHABETTER.40	DT	PJ	553	16k	A very well-written drill and tutorial in alphabetization with comprehensive marking.
ALPHASHIFT.40	DG	PJI	412	32k	Computer reprints words according to a hidden rule. Excellent drill/game using logic, math and the alphabet.
ANTONYM.40	G	PJI	701	16k	A 'CONCENTRATION' game for 1 or 2 players using antonyms as the final objective.
ANTONYMS CONC.40	GDT	PJI	403	32k	A 'CONCENTRATION'-type antonym drill with musical rewards (except on C-64).
CINQUAIN.40	GT	PSI	300	32k	Allows user to write a seasonal poem of 5 lines (cinquain).

(E)EB - English

Name of Program	Cat	Grade	PST	Mem	Description
CLOZE TESTV1.40	U		557	32k	Write a cloze test to printer with x copies, answer sheet and test analysis (reading level, etc.) For teachers.
CONTRACTIONS.40	DT	I	400	16k	Teaches students the correct formation of contractions and drills them on same.
CRYPTO.40	GU	PJISC	400	16k	Student devises own cryptogram and solves it. Program can find the frequency counts of the cryptogram as well.
DEF-N-SPELL.40	U	C	462	16k	Enables teacher to create and use a file of words for testing vocabulary and spelling.
DEFIN'N MATCH.40	D	JI	202	32k	Student must match 6 words with 6 definitions within a self-appointed time limit of 15, 25 or 35 seconds.
DEFINE&SPELL.40	TU	PJISC	462	16k	Given a user-input file of words, this program creates a test on vocabulary and spelling. Useful for teachers.
DEFINITION.40	D	I	202	16k	Program selects 10 of 30 multiple-choice vocabulary questions which may be modified by teacher, if desired.
ENGLISH.40	D	JI	200	16k	Student matches a pair of words with 1 of 4 other pairs that exhibits a similar relationship.
FLASH.40	D	PJI	452	16k	A word or phrase is flashed on the screen for a specified time. User must correctly retype what was flashed.
FLOOGEPRINTER.40	U	S	060	16k	Prints out about 700 nonsense words of 3 phonemes each. Uses: character names, action words for games, etc.
GRAMMAR 2.40	DT	JI	202	16k	Tutorial/drill on parts of speech. Student categorizes 60 words as verbs, adjectives, prepositions, etc.
GRAMMAR.40	D	I	202	16k	Student names various parts of speech in higlighted sections of a sentence - nouns, verbs, prepositions, etc.
GUESSTHATWORD.40	G	I	442	16k	A vocabulary game in which the student must discover a word by guessing letters.
HAIKU.40	TU	JI	000	16k	Program explains and 'writes' Haiku, randomly selecting stored words to produce poems with a computer theme.
HANGMAN (6).40	DG	JI	500	32k	A 'HANGMAN' game with graphics and wide range of words. No. of errors allowed before 'hanging' is adjustable.
HANGMAN 1.40	G	JI	322	16k	A game of 'HANGMAN' with graphic support and 5 categories of words.

(E)EC - English

Name of Program	Cat	Grade	PST	Mem	Description
HANGMAN 2.40	G	JIS	501	32k	Traditional 'HANGMAN', complete with graphics. The computer knows 215 unusual words.
HANGMAN 3.40	DG	I	222	16k	Student tries to identify a hidden word by guessing letters; too many guesses and player is 'hanged'.
HANGMAN 5.40	DG	JI	502	16k	A traditional 'HANGMAN' game which features 40 words and allows up to 11 incorrect guesses.
HANGMAN 6.40	DG	J	422	16k	A game of 'HANGMAN'. Student inputs letters until he/she is able to guess the secret word, or chances run out.
HANGMAN 7.40	G	I	400	16k	The traditional guessing game - solve the hidden word to avoid 'hanging'.
HOMO CONC.40	G	J	202	16k	A 'CONCENTRATION' game in which the student matches up words that sound the same.
HYPHEN.40	D	I	400	16k	The student is required to hyphenate a displayed word. Words are randomly chosen and hints are available.

CONT. (E)EC - ENGLISH....

INIT DIGRAPHS.40	D	P	302	16k	A simple, well-written drill on the digraphs 'TH', 'SH' and 'CH'; multiple-choice questions.
INSERT.40	DG	J	200	16k	Student inserts letters from a list into a given word, making a new word. Program hints at nature of new word.
JOTTO.40	G	PJI	402	16k	Player tries to match PET's hidden 5-letter word. Computer reveals number of correct letters in each guess.
KEYWORDS.40	D	J	442	16k	An interesting three-part test of student spelling skills.
LETTER RECOG.40	D	P	222	16k	Tests students' ability to recognize letters of the alphabet and the numerals 1-9.
LETTER SEQU.40	D	JIS	402	16k	Student must recall random letters flashed on screen. Choice of up to 25 letters and 5 flash speeds.
MACBETH QUIZ.40	D	IS	402	16k	Program poses questions on the content of Shakespeare's 'MACBETH'; student has 3 chances to answer correctly.
MADLIB.40	DGU	PJ	400	16k	Enables student to create 3 short stories by inputting nouns, adjectives, verbs, etc. requested by the program.
MATCH LET.40	D	P	202	16k	This program drills beginning students of the alphabet on letter matching.

(E)ED - English

Name of Program	Cat	Grade	PST	Mem	Description
MATCH MEAN 5.40	D	J	202	32k	Student has to match a given word with its synonym, chosen from a list. Grade 5 level, 30 questions.
MATCH MEAN 6.40	D	J	202	32k	Student has to match a given word with its synonym, chosen from a list. Grade 6 level, 30 questions.
MATCH MEAN 7.40	D	J	202	32k	Student has to match a given word with its synonym, chosen from a list. Grade 7 level, 30 questions.
MEDIAL VOWELS.40	D	PJ	402	16k	After reading a sentence, the student chooses the best word to fill in the blank.
MISSING LET.40	D	EP	200	16k	Computer displays an alphabet missing 1 letter, which the student must enter. Used letters are not repeated.
MISSPELLING.40	D	I	402	16k	Student is given a list of 5 words, one of which is misspelled. This word must be identified and corrected.
MM ADVFORMS.40	D	PJ	202	16k	Mr. Mugs: Drilling students on correct application of adverb forms. Refer L6 P201: 'IT'S SATURDAY'.
MM AVB FORMS.40	D	P	202	16k	Mr. Mugs: Drilling students on correct application of adverb forms. Refer L5 P14: 'MR. MUGS IS KIDNAPPED'.
MM CR COMP.40	D	PJ	202	16k	Mr. Mugs: Identification of question types (who, what, when, where). Refer L6 P101: 'MR. MUGS IS KIDNAPPED'.
MM CRL 1.40	D	P	202	16k	Mr. Mugs: Reading comprehension based on current story. Refer L6 P5: 'MR. MUGS IS KIDNAPPED'.
MM DARK WOOD.40	D	PJ	222	16k	Mr. Mugs: Vocabulary drill. Refer L4 P281: 'IN A DARK WOOD'.
MM HOMONYMS.40	D	PJ	202	16k	Mr. Mugs: Choosing the correct word of two that sound the same. Refer L6 P202: 'IT'S SATURDAY'.
MM LAD VF.40	D	P	202	16k	Mr. Mugs: Drilling students on applying verb forms. Refer L3 P348: 'MR. MUGS IS LOST'.
MM SAD STORY.40	D	P	202	16k	Mr. Mugs: Student selects ending to complete sentence. Refer L3 P333: 'MR. MUGS IS LOST'.
MM SHARE TIME.40	D	PJ	202	16k	Mr. Mugs: Vocabulary/comprehension drill. Refer L4 P39: 'SHARING TIME'.
MM VB FORMS 1.40	D	P	202	16k	Mr. Mugs: Drilling students on applying verb forms (fill-in-the-blanks). Refer L5 P95: 'MR. MUGS AT SCHOOL'.
MM VB FORMS 3.40	D	P	222	16k	Mr. Mugs: Drill on correct verb forms from Series 3. Refer L5 P61: 'MR. MUGS AT SCHOOL'.
MM VB FORMS 4.40	D	P	222	16k	Mr. Mugs: Drills students on verb forms of the Fourth Series. Refer L5 P191: 'IN THE RAIN'.

(E)EE - English

Name of Program	Cat	Grade	PST	Mem	Description
MM VB FORMS 5.40	D	P	222	16k	Mr. Mugs: Drills students on verb forms from Series 5. Refer L5 P203: 'IN THE RAIN'.
MM VB FORMS 6.40	D	P	222	16k	Mr. Mugs: Drills students on verb forms from the 6th Series. Refer L5 P230: 'IN THE RAIN'.
MM VB FORMS 7.40	D	P	222	16k	Mr. Mugs: Drills students on verb forms to be found in Series 7. Refer L5 P256: 'MR. MUGS TO THE RESCUE'.
MM VB FORMS 8.40	D	P	222	16k	Drills students on verb forms to be found in the 'Mr. Mugs' text, 8th Series.
MM VB FORMS 9.40	D	P	222	16k	Drills students on verb forms found in the 9th Series of the 'Mr. Mugs' book.
MM VERB FORMS.40	D	PJ	202	16k	Student selects the correct conjugation of a verb to complete sentence; 3 tenses of the verb are offered.
MM WORD 2.40	D	P	202	16k	Mister Mugs: Drilling students on sentence completion.
MM WORD MEANS.40	D	P	202	16k	Mr. Mugs: Drill on word meanings. Refer L3 P328: 'MR. MUGS IS LOST'.
MM WORDS 1.40	D	P	202	16k	Mr. Mugs: Sentence completion. Student fills the blank in a sentence by choosing a word from the list provided.
NEW TACHISTO.40	G	JISC	922	16k	Words are flashed on screen and student must enter each one; speed of flash increases as player improves.
NOT SO EASY.40	G		400	16k	User attempts to find the 'secret' underlying a mysterious paragraph.
NOUNS.40	DT	JI	222	16k	A tutorial and drill on nouns which provides definitions, questions and multiple-choice testing.
OLD PROVERBS.40	U	JIS	000	16k	Provides the student with a number of 'old proverbs' to read.
P'BLEM P'NOUN.40	D	I	204	16k	A multiple-choice drill of variable difficulty which gives the student practice in pronoun usage.
PARTS SPEECH.40	D	I	202	16k	Student determines whether a word is an adjective, verb, noun or preposition in this multiple-choice drill.
PAWS.40	D	PJ	412	16k	User corrects unpunctuated quotes selected by Toby the Tiger from the Jungle of Punctuation.
PETPITPATPOT.40	DG	I	402	16k	Student must guess 10 words having the prefixes 'PET', 'PIT', 'PAT' or 'POT'.

(E)EF - English

Name of Program	Cat	Grade	PST	Mem	Description
PLURALS.40	D	P	602	32k	Drills student on the basic plural forms. Excellent graphics encourage and reward answers to the 42 questions.
POEMS.40	G	JI	000	16k	A random poetry generator which can be easily altered.
POET.40	U	I	000	16k	Computer randomly arranges lines of poetry. The probability of line repitition, etc. is shown.
POETRY.40	T	JI	400	32k	Allows user to write simple poems using either 'is like' or 'I used to/ but now' constructions. User-friendly.
Q'S AND Z'S.40	D	J	400	16k	The student tries to find words beginning with the letters 'Q' or 'Z' which match given meanings.
READ LEV&EVAL.40	TU	PJISC	462	16k	This program enables the teacher to analyse the student's reading level.
READER.40	D	PJISC	100	32k	The program is designed to improve reading speed and comprehension. Teacher may modify text to required level.
RHYMING.40	D	P	202	32k	Program is a test, with graphic rewards, of user's rhyme-identification skills. Keeps score and elapsed time.
ROMEO&JULIET.40	D	SI	312	32k	A quiz on Shakespeare's 'ROMEO AND JULIET'.
S-SPELL.40	DG	J	202	16k	Student finds hidden word by filling in letter blanks; 20 letter guesses allowed; point bonus for getting word.
SCRAMBLE 4.40	DG	J	402	16k	Student must unscramble 10 randomly-chosen words, Grade 4 level. The first letter is given.
SCRAMBLE 5.40	DG	J	402	16k	Student must unscramble 10 randomly-chosen words, Grade 5 level. The first letter is given.
SCRAMBLE 6.40	G	J	402	16k	A well-designed word puzzle game, for Grade 6, which asks student to decipher a scrambled word (no time limit).
SCRAMBLE 7.40	G	I	402	16k	A well-designed word puzzle game, for Grade 7, which asks student to decipher a scrambled word (no time limit).
SCRAMBLE 8.40	G	I	402	16k	A well-designed word puzzle game, for Grade 8, which asks student to decipher a scrambled word (no time limit).
SCRAMBLE.40	G	P	400	16k	Student types in lines and they appear scrambled on the screen; letters then creep 'home' to re-form sentences.
SCRAMBLEDWORD.40	G	I	402	16k	Student is called upon to correctly unscramble various words.

(E)EG - English

Name of Program	Cat	Grade	PST	Mem	Description
SENT ANALYSIS.40	D		400	16k	Student is called upon to input various parts of speech into a given sentence.
SHAKESPEARE.40	D	IS	462	16k	Consists of 'Who am I' and 'Who said' questions about Shakespearean dramas. Requires some study/preparation.
SNERD.40	T	PJ	400	16k	A writing program which encourages student creativity and use of descriptive words.
SNOWYDAYNOUNS.40	DG	P	400	16k	This program challenges the student to find all the hidden nouns in a picture.
SP'G ERRORS 5.40	D	I	402	16k	Student identifies and corrects various misspelled words.
SP'G ERRORS 6.40	D	I	402	16k	Student identifies and corrects various misspelled words.
SPEED READ 2.40	D	PJIS	300	32k	A short phrase is flashed briefly on screen; student must repeat it. Variable levels of speed and difficulty.
SPEED READING.40	D	PJI	494	16k	Program flashes 1-9 digits which the user must recall. Duration of flash is variable.
SPEED SPELL 2.40	DG	P	422	32k	A word flashes on screen and the student types it. Flash speed is determined by spelling accuracy (Grade 2).
SPEED SPELL 3.40	DG	J	422	32k	A speed-spelling drill for Grade 3 (see 'SPEED SPELL 2.40'). Has 358 words.
SPEED SPELL 4.40	DG	J	422	32k	A speed-spelling drill for Grade 4 (see 'SPEED SPELL 2.40'). Has 483 words.
SPEED SPELL 5.40	DG	J	422	32k	A speed-spelling drill for Grade 5 (see 'SPEED SPELL 2.40'). Has 483 words.
SPEED SPELL 6.40	DG	J	422	32k	A speed-spelling drill for Grade 6 (see 'SPEED SPELL 2.40'). Has 450 words.
SPEED SPELL 7.40	DG	I	422	32k	A speed-spelling drill for Grade 7 (see 'SPEED SPELL 2.40'). Has 447 words.

(E)EH - English

Name of Program	Cat	Grade	PST	Mem	Description
SPEED SPELL.40	D			16k	A word-flash spelling drill.
SPELL BEE.40	D	PJI	410	16k	A word is flashed on the screen and the student must type it correctly; 6 levels of difficulty, modifiable.
SPELLER.40	D	J	402	16k	This program is a quiz on the meanings of 20 words; data may be modified to suit any grade level.
SPELLING 1.40	D	P	402	16k	A word is flashed on the screen and the student is asked to re-type it exactly.
SPELLING 2.40	D	P	402	16k	Computer scrambles various words entered by the student, who must then spell the words correctly.
SPELLING.40	D	PJ	202	16k	Student responds with 'Y' or 'N' depending on whether a given word is spelled correctly or incorrectly.
SPELLINGTUTOR.40	P	PJ	401	16k	A teacher inputs up to 50 words. The student must unscramble these words and also correct those misspelled.
STORY WRITER.V11	U	P	100	16k	A very popular simple word processor designed for primary students. Prints out in enhanced print if desired.
SWAP OLD ROM.40	D	J	422	32k	Student must swap word positions on a list until it has been put in alphabetical order.
SWAP.40	GT	J	420	16k	Specific words entered by the student are moved into alphabetical order to sound accompaniment.

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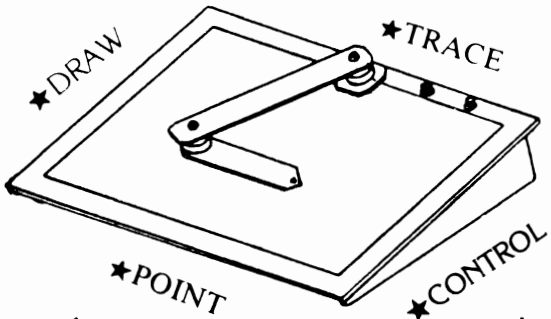

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CONT. (E)EH - ENGLISH....

SYLLABLES.40	D	J	602	32k	Student has to state the number of syllables in a word, then divide the word in the appropriate places.
TACHISTISCOPE.40	GD	PJ	551	16k	Increases reading speed by flashing short phrases on the screen; duration of flash varies with user's accuracy.
THEIR THERE.40	DT	J	402	16k	Presents a review and drill on the meanings and uses of 'THEIR', 'THERE' and 'THEY'RE'; 25 questions in all.
THEWORDMARKET.40	G	J	402	16k	Student must correctly spell a given word in order to 'purchase' word from the 'Word Market'.
TWENTY QUESTN.40	G	J	400	16k	Student selects a category; the computer poses questions entered beforehand by the teacher.
TWO TO TOO.40	DT	JI	402	16k	Teaches student the correct uses of 'TO', 'TOO' and 'TWO'.
UNSCRAMBLE.40	DG	I	402	16k	The student is required to unscramble words of various types.

(E)EI - English

Name of Program	Cat	Grade	PST	Mem	Description
VERB CHOICE.40	D	P	302	16k	Student fills in the blank with the correct one of three verb tenses presented; there are 10 questions.
VOCABULARY3.40	D	P	312	32k	A Grade 3 vocabulary test in multiple-choice form.
VOCABULARY4.40	D	J	202	16k	A Grade 4 vocabulary test which focuses on synonyms.
VOWEL MAGIC.40	D	PJ	260	16k	Student enters any word and is quizzed by the computer on the number of vowels the word contains.
WORD DEMO.40	O	JIS	400	16k	User enters up to 10 phrases and the computer rearranges them in different orders; no instructions.
WORD DRILL.40	DT	JI	202	32k	Student selects one of two homonyms to complete a sentence; if answer is incorrect, definitions are displayed.
WORD HUNT.40	D	JI	400	16k	The program gives clues in 'wanted poster' format. Student must identify the fugitive word.
WORD INVADERS.40	G	PJ	700	16k	The student must shoot the empty space in a moving word, then guess the missing letter that completes the word.
WORD MACHINE.40	DG	EP	302	16k	User must select 5 correctly spelled words from various 3-letter combinations that move across the screen.
WORD POWER.40	U	ISC	402	16k	Student or teacher can write word files or prepare a test on definitions. A good test-writing program.
WORD POWER2.40	T	JI	202	16k	Student selects proper definition of given word; adapts to all levels. For sample data load 'WORDPOWERSAMPLE'.
WORD QUEST.40	G	I	424	16k	Program creates a word-search puzzle. Student must locate the hidden words within a group of random letters.
WORD SEARCH.40	GU	JISC	000	16k	Program creates a search game by hiding user-selected words inside a crossword puzzle; print-out if desired.
WORDSHOOT.40	G	PJI	200	16k	Student 'shoots down' misspelled words and must spell them correctly afterwards.

(E)FA - French

Name of Program	Cat	Grade	PST	Mem	Description
FRENCH DRILL.40	D	JI	432	16k	A thorough drill in simple French vocabulary.
FRENCH NUMS.40	D	P	102	16k	A simple drill on French numbers.
INTERET CMPSE.40	DT	SC	311	16k	Questions relating to compound/accrued interest, capital and percentage. Interest table + calculator required.
LE PENDU.40	DG	JI	332	32k	A French version of 'HANGMAN' which utilizes common words and offers clues.
LES FRACTIONS.40	D	I	411	16k	Drills +, -, * and / with fractions; correct answers provided.
MATRICES MATH.40	DT	S	412	16k	Gives 10 examples on how to solve matrices. Allows student to input answers, then gives solutions.
PROGRES. GEOM.40	D	IS	202	16k	Drills student on problems of geometrical progression.
RACINE CARREE.40	D	I	202	16k	Student must calculate the square root of a given number.
REVUE PASSE.40	D	JI	220	16k	A good review of passe compose (requires instruction in passe compose beforehand).
SERIE 1.40	DT	I	000	16k	This program teaches student how to recognize patterns in a series.
VERBES.40	D	I	100	16k	Student must select the verb form (past and present are given) which correctly completes a sentence.

(E)GA - Games

Name of Program	Cat	Grade	PST	Mem	Description
ABSTRACT.40	G	JI	422	16k	A 'MASTERMIND' game with 3 numbers; a good test of logic and memory.
AFO!.40	G	PJ	000	16k	A Japanese variant of an 'invader' game. Player tries to down the 'AFO' with a laser, without being hit.
ARROW.40	G	PJI	211	16k	Player guides a 'snake' to hit target boxes while avoiding boundaries and the snake itself.
ATTRIBUTE BLK.40	G		200	16k	A logic game in which the player must find out which items belong to each card.
BATTLESHIP.40	G		212	16k	User plays against computer. Each has 5 ships hidden on a grid; winner is first to find and sink other fleet.

CONT. (E)GA - GAMES....

BIOCOMPAT.40	G	IS	402	16k	Calculates the compatibility of 2 persons according to their biorhythms.
BOWLING.40	S	PJ	202	16k	A bowling simulation for 1-3 players.
BREAKOUT.40	G	PJI	212	16k	Player's paddle deflects a ball into a wall of blocks until a 'break--out' is achieved.
CAREFUL.40	G	JI	000	16k	A fast action game whose objective is to avoid the perimeter and the obstacles which are continually appearing.
CASTLE QUEST.40	G		012	16k	An adventure game set in a castle.
CHASE.40	G		222	16k	A 2-person game of computer chase in which each player attempts to 'tag' the other.
CONCENTR'N 2.40	G	JIS	212	16k	A game which challenges the player to recall pairs of matching patterns.
CRAZY BALLON.40	G		112	16k	Player has 4 chances to guide a balloon through some prickly stars without hitting any of them.
CYCLON BATTLE.40	S	JI	902	16k	Player attempts to center cyclon fighters in a gunsight and shoot them down.
DRACULA.40	G	PJ	200	16k	Player searches a haunted house for Dracula's resting place, which must be found before midnight.
DRAGON ISLAND.40	G	J	000	16k	An unseen dragon is chased through its caves until either player or dragon is destroyed, or time has expired.

(E)GB - Games

Name of Program	Cat	Grade	PST	Mem	Description
DRAGON MAZE.40	G	PJ	200	16k	Object: escape an invisible maze before dragon arrives. Sections of maze walls become visible when struck.
DRAW 3.40	U	PJIS	200	16k	Permits the user to draw pictures on screen using graphic characters.
DRAW POKER.40	S	S	602	16k	Simulates a one-on-one game of 'DRAW POKER', with 5 cards and one draw of 3.
DROIDS.40	G	JI	212	16k	A game for up to 4 players. Object is to mine the most ore.
DUCK SHOOT.40	S	PJ	202	16k	The object is to hit a flying duck in the body (head and tail don't count). Bird dog retrieves downed ducks.
DUNGEON.40	G	JIS	242	32k	A adventure game of dungeon escape, with interesting creatures, a map and a key.
ELIZA.40	GS	IS	300	16k	User reveals personal problems to 'ELIZA' and receives sympathetic responses which encourage self-analysis.
FACES TO MAKE.40	G	P	100	16k	Enables user to make up a variety of faces by choosing from a collection of different noses, eyes and mouths.
FISH.40	S	JI	202	16k	Player tries to estimate number of trout in 3-20 lakes by catching, marking and returning fish.
FOOTBALL.40	S	PJI	204	16k	A simulation of American football. User has 7 plays to call on; probability of success differs with each.
FROG RACE.40	G	P	202	16k	Program allows 1-16 players to bet on a frog race. The different odds on each frog in the race are supplied.
HAMLET.40	G	JIS	422	16k	The game of 'OTHELLO' (which is a version of the Chinese 'GO') played against the computer.
HARD INVADERS.40	G	I	312	16k	A 'SPACE INVADERS' game done completely in machine language.
HURKLE.40	G		010	16k	Find the 'hurkle' hiding in a grid. One of the better grid/search games.
KENO.40	G	PJ	202	16k	A roulette-type board game. Player chooses up to 9 numbers to bet on; computer chooses 20. Match to win.

(E)GC - Games

Name of Program	Cat	Grade	PST	Mem	Description
KINGDOM.40	S	JI	332	32k	Player governs an agrarian kingdom, making decisions concerning food production, land purchases, etc.
LETTER 15.40	G	PJ	332	16k	A version of the logic game '15' using letters.
MARTIANS.40	G	J	222	16k	Player strives to catch the last remaining 'Martian' hiding in a grid.
MASTERMINDSP.40	G	JIS	345	32k	The game of 'SUPER MASTERMIND' with C-64 color.
MAZE.40	G	JI	100	16k	Program generates a maze (3 sizes), then times progress through it. Player may watch generation if desired.
MAZES.40	G	I	100	16k	Draws 3 different sizes of maze for player to traverse.
MILLE BORNES.40	G	JIS	232	32k	Reproduces the original card game. Player and computer vie to be the first to go 1000 miles by 'automobile'.
MIMIC.40	G	PJIS	952	32k	The game of 'SIMON' with music and graphics, offering 5 levels of play on a 3x3 grid.
MOUSE MAZE.40	G	IS	602	16k	Player/'mouse' must negotiate a maze in order to reach some cheese waiting at the exit.
NERVES.40	G	PJ	252	16k	A simple game that tests the user's ability to judge short intervals of time; 3 play levels.
NIM.40	G	PJI	240	16k	Player competes with the computer to be the last one to remove an object from 3 piles.
NUMBER-TOE.40	DG	PJ	222	16k	A version of 'TIC-TAC-TOE' in which player must make the first two numbers in a row add up to the third number.
OSCAR LUNAR.40	S		222	16k	A lunar-lander simulation in which all relevant information is updated on the screen during the descent.
PETALS-ROSE.40	G	JIS	302	16k	A puzzle involving the scoring of 5 dice. Can you figure out how the total score is calculated?
PETMAN 2.40	G	JI	200	16k	A 'PAC-MAN' game for the PET or C-64. One screen with 3 levels of difficulty.

(E)GD - Games

Name of Program	Cat	Grade	PST	Mem	Description
PINBALL.40	S	JI	111	16k	A simulation of a 'PINBALL' game.
PLANET PROBE.40	S	PJ	201	16k	Player must apply correct thrust against gravity to make a close pass over a planet. Gravity is variable.
PONG.40	G		201	16k	A game in which a bouncing ball is deflected to hit a target.
POSTAL ROUTE.40	G	JIS	122	16k	Player attempts to drive through a postal route without using the same path twice.
RAGING ROBOTS.40	G	JI	202	16k	Player tries to survive inside an enclosure by destroying 'raging robots' that are programmed to attack.
ROAD RALLY.40	G	JI	112	16k	Player attempts to drive a car five kilometers on one half-litre of gas.
ROAD TRACK.40	S		111	16k	A solo game in which player tries to move a 'car' around a track without hitting any walls.
ROADRACE.40	S	J	200	16k	Player attempts to negotiate track without colliding with the walls; speed is variable.
ROCKETS!.40	G	P	232	16k	A 1-player game in which the object is to guide a rocket through stars, etc. to the top of the screen.
ROTATE.40	G	JIS	200	16k	Player attempts to arrange letters in alphabetical order within a square by rotating 4 at a time, clockwise.
SHOOT.40	G	JI	000	16k	Two lines shoot across the screen; player presses 'F' and tries to hit the top line.
SNAKES.40	G	JIS	312	16k	Player tries to entrap opponent by creating a maze. 3 modes: comp. vs comp., player vs comp., or 2 players.
SPACE ATTACK.40	G	PJI	112	16k	A variation on the 'SPACE INVADERS' theme.
SPACE PILOT.40	S		212	16k	Player attempts to destroy arms warehouses by means of aerial bombardment.
SPADES.40	G	JISC	202	16k	A card game for 1 player. User must know rules of 4-handed spades to play; instructions included.
STAR TREK IV.40	S		222	32k	A passable 'STAR TREK' game which lacks the 'galaxy scan' feature of the Butterfield version.
STAR TREK.40	S	JIS	332	16k	A classic 'STAR TREK' game which puts player in command of a well-armed starship with a mission to fulfill.

(E)GE - Games

Name of Program	Cat	Grade	PST	Mem	Description
SUPERDRAW!.40	GU	PJ	200	16k	A drawing program in which user is able to change the character under the cursor.
TIC-TAC-PRO.40	G		222	16k	User plays 'TIC-TAC-TOE' with the computer, which 'learns' from its mistakes after a number of games.
TICTACTOE 2.40	G	PJ	221	16k	A variation of the game 'TIC-TAC-TOE'.
TORCH MAN.40	G	I	122	16k	Player must find Lois Lane in a 100 x 100 x 100 palace and rescue her from the evil 'Torch Man'.
TORP. BOMBER.40	S	PJI	902	16k	Player, as the pilot of a torpedo bomber, attempts to hit submarines lurking beneath the ocean surface.
WAREHOUSE.40	S	IS	552	32k	Simulates a day at a warehouse experiencing various levels of activity. User co-ordinates orders and shipments.

(E)RA - Geography

Name of Program	Cat	Grade	PST	Mem	Description
AFRICA & ASIA.40	D	I	202	16k	Quizzes students on their knowledge of Asian and African capitals.
ANCHORAGE-2.40	S	IS	300	32k	Simulates the navigation of a boat to a safe anchorage. Student has to take bearings, set course and speed.
CAN GEOG QUIZ.40	D	I	201	16k	Quizzes the student on miscellaneous Canadian geography facts.
CANADA QUIZ.40	D	JIS	302	16k	Asks 10 questions concerning Canada's political personalities, provinces and capitals.
CANADA.40		I	212	32k	A quiz on parts of Canada displayed on a map. Student must identify provinces, then name and locate capitals.
CAP CITIES.40	D	I	211	32k	Quizzes student on the capitals of world regions; choice of region is left to the student.
CAPITALS.40	D	I	211	32k	Allows student the choice of being drilled on Canadian, American or world capitals.
CITY SMOG.40	S	JIS	200	16k	Uses graphs to simulate various conditions that affect smog. The student inputs all data.
CLIM GRAPHS.40	O	JIS	202	16k	Tests a student's skill at reading and analyzing climate graphs.
FOREST FIRE.40	S	I	202	16k	Simulates a forest fire whose outcome depends on student's decisions.
GEO QUIZ.40	D	J	202	16k	A multiple-choice Canadian geography quiz.
GEOG. TEST.40	D	I	202	16k	A quiz on miscellaneous facts of American geography.
GEOGRAPH QUIZ.40	D	I	302	16k	A general quiz on Canadian geography.
GEOGRAPH.40	D	I	201	16k	A quiz on general geographic facts - exports, capitals, etc.

(E)RB - Geography

Name of Program	Cat	Grade	PST	Mem	Description
GEOGRAPHY.40	D	I	202	16k	A general quiz of miscellaneous geographical knowledge.
HAMMURABI.40	S	I	300	16k	Player 'rules' a country, making economic decisions concerning land management, distribution of food, etc.
HISTOGRAM.40	U	S	000	16k	Groups data into a histogram.
ICE.40	ST	S	000	32k	A good graphic simulation of glacier formation and behaviour.
ITALIAN QUIZ.40	D	I	201	16k	A general quiz on Italian geographic facts and aspects of Italian life (in English).
KOPPEN.40	D	IS	322	16k	Asks 10 questions on classifying weather patterns (temperature, precipitation, etc.) under the Koppen System.
LAKE DISTRICT.40	DG	JIS		16k	A 'HANGMAN'-type game, testing knowledge of mountains, towns and waterfalls in the Lake District of England.
LIMITS.40	S	IS	200	16k	Determines population-related growth rates. Factors include birthrate, deathrate, food, pollution, etc.
MALI.LIFE.40	S	I	202	16k	Simulates the decision-making process faced by a Mali tribesman selling cattle to support his family.
MAP DIRECT.40	D	J	302	16k	Tests the student's ability to find directions using a compass.
MILEAGE.40	U	IS	200	16k	Student keys in latitude/longitude of 2 or more places; computer returns distance between them in miles/km.
NORTH EAST.40	DG	JIS	202	16k	A 'HANGMAN'-type game, testing knowledge of rivers, towns, landmarks, etc. in north-eastern England.
OCEAN QUIZ.40	D	I	202	32k	Tests student's knowledge of ocean geography.
OPEN PIT MINE.40	GS	S	990	16k	A game simulating some of the hazards of open pit mining.
POP DYNAMICS.40	GS	JIS	200	16k	Simulates an ecological system involving rabbits, hawks and wolves. User manipulates various key factors.

(E)RC - Geography

Name of Program	Cat	Grade	PST	Mem	Description
POP LIMITS.40	S	S			Simulates population-related growth rates using student/standard sets for births, deaths, indust. output, etc.
POPULATION.40	S	JIS	200	16k	Draws a graph of population distribution by age from set data, or data input by the student.
STATES & CAP.40	D	I	312	16k	Tests user's knowledge of American states and capitals. Offers option of fill-in-the-blanks or multiple choice.
STATES & REG.40	D	I	200	16k	Quizzes the student about which region a particular state is found in.
SYMBOLOGY.40	D	JIS	202	16k	Students have to read a map, identifying symbols used on it.
U.S. POP.40	S	IS	320	16k	Student adjusts factors such as birth and mortality rates in order to alter human population and distribution.
VOLCANO SIMU.40	GS	JIS	220	32k	Player attempts to escape a volcanic eruption by making rational decisions as to a course of action.
WEATHERMAN.40	U	I	300	16k	Permits conversion between temperature scales; computes wind chill factor and humidity index.
WORLD ATLAS.40	T	I	000	16k	Graphically depicts maps of various countries on the screen.
WORLD CAPS.40	D	I	212	16k	Quizzes students on their knowledge of world capitals.

(E)JA - Language

Name of Program	Cat	Grade	PST	Mem	Description
FILIPINO.40	D	J	201	16k	A basic drill on common Filipino words. Simple format: a word is presented and user enters the translation.
FINGER SPELL.40	DT	J	100	32k	Uses graphics to teach the hand symbols for letters, and tests the student's recognition of these symbols.
LATIN 123.40	D	S	210	32k	Drills student on translation from English to Latin, or vice versa. Gives levels of difficulty & hints.
LATIN VOCAB.40	D	I	101	16k	Drills translation of simple English words into Latin. Displays words missed on first try at the end.
SWEDISH QUIZ.40	D	I	101	16k	Presents the student with English words to be translated into Swedish; no levels of difficulty provided.

(E)LA - Logic and Problem Solving

Name of Program	Cat	Grade	PST	Mem	Description
A V OR M.40	G	PJ	202	16k	Program gives the name of an object and student decides whether it is animal, vegetable or mineral.
ANDROID NIM.40	G	JI	212	16k	Player and computer take turns eliminating androids. The one who eliminates the last android wins the game.
BOTTLECAPS.40	G	JI	102	16k	Player and computer take turns removing bottlecaps; the one to take the last bottlecap loses the game.
BUTCH & SLIM.40	G		322	32k	Given certain facts about a robbery, the student uses logic to answer relevant questions.
CHESS BOARD.40	G	JIS	322	32k	A computer game of chess for two players.

CONCENTRATION.40	G	PJI	312	16k	Player must remember an assortment of patterns and match them up once they have been concealed.
CRAPS.40	S	JIS	202	16k	A simulation of the dice-rolling game called 'CRAPS'.
CRYPTOGRAM.40	G	IS	492	16k	Student tries to decipher a message by solving the encoding method.
CUBE.40	G	JIS	232	32k	The computer scrambles a Rubik's cube, and user attempts to solve it.
DRAW CAVE.40	G	JI	312	16k	An adventure game set in a maze. Player has to find treasures before starving, dying of thirst or being eaten!
ENERGY.40	G		332	16k	Requires the student to use logic to reason out various thermometer settings, given a number of clues.
FLIGHT SIMUL.40	S	JIS	432	16k	The computer simulates the flying of a small plane.
FUR TRADE.40	GS	JIS	312	16k	A simulation of fur trading in Early Canada. Player sells furs while trying to avoid disasters, ambushes, etc.
GUNNER.40	GS		222	16k	User tries to hit a target by providing the correct angle of fire for a cannon.
HI-Q.40	GS	JIS	502	16k	A simulation of the game 'HI-Q'. Object is to remove as many pegs as possible by jumping into empty holes.
IN-ORDER.40	G	JI	422	16k	Computer 'thinks' of a 3-digit number and the player tries to guess it with the aid of clues.

(E)LB - Logic and Problem Solving

Name of Program	Cat	Grade	PST	Mem	Description
IQ-TEST.40	DG	JISC	219	16k	Asks 20 mathematical sequence questions on each run and gives their solutions.
KALAH.40	G		332	16k	The ancient Egyptian 'pit-and-pebble' game. Player distributes pebbles so as to take over an opponent's pits.
KNIGHT'S TOUR.40	G	JISC	100	16k	A chess game which uses Warndorf's rule. Computer moves a 'knight' to every position on the chessboard.
LABYRINTH.40	G	JI	231	32k	The object, as the title suggests, is to find one's way through a maze.
LOGIBLOCK.40	G	I	422	16k	Player attempts to guess the two attributes of a block that the computer is 'thinking' of.
MAGIC SQUARE.40	G	PJIS	722	16k	A fascinating, frustrating logic puzzle.
MASTERMIND 2.40	G	JIS	432	16k	A computer version of 'MASTERMIND', involving the breaking of a code through use of logic.
MASTERMIND 3.40	G	JIS	432	16k	Computer version of the logic game 'MASTERMIND'. Player tries to break a 5-color code; variable difficulty.
MATCHES.40	G	JI	322	16k	A 'NIM'-type game played against the computer. Object is either to take the last match, or not to take it.
MAZE GENERAT.40	GU		200	16k	Generates mazes and draws them out on a printer.
MUGWUMPS.40	G	JI	322	16k	Object: find 4 hidden 'mugwumps' on a co-ordinate grid in 10 moves. Computer advises on proximity of targets.
OBJECT.40	DG	PJ	622	16k	A program for testing pupils' ability to distinguish between various shapes in groups.
OSERO.40	G	JIS	222	16k	The game of 'OTHELLO' played against the computer.
OTHELLO 2.40	G	JIS	200	16k	A computer version of the popular game of logic and capture. Opponent's pieces are taken by enclosing them.
OTHELLO FOR 2.40	G	JIS	212	16k	A 2-player game whose object is to capture an opponent's tokens by enclosing them.

(E)LC - Logic and Problem Solving

Name of Program	Cat	Grade	PST	Mem	Description
OTHELLO.40	G		232	16k	In this version of 'OTHELLO', player and computer attempt to capture each other's tokens by enclosing them.
PUZZLE.40	GU	JIS	000	32k	Allows student to design and solve crossword puzzles. Sample data may be obtained by loading 'PUZZLE.DATA'.
QUEST 3.40	G	JI		16k	An adventure game in which the player searches for treasure in a pirates' cave.
REMEMBERING.40	G		222	16k	Student, playing against the computer, tries to match hidden objects.
REVERSE.40	G	JI	202	16k	Player attempts to put 9 numbers in numerical order by reversing the first 'N' numbers.
RHYMECONC.40	G	JI	210	16k	A version of 'CONCENTRATION' with 2 players, using hidden rhyming words instead of cards or objects.
SEVEN GABLES.40	G	ISC	442	32k	An adventure game which traps the player in an old house containing numerous treasures.
SLOT MACHINE.40	S	JIS	402	16k	Offers a graphic simulation of playing a slot machine.
SNARK.40	G	J	322	16k	Player finds a 'snark' on a grid by entering the center and radius of a circle in which it might be hidden.
SOLITAIRE.40	S	JIS	732	16k	Lets user play all 3 versions of 'SOLITAIRE' on the computer.
TIC TAC TOE.40	G	PJ	202	16k	Student plays 'TIC-TAC-TOE' against the computer.
TOWER HANOI.40	G	JIS	332	16k	Move a pile of different sized blocks from one peg to another, without putting large blocks on smaller ones.
TRACE-A-WORD.40	G	PJI	402	16k	Student tries to find hidden words within a time limit.
TWENTY QUEST.40	G	PJ	592	16k	Computer acts as an 'artificial intelligence', asking questions to increase its knowledge in various areas.

(E)LD - Logic and Problem Solving

Name of Program	Cat	Grade	PST	Mem	Description
US CIVIL WAR.40	S	JIS	322	16k	A Civil War simulation. Object is to win as many battles as possible. Facts and figures have historical basis.
WATCHPERSON.40	G	JIS	221	16k	Player tries to find a way to walk through town without retracing steps.
WEIGH.40	S	JI	000	16k	User must find the odd weight, and determine if it is lighter or heavier, given only 3 chances at the scales.
WESTWARD HO.40	GS	JI	442	32k	An entertaining adventure program which simulates life in the Wild West at the time of the Gold Rush.
WUMPUS.40	G	JI	332	16k	An adventure game in a dodecahedron. Player hunts the 'wumpus' through a series of imaginary tunnels and rooms.
YAHTZEE.40	G	JIS	322	16k	A computer version of the game of 'YAHTZEE' in which player tries to roll various combinations with 5 dice.

(E)MA - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
ADD AND SUB.40	DT	I	402	16k	Drills the student on addition and subtraction of signed numbers.
ADD DRILL.40	D	J	202	16k	Student has option of doing addition problems with 0 to 9 rows of numbers, or 0 to 9 digits in each number.
ADD TEACHER.40	DT	P	224	16k	Teaches student how to add numbers together and provides cumulative marking.
ADDING DRILL.40	D	P	202	16k	A simple drill on adding two numbers in the range 1-100.
ADDING QUIZ.40	D	P	202	16k	An adding drill which utilizes numbers with up to 4 digits and points out incorrect digits in the answers.
ADDITION GAME.40	D	P	202	16k	Student is given 10 timed addition problems.
ADDITION RACE.40	DG	J	202	16k	Addition drill game. Players advance the two men on the screen by correctly answering addition problems.
ADDITION.40	D	IS	202	16k	A drill made up of 10 random addition problems; entry of digits is left-to-right.
ADDS AND SUBS.40	D	PJ	200	16k	Drills addition or subtraction and lets student count objects if answer is incorrect; good incentive graphics.
AGENT BLOTTO.40	D	P	222	16k	This program uses math questions to solve a mystery. Each correct answer reveals a letter in a secret message.
ALG. VECTORS.40	D	S	202	16k	Drills nine sub-topics under algebraic vectors.
ALGEBRA DRILL.40	DT	I	440	16k	A drill/tutorial in simplifying algebraic expressions.
ARITH DRILL.40	D	J	202	16k	A timed drill on +, -, and *, with optional levels of difficulty.
ARITHMETIC 1.40	D	J	422	16k	A drill in +, -, and * with levels of difficulty.
ARITHMETIC.40	D	J	202	16k	Practice with simple +, -, and *.
B.T.C. ADD.40	D	J		16k	A drill in addition facts against user-set time limit.
B.T.C. DIVIDE.40	D	P	202	16k	Poses division questions which are to be answered within a time limit set by teacher or student.

(E)MB - Mathematics

Name of Program	Cat	Grade	PST	MEM	Description
B.T.C. FRACT.40	D	J	222	16k	Practice in multiplying fractions within a user-set time limit.
B.T.C. MULT.40	DG	PJ	422	16k	Multiplication questions must be answered within a time limit specified at the beginning of the game.
B.T.C. SUBTRT.40	D	P	202	16k	Subtraction facts with up to 2-digit regrouping flash against the clock. In second part, player vs computer.
BAIRSTOW NTH.40	U	SC	200	16k	Uses Bairstow's iterative method to find successive quadratic factors of an nth order polynomial.
BALANCE.40	DS	JI	422	16k	Drills student in balancing various metric weights on simulated scales.
BASIC MATH.40	D	PJ	202	16k	A drill in basic +, -, * and /.
BEADS IN JAR.40	T	JI	200	16k	Provides an illustration of probability by drawing beads from a jar at random.
BETWEEN.40	D	P	200	16k	Student attempts to guess a secret number between given limits: 0 < number < 10.
BIG BINARY.40	U	IS	200	16k	Converts decimal numbers (up to 511) into binary form.
BIG DIVIDE.40	D	J	200	16k	A drill in simple division yielding 1 to 2-digit results.
BIG MATH.40	D	P	202	16k	Responses to 5 vertically arranged math problems (choice of +, -, * or /) are keyed in from right-to-left.
BIG SUBTRACT.40	D	I	200	16k	Drills the subtraction of whole numbers using large numerals in the screen display.
BIGTIME.40	DGU	P	200	16k	Creates a large 12 or 24 hour digital clock, with alarm.
BINOM. EXPAN.40	DT	S	302	32k	A drill in expanding binomial products using 'F.O.I.L.'
BINOMIAL DRIL.40	D	IS	202	32k	A drill on expansion of binomial multiplication.
BINOMIAL EXP.40	TU	I	200	16k	Explains and calculates binomials using Pascal's triangle and large graphics.

(E)MC - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
BODMAS.40	D	J	202	16k	A drill on the order of operations.
BOMB ADDITION.40	DG	J	200	16k	A drill/game using 2-digit addition problems. If answer is incorrect, a 'bomb' explodes.
BRAIN CRANE +.40	D	J	200	16k	This program builds up student addition skills by drill method. Graphics feature a crane which moves numbers.
BRAIN CRANE /.40	D	PJ	222	16k	Uses drill method and incentive graphics to 'build up' student's division skills.
BRAIN CRANE X.40	D	PJ	222	16k	This program 'builds up' the student's multiplication skills by drill method.
CALCULUS.40	DT	S	422	16k	A drill on simple calculus problems involving acceleration and velocity.
CAR RACE MULT.40	DG	P	202	16k	Two players race their 'cars' across the screen by answering multiplication questions.
CASH REGISTER.40	D	P	202	16k	After a 'purchase', user is required to give out correct change in the smallest number of bills and coins.
CHANGEMAKER.40	ST	J	200	16k	Simulates the buying of items in a store. Computer totals prices, adds sales tax and shows how to make change.
CHOICES.40	T	I	200	16k	A study in probability. Illustrates the number of ways to select 'R' items from 'N' items.
CLOCK.40	D	P	202	32k	Computer displays a clock face and student enters appropriate digital time. Total of 10 questions.
CO-ORDINATES.40	DT	JI	922	32k	A good introductory lesson on the cartesian coordinate system.
COIN PUZZLE.40	DG	JI	200	16k	Student must weigh coins on a balance in order to discover odd coin.
COLLECT TERMS.40	D	JI	200	16k	A drill in collecting like terms in algebraic expressions; three levels of difficulty.
COLLECTERMS 1.40	D	I	202	16k	A drill in collecting coefficients of like algebraic terms.

(E)MD - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
COLLECTERM 2.40	D	I	202	16k	Gives practice collecting coefficients of like algebraic terms.
COPY CAT.40	D	JI	200	16k	Drills student in remembering numbers and letters.
COUNT 1 to 10.40	T	P	200	16k	Teaches student counting from 1-10.
COUNT FIVE.40	T	P	000	16k	This program uses graphics to aid the student in learning how to count to ten.
COUNT TEN.40	D	P	200	16k	This program uses graphics to drill student in counting from 1-10.
COUNTING.40	D	EP	202	16k	This program helps youngsters learn counting by asking them how many objects are on the screen.
CURVE FIT.40	TU	SC	500	32k	Teaches evaluation of a polynomial to fit a set of points, integration and plotting included.
DARTS.40	DGS	JI	202	16k	Student answers problems in +, -, * and / in order to score points on a dart board; good range of difficulty.
DECIMAL ARITH.40	D	JI	402	16k	Computer generates random decimals for a quiz made up of 4 math problems (+, -, * and /).
DECIMAL SIZE.40	D	J	202	16k	The student selects the largest of three numbers with identical digits, but with different decimal position.
DECOMPOSE.40	DT	I	201	16k	This program teaches and drills the factoring of trinomial equations using the method of decomposition.
DERIV OF POLY.40	U	S	200	16k	This program finds the derivative of polynomials entered by the user.
DICE THROW.40	S	IS	000	16k	Demonstrates distribution of dice-sum frequencies using variable no. of dice and no. of sides to the dice.
DIV DRILL.40	D	J	202	16k	A drill in basic division with divisors from 1-10.
DRILL.40	D	P	202	16k	Drills addition, subtraction (to 20), division and multiplication (to 9 times table).
DRILLS.40	D	PJ	202	16k	Provides practice in +, -, * and /.
ELLIPSE TRANS.40	U	S	200	16k	Student inputs the variables (values less than 12) for computer-drawn elipses and transformations.

(E)ME - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
ENGGAME TWO.40	D	J	200	16k	User performs 4 operations on 5 numbers to solve a mathematical puzzle.
EQU'N MANIP.40	DT	JI	202	16k	Drills student on problems involving the isolation of a single variable in a simple equation; poor explanation.
EQUATION EXA.40	DGS	I	222	16k	Student finds how many marbles are in a bag by balancing bags against loose marbles on a simulated scale.
EQUATION X-Y.40	U	I	200	16k	User inputs A, B and C for linear equations and the program graphs the resulting line.
EQUATION.40	DT	I	202	16k	Student solves a linear equation in 1 unknown. Computer shows solution if requested.
EQUATIONS.40	D	I	200	16k	Emulates equation-solving procedure by asking student to find number of marbles in each bag on a balance scale.
EXPONENT MULT.40E	D	I	220	16k	A program which drills a student in simple algebraic multiplication involving monomials.
EXPONENTS.40	DT	I	202	16k	This program instructs and drills the student in multiplication and division of exponents.

FACTOR DRILL.40	D	IS	202	16k	A drill on factoring polynomial equations to the 6th degree. Requires 32k memory for higher option levels.
FACTOR TRI.40	D	I	200	16k	Provides practice in solving quadratic equations.
FACTOR TRINO.40	D	IS	202	16k	A drill on factoring trinomials into linear equations.
FACTOR WHOLE.40	D	JI	200	16k	Student must break various numbers down into their prime factors.
FACTORIAL.40	U	IS	200	16k	Provides answers to factorial up to 500.
FACTORS.40	U	JIS	200	16k	This program calculates the prime factors of whole numbers input by the user.
FAST MATH.40	DG	J	202	16k	Players compete in a game/drill whose object is to answer addition problems as quickly as possible.
FC'N GRAPH.40	U	I	200	16k	A good graphing utility. Self-modifying; inserts user-input functions into line 1025.
FLASHCARDS.40	D	J	202	16k	Drills students on +, -, and *.

(E)MF - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
FRAC EST/SOUN.40F	DG	J	822	16k	A fraction estimation game in which the student must guess the correct fractional distance to a target.
FRACTION GAME.40	DG	J	000	16k	A target appears on a number line from 0 to 2; user must guess the fractional value the target represents.
FRACTION PRAC.40	D	J	202	16k	Drills the user on conversion between decimals and fractions.
FUNC MACHINE.40	DGS	JI	500	32k	A simulated machine cranks out a number; student must guess the secret operation that's been performed on it.
FUNC PLOT.40	T	S	200	16k	Student can request examples of functions (circle, parabola, ellipse, etc.) and change the defining equations.
GAUSS REDUCT.40	U	S	200	16k	Student enters the coefficients of a system of linear equations and the computer calculates the answer.
GEOMETRY.40	D	JI	602	16k	A geometric shape recognition drill in which the student must name various polygons.
GEOMETRYTERMS.40	DT	JI	202	16k	Explains the geometric terms angle, point, line, line segment and ray and presents a quiz afterwards.
GRAPH PLOT.40	U	I	200	16k	Plots the graph of a user-defined function.
GRAPH PRINTER.40	U	JIS	200	16k	Program draws a graph according to user-specified parameters.
GRAPH SNAP.40	S	IS	300	16k	Graphs any equation. Allows the user to move a window around on the graph and to change the window's specs.
GRAPH.40	T	I	200	16k	User inputs co-ordinate and the computer plots it OR computer plots co-ordinate and the user names it.
GRAPHING.40	T	I	200	16k	Illustrates and compares 3 methods of graphing points.
HI-CALC.40	D	IS	200	16k	Student must use calculus to maximize an algebraic equation.
HI-LOW.40	G	PJ	200	16k	Computer guesses a number between 1 and 1,000,000 in less than 20 guesses.
HYPBOL TRANS.40	U	S	200	16k	From coefficients input by the student, a graph is plotted in standard position and with transformation.
IN-BETWEEN.40	G	JI	101	16k	Player bets on whether or not a third card's value is going to fall between that of two cards dealt face-up.
INDIRECT EVID.40	D	I	202	16k	Gives student practice in formulating hypotheses and drawing conclusions.

(E)MG - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
INT.ADD.FAST.40	D	JOI	202	16k	Drills students in integer and whole number addition.
INT/EX ANGLES.40	D	JI	200	16k	Drills students on the relationships between interior and exterior angles.
INTEGER ADD.40	D	J	202	16k	Drills student on the addition of single-digit signed numbers.
INTEGER ARITH.40	D	I	202	32k	A good drill in integer addition and subtraction.
INTEGER LINES.40	U	I	400	16k	Student inputs the coefficients of two linear equations and the computer gives their point of intersection.
INTEGERS 2.40	D	JI	202	32k	Drills student in +, -, * and / of integers.
INTEGERS.40	D	J	202	16k	Program offers a series of problems in +, -, and *.
INTEGRATION.40	T	I	200	32k	Demonstrates calculation of areas under curves by summing increasingly narrower strips of rectangles.
INTERPOLATION.40	DT	S		16k	A program on interpolation and determination of a circle.
INTERSECT LIN.40	U	IS	200	16k	Finds intersection point of two lines input by user.
INTERSECT PT.40	D	I	200	16k	The student finds the point of intersection of two lines by inference from information about the points input.
INTERSECTION.40	D	I	202	16k	A drill on the angles formed by intersecting lines.
INTGR'PYRMD.40	D	I	202	16k	For each correct answer to an addition or subtraction problem, another level is added to a 'pyramid'.
LADDER MULT.40	DG	J	202	16k	Drills multiplication tables. Correct answers move student up steps of a ladder.
LAZER MATH.40	DG	PJ	202	16k	Student must answer an addition problem before a laser destroys the block. Choice of number of digits (1-8).
LIMIT CIRCLE.40	TU	IS	400	16k	Calculates the limit of an equation for the area of a circle.

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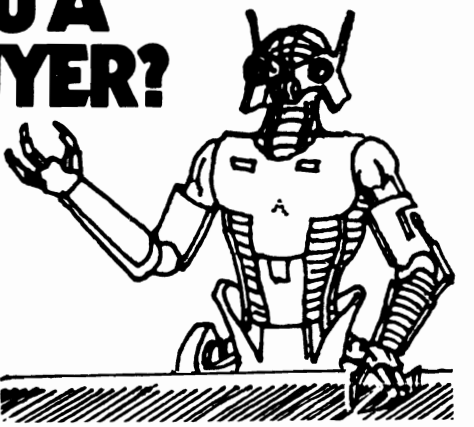

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(E)MH - Mathmetics

Name of Program	Cat	Grade	PST	Mem	Description
LIN EQN.40	D	IS	200	16k	Drill on solving linear equations.
LINE INTERSCT.40	U	J	200	16k	User inputs the parameters for two lines and the computer returns point of intersection.
LINEAR EQUAT.40	U	I	200	16k	Draws a graph of linear line with values for A, B and C supplied by the user.
LINEAR SYS.40	D	I	202	16k	Student can choose to solve up to 4 equations and 4 unknowns at one time; correct answer follows each turn.
LONG DIVISION.40	D	JI	202	16k	Drills student in integer long division with selectable levels of difficulty.
MAKING CHANGE.40	D	P	202	16k	Student must give out correct change using the fewest bills and coins possible.
MARBLE STAT.40	S	S	500	16k	Simulation of a probability machine with marbles dropping over a matrix of pegs.
MATCH UP NUM.40	DG	P	000	16k	Student is required to determine which two numbers on the screen are the same.
MATH DICE.40	D	P	200	16k	Develops counting skills by requiring the student to total the dots which come up with each throw of 2 dice.
MATH DRILL.40	D	P	204	16k	Drills basic addition, subtraction, multiplication and division using large-sized graphics.
MATH FACTS.40	D	PJ	202	16k	Drills students in +, -, * and /.
MATH MANIA.40	DG	J	000	16k	Student moves a character about the screen until a question mark is hit; a simple arithmetic question follows.
MATH PACK.40	T	S	200	32k	This program evaluates prime factors, cubic/quadratic equations, combinations & permutations, factorials, etc.
MATH SWIM.40	DG	PJI	202	16k	Drills 2 players on +, -, *, and /. Entertaining graphics of swimmers act as an incentive.
MATH TUTOR.40	D	PJ	202	16k	Drills student in +, -, * and /.
MATRIX MATH.40	DG	JI	000	16k	Provides factoring practice within the context of a game.

(E)MI - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
MATRIX.40 I	U	S	200	16k	Adds, subtracts, multiplies and determines matrices.
MEASURE.40	DS	PJ	000	16k	Student must read a ruler measuring various objects.
MET/STD CONV.40	U	JI	200	16k	Program performs metric/standard conversions for temperature, length, weight, area and volume.
METRIC (ECOO).40	D	JI	202	16k	Student is required to convert between various metric units.
METRIC CONVER.40	D	J	000	16k	Drills student in metric conversions within metric.
METRIC DRILL.40	D	PJI	200	16k	Program drills conversion of all units within metric, including volume.
METRIC DRILLS.40	D	JI	202	32k	Drills the user in metric conversions within the metric system.
METRIC M.40	D	PJI	202	16k	This program drills conversion of units of distance within metric.
METRIC TEST.40	D	JI	202	16k	Drills students in converting between various units of length within metric.
METRIC VOLUME.40	D	JI	422	16k	Practice in converting between units of volume within metric.
MICRO MATH.40	DT	I	401	32k	A drill/lesson on finding the coordinates of a point on a cartesian graph.
MICROMATH +-.40	DT	I	200	16k	Teaches and drills the addition and subtraction of integers.
MISSING NUM.40	D	EPT	200	32k	Student must identify the missing number in a series from 1-10. A happy/sad face indicates right/wrong answers.
MISSING NUMB.40	D	P	200	16k	Given a list from 1-20, student must type in the missing number.
MON.PRODUCT.40	DT	I	400	16k	Provides instruction and practice in multiplying 2 or 3 monomial factors.
MONOMIAL MULT.40	D	I	202	16k	Program allows practice in multiplying two or three monomial factors with exponents.

(E)MJ - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
MONSTER MULT.40	DG	PJ	701	32k	User builds wall to repel monster by correctly answering multiplication questions. Variable time, difficulty.
MULT BINOMIAL.40	D	IS	202	16k	Student must provide 3 coefficients corresponding to each binomial equation presented.
MULT DRILL.40	D	PJ	202	16k	A timed multiplication drill involving 2 numbers. Their values are set by student, as is no. of questions.
MULTIPLY.GS.40	DU	J	202	16k	For drilling in multiplication; saves results of test to disk or tape.
MUNCHKIN MULT.40	D	PJ	202	32k	A drill on times tables using a student-selected number from 1-99 and the numbers 1-10.
NUMBER GUESS.40	DG	EP	200	16k	Student is asked to guess a number from a number line.
NUMBER SEQ.40	D	J		16k	Student must supply the correct number sequence of 2-digit numbers.

CONT. (E)MJ - MATHEMATICS....

NUMBER TRAIN.40	D	P	502	16k	Student gives the number coming before and after a given one. A graphics 'train' arrives for a correct answer.
NUMBER-TOE 2.40	G	JI	202	16k	Similar to 'TIC-TAC-TOE', except that player must make the first two numbers in a row add up to the third one.
NUMBER.40	U	S	200	16k	Finds the mean, standard deviation, maximum and minimum of a user-input set of numbers.
OPERATIONS.40	D	JI	222	16k	Explains order of operations. Questions become harder if user gets 3 corrects in a row; 5 levels of difficulty.
ORDERED PAIRS.40	U	JI	000	16k	Generates ordered pairs once given function and starting point.
PARABOLA.40	U	S	700	32k	Plots and re-plots parabolas according to student-input parameters.
PARALLEL LINE.40	DT	I	202	16k	A drill in the 8 angles formed by a line intersecting 2 parallel lines.
PERIMETER.40	D	J	200	16k	Student must find perimeter of displayed rectangle. Dimensions are printed on 2 or 4 sides at user's request.
PERM AND COMB.40	U	IS	000	16k	Program computes permutations and combinations given size of set and subset.
PERMS & COMBS.40	U	S	200	16k	User inputs the variables n and r, the program computes the number ofcombinations (nCr) and permutations (nPr).
PI CALCULATOR.40	U	ISC	200	16k	Calculates pi to as many decimal places as requested. Slow - calculation to 40 places takes 7 minutes.

(E)MK - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
PIZZA.40	D	I	202	16k	Student must deliver pizza to houses located on the 1st quadrant of a cartesian coordinate plane.
PLACE VALUE#3.40	G	P	200	16k	Using random digits, player and computer compete to make 2 numbers with the largest difference between them.
PLACE VALUE.40	DT	J	202	16k	Student is taught the significance of a digit's position in a decimal number and is drilled on same.
PLANES.40	D	S	402	16k	A drill in evaluating equations dealing with planes.
PLANET INTEGR.40	DGT	I	712	16k	A graphing game whose object is to reach a certain point on a grid. Teaches graphing using X-Y axis.
POLAR I.40	U	I	200	16k	Student may enter the parameters for equation R=ACOS(BX) and see function plotted.
POLICE SUBTR.40	DG	J	202	16k	Student must correctly answer subtraction problems in order to save a town from robbers.
POLY PLOT.40	TU	IS	200	16k	Plots polynomials up to degree 5.
POLYFIT.40	U	S	200	16k	Finds the polynomial of best fit for a series of data.
POLYGON SECT.40	U	IS	200	16k	Calculates centroids and moments of inertia of polygons.
POWER-FACT.40	U	S	100	16k	Computes factors or powers up to 250 digits in length.
POWRS & ROOTS.40	D	I	202	16k	A drill in squares, cubes, square roots and cube roots of small and large numbers.
PRIME # SIEVE.40	T	I	200	16k	A tutorial on finding primes using the sieve of Eratosthenes.
PRIME FACT.40	U	JIS	000	16k	This program resolves any number into its prime factors.
PRIME FACTOR.40	U	JI	200	16k	Finds the prime factors of numbers entered by the user.
PRIME NUMBERS.40	U	JI	200	16k	Finds all prime numbers up to that entered by the student.
PROBABILITY.40	S	PJ	000	16k	Illustrates the random distribution of balls cascading between obstacles on the screen.
QUAD. EQ'N.40	T	S	200	16k	Student inputs the coefficients of an equation, solves it and compares the result with the computer's answer.

(E)ML - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
QUAD.40	DT	IS	202	16k	Asks student to determine the number and form of the roots in a given quadratic equation.
QUEUE.40	S	I	000	16k	Simulates queuing at a bank with 5 tellers' windows.
QUIZ ADD.40	D	EP	202	16k	Presents the student with a series of addition problems.
QUIZ DIVISION.40	D	J	200	16k	A simple division drill.
QUIZ MULT.40	D	PJ	202	16k	A straightforward drill on a series of multiplication problems.
QUIZ SUBTRACT.40	D	J	200	16k	Provides practice in simple subtraction.
R-PLOT.40	U	IS	200	16k	Takes sets of points and picks line of best fit; also gives statistics on each point.
RANDOM.40	S	PJ	000	16k	A poor simulation of a random generator, giving frequency of numbers.
RECIPES.40	U	J	200	16k	Converts kitchen measurements from Standard to S.I. or vice versa.
REDUCE FRACT.40	D	J	202	16k	A drill in reducing fractions.
RESULTANTS.40	U	S	200	16k	Resolves user-input vectors on a cartesian or polar grid.
REVERSE 1.40	G	JI	200	16k	Student must rearrange numbers or letters so that they are in the proper order.
RND GENERATOR.40	S	JI	200	16k	Program allows user to experiment with random number generator statement.
ROLLS TIL ONE.40	S	I	200	16k	Simulates the roll of a die, keeping track of the number of rolls needed to roll a one.

ROMAN.40	D	JI	402	16k Practice in conversion of Roman numerals to decimals and vice versa.
ROOTFINDER.40	U	IS	200	16k Finds the roots of a polynomial up to the 20th degree.
ROOTS QUIZ.40	D	IS	202	16k Drills students in finding roots to trinomial equations.
S.B.MATH.40	D	J	200	16k Story-book math problems using data (animals, people and food) input by the student.
S.N.B'KETBALL.40	DG	IS	002	16k A drill in the conversion of numbers to scientific notation.

(E)MM - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
SCIENTIFIC.40	D	I	202	16k	Provides practice in scientific notation.
SHAPES.40	DT	E	200	16k	Teaches the student to distinguish between various objects.
SI.CONVERSION.40	D	JI	202	32k	Drills students in metric conversion within metric.
SIEVE.40	T	JI	200	16k	Demonstrates method of determining prime numbers by eliminating multiples of integers.
SIGNIF DIGIT.40	D	IS	002	16k	A drill on the number of significant digits in various numbers.
SIMEQ. SOLVER.40	U	IS	200	16k	Solves up to 5 unknowns with 5 equations.
SIMP.SUBST.40	D	I	220	16k	A quiz in evaluating monomial expressions.
SINE GRAPH.40	TU	IS	200	16k	Student sets the parameters for a sine curve which is then plotted by the computer.
SLOPE AND INT.40	D	I	000	16k	Drills students on line equation forms and intercepts.
SLOPE/INTRCPT.40	T	I	200	16k	A tutorial on slope, x-intercept and y-intercept of linear equations.
SMALL MATH.40	D	P	220	16k	Drills students on addition and subtraction.
SNOOPY.40	DG	PJ	202	16k	Player keys in a number corresponding to Snoopy's relative position along a line in order to hit the Red Baron.
SPLASHDOWN.40	DG	J	200	16k	Student sums divers' scores. Each correct sum gives a letter of a mystery place-name which student must guess.
STATISTICS 1.40	U	IS	200	16k	Compares sets of numbers according to PMI correlation.
STATISTICS 2.40	U	IS	200	16k	Compares sets of numbers through the coefficient of determination.
STATISTICS 3.40	U	IS	200	16k	Compares sets of numbers through the correlation coefficient.
STATISTICS.40	U	IS	200	16k	Calculates median average, frequency and standard deviation.

(E)MN - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
STORY PROB.40	D	JI	202	16k	Student enters favorite friends, foods and animals and story problems are created using this data.
SUBTRACTION.40	D	J	402	16k	Drills subtraction with 4 digits.
SURVEY.40	U	IS	200	32k	A utility for taking surveys.
SYMMETRIC.40	O	J	200	16k	Draws a symmetrical pattern on the screen.
TABLES.40	D	J	422	16k	Drills multiplication of positive and negative numbers from -100 to 100.
TIC TAC ARITH.40	DG	PJ	500	32k	Math version of 'TIC-TAC-TOE' for 2. Player must answer arithmetic problem (+, -, *, /) to occupy a space.
TIC TOC CLOCK.40	GT	P	123	16k	A game designed to teach the student how to tell time.
TIME OF DAY.40	DT	P	200	16k	Instructs and tests the student in clock reading.
TIMES TIMER.40	D	PJ	220	16k	A multiplication drill in which the student tries to answer as many questions as possible in 60 seconds.
TRANSLATION.40	S	S	200	16k	Shifts Y=X squared according to user-chosen shifts in the 'X' and 'Y' directions. Shift is animated.
TREASURE ADD.40	D	P	202	16k	Student must add numbers in order to cross a stream; too many mistakes bring a 'dunking'.
TRIGONOMETRY.40	D	IS	202	16k	Drill on sine, cosine and tangent at 30, 45 and 60 degree angles.
TRINOMIAL FAC.40	DT	I	442	16k	This program gives practice in trinomial factoring, with excellent tutorial hints if required.
TWELVE BLOCKS.40	G	IS	600	16k	Student has 3 weighings to discover which one of 12 blocks is heavier/lighter than the others. Good graphics.
UP THE LADDER.40	DG	PJ	202	16k	Problems in addition of numbers from 0 to 99. Student goes up one rung of a ladder for each correct answer.
VECTOR ALGEB.40	D	S	400	32k	Drill in cross, dot product, addition and subtraction of vectors up to 12 dimensions.

(E)MO - Mathematics

Name of Program	Cat	Grade	PST	Mem	Description
VECTOR.40	U	IS	000	32k	A good utility package for manipulating vectors.
VELOCITY PROB.40	D	IS	202	16k	A drill in problems on velocity, time and distance.
Y EQUALS MX+B.40	U	I	200	16k	This program graphs lines, given slope 'M' and Y-intercept 'B'.
ZERO IN.40	G	J	200	16k	The computer picks a number and the student attempts to guess it.
ZONE X.40	DG	P	202	16k	A plotting game. The computer draws two invisible lines on a grid; student uses clues to find intersection.

(E)NA - Music

Name of Program	Cat	Grade	PST	Mem	Description
MUSIC FILE.40	U	JIS	400	32k	This program is a music file management system.
MUSIC MACHINE.40	U	JIS	800	32k	Program enables user to play/write music on a staff, and load/save compositions. Good features and graphics.
MUSIC THEORY.40	T	J	202	16k	A basic introduction to musical notation.
PUNK ROCK.40	D	IS	402	16k	A quiz on facts concerning punk rock.
SERIALISM.40	T	S	100	32k	Demonstrates the 12 tone row, including inversion, retrograde and retrograde inversion. A good tutorial.
SOUNDS.40	T		000	16k	A demonstration of PET sound effects.

(E)PA - Physical and Health Education

Name of Program	Cat	Grade	PST	Mem	Description
CHILD ABUSE.40	D	IS	202	16k	Program asks a series of questions to test the user's awareness of child abuse, teenage pregnancy and adoption.
DRIVER ED.40	D	IS	222	32k	A drill very similar to a beginner's permit test, based on the Driver's Handbook, Ministry of Transportation.
LIFE STYLES.40	GU	IS	200	16k	Offers an assessment of lifestyle, based on user-input data regarding health, excercise, personal habits, etc.
LIFESPAN.40	GU	IS	200	16k	Given user-input data on schooling, exercise, mental state, stress, etc., program estimates life expectancy.
METEOR.40	O	JIS	000	16k	Gauges reaction time and hand/eye co-ordination. User presses a key as soon as a 'star' on the screen 'falls'.
REACT.40	O	JIS	000	16k	Tests user's reaction time (reflexes) by timing how long it takes her/him to hit the space bar after a signal.
REACTION TEST.40	D	JI	202	16k	A test of student's reaction time to a stimulus.
REFLEX TIMER.40	O	JIS	002	16k	Tests user's reflexes by measuring reaction time.
RUNNING QUIZ.40	D	JIS	202	16k	A quiz on various aspects of running and jogging.
YELLOW LIGHT.40	GS	JIS		16k	Simulates a car approaching an intersection. When light turns yellow, player must decide whether to stop or go.

(E)SA - Science

Name of Program	Cat	Grade	PST	Mem	Description
ACCELERATION.40	GS	ISC	200	16k	Player estimates what the initial velocity of a ball must be for it to fall into a cup.
ALT.&AZIMUTH.40	U	ISC	200	16k	Calculates the positions of several stars.
BALANCE CHEM.40	DT	IS	200	32k	A tutorial/drill on balancing equations.
BIG OHM'S LAW.40	D	JI	302	16k	A drill on Ohm's law, using large numbers.
BROWNIAN.40	ST	JI	300	16k	A good simulation of Brownian motion.
BUOYANCY.40	DT	ISC	250	32k	A tutorial/drill on the concepts of mass, weight and buoyancy.
CASCADE.40	S	J	110	16k	A simulation of a waterfall.
CHARGED PART.40	ST	ISC	250	32k	A simulation and tutorial focusing on electron mass measurement.
CHEM 12.40	D	JIS	202	16k	A drill on nomenclature and the ratio of atoms from different elements in a compound.
CHEM CALC.40	U	JIS	200	16k	Calculates various chemical ratios and quantities given other known quantities.

CONT. (E)SA - SCIENCE....

CHEM QUIZ.40	D	SC	203	16k	A drill on symbols, valences and names of elements.
CHEM. PROB.40	DT	IS	202	32k	A drill on the 'mole' concept, and on conversion from and to particles, mass and volume.
CHEMIST.40	S	JISC	101	16k	Student attempts to dilute a dangerous acid to the correct chemical ratio.
CHEMISTRY.40	D	IS	202	16k	A drill on various aspects of chemistry. The questions are randomly chosen.

(E)SB - Science

Name of Program	Cat	Grade	PST	Mem	Description
CIRCUIT 3.40	U	ISC	200	16k	Calculates current through a resistor given its resistance and the voltage.
CIRCUIT 4.40	T	ISC	200	16k	Tutors the student on capacitors.
COMPOUNDS.40	D	ISC	202	16k	A drill on chemical nomenclature.
CONPRESS.40	U	I	200	16k	Converts measurements in one unit of pressure to another.
CYLINDER.40	DT	JI	322	32k	A drill/tutorial on reading graduated cylinders.
DECAY.40	U	I	200	16k	Calculates and graphs half-life and mass for decay.
DEFECT.40	TU	ISC	200	16k	Calculates and reviews concepts dealing with mass defect of isotopes.
DENSITY.40	U	ISC	200	16k	Calculates density given mass and volume.
DRILL SI.40	DT	IS	342	16k	A drill on metric conversion within metric.
E- CONFIGUR'N.40	T	ISC	300	32k	A tutorial on Schrodinger's model of the atom and placement of electrons in orbitals.
E.M.T.40	GS	ISC	210	32k	Student assumes the role of a doctor asked to diagnose various cases.
EARTHQUAKE.40	DT	ISC	210	32k	Tutors student on finding epicenters of earthquakes. Requires a handout.
ELECT. QUIZ.40	D	IS	201	16k	A drill on Ohm's law.
ELECTRICITY.40	TD	ISC	212	32k	A tutorial and drill on Ohm's law, energy, power, and energy cost problems.
ELECTRO MAG 2.40	ST	ISC	100	32k	A tutorial, with good graphics, on the applications of electromagnetism.

(E)SC - Science

Name of Program	Cat	Grade	PST	Mem	Description
ELEMENT QUIZ.40	D	ISC	201	16k	A quiz on chemical elements and symbols.
ELEMENTS.40	D	ISC	210	16k	A drill on the chemical symbols.
ENZYMES.40	ST	ISC	200	16k	Demonstrates the effect of various factors on the functioning of enzymes.
EQUIVALENTS.40	DT	ISC	243	32k	A tutorial/drill on chemical equivalents, molarity and normality.
FAST FOURIER.40	U	CS	200	16k	Fourier transformations and analysis of curves. The computer decomposes complex waves into components.
FISHING.40	GS	IS	202	16k	Player tries to estimate the number of trout in each of several lakes by catching, marking and returning fish.
FOOD CHAIN.40	D	JIS	200	32k	A drill having to do with the placement of organisms in a food chain.
FORCE CONV.40	U	JISC	100	16k	Performs conversions from one unit of force/mass to another.
FREQ & TIME.40	ST	ISC	300	16k	The student must estimate the period of a revolving square. Reviews the basics of frequency and period.
FUSE.40	D	JI	201	16k	A drill on choosing the appropriate fuses to handle a given current.
GAS EQUATIONS.40	D	ISC	200	16k	A drill on gas volumes, temperatures and pressures.
GEIGER.40	ST	IS	200	16k	An accurate simulation of a Geiger counter sensing radioactive samples.
GRAD CYLINDER.40	TD	ISC	210	16k	A tutorial and drill on reading graduated cylinders.
GRAVITY QUIZ.40	D	ISC	201	16k	This program is a quiz on planetary orbits and gravity.

(E)SD - Science

Name of Program	Cat	Grade	PST	Mem	Description
HARMONICDSPLY.4	U	ISC	200	16k	Graphs the effect of harmonics on the fundamental wavelength.
IDEAL GAS LAW.40	S	ISC	890	16k	A simulation of an experiment involving Boyle's and Charles' law (PV=nrT).
INTERFERENCE.40	U	ISC	200	16k	Program graphs waves separately along their interposed image.
INTERMODUL'N.40	T	ISC	200	16k	Calculates the intermodulation distortion products for every combination of frequencies entered by the user.

CONT. (E)SD - SCIENCE....

IONS.40	D	ISC	203	16k	A drill on the formulae and valences of ions and radicals.
KINEMATICS.40	D	ISC	203	16k	A drill on kinematic problems concerning the motion of a ball thrown vertically upwards.
LEVER.40	DS	JISCT	302	16k	Student learns to balance a simulated lever by altering the distance between the weight and the fulcrum.
LOCK-KEY.40	ST	ISC	200	16k	Shows the effects of inhibitors on the enzyme acetycholinesterase.
MAGIC POWDER.40	G	JIS	202	16k	Student deduces the identity of a mystery powder by the process of elimination.
MALARIA.40	GS	ISC	203	16k	Player administrates funds to build hospitals and provides medical supplies to combat an outbreak of malaria.
MASS.40	U	ISC	200	16k	Calculates the gram molecular mass of any compound, given the number and type of elements it contains.
MATCHING QU.40	D	JI		16k	Student matches questions on dispersion, solute, suspensions, etc. to correct answers. Responses are timed.
MATCHING SOL.40	D	ISC	201	16k	A drill in which the student is required to match questions to answers.
METRIC CONV.40	U	JISC	300	16k	A program which performs interactive metric conversions.
MILLIKANS EXP.40	S	ICS	800	16k	Simulates Millikan's oil drop experiment.
MINI EDISON.40	GS	ISC	202	16k	Student is put in charge of operating a simulated power station.
MITOSIS.40	ST	ISC	010	32k	Tutors the student on mitosis, using good graphic presentations.

(E)SE - Science

Name of Program	Cat	Grade	PST	Mem	Description
MOLARITY.40	U	IS	200	16k	A program which converts mass to moles to molarity.
MOLE CONCEPT.40	D	ISC	412	32k	A drill on converting from moles to gram molecular mass. The program has a built in calculator mode.
MOLECULAR LES.40	DT	ISC	230	32k	Tutorial and drill on VSEPR (Valence Shell Electron Pair Repulsion) method of determining shapes of molecules.
MOLECULE RACE.40	ST	ISC	300	16k	Simulates diffusion of molecules across space.
MOMENTUM CAI.40	DT	ICS	252	16k	Computer assisted instruction on momentum problems.
MOMENTUM TEST.40	D	ISC	202	16k	A quiz on momentum. Student should be familiar with 'MOMENTUM CAI.40' beforehand.
MOTION PROB.40	DT	ISC	200	32k	A tutorial and drill on problems in kinetics.
MUTANT.40	S	ISC	200	16k	Simulates the mutation of peppered moths to black moths within a population.
NICHE.40	S	ISC	201	32k	Simulates the effects of placing organisms in different habitats, with user controlling several variables.
NUC REACTOR.40	GS	ISC	311	32k	A simulation game in which the student controls the operation of a nuclear reactor.
OHM2.40	D	ISC	302	16k	Asks random questions on Ohm's law, with a time limit and scorekeeping provided.
ORBIT PLOT.40	S	JIS	200	16k	Plots the orbit of a satellite around a mass.
ORBIT.40	G	JISC	200	16k	User must locate and destroy an invisible spaceship by guessing its distance and angle in degrees.

(E)SF - Science

Name of Program	Cat	Grade	PST	Mem	Description
PALKO'S AUDIT.40	U	ISC	200	16k	Calculates average energy consumption given the frequency of use of several different appliances.
PERCENT COMP.40	U	ISC	200	16k	A chemistry utility program which calculates percent composition of each element in a compound.
PERCENT.40	U	ISC	200	16k	Calculates the percent composition of an element in a compound.
PERIODIC PROP.40	T	ISC	600	16k	Generates bar graphs of periodic properties vs atomic number.
PH PROBLEMS.40	DT	ISC	241	32k	A tutorial and drill on pH concepts.
PHOTEL.40	DS	ISC	200	16k	Given frequency of x-rays, user must find the voltage setting which causes a collector current to reduce to 0.
PHOTOSYNTH.40	S	ISC	210	16k	Simulation of an experiment varying the factors affecting the rate of photosynthesis.
POLLUTION.40	S	IS	200	16k	Simulates the depletion of oxygen in water systems by factors such as waste, temperature, treatment, etc.
PROJ.MOTION.40	S	JIS	200	16k	Plots trajectory of a projectile given initial height, angle of elevation and velocity.
PROJECTILE.40	DT	ISC	542	32k	Computer-assisted instruction on projectile problems.
RADIO DECAY.40	T	ISC	200	16k	Calculates one of the unknowns in the formula for radioactive decay.
RATE 1.40	T	JIS	200	16k	Demonstrates the effect of different factors on the rate of a reaction.
REG.POW.SUP.40	U	SC	100	32k	Prints out circuit diagrams for specified power supplies.
RESIST TEST V.40	D	IS	202	16k	A timed quiz on resistors.

(E)SG - Science

Name of Program	Cat	Grade	PST	Mem	Description
RESISTANCE.40	DT	ISC	250	32k	A tutorial and drill on series and parallel circuits.
RESISTORS.40	DT	IS	211	16k	A tutorial/drill on parallel and series circuits.
RMDL CHEMIST.40	DT	ISC	413	32k	A tutorial/drill on elements, radicals and acids.
SOLAR SYSTEM.40	ST	PJIS	200	32k	Displays a diagram of the solar system and provides information about it.
SPECIFIC HEAT.40	U	C	200	16k	Helps teacher to calculate and mark specific heat problems.
STOICHIOMETRY.40	U	ISC	200	16k	Calculates stoichiometric unknowns given information input by the user.
TEMP. CONV.40	DT	JIS	210	32k	A tutorial/drill on Kelvin and Celsius temperature scales.
TITRATE.40	ST	ISC	302	16k	A simulation of a titration experiment designed to give the student practice in that procedure.
VELOCITY.40	S	ISC	200	16k	Simulation of an experiment involving a cart. Requires a stop-watch, graph paper and a calculator.
VERNIER SCALE.40	DT	JISC	202	16k	A tutorial/drill on reading a vernier scale.
WAVES 3.40	ST	JIS	300	16k	A tutorial on, and simulation of, interference patterns.
WEATHER MAN.40	U	IS	200	16k	Converts temperatures and calculates humidex, wind chill factor, etc.
YOUNG'S.40	S	IS	200	16k	A simulation of double slit diffraction.

(E)TA - Technology

Name of Program	Cat	Grade	PST	Mem	Description
BRAILLE.40	DT	PJISC	200	32k	A tutorial and drill on Braille.
CIRCUITS.40	DS	JISC	722	32k	Drill on current flow through circuits. From a circuit diagram, student determines whether a lamp is on or off.
HOME.40	U	JISC	201	32k	Generates a graph of energy consumption in a typical home in Peterborough.
METER READING.40	D	IS	302	32k	Review and drill on the reading of a multimeter voltmeter scale.
MORSE CODE.40	D	JISC	202	16k	Program presents a letter in Morse code and gives the student 3 chances to identify it.
MULTIMETER.40	DT	ISC	312	32k	Tutorial and drill on reading voltmeters and micrometers.

(E)UA - Utilities

Name of Program	Cat	Grade	PST	Mem	Description
ALPHA SORT.40	U		410	16k	Sorts a list of names in alphabetical order.
BASE CHANGE.40	U	JIS	200	16k	A utility program which changes numbers from base 10 to bases 2-16. Input number range is 1 to 16,775,215.
COPY-ALL (HD)	U	JISC		16k	A utility for copying programs from one disk to another.
DISK DISPLAY.40	U		000	16k	A demonstration of PET disk drive commands.
DISK LISTER.40	U		000	32k	Stores directories of several disks on one disk.
GRAPH SUBRT.40	U	IS	000	16k	A subroutine which permits plotting in quarter character graphics; can be merged into a user's program.
HEXADECIMAL.40	U	JI	100	16k	A utility which enables conversion between hex and decimal numbers.
KEYBOARD.40	U		110	32k	Provides instruction in the use of the keyboard - cursor controls, graphic characters, etc.
MEMSEE.40	TU	IS	200	16k	Demonstrates how basic is stored in a microcomputer. Displays basic text and numeric storage; printed output.
UNCOMPACTOR	U		200	16k	Uncompacts programs from multi-statement lines to single statement lines.

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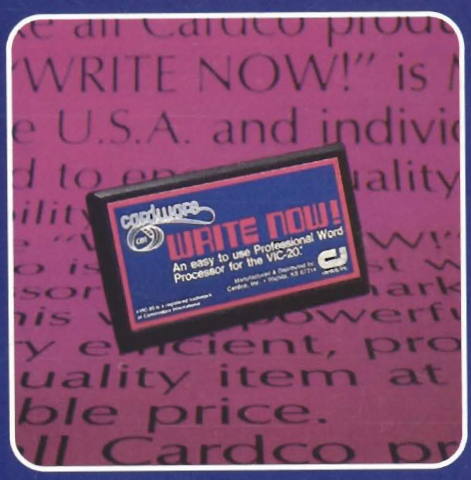

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