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THE NATIONAL NINTY-NINER

VOL III - NO. 3 - MARCH, 1986

THE 99ER'S ASSOCIATION
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CREATED FOR TI 99/4A HOME COMPUTER OWNERS

TABLE OF CONTENTS

THE NATIONAL NINTY-NINER

VOL III - NO. 3 - MARCH, 1986

DON VEITH - EDITOR
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ANNOUNCEMENTS

PRINTER'S PRESS BREAKDOWN DELAYS FEBRUARY ISSUE

By Don Veith, Editor

Our printer's press developed mechanical problems as he started to run off the February, 1986 issue. An exit roller mechanism failed to operate properly causing the press to jam constantly. Lo and behold, the roller mechanism and some other worn parts were ordered by the local dealer. It took two plus weeks to obtain the parts and repair the press.

The March, 1986, issue will be ran off early and both months will be mailed together. We do our best to print and mail each issue of THE NATIONAL NINTY-NINER on schedule by the sixth of each month an issue is due. Our apologies for the delayed delivery of the February, 1986, and hope that Murphy's Printer Law, whatever it states, will take up residence in some other printer's press for the remainder of 1986. Thank you.

DataBioTics, Inc. Announces The Release of SUPER SPACE

SUPER SPACE is a cartridge based product for the TI-99/4A that contains an Editor/Assembler GROM and an 8K-byte battery backed up RAM. A diskette contains several powerful programs that take advantage of the additional RAM memory in SUPER SPACE. The manual describes the product and the diskette features. The product is available in kit form as well as fully assembled and tested. Assembly instructions, component layout, and parts list for the cartridge are included in the manual. The manual and diskette may be purchased without the cartridge.

SUPER SPACE has the following features:

1) Editor/Assembler GROM. All features of the Editor/Assembler cartridge are fully functional with SUPER SPACE.

2) 8K-bytes of Expansion RAM in addition to any other expansion RAM on your system. This memory space is fully available to assembly language and console BASIC programs.

3) A built-in battery to preserve the data or programs stored in RAM memory. The battery is socketed for easy replacement.

4) The ability to create your own cartridges. If a GROM header is included with programs stored in the 8K-byte RAM, the programs can be selected from the start-up menu screen just like a normal cartridge program.

The diskette contains the following programs and files:

1) SUPER SPACE Menu Loader. This feature allows you to configure the SUPER SPACE RAM with up to 7 assembly language program names that can be selected from the start-up menu. A BASIC program allows you to initialize the SUPER SPACE RAM with a loader and GROM header template, edit the program names, and reset the computer.

2) Cartridge Vacuum/Loader. This feature allows you to back up your ROM-only cartridges to disk files then load and run them from SUPER SPACE.

3) Bitmap Graphics Demo. The source and assembled object for a bitmap graphics program is included on the diskette. The demo draws lines or circles and allows a screen to be dumped to a graphics printer.

4) Editor/Assembler Utilities. The source for a version of VSBW, VMBW, VSBR, VMBR, VWTR, KSCAN, GPLLNK, and DSRLNK are provided on the diskette. This allows you to write assembly language programs that do not depend on the standard Editor/Assembler utilities being loaded.

5) GROM Header Templates. The source for several GROM header templates is provided to allow the user to easily create cartridge-type programs.

The suggested retail pricing for SUPER SPACE is:

Fully Assembled and Tested ------$49.95
Kit Form----------$42.95
Manual and Diskette Only --------$14.95

BACK ISSUES VOLUME I (11/83-12/84)

The Back Issues - Volume I covering the time period of November, 1983 to December, 1984 are available for purchase. The publication consists of 90 pages of the original newsletters. We were able to make the publication available for a price of $10.00 which includes all shipping and handling charges. The back issues will be available for shipment on March 15, 1986 which is about two (2) weeks behind our original deadline of March 1, 1986. If you are interested in obtaining a copy, please forward your $10.00 to our address on the cover page.

We currently plan to have the Back Issues - Volume II, covering January, 1985 to December, 1985 available for purchase during September, 1985. The price of Volume II will be $15.00 which includes shipping and handling. Individual issues may be purchased for the cover price of $2.00. We are currently able only to supply copies of issues from September, 1985 to the present.

ODDS_'N_ENDS

99'FEST-WEST'86

By Don Veith

I was, at the last minute, able to attend this event on March 1, 1986 at the Shrine Auditorium in Los Angeles. Terrie Masters and the Los Angeles 99'ers are to be congratulated for the excellent job of pulling the show together. I think that the mezzinine area was an excellent choice for the TI portion of the show. The main floor area had exhibitors for other brands of computers present.

All of the major TI Users Groups in Southern California were represented either by members present or the purchase of booth space in the vendor area. A gentleman, who writes for a computer magazine in Italy, would have probably won the prize for the greatest distance travelled to reach the show. Vendors present included Bit's & Chips from Seattle, Compuserve, Millers Graphics, Myarc, DataBioTics, Ryte Data from Canada, T.A.P.E., Asgard Software, Super 99 Monthly, and Genial Software (that nut Barry Traver travelled three days and nights from Philadelphia to attend). There were more vendors present which I did not have time to talk with. Darrell Ingold, in the next article, I hope, will have a more detailed list.

Both Millers Graphics and Myarc did demonstrations and answered questions in an area set aside as an auditorium. Craig Miller did an outstanding demonstration on his incredible GRAMCRACKER and discussed a new card under development. We did not arrive in time to see the demonstration. The new card supports the addition of an IBM keyboard to the 4A allowing the user freedom to move back from the computer. The support card for the keyboard plugs into a slot in your TI Expansion System. The keyboard cord, similar to a spiral telephone cord, plugs into the card and is attached to the keyboard. Now, Millers Graphics only supplies the interface in the PEB, you must go out and obtain a keyboard on your own. I would say that there should be no complaints about keyboard selection since the individual is in the driver's seat on its selection. I know, when is the dummy writing this article going to get to the price and date available information???

Ed. Note: At the time that Don had written this much of his article he be became quite ill with what turned out to be an infection in the blood vessels of his right leg. He was unable to finish the article prior to publication time and any additional information about the show that we have is in my article. Acting Editor, Darrell Ingold. I agreed to edit this month's newsletter on a one time basis while Don is recuperating.

TI-WEST-FEST

By Darrell Ingold

This March came in like a lion at the Shrine Auditorium in Los Angeles. Saturday, March 1st, hearlded the beginning of a large computer show and sale...with the entire mezzanine dedicated solely to TI!. This special arrangement was due largely to the effort of Terrie Masters of the LA 99ers. Admission to the whole show was $6.00 for the weekend. There were hardware and software dealers galore on the main floor pushing disks, drives, printers and hardware with names that haven't even been translated from Japanese yet. On the mezzanine however was the REAL computer stuff!

Registrants were given name tags produced on a TI99 4/A computer and there was a lecture area where there were several presentations including one by Craig Miller (of Miller's Graphics) and Lou Phillips from Myarc.

The real highlight of his presentation was the unveiling of the new, yet-to-be-named/ better-than-the-99/8, TI type computer with 256K of resident memory. The unit will have a 2 megabyte capability for even greater expansion. One of the main reasons for the delay in getting it on the market, according to Lou, was the late arrival of the power supply which just arrived last week, only 90 days behind expected schedule! Of the 20 prototypes now ready, 10 of them have gone to software developers. Not a lot if information is being released just yet but it is known that the machine has fractural graphics capability (ability to make multi-colored pixels) and there will be available a quad density option for the disk controller!

Lou points out that there has been no official Myarc announcement, to date (meaning March 1, 1986) of the new machine and that a press release would be done when the machine is ready for sale, as well as a mail-out to users groups.

Craig Miller showed the prototype of a new PEB card that will allow the use of an IBM type keyboard; that's the one with all the extra keys! The card would be inserted into the PEB and the IBM keyboard would plug directly into the TI console with coil telephone type wire connector. This would allow much easier movement of the keyboard around the desktop and freedom from the curse of the big black PEB cable. Besides being able to use the enlarged keyboard of the IBM, Craig promised an upgrade for the card soon that will allow programable features for the 'alternate' keystrokes of the IBM keyboard. He has promised more information just as soon as it is released so stay tuned for an in-depth review in the near future.

The LA 99ers had a large multiple table offering of new/used hardware and an impressive selection of software including Jim Peterson's Tiger Cub line. He's the man who wrote Nuts & Bolts #1/#2. The double row of booths on the other side of the mezzanine included Miller's Graphics and Myarc both with good demos and product on hand to sell. Craig's booth was probably the most consistantly busy throughout the day Saturday. I'm sure he was rather hoarse by the end of the weekend. His wife was also there to help him but most of the participants wanted to 'talk shop' with Craig.

Other publications than ours were also represented. SUPER 99 MONTHLY and the new disk magazine GENIAL TRAVeLER had their booths to answer questions and take subscriptions. Barry spent three days on the bus just to be there that weekend!

Bits n Chips from Seattle, Washington was there with a well rounded selection of software and many hardware items as well as some show specials. Her prices were very competitive. Check below for list of addresses of participants.

Asgard Software came from Rockville, MD. There booth was entirely their line of home and business software including Schedule Manager, Screen Scroll Package, Disk Data Base, GraphX companion and others. Prices ranged from $7.00 to $20.00.

Down from Ontario, Canada was Ryte Data. They were featuring their 128k/512k RAM/GRAM Card as well as displaying the 99 Mouse, Extended Basic IIplus and 128k stand-alone memory.

Also from Ontario (but the California type) was T.A.P.E. (Technical Application Product Engineering). Their version of TI Mouse was chasing around the table with their Mechatronics 128k memory expansion available in stand-alone or PEB card types.

Dresselhous was trying to corner everyone who would listen to get them to buy their "fingerprint". Not really their fingerprint but their control device for the Epson printer that gives fingertip control of the various printer features. This product also worked on TI printers.

Datasystems from Oxnard, CA had lots of original software including games but of particular note were there specialty items like a will kit for making your own will. I have spoken to George Molod and perhaps their will be some reviews of his specialty items in the National Ninty-Niner before long.

Silver Wolf Software of Rohnert Park, California had a large selection of software, hardware and supplies including the extender cable for the black PEB cable. This cable allows you to put the black cable up to 30" away (out of sight).

L and M Systems (Les Merryman), was in the Myarc booth since he is the west coast supplier for them. He supplies dealers but can also be contacted directly if you have no Myarc dealer in your area. He is also the repair/exchange center as well. Some software is available from him including the Silver Wolf line of products (listed above).

Texaments' Steve Lamberti came all the way from Patchogue, NY to show his software products. Among a number of packages (including games) was a very intriguing program that was, I believe, called Detective 99. It would (at the blink of an eye) locate all the variables in a program and list them neatly for you. It would also locate and list almost all commands (FOR/NEXT/GOTO ETC). Programmers take note! I am contacting Steve about a review of that particular program right here in the NNNer.

CompuServe and The Source both were vying for new customers showing all the nifty things each of their services would do and why the average TI users simply could not live without them! Actually there were many fine features on both, particularly in the electronic mail area. Both have toll free numbers for more information.

Bill Mosied representing the many fine new products of DataBiotics was on hand to demo and explain what they were and how to use them. Diskmaster I (disk manager), 4A-Talk (communications software) and the MiniWriter series were the mainstays of this booth. The MiniWriter series is a word processer possessing many of the features found in TI-Writer that is cartridge based.

Representatives from a number of the region's users groups were there. In addition to the LA 99er already mentioned, there were booths for Pomona, San Diego, San Fernando Valley, Ojai, South Bay (Orange County) and even from San Francisco and Las Vegas!

No doubt I've missed some of the dealers but with all the hustle and bustle of the show and my limited time that is the best my memory will serve. Wish you had been there too!

Dealer address list:

Asgard Software, P.O. Box 10306, Rockville, MD 20850

Bits & Chips, 23637 Highway 99, Edmonds, WA 98020, 775-7390
Super 99 Monthly (Bytemaster), 171 Mustang St., Sulphur, LA 70663

CompuServe, P.O. Box 20212, Columbus, Ohio 43220, 800/848-8199

Datasystems, 2301 Churchill Dr., Oxnard, CA 93033, 805/483-3464

DataBioTics Inc., P.O. Box 1194, Palos Verdes, CA 90274

Dresselhaus Computer Products, 837 E Alosta Ave., Glendora, CA 91740, 818/914-5831

GENIAL TRAVeLER, 835 Green Valley Dr., Philadelphia, PA 19128

L and M Systems (Les Merryman), 2330 East Ave J-8 #173, Lancaster, CA 93535, 805/948-1587

Ryte Data, 210 Mountain St., Haliburton, Ontario, K0M 1S0, Canada, 705/457-2774

Silver Wolf Software, P.O. Box 1544, Rohnert Park, CA 94928-1126, 707/528-7866

T.A.P.E., 1439 Solano Pl., Ontario, CA 91764, 714/989-9906

Texaments, 53 Center St., Patchogue, NY 11772, 516/475-6463 (24hr on line data)

The Source, 1616 Anderson Road, McLean, VA 22102, 800/336-3366

ARTICLES

MULTIPLAN - A Comparison Of The TI And Commodore Implementations

By Leonard Lanigan

Users of the TI-99/4A soon become painfully aware of the dearth of quality applications software available for their computer. To my knowledge, the only programs of any real sophistication produced by TI were TI-Writer, Multiplan and the Plato Educational series. The latter were so painfully overpriced that they might as well never have been released. Other worthy software, such as the Editor/Assembler, and the Pascal operating system exist, but can hardly be considered "applications" programs. I have tried several third party data management programs, and have yet to find one very useful. Why should this be?

The fact that the machine has been discontinued certainly has much to do with the situation now, but why were so few good programs developed while the computer was in production? Lack of an installed user does not seem likely---the TI was the most popular computer in the world for some time, and is still exceeded by only a few machines. As a comparison, consider the Commodore 64K, a computer of similar price, intended to appeal to the same market. The C-64 has several obvious advantages: full 64K memory in the standard configuration, superb graphics, unmatched sound generation and relatively inexpensive peripherals. It is, and deserves to be, a popular computer. Programmers have developed a massive amount of quality software---literally scores of word processors, dozens of spreadsheets, and a number of data management programs, including Superbase, which compares nicely with programs like Personal Pearl, and far exceeds anything available for the TI.

Can it be that the TI is an inferior computer, unsuited to serious applications? I have used the TI Home Computer since the original TI-99/4A (The old 40 key consol), and while I have several other computers. I still use my TI (though not the old one) more than any of the others. TI-Writer is a great program, capable of far more than any other word processor that I usually use. The UCSD p-System is an excellent operating and program development system, and I prefer the TI implementation to the Apple Pascal I have available.

But the only way to compare the computers is running the same program on them, and as Multiplan is available for both the TI and the C64 (actually I am using the portable SX-64), and represents, in my opinion, the best spreadsheet for either of them, it seems a good candidate for testing.

Let's look at a few of the details of each implementation:

(1) The TI system uses both a GROM module and a system disk. One disk drive is required, thought two are much better.

(2) The C64 version (from HESware) resides entirely on disk, no module is used (though the C64 has a place for one). It is interesting to note that while the commodore version of Multiplan is more efficient with two drives (as is the TI version), it is not designed to use with two of the normal 1541 drives! A completely different drive configuration is needed to use two drives. This strange situation is all too common with software for the C64. Worse yet, much of the software designed to run on one 1541 drive will not run at all on the dual drive system! This strange situation eludes any attempt at logical explanation .

(3) Continuing with the comparison, the available memory in the TI after loading the program is 15416 bytes out of 48K total, while in the SX-64, 21044 bytes are free for use, of the 64K total. Available memory determines the size of the spreadsheet that can be accomodated in memory, and here the Commodore is clearly ahead. Fortunately, Multiplan allows linking spreadsheets, and size limits are more apparent than real.

Other significant comparisons to consider are: time to load the program, time to load and save files, and time to execute the various commands.

(4) In the load/save times, the TI comes out a winner, performing some 3-5 times faster than the Commodore. This is largely due to the very slow serial drive interface used by the Commodore, as opposed to the much faster parallel system used in the TI machine.

(5) This next part comes as a surprise to me, and I was tempted to leave it out, but a comparison that is not accurate is both useless and misleading. I have always felt that Multiplan on the TI ran much faster than ison the SX-64, largely because the SX seems to access its very slow disk drive for nearly every command. Obviously the program is depending on multiple overlays to free up maximum user memory. Waiting for the drive seems to take forever. The TI rarely accesses the disk, most of the program resides in memory, or in the GROM module. (If anyone out there has examined the contents of the module to see what's i it, I'd like to know.)

Of course, until I started this article, I had never used Multiplan simultaneously on both machines, and my sense of time was never put to the test. Now I have compared the command execution times for both machines, and i must admit that the SX does things much faster, even including the time for disk accesses. OUCH!!! How can ir be that an 8-bit processor running at 1MgHz can outperform a 16-bit machine running at 3MgHz, and by a factor of 4-5, in an application which is number crunching? Can it be that the use of the GROM slows things down? TI BASIC is slower than the SX BASIC by a factor of 5 in most applications, largely because GROM (which contains BASIC) is slow memory, and GPL (Graphics Programming Language) is much slower than true machine code. If this is the cause of TI's lack of speed, it seems that Multiplan, rewritten in machine code using the multiple overlay technique evidenced in the c64 version, would speed things up considerably. The much higher speed of the TI disk system, combined with a more powerful processor running at three times the clock rate should make the TI much faster than the commodore, even with 16K less memory.

I any event, Multiplan on the TI remains a good program, and the fact that I have two (fast) drives in my TI system as opposed to a single (slow) drive in the SX makes Multiplan much more convenient to use with the TI-99/4A. I find that I am constantly having to interrupt my work to swap disks with my SX, and saving files is a real pain---I have finally taken up saving the entire Multiplan program on each data disk, just to avoid the hassle of changing disks at inopportune times. This results in the loss of more than half of the available space on every data disk. Even using the TI with one drive is less painful than doing so with the Commodore (I never use one drive on the TI-except to see if it can be done).

True, there is always that intangible, but important factor of personal preference, and I like my TI system. The SX sees use where portability is needed, or where suitable software simply is not available for the TI (for example database management, genalogical research, and a couple of other specialized tasks). For word processing (other than formal work requiring indexing , etc.), spreadsheet work, or program development (using the p-System), my TI remains my most used computer.

THE HISTORY OF SUPER SPACE

By Edgar Dohmann

In 1982 Texas Instruments released the Mini Memory cartridge. This device included a subset of the Editor/Assembler features but it also had a few unique features of its own. One of the most significant was the fact that in addition to GROM memory, it also had 4K bytes of ROM and 4K bytes of battery backed up RAM. The main purpose of this cartridge was to provide a low cost means of memory expansion plus some assembly language programming capabilities to those who had console-only systems.

The Mini Memory cartridge served its purpose and based on 1982 technology, it was indeed an economical way to provide a minimal system expansion. However, the main thing this cartridge did was make many of us wish that TI had included cartridge RAM with the Editor/Assembler as well. The advantages of Mini Memory combined with the power of Editor/Assembler would have been a great product.

The first attempt at providing such a product that I am aware of came in mid 1984. Visanu West of Los Angeles, who does some hardware development for DataBioTics, built a device that was dubbed SUPER CHARGER. SUPER CHARGER was a modified TI INVADERS cartridge with the GROM removed and replaced by the GROM from an Editor/Assembler cartridge. In addition, four 2K-byte RAM chips were piggy-backed and installed into the ROM socket area of the cartridge.

To make room for the four piggy-backed RAM chips, Visanu cut a rectangular hole in the top of the cartridge case. A hex inverter was also "sky-wired" inside the cartridge to invert the DBIN signal from the cartridge socket to provide the proper polarity to the RAM's Output Enable line.

I received one of these SUPER CHARGERS from DataBioTics in November of 1984 when I started doing some hardware and software development work for them. I demonstrated the cartridge at the November 1984 JUG meeting and while some interest was expressed, there was also concern over the amount of modification work required to build one and the lack of application software to make use of the device.

Visanu and I discussed the feasibility of making a real product out of SUPER CHARGER with DataBioTics. DataBioTics was interested but we decided to put further development on hold until the prices for 8K byte RAM chips became more reasonable. In late 1984, the prices were quite high and the low power CMOS varieties were not yet available.

Early in 1985 I developed a preliminary version of SUPERBUG II which I could load into my SUPER CHARGER. My plans were to jointly develop a version of SUPERBUG II for distribution along with a true SUPER CHARGER product. During the first quarter of 1985, technological advances in CMOS static RAMs and lithium batteries gave us reasonably priced 8K byte RAMs and lithium batteries making it feasible to now build a battery backed up SUPER CHARGER. Now our original dream of a combined Mini Memory and Editor/Assembler could be realized.

Apparently many other people shared this dream and were working on similar developments at the same time. In Australia, Bernie Elsner removed the ROM and RAM chips from his Mini Memory early in 1985 and replaced them with an 8K byte CMOS RAM. By April of 1985, I had the first prototype board of what would become SUPER SPACE working properly. Also in April of 1985, I received an advertisement for RAMPORT from OSRAM Industries in Victoria, Canada.

RAMPORT was similar to the board I was developing except that it did not have an Editor/Assembler GROM included. RAMPORT does include a disk with a couple of interesting application features such as a TI FORTH kernel that runs out of the cartridge and a ROM cartridge backup program. I decided that the time was obviously here for a product like I was working on, so I continued working on SUPERBUG II and the enhanced SUPER CHARGER.

In June and July of 1985 the floodgate of interest was opened when MICROpendium ran a two-part article by John Clulow, Ron Gries, and David Romer on a device they called SUPER CART. These articles described how to modify a TI INVADERS cartridge to combine an Editor/Assembler GROM and 8K bytes of battery backed up memory. SUPER CART is essentially the same device as Visanu West's SUPER CHARGER but it has all 8K bytes of memory in one chip and includes a battery.

I was glad to see the Clulow/Gries/Romer articles. Even though my product might lose some potential sales because people were building their own units, I felt that the publicity generated by MICROpendium would offset this somewhat by creating a larger demand for the product. Also, I felt that many people would not want to bother with modifying cartridges if they could buy a fully assembled and warranted unit at a reasonable price.

Even though my product development was not quite finished, I immediately informed MICROpendium of my status. In June of 1985, DataBioTics decided that we would call the new product SUPER SPACE. MICROpendium was kind enough to print an announcement of our product in its August, 1985 issue. At the time I had hoped to have production units ready by September or October at the latest.

As we have seen first hand in the TI-99/4A community many times, product development is a tedious process when you want to be sure you have a high quality, reliable product. This was also the case with SUPER SPACE. Final product approval was obtained at last from DataBioTics on December 28, 1985. The product was formally released on that date. At least I managed to make it an official 1985 product.

The first production run of circuit boards was finished in September, 1985. Extensive Beta testing indicated that we needed to improve the memory retention reliability of the battery circuit. An acceptable design was approved in October so new boards could be built. The original application features included several GROM header templates and a bitmap graphics and screen dump demo that could be loaded into SUPER SPACE. I had written the manual for SUPER SPACE and DataBioTics made an initial printing run.

In November of 1985 DataBioTics demonstrated SUPER SPACE at the Chicago TI Faire. The reaction to the product was good but after the Faire, DataBioTics requested that I add some new features to the application disk to make the product more valuable and attractive. As a result, I added the Menu Loader and Cartridge Vacuum features to the product. Adding these new programs to the disk and writing manual updates added another 5 weeks to the product development cycle, but I think it was worth the delay.

I am grateful to everyone who has made a contribution to the development of SUPER SPACE or shared our dream for such a product. Visanu West gave me the initial incentive to develop SUPER SPACE, DataBioTics gave me the opportunity, and MICROpendium gave me the publicity. My thanks also go to other developers of similar products like Bernie Elsner, Osram Industries, John Clulow, Ron Gries, and David Romer who demonstrated that there is indeed a need for this product in the marketplace.

Above all my thanks go to everyone who has or will purchase SUPER SPACE in any of its 3 versions (fully assembled, kit, or manual and disk only). I hope that everyone enjoys the product and feels they got their money's worth from it. I will appreciate any feedback or suggestions for improvement of the product. I also hope that more applications will be developed that take advantage of this additional memory space. I would like to also hear about any specific requests that users might have for applications using this memory space. Comments or suggestions should be sent to DataBioTics and they will forward them to me.

CP/M-Part 7

By Leonard Lanigan

This will be a brief update on the CP/M scene. A lack of software available to me has made it difficult to continue a regular flow of information about the capabilities and utility of the Morning Star Software CP/M processor card. There is no lack of software available, but I have not been able to justify the expense of buying some of the programs I need to do the through testing I had envisaged. However, there is some hope on that front, as I have recently found someone who has gone from an Osborne 1 to an MS-DOS computer, and he indicated that he is willing to let me use his Osborne, and software library for testing. I have not yet received any of the software or the machine, but hope springs eternal.

On a more positive note, I have finally succeeded in interfacing the Heathkit H-9 terminal to the TI, giving me an 80 column output from the CP/M card. A simple modification (correction) to the I/O board of the terminal, and wiring a suitable interface cable did the trick, and the terminal functions properly at any speed from 110 to 9600 baud. I have not been able to check the CP/M setup program at 19.2K baud, or at 34K baud, simply because the terminal is not fast enough, but I have no reason to doubt it will work. Thus far, every function of the Morning Star card has worked exactly as it should. A simple assembly program is needed to allow the terminal to output along with the TI monitor.

Following are the instructions to enter, assemble and run the program to enable the terminal:
Load DDT, give the command A100 (this causes the assembly to begin at 100hex), then enter the following program:

```
LHLD    1       MVI     M,CD
LXI     D,9     RET
DAD     D
```

A second 'return' following RET will return the system to the DDT prompt.
To see the program you have just written, simply type L100, and the following listing should appear:

```
0100   LHLD   0001          0107   MVI    M,CD
0103   LXI    D,0009        0109   RET
0106   DAD    D
```

Type "ctrl C" to return to the CP/M A> prompt, and save the program: "SAVE 1 HON.COM". This program will turn the terminal on, but before we use it, perhaps it would be nice to be able to turn it back off, so let's do a bit of modification: Type DDT HON.COM to load the program with the debugger. Then enter the line: A107 MVI M,C3. Enter "ctrl C" to get back into CP/M, and save the program: SAVE 1 HOFF.COM.

Now we can turn the terminal on and off at will. The names HON.COM and HOFF.COM are just short and easy for me to remember "H(eath)ON and H(eath)OFF, with the suffix COM to indicate that they are executable programs (as opposed to text or document files).

My great $15 terminal has a couple of limitations that make it less useful than might be expected. First, it displays only 12 lines per screen. This is inconvenient, but not disasterous. The real kicker is that it recognizes only uppercase letters. Lowercase comes out as gibberish, making the use of all caps necessary. Please understand that this is a limitation of the terminal I am using, not of CP/M or of the MSS card. Running at 9600 baud, there is no noticable delay between the terminal and the TI monitor. One of these days I may modify the terminal, or aquire another that will allow lower case, and 24 line screens. In any case, I can now state with authority that such interfacing is possible, and does work as it should. To get a bit away from CP/M, the terminal also works with p-System, when accessed as #8: or #9:. I have not bothered to use the terminal as an input device, although it would not be difficult, primarily because I prefer the keyboard of the TI. The H-9 keyboard is no more standard than the TI, and has more sticking and bouncing problems. And truth to tell, I just like the feel of the TI keyboard.

That's all for this installment. As soon as I can obtain some of the software, or come up with something else of interest, I will be at it again.

FAIRWARE REVIEW

PILOT - A [illegible] Language

By Bill Nares - Pomona Valley (CA) Users Group

You're the PILOT
Programmed Inquiry Learning or Teaching

Here is a brief description by Bill Nares of another programming language available for our TI99/4A.

Although I've just spent a few days learning about PILOT, I can really write a useful, enjoyable program. This language is EASY. It doesn't have many of the capabilities of TI BASIC, but it does have others not found in even TI Extended Basic.

Thomas P. Weithofer sent me the program PILOT 99, and documentation. He developed this TI99/4A version with help from Texas Instruments, Cin-Day Users Group, and Xavier University professionals. It's copyrighted 1985 by Thomas Weithofer and portions of the manual are by permission of Texas Instruments. It is a public domain package that costs one only about $10.00 plus 2 SSSD disks. What a great value! Thomas' address is 1000 Marbury Drive, Cincinnati, Ohio 45224. Many TI User Groups will have a copy in their library.

PILOT was largely created by John A. Starkweather, Ph.D. at Univ. of Cal. in San Francisco starting in 1962. In 1973 national standards were developed for the basic commands (only 8) and syntax, and now one can get a version of PILOT for most personal computers. It was developed on a small computer to be able to function completely on a small computer. Dr. Starkweather wrote a short book, which I've found to be the perfect guide. It's called, "A User's Guide to PILOT" and published by Prentice-Hall, Inc. at Englewood Cliffs, New Jersey 07632. I ordered it at the local B. Dalton Bookseller.

I would evaluate the TI version as one of the best teaching aids available in the world of software, since it's easy to write programs and offers most all of the features that make a lesson useful and enjoyable. The only feature I would like to see added is that of Speech.

PILOT 99 seems to be written in TI-Forth and thus a program can run pretty fast. It shows the power and versatility of TI-Forth. While one is thus limited to a small program running at one time, one can run programs quickly with each drawing needed data from files the other programs have created.

To use the version of PILOT 99 that I got, you will need TI's Editor/Assembler cartridge, expanded memory, a disk system, and a word processor that can create display/variable-80 (text) files. You would write the program in the word processor just like the big computers/software use , which is nice in some ways since with one like TI-Writer you've got a full screen editor and other useful commands available. Then you would fire up the Editor/Assembler and use the Load and Run Option, entering DSKn.PILOT. When it is loaded enter the file name of the program you created with the word processor. The PILOT 99 software will run the program until it finds an error in which case you get an error message at that point. Thomas Weithofer says there is also a version one can use out of TI Extended Basic.

PILOT 99 adds many commands beyond the basic PILOT set. You have all the normal TI Extended Basic Sprite Commands, which provide great enjoyment to a user and liven the presentation of any subject matter. Thomas has also added the Joystick commands, TI's character graphics commands with color, real live Bit Map Graphics ie, Draw Circle, and Mass Storage device commands for files usage.

The manual is excellent, all 70 pages of it (on disk). Each command is described and an example given in a program context. However, it says that data files are Internal Fixed 80 Relative Update, but the file I got when writing data out to disk was Display Fixed 80. To help me use the manual I created a kind of Table of Contents and Index.

Bit Map graphics are easy to create and are displayed in the top 2/3rds of the screen with the bottom 1/3 reserved for full sized text. In the top 2/3rds graphics area you can also display text, but it will be smaller(64 characters per line). The command for Draw Rectangle is: DR: row1, cla1, row2, cla2, ie. DR:50,50,100,100 will draw a rectangle with the top left at position 50,50 and the bottom right at 100,100. Then one could use the command "T:Thats a rectangle, folks!" to produce the message at the bottom of the screen.

Better yet, to describe the language, you could ask the computer operator ie. student some questions about the rectangle. Here's a really short program to illustrate.

By the way, PILOT doesn't use line numbers. It's like LOGO, LISP, and some other advanced languages in this respect. One uses labels and subProgram like techniques to structure the program and direct the flow of action.

```
R: Remark only - prog. to demo a Q A.
IG:
DR: 50,50,100,75
TG: 1,5,shape is 50 by 25 units
T: how high is that rectangle?
A: #A
M: 50,50 UNITS
TY: That's perfectly correct
TN: Nope, thats not just right
T(#A=25): You were thinking of the WIDTH
T: press any key to proceed

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

R: is for a REMark
IG: is to Initialize Graphics
TG: puts the text at row,column used
T: is to Type something to the screen.
       (TP: is to Type to Printer)
```

A: is to Accept an Answer
M: is to Match to the following possible strings
    each separated by a comma
TY: is to Type only if the previous Match was True
TN: is to Type only if the previous Match was Not-true
T(#A=25): is to Type only if the expression is True
    (here users answer of 25 would be true)

Instead of the TY: and TN: we could have used a command- JM:$LABEL for Jump-on-Match to a label. After the $label would come some testing routine that ended with an E: command to return the program flow to the line following the JM:$label.

We could have used the Match or Jump command- MJ: string-to-match,more. If no match is found to the strings in the statement, the program jumps to the next M: or MJ: statement.

User subroutines are invoked with a simple- "U:$YOUALL" (U:$title). They are also ended with the command- E:.

Problems can be identified with the PR: command, then you can jump to them easily.

You can put the Y or the N or the conditional expression ie,(#A=25) after any of the basic commands.

To save that answer to a disk file we would just add a command- Write Answer- WA: right after the A: in the program above. Earlier in the program you would have the command to open the file- OF: DSK2.FILENAME or some other file and then later would close the file with- CF:.

For math you use the C: (Compute command) with the characters <- instead of the = sign. For example: C: #F<-88 or C: #E<-#6. The first sets F equal to 88 while the second sets E equal to the value of 6. All the other TI numeric operators ie. + are available as are the numeric functions such as TAN for Tangent.

PILOT is for easy interaction between the computer and the user. A simple example of it is:
```
T: Enter your name
A: $A
T: Enter an adjective
A: $B
T: Enter a type of animal
A: $C
T: Enter a part of an animal
A: $D
T: Enter a color
A: $E
CH: (this means Clear-Home the cursor)
R: $ $ $ $
T: $A had a $B $C,
T: whos $D, was $E as snow
T: Everywhere that $A went, the $C
T: was sure to follow.
```

There are many other commands in PILOT 99, but most are just like TI Basic or the Sprites in TI Extended Basic. Most are easy to remember and there are only 54 with the 1 or 2 digit code. I've barely scratched the surface in this memo of the many ways the commands can be combined to produce a very enjoyable interactive session of learning or data collection. Dr. Starkweather describes many in his book.

---EXPLORE--- in Harms Way

P I L O T -- For the TI-99/4

-- COMMANDS ---		DESC.	DETAIL
REGULAR COMMANDS		7	
A:	Accept	7	15
AS:	Accept one char	7	16
C:	Compute	7	18
CH:	Clear Home	7	21
CS:	Compute String	7	23
E:	End	D	DD
J:	Jump	7	35
JM:	Jump on Match	7	36
M:	Match	7	39
MJ:	Match or Jump	8	40
PR:	PRoblem	8	43
R:	Remark	8	44
T:	Type	8	59
TH:	Type and Hang	8	62
TP:	Type to Printer	8	63
U:	User subroutine	8	64
CHARACTER GRAPHICS COMMANDS		9	
CC:	Character Color	9	19
CP:	Character Pattern	9	22
HC:	HChar	9	32
IT:	Init. Text Mode	9	34
SN:	ScreeN color	9	55

COMPUSERVE_ARTICLE

NOTES ON THE NEW COMPUTER from The Chicago Faire

By J. Peter Haddie, Boston Computer Society TI User Group.

As everyone is aware, Myarc is planning to introduce a new computer which is rumored to be based on the design othe ill-fated TI 99/8. In fact, Myarc even had a 99/8 to play with before it was cancelled in just two months before TI left the home computer market. The truth about the 99/8 was that is was largely incompatible with the 99/4AThus when Myarc decided to design a new computer, they had to make major changes to the design of the 99/8 and the result of this work is a computer originally named "Noah" (from the "arc" in Myarc . . .) and now in search of a number for a name.

It was widely expected that Myarc would show this computer at the TI Faire in Chicago on November 2. But no dice. They brought along an empty shell of what the machine would look like and a mother board that they claimed was the machine. You may well ask then, why didn't they show it in operation. The answer is simple, although Myarc wouldn't admit it straight out. They blew a chip on the board when they were working on it the day before the show and were unable to replace it in time. But Lou Phillips, President of Myarc still gave a very clear picture of what this new, unnamed machine is all about.

First the basic information. It is expected to be release in the first quarter of '86 and sell for $499. The machine has an IBM key board complete with a slash key where the left shift key should be. There are 10 function keys but instead of being mounted on the left of the keyboard as on the IBM keyboard they are mounted across the top of the unit horizontally. There is also a numeric keypad like on the IBM, but instead of an oversized plus (+) key there is a large enter key to facilitate in numeric entry. The cartridge port has been moved to thupper left hand part of the machine above the first few function keys. It will come initially with 256K of CPU memory (expandable to a full 2 megs), 64K of VDP memory, 64K of ROM, a parallel output, and an RS232 I/O port, two internal expansion slots, and a port to hook up a mouse.

The mouse Phillips mentioned was the MS (Microsoft) Mouse which brings up the issue of IBM compatibility (more later). The internal ROM includes 48K of library routines, 8K of GPL intergreter and 8K (seems like a lot to me) of mouse support. When the machine powers up 16K of RAM is used for various internal tasks so that you are left with about 240K of space for your programs. And remember that all throutines, screen and graphics tables are kept in the 64K of VDP memory, so that you really have quite a lot of memory to work with. If you choose to expand the RAM of the system, it will have to be done externally using 3 off board RA expansion banks. The current Myarc memory cards such as their 128 and 512K cards will work as memory expansion.

The machine is built around the TMS9995 microproccessor which is a more advanced version of the TMS9900 insidyour TI-99/4A. The 9995 is 2.3 times faster and comparable in speed to a Motorola 68000 that drives Apple's Macintosh. According to Mack McCormick the 9995 can run as fast as 12 mgHz but it looks like it will only be running at an incredible 10.7 mgHz due to some technical considerations. The 9995 uses 16 bit parallel memory on the main board which allows it to go even faster than the 9900 which was a 16 bit processor doomed to forever run on an bit bus thus working at only half speed (roughly...) The

machine will be able to run nearly all programs written for the 99/4A through a bit on the gate array which when set will make the machine look nearly identical to a 99/4A. Thus all your software is still good. Almost. Myarc says 99% compatability. The exceptions they've found are programs that use non-standard methods to scan the keyboard. Only two programs are affected so far. No big deal.

The reason for the problem is that the 99/4A has 48 keys and the new machine has 84 so that a different KSCAN routine obviously had to be used. The programs that don't work use their own KSCAN routine and thus will not work. A few more comments on compatability. There will probably not be immediate support for speech. The machine can support it but there will be no port for you to plug it into the side of the machine. Myarc is planning to develop something like the Triple Tech card from CorComp to allow you to put the speech synthesizer inside the PE Box.

There is worse news though for those of you with a P-Code card. Mac McCormick said that the card is a techincal nightmare and the increased development timand costs to allow it to work wouldn't be worth it. Besides, he added, P-Code is essentially dead as even its creator has abandoned it.

Now here's the bad news for everyone. You can use your current PEB but you will have to buy a card from Myarc to be able to do it. The reason is the flex cable and card that connect your console the your PEB doesn't have the intelligence or connectors to allow the new machine to access the expanded memory in the PEB on a 16 bit bus or using the new PAB format (more later). However having to buy the is new card isn't all bad. It won't have as bulky a cable as the TI card so you can move the console around freely. It will have a time and date function built in so that you don't need a clock card. It is an added expense however. The communications chip is the same 9901 that is used in the 99/4A running at the same speeds.

The graphics chip inside the machine is perhaps the single most impressive component. Myarc is using the 9938, a chip TI developed and then abandonded (like all good things). It has 64 pins and is now being produced by the Japanese (who else?). It is fully compatable with 9918A inside the 99/4A but supports extra modes and features. Where the 9918A has 8 control registers for graphics characteristics, the 9938 has 32 which allows for an incredible amount of flexibility and power. The 9938 has two text modes. The first is identical to the text mode of the 9918A except that you can choose the foreground and background colors from a set of 512 colors instead of 16. Text mode two is 80 by 24 or 80 by 26 (which allows for a status line at the bottom like on the IBM) with 6 x 8 characters and a choice of two colors from the same 512. Multicolor mode is still there as well as graphics mode one.

Graphics mode two allows definition of 768 different patterns and a choice of 16 colors from the 512. Graphics mode three is the same as mode 2 except that instead of only being able to have four sprites on a horizontal line at a time you can have up to ten on a horizontal row. Graphics mode four is similar but has 256 x 212 resolution and graphics five can support up to 512 x 424 using interlacing but this mode can only be displayed on an RGB monitor. Graphics mode six has 512 x 212 resolution and 16 colors. Each pixel can have its color individually defined. This mode requires the full 64K of VDP memory for storing the screen. Graphics mode seven has the same resolution but uses a full byte of memory to define thcolor for each pixel which means that each pixel can be one of 256 colors! This mode requires additional VDP memory to use and Myarc has made provisions for up to 196K of VDP RAM to be put in the console. One of the control bits on the 9938 allows fowhat Phillips calls "animation tricks." He says that it can do screen swapping which essentially provides for automatic animation controlled by the 9938.

The machine will support the old PAB (Peripheral Access Blocks) format iVDP memory so that, in theory, all peripherals manufactured to TI specifications will work. There is some question as to whether or not the CorComp disk controller will work but Myarc seemed to imply that it would. A new PAB format will also be supported. It will be identical to that developed for the 99/8 and will reside in CPU memory for faster speed. It will also allow for logical record lengths of up to 4096 characters instead of the 25on the 99/4 and will have a full byte reserved for error codes which means there can be 256 error codes instead of 8 as in the old PAB format. Including support for both the new and old PAB formats is one of the major changefrom TI's 99/8.

TI was planning to abandon the old PAB format which would have made your PEB 100% useless. Myarc has made provisions so that you don't have to buy a whole new system. Phillips said that the first twperipherals that would be released would be the new PEB interface (described above) and a new disk controller card that will fit in the internal expansion slot for people who don't have (and don't need to buy) the PEB. This disk controller will supporquad density disks which means almost a full megabyte of storage on a single floppy. Phillips said that they already have a version of this controller working and will probably release a version of it for the 99/4A as well.

After those two cards arcomplete Phillips says that the next thing he plans to work on is a card that will allow for IBM compatability. He commented that the reason for choosing the keyboard they are using was so that it could be made into a PC compatable computer easily. He also said that 3.5 inch drives were a definite possibility in the not too distant future. The computer will come with Extended BASIC built in. But not TI Extended BASIC. Instead it will use an advanced version of Myarc's Extended BASIC II.

Phillips said that XB II is very similar to GW Basic from Microsoft and is somewhere between 2 and 4 times faster then TI Extended BASIC. A complete description of XB II, which is now available for use on the 99/4A when using Myarc's 128/512K memory expansion card, will be given elsewhere as it is too long to fit here. The additions to XB II that will be included in the new computer include full mouse supportadvanceevent driven control keys (which means that you can set your program to automatically branch to a certain line number when a given key is pressed), and support for the new PAB format.

"Phillips has promised to release a reference manual for the machine similar to the one released by IBM for the PC. In other words, the machine will have an open architecture and no hidden secrets like TI kept with GPL. This should help enormously in getting new software written and hardware builfor the machinby third party companies which can fully utilize the incredible power of Myarc's new machine. Phillips has promised to release the machine and claims that Myarc has sufficient capital to allow it to bring the computer to market. He did howeveadmit that they are expecting a "hard, up-hill battle" for the first year. When asked about other languages, Phillips said that Pascal would probably not be next but that C would be. His reasoning is that C is what ireally in vogue now and it would make new software development easier.

Listening to Phillips talk about this new machine made a few things very clear. First, Myarc really has a machine nearly ready to release. Second, the machine is state of the art and really something that could compete in the current market. Third, Myarc is thinking long term and has big plans. Now whether or not a small engineering company from New Jersey working

with a computer developed by TI and lost TI millions, can actually succeed is another question.

I think that if anyone can, Myarc will. But there is no way to findout except wait. A few notes concerning this file: This file was written on November 4 1985 by J. Peter Hoddie, co-director of the Boston Computer Society, TI 99/4A User Group. It is based on several pages of notes I took at the TI Faire in Chicago on November 2, 1985, during a talk given by Lou Phillips of Myarc. This file is not complete. I have lots more information on the product and many more editorial comments to make. However, in the interest of getting this information to you as quickly as possible, I have tried to keep this to a bare minimum (about 55 sectors!). A complete article plus a full description of the faire, the products, people, and talks will be completed in time for the November 20, 1985, BCS meeting. It should be well over 10 pages in length. If you want a copy, come to the meeting or send $1 to the address below. This file is a rough draft. You may distribute it or publish it in part or in whole as you wish. Please include the author's name and the information where the final version may be obtained.
Thanks.

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(reconstructed and uploaded to Compuserve by Barry Boone [76354,1637])

HINTS 'N TIPS

CORRECTING ERRATIC OPERATION OF THE TI-99 COMMAND MODULES

By Richard K. Stevens

When I started experiencing erratic operation of my my T-99 Command Modules, I found that many of my modules experienced similar behavior at the same time. At first I attributed this problem to static buildup on the computer/Command Modules. I have my computer in an area with a nylon rug, but no amount of care in handling the modules or waiting for the static to discharge seemed to help. There seemed to be no logic or pattern to when I could get the Command Modules to function properly. Finally, I discovered that I could temporarily correct the problem. This was done by inserting a dull blade (of a table knife) through the foremost air vent on the top of the computer and pushing down on the Command Module socket which lies just under the vent slot. This action allowed me to temporairly fix the erratic behavior of a module (provided I did not remove or stress the connection of the module to the computer).

Frustration with this problem caused me make a vow to get inside the computer and permanently correct the problem.

The TI-Command Module's interface with the main circuitry of the computer is through an internally mounted PC Extender Board. The extender board edge connects with a socket located on the top side of the main computer circuit board and extends through the top electromagnetic interference (EMI) shield. The extender board provides an electrical connection to the command modules through an edge connector which is soldered at right angles to the extender board. When the extender board was fabricated, the board is dip soldered and solder coats the edge connector finger "lands" which extend into the main frame socket. Over a period of time, with repeated insertions and extractions of command modules, indentations are worn into the soft solder surfaces and erractic electrical contact is the result. This may be corrected by burnishing the excess solder off the PC edge connector "land" surfaces with a nylon scrub pad. In my case, I have found this remedial action has only been required once. I have been pleased with the operation of the command modules since refurbishing the surface in this manner.

ENTERING THE COMPUTER CASE

The TI-99/4A case is entered by separating the top and bottom half shells. First, disconnect all external cables and other I/O devices from the computer. Next, turn the computer over onto its top so the undersurface is facing you with the front edge nearest your body. Pop the plastic ON/OFF switch cap off the internal slide switch by simply pulling it forward out of the case. Now, remove the seven Phillips head screws recessed into the bottom of the case. It may be necessary to remove two plastic anti-tamper threaded sleeves from the the two rear corners before access to the underlying screws can be gained. This can be accomplished by using an Allen wrench to back the sleeves out of the bottom cover. The bottom cover may now be lifted off the case and set aside with the other hardware.

The computer can now be viewed. It consists of three main modules. The Power Circuit board lies in the front left corner of the inverted computer case. The keyboard extends from the Power Supply Board across the front of the computer case towards the viewed right hand side. The mainframe logic board runs across the full length of the case towards the rear of the cabinet. The Extender Board, which interfaces the Command Modules to the mainframe board, lies under the left end of the mainframe circuit board.

GAINING ACCESS TO THE EXTENDER BOARD

The mainframe power supply and keyboard circuit board should be released from the top half of the computer case at the time to minimize potential damage to the frail ribbon cable which electrically joins the keyboard to the mainframe logic board. The main frame circuit board is fastened to the case by three small Phillips head screws located in the viewed front left corner, rear left corner, and rear center (inset) of the shielded mainframe board. It is not necessary, in fact, NOT RECOMMENDED that any of the larger Phillips head screws fastening the EMI shields be loosened or removed. The keyboard is held down by the two screws each located along the left and right edges of the keyboard circuit board. AGAIN, CAUTION IS ADVISED NOT TO REMOVE ANY SCREWS FROM THIS BOARD!! Finally, release the power supply board from the case by removing the two screws which straddle the one (inset) left edge keyboard screws which in turn are located along the viewed right edge of the power supply board.

Now, pick up the computer case with the thumbs of both hands placed under the top surface of the case and the fingers of both hands straddling the three circuit boards along the the left/right centerline of the case. Slowly invert the case (and loosely mated circuit boards) away from you until the case lies upright on your work surface with the rear facing you. Now lightly shake the circuit boards out of the top half case shell and gently release the power cord socket from the case. The command module extender board may now be seen nested in the connector socket on the top of the mainframe logic board. Gently remove remove the extender board by slowly rocking the board edge-to-edge out of the socket.

Clean the contactor surfaces of the extender board of excess solder by scrubbing the contactor "lands" with a nylon scrubber (Scotchbrite pad). Remember to do both sides of the extender board. Remove enough of the solder from these surfaces that the electrical "lands" appear flat and without blemishes. Also burnish the connector fingers of both the extender board socket and the mainframe/extender board socket with an old clean nylon toothbrush. If possible, finish up the job by flushing out both edge connector sockets with residue-free spray freon electrical contact cleaner. The burnished portions of the PC extender board edge connector should also be flushed with the same cleaner and polished with the toothbrush while spraying them with the freon cleaner. Give both sockets and the edge connector a final rinse with the cleaner before reassembling the extender board to the mainframe logic board. Reinsert the PC extender board into the computer by inserting it back into the mainframe edge connector socket with the PC mounted socket facing the direction of the Power supply board.

Before the computer is reassembled, it is highly recommended that the ribbon cable which connects the keyboard to the computer main board be inspected for signs of stress. The ribbon cable is most susceptible to damage where it is soldered to the keyboard circuit board. Look for the frayed or broken strands of multi-strand wire where the wire emerges from the plastic insulation of the ribbon and where it is soldered to the keyboard PC board. This condition, if it exists, is usually most evident on either or both of the endmost conductors. Even if it appears that the frayed wire may survive the reassembly of the computer, you will save yourself a lot of grief if you redress the ribbon cable to the keyboard PC board at this time. Failure of this cable is usually identified by groups of keys either generating improper characters or failing to respond at all.

If it is decided that your ribbon connector should be redressed to the keyboard PC, gently pry the ribbon cable connector off the main board connector pins with a small knife or flat blade screwdriver. Be sure not to bend the connector pins on the main circuit board in the process of removing the ribbon connector. Carefully note the direction the ribbon connector faces as you pull the PC board away from the rest of the computer assembly.

Cut squarely across the full width of the ribbon cable leaving about one-eighth of an inch of plastic insulation on the wire stubs still soldered to the keyboard PC board. With a pencil soldering iron (and a solder sucker, if you have one), remove the stub wires, excess solder, and plastic insulation from the row of solder eyelets progressing from one end of the stub ribbon cable towards the other. Make sure the solder eyelets are clear of wire fragments and are open from PC board side-to-side. Scrape and remove solder rosin flux from the eyelet area after the rosin hardens.

Use a small knife or wire cutters to split the plastic insulation back from the cut end of the cable/connector a distance of one-quarter of an inch on each side of the wires in the ribbon. Cut the loose plastic insulation tabs away from the ribbon cable close to the ends of the previous cuts. Finally, strip about three-sixteenths of an inch of insulation away from the cut end of each wire in the cable taking care not to nick the wire with either the wire stripper, wire cutters, or small knife used to remove the insulation on the wires. Now make sure the individual strands and wire in each conductor are twisted (clockwise) into a compact uniform wire bundle.

Slowly and carefully insert the connectors of the ribbon cable into the keyboard PC from the key side, starting at one end of the ribbon cable and progressing from one side of the ribbon connector and advancing one connector at a time towards the other side. The open face of the ribbon connector should be facing down (or away from the keys of the keyboard). When all the wires have been inserted into the eyelets, press the ribbon cable down onto the eyelet pads until the plastic insulation of the cable "bottoms" onto the eyelet pads. Now, carefuly bend the connector wire bundles over flat onto the eyelet pads on the bottom side of the keyboard PC board.

Finally, with a hot pencil iron, quickly solder each wire connector to the solder eyelet pads from the bottom (or wire stub side of the circuit board). Remove the heat from the solder when it appears to "wet" the wire and pad and starts flowing into the eyelet. The solder should form a slightly domed bead which coats the full diameter of the eyelet pad.

Replace the keyboard to its former position with respect to the other computer boards and carefully push the ribbon connector back onto the connector pins of the main computer board.

The computer boards can be reassembled to the case by reversing the disassembly process. Before this is done, look at the top half shell of the interior and note the cutout in the plastic where the command module extender board will protrude into the module cavity under the top vent slot. It is important that the case is placed over the main computer logic board so the extender board projects into this cavity without interference. When the top cover is jockeyed into position over the three boards, grasp the three boards and case in a similar fashion to which they were released to your work surface. Invert the loosely assembled top shelf and boards onto the work surface. Before you reinsert all the small headed Philips screws through the boards into the case, making sure each of the boards are nested onto the appropriate plastic guide posts. Now tighten the screws lightly but snugly.

By now you have discovered that the cover door for the I/O device connector has fallen out of the case top shell. No problem--just insert it back into the guide slots so that the long flat tab is facing out on the top edge of the viewed slide door. While you are at it, insert the power cord connector into the guide slots in its respective aperture. Replace the bottom shell to the assembly in similar fashion using the remaining larger headed screws. (you may discard the anti-tamper sleeves or replace them in the rearmost screw hole cavities, as you wish.)

You should now test all the keyboard functions, joysticks, I/O devices and video display to make sure the computer has not taken any insipient faults. Oh yes, don't forget the Command Module! After all, that is what all this was about!

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FOR "THE NATIONAL NINTY-NINER"
PUBLISHED BY THE 99'ERS ASSOCIATION

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