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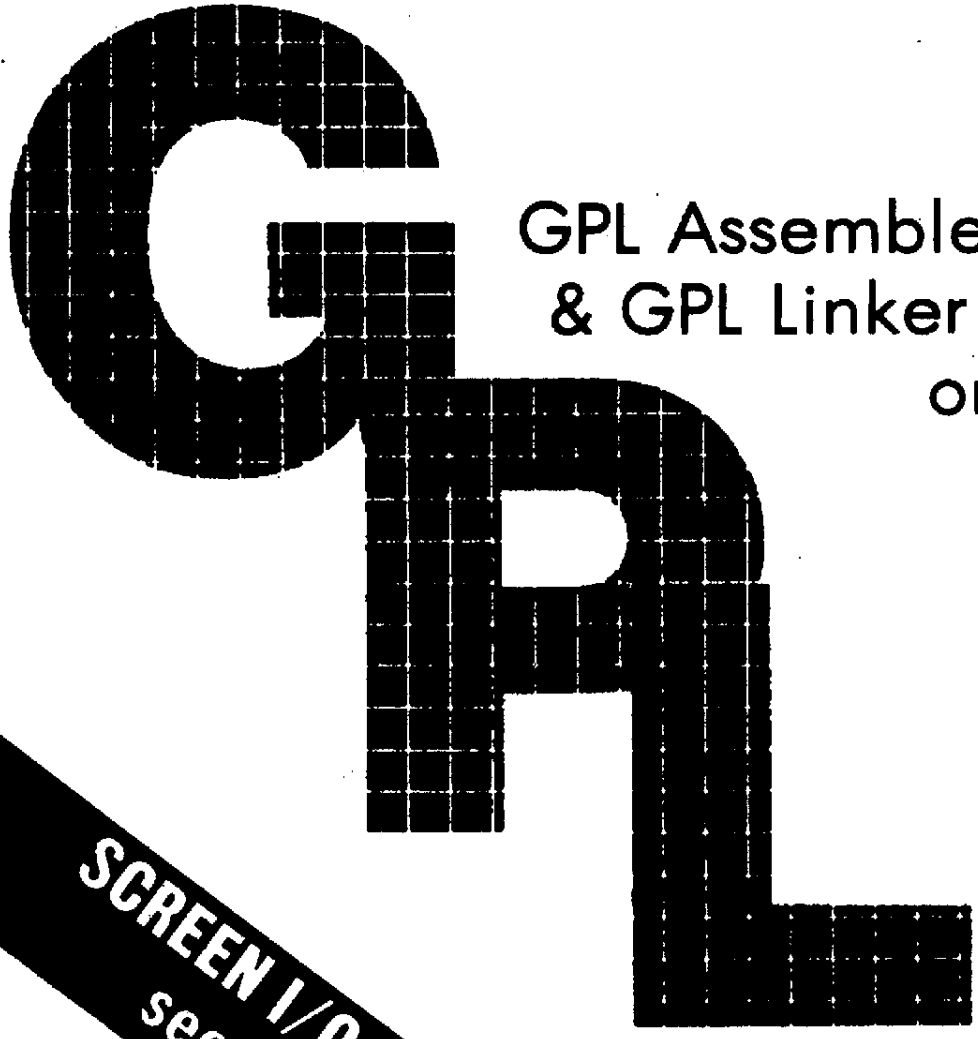

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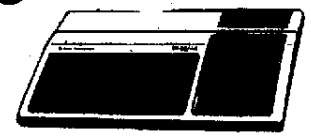

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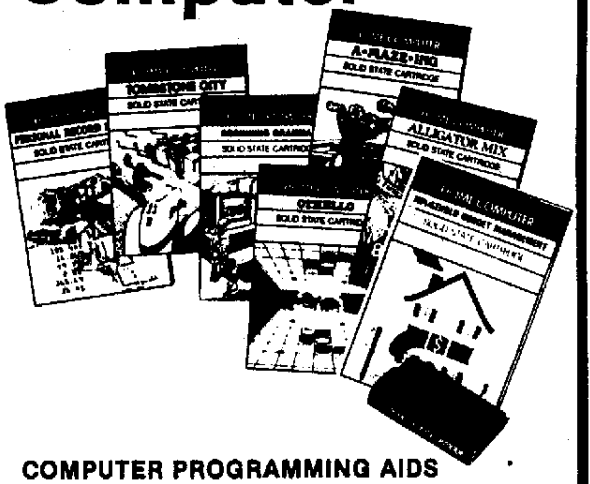

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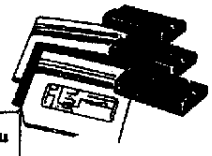

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Comments

Getting into GPL

This issue marks our first foray into the realm of GPL. GPL (graphics programming language) is a language created by Texas Instruments as used as a basis for its home computer. All of a sudden, it seems, everyone is getting on the GPL band wagon. Both John Clulow and Mack McCormick are enthralled with GPL, after years of ignoring it. We're publishing a review of several GPL related products by John, and Mack's series on GPL will begin in the September issue. Mack is looking for input from readers on what direction to take, and we'll look forward to see what happens.

PIRACY DEBATE CONTINUES

The company that markets 1-2-3 for the PC market has decided to eliminate the protection schemes on some of its software packages. Lotus Development says that it will provide large users of its software with disks that eliminate protection schemes from its existing software. The move is an experiment on the part of Lotus and may be extended to individual owners. Many software producers in the PC market have taken to selling unprotected software (some offer a protected version for a lesser price and an unprotected version at a premium price).

Much of the impetus in the drive to unprotect software comes from those who use protected software. Complaints range from not being able to load a protected program to a hard disk to having to purchase expensive software and firmware whose sole purpose is to defeat software protection schemes. Of course, the fear of rampant piracy of software is the reason softare protection is used.

What does this have to do with the TI market, where a lot of software is protected, but few of the protection schemes are effective? Protection continues, of course. But let's face it, most of the protection schemes are designed to keep non-programmers from defeating it. The more creative and persevering users sooner or later manage to defeat these protection schemes. At this point, the most effective schemes involve physically damaging a diskette or initializing it using another computer operating system in such a way that it can be read but not cataloged by a TI. (There are some who say that a TI can be used to break protection schemes used on PC software.)

Now a new type of program has reached the market, a track copier. Track copiers are designed to copy any disk, regardless of the protection measures. There has been a lot of debate on various bulletin boards, and even CompuServe loyalists have turned in their ID numbers when the TI Forum uploaded a track copier into its data library. Where will the debate over copy protection and piracy end? It's hard to tell, but in the PC market it is beginning to appear that the debate is moot. Will the TI market go the same way? The advent of the track copier may hasten the decision (it is being widely disseminated as Fairware.)

WHY ARE THERE ERRORS?

More than one reader has inquired why program listings in MICROpendium sometimes have errors. Some ask why we just don't take a program listing and run it straight, without breaking it down into columns as we do.

Be assured that every program that appears in MICROpendium is tested prior to running. In the case of BASIC programs, after the program is successfully run, we save it in a merge format and then load a program by Jim (Tigercub) Peterson that converts it into a 28-column, display/80 format. We then load the file into TI-Writer editor and run it out on a printer using an elite font.

Typically, errors that appear in programs were put there by the authors (running a program may not uncover all errors). Other sources of errors range from inadvertently hitting a key just before outputting the program to a printer to renumbering line numbers and not double-checking that all line number references remain in synch.

We have also found that some programs tested on one system using TI cards exclusively may not run quite as well as the same program run on another system using cards by other manufacturers. Also, at least once, we left out necessary directions without which the program could not work.

Printouts of assembly language programs are provided by the author. We use these exclusively for assembly listings, rather than reentering it. In most cases, authors include a disk with the assembly program listing and we will run it to make sure it does what it is supposed to do.

While explaining our procedures isn't going to eliminate errors, we want you to know that we do our best to catch them before going to press, and we rely on you to let us know when we've slipped up.

INDEX COMING

We are at work on an index of all our issues to date (something frequently requested by readers) and hope to have it available in both disk and hard-copy format soon. When we do, we will announce how readers who wish to do so may acquire copies.

—JK

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The *SST EXPANDED BASIC COMPILER* contains the standard features of Basic, plus most of the features of *EXTENDED BASIC*. It also includes many commands that are not available in *TI BASIC* or *TI EXTENDED BASIC*. A major feature of the *SST EXPANDED BASIC COMPILER* is the ability to add your own commands. If you have need of a command not commonly found in Basic, you can easily add it to our compiler (*Editor/Assembler* module only).

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An example of the speed is a benchmark program that appeared in the January, 1985 issue of Compute Magazine: "MSX is Coming" by Tom Halfhill. The program does a bubble sort on an array of 150 elements. The times in minutes:seconds are:

SST Expanded Basic (Integer Arithmetic)	0:31	Apple II plus	6:24	TRS-80 Color Computer	8:01
		Apple IIC	6:33	Commodore 16	8:35
SST Extended Basic (Floating Point Arithmetic)	2:05	Commodore Vic-20	6:34	Commodore Plus/4	8:36
		IBM PC jr.	6:59	Atari 800XL	8:55
IBM PC	5:45	Commodore 64	7:02	Atari 800	9:00
Goldstar MSX	6:20	Commodore 8032	7:16	TI 99/4A Basic	12:58

Many commands will be directly compiled, however some changes will be required to compile an existing program.

The following is a list of commands found in the *SST EXPANDED BASIC COMPILER*.

Floating point: + - * / ABS ATN COS EXP INT LOG SIN SQR TAN LET INPUT IF INTER FLOAT DIM

Integer: + - * / ABS LET INPUT IF PRINT FOR-NEXT DIM DISPLAY FLOAT INTER COLOR CHAR VCHAR GCHAR KEY CLEAR PEEK PEEKV LOAD POKEV OPEN CLOSE LINKER SCRON PRINTAT INPUTAT RESETAT INSTRINGA OUTSTRINGA POS SEG VAL LEN SOUND ADDSTRING STR CHR ASC FLOATIN FLOWOUT SUBIN SUBOUT PLOTMODE PLOTCHR PLOT GPLOT USING UNUSE SIG JOYST SPRITEMODE SPRITEA MOTIONA SCHARA PATTERNA COLORA LOCATEA POSITIONA MAGNIFYA DELSPRITEA DISTANCEA COINCA SCREEN SCROLL RANDOMIZE RND SCREENON USERA-USERE

SST EXPANDED BASIC requires Memory Expansion, Disk Drive and either Editor/Assembler or Mini-Memory. The following features are some of the many you will receive with the *EXPANDED BASIC COMPILER*:

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- Link compiled programs together having localized or global variables.
- Pass floating point variables from TI Basic to a compiled program.
- Bit map mode - access to all pixels.
- Specify format of variables to be printed.
- Specify the number of bytes to work with in floating point.
- Scroll the screen to the left or right.
- Scroll only a part of the screen.
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Feedback

Would like to see Dow flight simulator

I am planning to become a pilot and was...disappointed in 4A Flyer. It was not realistic at all, unlike Dow4 which is very "lifelike." I would like to encourage John Dow to make the flight simulator. As far as the price goes, I think whatever it takes to make the best program. I would probably be willing to pay up to $60-70, maybe even more. Of course, if it is less then I wouldn't complain.

Todd Handel
Stoughton, Massachusetts

Parameters, screen dump advice given

In regard to the inquiry about the GP-100TI printers (July 1986), I also had problems with a Gorilla Banana which is apparently the same printer or at least compatible; after many tries at different parameters I found "RS232.BA=4800.DA=8.PA=N" works for me very well. I hope this will also solve Mr. Hazboun's problem.

In regard to a good screen dump I purchased Quality 99 Software's Screen Dump II program which is compatible with mine and Axiom GP-100 printers.

It is a resident program which after entered resides in memory until the computer is shut off. It prints horizontally or in a larger version vertically. It also needs the above parameters to work but this is no problem as they allow these to be entered.

R.J. Kaspar
Lakewood, Ohio

Lost in the BBS world

For the past several weeks I have been involved in trying to obtain and set up a BBS system for the users group for which I beling. At first it seemed like a simple enough task, but shortly after the project started the nightmare began.

The first thing I did was obtain a copy of [Ralph] Fowler's "TIBBS" from one of the members in the group. After days of work, I could not get the system to run. Not getting discouraged, I set out on my journey into the land of the BBSs. I spent days on the phone with my trusty TI talking with sysops across the nation. Each one had something different and now I am plagued with so many versions and so many systems that I am lost in the world of the BBSs.

The reason for this letter is to ask you and your readers for help. Is there any BBS system out there that is easy to set up and run? I would like certain features in the system, 300/1200 baud, XModem transfers and a good message base. If possible it should be written in assembly language for speed.

My hardware configuration consists of the TI console, expansion box with the following cards, Myarc disk controller, Myarc 512K card, CorComp RS232. Also I have one DSDD and SSSD drives. My modem is a Hayes-compatible 300/1200 baud.

If you or any of your readers have any suggestions they would be appreciated.

Herman Mosakowski
Portland, Tennessee

You will possibly be given a choice of even more versions and systems when our readers write, but here's hoping you will become less lost.—Ed.

Mini-Writer files

Can anyone out there tell me, will Mini-Writer III read and print a cassette file which was created by Mini-Writer I?

Merle Vogt
Von Ormy, Texas

Joe Miller of IEC, one of the firms distributing DataBioTics' Mini-Writer, says there should be no problem with the files from I to II or III. He notes that there are problems in going the opposite direction, however, because the storage space decreases.—Ed.

Heat wave blues

I have found a cheap way to keep your computer cooler. Get a two-foo air hose used in fish tanks and one ai pump also used in fish tanks. Connec one end of the hose to the air pump Connect the other end under the gron port.

The air pump will make a low nois and vibration but it will keep you computer cooler.

Johnathan L. Leste
Jolo, West Virgini

Wishes for TI-Writer

I am a TI99/4A owner with a spar in the closet and I have a system a work as well, and I plan to replace (o augment) both systems with Geneves.

I use both systems for a variety o things, a large one of which is wor processing with TI-Writer. I have use the LF and PF functions to send an receive data by telephone and fro other computers; I also have use 4A/Talk for that.

TI-Writer is great as far as it goes and what I sincerely hope is that some one will take it a bit farther. Things i could use are—

(1) Joystick control of the cursor (I actually use a roller-controller). The fire button should operate like FCTN 2—insert character.

(2) Required vertical space. To be used to prevent starting a single line from a paragraph at the bottom of a page, and to prevent having a heading for a paragraph on one page and the paragraph to which it refers on the next. The printer would stop printing on the page a line or two early.

(3) A printer pause instruction to allow changing daisy-wheels in mid-printing.

(4) Footnote handling.

(5) Right-hand justification for use with proportional-spacing printers.

(6) Double transliterations—just as a single ampersand triggers underline and a double ampersand triggers print-

(Please turn to Page 10)

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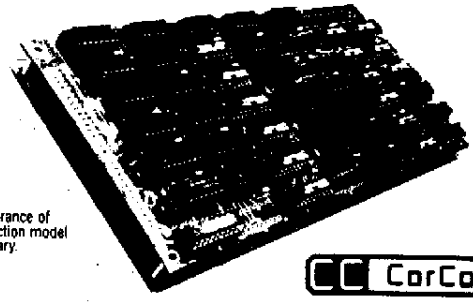

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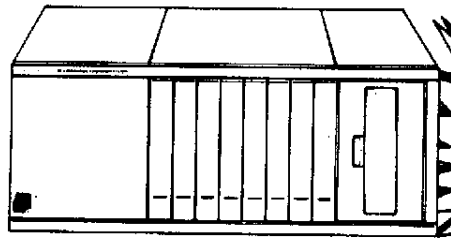

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Feedback

(Continued from Page 8)

ing an ampersand, so should any two-character combination be possible. This would allow easy access to characters in the range of 129-255 on printers that have them.

(7) Handshakes that allow double-striking, underlining, etc., to be performed by the printer with escape sequences.

(8) The capability to transmit CHR$(13) to the printer and accept it from an external source. (Brother printers use ESC CR as a master reset.)

(9) Capability to add to (append) a disk file without overwriting.

How do you load the TI-Writer disk into RAMdisk anyway? How can I use the 128K memory to print spool to a peripheral called AXIOM? Help!

Jim Rieger
Ridgecrest, California

The type of writing we do with TI-Writer does not require the functions you seek, but they may be useful to others.

Loading TI-Writer into a RAMdisk requires copying the TI-Writer programs (CHARA, FORMA, etc.) to the RAMdisk using a disk manager program.

We are not familiar with Axiom printers, nor do we know which 128K card you are referring to; so we can't really help you on the use of a spooler. (We use the CorComp Triple-Tech printer buffer and it directs the data to whatever serial or parallel device we specify, referencing PIO or RS232.)

As far as sending escape sequences, we have published several articles on this subject. The easiest way we've found to send printer controls using TI-Writer is to define them through the Transliteration command and save the definitions as an Include File. This allows one to redefine seldom used keys, such as the left and right brackets, as flags to turn double-striking on and off.

Readers who have suggestions for Mr. Rieger's other comments may want to submit a User Note or Feedback letter.—Ed.

Double-sided drives

I'm writing about Jeff Shaw's review of Myarc's disk controller card, which appeared in the June issue.

In the first paragraph, he points out, "One of the biggest hardware advances for the 99/4A has been the introduction of disk controllers able to handle double-sided drives."

This statement is not correct. The original TI controller is such a controller. It handles single and double-sided disk drives as well as older types that use fewer than 40 tracks (ex. 35). It doesn't, however, support double-density recording. I hope this will clear up any confusion for those users wishing to add double-sided drives to their TI system. You do not need any special controller to add a double-sided drive.

Stephen J. Tuorto
Bayshore, New York

Printer compatibility

In response to Arthur Hazboun (Feedback, July 1986):

Throughout the years of the computer revolution I have noticed many unsatisfied consumers in computer-related industries who were misled by false advertising, or what some call "stretching the truth." Since the introduction of TI Artist our advertising has always stated what printers the software package was compatible with. Those printers included "Epson (compatible), Okidata 92 and 93, Axiom GP-100 and Prowriter" printers. At no time did our advertising claim that TI Artist performed properly using an Axiom GP-100TI printer.

Unfortunately for all parties involved, Axiom has shown a habit of altering the internal software within its printers of a similar model, thus making them incompatible with certain software packages like TI Artist. As time permits we try to correct any of these unanticipated problems, and apologize for any inconvenience they may have caused our customers.

At the time Mr. Hazboun had written to us explaining his difficulty getting TI Artist to work properly with his Axiom GP-100TI printer, all we could offer him was a prompt refund and an explanation about Axiom changing the software within its printers. Since that time a small revision to TI Artist has been made and it now performs correctly using an Axiom GP-100TI printer.

Steven C. Lamberti
Texaments
Patchogue, New York

Software wanted

My son has a Commodore 64 computer. He recently obtained from Load & Go Software a program called "Home Finance Organizer." It has the following subdivisions: 1) Address keeper; 2) Checkbook balancer; 3) Budgeter.

I would be interested in obtaining a program similar to this for my TI99/4A. However, there is no address on the Load & Go disk and I don't know if they also make a program that will run on my computer.

Edward A. Dawson
Zellwood, Florida

There may be several similar, multi-function programs for the TI. One that comes to mind is Home Information Management System by VMC Software, P.O. Box 326, Cambria Heights, NY 11411. This package includes a checkbook manager, address book and home inventory manager. It retails for less than $30. It requires Extended BASIC, disk system and expansion memory.

The Feedback column is for readers. It is a forum to communicate with other readers. The editor will condense excessively lengthy submissions where necessary. We ask that writers restrict themselves to one subject for the sake of simplicity. Our only requirement is that items be of interest to persons who use the TI99/4A home computer. Mail Feedback items to: MICROpendium, P.O. Box 1343, Round Rock, TX 78680.

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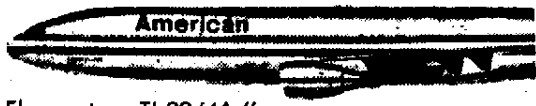

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Screen I/O package

By J. PETER HODDIE

Did you ever wish you could use a 40-column screen with TI Extended BASIC? Or want to display text in horizontal or vertical directions? Or use text strings longer than one line with ACCEPT AT or DISPLAY AT? Or adjust margins to your own choice of settings? The assembly routines provided with this article allow you to do all that and more, without sacrificing any of the power of Extended BASIC.

You do not need to understand assembly language to use these routines, but you must have an expanded system with a 32K memory expansion or more and at least one disk drive. First, you need to get the routines in object code form, which you can do in either of two ways. You can type the source code as it is printed here and assemble it into object code using the "R" option only from the Editor/Assembler (or the equivalent from a system such as FunnelWriter).

LOADING THE OBJECT CODE

Once you have the object code on disk, you must enter Extended BASIC and load the routines. You can do this in any of three ways, depending on your applications. If you are just familiarizing yourself with the routines' capabilities, you can use immediate mode by typing CALL INIT :: CALL LOAD("DSKn.filename"), where n is the number of the drive you are loading from and filename is the name you have given the object code file. You can also use CALL LOAD... as a line in an Extended BASIC program, or you can merge the object code with your program using a utility like ALSAVE (Genial TRAVelER, issue 1.3 from Barry Traver).

BEGIN

The first routine you should use is CALL LINK("BEGIN"), either from immediate mode or as an early step in a program. This resets all the routines back to their default settings.

INIT

The next thing you should do is to define your environment with the "INIT" routine. This routine defines the left and right margin, as well as whether you are in text or graphics mode. If you do not specify anything, the routines will default to graphics (32-column) mode, with a left margin of 3 and a right margin of 30 as is normal in Extended BASIC. You call the INIT routine as

(Please turn to Page 20)

Screen I/O

```
        DEF  ACCEPT,INIT,DSPLY
        DEF  CLS,SCREEN,BEGIN

* (C) COPYRIGHT 1986 J. PETER HODDIE

* EQUATES FOR EXTENDED BASIC

GPLWS   EQU  >83E0
VSBW    EQU  >2020
VMBW    EQU  >2024
VSBR    EQU  >2028
VMBR    EQU  >202C
VWTR    EQU  >2030
VDPWD   EQU  >8C00
VDPWA   EQU  >8C02
KSCAN   EQU  >201C
STRREF  EQU  >2014
STRASG  EQU  >2010
NUMREF  EQU  >200C
FAC     EQU  >834A
XMLLNK  EQU  >2018
CFI     EQU  >1288

*************************
* SCREEN CONTROL BLOCK: FOR REFERENCE BY FUTURE ROUTINES

INTSAV  BSS  2
TIMER   BSS  2

MLEFT   DATA 3              LEFT MARGIN
MRIGHT  DATA 30             RIGHT MARGIN
LINE    DATA 28             CHARS PER LINE

MODE    DATA 32             SCREEN MODE (32=GRAPHICS; 40=TEXT)
WIDTH   DATA 32             SCREEN "WIDTH" (USUALLY 32 OR 40)
SBA     DATA >0000          SCREEN BASE ADDRESS

* END OF SCREEN CONTROL BLOCK
*************************

LENGTH  BSS  2              LOWER BYTE IS FOR LENGTH OF STRING
BUFFER  BSS  258

        BSS  2              LENGTH WORD FOR VALID
VALID   BSS  128            BUFFER FOR VALIDATE

VDPBUF  BSS  256            SAVE VDP INFO FOR 40 COLUMN ROUTINES.

CURUND  BSS  2              SAVE FOR CHARACTER UNDER CURSOR
CURTIM  DATA 15             CURSOR BLINK RATE IN SIXTIETHS OF A SECOND
CURON   BSS  2              CURSOR ON/OFF
CURP1   BSS  2              CURRENT CURSOR POSITION IN STRING
CURP2   BSS  2              CURRENT CURSOR POSITION ON SCREEN
FIRST   BSS  2              WHERE TO START PUTTING STRING

INSFLG  BSS  2              INSERT FLAG. >FFFF MEANS TRUE. IE INSERT IS ACTIVE

LSTKEY  BSS  2              LAST KEY PRESSED

MYREGS  BSS  32             MY WORKSPACE

OLDWID  DATA 32             WIDTH BEFORE CURRENT "INIT"
OLDSBA  DATA >0000          OLD SBA

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

BEGIN
        LI   R0,32          SET WIDTH,OLDWIDTH AND MODE TO 32
        MOV  R0,@WIDTH
        MOV  R0,@OLDWID
        MOV  R0,@MODE

        CLR  @SBA           MAKE SURE SCREEN IS AT >0000
        CLR  @OLDSBA
```

(Please turn to Page 14)

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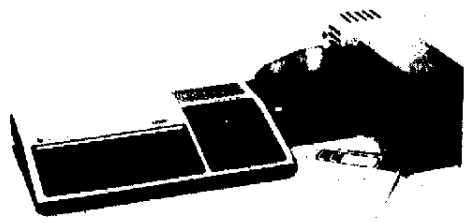

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SCREEN I/O

(Continued from Page 12)

```
       LI   R0,3
       MOV  R0,@MLEFT    MAKE LEFT MARGIN 3
       LI   R0,30
       MOV  R0,@MRIGHT   RIGHT MARGIN 30
       LI   R0,28
       MOV  R0,@LINE     AND LINE WIDTH 28

       B    @>006A       AND RETURN TO XB

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

* CALL LINK("ACCEPT",X,Y,LENGTH,VALIDATE$,RETURN$)

ACCEPT
       LWPI MYREGS

       MOV  @>83C4,@INTSAV    * SAVE CURRENT INTERRUPT POINTER
       LI   R1,JIFFY      * GET ADDRESS OF JIFFY COUNTER
       MOV  R1,@>83C4     * INSTALL JIFFY COUNTER

       CLR  @INSFLG       * CLEAR THE INSERT FLAG
       SETO @LSTKEY       * RESET LAST KEY HOLD
       CLR  @CURP1        * SET POINTER TO BEGINNING OF STRING
       SETO @CURON        * TURN CURSOR ON
       MOV  @CURTIM,@TIMER    * INITIALIZE CURSOR TIMER

       BL   @CALC         * GET X AND Y COORDS

       LI   R2,BUFFER
       LI   R1,>2000      * SPACE CHARACTER . . ASCII32
CLST1  MOVB R1,*R2+           *  FILL REST OF STRING
       CI   R2,BUFFER+256     *  WITH SPACES . . .
       JNE  CLST1             *
       SETO @LENGTH
       CLR  R0
       LI   R1,5
       LI   R2,BUFFER-1
       BLWP @STRREF       * GET INITIAL STRING

       LI   R0,>007F      * LENGTH OF VALIDATE STRING
       MOV  R0,@VALID-2
       CLR  R0
       LI   R1,4
       LI   R2,VALID-1
       BLWP @STRREF       * GET VALIDATE STRING

       LI   R1,3
       BL   @GETNUM
       MOV  R1,@LENGTH    * GET USERS LENGTH

       BL   @SHOW

SCAN   LIMI 2
       LIMI 0
       BLWP @KSCAN
       CLR  R0
       MOVB @>8375,R0     * GET KEYPRESS
       CI   R0,>FF00      * NO KEY PRESSED??
       JNE  SCAN1         * IF NO KEY, GET THE NEXT
       SETO @LSTKEY
SCAN0  B    @NEXT1

SCAN1
       CB   R0,@LSTKEY    * IS IT SAME KEY AS BEFORE?
       JEQ  SCAN0         * IF SO, GET OUT
       MOVB R0,@LSTKEY    * SAVE LASTKEY

       CI   R0,>0D00      * IS IT AN ENTER
       JNE  SCAN1B
       B    @EXIT

SCAN1B CI   R0,>0800      * IS IT A BACKSPACE
       JNE  SCAN3
       CLR  @INSFLG
       MOV  @CURP1,@CURP1
       JEQ  SCAN1A
       DEC  @CURP1
SCAN1A B    @NEXT

SCAN3  CI   R0,>0900      * IS IT A FORWARD SPACE
       JNE  SCAN4
       CLR  @INSFLG
       MOV  @LENGTH,R9
       DEC  R9
       C    @CURP1,R9
       JEQ  SCAN1A
       INC  @CURP1
       B    @NEXT

SCAN4  CI   R0,>0300      * IS IT A DELETE CHAR
       JNE  SCAN5
       CLR  @INSFLG
       LI   R0,BUFFER
       A    @CURP1,R0
       MOV  R0,R1         * R0 WE MOVE TO
       INC  R1            * R1 WE MOVE FROM
SCAN4A MOVB *R1,*R0       * MOVE A CHARACTER
       INC  R0
       INC  R1
       CI   R1,BUFFER+256 * ARE WE DONE?
       JNE  SCAN4A
       DEC  R1
       LI   R2,>2000
       MOVB R2,*R1
       JMP  SCAN2

SCAN5
       CI   R0,>0400      * IS IT AN INSERT
       JNE  SCAN9
       SETO @INSFLG
       JMP  NEXT

SCAN9
       CI   R0,>0800      * IS IT AN UP ARROW?
       JNE  SCANA

       MOV  @CURP1,R1
       S    @LINE,R1
       MOV  R1,R1
       JGT  SCAN9A
       CLR  R1
SCAN9A MOV  R1,@CURP1
       B    @NEXT

SCANA
       CI   R0,>0A00      * IS IT A DOWN ARROW?
       JNE  SCAN6

       MOV  @CURP1,R1
       A    @LINE,R1
       MOV  @LENGTH,R2
       DEC  R2
       C    R1,R2
       JLT  SCANAA
       MOV  R2,R1
SCANAA MOV  R1,@CURP1
       B    @NEXT

SCAN6
       CI   R0,>0700      * IS IT AN ERASE WHOLE LINE?
       JNE  BREAK
       CLR  @INSFLG
       CLR  @CURP1
       LI   R0,BUFFER
       LI   R1,>2000
SCAN6A MOVB R1,*R0+
       CI   R0,BUFFER+256
       JNE  SCAN6A
       JMP  SCAN2

BREAK  CI   R0,>0200      * IS IT A BREAK (FCTN-4)
       JNE  VAL
       MOVB @>8345,R0     * GET XB SYSTEM FLAGS
       ANDI R0,>4000      * ISOLATE "ON BREAK" BIT ->THANKS CRAIG MILLER
       JNE  BREAK1        * BIT IS RESET, ON ERROR NEXT
       B    @EXITQ        * WE HAVE A BREAK, GET OUT FAST
BREAK1 B    @SCAN         * ON BREAK NEXT, IGNORE IT AND GO ON.

VAL
       MOV  @VALID-2,R2
       JEQ  SCAN7
       DEC  R2
       LI   R1,VALID
VAL1   CB   @VALID(R2),R0
       JEQ  SCAN7
       DEC  R2
```

(Please turn to Page 16)

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SCREEN I/O

(Continued from Page 14)

```
       CI   R2,-1
       JNE  VAL1
       JMP  NEXT

SCAN7
       MOV  @INSFLG,@INSFLG   * IS INSERT ON??
       JEQ  SCAN8             * IF NOT ON, THEN GO ON

       MOV  @LENGTH,R3
       DEC  R3
       C    @CURP1,R3         * ARE WE AT THE END OF THE STRING?
       JEQ  SCAN8             * IF SO, DON'T INSERT A CHAR.
       LI   R3,BUFFER
       A    @LENGTH,R3        * MOVE TO R1
       MOV  R3,R1
       DECT R3                * FROM R3
       DEC  R1                * CORRECTION, AGAIN
       LI   R2,BUFFER
       A    @CURP1,R2         * GET ADDRESS TO STOP MOVING AT
SCAN7A MOVB *R3,*R1           * MOVE THE BYTE
       DEC  R3
       DEC  R1
       C    R1,R2
       JNE  SCAN7A

SCAN8  MOV  @CURP1,R1         * GET CURRENT STRING POSITION
       MOVB R0,@BUFFER(R1)    * PUT CHARACTER INTO STRING
       MOV  @LENGTH,R2
       DEC  R2
       C    @CURP1,R2         * ARE WE AT END OF STRING
       JEQ  SCAN2             * IF SO, DON'T INCREMENT POSITION
       INC  @CURP1            * INCREMENT COUNT
SCAN2
NEXT   BL   @SHOW
NEXT1
       MOV  @TIMER,@TIMER     * HAVE WE TIMED OUT
       JNE  NEXTEX            * IF NOT, GO ON
       MOV  @CURTIM,@TIMER    * RESET TIMER
       MOV  @CURON,@CURON     * IS CURSOR ON?
       JEQ  NEXT2             * IF NOT, TURN ON
       CLR  @CURON            * TURN CURSOR OFF
       MOV  @CURP2,R0         * GET CURSOR POSITION
       MOVB @CURUND,R1        * GET CHARACTER UNDER CURSOR
       A    @SBA,R0           * ADD IN SCREEN OFFSET
       BLWP @VSBW             * PUT IT UP
       S    @SBA,R0           * TAKE OUT OFFSET
       JMP  NEXTEX            * GET OUT
NEXT2  SETO @CURON
       MOV  @CURP2,R0
       LI   R1,>7E00
       A    @SBA,R0           * ADD IN OFFSET
       BLWP @VSBW
       S    @SBA,R0           * TAKE OUT OFFSET

NEXTEX B    @SCAN

EXIT
       LI   R0,BUFFER+255
       LI   R1,255
       LI   R2,>2000
EXIT1  CB   R2,*R0            * IS IT A SPACE
       JNE  EXIT2             * IF NOT, WE'RE DONE
       DEC  R0                * OTHERWISE, DECREMENT POSITION
       DEC  R1                * AND COUNT
       JLT  EXIT2             * IF LENGTH IS 0, THEN NULL STRING.
       JMP  EXIT1

EXIT2  INC  R1                * CORRECTION . . AS USUAL
       MOV  R1,@LENGTH        * PUT LENGTH IN THE RIGHT PLACE
       CLR  R0
       LI   R1,5
       LI   R2,LENGTH+1
       BLWP @STRASG

EXITQ  MOV  @CURP2,R0
       MOVB @CURUND,R1        * KILL CURSOR
       A    @SBA,R0           * ADD IN SCREEN OFFSET
       BLWP @VSBW

       MOV  @INTSAV,@>83C4    * RESTORE INTERRUPTS TO WHERE THEY WERE
       LWPI GPLWS             * RELOAD REGISTERS FOR XB RETURN
       B    @>006A            * RETURN TO XB
************************
```

```
SHOWRT BSS  2

SHOW   MOV  R11,@SHOWRT
       MOV  @FIRST,R0         *  GET WRITE ADDRESS
       CLR  R2                * RESET COUNTER

SHOW0  MOV  R0,R5
       CLR  R4                * PREPARE FOR THE DIVISION
       DIV  @WIDTH,R4         * PUT REMAINDER IN R5

       INC  R5                * ANOTHER OFFSET CORRECTION?
       C    R5,@MLEFT         * ARE WE IN LEFT MARGIN?
       JLT  SHOW1             * IF SO, CORRECT

       C    R5,@MRIGHT        * ARE WE IN RIGHT MARGIN?
       JGT  SHOW1             * IF SO, CORRECT

       JMP  SHOW2             * GO ON, NO MARGIN PROBLEMS

SHOW1  INC  R0                * ADD ONE TO SCREEN ADDRESS AND TRY AGAIN
       JMP  SHOW0

SHOW2  MOVB @BUFFER(R2),R1    * GET NEXT BYTE TO WRITE
       LIMI 2
       LIMI 0
       AI   R1,>6000          * PUT IN BASIC OFFSET
       LI   R9,JIFFY
       C    @>83C4,R9         * ARE INTERRUPTS ENABLED?
       JNE  SHOW3             * IF NOT, WE ARE IN DSPLY, NOT ACCEPT
       C    R2,@CURP1         * ARE WE WHERE THE CURSOR IS?
       JNE  SHOW3
       MOV  R1,@CURUND        * SAVE CHARACTER UNDER CURSOR
       MOV  R0,@CURP2         * SAVE CURSOR POSITION
       LI   R1,>7E00          * CURSOR CHARACTER
SHOW3  A    @SBA,R0           * ADD IN OFFSET
       BLWP @VSBW             * PUT IT UP
       S    @SBA,R0           * TAKE OUT OFFSET

       INC  R0
       INC  R2
       C    R2,@LENGTH        * ARE WE DONE YET?
       JNE  SHOW0             * IF NOT, KEEP ON GOING

SHOWEX MOV  @SHOWRT,R11
       RT

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

JIFRT  BSS  2

JIFFY
       MOV  @TIMER,@TIMER
       JEQ  JIFFY1            * THANKS TO PAUL CHARLTON FOR THIS METHOD OF
       DEC  @TIMER            *  TIMING THINGS.

JIFFY1 MOV  @INTSAV,R12       * GET THE ADDRESS OF THE OLD INTERRUPT ROUTINE
       JEQ  JIFFYX            * IF THERE,  IT IS ZERO, IF NOT, SKIP AHEAD
       MOV  R11,@JIFRT        * SAVE RETURN ADDRESS, IN CASE
       BL   *R12              * EXECUTE TO OTHER INTERRUPT ROUTINE
       MOV  @JIFRT,R11        * RESTORE RETURN ADDRESS

JIFFYX RT

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

CALC
       MOV  R11,R10           * SAVE RETURN ADDRESS

       LI   R1,1
       BL   @GETNUM
       DEC  R1
       MOV  R1,R5             * GET THE X COORDINATE
       MPY  @WIDTH,R5         * CALCULATE ROW DISPLACEMENT IN R6

       LI   R1,2
       BL   @GETNUM
       A    R1,R6             * GET ROW OFFSET AND ADD TO R6
       DEC  R6
       MOV  R6,@CURP2
       MOV  R6,@FIRST

       B    *R10              * RETURN THROUGH R10

************************
```

(Please turn to Page 18)

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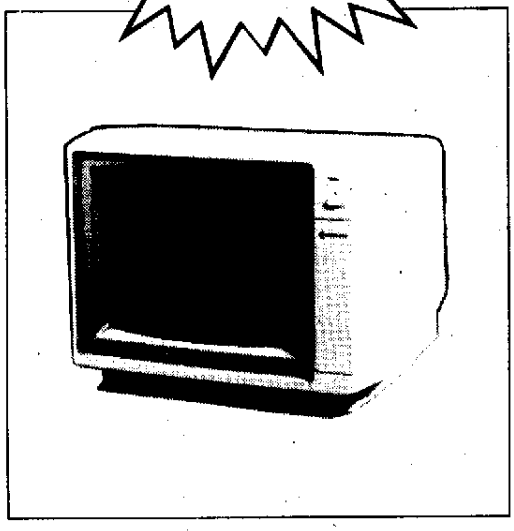

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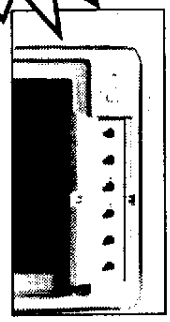

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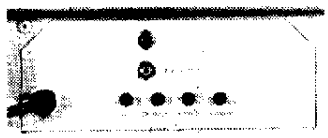

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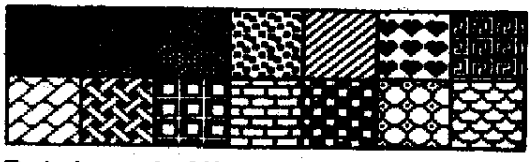

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SCREEN I/O

(Continued from Page 16)

```
GETNUM
       CLR  R0
       BLWP @NUMREF       * R1 CONTAINS ELEMENT NUMBER IN LINK
       BLWP @XMLLNK       * LIST TO GET NUMBER FROM
       DATA CFI
       MOV  @FAC,R1       * VALUE IS RETURNED IN R1
       RT

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

DSPLY
       LWPI MYREGS

       BL   @CALC

       LI   R0,>00FF      MAXIMUM OF 255 CHARACTERS
       MOV  R0,@LENGTH
       CLR  R0
       LI   R1,3
       LI   R2,BUFFER-1
       BLWP @STRREF
       MOVB @LENGTH+1,R0
       JEQ  DSPLYX

       BL   @SHOW

DSPLYX LWPI GPLWS
       B    @>006A        RETURN TO XB

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

* CALL LINK("INIT",LEFT_MARGIN,RIGHT_MARGIN,WIDTH)
* WHERE WIDTH INDICATES 40 OR 32 COLUMN MODE
* OTHER VALUES WILL GIVE INTERESTING
* RESULTS: SEE BARRY TRAVER'S GT #3!
* NOTE THAT NO RANGE CHECKING IS DONE.

INIT
       LWPI MYREGS

       MOVB @>8312,R9     * GET NUMBER OF PARAMETERS IN LINK
       SRL  R9,8          * IN WORD IN R9
* THANK YOU TO DANNY MICHAEL'S MARVELOUS SCREEN DUMP

       LI   R1,1
       BL   @GETNUM
       MOV  R1,@MLEFT     * GET LEFT MARGIN

       LI   R1,2
       BL   @GETNUM
       MOV  R1,@MRIGHT    * GET RIGHT MARGIN

       CI   R9,2          * DO WE HAVE 2 PARAMETERS ONLY?
       JEQ  INIT2         * IF ONLY 2, THEN SKIP TO THE END.

       MOV  @WIDTH,@OLDWID     * SAVE THE CURRENT WIDTH
       MOV  @SBA,@OLDSBA       * SAVE CURRENT SBA

       LI   R1,3
       BL   @GETNUM
       MOV  R1,@WIDTH     * GET SCREEN WIDTH (32 OR 40,USUALLY....)

       MOV  R1,R4         * GET CURRENT WIDTH
       C    R4,@MODE      * IS WIDTH SAME AS MODE?
       JEQ  INIT1         * IF SO, SKIP AHEAD
       CI   R4,32         * IS WIDTH 32?
       JEQ  INIT32        * SET WIDTH
       CI   R4,40         * IS WIDTH 40?
       JEQ  INIT40
       JMP  INIT1

INIT32 LI   R0,>01E0      * SET TO 32 COLUMNS
       BLWP @VWTR         * WRITE TO VDP REGISTER 1
       SWPB R0            * GET DATA IN HIGH BYTE OF R0
       MOVB R0,@>83D4     * MOVE DATA FOR KSCAN
       MOV  R4,@MODE      * SET CURRENT MODE
       LI   R0,768        * RESTORING DATA AFTER SCREEN
       LI   R1,VDPBUF     * ADDRESS OF WHERE DATA IS.
       LI   R2,256        * MOVE 256 BYTES
       BLWP @VMBW         * RESTORE THE BYTES
       JMP  INIT1

INIT40 LI   R0,>01F0      * SET TO 40 COLUMNS
```

(Please turn to Page 20)

MegaRam™ from ATRONIC

The only full megabyte (1024k) RAM memory expansion for the 99/4A has now been introduced in North America. This new stand-alone unit attaches to the I/O connector to add the standard 32k PLUS 992k of extra memory. The innovative "SUPERVISOR" program monitors memory use, RAMDISK functions and bank-switching for application programs. MegaRam works with XB or E/A languages and other TI modules which require 32k. Compatible with virtually all TI programs. MegaRam does not come as an Expansion Box card due to the direct address line access needed. Price: $575.95 (US) for twice the memory in this astounding product! Requires console, drive, XB or E/A.

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RS-232 with 32k memory on board. Two serial ports and one parallel port. Works like TI's RS-232 card except that the parallel port is not bi-directional. Gives you more room in your PE box. Price: $175.95 (US).

Super Clock Support

Designed for the CorComp Clock Peripheral—Triple Tech Card or Stand-alone models. This utility package provides more functions for use in your Extended Basic programs. Direct access to the clock ROM at assembly speed gives you these features: three independent timers to set and read; alarm function; two interrupt routines to display time and date on screen with CTRL T—continuously or on your command; all time and date displays are in 12 or 24 hour format using **TEXT**. This program also allows the week, date and time to be set independently rather than all together.

Program disk is not copy protected to allow you full use in your Extended Basic programs. Package includes disk and instructions. Only $17.95 plus $2 shipping (US funds).

BASIC Compiler V1.1

New Basic Compiler that is finally easy to use! Supports virtually all Basic and Extended Basic commands in existing programs. Simply load and compile programs from a menu driven directory on your screen. No extensive re-writing, variable declarations or conversions are required. Compiler produces code-list in one pass containing all variable addresses and jump list. Package includes Extended Basic Loader, Floating Point Loader, Integer Loader, Disk Menu program and DSR program for the Compiler support. This Compiler cannot unravel DEF statements and stops on the END statement—no SUB's allowed. TRACE, BREAK, ON ERROR, CALL LOAD and CALL LINK may produce execution errors. Requires 32k, disk. Price: $20.00 plus $2 shipping (US funds).

XBII plus

As reviewed in Micropendium October 1985. This command module gives you all the features of Extended Basic PLUS 40 new commands. Totally compatible with TI's XB, this enhanced version gives your programs more power to access your 99/4A. Commands such as MLOAD, MSAVE, VPEEK, VPOKE, GPEEK are superior to most other Basic environments. Various demo programs and new applications using high resolution graphics make this module a "must" for Extended Basic users. Comes complete with a 95 page manual. Requires console and 32k. $75.00 (US) plus $2 shipping.

ENHANCED GPL Assembler V2.1

NOW with high memory loader package

This package includes the GPL Assembler disk, printed documentation, GPL tips and hints, update support service and commented GROM/ROM listings (with the book "INTERN"). An example for a command module type GPL program is included with source, object and list files on disk.

Requires: 32k memory, disk drive(s), TI Editor Assembler package. Printer/RS-232 recommended.

Price: $59.95 Package w/ INTERN $75.00 (US)
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SCREEN I/O

(Continued from Page 18)

```
      BLWP @VWTR        * WRITE TO REGISTER 1
      SWPB R0           * GET DATA IN HIGH BYTE OF R0
      MOVB R0,@>83D4    * MOVE DATA FOR KSCAN
      MOV  R4,@MODE     * UPDATE CURRENT MODE
      LI   R0,768       * SAVING DATA AFTER SCREEN
      LI   R1,VDPBUF    * ADDRESS OF WHERE DATA IS.
      LI   R2,256       * MOVE 256 BYTES
      BLWP @VMBR        * SAVE THE BYTES

INIT1 CI   R9,4         * DID WE GET 4 PARAMETERS?
      JNE  INIT2        * IF NOT, THEN NOT TOUCHING SBA, SO SKIP AHEAD

      LI   R1,4
      BL   @GETNUM      * GET THE NUMBER
      CI   R1,1         * IS IT A ONE?
      JNE  SLOC1        * IF NOT, SKIP AHEAD

      LI   R0,>0200     * SCREEN IMAGE TABLE AT >00=>400
      BLWP @VWTR        * WRITE TO VDP REGISTER 2
      CLR  @SBA         * RESET Screen Base Address
      JMP  INIT2        * RETURN

SLOC1 LI   R0,>020E     * SCREEN IMAGE TABLE AT >0E=>400=>3800
      BLWP @VWTR        * WRITE TO VDP REGISTER 2
      LI   R0,>3800
      MOV  R0,@SBA      * RESET Screen Base Address

INIT2 MOV  @MLEFT,R1
      MOV  @MRIGHT,R2
      S    R1,R2
      INC  R2
      MOV  R2,@LINE     * CALCULATE THE NUMBER OF CHARS PER LINE

      LWPI GPLWS
      B    @>006A       * RETURN TO XB

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

* CALL LINK("CLS")
* CLEARS THE SCREEN IN EITHER 40 OR 32 COLUMN MODE

CLS
      LWPI MYREGS

      LI   R2,32*24     * NUMBER OF CHARACTERS ON A  32 COLUMN SCREEN
      LI   R1,40        * PREPARE TO CHECK FOR  40
      C    R1,@WIDTH    * IS WIDTH 40?
      JNE  CLS1         * IF NOT, SKIP AHEAD
      LI   R2,40*24     * IF SO, LOAD R2 WITH CHARS FOR A 40 COLUMN SCREEN

CLS1  LI   R4,>4000     * DATA  FOR SDC BELOW
      CLR  R0           * ADDRESS TO WRITE IN VDP MEMORY
      A    @SBA,R0      * GET IN THE OFFSET
      SWPB R0           * SWAP THE BYTES, WRITE LOW BYTE FIRST
      MOVB R0,@VDPWA    * SEND MSB BYTE TO ADDRESS
      SWPB R0           * GET THE HIGH BYTE TO WRITE
      SOC  R4,R0        * SET BIT
      MOVB R0,@VDPWA    * WRITE OTHER BYTE OF ADDRESS TO VDP

      LI   R0,>0000     * BASIC  SPACE CHARACER 32+>60 IN MSB
CLS2  MOVB R0,@VDPWD    * WRITE A BYTE TO VDP
      DEC  R2           * DECREMENT COUNTER
      JNE  CLS2         * IF NOT ZERO, KEEP GOING

      LWPI GPLWS
      B    @>006A       * RETURN TO XB

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

* CALL LINK("SCREEN",FC,BC)
* SETS SCREEN COLOR TO BC AND IN TEXT MODE
* SETS CHARACTERS TO FC, BOTH PARAMETERS MUST
* ALWAYS BE PRESENT

SCREEN
      LWPI MYREGS

      LI   R1,2
      BL   @GETNUM
      MOV  R1,R5        * GET BACKGROUND COLOR
      DEC  R5

      LI   R1,1
      BL   @GETNUM
      MOV  R1,R0        * GET FOREGROUND COLOR
      DEC  R0

      SLA  R0,4         * MOVE FOREGROUND OVER SO WE CAN MASK.
      SOC  R5,R0        * MASK THE TWO TOGETHER IN R0
      ANDI R0,>00FF     * MAKE SURE WE AREN'T RUNNING OVER . . CRASH CITY!
      AI   R0,>0700     * AND WE NEED TO WRITE TO REGISTER 7
      BLWP @VWTR        * WRITE TO REGISTER

      LWPI GPLWS
      B    @>006A       * RETURN TO XB

      END
```

ACCEPT AT—

(Continued from Page 12)

follows:

CALL LINK("INIT",LMAR,RMAR[,MODE[,SCRLOC]])

LMAR is the left most column to be used and RMAR is the right most column to be used. MODE should be either 32 or 40 depending on whether you want text or graphics mode. If you leave out the MODE parameter, it will retain its current value. If you use text mode, make sure that you reset to graphics mode before your program ends or the computer will crash in certain cases.

There is an optional fourth parameter, SCRLOC, which can be used to prevent problems when running 40 columns in a program. Usually the 40-column screen buffer will interfere with several commands, including SUB, CHR$, ON ERROR, PRINT and RND. In these cases, it can be overcome by setting 1 for a normal screen and 2 for a 40-character screen as the fourth parameter. Before running your program, you should type CALL FILES(6) and NEW when using the SCRLOC parameter. What this does is move the screen buffer from where it normally resides into one of the disk buffers. Thus more disk buffers are allocated with the CALL FILES statement. With this option in place Extended BASIC will behave normally except that all screen access must be handled with this package. Note that if you use SCRLOC as 2 for all your 40-column screen access your program will not crash the computer on an error or CTRL-4, which is the case with SCRLOC as 1. Mark Hoogendoorn, creator of the 99BBS system, found this solution to the 40-column problem. The technique has been tested with TI and CorComp and late model Myarc disk controllers and causes no problems. If you have problems with a Myarc controller, consider upgrading to the latest EPROM from Myarc.

If you are not sure whether to use the SCRLOC parameter and CALL FILES(6), try running without it at first. If you have problems with some

(Please turn to Page 22)

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ACCEPT AT—

(Continued from Page 20)

Extended BASIC commands, try adding the fourth parameter first, with 1 and 2 corresponding to modes of 32 and 40. If you have disk file access, execute CALL FILES(6) and then NEW before running.

ACCEPT

The ACCEPT at routine is called as follows:

CALL LINK("ACCEPT",X,Y,L,V$,R$)

X and Y are the screen coordinates for the ACCEPT AT. L is the maximum length of the string to accept and may be as large as 255 characters. V$ is the validate string and may be up to 127 characters long. If it is a null string (""), no checking is done. R$ is the result of the ACCEPT. R$ is also the default value for input. R$ must be a string variable, not an actual string in quotes in the ACCEPT statement. To specify a default of "DSK1.FROG", set R$="DSK1.FROG" before executing the CALL LINK. Note that the returned string will be stripped of all trailing spaces.

After calling ACCEPT, the left and right arrow keys, insert, delete, erase all, and enter keys behave as usual. The up and down arrow keys move you up and down in the input field rather then terminating the input. The only way to terminate input is with the ENTER key.

Note that with a string length of over 200 characters the ACCEPT becomes a bit slow in response to key presses especially with a long validate string.

DSPLY

To put text on the screen using the environment defined using the INIT routine, use the DSPLY routine. It is called by:

CALL LINK("DSPLY",X,Y,S$)

where X and Y are the coordinates to put the string at and S$ is the string to be displayed.

Note that no range checking is done on INIT/ACCEPT/DSPLY so make sure that your coordinate settings are valid. Otherwise you could end up crashing the assembly code, writing out color and character tables or who knows what!

CLS

Because Extended BASIC's CALL CLEAR statement does not clear a 40-column screen, a similar routine has been provided which will work with a 32- or 40-column screen. It is called as follows:

CALL LINK("CLS")

SCREEN

When you switch to text mode, nothing will appear on the screen, because Extended BASIC does not support text mode. A special routine has been provided to allow you to set

(Please turn to Page 24)

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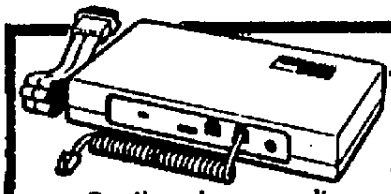

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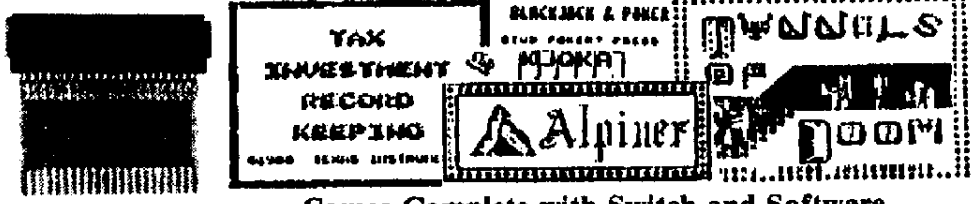

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ACCEPT AT—

(Continued from Page 22)

the text and background colors, and is called as follows:

CALL LINK("SCREEN",CHAR—CLR,SCREEN—CLR)

I recommend that you use the CLS and SCREEN routines in this package instead of the Extended BASIC equivalents because they keep track of whether you are in text or graphics mode and act accordingly. Thus if, during the development of your program, you decide to switch from one mode to another, much less re-coding of your program will be required.

DEMONSTRATION PROGRAM

The accompanying program is a modification of an Extended BASIC program by Barry Traver that originally appeared in Issue No. 3 of his Genial TRAVelER Diskazine. It demonstrates use of all the routines in this package, including how to use them to put up text in all directions, and to switch from one screen display to another quickly. Thanks to Barry for allowing the use of his program in this article.

The source code, object code, and demonstration program may be downloaded from BCS TI99 BBS No. 2 at (617)335-8475 operating 24 hours a day at 300/1200 baud with TE2 and Xmodem transfers. To obtain the files on disk send $3 to:

Boston Computer Society
TI99 User Group
ATTN: J. Peter Hoddie
One Center Plaza
Boston, MA 02108

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Note: Walt Howe also contributed to this article.

```
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ey Drive, Philadelphia, PA 1
9128 (phone: 215/483-1379) -
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110 DISPLAY AT(10,1)ERASE AL
L:"SCREEN PACKAGE DEMO"
120 DISPLAY AT(12,1):"BY BAR
RY TRAVER AND"
130 DISPLAY AT(14,1):"    J.
 PETER HODDIE"
140 DISPLAY AT(16,1):"MODE (
32 OR 40)? 40" :: ACCEPT AT(
16,18)SIZE(-2):W :: IF W<>32
 AND W<>40 THEN 140
150 CALL LINK("BEGIN"):: CAL
L LINK("INIT",3,30,W,2):: CA
LL LINK("CLS"):: CALL LINK("
SCREEN",2,8)
```

(Please turn to Page 26)

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DEMO

(Continued from Page 24)

```
160 C,R=4 :: NUM$="012345678
9"
170 CALL KEY(3,K,S):: CALL C
HAR(97,"000000FFFF0000001818
181818181800000001F1F181818
000000F8F8181818")
180 CALL CHAR(101,"1818181F1
F000000181818F8F8000000")
190 CALL LINK("DSPLY",1,4,"V
ERT/DIAG STRING DEMO")
200 CALL LINK("DSPLY",2,3,"a
aaaaaaaaaaaaaaaaaaaaaaaaaa"
)
210 CALL LINK("DSPLY",19,3,"
aaaaaaaaaaaaaaaaaaaaaaaaaa
")
220 CALL DOWN(2,2,"cbbbbbbbb
bbbbbbbbe")
230 CALL DOWN(2,31,"dbbbbbbb
bbbbbbbbbf")
240 FOR Z=1 TO 4 :: CALL LIN
K("INIT",3,30,32,1):: GOSUB
350 :: CALL LINK("INIT",3,30
,W,2):: GOSUB 350 :: NEXT Z
250 CALL LINK("INIT",3,30,W)
260 CALL LINK("INIT",3,30,W)
270 CALL LINK("DSPLY",20,1,"
STARTING ROW (3-17)?"):: R$=
STR$(R):: CALL LINK("ACCEPT"
,20,23,2,NUM$,R$):: R=VAL(R$
):: IF R<3 OR R>17 THEN 250
280 CALL LINK("DSPLY",21,1,"
STARTING COLUMN (3-30)?"):::
C$=STR$(C):: CALL LINK("ACCE
PT",21,26,2,NUM$,C$):: C=VAL
(C$):: IF C<3 OR C>30 THEN 2
80
290 CALL LINK("DSPLY",22,1,"
STRING?"):: CALL LINK("ACCEP
T",22,10,19-R,"",M$)
300 CALL LINK("DSPLY",23,1,"
DIRECTION (D, DL, OR DR)?"):
: CALL LINK("DSPLY",24,1,"(D
OWN DOWNLEFT OR DOWNRIGHT)")
:: CALL LINK("ACCEPT",23,28,
2,"DLR",P$)
310 IF P$="D" THEN CALL DOWN
(R,C,M$):: GOTO 250
320 IF P$="DL" AND C-LEN(M$)
>1 THEN CALL DOWNLEFT(R,C,M$
,W):: GOTO 250
330 IF P$="DR" AND C+LEN(M$)
<30 THEN CALL DOWNRIGHT(R,C,
M$,W):: GOTO 250
340 GOTO 300
350 FOR Q1=1 TO 200 :: NEXT
Q1
360 RETURN
370 SUB DOWN(R,C,M$):: CALL
LINK("INIT",C,C):: CALL LINK
("DSPLY",R,C,M$):: SUBEND
380 SUB DOWNLEFT(R,C,M$,W)::
 P=W*(R-1)+C :: RN=INT((P-1)
/(W-1))+1 :: CN=P-(RN-1)*39
390 CALL LINK("INIT",CN,CN,W
-1):: CALL LINK("DSPLY",RN,C
N,M$):: SUBEND
400 SUB DOWNRIGHT(R,C,M$,W):
: P=W*(R-1)+C :: RN=INT((P-1
)/(W+1))+1 :: CN=P-(RN-1)*W
410 CALL LINK("INIT",CN,CN,W
+1):: CALL LINK("DSPLY",RN,C
N,M$):: SUBEND
```


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QUALITY 99 SOFTWARE

TI gives user groups diagnostic software

Texas Instruments was scheduled to send out diagnostic software for the TI99/4A to users group the latter part of July or the first part of August.

According to Pam Holt of TI, the programs, which help users test out their hardware, have been placed in the public domain by TI.

She said that TI was "checking addresses" for users groups before sending out the programs.

She said groups not on TI's list who wish to receive them may do so. Users groups may receive a start-up kit by writing Texas Instruments Inc., Attention Consumer Relations, P.O. Box 53, Lubbock TX 79408.

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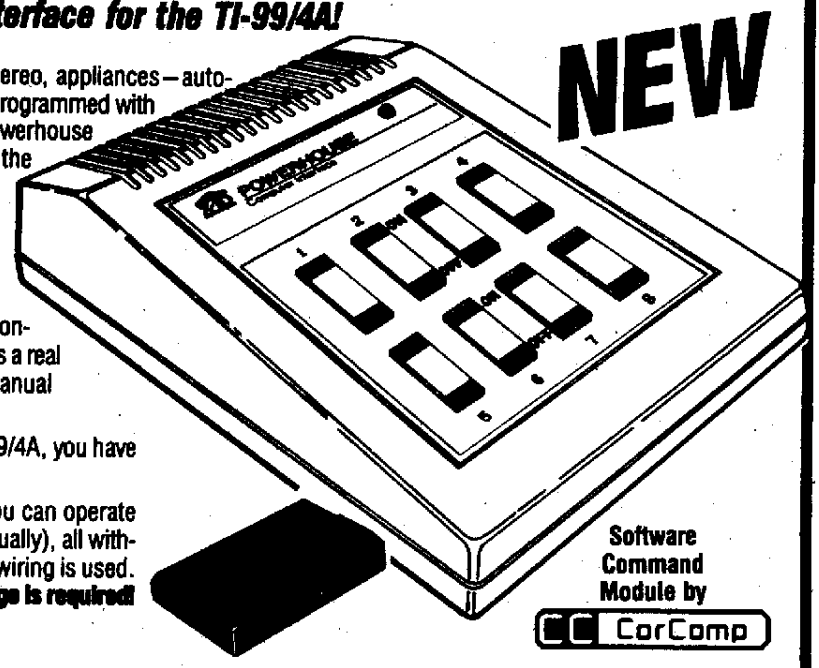

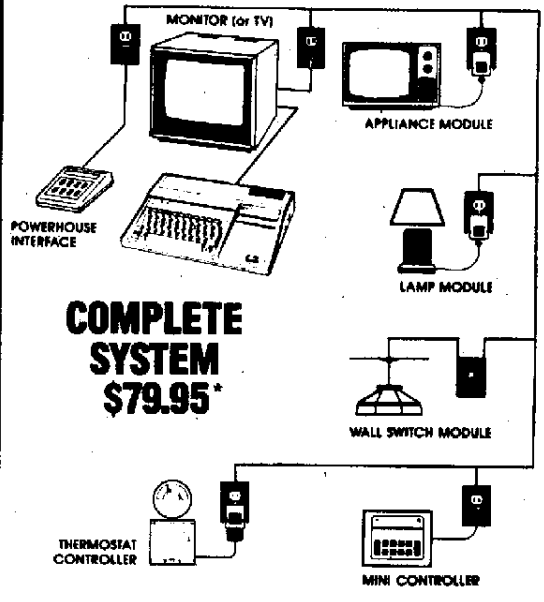

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BASIC/XBASIC

Self-modifying programs-Part 2

By LEE WILKERSON

The first part of this article (June issue) covered the token system used by the TI for storing BASIC programs in RAM. As noted, the instructions in ROM take each program line which is typed in and change it to condensed format. In order for a BASIC program to modify itself, it must include a subroutine to duplicate the essentials of that process, and then insert the resulting data string into RAM.

This part includes a general Extended BASIC routine which does just that (listing No. 1). In itself, this is not a very useful program, but it can be instructive, and can also serve as the basis for more interesting projects.

For the sake of simplicity, and to keep the routine to a reasonable length for this article, two major aspects of the conversion process have been deliberately omitted. First, unquoted strings are not checked for, so it is not possible to use CALL, DATA, or REMARK statements. IMAGE can be used if the format string is quoted. Second, line numbers are not handled, so GOTO, GO SUB, etc. cannot be used. It is OK to use IF...THEN...ELSE and RESTORE if line numbers are not included. If you want the routine to include these capabilities it will not be very difficult to modify it. The routine also has minimal error detection.

In the following explanation of the program, the most important variable names are shown in parentheses after the items they represent. The program begins with a short driver section (lines 170-220) for entering a single text string (LINE$), which will be converted and inserted into RAM in place of dummy line 610. Note that after the line is entered CHR$(0) is tacked onto the end. This byte is required to mark the end of every program line. Also, two CHR$(255) bytes are added on after that. These are required to mark the end of a program, and are used here since the new line will replace the last line in this program. If a line is being changed in the middle of a program these two bytes must not be added.

Lines 250-330 contain the data necessary to replace keywords with the proper token values. Do you notice the pattern in the arrangement of the keyword data, and can you figure out why they must be in this (or a similar) order?

The conversion process begins with the section in lines 360-420, which scans the entered line (LINE$) for quote marks. Quoted text is removed, saved in an array (QT$()), and replaced with a marker byte (CHR$(172)). Double quotes inside the string are replaced with single quotes, and the quoted string flag and length (QL) bytes are prepended to it. The number of quoted strings (NQS) is incremented. A maximum of 25 quoted strings can be included in any one line.

The second part of the conversion happens in the FOR...NEXT loop in lines 450-470. The DATA statements are read and each keyword found (TK$) is replaced with the corresponding token (TK). This is another place where oversimplification creates a weakness: if a variable name contains an embedded keyword the conversion will be erroneous. Lines 490-560 remove spaces from the string, and numbers are flagged with the proper token (CHR$(200)) and length (UQSL) bytes. Finally, line 580 restores quoted strings to the proper locations.

After the text line has been changed to internal format, how do you know where to load it into memory? Line 190 shows how to find the location of the highest numbered line in RAM. First, PEEK address -31952 and get the two values stored there (A and B). Multiply A by 256 and add B to get the address which stores the location of the highest numbered line in memory. PEEK this address and get two values (C and D). Multiply C by 256 and add D to get the starting address of the last line in the program. This is where the converted string is inserted into memory, byte by byte, into sequential addresses.

After the new line has become part of the program, it is tested by branching to it as if it were a subroutine. If the last statement in the line is RETURN the process can be repeated.

You may be wondering if all this is merely for experimenting with the TI, or whether it can be a tool with some practical uses. Besides helping understand how programs are stored, this type of routine can be put to work in useful self-modifying programs. One example is a program of mine which lets the user evaluate any mathematical function by entering it into the program as if it were a BASIC DEF statement. The line is inserted into memory, then evaluated and plotted on the screen or printer. Any number of functions can be entered and evaluated in a session, without the chore of repeatedly halting the program, editing a DEF statement and running it again.

In a similar manner, other types of program lines could be tested, such as short algorithms, IMAGE formats, etc.

This type of routine could also be developed into a general text-to-program converter, with the output going either to a disk file in MERGE format, or directly into memory.

There are some cautions to bear in mind when a program uses this type of routine to alter its area of memory.

(Please turn to Page 30)

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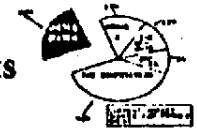

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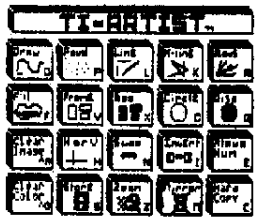

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BASIC/XBASIC—

(Continued from Page 28)

Don't include DIM, SUB, SUBEND or OPTION BASE statements, or introduce any new variables, or it will almost certainly halt with an error. Be sure any line you enter has absolutely correct syntax, or the computer may do things you've never seen before. After a program has been run and has modified itself, don't SAVE it or RUN it again. The results of changing program RAM are sometimes unpredictable, especially if incorrect data is loaded in, and there is always a chance of the system crashing. Even listing an altered program may cause a crash or system lockup.

```
100 ! CONVERT TEXT TO
110 ! INTERNAL FORMAT
120 !
130 ! BY LEE WILKERSON
140 !
150 CALL INIT :: DIM QT$(25)
160 ! TEST DRIVER
170 PRINT "ENTER ""PROGRAM L
INE"":"
180 LINPUT LINE$ :: LINE$=LI
NE$&CHR$(0)&CHR$(255)&CHR$(2
55):: GOSUB 350
190 CALL PEEK(-31952,A,B)::
CALL PEEK(A*256+B-65534,C,D)
:: ADDR=C*256+D-65537
200 FOR I=1 TO LEN(LINE$)::
CALL LOAD(ADDR+I,ASC(SEG$(LI
NE$,I,1)))):: NEXT I
210 GOSUB 610 :: GOTO 170
220 END ! OF TEST DRIVER
230 ! CONVERSION ROUTINE
240 ! KEYWORDS AND TOKEN DAT
A
250 DATA 246,SEQUENTIAL,149,
RANDOMIZE,251,PERMANENT,243,
VARIABLE,254,VALIDATE,244,RE
LATIVE,245,INTERNAL,166,WARN
ING,145,UNTRACE
260 DATA 143,UNBREAK,167,SUB
EXIT,148,RESTORE,232,NUMERIC
,162,DISPLAY,248,UPDATE,234,
UALPHA,136,RETURN,247,OUTPUT
270 DATA 170,LINPUT,153,DELE
TE,249,APPEND,164,ACCEPT,237
,USING,144,TRACE,156,PRINT,1
```

(Please turn to Page 32)

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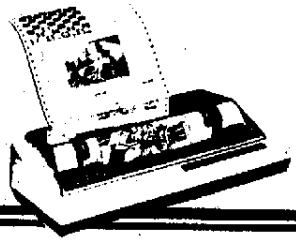

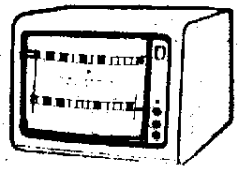

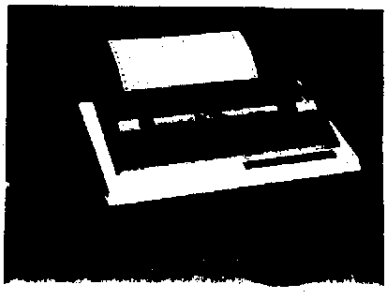

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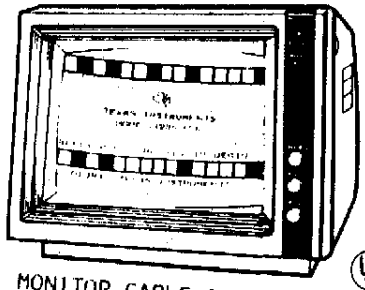

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CONVERT—

(Continued from Page 30)

```
46,INPUT,163,IMAGE,135,GOSUB
,250,FIXED
280 DATA 165,ERROR,239,ERASE
,233,DIGIT,160,CLOSE,142,BRE
AK,176,THEN,219,STR$,152,STO
P,178,STEP,235,SIZE,216,SEG$
290 DATA 225,RPT$,151,READ,1
59,OPEN,150,NEXT,134,GOTO,12
9,ELSE,147,DATA,214,CHR$,157
,CALL,238,BEEP,188,XOR,218,V
AL
300 DATA 212,TAN,252,TAB,211
,SQR,210,SIN,209,SGN,169,RUN
,215,RND,222,REC,217,POS,189
,NOT,224,MIN,223,MAX,208,LOG
310 DATA 141,LET,213,LEN,207
,INT,140,FOR,206,EXP,202,EOF
,139,END,137,DEF,205,COS,204
,ATN,220,ASC,187,AND,236,ALL
320 DATA 203,ABS,177,TO,221,
PI,186,OR,155,ON,132,IF,133,
GO,240,AT,130,::,197,^,242,?
,192,),190,=,191,(
330 DATA 180,;,181,:,196,/,1
94,-,179,",",193,+,195,*,182
,),183,(,184,&,253,#
340 ! REMOVE AND SAVE QUOTED
 STRINGS
350 Q$=CHR$(34):: NQS=0
360 QT1=POS(LINE$,Q$,1):: IF
 QT1=0 THEN 440
370 QT2=POS(LINE$,Q$,QT1+1)
380 IF SEG$(LINE$,QT2+1,1)=Q
$ THEN LINE$=SEG$(LINE$,1,QT
2-1)&CHR$(171)&SEG$(LINE$,QT
2+2,255):: GOTO 370
390 NQS=NQS+1 :: QL=QT2-QT1-
1 :: QT$(NQS)=CHR$(199)&CHR$
(QL)&SEG$(LINE$,QT1+1,QL)
400 A=POS(QT$(NQS),CHR$(171)
,1):: IF A>0 THEN QT$(NQS)=S
EG$(QT$(NQS),1,A-1)&Q$&SEG$(
QT$(NQS),A+1,255):: GOTO 400
410 LINE$=SEG$(LINE$,1,QT1-1
)&CHR$(172)&SEG$(LINE$,QT2+1
,255)
420 GOTO 360
430 ! REPLACE KEYWORDS WITH
TOKENS
440 RESTORE 250
450 FOR I=1 TO 103 :: READ T
K,TK$
460 TL=POS(LINE$,TK$,1):: IF
 TL>0 THEN LINE$=SEG$(LINE$,
1,TL-1)&CHR$(TK)&SEG$(LINE$,
TL+LEN(TK$),255):: GOTO 460
470 NEXT I
480 ! FLAG NUMBERS AND STRIP
 SPACES
490 FOR I=1 TO 255
500 A=ASC(SEG$(LINE$,I,1)):
 IF A=32 THEN LINE$=SEG$(LIN
E$,1,I-1)&SEG$(LINE$,I+1,255
):: GOTO 500 ELSE IF A=0 THE
N 580
510 IF A<46 OR A>57 OR A=47
THEN 560
520 UQSL=1 :: FOR J=1 TO 255
-I
530 AJ=ASC(SEG$(LINE$,I+J,1)
):: IF AJ<46 OR AJ>57 OR AJ=
47 THEN 550 ELSE UQSL=UQSL+1
540 NEXT J
550 LINE$=SEG$(LINE$,1,I-1)&
CHR$(200)&CHR$(UQSL)&SEG$(LI
NE$,I,255):: I=I+UQSL+1
560 NEXT I
570 ! REINSERT QUOTED STRING
S
580 FOR I=1 TO NQS :: A=POS(
LINE$,CHR$(172),1):: LINE$=S
EG$(LINE$,1,A-1)&QT$(I)&SEG$
(LINE$,A+1,255):: NEXT I
590 IF LEN(LINE$)>166 THEN P
RINT : :"THE LINE WAS TOO LO
NG TO    CONVERT TO INTERNAL
 FORMAT." :: STOP
600 RETURN
610 !DUMMY LINE!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

Reviewed in MICROpendium

1984

February: B-1 Nuclear Bomber, Tandon TM-100 Disk Drive, Void, Beanstalk Adventure, Microsurgeon, On Gaming, Database 500

March: Star Trek, Escape From Balthazar, Garkon's Getaway, Sky Diver, Mail-Call, Prowriter 8510 Printer

April: Monthly Budget$ Master, Budget Master, Home Budget, Thief, Donkey Kong, Khe Sanh

May: Companion Word Processor, Q*Bert, Mad-Dog I & II, Programs for the TI Home Computer

June: Creative Expressions Accounts Receivable/Accounts Payable, CDC 9409 Disk Drive, Starship Concord, Lost Treasure of the Aztec, ASW Tactics II

July: Theon Raiders, Introduction to Assembly Language for the TI Home Computer, Game of Wit, Pole Position

August: TE-1200, Tower, Galactic Battle, Galaxy

September: Wycove Forth, 99/4 Auto Spell-Check, QUICK-COPYer, Wizard's Dominion, Anchor Automation Mk XII Modem

October: Killer Caterpillar, ZORK I, Defender

November: 9900 Disk Controller Card/Manager, Super Bugger, Transtar 120S printer, Floppy-Copy, Data Base-X

December: Gravity Master, Data Base Manager System, Learning 99/4A Assembly Language Programming

1985

January: Super Sketch, Foundation Computing 128K Card, PTERM-99, TI-Runner

February: Super Extended BASIC, Beginning Assembly Language for the TI, ZORK II

March: Morning Star Software CP/M Card, WDS/100 Winchester Disk Drive, Sketch Mate, BMC Color Monitor

April: 9900 Micro Expansion System, Disk + Aid, Gemini 10X-15X

May: Character Sets and Graphics Design, Draw 'N Plot

June: GRAPHX, DATA BASE I

July: Acorn 99, Advanced Diagnostics

August: Model Dow-4 Gazelle, TI-Artist, PC-KEYS, Not-Polyoptics' Bankroll

September: Midnite Mason, Myarc 32K/128K Card, GRAPHX Companion

October: 4A/TALK, Extended BASIC II Plus, XB Detective, Console Writer 2.1

November: Foundation Z80A/80-column cards, 9900BASIC, Adventure Editor

December: Display Enhancement Package, Triple Tech

1986

January: BITMAC, Starcross

February: Night Mission, Peripheral Diagnostic Module, BA-Writer

March: Super Duper, Tunnels of Doom Editor, Business Graphs 99

April: U.S. Open Tennis, PRBASE

May: 4A Flyer, GRAM Kracker, Artist's Companion

June: Myarc Disk Controller Card, Maximem

July: Horizon RAMdisk, Old Dark Caves, Funlwriter, TI99/4A Macro Assembler

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Techie Corner

Forth and Myarc's 128K card

By MACK McCORMICK

As promised I'll write a few words about the goings on here in the TI community in Germany. Let me answer a a letter first. The mail is really backing up here. I apologize for not being able to give you a personal reply if you have written. If I feel your letter is of interest to others I'll include it here.

Dear Mack,

I recently purchased a Myarc 128K card and I think it is the best investment I have ever made for my TI. I do have one complaint though. The manual doesn't describe how to access the card from assembly language or Forth. I need to use the CALL commands like CALL PART or CALL RDDIR from my Forth program.

Roy Richards
Bremerton, WA

Roy,

The card was not intended to have the CALLs accessed from A/L but there is a way. Using DEBUG look in the DSR ROM header of the card at CRU address >1000 for the GPL subprogram entry point (6th word. >437E on my card). This value points to a list of the GPL suboutines. Go to that list and, for example, find PART (>54FE in my card 3 bytes back from the P in PART).

The immediate problem you have is that page 1 of RAM is paged in and your program in page 0 vanishes as soon as you enter the part routine. (See the manual for more details on paging.) You must either have this part of your program reside in a SUPER SPACE module at >6000 or save, use and restore some of the PAD at >8300. R11 should contain your return address after you BL @ >54FE. R4 will be loaded with the address of your workspace by the RD routine. R4 offset by >FF4C (>FF4C(R4)) must point to the address of the command bytes in VDP RAM.

For example, when accessing this routine from BASIC R4 contains >83E0. When offset by FF4C location >832C points to the address in RAM which is >0322 in the screen image table. This is actually the space (>80) prior to the word PART on the screen. The Ram Disk adds 5 bytes to this address or >0327 to skip over the word PART and point to the left paren (>B7) in VDP RAM. The string in VDP uses standard BASIC tokens and ASCII values. Example: >B7C803313238B3C803333834B6, is the command for (128,384). B7 is the left paren, C8 is a numeric constant, 03 is the byte length, 313238 is ASCII 128, B3 is a comma, C803 same as before, 333834 is ASCII 384, and B6 is right paren. All you would have to change is the ASCII values to use your own partition. R11 is incremented by two (INCT) before returning so you should have a NOP instruction after your BL.

That should should get you going. The same technique will work for all the other GPL routines in the card, too. A few tricks but it works great and gets around the BASIC enviornment limitation. This is pretty advanced but I trust you followed it.

The TI community is really active here in Germany. My closest friend here is a German, Werner Volker, who I met through the TI. I suppose the one fact that always continues to amaze me is how this computer brings folks together.

First, a few words about the users. They, by and large, are knowledgeable about the TI and its inner workings. They tend to be very knowledgeable in hardware. There is no hesitation to open a component or console and make major modifications. (More on hardware later.) They are very friendly and show a genuine desire to help one another and share. There is a gap (which I am trying to fill) on available software and hardware from the States.

The software here is excellent though it tends to be more oriented toward utilities and technical applications. Most is written in assembly language.

There are two excellent GPL disassemblers, a GPL assembler (works great; more in a later article) TI Discovery, which yields plentiful information on cards in the PEB, GPL disassembler, and memory manipulator. And there are programs to combine six common utility programs/modules into a GRAM card. And many super music and graphics programs. The GROM-based program Advertiser with a 60-page manual is a new programming language for the TI. It has very simple graphics and sound commands which enable complex programming tasks. It is a joy to use.

The hardware is truly superb. I have tested and used extensively the following: A GRAM card; a fully functioning Mouse which works great with programs such as TI-Artist; an EPROM programmer which is simple to use and plugs into the cartridge port; a slow motion device for graphics; an external DSR card which enables you to write your own routines to be CALLed from command level or running programs; a GROM emulator cartridge (same size as a normal TI cartridge) which allows you to copy GROM cartridges to EPROM; a four-color plotter; and a GRAM module scarcely larger than a normal module yet with the capability to store 3 normal GROM cartridges to battery backed RAM (this was the prototype GRAM card). Finally, a new 80-column card using the MSX video chip.

The printed material here for the TI is scarce. The principle magazine is TI Revue. A fact filled monthly in MICROpendium format with tons of technical software and hardware con-

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Make your own overlays

It's unfortunate, in a way, that all programs do not work alike. Think of how much simpler life would be if there were a master template of function and control keys that would be interchangeable among a variety of programs.

Of course, that's not possible. You can't design, say, a terminal emulator around the function key definitions used by TI- Writer. Hence the need for keyboard overlays.

Unfortunately, not all programs come with overlay strips. Also, it's easy to misplace or lose an overlay. What then? Well, Michael Machonis of Severna Park, Maryland, has developed a program called PRINTSTRIP that prints overlays on Epson compatible printers. (Readers may modify the printer codes in the program for use with noncompatible printers.)

Notes Machonis, "PRINTSTRIP is a program to create keyboard overlay strips for different programs, saves them to disk and prints them out." The program requires Extended BASIC.

Machonis warns that the program is not a "model of structured programming. I'm a firm believer in the axiom, 'if it works, it's good.' To me, the fun of programming is having the finished product produce the desired results. Conforming to a strict set of rules just to make the code look pretty would make an enjoyable hobby a laborious chore." We might add, to each his own.

The keyboard overlay files can be read by TI-Writer.

The program is straightforward in operation. It will prompt the user for input from the keyboard to design a new overlay or to load an overlay from disk. (The program will list a disk catalog of up to 99 overlays.) If you are creating an overlay, the program prompts for normal or compressed print. Normal print allows 6-7 characters per entry while compressed print allows **11-13 characters.**

After selecting the print size, the user is prompted to enter the overlay text for each key. The upper row is done first, key by key, then the lower row.

After finishing, the program prompts for the number of copies to print. A zero will cancel the print operation.

After printing you are prompted to save the overlay to disk, using up to nine characters for the file name.

PRINTSTRIP

```
100 !************************
    * PRINTSTRIP by:       *
    * MICHAEL A. MACHONIS  *
    * SEVERNA PARK, MD     *
    *                      *
110 !*                     *
    * DELETE LINE #510 IF  *
    * YOUR PRINTER DOES    *
    * NOT SUPPORT SUPER-   *
    * SCRIPT.              *
120 !************************
130 CALL CLEAR
140 CALL CHAR(100,"000000000
000FFFF")
150 CALL CHAR(104,"FFFF")
160 CALL CHAR(101,"030303030
3030303")
170 CALL CHAR(102,"303030303
0303030")
180 DISPLAY AT(9,1):RPT$("d"
,28):"   e   fPRINT-A-STRIPe
   e":RPT$("h",28): :RPT$("d
",28):"   eby fMIKE MACHONIS
e   e":RPT$("h",28)
190 DISPLAY AT(24,3):"PRESS
ANY KEY TO CONTINUE" :: CALL
 KEY(0,K,S):: IF S=0 THEN 19
0
200 CALL CHARSET
210 DIM A(11),A$(2,11),B$(2,
11),E$(13),G$(99)
220 P$(2)=CHR$(27)&"@"&CHR$(
27)&"E"&CHR$(27)&"G"&CHR$(27
)&"-1" :: Q(2)=80 :: W$(2)="
######"
230 P$(1)=CHR$(27)&"@"&CHR$(
15)&CHR$(27)&"G"&CHR$(27)&"-
1" :: Q(1)=137 :: W$(1)="###
########"
240 OPEN #1:"PIO.CR"
250 K=0 :: C$="UPPER"
260 DISPLAY AT(12,1)ERASE AL
L:"1> INPUT FROM KEYBOARD":
:"2> INPUT FROM DISK": :"YOU
R CHOICE ? 1" :: ACCEPT AT(1
6,15)BEEP SIZE(-1)VALIDATE("
12"):IN :: IF IN=1 THEN 290
270 GOSUB 620
280 OPEN #3:"DSK1."&F$ :: IN
PUT #3:P :: FOR I=1 TO 2 ::
FOR J=1 TO 11 :: LINPUT #3:A
$(I,J):: NEXT J :: NEXT I ::
 CLOSE #3 :: GOTO 370
290 DISPLAY AT(12,1)ERASE AL
L:"1> COMPRESSED PRINT": :"2
> NORMAL PRINT": :"YOUR CHOI
CE ? 1" :: ACCEPT AT(16,15)B
EEP VALIDATE("12")SIZE(-1):P
300 IF P=1 THEN RESTORE 800
ELSE RESTORE 810
310 FOR I=1 TO 11 :: READ A(
I):: NEXT I
320 K=K+1
330 DISPLAY AT(1,8)ERASE ALL
:"INPUT "&C$&" ROW"
340 FOR I=2 TO 18 STEP 2 ::
DISPLAY AT(I+2,1):"OVER KEY"
;I/2 :: NEXT I :: DISPLAY AT
(22,1):"OVER KEY 0": :"OVER
KEY ="
350 FOR I=2 TO 22 STEP 2 ::
J=I/2 :: ACCEPT AT(I+2,12)BE
EP SIZE(A(J)):A$(K,J):: NEXT
 I
360 IF K=1 THEN C$="LOWER" :
: GOTO 320
370 DISPLAY AT(12,1)ERASE AL
L:"HOW MANY STRIPS ? 1" :: A
CCEPT AT(12,19)BEEP SIZE(-4)
VALIDATE("1234567890"):S
380 IF P=1 THEN RESTORE 800
ELSE RESTORE 810
390 FOR I=1 TO 11 :: READ A(
I):: E$(A(I))="|"&RPT$("#",A
(I)):: NEXT I
400 PRINT #1:P$(P)
410 FOR C=1 TO S
420 PRINT #1:RPT$("-",Q(P));
CHR$(13);CHR$(10)
430 K=1
440 FOR I=1 TO 11
```

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JOY PAINT 99

The joy of painting can be yours

By RICHARD BAILEY

Several graphics programs are already available for the TI, so what would justify yet another one with a $39.95 price tag?

It would have to be easier to use, have greatly expanded capabilities, and have excellent support. This is exactly what you get with JOY PAINT '99 from Great Lakes Software.

JOY PAINT '99 is so user-friendly that you could use the program without reading the manual (but I don't recommend this practice). There are no complicated commands or keystrokes to memorize: every feature is available on screen either from the easy-to-understand "icons" (or tools as they are sometimes called) or from a pull-down menu, all accessed by using the joystick and fire button. Creating a picture is so much easier because you can concentrate on your drawing and not be distracted by having to enter cryptic commands via the keyboard or wade through menus as in some other programs.

Just because it's easier to use doesn't mean it's a simple program. It is loaded with features. Anyone who writes his own programs knows how difficult it is to make a program look simple to the user. Obviously a lot of effort went into the development of JOY PAINT '99.

For support there is JOY PAINT PAL, also from Great Lakes Software. This disk is available for $9.95 and has a conversion program that will allow you to use screens developed with GRAPHX, DRAW 'N PLOT and TI-Artist. This means that if you have one of these other programs you will not lose any of your creations. You will also have available a vast library that has been developed for these other programs. This disk also includes printer utilities and other features that would not fit in JOY PAINT '99.

It is difficult to do JOY PAINT '99 full justice in a review because you really need to sit down at the computer and use JOY PAINT to truly appreciate what it is capable of doing and how easy it is to use. It does have some limitations and I do have some personal preferences that I will describe to you, but, over all, the program is fantastic!

Review

Report Card

Performance ..... **A**
Ease of use ..... **A**
Documentation ..... **A–**
Value ..... **A**
Final Grade ..... **A**

Cost: $39.95
Manufacturer: Great Lakes Software, 804 E. Grand River Ave., Howell, MI 48843
Requirements: Console, monitor or TV, 32K, disk system, joystick and either Editor/Assembler, Extended BASIC, Mini-Memory or TI-Writer.

For system requirements, you must have 32K and disk drive, and an Epson compatible printer helps if you want to get a hard copy of any of your creations. JOY PAINT PAL has an Axiom print utility.

The first thing you should do with JOY PAINT '99 or any other program is read the instruction manual. The manual consists of 16 8½x11-inch pages that can be punched and inserted into a three-ring binder. It is written in easy-to-understand English, avoiding computerese. The wording of a few phrases is awkward or misleading. For instance, on the use of icons it states that icons must be returned, while all you really have to do is pick up a new icon.

All the problems with the manual are of this magnitude. They aren't too significant, are slightly misleading, and after you've used the program once or twice you understand what is really meant. Most or all of these minor problems will be corrected by the time you read this review. Great Lakes has

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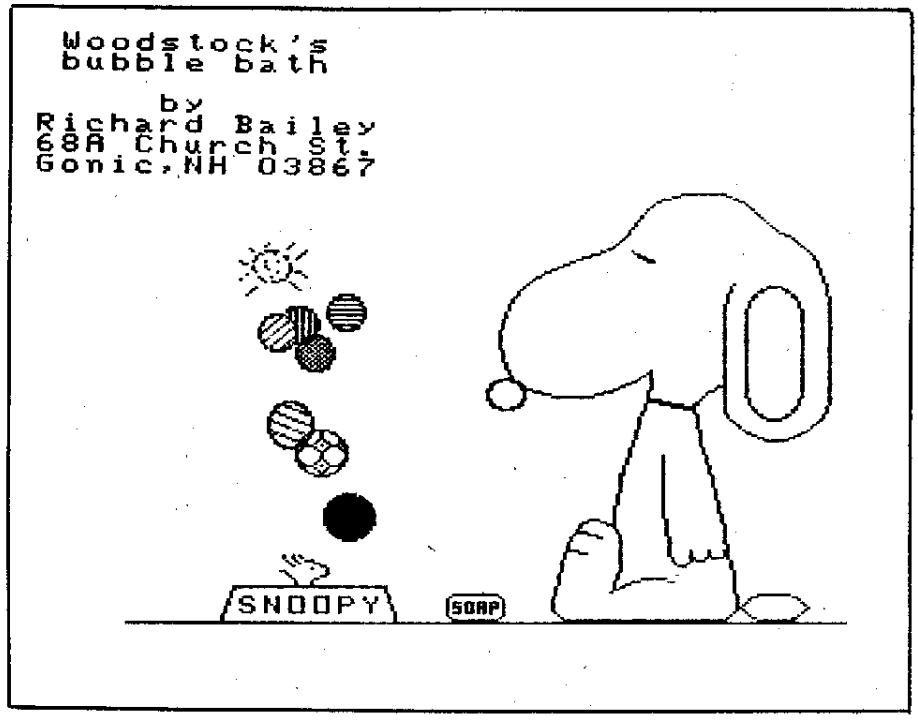

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been very receptive to suggestions on possible improvements to the manual and the program.

Loading the program is simple. There are loading instructions on dthe disk label telling you how to load using XBASIC, Editor/Assembler, TI-Writer or Mini-Memory. Loading time is about 1½ minutes with XBASIC taking slightly longer. What is on disk is one version that will not load from E/A option #5 or similar environments. Because XBASIC will not handle this compressed object code, Great Lakes has included a loader that duplicates the E/A cartridge functions. Selecting XBASIC will autoload a menu that looks like the E/A cartridge. Select option #5 from this menu, press enter and JOY PAINT will load. The advantage of this approach is that, unlike GRAPHX, which has three separate versions depending upon which cartridge you want to use to load it, JOY PAINT '99 has one version for all cartridges, giving the user more flexibility.

While JOY PAINT is loading you must not have a write-protect tab on the disk or the title screens will not load properly. There are three title screens that load sequentially, one each time the program is loaded. These title screens were developed using JOY PAINT and give you a sampling of what you can do with the program.

Once the program is loaded you have a screen that looks like the window shown in the ads in MICROpendium. If you haven't already, release the alpha lock because almost every function will be accessed from the joystick and you can't go up unless you release the alpha lock. Initially the cursor has the pencil icon assigned to it and to start drawing, just press the fire button and move the joystick to draw a line.

Vertically along the left side are the icons (tools) that you have for your use. To pick up another icon move the cursor, which is initially a pencil, into this area to pick up the tool you wish to use. Whenever you choose another icon or select another feature you get a "blup" tone to indicate that the operation has been accomplished. This audio feedback helps let you know what is going on. When you move into the icon area the cursor changes to a small circle to indicate it is in the icon area. Move the circle to the icon you want to use, press the fire button to pick it up, and move it onto the screen to use. By reading the manual and practicing a few minutes you will find you are more proficient with JOY PAINT than you could be with some of the other programs after a few hours.

Briefly, these are the functions of the icons you have available:

1) Text—allows upper and lower case, punctuation and numbers, and has auto-repeat, making it as easy to use as most word processor text editors.

2) Pencil—for freehand drawing with a line width of one pixel. Just press the fire button while moving the pencil icon, and a line will be drawn at the pencil point.

3) Spray paint—gives light coverage in the pattern selected, just like a spray can.

4) Paint brush—paints in the pattern selected in a width selected from the EXTRA "brushes" function.

5) Line, Circle, Rectangle—perform the obvious function. Concentric circles are harder to obtain than with GRAPHX, but, by using a trick I'll describe, can be quite easy. To draw a true circle simply make a diagonal line on the screen and make a circle by placing the start "+" at the beginning of the line and the end "+" at the end of the line. Print the circle and see how round it is on the printout. If it's not round, clear the screen using NEW and try another line at a slightly different angle, repeating this process until you get a true circle on the printout. Save this line to your work disk and use it whenever you want to create circles. Concentric circles are made by making "tick" marks at the beginning and at the end of the circle line and then two more "tick" marks the same distance in from each end. The outer two tick marks are for the outer circle and the inner two for the inner circle.

ERASER and FATPIXEL can be used to erase the circle line and tick marks from your drawing when you are finished drawing these circles. I prefer the center-radius method for drawing concentric circles, but understanding the midpoint of a line method used in JOY PAINT and a little practice will give you perfect concentric circles. The angle of the diagonal line may vary from printer to printer and you'll need a different line for circles you print out using the double size print option which automatically prints sideways. This is because the aspect ratio of printers is not one-to-one. That is, a line drawn 100 pixels long horizontally will print a different length than one drawn 100 pixels long vertically.

This is a function of the printer and we have to live with it.

6) Eraser—clear an 8-by-8 pixel area under the cursor while the fire button is pressed. From the pull-down menu use the FATPIXEL function option for fine tuning or CLEAR function for clearing large areas.

7) Fill—works on most complex enclosed areas in one pass. Fills with any one of the 26 pre-defined patterns available or with your own pattern if you have the pattern editor on the JOY PAINT PAL disk.

8) Move screen window—the two opposing horizontal and the two opposing vertical arrows allow you to move the screen window over the entire drawing area which is almost twice the size of the window. Place the circle-shaped cursor on the head of the arrow for the direction you want the *window* to move. The background appears to move in the opposite direction.

Horizontally across the top is an area that does two things. First, it will allow you to access the pull-down menu with many added powerful features. Second is one of the features I appreciate most. This is the UNDO function. It allows you to recover from

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JOY PAINT 99—

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almost all errors you could make. If you try to fill a shape and have a "leak" you end up filling the whole screen. No problem with JOY PAINT! Just select UNDO as the very next thing you do and you can recover from this error. You cannot recover from some operations like deleting a file from disk (which is understandable) but for any drawing error you might make it can be a real timesaver.

The added functions on this menu allow you to perform file functions such as LOAD, SAVE, PRINT picture, disk DIRECTORY, DELETE file, NEW (which clears the entire drawing area) and QUIT. Most drawing programs lack many of these features that allow you to see or manipulate what is on your work disk. It can be annoying if you save a second file with the same name as another, wiping out the first. With JOY PAINT you don't have this problem if you use these features. The only problem with the SAVE feature is that it doesn't check to see if there is sufficient disk space available for the file you are saving. If the file doesn't fit it gives you an error message but writes that portion of the file it could and enters the name of the file in the disk directory.

You have to remember to delete this partial file or you may forget and try to load it at some later date. TI's SAVE function has the same problem, so most people have probably encountered this before.

The PRINT feature will first ask you for the printer name (the default is PIO). You must press ENTER to reaccept this default or type in your printer name if it is different. Don't forget the ".CR" on the end. If you know what name you will be using you can change this permanently using the CONFIGURE program mentioned in the manual.

Anytime you see the cursor change to what looks like two equal signs, one above the other, the program is looking for a keyboard entry. This occurs when JOY PAINT is looking for the printer name, a file name to load or save, or with the text mode. After you have entered the printer name you can then select either single/double density and single/double size using the joystick. Once you've entered your printer name this will become the default until you QUIT, so you don't have to keep re-entering your printer name every time you print a picture. If you know ahead of time that you are going to make a double-sized printout, don't use the two top (16 pixels) lines, as they will exceed the 80-column limit of the printer and will not print.

Like most of the graphics programs I've used, JOY PAINT does not reset the printer after printing a picture. If you QUIT the program and go to use the printer without turning the printer off, then on, to reset it, the line spacing will be wrong.

The EXTRA features are some of the more interesting and useful you will find. The FATPIXEL or zoom function allows you to fine-tune any area of your drawing on a pixel-by-pixel basis. The area you are working on is shown magnified eight times near the middle of the screen. In the upper left is shown the same area unmagnified. As you make your changes to the magnified area, the same changes are being made to the unmagnified area to let you see exactly what it will look like. When you are through using FATPIXELs simply move the pencil icon into the box at the bottom that says "JOB DONE". Press the fire button and you return to your picture with the changes incorporated in your drawing.

FLIP (horizontal and vertical) and ROTATE allow you to make mirror images or 90-degree rotations of any area up to 10,000 pixels. You have to be careful not to exceed this limit or you could lose anything over the 10,000-pixel limit. Fortunately, the UNDO feature will allow you to recover from this sort of error so nothing is really lost. INVERT gives you "reverse video" of a selected area, and MAGNIFY can be used over and over again to enlarge even one pixel to fill a 10,000-pixel area. The REDUCE option on the JOY PAINT PAL disk is the opposite of MAGNIFY and can shrink any area. CUT, PASTE, MOVE and COPY allow you to modify your creation or add "clipboard" parts from one file to another. This area of the program isn't as easy to use as the clipboards in GRAPHX, but works well once you get used to it.

COLOR allows you to change the foreground and background colors used in the program. JOY PAINT is a two-color program (unlike some of the others), but I use a high-resolution B/W monitor and all the pictures I print are black and white, so I don't find this a limitation. If you are interested mainly in how the pictures look on the screen in color (such as the quilt designs I have with GRAPHX and my second system), you might find this a problem, so keep it in mind.

VIEW allows you to see how just the screen drawing area (plus a little) looks without the icons while SHOW PAGE gives you the entire drawing area shown about one-quarter size to give you an overview of your drawing.

The last feature, OWNER is unique. Encoded in a file on disk is the name and address of the purchaser of the disk. If by some remote chance you could copy the disk, your name goes with it. If illegal copies show up, Great Lakes Software knows who the guilty party is and can take action. I think this is a good way to discourage pirating and quite innovative.

Horizontally across the bottom are the patterns that you have available with the Fill, Spray and Paint functions. The pattern (texture) that is selected is displayed at the bottom left so you always know what pattern you are using. Thirteen patterns are shown, but by moving the cursor into the area on the bottom that has the two arrows and pressing the fire button you can toggle 13 more patterns onto the screen to choose from. The JOY PAINT PAL disk has a pattern editor so you can create patterns to suit your needs.

What can you do with JOY PAINT?

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GPL Assembler, TI99/4A INTERN, GPL Linker

Secrets are revealed at last

By JOHN CLULOW

Graphics Programming Language (GPL), used for TI Command Modules, was one of the company's best kept secrets. But with the recent introduction of the book TI99/4A INTERN, a GPL assembler, and a GPL Linker, this powerful language is now available to all users. No special hardware is required: While GRAM emulating devices can be used, the Linker also allows GPL programs to be run using the 32K memory expansion.

THE GPL ASSEMBLER

The assembler, written by Marcus Weiand, is designed to be used in conjunction with the TI Editor/Assembler module. Source code is prepared with the E/A editor (or any editor which produces DIS/VAR 80 files.) The GPL assembler, substituted for ASSM1 and ASSM2 on the E/A disk, is loaded from the module menu just like the E/A assembler.

The GPL assembler prompts are identical to those of the E/A assembler. The options list allows for compressed object code and generation of list files and symbol tables. The maximum number of assembler passes can also be specified. A comprehensive set of error messages helps the user diagnose program problems. Many of the standard E/A assembler directives

Review

are included in the GPL assembler and several new directives are added.

The Formatted Block Move instruction (FMT) is used in GPL to specify how data are to be formatted when they are moved to the display. The GPL assembler contains a special subset of instructions which make it very easy to display information on the screen with the FMT processor.

A short GPL program will be used to illustrate some aspects of the GPL assembler. When loaded into a GRAM simulating device such as MAXIMEM or GRAM Kracker, the program adds a new TI BASIC subprogram: CALL GPL. When the CALL GPL statement is executed, the word "MICROpendium" is displayed on the screen 1000 times at random locations. The screen then scrolls up one line and the subprogram returns to BASIC.

As is evident in the sample program (reproduced at the end of this article), GPL and assembly language have a lot in common. However, a GPL program requires fewer lines of source code and less program memory than an assembly language equivalent. This is true in part because GPL allows easy access to GROM/GRAM, VDP, and CPU memory; no special utilities are required. It also provides more flexibility in memory addressing. Direct, indexed, and indirect modes can be used with any symbolic or immediate address. Workspace registers are not used.

While not quite as fast as assembly language, for most applications GPL should have more than adequate speed. A TI BASIC program that does the same thing as the sample program takes 821 seconds to execute. In Extended BASIC, using DISPLAY AT, only 205 seconds are required. The GPL routine, however, takes only 4.3 seconds. While assembly language is a little faster, the added programming difficulty would not be worth the effort.

Since this routine is to be accessed by a CALL from BASIC, the location of LIST is the fifth word after the GROM header. If the program were to be executed from the power-up menu, LIST would have been the third word after the header. More than one type of routine can be placed in a GRAM, and the list for each type may contain multiple entries.

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GPL Assembler
Report Card

Performance ..... **A**
Ease of Use ..... **A**
Documentation ..... **C**
Value ..... **C**
Final Grade ..... **B**

Cost $59.95
Distributor: Ryte Data, Box 210, Mountain St., Haliburton, Ontario, Canada K0M 1SO
Requirements: 32K memory expansion, disk system, Editor/Assembler, printer optional

TI99/4A INTERN
Report Card

Performance ..... **B+**
Ease of Use ..... **A**
Documentation ..... **A**
Value ..... **A**
Final Grade ..... **A**
Cost: $17.95
Distributor: T.A.P.E. Ltd., P.O. Box 4042, Ontario, CA 91761. (Ryte Data, one of a number of dealers who stock this book, is selling it as part of a package with the other two products.)
Requirements: Familiarity with assembly language

GPL Linker
Report Card

Performance ..... **A**
Ease of Use ..... **A**
Documentation ..... **A**
Value ..... **A+**
Final Grade ..... **A**
Cost: $10.00
Distributor: Ryte Data
Requirements: Same as GPL Assembler

GPL ASSEMBLER, TI99/4A INTERN, GPL LINKER—

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In this case there is only one entry, s the DATA at LIST is 0. If another CALL routine had been included, the DATA would have pointed to that routine's entry in the list. The entry consists of the starting GRAM memory location, START, and the routine name. The STRI directive places the ASCII codes for GPL in memory preceded by the length byte.

Because this program is executed within the BASIC environment, 96 must be added to all ASCII codes. This is true for the MSG 'MICROpendium' and for the space character (128 = 32+96) used to fill the screen in line 33.

GPL op-codes are byte oriented. If preceded with a 'D', used in the program are no4 found in assembly language: ALL fills the screen with the character specified in the operand; ST stores a value in the destination operand; MUL multiplies the source byte by the destination byte and stores the result as a word in the destination address; RAND generates a random number from 0 to the value in the operand and places the byte value at H8378; MOVE moves the number of bytes in the first operand starting at the address in the second operand to the address specified in the destination operand; BR branches to the address in the operand if the condition bit of the GPL status byte is reset; and finally, CALL executes GPL subroutines elsewhere in GROM/GRAM.

The facility with which the GPL assembler can handle memory transfers is illustrated by the block move in line 42. Twelve bytes are moved from GROM/GRAM memory address MSG to the VDP memory address pointed to by the CPU word DIS. (The asterisk indicates indirect addressing mode.) That's pretty sophisticated for a single line of source code!

While the GPL assembler deserves an "A" for performance and ease of use, its documentation leaves a lot to be desired, especially for a product priced at $60. If the sample program seems pretty straightforward, then, with the GPL assembler, *Intern* book and Linker, you will probably be writing programs in no time. But if you find the sample program confusing, you will likely be frustrated with the documentation that comes with the product.

The documentation does explain how to assemble a program. But at the very least, one would also expect a description of each mnemonic, its effect on the status byte, its format type, and possibly its op-code value. The 12-page Program Manual only gives a list of GPL mnemonics. (You have to guess at what each one does.) There is a hint, at least, of what the special FMT commands do, but the half page devoted to them leaves a lot of questions unanswered. A second booklet, Addendum 1, contains some additional information, but half of its 18 pages are devoted to a very sparsely documented (in German) pseudo-disk GPL program for the GRAMcard; not exactly the kind of thing a novice would prefer to cut his teeth on. Ryte Data, the exclusive distributor of the GPL assembler in North America, is working on more complete documentation and tutorial materials, but these are not available as of this date.

Once you have assembled a program it can be loaded into a GRAM device if you have an appropriate loader. You can get a MAXIMEM loader, but one for the GRAM Kracker is not yet available. Ryte Data told me it plans to supply loaders to registered GPL assembler owners free of charge. Another alternative is to write your own loader in assembly language; only four tag characters are used (9, B, F, and :). The assembler does not produce relocatable code.

Should you decide to buy the GPL assembler, you will also receive (free of charge) a licensing agreement. When you develop a "commercial program" using the assembler, you are expected to pay the German company a $100 fee. However, this is only required for the first ten programs you develop. (After that, it's all gravy).

TI99/4A Intern

The *Intern* book, by Heiner Martin, provides a commented, disassembled listing of the console ROM and GROMs. While this book is invaluable to anyone interested in exploring how the system works, it is an absolute must for those who decide to buy the GPL assembler. The book is available from several sources for $17.95, and with the purchase of a GPL assembler from Ryte Data, you can get it for $10.

The 18-page description of GPL mnemonics and statement formats supplies much of the information that is missing in the assembler documentation. In addition, the book makes a wealth of subroutines easily accessible to the GPL programmer. The listings are very well commented, and with a little practice I found it easy to locate subroutines; such as the one that scrolls the screen up a line in the sample program.

The listings also make it much easier to solve problems encountered in programming. For instance, I could not get the sample program to return to BASIC without an INCORRECT STATEMENT error message. From a look at the listing for CALL CLEAR it was apparent that I had to include CALL H37B4 to fetch the next BASIC token.

Pages 7-77 are devoted to the ROM listing. This includes the GPL interpreter, part of the BASIC interpreter, XML utilities, and the interrupt routine. Many of these routines are accessible in GPL with the XML instruction.

Following the introduction to GPL, pages 96-207 give the listings for GROMs 0, 1 and 2. Useful information on the BASIC interpreter is provided along with descriptions of the value stack and symbol table.

In spite of its utility, there are a few

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GPL ASSEMBLER, TI99/4A INTERN, GPL LINKER—

(Continued from Page 39

problems with the book. The most important one involves the FMT instruction (formatted block move) sometimes used to display data on the screen in GPL. FMT is a relatively complex instruction. In fact, FMT operands have their own separate processor within GPL. Under the description of FMT, however, no explanation is provided: The reader is referred to the ROM listing for the FMT processor! Understanding the structure of FMT statements is difficult enough when you study a straightforward explanation. Good luck to anyone who tries to figure it out by studying the two-page assembly language listing for the FMT processor. The GPL assembler uses an entirely different approach to FMT so its documentation is of no help. Every time I run into a section of GROM listing that uses FMT, I am frustrated by the book's failure to explain it.

By comparison, the other problems are minor. First, several pages of mathematical routines in the listing for GROM 0 are not commented. The author says this is the case because use of these routines is explained in the E/A manual. If you only want to use the routines, comments are not needed, but suppose you want to study how they work? I also found two minor errors in the descriptions of GPL instructions. The first is the description for SRL. This instruction shifts bits to the right, not to the left as stated in the book. Finally the EX (exchange) instruction can be used with a 'D' to operate on words. Neither the book nor the GPL assembler manual indicates that this is the case.

The GPL Linker

The Linker, by Monty Schmidt, is an ingenious program which allows GPL to be executed without additional hardware. The program converts object code produced by the GPL assembler into program-type files. These files can then be run with E/A Option 5 or with the Extended BASIC loader provided.

The linker package allows for 24K of GPL code. That's a lot of memory, especially when you take the efficiency of GPL into account. Code may be designated for any of four 6K GROMs corresponding to GROMs 3-6.

The documentation is clearly written and the program is very easy to use. It represents an important contribution because it makes it possible for anyone with 32K and a disk system to run GPL programs written with the GPL assembler. (The Linker does not support GPL routine types other than those which can be selected from the power-up menu. Addition of a CALL to BASIC, for instance, would not work with the Linker.)

The Linker is available from Ryte Data with the purchase of the GPL assembler for an additional $10. It is definitely the best bargain of these three products, and I would highly

(Please turn to Page 41)

```
0001  ********************************************************
0002  *          GPL ASSEMBLER SAMPLE PROGRAM - CALL GPL      *
0003  *-------------------------------------------------------*
0004        GROM >6000 * THIS PROGRAM WILL GO IN GROM 3
0005        DATA >AA01 * STANDARD GROM HEADER DATA
0006        DATA 0     * NOT USED - ALWAYS ZERO
0007        DATA 0     * START OF LIST OF POWER-UP ROUTINES
0008        DATA 0     * START OF LIST OF MENU SELECTED PROGRAMS
0009        DATA 0     * START OF DSR ROUTINE LIST
0010        DATA LIST  * START OF LIST OF BASIC CALL ROUTINES
0011        DATA 0     * START OF INTERRUPT SERVICE ROUTINES LIST
0012        DATA 0     * START OF BASIC SUBPROGRAM LIST
0013  *
0014  * LIST OF BASIC CALL ROUTINES (ONLY ONE IN THIS LIST)
0015  *
0016  LIST  DATA 0     * POINTS TO NEXT LIST ITEM. IF 0, LAST ONE.
0017        DATA START * POINTS TO BEGINNING OF THE ROUTINE
0018        STRI 'GPL' * LENGTH BYTE FOLLOWED BY NAME: 'GPL'
0019  *
0020  * SET UP LABELS AND DATA FOR THE ROUTINE
0021  *
0022  COUNT EQU  >8302    * COUNTER, A WORD
0023  DIS   EQU  >8304    * POINTS TO DISPLAY LOCATION, WORD
0024  COL   EQU  >8306    * COLUMN NUMBER (0-31), A WORD
0025  RND   EQU  >8378    * RANDOM NUMBER FROM RAND, A BYTE
0026  *
0027  MSG   DATA >ADA9,>A3B2,>AFD0  * BYTE VALUES FOR 'MICROp'
0028        DATA >C5CE,>C4C9,>D5CD  * BYTE VALUES FOR 'endium'
0029                                * WITH 96 ADDED TO EACH
0030  *
0031  * CLEAR SCREEN AND START PROGRAM
0032  *
0033  START ALL  128            * FILL SCREEN WITH SPACES (32+96)
0034        DST  1000,@COUNT    * STORE 1000 IN COUNT
0035  LOOP  RAND 23             * GET A RND ROW NUMBER 0-23
0036        ST   @RND,@DIS      * MOVE THE BYTE TO MSB @DIS
0037        MUL  32,@DIS        * MPY ROW*32 - RESULT IS A WORD
0038        RAND 20             * GET A RND COLUMN 0-20
0039        ST   @RND,@COL      * MOVE THE BYTE TO @COL
0040        DSRL 8,@COL         * MOVE BYTE TO LEAST SIG BYTE
0041        DADD @COL,@DIS      * ADD THE WORD TO @DIS
0042        MOVE 12,G@MSG,V@DIS * MOVE 12 BYTES FROM GROM TO VDP
0043        DDEC @COUNT         * SUBTRACT 1 FROM @COUNT
0044        BR   LOOP           * ANOTHER LOOP IF @COUNT NOT 0
0045        CALL >37B4          * GET NEXT TOKEN (END OF LINE)
0046        CALL >56CD          * SCROLL SCREEN UP ONE LINE
0047        CALL >0012          * RETURN TO BASIC
0048        END                 * STOP ASSEMBLY
```

GPL PACKAGE—

(Continued from Page 40)

recommend it to anyone buying the assembler.

THE GPL PACKAGE

In the process of reviewing these products, I have become excited about GPL. Some of the deficiencies in the assembler documentation and *Intern* book are frustrating, but GPL is so much fun that it is easy to minimize the extent of the problems and to find ways around them. I believe that just about anyone who enjoys assembly language programming will love GPL and be willing to put up with less than ideal documentation. As time goes on, I am sure we will see many GPL tutorials and lots of additional information.

At $75 for all three items, the package is expensive. TI users have become used to high quality at very low prices (e.g., Millers Graphics EXPLORER), and I think many people will perceive the package to be overpriced.

JOY PAINT 99—

(Continued from Page 37)

Well, as one who failed to be accepted to the drawing schools that advertise on the inside of matchbooks (and they accept *everyone*!), I obviously need all the help I can get—JOY PAINT makes even me look good. Comic strips or any line drawings are a good place to start. I've found that cross-stitch magazines available at sewing and fabric stores are a great source of material that is already laid out on a grid. The ability to use the clipboard art already available for the other programs should give you plenty of ideas. If you have a club newsletter you can make professional-looking ads or notices. You can make letterheads, etc., etc.

If you're more creative there is no limit to what you can do.

Conclusion: JOY PAINT '99 is a truly great graphics program and compares favorably with ones I've seen demonstrated on IBM, Apple and other machines. For drawing schematics I still prefer GRAPHX with its clipboard and checkerboard background but with the conversion program on JOY PAINT PAL you can fine-tune your schematics much more easily with JOY PAINT than you can with GRAPHX. I've found that these two graphics programs compliment each other and fill all my graphics needs.

For freehand drawing, JOY PAINT's capabilities and ease of use have no equal. I hope we will see more programs of this caliber. It is programs like this that will help keep the TI alive.

I am just sorry that no review can do JOY PAINT full justice. I'm sure I've left out something that someone else would find important, but with a program with so many features, it's difficult to include everything. If you get a chance to see JOY PAINT demonstrated at one of your club meetings, you'll see what I mean.

TECHIE—

(Continued from Page 33)

struction articles. A great magazine for the TI user with a technical slant. One catch, of course it's written in German. Between the German I can speak and read and the help of my German friends and the Germans who work for me I'm able to understand most of it.

User groups here are scarce. There are three American user groups I am familiar with: One in Stuttgart, Nurnburg and Belgium. Each have about 30 or fewer members.

Most folks have TI systems without much expansion. They have by and large been out of the mainstream and as a result have missed many of the new hardware and software releases from the States. I have not located any German user groups in the surrounding area. That is my next major priority here.

I plan short articles on some of the hardware and software mentioned here as well as a few simple construction projects. Please drop me a line and le me know the type articles you woul most enjoy seeing. Until next time....

Readers with technical question about TI home computing may writ Mack at:
HHC, 1ST INF DIV(FWD)
APO NY 09137

PRINTSTRIP—

(Continued from Page 34)

```
450 IF LEN(A$(K,I))<A(I)THE
 B$(K,I)=RPT$(" ",(A(I)-LEN
A$(K,I)))/2)&A$(K,I)ELSE B$
K,I)=A$(K,I)
460 IF I<>1 THEN 470 ELSE PR
INT #1,USING W$(P):B$(K,I);
: GOTO 480
470 PRINT #1,USING E$(A(I)):
B$(K,I);
480 NEXT I
490 PRINT #1:CHR$(13)&CHR$(1
0)
500 K=K+1 :: IF K=2 THEN 44C
510 PRINT #1:CHR$(27)&"-0";C
HR$(27)&"J"&CHR$(1);CHR$(27)
&"SO";RPT$("-",Q(P));CHR$(27
)&"T";CHR$(27)&"-1"
520 PRINT #1:RPT$(CHR$(10),2
)
530 NEXT C
540 PRINT #1:CHR$(27)&"@"
550 IF IN=2 THEN 600
560 DISPLAY AT(12,1)ERASE AL
L:"SAVE TO DISK ? Y/N"
570 CALL KEY(0,K,S):: IF S=0
 THEN 570 ELSE IF (K=89)OR(K
=121)THEN 580 ELSE 600
580 DISPLAY AT(12,1)ERASE AL
L:"ENTER FILE NAME": : :"DSK
1." :: ACCEPT AT(15,6)BEEP S
IZE(9):F$ :: F$="DSK1."&F$&"
*"
590 OPEN #2:F$ :: PRINT #2:P
 :: FOR I=1 TO 2 :: FOR J=1
TO 11 :: PRINT #2:A$(I,J)::
NEXT J :: NEXT I :: CLOSE #2
600 DISPLAY AT(12,1)ERASE AL
L:"QUIT PROGRAM ? Y/N": :"YO
UR CHOICE ? Y" :: ACCEPT AT(
14,15)SIZE(-1)BEEP VALIDATE(
"YyNn"):Y$
610 IF (Y$="N")OR(Y$="n")THE
```

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Newsbytes

Geneve due in fall

Myarc's new Geneve Model 9640 Family Computer will be available for commercial distribution in September "unless there is some inordinate delay," according to Lou Phillips of Myarc.

"The hardware has been out in the field for months and we're working like crazy on software and on compatibility with people's hardware," he says. "We are well on the way. We're producing windowing software."

He says the company is shipping its Mini-Peripheral Expansion System with 128K, which includes RAMdisk and which also has a floppy-based disk manager and can also run 128K with the Extended BASIC II of Myarc. He notes that existing MPES systems can be upgraded to 128K by Myarc, "probably for $99.95."

For further information, contact Myarc at P.O. Box 140, Basking Ridge, NJ 07920 or (201) 766-1700.

Workshop set on East Coast

The North Eastern 99'ers Computer Club will hold its second annual Computer Workshop, to be held from 10 a.m. to 4 p.m. Saturday, Oct. 11, at Joseph Jenks Junior High School in Pawtucket, Rhode Island.

According to organizers, this event promises to be the first opportunity for TI-99/4A users on the East Coast to see the latest developments in software as well as hardware after the summer vacation season. Other activities will include lectures, demonstrations (including the new Geneve computer by Myarc Inc.), and general help sessions. User groups and dealers are invited to take booths to demonstrate their software and products.

For more information contact: North Eastern 99'ers, 76 Herschel St., Providence, RI 02909. Or Contact Bob Levetin: Source-TI5278; CompuServe-73267,101.

J & K H reduces prices on software

J & K H Software has announced price reductions for its entire product line as of July 16.

Super Extended BASIC is not at a list price of $49.95, a $50 cut from the previous $99.95.

Other new prices are Multi-Disk Informer (SXB version), $12.95; Multi-Disk Informer (stand-alone), $17.95; Video Titles I (disk or tape), $19.95; Video Titles II, $34.95; Video Titles II Accelerator, $19.95; and Video Titles III (disk or tape), $12.95.

Jim Hollender, president of J & K H software, says all items may be purchased direct from the company or any of its authorized dealers, including Tenex Computer Express and Pilgrims' Pride.

For further information, contact J & K H Software, 4911 S. 31st St., Arlington VA 22206-1655 or (703) 820-4131.

New Tigercub disk

Tigercub Software announces the release of Tips from the Tigercub Volume 3, described as a full disk of 62 programs, routines, tips and tricks, containing the domplete contents of the Tigercub newsletters Nos. 25-32.

Volume 3 is available for $15; any two of the volumes is available for $27 or all three for $35, postpaid.

For further information, or to order, write Tigercub Software, 156 Collingwood Ave., Whitehall, OH 43213.

CorComp software under development

CorComp's Memory Plus Software Line, designed to work with the company's 512K expansion card, is under development, with the first item due for release "probably mid to late October," says Jackirae Sagouspe, CorComp president.

The majority of the word processing program is finished, she says, with the company working on adding new features. This will be the first product released, with a data base manager and spread sheet program to follow.

She says that persons who have ordered the 512K Memory Plus card have been put on the mailing list to be notified of the release and receive discount coupons toward the software.

"We are first and foremost a hardware company," Sagouspe says, adding that one thing the company has been doing is getting feedback from users as to what they want in the utility programs.

TI users group for clergy organized

A group of United Methodist pastors from the Northwest Texas Conference of the United Methodist Church have begun a users group exclusively for pastors who use "or at least own and would like to use the TI99/4A computer," according to the Rev. Steve Venable, pastor of the First United Methodist Church of Mobeetie.

Venable says that such individuals "experience special needs and expectations [in regard to the computer] that those in other vocations or using different computers do not."

He asks that persons who have suggestions for a name for the group or who would like to join contact him at P.O. Box 97, Mobeetie TX 79061 or (806) 845-3751.

QUALITY 99 issues fall software catalog

The new fall catalog from QUALITY 99 SOFTWARE is now available.

It includes six new programs: QS-SOLITAIRE, MATCH MATE, QS-CLOCK, DATA BASE 99 UTILITIES, QS-RAMCHIP and Best of Draw 'N Plot, Vol. 1.

A free copy is available from QUALITY 99 SOFTWARE, 1884 Columbia Rd. #1021, Washington, DC 20009 or (202) 667-3574.

User Notes

Users group operates TI bulletin board

The WIZ/TIB bulletin board is a TI-only bulletin board operating in Harrisburg, Pennsylvania.

The board operates 24 hours a day, seven days a week, according to David E. Ratcliffe, sysop.

He says it is based on a 10 meg hard drive with two phone numbers sharing a common data base, and that it offers informational text files, E-mail and one message base (temporarily), with X-modem uploads and downloads "coming shortly."

WIZ/TIB is sponsored by the Central Pennsylvania TI Users Group.

Telephone numbers for WIZ/TIB are (717) 657-4997 and (717) 657-4992. Terminal program settings are 8 data bits, 1 stop bit, no parity and 300 baud (1200 coming), according to Ratcliffe.

He says access to WIZ/TIB is free with a one-to-two-day wait for full validation.

PRINT STRIP—

(Continued from Page 41)

```
N 250 ELSE 820
620 OPEN #4:"DSK1.",INPUT ,R
ELATIVE,INTERNAL
630 FOR L=1 TO 127
640 INPUT #4:FN$ :: IF FN$="
" THEN 670
650 IF SEG$(FN$,LEN(FN$),1)=
"*" THEN F=F+1 :: G$(F)=FN$
660 NEXT L
670 CLOSE #4
680 CALL CLEAR
690 FOR M=1 TO F
700 DISPLAY AT(Z*2+1,N):USIN
G "##> ##########":M,SEG$(G$(
M),1,LEN(G$(M))-1)
710 Z=Z+1 :: IF Z=11 THEN Z=
0 :: CK=CK+1
720 IF CK/2=INT(CK/2)THEN N=
1 ELSE N=16
730 IF (INT(M/22)=M/22)THEN
740 ELSE 760
740 DISPLAY AT(24,1):"DISPLA
Y MORE FILES ? Y/N" :: CALL
KEY(0,K,S):: IF S=0 THEN 740
750 IF (K=89)OR(K=121)THEN C
ALL CLEAR ELSE 770
760 NEXT M
770 DISPLAY AT(24,1):"YOUR C
HOICE ? 1" :: ACCEPT AT(24,1
5)BEEP SIZE(-2)VALIDATE("123
4567890"):CH :: IF (CH=0)OR(
CH>F)THEN 770
780 F$=G$(CH):: F,CK,Z,N=0
790 RETURN
800 DATA 11,11,13,11,12,12,1
1,12,12,11,11
810 DATA 6,6,7,6,7,6,6,7,7,6
,6
820 END
```

Author finds bug in NUMWORDS

William J. Bullock, author of NUMWORDS, which ran in the January 1986 issue of MICROpendium, has uncovered a small bug in the program. He writes:

The problem arises when one attempts to change a "teen" number that has a decimal value included that is .5 or higher. The program is intended to change only the whole number portion of numbers to words, but it doesn't work in this instance. For example, it would convert 14.5 to "fifteen" and 1517.7 to "one thousand five hundred eighteen." There is no problem with any number not involving an "eleven," "twelve" or "-teen."

The fix is simple. It involves placing the integer function into three lines, specifically lines 10130, 10210 and 10230. Add INT(as indicated in the new versions of these lines given below and be sure to close the newly added parentheses.

```
10130 IF NOTH<10 THEN DOLLAR
0$=AW$(NOTH)&" THOUSAND " ::
 GOTO 10160 ELSE IF NOTH<20
AND NOTH>10 THEN DOLLAR0$=AW
EEN$(INT(NOTH-10))&" THOUSAN
D " :: GOTO 10160
10210 IF AMOUNT1<20 AND AMOU
NT1>10 THEN DOLLAR2$=AWEEN$(
INT(AMOUNT1-10))ELSE DOLLAR2
$=AWT$(NOTN)&"-"&AW$(NOON)
10230 IF NOTN=0 THEN DOLLAR$
=AW$(NOON)ELSE IF NOON=0 THE
N DOLLAR$=AWT$(NOTN)ELSE IF
AMOUNT>10 AND AMOUNT<20 THEN
 DOLLAR$=AWEEN$(INT(AMOUNT-1
0))ELSE DOLLAR$=AWT$(NOTN)&"
-"&AW$(NOON):: GOTO 10240
```

PUTDOT problem

Several readers have written to tell us about problems they have uncovered with an article by Darren Leonard about computer aided design. The article appeared in the June issue.

One apparent problem appears in line 507 of a subroutine called PUTDOT. The last part of line 507 references line 32767, which is a nonexistent line number. While it seems to be in error, it is nonetheless what the author wrote. Also, it has been pointed out that a subprogram called CIRCLE does not include a call to the PUTDOT subroutine, as do other subprograms included with the article. We recommend entering CALL PUTDOT(X,Y) as a program line between lines 150 and 160 of the CIRCLE subroutine. Again, the copy submitted by the author did not include the CALL to the PUTDOT subroutine.

Marjorie Mountjoy, of Columbia, Maryland, says she substituted a warning buzzer and went to subend to correct the problem in line 507 of the PUTDOT subroutine.

She writes: "For my own purposes, I prefer to go into PUTDOT wikth the actual values of the screen coordinates. This makes PUTDOT compatible with SPRITE. I have therefore altered line 503 to read: X = INT(X) :: Y = INT(Y). And in lines 501 and 502 I have added bell to indicate the point is off the screen."

The author has been vacationing for most of the summer and has been unavailable. However, we expect a second installment on the CAD article in the near future.

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User Notes

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Sorting with limited memory

Charlie Brown Sr., of Cranston, Rhode Island, writes:

Recently I was reading through some old issues of MICROpendium and I came across an article by Walter Moore. He had a problem with sorting a large file because of memory limitations. Well, I recently had the same problem and I came up with the solution for me. It requires Extended BASIC and two disk drives.

My file, from TI-Writer, was a listing of all the employees where I work. It was originally entered in order by each person's seniority date. One line for each entry and the first three positions represent each person's clock number.

CL#	NAME	SENIORITY DATE
247	Charlie Brown	09/09/74
100	another name	09/10/75

etc.

Two items to note:

1. No matter how much I compressed an Extended BASIC program, I couldn't load the whole file into memory to sort by conventional means. Even CALL FILES didn't open enough room.

2. Not all of the numbers between 001 and 999 are used as there are only 249 employees using numbers within this range.

Do not use the Save File option of TI-Writer. Instead, use Print File. This will eliminate any control characters and the tab line saved by TI-Writer.

The program itself is in two steps. First, it reads the original file (in this case it is called SENIORITY) and saves each item to a second file (CLOCKA in this example) in REC# position that corresponds to the clock number. Second, it reads the CLOCKA file in order by REC#s, and if it is in the proper syntax (one of our entries) then it is saved to the No. 3 file (CLOCKNUMBS) in sequential order. Sorted! In 10 minutes! Which ain't bad for XBASIC with no machine language aid.

Those who use this program should make sure to delete all lines that do not start with a clock number. Failing to do so will result in a syntax error in line 170. Also, blank lines should be deleted or a syntax error will occur in line 270.

Here is an explanation of the program:

110 Initializes high and low value to speed up sort.

120 Lets you know that program is working.

130 Opens TI-Writer file (SENIORITY) saved with Print File function.

140 Opens file (CLOCKA) for output.

150 Increments numbers on screen.

160 Reads items from TI-Writer file named SENIORITY.

170 Establishes value of clock number and prints items to CLOCKA by REC#.

180 Resets high or low value if required.

190 Checks to see if finished.

200 Closes SENIORITY file.

210 Closes CLOCKA file.

PART 2

220 Keeps screen active.

230 Opens CLOCKA file.

240 Opens final output file (CLOCKNUMBS).

250 Checks existing clock numbers.

260 All clock numbers must have three numbers.

270 Reads item number from CLOCKA file.

280 If first three positions have a value corresponding to the REC# in CLOCKA, it prints the item to CLOCKNUMBS file.

290 Continues the loop.

300 Closes CLOCKA.

310 Close CLOCKNUMBS file.

```
100 ! SORTER
110 HIGH,X=0 :: LOW=999
120 DISPLAY AT(2,8)ERASE ALL
:"S O R T E R": :TAB(7):"W O
 R K I N G": :TAB(11):"Part
1": :"Number of items:"
130 OPEN #1:"DSK1.SENIORITY"
,INPUT ,DISPLAY ,VARIABLE 80
140 OPEN #2:"DSK2.CLOCKA",RE
LATIVE 300,INTERNAL,OUTPUT,F
IXED 80
150 X=X+1 :: DISPLAY AT(8,17
):X
160 INPUT #1:A$
170 A=VAL(SEG$(A$,1,3)):: PR
INT #2,REC A:A$
180 LOW=MIN(LOW,A):: HIGH=MA
X(HIGH,A)
190 IF EOF(1)THEN 200 ELSE 1
50
200 CLOSE #1
210 CLOSE #2
220 DISPLAY AT(10,11):"Part
2": :"Number of items checke
d:": :LOW;"to";HIGH;":"
230 OPEN #2:"DSK2.CLOCKA",RE
LATIVE 300,INTERNAL,INPUT ,F
IXED 80
240 OPEN #1:"DSK1.CLOCKNUMBS
",OUTPUT,DISPLAY ,VARIABLE 8
0
250 FOR X=LOW TO HIGH :: B$=
STR$(X):: DISPLAY AT(14,14):
X
260 IF LEN(B$)<3 THEN B$="0"
&B$ :: GOTO 260
270 INPUT #2,REC X:A$
280 IF SEG$(A$,1,3)=B$ THEN
PRINT #1:A$
290 NEXT X
300 CLOSE #2
310 CLOSE #1
320 END
```

Transporting Multiplan files

Gary Matthews of the Atlanta TI user group passes on some advice he picked up from Guy Romano, who runs Amnion Helpline. It has to do with transporting a Multiplan file from a TI99/4A to a MS-DOS machine, or another microcomputer for that matter. The following is based on his article.

As you know, Multiplan spreadsheets can be saved to disk in three basic ways: As a standard disk file; as a print file, which is an ASCII text format that looks like a spreadsheet but has no formulas associated with it; and as a SYLK file (symbolic format),

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User Notes

(Continued from Page 44)

which is an ASCII representation of the spreadsheet that includes formulas and cell formatting.

The purpose of the symbolic format is to allow the spreadsheet to be converted to a universal form that is usable by Multiplan no matter what machine is running it. That means that a Multiplan spreadsheet created on a TI99/4A could be used by another computer running Multiplan.

The actual transfer of the symbolic file from a TI to another computer brand would be done using a modem or direct connect RS232 connection that allows the transferring of ASCII (or Display) files. After the transfer, theoretically, the user of the non-TI computer should be able to run Multiplan and load the transferred file.

Unfortunately, this doesn't work. The TI Multiplan symbolic format doesn't create true ASCII files. Rather it writes the files as Internal/128. An ASCII file would be Display/128.

Romano apparently discovered this discrepancy while trying to transfer a TI Multiplan file to a Digital Equipment Corp. Rainbow computer. However, he found a fix for the problem.

Using a disk sector editor, find the second to the last byte of the first line of the file. In Hex, you will see it is an 02. Change it to 00. That will cause the file trype to be converted from Int/128 to Dis/128. (It is recommended that the SYLK file be copied to a newly initialized diskette. This simplifies the process of locating the above address.) Now the symbolic file format will be in ASCII and can be transferred and loaded by another computer.

Move command using CC manager

This tip comes from Randy's RuMor Rag bulletin board, via the Delaware Valley User Group newsletter. It will be of interest to anyone with a CorComp disk controller.

(Please turn to Page 46)

Macro assembler additions noted

We are embarrassed. Last month we published a review of the TI99/4A Macro Assembler and left out three routines used as examples. The routines were referenced in the article, and we can only hope that readers didn't spend too much time trying to find them. The review was written by John Clulow, who displayed great forbearance in the face of our error. Included below are the three routines. Please refer to the review in the July issue for more information.

Listing 2

```
 $MACRO KEY
 $SET &L0,'@RAGSMK'
 $SET &L1,'@RAGSCM'
 $SET &L2,'@RAGSV1'
 $SET &L3,'RAGSRN'
 &P0 JMP $+8
 &L0(2.6) DATA >DF00
 &L1(2.6) DATA >FF00
 &L2(2.6) DATA 0
  MOVB &P1,@>8374
  BLWP @RAGSCN
  MOVB @>8375,&P2
  CLR  &P3
  CLR  &L2
  MOVB @>8375,&L2
  C    &L2,&L1
  JEQ  &L3
  DEC  &P3
  SZCB &L0,@>837C
  JNE  &L3
  INCT &P3
 &L3 MOV &P3,&P3
 $END
```

Listing 3

```
THE STATEMENT:

LABEL   KEY   R3,R4,R5

WOULD GENERATE THE SOURCE:

LABEL   JMP   $+8
RAGSMK  DATA  >DF00
RAGSCM  DATA  >FF00
RAGSV1  DATA  0
        MOVB  R3,@>8374
        BLWP  @RAGSCN
        MOVB  @>8375,R4
        CLR   R5
        CLR   @RAGSV1
        MOVB  @>8375,@RAGSV1
        C     @RAGSV1,@RAGSCM
        JEQ   RAGSRN
        DEC   R5
        SZCB  @RAGSMK,@>837C
        JNE   RAGSRN
        INCT  R5
RAGSRN  MOV   R5,R5
```

Listing 1

```
        DEF   SCROLL
        REF   RAGGET,RAGDS1,RAGKIN
        REF   RAGSCL,RAGOPE,RAGCLO
WS      BSS   32
BUFFER  BSS   81
PROMPT  BYTE  19
SPACE   TEXT  '                FILE: DSK'
WINDO1  SCB   TOP=0,BOT=520,LEN=40,TE,SP,ML
WINDO2  SCB   TOP=680,BOT=880,LEN=40,INP=899,TE,SP
FILE    DCB   PAB=>0FE0,END=EOF,ERR=EOF
PDATA   PAB   VA,DI,SE,INP,RL=80,BU=>1000,FD=DSK1.ABCDEFGHIJ
SCROLL  LWPI   WS
        CLR   R3
        CLR   R4
        LI    R0,>F081
        MOVB  R0,@>83D4
        SWPB  R0
        SETV  R0
        LI    R0,>87F5
        SETV  R0
NEXT    PRINT @WINDO2,@PROMPT
        INPUT @WINDO2,=12,QUIT
        MOVBL @SPACE,@PDATA+15,=10
        LI    R0,896
        SETV  R0
        LI    R0,15
        MOV   R0,R2
        LI    R1,PDATA+10
VDMOVE  MOVB  @>0800,*R1
        CB    *R1+,@SPACE
        JEQ   LENGTH
        DEC   R0
        JNE   VDMOVE
LENGTH  S     R0,R2
        SWPB  R2
        MOVB  R2,@PDATA+9
        OPEN  @FILE
READ    GET   @FILE,@BUFFER
        PRINT @WINDO1,@BUFFER
        B     @READ
EOF     CLOSE @FILE
        B     @NEXT
QUIT    LIMI  2
        LWPI  >83E0
        BLWP  @0
        END
```

User Notes

(Continued from Page 45)

Apparently, the File Utilities of the CorComp disk manager include a Move command that is not documented. After selecting option 1 from the File Utilities menu, the computer loads a directory of the selected disk into memory. The directory then appears and the user may enter R, D or C to rename, delete or copy a file. Entering the letter M will result in the selected file being copied to the destination disk after which it will be deleted from the source disk. This function also is available using the DM-1000 program.

Program changes for Axiom printer

Extended Software Company provided the following changes to its Screen/Dump program that will allow it to be used with the Axiom GP-100 TI printer (but not the Axiom GP-100 TI II printer). The modifications were submitted in response to a Feedback item in last month's MICROpendium. As published, the changes are for the disk-based version of the screen dump program. Those with the cassette version will need to make the following line number changes:

Disk	Cassette
160	200
180	220
190	230
210	250
270	310

```
160 OPEN #1:"AXIOM.CR",OUTPU
T
180 PRINT #1:CHR$(27);CHR$(7
6);CHR$(2);! SET DISTANCE BE
TWEEN LINES
190 PRINT #1:CHR$(27);CHR$(7
0);CHR$(66);! RESETS TOF SO
YOU DON'T SKIP PERF IN MIDDL
E OF DUMP
200 FOR R=1 TO 24
210 PRINT #1:CHR$(13);CHR$(1
0);RPT$(" ",24);CHR$(27);CHR
$(71);CHR$(1);CHR$(0);
220 FOR C=1 TO 32
230 FOR GCHAR(R,C,X):: CALL
HCHAR(R,C,42):: X=X-31 :: IF
 X<1 THEN X=1 :: GOTO 300
240 IF K(X,1)<>-1 THEN 300 E
LSE CALL CHARPAT(X+31,A$)
250 IF A$=B$ THEN X=1 :: GOT
O 300
260 IF A$=C$ THEN X=0 :: GOT
O 300
270 G=7 :: FOR A=15 TO 1 STE
P -2 :: B(0,G)=POS(H$,SEG$(A
$,A,1),1):: B(1,G=POS(H$,SEG
$(A$,A+1,1),1):: G=G-1 :: NE
XT A
```

User Notes is a column of tips and ideas designed to help readers put their home computers to better use. The information provided here comes from many sources, including TI home computer user group newsletters. MICROpendium will pay $10 for any item sent in by readers that appears in this column. Mail tips to: MICROpendium, P.O. Box 1343, Round Rock, TX 78680.

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