Processor Technology
Extended Cassette
BASIC on CP/M
Users Manual

T A D Enterprises

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INTRODUCTION

Congratulations on your purchase of this software product. The program supplied will allow you to run all of your Extended Cassette programs originally written for Processor Technology Extended Cassette BASIC under the CP/M operating system. The purpose of this manual is to provide you with detailed information on how to get BASIC up and running on the disk and also use the utility program supplied with this manual. In addition, the patches are given to convert BASIC5 to run under CP/M.

SYSTEM REQUIREMENTS

In order to use this software there are several requirements. Extended BASIC must be used in conjunction with the SOLOS or CUTER monitor programs, both products of Processor Technology Corporation. Also needed is an original copy of Processor Technology Extended Cassette Basic REV. A, since this is not supplied with this package. For reading and writing files on cassette tape, a Processor Technology CUTS cassette interface system is necessary. This interface is built in on a SOL terminal computer.

In order to make Extended BASIC run under CP/M at least 32K of continuous memory from location zero is required. In addition, CP/M must reside at the top of this 32K RAM space. If your CP/M uses more than 6K of memory, then you must allow enough memory to make the end of the transient program area end at 4E00H or higher. If your CP/M system uses the TPA memory during a warm boot, it cannot destroy more than 1K of memory from location 100H or else this program will be destroyed. This restriction is only applicable during installation and can be ignored once Basic on CP/M has been placed on disk. One additional requirement is that if you are using CUTER, ram must follow immediately after wherever CUTER is located. The ram area is used during block reads for storage of the file header block. This requirement is already met in a SOL terminal computer.

INSTALLATION

In addition to receiving this manual, you also received a cassette tape containing the necessary program code to make BASIC run under CP/M along with a BASIC utility program. This tape has been recorded using the CUTS cassette interface standard with a baud rate of 1200 Baud.

In order to make installation as painless and trouble-free as possible, you should now take time to read this section once thoroughly in order to make sure that you understand what needs to be done.

STEP 1.
Hook up a cassette recorder as unit 1 to your CUTS cassette interface. See your manual for instructions on how to do this if one is not already connected to the computer.

STEP 2.
Boot up your 32K or larger CP/M system. (Note - Do not load DDT at this point or you may not have enough memory to hold BASIC.)

STEP 3.
Halt your computer and go to the SOLOS/CUTER monitor. (On a SOL terminal computer this can be done by hitting UPPER CASE and REPEAT simultaneously).

STEP 4.
Place an original unmodified version of Processor Technology Extended Cassette BASIC into the cassette recorder. Type the following on the keyboard:
>GET BASIC/1 500 ‹cr›
Now hit the play button on your recorder. BASIC will load into the CP/M transient program area (TPA) starting at 500 H. When loading is completed, the SOLOS/CUTER prompt character will reappear along with a message showing the header information from the tape. Your screen should look like this:
>GET BASIC/1 500   BASIC B 0000 3F85

STEP 5.
Rewind the tape and remove it from the cassette recorder. Now insert the cassette supplied with this manual and make sure it is fully rewound and on side A. Type the following on the keyboard when the tape is ready:
>XEQ MODPG/1 ‹cr› or   >GET MODPG/1 ‹cr›
                          >EXEC 4121 ‹cr›
and hit the play button on the recorder.

SOLOS/CUTER is now loading the necessary program to link BASIC to CP/M. When it is loaded, it will modify BASIC to run under SOLOS or CUTER. (Note-Since CUTER is relocatable it must be at the location at which you intend to run it when running BASIC under CP/M.) This is due to the fact that it is impossible for CP/M to tell BASIC where CUTER is located after loading BASIC. If you have a SOL, the program assumes that SOLOS is located at 0C000H. When this step is complete, your computer will automatically warm boot back to CP/M. Now you must save BASIC on disk. Type the following command to perform this function:

<p align="center">A ›SAVE 77 BASIC15. COM</p>

Your installation of Extended Cassette BASIC on disk is now complete. From now on we will refer to ᴼA.ᴊIC as 'BASIC on CP/M'. If you wish to put in a custom printer driver, refer to the section on user printer drivers in this manual. At this point, you can patch BASIC on CP/M by using DDT. If your BIOS uses memory from 0CA63H thru 0CA73H or pseudo-output-port 3, then you must modify the user printer driver before attempting to run BASIC on CP/M.

LOADING BASIC on CP/M

Now that you have placed BASIC on disk it is time to verify that it works properly with your system. This section will tell you how to load BASIC on CP/M and initialize it properly.

To load and run BASIC on CP/M type the following on your keyboard:

<p align="center">A ›BASIC15 ‹cr›</p>

BASIC will now load and display a title block stating the revision and CP/M version number along with the copyright messages. If a title block does not appear it means that the CP/M system in use is not large enough to hold BASIC in memory or that it was not installed correctly. If a BDOS or BIOS error occurs while loading, you should investigate the source of the problem before continuing any further in this section.

Appearing after the title block will be a message stating the last available memory address available to BASIC. This address is the last byte of the transient program area (TPA). BASIC has overlayed the CCP portion of CP/M in order to give the maximum amount of memory to user programs. Please note that BASIC will relocate itself to run in any size CP/M system that is 32K or larger. (CP/M does not have to be same size as that used during installation). However, SOLOS or CUTER must be in the same place that it was in during installation. If BASIC was installed to run with CUTER, it may not run with SOLOS. Initialization at this point is the same as for the cassette version. In order to use the utility program supplied on cassette with this manual, you should now read the next section.

LOADING THE UTILITY PROGRAM

Included on the cassette supplied with this manual is a utility program that can be used to load data and text files from tape and save them on disk. In addition, it will save data and text files from disk onto a tape. The program also provides information on the trace mode and other items discussed elsewhere. The purpose of this section is to provide you with instructions on how to get this program from the tape onto the disk.

The following procedure should be used to read the utility program into memory and then place it on disk:

1. Boot up the CP/M system and load BASIC on CP/M
   Type the following direct commands:
2. POKE 2692,19
3. POKE 2693,PEEK(9816)
4. GET UTIL/1
5. SAVE UTIL/1
6. BYE

From now on, the utility program can be used to perform steps 2 and 3 above along with it's other functions. Please note that you can transfer more than one file before typing the "BYE" command.

USER ADJUSTABLE FEATURES

An extension to BASIC has been provided with your new system that allows you to trace program statement execution. Whenever a statement is executed, it's line number will be displayed on the VDM in inverted video. This trace mode can be turned on and off by direct keyboard commands or under program control. The utility program command "TRCE" will give you more complete information about how to enable and disable this function. One other command that the utility program provides is the ability to display or change the CP/M filetype currently being used for disk files. Thus, your programs can be named with any 3 letter filetype that you might want. The default filetype used when starting Basic is ".ECB". Another additional feature of the utility program is the ability to cause all disk I/O to go to Drive A. Where this would be useful is the case of a system that has only one drive hooked up. The way it works is as follows --- Whenever a reference is made to cassette unit 2, the unit actually selected is unit 1. Thus, it is possible to have two files open at the same time on the same disk (Drive A).

USE PRINTER DRIVERS

Included in the initialization code of BASIC is a routine to move bytes from the end of BASIC to the SOLOS/CUTER ram area and set pseudo-output-port 3 to this address. The code for this routine is shown at the end of this manual. Your custom printer driver can be patched in using the DDT Program in CP/M. Please note that some code is in this routine that fixes a bug for nulls to printers. If you extend the size of BASIC to be greater than 77 pages, be sure to save the new size. Of course, the area after the user area is available for your use to put in any custom patches to BASIC. Just remember to load the HL registers with the address of SOLOS or CUTER before jumping to location zero.

RETURNING to CP/M

When the initialization dialogue is complete the BASIC prompt message "READY" will appear. If you wish to return to CP/M, type the following command:

>BYE

If for some reason you should desire to go to SOLOS/CUTER, you must restart your computer and go to it. (On a SOL this is accomplished by hitting UPPER-CASE and the REPEAT keys simultaneously). To return to BASIC after using SOLOS, just type the following command:

>EXEC 0 (cr)

It is now time to try all of the above functions described in this manual. If any of them do not work, then your installation or system configuration is incorrect. If you are unable to get a function operating, please write a letter describing the problem along with a completedescription of your system hardware/software configuration.

PATCHES MADE TO BASIC

Several patches to BASIC have been published by Processor Technology Corp. This section gives the code that has been implemented in this software product. Please note that the checksum calculation is no longer used in this version of BASIC and that changes relating to checksum values are not incorporated.

Bug in For/Next Loops Fix
B50: C1 CA 40 0B
Patch to use Solos/Cuter CRLF routine (allows setting of nulls)
2670: AF 32 6F 28 C3 F9 C2
(Cuter jumps to C342H)
SQR Function

THEORY OF OPERATION

The purpose of this section is to give a brief discussion of how this conversion system operates. No attempt is made here to give actual code for any of the routines used.

After loading Basic, CP/M will jump to the start of the TPA at 100H. During installation a jump instruction was placed here to go to the start of mods for CP/M (JMP 4154H). If your CP/M uses the TPA during a warm boot, then this jump instruction may not be present. If this is the case, you must modify Basic on disk to include this jump instruction using whatever utilities you have available. After jumping to the CP/M mods, several things take place. A call to CP/M is made to initialize the disk system (INIT command) to drive A. This is done so that you can swap disks in drive B without having to run the utility program. The next thing that is done is to modify all address references to point to SOLOS or CUTER, Remember that the address used is the place where SOLOS or CUTER resided when doing the installation. When this is completed, the CP/M mods are moved to the area occupied by the CCP in CP/M. Then the initialization dialogue takes place asking the user for what functions are to be deleted. At this point, the run-time mods are complete and a jump is made to the user area. The HL register pair contain the address of where the monitor program is located (0C000H for Sol-20's).

While this discussion has been brief, it should give you a general idea of what happens before the "READY" prompt appears on the screen.

```
            ORG     4D1FH
USER:       PUSH    H                       ;Save addr. of SOLOS
            LXI     H, SOLOS+0A63H          ;Destination address
            LXI     D, DATA                 ;Source address of data
            LXI     B, 17                   ;Number of bytes to move
            CALL    BLKMOV                  ;Move data (BLKMOV is located ;at location 4194H
            LXI     H,SOLOS+0A63H           ;Put address of destination here
            SHLD    SOLOS+802H              ;Set custom output address
            NOP                             ;Reserve 3 bytes for patching
            NOP
            NOP
```

; The following code fixes BASIC to use CRLF routine in SOLOS or CUTER in order to allow setting the number of NULL
; characters to be output to the printer. This routine is not essential for proper operation of BASIC and may be deleted if
; not needed.

```
            LXI     H,32AFH
            SHLD    2670H
            LXI     H,286FH
            SHLD    2672H
            MVI     A,0C3H
            STA     2674H
            IF      SOLOS
            LXI     H,SOLOS+2F9H
            ELSE
            LXI     H,CUTER+342H
            ENDIF
            SHLD    2675H
```

; End of CRLF fix routine.
;
;Prepare to jump to BASIC

```
            POP     H                       ;Restore addr. of SOLOS
            JMP     0                       ;Jump to BASIC
```

; The following data bytes are used for a custom printer driver. Your printer driver should be located here. The length
; of your driver should be placed in location 4D27H 4D28H. The data shown below is for an IDS IP 125 serial printer
; connected to the SOL serial port.

```
            ORG     4D50H
DATA:       DB      0DBH, 0F8H, 017H, 0D2H, 063H, 0CAH, 0E6H
            DB      040H, 0C2H, 063H, 0CAH, 078H, 0D3H, 0F9H
            DB      0C3H, 054H, 0C0H
```

; End of printer driver data. The rest of RAM from here on up is available for your use for any machine language code that
; you may want.

```
            ORG     4D61H
```

BASIC5 CONVERSION NOTES

The program MODPG on the cassette supplied can be modified to make BASIC5 work under CP/M as a disk basic if you
like. Shown below are the necessary changes to do this.

Load BASIC5 from cassette at location zero and execute it from SOLOS or CUTER. Now save it on cassette with the
following command: **SAVE BASIC 0 1ADA**

Now boot up your 32K or larger CP/M system. Restart your machine and go to SOLOS/CUTER. Load BASIC5 from the cassette that you just saved it on using the following command: **GET BASIC 500**

Now place the cassette containing MODPG in the recorder and load MODPG with the following command: **GET MODPG** (do not XEQ it)

Now make the following changes using the SOLOS/CUTER monitor:

EN 100 ‹cr›
:C3 54 41 417D: 01 DA 1A 4192: E2 41 41EC: D3 1A 00 00 00 ‹cr›
:41FA: 1E 05 00 00 00 4204: 28 05 00 00 00 00 00 00 ‹cr›
:4211: 3D 05 4218: 88 05 00 00 00 4222: F4 02 ‹cr›
:4229:89 02 422B: C3 43 43 4343: 2A D5 1A ‹cr›
:4348: 00 434B: 00 434E: 00 00/ ‹cr›

The following patch specifies the address of SOLOS/CUTER:

EN 4356 ‹cr›
:00 CO/ ‹cr›

The following patch bypasses the CRLF fix in the user area. If you have modified this area, do not make this patch:
EN 4D32 ‹cr›
:C3 4C 4D/ ‹cr›

The following patch specifies the filetype to be used for disk filenames: (.BS5)
EN 4703 ‹cr›
:42 53 35/ ‹cr›

Now **EXEC O** to warm boot. Then SAVE 77 BASIC5. COM.

Now you have a running version of BASIC5 under CP/M. To run it, type BASIC5.

The following procedure can be used to load programs for BASIC5 from tape and place them on disk. First, load and execute BASIC5. Then use the BYE command. Note that BYE will return to SOLOS/CUTER and not CP/M. Now you must enter the address of the SOLOS read block routine using the following command:

EN 289 ‹cr›
:13 CO/ ‹cr› Now return to BASIC5 by **EXEC O.**

From now on until the next boot, BASIC5 will read programs from tape unit 1. However, the save command will save the programs on disk. In order to save a program on tape, the following procedure should be used:
First, load and execute BASIC5. Then use the BYE command.
Now you must enter the address of the SOLOS write block routine using the following command:
EN 2F4
:16 CO/ ‹cr› Now return to BASIC5 by **EXEC O.**

From now on until the next boot, BASIC5 will save programs from memory onto tape unit 1. However, the GET command will still load programs from disk. If both of the above patches are made, BASIC5 will GET and SAVE from tape only. Note that data files will always be fetched from disk and they can only be saved on disk. In order to get BASIC5 data files from tape onto the disk, the Utility program supplied with this package for BASIC15 should be used.

In order to return to CP/M, a cold boot must be performed.

Sometimes it is necessary to exchange disks while in BASIC5. The following procedure can be used to do this: Use the BYE command to go to SOLOS. Then **DUMP 51E 51F** to obtain the address of the CP/M interface software. Subtract 7 from this value and convert it to decimal. Now return to BASIC5 by **EXEC O.** Now swap disks and type the following command:
A=XXXXX where XXXXX is the decimal number that you just calculated.
A=CALL (A+10) This will perform the INIT command on CP/M.
Note that the value XXXXX will only change if the CP/M system size has changed. Thus, if you always use the same size system, this value could be hard coded in your programs.

The SNGL command can also be implemented by calculating A as before. Then you must place the following values into memory specified by the following POKE commands:
POKE A+28,62:POKE A+29,1;POKE A+30,0

Note that the POKE command is not available in BASIC5, so you must exit BASIC5 and enter these values using SOLOS or CUTER.

Note---to calculate the value of A in Extended BASIC15, the following command can be used:
A=PEEK(1249)*256+PEEK(1248)-4

The single command is the same as BASIC5. See the UTILITY Program for more information on how to use the single command for advanced disk I/O.

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January 19, 1980
RE: BASIC on CP/M

Since the initial release of BASIC on CP/M, several items have come to my attention. Information regarding these is included in this letter.

1) Some users have requested information on how to make the SNGL command permanent. This can be done by changing the following in BASIC15 using DDT.
```
S4706 3A 3E
 4707 67 01
 4708 4B 00
 4709 C9 .
```

2) BASIC5 does not read data files correctly due to the method of detecting End-of-files. The following change should be made using DDT.
```
S4800 CA 00        (An end of file is the Control-Z character)
 4801 0D 00
 4802 48 00
 4803 FE .
```

3) When saving a program or data file it is possible to use lower case letters for the name. When doing this it makes the file impossible to erase or type using normal CP/M commands. However, the file or program is always accessible to BASIC15. This feature was included to allow some measure of file security for the user.

4) When writing to a file from BASIC5 or BASIC15, the old data is always overwritten from the beginning of the file. Thus, reading and writing from the samefile will cause problems. It is best to use one filename for input and another for output.

5) End-of-file detection in BASIC15 is done by looking for either a control-z or a null byte. Change number 2 above will delete the check for a null byte. This would only be necessary if you are saving non-ascii data in data files.

6) BASIC on CP/M will work with CP/M 2.0 if you should decide to upgrade to it.

I hope that this letter has been informative and answers your questions. I would be happy to answer any questions that may arise if you send me a letter to the address above.

TAD Enterprises