

## USER ENTRY

This prompt will reappear each time you respond to it with a file name and carriage return, as shown:

Enter Selection File Spec(s). (X /Y/Y/Y) =====> **TESTFILE.DOC RETURN**

Enter Selection File Spec(s). (X /Y/Y/Y) =====> **RETURN**

or a batch file name, as shown:

Enter Selection File Spec(s). (X /Y/Y/Y) =====> **;**BATCHFIL.DOC RETURN****

Enter Selection File Spec(s). (X /Y/Y/Y) =====> **RETURN**

The file named "TESTFILE.DOC" will be restored. The files within batch file "BATCHFIL.DOC" will also be restored. The specification of a batch file must be preceded by a semicolon. (See 5.5 "Creating Batch Files".)

Each file name entry must be followed by a carriage return. Ambiguous file names can be entered (using wild card symbols "\*" and "?"). No drive names can be specified at this prompt.

## SELECTION FILE OPTIONS

You can also limit the types of files that may be affected during the RESTORE Operation by specifying Selection File Options with file names. (These Options are not to be confused with the Main Menu Options for Operation Selection, although they are entered in a similar fashion.)

These Options are entered after the name of any file specified for selection. Each Option letter must be preceded by a slash mark. If no Options are entered, BRS assumes default values. (See "Selection File Option Defaults".) A description of each of these Options follows.

- /A **All System and Non-System files Option.** It defines the Backup Operation so that System and/or Non-System files are affected. This is a default Option.

- /N Non-System files Option.** It defines the Backup Operation so that only Non-System files may be affected.
- /S System files Option.** It defines the Backup Operation so that only System files may be affected.
- /U Current User Option.** It defines the Backup Operation so that only those files accessible through the currently logged User area may be affected. This is a default Option.
- /U\* All User files Option.** It defines the Backup Operation so that the files to be affected can be accessed through any User area.
- /Un User Number “n” files Option,** where “n” is an integer from zero (0) to fifteen (15), inclusive. It defines the Backup Operation so that only the files of User number “n” are affected.

You can respond to a single Selection File prompt with both a file name and Options, as shown in the following example:

Selection File Spec(s) ==>**TESTFILE.COM/N/U\* RETURN**

In this example, **TESTFILE.COM** is the filename, **/N** is a limit for only Non-System files, and **U\*** allows all user files to be affected.

### **FILE SELECTION OPTION DEFAULTS**

The default values for the Backup and Restore Options are marked on the menu: “A—All File Types (Default)”, and “U—Current User # (Default)”. If a file name is entered in response to a Selection File prompt **without** File Selection Options, then the RESTORE operation will affect files of all types that belong to the current user.

## **INVALID FILE SPECIFICATION**

If you respond to the prompt by entering the name of a file that does not exist on the specified drive device, BRS will display the message:

No Files Found for Entered Spec.

and redisplay the prompt. File Selection Specifications often produce these errors as well:

Invalid Option Format or Selection

and

Invalid User Number or Format

## **OVERRULED FILE SELECTION SPECIFICATION**

If you enter the same file name in response to both the Rejection File prompt and the Selection File prompt, the file's "rejection" will prevail. The twice specified file will not be affected by the Operation.

## **ENDING FILE SELECTION SPECIFICATIONS**

You may end the specification of selection files by entering a carriage return alone in response to the prompt (as shown),

Enter Selection File Spec(s)? ====>

The immediate entry of just a carriage return at this prompt will cause the RESTORE operation to be executed. After execution, BRS will redisplay the Master Menu and prompt for another Operation.

## 5.5 Creating Batch Files

You may enter several file names in response to a single specification prompt by storing these file names in a batch file. A batch file is a text file composed entirely of file names.

The name of the batch file itself can then be entered at the prompt to trigger the entry of all of the file names within the batch file. The batch file will be read by BRS, and each file named within it will be excluded from (if entered at a rejection prompt) or included in (if entered at a selection prompt) the RESTORE Operation. When entered, the name of the batch file must be preceded by a semicolon (;), as in the following example:

```
Enter Rejection File Spec(s). ====;>BATCHFIL.DOC RETURN
```

The batch file can be composed using the ED utility or another text editor or word processor. It can be given any file name that fits the CP/M file naming conventions.

The file names within the batch file should be entered on separate, successive lines. Each line must be terminated with a carriage return. The example batch file BATCHFIL.DOC, for instance, contains the following file names:

```
ABSTRACT.REC
TAXES1.REC
TAXES2.REC
TAXES3.REC
```

When "BATCHFIL.DOC" is specified, BRS automatically displays the files it contains, so it appears as if you entered them at separate prompts. Hence, specifying "BATCHFIL.DOC" would produce the following display:

```
Enter Selection File Spec(s). ====;>BATCHFIL.DOC RETURN
```

```
Enter Selection File Spec(s). ====;>ABSTRACT.REC RETURN
```

```
Enter Selection File Spec(s). ====;>TAXES1.REC RETURN
```

```
Enter Selection File Spec(s). ====;>TAXES2.REC RETURN
```

```
Enter Selection File Spec(s). ====;>TAXES3.REC RETURN
```

```
Enter Selection File Spec(s). ====;> RETURN
```

Batch file names can be specified at either rejection or selection prompts. Additionally, files within a batch file can have selection Options when their batch file is specified at a selection prompt.

## 5.6 RESTORE Execution

When the actual RESTORE execution begins, BRS will display the following message:

```
***** RESTORE OPERATION IN PROGRESS *****
```

When a Disk Set includes several floppy disks, BRS must transfer the selected files from each of these disks one at a time onto the Winchester disk. This disk-by-disk transfer process requires an interruption in the execution of the RESTORE Operation as BRS prompts you to insert the next disk (Disk Set Volume) that contains a specified file. Whenever the directory indicates to BRS that a file is on a disk (Disk Set Volume) that is not in the specified drive, BRS displays a prompt in the following form:

```
Load Drive   X: with Volume  nn of Backup Disk Set.
             Enter Carriage Return When Ready.
```

Where "x:" is the drive specified in response to one of the initial BRS prompts; and  
where "nn" is the number of the the Disk Set Volume that BRS is now ready to restore to the Winchester disk partition.

You should insert the disk with a volume number corresponding to the one in the prompt, and then a carriage return. When BRS finishes restoring all of the selected files that it can find on the inserted disk, it will display the message:

```
Load Drive   X: with Volume  nn of Backup Disk Set.
             Enter Carriage Return When Ready.
```

Where "x:" is the drive specified in response to one of the initial BRS prompts; and

where "nn" is the number of the Disk Set Volume that BRS is now ready to restore. This number increases in increments of one each time the prompt is displayed during a RESTORE Operation. Hence you should insert a disk with a higher volume number each time.

The preceding display reappears until you insert the last disk (volume) in the Disk Set. After BRS restores the selected files from the final Disk Set Volume, the RESTORE Operation is terminated and the Master Menu reappears.

### **WRONG DISK ERROR**

If you are prompted to load "Volume 01" and insert a disk other than Volume 01 (the Directory Disk), the following error message will appear:

Wrong Disk Inserted in Drive

Enter (CR) for Master Menu

Respond to this message by entering a carriage return. The Master Menu will appear.

If you are prompted to load a disk volume other than Volume 01 and insert the wrong disk volume, the following error message will appear:

Wrong Disk Inserted in Drive

Load Drive X: with Volume nn of Backup Disk Set  
Enter Carriage Return When Ready

Where "x:" is the drive specified in response to one of the initial BRS prompts; and

where "nn" is the number of the Disk Set Volume that BRS is now ready to restore.

A disk will be considered "Wrong" by BRS if it does not belong to the same Disk Set as the Directory Disk, or if it belongs to the disk set but has a different volume number than the one that is requested in the prompt.

## DELETING OLD WINCHESTER DISK FILES

When files are restored to the Winchester Disk from Backup Floppy Disks, the old original file (from which the Backup was copied) must be erased to allow space for the restored copy from the Backup.

If you also responded to the Master Menu prompt by specifying the "/P" (Prompt) Option, then BRS will ask whether or not you want to delete a given file before the program actually deletes that file. The following message would appear:

```
Found User# 00 TEST.ASM      Select ? (Y/N) <Y>
```

Where TEST.ASM is the name of the file that BRS had located from its list of files to be deleted. The question is to be answered with either a "Y" or an "N". The default of "Y" (shown as <Y> on the monitor) is assumed if you enter only a carriage return. Entering "N" will cause BRS to skip over that particular file and not delete it.

If you did **not** respond to the Master Menu prompt by specifying the "/W" (Warning messages suppressed) Option, then the warning messages will be active. Under these conditions, you will be prompted to verify that the files are to be deleted with the following display:

```
*****Warning! Files on Winchester Disk are Going to be Deleted*****  
Enter (CR) to Cancel Deletion Process
```

To stop the deletion, you must enter a carriage return. To begin the deletion, you can enter any other keyboard character.

However, if the "/W" Option was entered, BRS will not offer you the alternative of canceling the deletion process.

## 6 COMPARE FILES

When large amounts of data are transferred between disks, it is extremely important to be able to determine whether or not the copied data (on the Backup Floppy Disk) is exactly the same as the original data (on the Winchester Disk).

The COMPARE Files Operation compares files on a Backup Disk against the corresponding files on the Winchester Disk to make sure that the data within the two files is exactly the same.

### 6.1 Selecting the COMPARE Files Operation

To select the COMPARE Files Operation, enter the letter C and a carriage return at the Master Menu Selection prompt. (No Master Menu Options can be selected with this operation.)

```
Select Operation (X /Y/Y/Y) ====> C
```

BRS will complete the Operation title by displaying the characters "ompare Files" after the "C".

When this Operation is selected, BRS displays the following prompt:

```
Load Drive X: with Volume 01 of Backup Disk Set.
Press RETURN when ready.
```

Where "Drive X:" refers to the drive specified before the Master Menu appeared.

After you insert the first disk of a Backup Disk Set and enter a carriage return, BRS will check to see if the inserted disk contains a Backup Disk Set Directory (stored in a file named MASTERBRS.DIR).

If BRS finds a directory on the disk, it will display the following information from the directory:

```
Backup Disk Set: Created mm/dd/yy
                  Start vol. 01
                  Last vol. nnn
```

```
Is This The Correct Backup Set? (Y/N) <Y> ====>
```



Where “mm/dd/yy” is the date of the BACKUP Operation that created the file copies in this Backup Disk Set; and

where “nnn” is the number of disks in the Backup Disk Set, and also the volume number of the last disk in the set.

If the creation date and volume number are the same as those of the Backup Disk Set being compared, then enter the letter Y or a carriage return. BRS will then prompt for file names. If the date and volume number are not those of the Disk Set you wish to compare, then N should be entered.

## 6.2 Entering File Names

### ENTERING WINCHESTER DISK FILE NAME

After you have confirmed that the Volume 01 disk from the correct Backup Disk Set was inserted, BRS will then prompt:

```

Compare Function
-----
Enter Winchester Disk Filename ====>

```

At this prompt, you respond by entering the name of the Winchester Disk file to be compared and a carriage return. After you enter a valid file name, BRS prompts for a floppy disk file name.

### INVALID WINCHESTER DISK FILE NAME ENTERED

If you specified the name of a file that is not on the currently logged Winchester Disk partition, the following error message is displayed:

```
Source File Not Found
```

### **ENTERING FLOPPY DISK FILE NAMES**

After you have entered a valid Winchester Disk file name, BRS will display the following prompt:

```
Enter Floppy Disk Filename ====>
```

At this prompt, enter the name of the Floppy Disk file to be compared with its corresponding Winchester Disk file. Then end this entry with a carriage return.

### **INVALID FLOPPY DISK FILE NAME ENTERED**

If you specified the name of a file that is not in the Backup Disk Set, the following error message is displayed:

```
Destination File Not Found
```

### **FILE NAME SPECIFICATION ERROR MESSAGE**

If you specify a drive name (such as "A:") at either of the file name prompts, the following error message is displayed:

```
Drive Specifications NOT allowed.
```

## **6.3 COMPARE Execution**

When BRS finds the specified file name in the directory of the Volume 01 Disk, it will prompt you to insert the Disk Set Volume that contains the file. The following prompt will appear:

```
Load Drive X: with Volume nn of Disk Set.  
Enter RETURN when ready.
```

Where "x:" is the floppy disk drive in the H/Z-67 drive unit; and

where "nn" is the number of the volume that contains the file that you specified for the COMPARE operation.

The COMPARE operation compares each byte in both files. If the data in each file is identical, the following prompt is redisplayed:

```

Compare Function
-----
Enter Winchester Disk Filename ====>

```

You can now COMPARE another file.

## 6.4 Compare Error

If the files do not compare exactly, BRS will notify you with a display in the following form:

```

Data Miscompared at Record rrrr      Reading file COMPFIL.E.NAM
Enter Carriage Return When Ready

```

Where "rrrr" is the location of the discrepancy between the data in the two files, expressed in a hexadecimal number; and

where "COMPFIL.E.NAM" represents the name of the Winchester Disk file that does not match the Floppy Disk file.

BRS will redisplay the following prompt after you enter a carriage return:

```

Compare Function
-----
Enter Winchester Disk Filename ====>

```

## 6.5 Remedy for Dissimilar Files

If discrepancies are found between files, you should first be sure that they were supposed to have been identical in the first place. If the files were supposed to have been identical, you should determine which of the two files contains the error, and delete that file. Then you should perform the BACKUP or RESTORE operation again. You should also run the COMPARE Operation again to test the newly made file against his source file to see that they are indeed identical.

## 6.6 Ending the COMPARE Operation

You can end the COMPARE Operation by entering a carriage return alone at the "Enter Winchester Disk Filename" prompt or at the "Enter Floppy Disk Filename" prompt. BRS will then redisplay the Master Menu.

## 7 THE LIST DIRECTORY OPERATION

The LIST operation enables you to obtain the following information about a Backup Disk Set:

- creation date of set;
- number of volumes in set;
- drive name assigned to Winchester Disk partition;
- file names within set;
- user area numbers of files within set; and
- volume numbers of disk(s) on which files reside.

### 7.1 Selecting the LIST Operation

To select the LIST Operation, enter the letter L and a carriage return at the Master Menu selection prompt. (No Master Menu Options can be entered with the LIST Operation.)

Select Operation (X /Y/Y/Y) == => List Directory

BRS will complete the operation title by displaying the characters "ist Directory" after the "L" you enter.

When this Operation is selected, BRS displays the following prompt:

Load Drive X: with Volume 01 of Backup Disk Set.  
Enter Carriage Return When Ready.

Where "Drive X:" refers to the drive specified before the Master Menu appeared.

After you insert a disk and enters a carriage return, BRS will check to see if the inserted disk is Volume I and contains a Backup Disk Set Directory (stored in a file named MASTERBRS.DIR).

If BRS finds a directory on the disk, it will display the following information from the directory:

```
Backup Disk Set:  Created mm/dd/yy
                  Start vol. 01
                  Last vol. nnn
```

```
Is This The Correct Backup Set? (Y/N) <Y> =====>
```

Where “mm/dd/yy” is the date of the BACKUP Operation that created the file copies in this Backup Disk Set; and

where “nnn” is the number of disks in the Backup Disk Set, and also the volume number of the last disk in the set.

## 7.2 LIST Directory Display

After you enter the letter **Y** or a carriage return at the “Correct Backup Set?” prompt, BRS displays a “Listing of Backup Directory”. This display appears in the form of the following example:

```
Listing of Backup Directory
Created: 02/31/82
Highest Volume Written: 003
```

FILENAME	USER	VOLS	FILENAME	USER	VOLS		
-----	----	----	-----	----	----		
C:TEST1	COM	00	01-01	C:TEST	REL	03	01-01
C:TEST	ASM	03	01-01	C:TEST	PRN	15	01-02
C:TEST	COM	07	01-01	C:FILE1	ASM	15	01-02
C:FILE2	ASM	15	02-02	C:FILE3	ASM	09	02-03
C:FILE4	ASM	15	03-03				

If you have a terminal with a video screen, the entire display might not fit on the screen at once. In such a case, the directory listing will scroll up the screen. You can suspend the scroll by entering a **CTRL-S**, and resume the scroll by entering another **CTRL-S**.

## 8. THE EXIT TO CP/M OPERATION

To select the EXIT Operation, you should enter the letter **E** and a carriage return at the Master Menu Selection prompt. (No Master Menu Options can be entered with the EXIT Operation.)

Select Operation (X /Y/Y/Y) ====> **Exit** to CP/M

BRS will complete the operation title by displaying the characters "xit to CP/M" after the "E".

The BRS utility will end and the CP/M operating system will return. CP/M will display the system prompt as shown:

A>

**NOTE:** If you performed bootstrap with the floppy disk drive of the H/Z-67 drive model prior to invoking BRS, then CP/M will display the following message when you exits from BRS:

Place a Bootable Disk in Drive A:  
Enter Carriage Return When Ready

You must perform the activities described in the prompt to produce the "A>" system prompt.

## 9 BRS ERROR MESSAGES

Invalid Date Entered

**EXPLANATION:** You entered a date specifying a month value greater than 12, or a day value greater than 31. "Enter Today's Date" prompt will reappear to accept a valid entry.

Source File Not Found

**EXPLANATION:** You entered the name of a file that does not exist on an assigned Winchester Disk partition. Enter the name of an existing file or assign a drive name to the partition that contains the desired file (see ASSIGN).

Destination File Not Found

EXPLANATION: You entered the name of a file that does not exist on the floppy disk in the H/Z-67 drive slot. Enter the name of a file on this floppy disk.

Invalid file format or Contains Wildcards

EXPLANATION: You entered a file name that did not conform to CP/M file naming conventions, or a file name that contained wildcard characters (\* or ?). Enter a valid file name without wildcard characters.

Invalid drive specification

EXPLANATION: You entered a drive name that is not possible with the CP/M Operating System. Enter a drive name within the range "A:" through "P:".

Drive Specifications NOT allowed

EXPLANATION: You answered a prompt by specifying both a drive name and a file name. You must specify the desired drive names when beginning the BRS session, before selecting an Operation from the Master Menu.

No Files Found For Entered Spec

EXPLANATION: You entered a file name that does not exist on the disk. Enter the name of an existing file.

Invalid User Number or Format

EXPLANATION: You entered a Selection File Specification with an invalid user number, or in an improper form. Enter the specification with a user number in the range 0-15.

Rejection Table is Full            Hit (CR) to Continue

EXPLANATION: You tried to enter more than 40 Rejection File Specifications. Enter a carriage return; then BRS will begin prompting for Selection File Specifications.

Directory is Full                    Must Enter RETURN!!

EXPLANATION: User attempted to perform a Backup or Restore Operation involving more than 2000 file names. User must enter a carriage return to access the Master Menu, and should perform a number of separate Backup or Restore Operations involving no more than 2000 files each.

Current Floppy Disk is Full  
Load Drive X: with a Blank Floppy Disk

EXPLANATION: BRS is executing a Backup Operation, and has filled a floppy disk. User should remove full disk, insert a blank floppy disk, and enter a carriage return to continue the Operation.

Submit File Not Found

EXPLANATION: User entered the name of a batch file that does not exist on the disk or partition involved in the Operation. User should enter the name of an existing batch file.

Drive not Available in Current Configuration

EXPLANATION: User specified a partition that has not yet been assigned, or a floppy disk that is not within the H/Z-67 drive model. User should specify an assigned partition or the floppy disk drive in the H/Z-67 drive model.

Data Miscompared at Record nnnn      Reading File

\*\*\*\* JOB ABORTED \*\*\*\*

Fatal Errors Have Occurred !!

Enter (CR) for Master Menu

EXPLANATION: Data within two compared files is not identical, and one of the discrepancies between the files occurs at the record indicated by "nnnn".

\*\*\*\* JOB ABORTED \*\*\*\*

Fatal Errors Have Occurred !!

Enter (CR) for Master Menu

EXPLANATION: BRS failed in an attempt to execute the selected Operation. Execution of the selected Operation ends. User should enter a carriage return to access the Master Menu, and repeat the Operation. If this error message occurs repeatedly, you should make a new copy of the BRS.COM file from the Distribution Disk.



Read Error Condition Code nn Reading File

\*\*\*\* JOB ABORTED \*\*\*\*

Fatal Errors Have Occurred !!

Enter (CR) for Master Menu

**EXPLANATION:** BRS failed in attempt to read data from a file. Execution of the selected Operation ends. User should enter a carriage return to access the Master Menu, and repeat the Operation. If this error message occurs repeatedly, you should make a new copy of the BRS.COM file from the Distribution Disk.

Write Error Occurred, Condition Code nn Writing File

\*\*\*\* JOB ABORTED \*\*\*\*

Fatal Errors Have Occurred !!

Enter (CR) for Master Menu

**EXPLANATION:** BRS failed in an attempt to write data to a Winchester Disk partition. Execution of the selected Operation ends. User should enter a carriage return to access the Master Menu, and repeat the Operation. If this error message occurs repeatedly, you should make a new copy of the BRS.COM file from the Distribution Disk.

Winchester Disk is Full. Allow 32k to Run Program

\*\*\*\* JOB ABORTED \*\*\*\*

Fatal Errors Have Occurred !!

Enter (CR) for Master Menu

**EXPLANATION:** During the Backup Operation, BRS makes a Master Directory of file names on the partition that is being backed up. If the Backup Operation involves a large number of file names, then the partition might not have space for the directory. Hence you must create more empty space on the partition. If this error occurs, you should enter a carriage return to access the Master Menu, exit from BRS to the CP/M Operating System, and erase (see ERA) enough data from the partition to create at least 32 kilobytes of unused storage space (see STAT). Then you can invoke BRS again and repeat the Backup Operation. During this Operation, you should enter 2000 or fewer Selection File Specifications.

Wrong Disk Inserted in Drive

Enter (CR) for Master Menu

**EXPLANATION:** BRS prompted you to insert Volume 01 (the Directory Disk), and the disk you inserted either was not a Volume 01 disk or was the Volume 01 disk of the wrong Backup Disk Set. Enter a carriage return at this prompt and the Master Menu will appear. At the Master Menu, you can select a BRS operation again.

Wrong Disk Inserted in Drive

LoadDrive X: with Volume nn of Backup Disk Set  
Enter Carriage Return When Ready

**EXPLANATION:** BRS prompted you to insert a specific volume (other than Volume 01) from your Backup Disk Set, and the disk you inserted either was not the specified volume or was the specified volume for a different Backup Disk Set. Insert the nnth volume of the appropriate Backup Disk Set and enter a carriage return.

# BSYSGEN

## *The Utility that Copies the Operating System Between Disks*

The BSYSGEN utility is used to transfer either part or all of the CP/M operating system to a disk, depending on the circumstances. Unlike the SYSGEN utility the BSYSGEN utility can **not** be used to copy the system kernel directly from memory to a disk after running a MOVCPMxx utility, although it can copy a file that was recorded by the SAVE command after execution of MOVCPM.

NOTE: Heath/Zenith releases of the CP/M Operating System consist of a system kernel and the file BIOS.SYS. To make a disk bootable, you must put the system kernel on the disk's system tracks and the file BIOS.SYS on the disk's file area. BSYSGEN will copy the system kernel under all circumstances, and the file BIOS.SYS under some circumstances.

BSYSGEN can be used by two methods: the BSYSGEN Prompt Method or the System Prompt Method.

# 1 BSYSGEN PROMPT METHOD

Under the BSYSGEN Prompt Method, you first load the BSYSGEN utility into computer memory, and then respond to BSYSGEN prompts that define the operation.

## 1.1 BSYSGEN Invocation

To begin under this method, type the following command at the system prompt:

```
A>B SYSGEN RETURN
```

The following display will appear:

```
BSYSGEN VER 2.0.04
SOURCE DRIVE NAME :
```

## 1.2 Specifying the Source

At the "SOURCE DRIVE NAME :" prompt, you can specify the drive containing the disk from which the system will be copied. Enter the letter that stands for that drive.

The following example shows how you would answer this prompt if the source of the system was to be the disk in drive A:

```
SOURCE DRIVE NAME (OR RETURN TO SKIP): A
```

NOTE: BSYSGEN can only copy the system between disks of the same type. Therefore, you can **not** enter a carriage return at this BSYSGEN prompt to copy a system that has been moved into computer memory by a MOVCPMxx utility. (If you do wish to copy the system from memory after a MOVCPMxx activity, use the SYSGEN utility.)

BSYSGEN will now prompt you to confirm your selection of the source drive, with a prompt in the following form:

```
SOURCE ON A, THEN TYPE RETURN:
```

You can confirm your specification of the source drive name by entering a carriage return at this prompt. You can also abort the BSYSGEN operation and return control to the operating system by holding down the **CTRL** key and pressing the **C** key.

If you confirm the “SOURCE ON” prompt with a carriage return, BSYSGEN will then display the message:

```
FUNCTION COMPLETE
COPY BIOS.SYS (Y/N):
```

### 1.3 Copying BIOS.SYS with BSYSGEN

To instruct BSYSGEN to copy the file BIOS.SYS from the source disk to the destination disk, press **Y** at the “COPY BIOS.SYS (Y/N):” prompt. If you do **not** wish to copy BIOS.SYS, press **N**.

NOTE: If you decline to copy the BIOS.SYS file using the BSYSGEN utility, you can copy it to a disk using the PIP utility or record a new one on a disk using the MAKEBIOS utility.

If you pressed **Y** to copy BIOS.SYS, BSYSGEN will display the message “FUNCTION COMPLETE”, and then prompt for destination. If you pressed **N** to forgo the copying of BIOS.SYS, BSYSGEN will immediately prompt for destination.

### 1.4 Specifying the Destination

A few seconds after you have made an entry at the “COPY BIOS.SYS” prompt, BSYSGEN will prompt for destination as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

The first time this prompt appears, you should type the drive letter for the disk that you wish to receive the system. For instance, type **B**. BSYSGEN would then display a prompt in the following form:

```
DESTINATION ON B, THEN TYPE RETURN
```

Confirm your destination specification by entering a carriage return at such a prompt.

BSYSGEN will again display the “DESTINATION DRIVE NAME (OR RETURN TO REBOOT):” prompt. This time, you can specify a different drive name, insert a new disk into the former destination drive and specify this drive again as the destination, or enter a carriage return to cause a warm boot. (A warm boot will exit you from the BSYSGEN utility to the CP/M Operating System. Then a system prompt will be displayed.)

## 2 SYSTEM PROMPT METHOD

The System Prompt Method enables you to enter all of the specifications necessary for a BSYSGEN operation in a single command line entered at the CP/M system prompt.

### 2.1 Command Line Entry

System Prompt Method BSYSGEN commands are entered in the following form:

```
A>BSYSGEN {destination}={source}{[option,option]} RETURN
```

Where **BSYSGEN** is the command line function, stored in the file BSYSGEN.COM on the logged disk;

where **{destination}** is the name of the drive that contains the disk receiving the copy of the system;

where **{source}** can be either a drive name, a file name, or both; and

where **{[option,option]}** represents letters enclosed in square brackets [] and separated by a comma , to specify how the BSYSGEN operation should be conducted.

NOTE: In a command line equation, the data source is always on the right and the data destination is always on the left.

### 2.2 System Sources

The system source can be one of the following four types:

- Drive Name, including a letter for a drive within your hardware environment and a colon, as with **A:, B:, C:, D:, E:, or F:;**
- File Name, which specifies a file that was created and stored by consecutive MOVCPMxx and SAVE commands, as with **CPM32.SYS, CPM48.SYS, or CPM64.SYS;** or
- Drive Name and File Name, where the file desired for the system kernel source resides on a disk in a non-default drive and the drive name must specify that drive, as with **B:CPM48.SYS** or **C:CPM64.SYS.**

## 2.3 BSYSGEN Options and Defaults

BSYSGEN command lines entered by the System Prompt Method can include the following options (enclosed in square brackets []):

- B** BIOS.SYS file will be copied with the system kernel, from the specified source to the specified destination. If a file named BIOS.SYS already exists on the destination disk, it will be overwritten.
- N** No prompt will be displayed during this operation.

When you enter a BSYSGEN command line with source and destination specifications, and neglect to specify options, BSYSGEN will perform the operation according to these default criteria:

- BIOS.SYS file will **not** be copied, regardless of the source of the rest of the system (unless option B is entered when source is not memory).
- Prompt **will** be displayed to confirm which drive will receive the copy of the system (unless option N is entered). The BSYSGEN prompt appears as shown:

```
BSYSGEN VER 2.0.04
```

```
DESTINATION ON B, THEN TYPE RETURN
```

## 2.4 System Prompt Method Examples

```
A>BSYSGEN B:= A: RETURN
```

BSYSGEN will copy the system kernel from the disk in drive A to the disk in drive B. The BIOS.SYS file from A will **not** be copied and a prompt **will** appear before the copying, by default.

```
A>BSYSGEN B:= D:[N] RETURN
```

BSYSGEN will copy the system kernel from the disk in drive D to the system tracks of the disk in drive B. The BIOS.SYS file will **not** be copied, by default. A prompt will **not** appear before the copying, as specified by the N option.

**A>D:BSYSGEN B:=C:CPM64.SYS[B,N] RETURN**

The BSYSGEN utility, in this case, is stored on the disk in non-default drive D. It will copy the system kernel from the file named "CPM96.SYS" (recorded onto the disk in drive C by the SAVE command after creation in memory by the MOVCPMxx command), and put it on the system tracks of the disk in drive B. It will also copy the BIOS.SYS file from drive C to drive B, and display no prompts during the operation, as specified by options.

### **3 BSYSGEN ERROR MESSAGES**

INVALID DRIVE NAME

EXPLANATION: You must specify drive names using the names of drives that exist in the hardware environment, and are recognized by the operating system that was loaded at bootstrap.

NO SOURCE FILE ON DISK

EXPLANATION: The drive specified as "SOURCE DRIVE" did not contain the file BIOS.SYS. You should use a different disk in the source drive, or rename a BIOS file that has been given a different name to "BIOS.SYS".

SOURCE FILE INCOMPLETE

EXPLANATION: BSYSGEN failed in an attempt to copy the file BIOS.SYS from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. Reset, perform bootstrap, and re-enter the BSYSGEN command using a different disk in the source drive.

WRITE ERROR DURING BIOS.SYS

EXPLANATION: Try BSYSGEN again with a destination disk that is write enabled, formatted, and has at least 6 kilobytes of free space.



## ERROR READING BIOS.SYS

EXPLANATION: BSYSGEN failed in an attempt to copy the file BIOS.SYS from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. Reset, perform bootstrap, and re-enter the BSYSGEN command using a different disk in the source drive or using a different disk to perform bootstrap.

## PERMANENT ERROR, TYPE RETURN TO IGNORE

EXPLANATION: The system kernel or BIOS.SYS file are either incompatible with the destination disk type or otherwise flawed. Reset, perform bootstrap, and re-enter the BSYSGEN command using a different disk in the source drive or using a different disk to perform bootstrap. Under some circumstances, you must use a MOVCPM utility before BSYSGEN.

## UNABLE TO SELECT DRIVE

EXPLANATION: Specify the name of a drive that can be accessed by BSYSGEN. Such a drive must be a valid drive that is recognized by the operating system.

## COMMAND SYNTAX ERROR

EXPLANATION: System Prompt Method command line was entered without following the entry form explained in "2.1 Command Line Entry". Enter command again after reviewing this entry form.

## ILLEGAL OPTION

EXPLANATION: System Prompt Method command line was entered with an option other than a B or an N. Re-enter command with either, none, or all of the BSYSGEN options B and N. Enclose the option(s) in square brackets and separate them with a comma if both are used.



# CONFIGUR

## *The Utility that Customizes the CP/M Operating System for Several Characteristics of the Hardware Environment*

The CONFIGUR utility helps you to change the CP/M Operating System so that it will control specific hardware devices.

When invoked (Section 1), CONFIGUR offers you two methods for changing the system: the Standard System Method (Section 2) or the Menu Selection Method (Section 3). The former method automatically changes the operating system to accommodate only certain devices. The latter method enables you to type selections at menus to change the system to accommodate a wide variety of hardware characteristics and/or your preferences (Sections 4 through 7).

CONFIGUR is usually run during the first session of CP/M use in a particular hardware environment. But it should also be run whenever a component of the hardware environment is added or changed.

NOTE: CONFIGUR always makes some changes to the image of the CP/M Operating System that was loaded into computer memory during bootstrap, but these changes are only recorded on the disk if the disk is not write protected. If the disk is write protected, then the changes will only remain in effect until the computer is reset.

Changing only the system image in memory and not the system on the disk is an effective way to test the changes that CONFIGUR makes to the system before recording these changes on a disk.

# 1 CONFIGUR INVOCATION

CONFIGUR is invoked by responding to the system prompt with a command line in the following form:

```
A>CONFIGUR RETURN
```

NOTE: Heath/Zenith CP/M Distribution Disks are preset at the factory so that the CONFIGUR utility will be invoked automatically when you perform bootstrap with the write-protected distribution disks. This automatic invocation feature can be changed (Section 7).

When invoked, CONFIGUR identifies itself with a display in the following form:

```
Heath/Zenith Configuration Program  
Version 2.2.04  
Serial Number: sss-ssss
```

```
This program configures the CP/M operating  
system to a particular hardware environment.
```

```
Please wait during hardware verification...
```

At this point, the CONFIGUR utility will probe parts of your hardware environment. After this probe, CONFIGUR displays some of the characteristics of some of your hardware devices, for example:

```
H/Z89 with 48k of random access memory (RAM)  
03 H/Z17 minifloppy drive(s)  
CRT baud rate is 9600  
00 additional serial ports found
```

This display differs depending upon the assortment of devices in your hardware environment. However CONFIGUR always notes the type of microcomputer, the terminal baud rate, and at least one type of disk drive.

If the disk with which you performed bootstrap is write protected, then CONFIGUR cannot make any changes to the operating system recorded on this disk, and displays the following message:

```
Drive A disk is write-protected.  
Modifications will NOT be made to this disk for this CONFIGUR run.
```

The bottom line of this display is a prompt that appears as follows:

```
Standard system (Y or N)? <Y>:
```

This prompt presents you with the choice of changing the system through the Standard System Method (Section 2) or through the Menu Selection Method (Section 3).

## 2 STANDARD SYSTEM METHOD

CONFIGUR can automatically apply limited changes to the operating system to allow the system to control your terminal, at least one type of disk drive, and a particular type of printer.

These standard system changes will be made if you enter the letter **Y** or a carriage return at the standard system prompt, as shown:

```
Standard system (Y or N)? <Y>: Y
```

The automatic standard system changes adjust the operating system so that it recognizes the hardware characteristics CONFIGUR found in its limited probe of the hardware environment.

In addition, the standard system changes adjust the operating system to recognize the following other criteria:

- A CRT: device set at a baud rate of 9600, will transfer data through port 350Q, with no nulls after carriage returns;
- A TTY: device set at a baud rate of 300, will transfer data through port 320Q, with no nulls after carriage returns, and without translating all letters to uppercase;
- A modem set at a baud rate of 300, will transfer data through port 330Q, with no nulls after carriage returns, and without translating all letters to uppercase;
- A printer set at a baud rate of 4800, will transfer data through port 340Q, with no nulls after carriage returns, and without printing all letters in uppercase;
- Use of the DELETE key will not cause characters to be echoed (repeated) on the console display;
- Serial Printer ready signal polarity will be set "LOW";
- Serial Printer ready signal will be carried by "RTS (Pin 4)";
- Parallel Printer ready signal polarity will be set "HIGH";
- A Z89-11 interface card's LPT device will facilitate "PARALLEL" data transmission;
- 5.25-inch disks will write 48 tracks per inch (tpi);
- 5.25-inch disk step rates are set to 30ms;
- Detailed disk error messages will not appear;
- The logical/physical device pairings (IOBYTE) are set as CON:=CRT:, RDR:=UR1:, PUN:=UP1:, and LST:=LPT:; and
- No program will be automatically invoked after the next warm or cold boot.

After you type **Y** at the "Standard system" prompt, CP/M immediately displays the system prompt.

### 3 MENU SELECTION METHOD

CONFIGUR also enables you to change the operating system through the Menu Selection Method, by typing selections that are listed on a series of menus.

Actually, CONFIGUR has already made a few automatic changes to reflect the hardware characteristics it found in its limited probe of your environment. But most users will benefit from making some additional changes through CONFIGUR menus. To begin making these changes, you should refuse the changes offered at the "Standard system" prompt by typing the letter N, as shown:

```
Standard system (Y or N)? <Y>: N
```

When an N is typed at this prompt, CONFIGUR will display the main menu, as shown:

```
CP/M Configuration

A   Set Terminal and Printer Characteristics
B   Set Disk Parameters
C   Change the Default I/O Configuration
D   Automatic Program Control

X   Configure, making changes to memory only
Y   Configure, making changes to both memory and disk
Z   Quit, making no changes
```

From CONFIGUR's main menu (shown above) you can access a submenu by typing one of the letters **A**, **B**, **C**, or **D**; or return to the system prompt by typing **X**, **Y**, or **Z**. Each submenu enables you to select changes or return to the main menu.

NOTE: If the disk you booted up with is write protected, the "Y" selection will not appear and you will not be able to make "changes to both memory and disk".

## 3.1 CONFIGUR Submenu Options

The following key describes the different uses for each of CONFIGUR's four submenus.

### Submenu A Option:

- To change the system baud rate and/or port address setting for a video terminal, printing terminal, printer, input modem or output modem;
- to change the treatment of lowercase letters sent to a video terminal, printing terminal, or printer;
- to change the number of nulls sent after each carriage return to a video terminal, printing terminal, or printer;
- to change the way a terminal treats characters that are deleted with the "DELETE" key;
- to change the voltage level (polarity) and/or the connection pin used for the "printer ready signal" between the terminal and either a serial printer or a parallel printer;
- to determine whether a Z89-11 interface card will use the LPT physical device for parallel or serial data transmission; and/or
- to return to the main menu while saving or ignoring the changes selected at this submenu.

### Submenu B Option:

- To change the step rate of 5.25-inch disk drives;
- to change the number of tracks per inch (tpi) used to store data on 5.25-inch soft-sectored disk drives;
- to turn on/off the display of detailed disk error messages; and/or
- to return to the main menu while saving or ignoring the changes selected at this submenu.

### Submenu C Option:

- To change the match-up of logical input/output devices with physical input/output devices; and/or
- to return to the main menu while saving or ignoring the changes selected at this submenu.



**Submenu D Option:**

- To turn on/off the automatic invocation of a command;
- to change the text of the command that should be invoked after every cold boot and/or after every warm boot; and/or
- to return to the main menu while saving or ignoring the changes selected at this submenu.

## 3.2 CONFIGUR Exit Options

By typing one of the **X**, **Y**, or **Z** options at the bottom of the main menu, you can exit from CONFIGUR to the CP/M Operating System. The following key describes the other functions of each exit option.

**Exit Option X:** You can apply the selected changes **only to the system in computer memory** by typing the letter **X** at the main menu.

**Exit Option Y:** You can apply the selected changes **both to the system in memory and the system on the disk** by typing **Y** at the main menu. However, this option will not be displayed if the disk used to perform bootstrap was write protected when CONFIGUR was invoked. Changes entered through CONFIGUR cannot be recorded on a write-protected disk.

**Exit Option Z:** You can **nullify all changes** selected at all of the sub-menus by typing **Z**.

When either **X**, **Y**, or **Z** is used to exit from CONFIGUR, the CP/M Operating System will display the system prompt beneath the main menu.

**NOTE:** The CONFIGUR utility can detect many invalid entries. If you make an invalid entry, the terminal might emit audible beeps or refuse to display a selection. In such a case, you should re-enter the selection.

## 4 SUBMENU A: TERMINAL/PRINTER CHARACTERISTICS

Typing **A** at the main menu selection prompt will cause CONFIGUR to display the following submenu:

```
A  CRT:  Baud rate: 9600 Port: 0E8H = 350Q
B  TTY:  Baud rate:  300 Port: 0D0H = 320Q
C  LST:  Baud rate: 4800 Port: 0E0H = 340Q
D  UR1:  Baud rate:  300 Port: 0D8H = 330Q
E  UP1:  Baud rate:  300 Port: 0D8H = 330Q

F  Force output to upper case on CRT: TRUE
G  Force output to upper case on TTY: FALSE
H  Force output to upper case on LST: FALSE
I  Nulls outputted after CR on CRT: 0
J  Nulls outputted after CR on TTY: 0
K  Nulls outputted after CR on LST: 0
L  Echo on DELETE:  TRUE

M  Serial Printer Ready Signal Polarity <HIGH,LOW>: LOW
N  Serial Printer Ready Signal <DTR (Pin20),RTS (Pin4)>: RTS
O  Parallel Printer Ready Signal Polarity <HIGH,LOW>: HIGH
P  Z89-11 LPT Selection <PARALLEL,SERIAL>: PARALLEL

Y  Finished, make changes and return to main menu
Z  Quit, make no changes and return to main menu
```

Selection:

(This sample display may differ from the displays of some users.)

The selections in submenu A enable you to do the following:

- Change the system baud rate and/or port address setting for a video terminal, printing terminal, printer, input modem or output modem;
- change the treatment of lowercase letters sent to a video terminal, printing terminal, or printer;
- change the number of nulls sent after each carriage return to a video terminal, printing terminal, or printer;
- change the way a terminal treats characters deleted with the “DELETE” key;
- change the properties of the printer ready signal; and
- change the voltage levels (polarity) and/or the connection pins used for the “printer ready signals”;
- select whether a Z89-11 interface card will use the LPT physical device for parallel or serial data transmission; and/or
- return to the main menu while saving or ignoring the changes selected at this submenu.

This text guides you through these operating system changes.

## 4.1 Change Baud Rate and/or Port Address

*(Selections A, B, C, D, and E)*

This section explains how to make baud rate and port address changes to physical devices. Users unfamiliar with these terms might benefit from reading the following explanations.

### PHYSICAL DEVICE NAMES

The four-character names in selections A through E (such as CRT: and TTY:) are physical device names. Physical Device Names are abbreviations by which you will identify a particular kind of hardware device, as shown:

- “CRT:” refers to video terminals (Cathode Ray Tube)
- “TTY:” refers to printing terminals (TeleTYpe)
- “LST:” refers to line printers (LiSTing device)\*
- “UR1:” refers to input modems (User-defined Reader 1)
- “UP1:” refers to output modems (User-defined Punch 1)

### BAUD RATE

Baud rate is the speed with which a physical device transmits or receives data. Since the CP/M operating system is responsible for controlling the passage of data between your devices, it must know how fast these devices are able to pass data.

The baud rate for a particular physical device is displayed on the line with that device’s physical name. (Valid baud rates are: 38400, 19200, 9600, 4800, 2400, 1800, 1200, 600, 300, 150, 134, 110, and 75.)

### PORT ADDRESSES

The CP/M operating system sends and receives data through electrical connections known as ports. A port address enables CP/M to locate a specific port through which it can access a device.

In the submenu A selections, port addresses are expressed in values from two different numbering systems: hexadecimal and octal. When the port address value is entered, it is in the form of either a hexadecimal number or an octal number. Some valid port values are: 320Q = 0D0H, 330Q = 0D8H, 340Q = 0E0H, and 350Q = 0E8H.

\* Actually, “LST:” is not a physical device name, but a logical device name. This distinction will be explained in Section 6. During submenu A operations, LST: should be treated as though it were a physical device name.

## HOW TO CHANGE BAUD RATES AND PORT ADDRESSES

To change a baud rate and/or port address, you should first determine what physical device names apply to the machines within the hardware environment (e.g. terminal, printer, modem). Considering each machine, one at a time, you should type the letter (A, B, C, D, or E) that corresponds to that machine.

A	CRT:	Baud rate:	9600	Port:	0E8H	=	350Q
B	TTY:	Baud rate:	300	Port:	0D0H	=	320Q
C	LST:	Baud rate:	4800	Port:	0E0H	=	340Q
D	UR1:	Baud rate:	300	Port:	0D8H	=	330Q
E	UP1:	Baud rate:	300	Port:	0D8H	=	330Q

This portion of submenu A (as it appears on your terminal) display shows the baud rate and terminal values currently used by the system. If a particular device does not currently work as it should, you should change it's baud rate to match the rate listed in Table 2-1. If a machine being used is not listed in Table 2-1, you should refer to that machine's manual.

If you have a Heath/Zenith microcomputer, then it should not be necessary to change the port address values. If you have a microcomputer other than one furnished by Heath/Zenith, then you should refer to the manual of the microcomputer used to determine the proper port addresses for each device.

You can start a change by typing one of the selection letters (A, B, C, or D). CONFIGUR will first display the corresponding physical device name and prompt you to enter the baud rate, as shown in the following example:

LST Baud rate:

The baud rate numbers must be entered carefully, because CONFIGUR anticipates certain baud rate values, and usually only needs to know the first digit or two before it assumes and displays the entire number.

Immediately after CONFIGUR accepts the baud rate value, it displays the word "Port:" and waits for you to enter the port address value, as shown:

```
LST Baud rate: 9600 Port:
```

This value must be entered in hexadecimal or octal values, but the "H" or "Q" radix symbol that usually accompanies values in these number systems is not necessary. If you do not wish to change the port address, a carriage return can be entered at this prompt.

When an entry is made at the "Port:" prompt, CONFIGUR will redisplay submenu A with any new values you entered.

NOTE: CONFIGUR changes only the operating system's **expectations** of a particular baud rate for a particular device. CONFIGUR does **not** change the baud rate of the device itself. The baud rate of a peripheral device can sometimes be changed according to instructions in the device's hardware manual.

If you wish to change the baud rate of the CRT: or TTY: (when one of these devices is used as the terminal), change the CRT: or TTY: value in submenu A first. Then, after exiting from CONFIGUR, manually change the baud rate of the terminal to match the selection made through CONFIGUR. (If the baud rate had been manually changed on the terminal first, you will be unable to use the terminal to communicate with CPM or CONFIGUR.)

This table illustrates the selection letter, baud rate, and port address you should enter for a particular hardware item. Some baud rates are subject to change. A device's hardware manual should be consulted to verify baud rates.

SELECTION LETTER	DEVICE NAME	DEVICE DESCRIPTION	INTERFACE	HEATH/ZENITH CATALOG NAME	BAUD RATE	PORT ADDRESS
A	CRT:	video terminal	Z-89-3	H/Z-19	9600	0E8H = 350Q
			Z-89-3	H/Z-89	9600	0E8H = 350Q
			Z-89-3	H/Z-90	9600	0E8H = 350Q
			Z-89-11	H/Z-19	9600	0E8H = 350Q
			Z-89-11	H/Z-89	9600	0E8H = 350Q
			Z-89-11	H/Z-90	9600	0E8H = 350Q
B	TTY:	printing terminal	Z89-3	LA-34 DECwriter (WH-34)	300	0D0H = 320Q
			Z89-3	LA-36 DECwriter (WH-36)	300	0D0H = 320Q
			Z89-3	Diablo KSR 1640	1200	0D0H = 320Q
			Z89-11	LA-34 DECwriter (WH-34)	300	0D8H = 330Q
			Z89-11	LA-36 DECwriter (WH-36)	300	0D8H = 330Q
			Z89-11	Diablo KSR 1640	1200	0D8H = 330Q
C	LST:	line printer	Z89-3	Heath H-14	4800	0E0H = 340Q
			Z89-3	Texas Instruments TI-810 (WH-24)	4800	0E0H = 340Q
			Z89-3	Heath/Zenith H/Z-25	4800	0E0H = 340Q
			Z89-3	LA-36 DECwriter (WH-36)	300	0E0H = 340Q
			Z89-3	Diablo 1640 (WH-44)	1200	0E0H = 340Q
			Z89-3	Diablo KSR 1640 (WH-44K)	1200	0E0H = 340Q
			Z89-3	Diablo 630 (WH-54)	1200	0E0H = 340Q
			Z89-3	Diablo 1610/1620/1650	1200	0E0H = 340Q
			Z89-3	Epson MX-80 (serial)	4800	0E0H = 340Q
			Z89-11	Heath H-14	4800	0E0H = 340Q
			Z89-11	Texas Instruments TI-810 (WH-24)	4800	0E0H = 340Q
			Z89-11	Heath/Zenith H/Z-25	4800	0E0H = 340Q
			Z89-11	LA-36 DECwriter (WH-36)	300	0E0H = 340Q
			Z89-11	Diablo 1640 (WH-44)	1200	0E0H = 340Q
			Z89-11	Diablo KSR 1640 (WH-44K)	1200	0E0H = 340Q
			Z89-11	Diablo 630 (WH-54)	1200	0E0H = 340Q
			Z89-11	Diablo 1610/1620/1650	1200	0E0H = 340Q
			Z89-11	Epson MX-80 (serial)	4800	0E0H = 340Q
Z89-11	Epson MX-80 (parallel)	none	not applicable			
D	UR1:	input modem		Novation CAT Acoustic (WH-13)	300	0D8H = 330Q
and	and	and		Lexicon LEX-11 (WH-23)	300	0D8H = 330Q
E	UP1:	output modem		UDS Direct Connect (WH-23)	300	0D8H = 330Q
				Hayes SMARTMODEM (WH-43)	300	0D8H = 330Q

Table 2-1  
Submenu A Baud/Port Values

## 4.2 Change Treatment of Lowercase Letters

*(Selections F, G, and H)*

This portion of submenu A involves three devices. These selections enable you to change the operating system so that it translates lowercase letters into uppercase letters before they are sent to an output device such as a video terminal (CRT:), printing terminal (TTY:), or printer (LST:).

```
F Force output to upper case on CRT: FALSE
G Force output to upper case on TTY: FALSE
H Force output to upper case on LST: FALSE
```

These three selections offer you only two alternatives: "TRUE" and "FALSE". Therefore, you merely have to type one of the letters (F, G, or H) to cause the opposite value to be displayed for that device.

When one of the displayed lines for a device ends with the word "TRUE", then CP/M will automatically translate all lowercase letters sent to that device into upper case (if you choose to save these changes to the system).

This type of letter translation is necessary for devices that can produce only uppercase letters (such as the H9 video terminal). You should consult a device's hardware manual to determine whether it can produce lowercase letters.

### 4.3 Change Number of Nulls Sent After Carriage Returns

*(Selections I, J, and K)*

This portion of submenu A involves three devices. These selections enable you to change the operating system so that it sends a specified number of null characters to a particular device after each carriage return that is sent to that device.

```
I   Nulls outputted after CR on CRT: 0
J   Nulls outputted after CR on TTY: 0
K   Nulls outputted after CR on LST: 0
```

You can start a change to the number of nulls by typing one of the selection letters (I, J, or K). CONFIGUR will display a prompt for the selected device, as shown:

```
Nulls after CR on LST :
```

You should then answer this prompt with a number from zero to seven, depending on the number of nulls the device requires. CONFIGUR will immediately redisplay submenu A, showing any changes you made to the null settings.

Video terminals, printing terminals, and printers sold by Heath/Zenith require zero nulls after each carriage return. Users with devices not obtained through Heath/Zenith should consult the devices' hardware manuals to determine the number of nulls the devices requires.



## 4.4 Change Terminal Treatment of Deleted Characters

*(Selection L)*

The "L" selection from submenu A involves the video terminal (CRT:) or printing terminal (TTY:) device. These selections enable you to change the operating system so that it causes the terminal to redisplay characters deleted with the "DELETE" key ("DLT" key on some terminals). The display will be activated if the "L" line ends with the word "TRUE".

```
L Echo on DELETE: TRUE
```

This selection offers you only two alternatives values: "TRUE" and "FALSE". Therefore, you merely have to type the letter L to cause a different alternative to be applied to the operating system (if you choose to save these changes). When you type L, submenu A is redisplayed with the new value.

The "Echo on DELETE" feature is often desired by users of printing terminals, but seldom desired by users of video terminals that can back space.

**NOTE:** This feature is automatically put into effect (becomes "TRUE") whenever the MOVCPMxx and SYSGEN utilities are run, and it is disabled (becomes "FALSE") when **any** changes made by the CONFIGUR utility are saved to memory or to disk.

## 4.5 Change Properties of Printer Ready Signal (Selections M, N, O, and P)

This portion of submenu A enables you to change the operating system's expectations of the Printer Ready Signal and the ports used to communicate with a printer through the Z89-11 interface card.

```

M   Serial Printer Ready Signal Polarity <HIGH,LOW>: LOW
N   Serial Printer Ready Signal <DTR (Pin 20),RTS (Pin 4)>: RTS
O   Parallel Printer Ready Signal Polarity <HIGH,LOW>: HIGH
P   Z89-11 LPT Selection <PARALLEL,SERIAL>: PARALLEL

```

These selections involve the electrical signal that a printer sends, through a cable, to the computer when it is ready to print more data. This signal is called the "printer ready signal".

The printer ready signal is sent at a certain "polarity" (level of voltage). It can be sent at a "HIGH" voltage level or a "LOW" voltage level, depending on the kind of printer being used.

By typing **M**, the user of a **serial** printer can change the operating system's expectations of a particular voltage level from a serial printer.

Most serial printers available through Heath/Zenith send this signal at the "LOW" voltage level. However, to determine appropriate voltage level setting for a particular printer, you should refer to the printer's manual.

The serial printer ready signal travels through a special cable identified by the model number "RS-232C". This cable contains a bundle of wires, each connecting a pair of metal "pins". (One member of this pin pair plugs into the computer, and the other member plugs into the printer.) Because each pin carries a specific kind of signal between the printer and the computer, each pin is numbered. And the pin that helps transmit the printer ready signal is either pin number 20 or pin number 4, depending on the kind of printer being used.

By typing **N**, the user of a serial printer can change the operating system's expectations of which numbered pin will transmit the printer ready signal from a serial printer. The system will expect this signal to come in either the Data Terminal Ready fashion (DTR through Pin 20), or in the Ready To Send fashion (RTS through Pin 4) To determine which pin in the RS-232C cable a particular serial printer uses for the printer ready signal, refer to the serial printer's manual.

By typing **O**, the users of a parallel printer can change the operating system's expectations of a particular voltage level from a parallel printer.

Most parallel printers available through Heath/Zenith send this signal at the "HIGH" voltage level. However, to determine appropriate voltage level setting for a particular printer, refer to the printer's manual.

The Z89-11 interface card (available with this CP/M version) is capable of data transmission to and from either serial or parallel printers through the LPT physical device. However, the type of printer used must be specified through the **P** selection.

By typing **P**, you can change the specification of which kind of printer (serial or parallel) will be used.

When you type the letter for any of these four selections, the opposite value goes into effect (if you save this change). In addition, CONFIGUR redisplays submenu A with the newly selected values in place.

## 4.6 Return to Main Menu

*(Selections Y and Z)*

These submenu A selections enable you to exit from the submenu to the main menu.

- Y Finished, make changes and return to main menu
- Z Quit, make no changes and return to main menu

By typing **Y**, you also instruct CONFIGUR to preserve the selections entered at submenu A (although none of the changes from any submenu can be applied to the operating system until you exit from the CONFIGUR utility entirely).

By typing **Z**, you instruct CONFIGUR to abandon any changes entered at submenu A.

After either of these entries, CONFIGUR will redisplay the main menu, as shown:

```
CP/M Configuration

A  Set Terminal and Printer Characteristics
B  Set Disk Parameters
C  Change the Default I/O Configuration
D  Automatic Program Control

X  Configure, making changes to memory only
Y  Configure, making changes to both memory and disk
Z  Quit, making no changes
```

You can now access a submenu or exit from CONFIGUR entirely.

**NOTE:** If the disk being configured is write protected, the Y selection from the main menu will not be available, and changes cannot be recorded on disk.

## 5 SUBMENU B: SET DISK PARAMETERS

Typing **B** at the main menu selection prompt will cause CONFIGUR to display the following submenu:

```
A  5.25 Inch Soft Sector'd Unit 0  Step Rate: 30ms  Track Density: 48tpi
B  5.25 Inch Soft Sector'd Unit 1  Step Rate: 30ms  Track Density: 48tpi
C  5.25 Inch Soft Sector'd Unit 2  Step Rate: 30ms  Track Density: 48tpi

D  5.25 Inch Hard Sector'd Unit 0  **undefined**
E  5.25 Inch Hard Sector'd Unit 1  **undefined**
F  5.25 Inch Hard Sector'd Unit 2  **undefined**
G  Detailed Disk Error Messages:  FALSE

Y  Finished, make changes and return to main menu
Z  Quit, make no changes and return to main menu
```

(This display might differ slightly for some users.)

The selections in submenu B enable you to do the following:

- Change the step rate of 5.25-inch disk drives;
- change the number of tracks per inch (TPI) for 5.25-inch soft-sector'd disk drives;
- turn on/off the display of detailed disk error messages; and/or
- return to the main menu while saving or ignoring the changes selected at this submenu.

## 5.1 Change 5.25-inch Disk Step Rate

This text explains how you can change the step rate and/or track density for 5.25-inch disk drives. Users unfamiliar with disk drive technology might benefit from the brief explanations provided here.

### DISK DRIVE UNIT

A disk drive unit is a single physical disk drive, or one of the drive slots visible to you. Each of the 5.25-inch disk drive slots (within each disk drive group) are given distinct unit numbers from zero through two.

CONFIGUR automatically tries to find out how many disk drive units are connected to the computer when it probes the hardware environment. If CONFIGUR finds that an environment contains a particular unit, it will reflect these findings by displaying a step rate (ms) value next to that unit in submenu B. If CONFIGUR does not find a particular unit, then CONFIGUR will display the word “\*\*undefined\*\*” next to the corresponding unit in submenu B.

NOTE: If you have both hard-sectored and soft-sectored 5.25-inch drives, and have not yet run the MAKEBIOS program for the operating system in use, then this operating system only acknowledges one type of 5.25-inch drive in the hardware environment. Therefore, CONFIGUR could only find one type of drive during its hardware probe, and submenu B will show all three units for one type of drive as “\*\*undefined\*\*”.

### STEP RATE

Step rate is the rate of speed at which the read/write head moves from one track of a disk to another while reading or writing data. Step rates are measured in thousandths of a second, or milliseconds (ms).

Step rates can range from 4 to 36 milliseconds, where 4ms is faster than 36ms. Only even numbered step rates can be entered. A faster step rate can hasten the transfer of data to and from the disk, but it might also cause the read/write head to move across the disk too fast to transfer data reliably.

With CP/M Version 2.2.04, Heath/Zenith recommends that the step rate be left at the preset step rate of 30ms for most work with 5.25-inch hard-sectored disks (which run under the H17 controller card).

Heath/Zenith recommends that 5.25-inch soft-sectored drives (which run under the H37 controller card) be set to operate at a step rate of 30ms when the disks used are 48 tpi, and 6ms when the disks used are 96 tpi. (“tpi” is an acronym meaning “tracks per inch”.) Users who change the operating system to run disks at other step rate should first read the text on Step Rate Error Checking.

The step rate for 8-inch disks cannot be changed through CONFIGUR.

### **STEP RATE ERROR CHECKING**

To check the current disk error rate, use the DDT utility (Dynamic Debugging Tool) and examine the value of the SECNT label in the BIOS that is active in memory. You can determine the address at which this value exists, by assembling BIOS.ASM, producing a BIOS.PRN file during the assembly, and analyzing the BIOS.PRN file for the address of the SECNT label you wish to check. The SECNT value shows the number of soft (recoverable) errors that have occurred in read/write operations with the disk. This value needs to be maintained at a relatively low level. If the value becomes too large, the step rate should be increased so that the read/write head is allowed additional time to step from track to track while reading or writing.

### **TRACK DENSITY**

There are two types of 5.25-inch soft-sectored disk that can be used in an H/Z-37 drive unit: a “48 tpi disk” and a “96 tpi disk”. The distinction between the two lies in their track density, or the number of tracks per inch (tpi) that cover the surface of the disk.

The 48 tpi disk has a total of 40 tracks, while the 96 tpi disk has a total of 80 tracks. Each H/Z-37 drive unit must be set to accommodate the type of disk used in it. This setting will determine the manner in which the FORMAT utility prepares disks in that drive, and thus the manner in which data is stored on these disks.

## HOW TO CHANGE STEP RATES AND/OR TRACK DENSITIES

To change the step rate for a 5.25-inch disk, you must first type the selection letter (**A**, **B**, **C**, **D**, **E**, or **F**) for a disk drive unit that currently has a step rate number listed next to it.

```

A   5.25 Inch Soft Sectored Unit 0 Step Rate: 30ms Track Density: 48tpi
B   5.25 Inch Soft Sectored Unit 1 Step Rate:  30ms Track Density: 48tpi
C   5.25 Inch Soft Sectored Unit 2 Step Rate:  30ms Track Density: 48tpi

D   5.25 Inch Hard Sectored Unit 0 **undefined**
E   5.25 Inch Hard Sectored Unit 1 **undefined**
F   5.25 Inch Hard Sectored Unit 2 **undefined**

```

**NOTE:** The selection letters in submenu B do not necessarily correspond to the drive name letters of the drive units.

When you type a selection letter, CONFIGUR will display a prompt in the following form:

```
Soft Sector Unit 0 Step Rate ?
```

You can now enter a number for the new step rate of the selected drive unit, and a carriage return. If you selected a hard-sector drive unit, then any even number from 4 through 36 can be entered (at your own risk). If you selected a soft-sector drive unit, then only the numbers 30, 20, 12, or 6 can be entered.

After you enter a step rate number and carriage return, CONFIGUR displays a prompt for a track density change, as shown:

```
Soft Sector Unit 0 Track Density ?
```

At this prompt, you should enter either **48** or **96** (depending on the desired density for the specified unit) and a carriage return.

After the carriage return, CONFIGUR will redisplay submenu B with the newly entered step rate and/or track density.

**NOTE:** Heath/Zenith recommends that a step rate of 30 be applied to drives controlling 48 tpi disks, and that a step rate of 6 be applied to drives controlling 96 tpi disks.



## 5.2 Turn On/Off Detailed Disk Error Messages

Most users will encounter error messages at some time during use of the CP/M Operating System. However these error messages are usually brief and general in their description of the problem that occurred. By causing submenu B selection G to indicate "TRUE", you can change the operating system so that it displays a code with each operating system error message. This code includes a two-digit hexadecimal number that can be translated into a more detailed explanation of the problem.

```
G   Detailed Disk Error Messages: FALSE
```

This selection offers you only two alternative values: "TRUE" and "FALSE". Therefore, you merely have to type the letter G to cause the opposite alternative to be applied to the operating system (if you choose to save these changes). When you type G, submenu B is redisplayed with the new value.

More information about detailed error messages is available in Appendix A.

## 5.3 Return to Main Menu (Selections Y and Z)

These submenu B selections enable you to exit from the submenu to the main menu.

```
Y   Finished, make changes and return to main menu
Z   Quit, make no changes and return to main menu
```

By typing Y, you also instruct CONFIGUR to preserve the selections entered at submenu B (although none of the changes from any submenu can be applied to the operating system until you exit from the CONFIGUR utility entirely).

By typing Z, you also instruct CONFIGUR to abandon any changes entered at submenu B.

After either of these entries, CONFIGUR will redisplay the main menu, as shown:

```
CP/M Configuration

A   Set Terminal and Printer Characteristics
B   Set Disk Parameters
C   Change the Default I/O Configuration
D   Automatic Program Control

X   Configure, making changes to memory only
Y   Configure, making changes to both memory and disk
Z   Quit, making no changes
```

You can now access a submenu or exit from CONFIGUR entirely.

NOTE: If the disk being configured is write protected, the Y selection from the main menu will not be available, and it will not be possible to record changes from this CONFIGUR session on the disk.

## 6 SUBMENU C: CHANGE THE DEFAULT I/O CONFIGURATION

Typing C at the main menu selection prompt will cause CONFIGUR to display the following submenu:

```
A   CON: = CRT: Available TTY: CRT: BAT: UC1:
B   RDR: = UR1: Available TTY: PTR: UR1: UR2:
C   PUN: = UP1: Available TTY: PTP: UP1: UP2:
D   LST: = LPT: Available TTY: CRT: LPT: UL1:

Y   Finished, make changes and return to main menu
Z   Quit, make no changes and return to main menu
```

Selection:

(This sample display might differ from the user's display.)

The menu shows how the CP/M Operating System currently matches logical device names with physical device names. Immediately to the right of the current devices are lists of other available devices.

The selections in submenu C enable you to do the following:

- Change the selection of logical input/output devices with physical input/output devices; and/or
- Return to the main menu while saving or ignoring the changes selected at this submenu.

## **6.1 Change the Logical/Physical Device Selection**

*(Selections A, B, C, and D)*

This portion of submenu C enables you to match logical devices with the appropriate physical devices. These selections are essential to inform the operating system of how the different components of the hardware environment are connected.

A logical device name is the most general name used for a category of hardware items. Therefore, each logical device name can apply to a wide range of hardware items. However, CP/M uses only four logical device names. And all input/output machines within the hardware environment must be matched up with these four names.

You match a specific hardware item to a logical device name indirectly, by using a physical device name as an intermediate name. A physical device name is more specific than a logical device name.

Table 2-2 will help you to determine which physical device names can be matched with which logical device names.

**NOTE:** The suggestions in this table may become invalid if you change device port addresses.

This table suggests which physical devices can be matched up with each logical device, based on the kind of hardware product you have.

SUBMENU C SELECTION LETTER	LOGICAL DEVICE NAME	PHYSICAL DEVICE NAME	DESCRIPTION AND/OR CATALOG NAME OF RECOMMENDED INPUT/OUTPUT MACHINE
A	CON:	TTY:	Any non-handshaking RS-232 ASCII terminal at port 0D0H
		CRT:	Any non-handshaking RS-232 video terminal at port 0E8H
		BAT:	A pseudo batch device using RDR: for input and LST: for output
		UC1:	Any handshaking RS-232 terminal with ETX/ACK protocol, eg. Diablo KSR 1640 printing terminal
B	RDR:	TTY:	Any non-handshaking RS-232 ASCII terminal at port 0D0H
		PTR:	Null source, not implemented, returns an "end-of-file" character when accessed
		UR1:	Any non-handshaking serial device at port 0D8H (eg. a modem)
		UR2:	System terminal
C	PUN:	TTY:	Any non-handshaking RS-232 ASCII terminal at port 0D0H
		PTP:	Null sink, not implemented
		UP1:	Any non-handshaking serial device at port 0D8H (eg. a modem)
		UP2:	System terminal
D	LST:	TTY:	Any non-handshaking RS-232 ASCII terminal at port 0D0H (eg. WH-34)
		CRT:	Any non-handshaking RS-232 video terminal at port 0E8H
		LPT:	Serial printer with hardware handshaking (at port 0E0H) or parallel printer (at port 0D0H)
		UL1:	Any handshaking RS-232 printer with ETX/ACK protocol (eg. a Diablo printer)

Table 2-2

You can start a device assignment change by typing any of the selection letters (A, B, C, or D). CONFIGUR will display the logical device name and the "=" sign for the selected letter, in the following form:

LST: =

At a prompt such as this, enter the first three letters of the new physical device assignment. (No colon or carriage return is necessary.) CONFIGUR will redisplay submenu C with the new assignments.

NOTE: The logical/physical device assignments displayed on CONFIGUR's submenu C can be temporarily changed outside of CONFIGUR, by using the STAT utility, as explained in the text on STAT.

## 6.2 Return to Main Menu

*(Selections Y and Z)*

These submenu C selections enable you to exit from the submenu to the main menu.

- Y Finished, make changes and return to main menu
- Z Quit, make no changes and return to main menu

By typing **Y**, you also instructs CONFIGUR to preserve the selections entered at submenu C (although none of the changes from any submenu can be applied to the operating system until you exit from the CONFIGUR utility entirely).

By typing **Z**, you instruct CONFIGUR to abandon any changes entered at submenu C.

After either of these entries, CONFIGUR will redisplay the main menu, as shown:

- ```
CP/M Configuration

A  Set Terminal and Printer Characteristics
B  Set Disk Parameters
C  Change the Default I/O Configuration
D  Automatic Program Control

X  Configure, making changes to memory only
Y  Configure, making changes to both memory and disk
Z  Quit, making no changes
```

You can now access a submenu or exit from CONFIGUR entirely.

NOTE: If the disk being configured is write protected, the Y selection from the main menu will not be available, and changes cannot be recorded on disk.

## 7 SUBMENU D: AUTOMATIC PROGRAM CONTROL

Typing **D** at the main menu selection prompt will cause CONFIGUR to display the following submenu:

```
A  Run automatic command line on Cold Boot: TRUE
B  Run automatic command line on Warm Boot: FALSE
C  Automatic command line: CONFIGUR
Y  Finished, make changes and return to main menu.
Z  Quit, make no changes and return to main menu.
```

Selection:

(This sample might differ slightly from the user's display.)

The selections in submenu D enable you to do the following:

- Turn on/off the automatic invocation of a command;
- change the command that should be automatically invoked after every cold boot and/or warm boot; and/or
- return to the main menu while saving or ignoring the changes selected at this submenu.

### 7.1 Turn On/Off Automatic Command Invocation

*(Selections A and B)*

This portion of submenu D enable you to change the operating system so that it starts running a command automatically, after a cold boot or warm boot.

```
A  Run automatic command line on Cold Boot: TRUE
B  Run automatic command line on Warm Boot: FALSE
```

These selections each offer you only two alternative values: "TRUE" and "FALSE". Therefore, you merely have to type the letter **A** or **B** to cause the opposite value to be immediately displayed.

## 7.2 Change Automatic Command Line

*(Selection C)*

This submenu D selection enables you to change (or add) the command that can be automatically invoked upon a cold boot or warm boot.

C Automatic command line: CONFIGUR

To start this change, you must first type C. CONFIGUR will display the following prompt:

Automatic command line:

You can now enter any valid CP/M command line that ends with a carriage return. After you enter the carriage return, CONFIGUR will redisplay submenu D with the new automatic command line.

Any valid resident command, transient command (utility), or application program is acceptable in the automatic command line. However, any file that the command line refers to must reside on the disk specified in the command line. For example, if the line reads:

C Automatic Command Line: B:SC

Then the file "SC.COM" must reside on the disk in drive "B:" for the command to work. If any data referenced in the command line cannot be found in the specified drives, then command execution will be aborted and an error message will be displayed.

NOTE: We recommend that you do not cause a command to be run automatically on **both** a cold boot and a warm boot if this command performs a warm boot as it finishes execution. Doing so would cause the command to execute on cold boot, then execute again whenever you tried to exit to the operating system. Thus no activities outside of this command would be possible when you booted up with this disk.

### 7.3 Return to Main Menu *(Selections Y and Z)*

These submenu D selections enable you to exit from the submenu to the main menu.

- Y Finished, make changes and return to main menu
- Z Quit, make no changes and return to main menu

By typing **Y**, you also instruct CONFIGUR to preserve the selections entered at submenu D (although none of the changes from any submenu can be applied to the operating system until you exit from the CONFIGUR utility entirely).

By typing **Z**, you also instruct CONFIGUR to abandon any changes entered at submenu D.

After either of these entries, CONFIGUR will redisplay the main menu, as shown:

```
CP/M Configuration

A Set Terminal and Printer Characteristics
B Set Disk Parameters
C Change the Default I/O Configuration
D Automatic Program Control

X Configure, making changes to memory only
Y Configure, making changes to both memory and disk
Z Quit, making no changes
```

You can now access a submenu or exit from CONFIGUR entirely.

**NOTE:** If the disk being configured is write protected, the Y selection from the main menu will not be available, and changes cannot be recorded on disk.



## 8 CONFIGUR ERROR MESSAGES

Unable to open BIOS.SYS

**EXPLANATION:** The CONFIGUR utility is trying to access the file BIOS.SYS (since this file is part of the operating system) but the file is not present. You must have a BIOS.SYS file (by that name) on the disk being used for bootstrap. This file must be for the appropriate version of CP/M, and it must have the ability to control the disk devices being used.

INCONSISTENT Version number. . .can NOT configur!!

**EXPLANATION:** You must implement CONFIGUR program with same version number as the CP/M Operating System being used.

INCONSISTENT version number or CONFLICTING program in memory. . .  
can NOT configure!!

**EXPLANATION:** You must implement CONFIGUR program with same version number as the CP/M Operating System being used.

Drive A disk is write protected.

Modifications will NOT be made to the disk for this CONFIGUR run.

**EXPLANATION:** To make CONFIGUR changes go into effect, the disk used to perform bootstrap should be write enabled, by removing the adhesive tab from a 5.25-inch disk or by adhering the adhesive tab to an 8-inch disk.



# DDT

## *The Dynamic Debugging Tool*

This text assumes that you are familiar with assembly language programming, the hexadecimal number system, and 8080 CPU registers. Caution is advised when using DDT.

The Dynamic Debugging Tool (DDT) utility enables you to debug machine language programs (files with the extension "HEX" or "COM"). DDT loads a program into the Transient Program Area of the computer's memory (1). During a debugging session, the utility exposes and manipulates the hexadecimal, assembly language, and ASCII forms of the loaded program when you implement the special DDT commands (3). You can copy the results of the debugging session to a disk file by exiting from DDT and implementing the SAVE resident command (2).

# 1 DDT INVOCATION

The DDT utility can be invoked using two methods.

## 1.1 System Prompt Invocation Method

You respond to the system prompt with a command line in the form:

```
A>DDT {file name} RETURN
```

Where **{file name}** is the complete name of a program file residing on the default disk with a "HEX" or "COM" extension. This file is automatically loaded into the computer's memory beginning at address 100H (the Transient Program Area start.)

DDT will identify itself with the message:

```
DDT VERS n. n
NEXT PC
aaaa pppp
-
```

Where "n. n" is the utility's version number;

where "aaaa" is the next available memory address after the program is loaded (or the address after the last address occupied by the loaded program);

where "pppp" is the current position of the program counter within the Transient Program Area (this value is 0100 when the program is first loaded into memory); and

where "-" (the hyphen character) is the DDT prompt, at which you can enter special DDT commands.

Because DDT loads programs into the Transient Program Area beginning at address 0100, you can approximate a program's size by subtracting 0100 from the "aaaa" value in the display.