RC855 Work Station
Users Guide

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RC855 Work Station
User's Guide

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Abstract: This manual describes how to install and operate the CP/M operating system on the RC855 Work Station.

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1. INTRODUCTION

The interface between the RC855 Work Station and its user is the CP/M operating system. CP/M provides the user with a flexible and manageable means of control over the resources of the work station. Specifically:

- CP/M creates an orderly and consistent input/output environment for the various units of the work station to operate in. These units include the console, disk drives, hard disk and printer.

- CP/M allows the user to find out what files (programs and data) are on a disk, how large the files are, and how much space is left on the disk. CP/M also handles the writing and reading of information to and from the disk.

- CP/M provides for the loading and execution of user programs. These programs include utility programs for various "housekeeping" tasks as well as applications packages, for example, a word-processing system, mailing-list system, or accounting system.

The present User's Guide gives a brief description of the CP/M operating system available for the RC855 Work Station. Those wishing a complete description of CP/M should consult the Digital Research manuals listed in appendix A (ref. [1]). The User's Guide also contains reference material for the RC855 implementation of CP/M, which, besides the RC855 BIOS, includes several additional utility programs. CP/M and the RC855 implementation of CP/M are described in more detail below.

Chapter 2 explains how to get started using CP/M, and chapter 3 how CP/M "works" in general. After having read these two chapters, the user will be able to run programs on the RC855 Work Station, as described in chapter 4.

1.1 CP/M

CP/M (Control Program/Microprocessors) is a software system designed to record and retrieve programs and data on disks. Like other software systems, it is a collection of interrelated programs which perform specific tasks within the system. CP/M operates with 8080 and Z80 microprocessors and is largely independent of the design of the computer and disk system. It has therefore been adopted for use with most computers employing the 8080 and Z80 families of microprocessors. CP/M is today the industry standard in operating systems for small computers, and a multitude of high-level languages and applications software has been designed to run under its control.

CP/M is divided into four main parts:

CCP

The Console Command Processor, or CCP, is the interface between the user's console and CP/M. The CCP executes its own, built-in commands to

- list the filenames in a directory,
- delete a file,
- rename a file,
- display the contents of a text file, and
- save a copy of the memory contents in a file.

The CCP also executes transient commands to control the operation of various programs. The built-in and transient commands are described in chapter 4.

BDOS

The Basic Disk Operating System, or BDOS, provides disk and file management capabilities and dynamic file allocation. In addition, the BDOS executes primitive operations to

- select a disk drive for further operations,
- create a file entry and prepare for opening,
- open a file for further operations and read in the file control block,
- close a file and write out the file control block,
- search for a disk file by name,

- delete a filename and free the allocated disk space,
- rename a file,
- read a record from a file, and
- write a file record to a disk.

TPA

The Transient Program Area, or TPA, holds programs loaded from disk under control of the CCP. The TPA is found between random-access memory address 0100H ("H" denotes the hexadecimal radix) and the starting address of the CCP. A program executing in the TPA can overlay the memory areas occupied by other parts of CP/M in order to use them as its data area. The complete CP/M system is reloaded from disk, if the transient program branches to the bootstrap loader at the end of execution.

BIOS

The Basic I/O System, or BIOS, defines the particular hardware environment in which CP/M will operate and performs logical device mapping. The BIOS includes a buffer manager and the primitive operations necessary to interface standard peripherals, such as CRT terminals, printers, and disk drives. An example of patching a customized BIOS into CP/M is given in appendix C.

For a full discussion of these matters, see ref. [1], chapters 5 and 6.

1.2 RC855 CP/M 1.2

The CP/M system supplied for the RC855 Work Station is a 56K CP/M version 2.2 with 50.75 K bytes available for transient programs. The system supports either one or two 8-inch diskette drives, each with a capacity of 1124 K bytes, or one or two 5.25 inch diskette drives, each with a capacity of 780 K bytes. In addition, the system supports a hard disk with a capacity of up to 10,084 K bytes. The diskette formats are described in appendix E, and the hard disk is described in appendix G.

The CP/M disk drives A and B (ref. [1], 1.2) are supported as the RC855 flexible disk drives 1 and 2, respectively. The CP/M disk drives C-G are supported on the hard disk. The RC855 printer port is supported as the CP/M output list device, LST (ref. [1], 1.6.1). The RC855 line port is supported as the CP/M reader/punch devices, RDR and PUN (ref. [1], 1.6.1). Further information on peripheral support is given in appendix F.

The system does not support the IOBYTE function nor the modification of logical-physical device assignments by the STAT command (ref. [1], 1.6.1).

The system does not include the MOVCPM program (ref. [1], 1.6.9).

The RC855 implementation of CP/M, release 2.0, includes all patches from Digital Research up to and including patch No 9 of February 11, 1982.

2. INSTALLING CP/M

The CP/M package for the RC855 Work Station contains:

a. This manual.

b. The Digital Research manual:
CP/M Operating System manual

c. Diskette containing your CP/M system (this will henceforth be referred to as the System Diskette).

d. Software License Agreement and Registration Card.

Your copy of the CP/M system for the RC855 is provided with a serial number and is licensed for your use only on a single RC855 Work Station. Therefore, before opening the diskette package, please read the Software License Agreement carefully and fill in and return the Registration Card.

Do not write on the original distribution diskette. It is your master copy and last resort in the event of errors. Start by making a backup copy of this diskette as described in section 2.3. It may be wise to keep an additional backup copy in a safe place.

2.1 Notational Conventions in This Manual

The following notational conventions apply in the examples presented in this manual:

- A comment is preceded by a semicolon (;).
- Keyboard input is underscored.
- A "cr" indicates that the "RETURN" key is pressed.

Note that the "RETURN" key is marked ↵ on the RC855 keyboard.

2.2 How to Start the System 2.2

The following procedure will load the CP/M system from disk into the RC855 random-access memory. This system bootstrap operation is also known as a system boot, cold boot, or cold start.

- Turn on the disk drive(s).
- Turn on the console.
- Insert the System Diskette in drive A (drive 1).
- Wait for the following sign-on message to be displayed:

```
RC855 56k CP/M 2.2
A>
```

This message indicates that CP/M is ready to accept a command (ref. [1], 1.2). The message may include the warning "Hard Disk: not configured." This warning can be disregarded for the moment.

Note: To stop the system, remove all disks and then turn off the drives and console.

2.3 How to Copy the System Diskette 2.3

This section shows how to copy the System Diskette. The utility programs FORMAT and BACKUP are used. Both programs are fully described in chapter 4.

2.3.1 Two-Drive System 2.3.1

Start by formatting a fresh diskette for the copy. Insert the System Diskette in drive A (drive 1) and the new diskette in drive B (drive 2) and proceed as follows:

```
A>FORMAT cr
RC855 FORMAT
Disk formats:  1 - 8" Single Sided/Single Density
               2 - 8" Double Sided/Double Density
```

```
Select disk format (1/2) 2
Select drive (A/B) B
Insert disk to format, then press <return> cr
Format disk in drive B (y/n) Y
Number of formatted tracks 077
Format completed
Format another disk (y/n) N
Insert CP/M System Disk in drive A, then press <return> cr
A>

;continue with BACKUP

A>BACKUP cr
RC855 BACKUP
Source Drive (A/B/C): A
Destination drive (A/B/C): B
Insert SOURCE disk, then press <return> cr
Insert DESTINATION disk, then press <return> cr
Verifying copy
BACKUP complete
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

Please note that the prompt for the disk format only appears when 8 inch disk drives are used. 5.25 inch disk drives are by default set to double sided/double density. In addition, the number of formatted tracks will be 80 for 5.25 inch drives, not 77 as above.

2.3.2 One-Drive System

2.3.2

Start by formatting a new diskette for the copy. Insert the System Diskette in the drive and proceed as follows:

```
A>FORMAT cr
RC855 FORMAT
Disk formats:  1 - 8" Single Sided/Single Density
               2 - 8" Double Sided/Double Density
```

```
Select disk format (1/2) 2
Select drive (A/B) A

; remove the System Diskette from the drive and
; insert the new diskette

Insert disk to format, then press <return> cr
Format disk in drive A (y/n) Y
Number of formatted tracks 077
Format completed
Format another disk (y/n) N

; change back to the System Diskette

Insert CP/M System Disk in drive A, then press <return> cr
A>

;continue with BACKUP

A>BACKUP cr
RC855 BACKUP
Source drive (A/B/C): A
Destination drive (A/B/C): A

; source disk = System Diskette
; destination disk = new diskette

Insert SOURCE disk, then press <return> cr
Insert DESTINATION disk, then press <return> cr

; continue to alternate between the source disk
; (System diskette) and the destination disk
; (new diskette) until the following message is
; displayed

Verifying copy
BACKUP complete

; final change back to System Diskette
```

Insert CP/M System Disk in drive A, then press <return> or

A>

Please note that the prompt for the disk format only appears when 8 inch disk drives are used. 5.25 inch disk drives are by default set to double sided/double density. In addition, the number of formatted tracks will be 80 for 5.25 inch drives, not 77 as above.

2.4 How to Install Disk Drives C - G 2.4

RC855 Work Stations including a hard disk (RC874/02 or RC874/03) will support up to 5 additional CP/M disk drives: C, D, E, F and G.

Unlike A and B, which are actual hardware units, C - G have been implemented on the hard disk and thus will be referred to as logical disk drives.

C is available to the user once hardware installation of the hard disk is complete (see ref. [4]). D - G are not available until the hard disk has been configured (as described in subsection 4.3.3).

Note: From the CP/M point of view there is no difference between a physical disk drive (A or B) and a logical disk drive, thus the term "drive" may refer to either. By analogy the term "disk" may refer to a flexible disk (i.e. a diskette) or a logical disk.

3. OPERATING CP/M

This chapter contains general information on the operation of the CP/M system. The various commands which can be given to CP/M are described in chapter 4. Error recovery procedures are described in chapter 5.

3.1 Restarting the System

The CP/M system can be restarted in two different ways. In either case an executing program will be aborted, control will return to the CCP, the system prompt (usually "A>") will reappear, and CP/M will accept a new command.

System Boot (Cold Boot)

A system boot (cold boot or cold start) occurs whenever the system is started, as described in section 2.2. A system boot will also occur when the RESET button at the back of the console is pressed (hard reset) or when the CTRL and CLEAR keys are pressed simultaneously (soft reset). Note that a soft reset is possible only so long as the BIOS is active.

System Reboot (Warm Boot)

A system reboot (warm boot or warm start) will occur when the CTRL and C keys are pressed simultaneously. Note that a system reboot is required when a new disk is introduced with the intent to write on it (disk reset).

3.2 Command Lines

A command is generally given to CP/M by typing a command line immediately following the system prompt ("A>"). The typical command line contains, from left to right:

- the name of the command, e.g. DIR or STAT,
- a mandatory blank, and
- an argument, e.g. a file reference.

The command line is terminated by pressing the "RETURN" key, which causes the command to be executed. "RETURN" also generates a carriage return and line feed, moving the cursor to the beginning of the next line.

3.3 Line Editing and Output Control 3.3

The editing of command lines and the control of console output are described in ref. [1], 1.5.

Note that CTRL-C may be used to perform a system reboot not only while the user is typing command lines but also when CP/M utilities are requesting input.

The following remarks apply to the RC855 keyboard:

- The key marked ← deletes the last character typed.
- The key marked → deletes the last line typed.
- The key marked PRINT copies all subsequent console output to the list device.

Note also that an up arrow (↑) may be used to denote the CTRL key in various CTRL-key combinations, e.g. "↑C" for "CTRL-C" (system reboot).

3.4 File References 3.4

Nearly all of the CP/M commands reference a file or a group of files.

A file reference identifies a particular file or group of files on a particular disk. The reference consists accordingly of a filename and possibly a preceding disk drive name. The filename comprises a primary name, which is the proper name of the file, and a secondary name, or extension, which indicates the type of the file. The general form of a filename is

pppppppp.sss

where pppppppp is the primary name of eight characters or less, and sss is the secondary name, or extension, of three characters or less. Note that a period (.) is mandatory between the two names.

Extensions

Specific extensions are required by CP/M for several types of files. (Note that word-processing and other systems may require different extensions). Specific extensions are not required by CP/M for data or text files, but are often a convenience for the user. Here are some standard CP/M extensions:

COM	command file of a transient command (directly executable program)
ASM	source file of an assembly language program
PRN	listing file of an assembly language program
HEX	program file of an assembly language program in "hex" format machine code
BAK	backup file created by ED before modification of the original file
SYS	system file

Unambiguous and Ambiguous Filenames

The filename form pppppppp.sss identifies a single file, and is therefore called an unambiguous filename. A reference containing an unambiguous filename is indicated by "ufn" in the command descriptions in chapter 4.

An ambiguous file reference may be satisfied by several different files. In an ambiguous filename, an asterisk (*) can be used to match all eight characters in the primary name and/or all three characters in the secondary name. Also, a question mark (?) can be interspersed throughout the primary and secondary names to match any single character in the "?" position. The "*" and "?" are sometimes called wild-card characters. A reference containing an ambiguous filename is indicated by "afn" in the command descriptions in chapter 4.

Drive Name

A filename can generally be preceded by a disk drive name (for instance A or B) in order to log in the drive containing the disk with the relevant file(s) before the file operation takes place. The filename and the drive name must be separated by a colon (:).

Examples

```
A>DIR FILE4.TXT cr      ;lists, if found, the file (unambiguously)
                        ;named FILE4.TXT

A>DIR *.COM cr          ;lists any and all files with the COM ex-
                        ;tension

A>DIR HAZ.* cr          ;lists any and all files with the primary
                        ;name HAZ

A>DIR *.* cr            ;lists all of the files on the disk in
                        ;drive A

A>DIR FILE?.TXT cr      ;lists any and all files whose primary
                        ;names match FILE? (e.g. FILE1, FILE2,
                        ;and FILE3) with the TXT extension

A>DIR B:*.TXT cr        ;lists any and all files with the TXT ex-
                        ;tension on the disk in drive B
```

For a more detailed description of file references, see ref. [1], 1.2.2. The DIR command is described in chapter 4.

3.5 Switching Drives 3.5

CP/M indicates the currently logged drive, and by implication the disk which it contains, by prompting with the disk drive name (for instance A or B) followed by a right angle bracket (>). On a multi-drive system, the user can switch the currently logged

drive by typing the disk drive name followed by a colon (:) when the CCP is awaiting console input (see further ref. [1], 1.3).

Example

```
A>C: cr                    ;logs in drive C
C>
```

3.6 US ASCII Character Set 3.6

The RC855 keyboard has a number of variants, corresponding to different national ASCII character sets. Since the CP/M system assumes the use of the US ASCII character set, the question of "which key to press" may arise. A case in point is the square brackets ([]) required by CP/M for PIP parameters, which are not represented in all ASCII character sets. The characters on each RC855 keyboard which differ from the US ASCII characters are listed in appendix D.

4. CP/M COMMANDS 4.

This chapter describes the commands which can be given to the CP/M operating system from the user's console. The commands are arranged in three groups according to their principal applications: file handling, program handling, and device handling.

CP/M commands are implemented on two levels: built-in commands and transient commands.

Built-In Commands

The built-in commands can always be executed, as they are part of CP/M itself. Since they do not exist as files, they are not listed in the directory.

Transient Commands

A transient command can be executed only if it exists as a command file (COM extension) on the disk in the currently logged drive. The execution of a transient command causes the command file (containing a directly executable program) to be loaded into the TPA. The transient programs which can be executed in this manner include:

- the standard CP/M editor, assembler, debugger, and utilities,
- the RC855 CP/M utility programs, and
- high-level languages and applications software of the user's own choosing.

The primary name of the command file is used as the name of the transient command in the command line.

Examples

A>ERA (argument) cr ;built-in command ERA

A>PIP (argument) cr ;standard transient command PIP

```
A>TRANSFER (argument) cr    ;RC855 transient command TRANSFER

A>COBOL (argument) cr       ;transient command to load the CIS
                            ;COBOL compiler

A>WS cr                     ;transient command to load the
                            ;WordStar word-processing system
```

Note that it is possible to exit from a CP/M utility by performing a system reboot (CTRL-C) when the utility is requesting input.

4.1 File Handling Commands 4.1

This group of commands comprises DIR, ERA, REN, TYPE, STAT, PIP, TRANSFER, ED, CAT and FILEX.

4.1.1 DIR 4.1.1

Built-in command,
the forms of which are: DIR ufn cr
DIR afn cr

The DIR (directory) command lists on the console one or more filenames in the directory of the disk in the currently logged drive.

Note that console output can be temporarily halted by pressing the CTRL and S keys simultaneously.

Examples

```
A>DIR FILE4.TXT cr      ;lists, if found, the file (unambiguous-
                        ;ly) named FILE4.TXT

A>DIR *.COM cr          ;lists any and all files with the COM ex-
                        ;tension
```

A>DIR HAZ.* cr ;lists any and all files with the primary ;name HAZ

A>DIR *.* cr ;lists all of the files on the disk in ;drive A

A>DIR cr ;short form of the above command

A>DIR B: cr ;equivalent to the command DIR B:*.* cr

A>DIR B:*.TXT cr ;lists any and all files with the TXT ex- ;tension on the disk in drive B

See further ref. [1], 1.4.2.

4.1.2 ERA 4.1.2

Built-in command,
the forms of which are: ERA ufn cr
ERA afn cr

The ERA (erase) command deletes one or more filenames in the directory of the disk in the currently logged drive, and frees the allocated storage space on the disk.

Examples

A>ERA FILE4.TXT cr ;deletes, if found, the file (unambigu- ;ously) named FILE4.TXT

A>ERA *.ASM cr ;deletes any and all files with the ASM ;extension

A>ERA HAZ.* cr ;deletes any and all files with the pri- ;mary name HAZ

A>ERA FILE?.TXT cr ;deletes any and all files whose primary ;names match FILE? (e.g. FILE1, FILE2, ;and FILE3) with the TXT extension

```
A>ERA *.* cr              ;deletes all of the files on the disk in
ALL FILES (Y/N) ? Y       ;drive A following the Y (yes) confirma-
                          ;tion

A>ERA B:*.PRN cr          ;deletes any and all files with the PRN
                          ;extension on the disk in drive B
```

See further ref. [1], 1.4.1.

4.1.3 REN

Built-in command,
the form of which is: REN ufn1=ufn2 cr

The REN (rename) command renames an unambiguously named file in the directory of the disk in the currently logged drive. The old filename is indicated by "ufn2", and the new filename by "ufn1".

Examples

```
A>REN HAZMAY31=HAZMAY30 cr    ;the file HAZMAY30 is renamed
                              ;HAZMAY31

A>REN FILE7.TXT=FILE7.BAK cr  ;the file FILE7.BAK is renamed
                              ;FILE7.TXT

A>REN B:DATA4=DATA1 cr        ;the file DATA1 on the disk in
                              ;drive B is renamed DATA4
```

See further ref. [1], 1.4.3.

4.1.4 TYPE

Built-in command,
the form of which is: TYPE ufn cr

The TYPE command displays on the console the contents of an unam-

biguously named ASCII text file (e.g. a source file or PRN file) on the disk in the currently logged drive.

Note that console output can be temporarily halted by pressing the CTRL and S keys simultaneously.

Note also that console output can be copied to the list device by pressing the PRINT key.

Examples

```
A>TYPE HAZMAY31 cr          ;displays the contents of the file
                            ;HAZMAY31

A>TYPE FILE7.TXT cr         ;displays the contents of the file
                            ;FILE7.TXT

A>TYPE B:PROG1.PRN cr       ;displays the contents of the file
                            ;PROG1.PRN on the disk in drive B
```

See further ref. [1], 1.4.5..

4.1.5 STAT 4.1.5

Standard transient command, the forms of which are:

```
STAT cr
STAT argument cr
```

The STAT command can display on the console a variety of information, particularly on the status of files and disks, and perform certain file and device handling functions (see examples below). The status information for files includes the file size and the access mode, and for disks, the number of unused bytes and the access mode.

Note that files with the $SYS (system) attribute are not listed in the directory, but their status, enclosed in parentheses, will be displayed by STAT.

Examples

```
A>STAT FILE4.TXT cr          ;displays the status of the file
                             ;(unambiguously) named FILE4.TXT

A>STAT FILE4.TXT $S cr       ;equivalent to the above command,
                             ;but provides additional informa-
                             ;tion on the file size

A>STAT B:*.TXT cr            ;displays the status of any and all
                             ;files with the TXT extension on
                             ;the disk in drive B

A>STAT cr                    ;displays the status of the disk in
                             ;drive A

A>STAT B:DSK: cr             ;displays the drive characteristics
                             ;of the disk in drive B

A>STAT SAMPLE.TXT $R/O cr    ;sets the read-only attribute on
                             ;the file SAMPLE.TXT (until reset
                             ;by a $R/W)

A>STAT SAMPLE.BAK $SYS cr    ;sets the system attribute on the
                             ;file SAMPLE.BAK (until reset by a
                             ;$DIR)

A>STAT B:=R/O cr             ;sets the read-only attribute on
                             ;the disk in drive B (until the
                             ;next warm or cold boot)

A>STAT VAL: cr               ;displays a list of the possible
                             ;STAT commands and a list of the
                             ;possible device assignments

A>STAT DEV: cr               ;displays the actual device assign-
                             ;ments
```

A>STAT USR: cr ;displays the number of the current ;user area (see subsection 4.3.8)

Note that, in the RC855 implementation of CP/M, the STAT command cannot be used to change the actual device assignments.

See further ref. [1], 1.6.1.

4.1.6 PIP

4.1.6

Standard transient command,
the forms of which are: PIP cr
PIP destination=source cr

The PIP command (either form) loads and executes the CP/M Peripheral Interchange Program. The primary use of PIP is to copy, or transfer, files between disks or between a disk and a peripheral device. PIP, however, is not just a simple "copy" program, but a general transfer program provided with numerous processing options.

PIP can be executed as a single-line command, where the destination is the file or logical device that receives the copy, and the source is the file or logical device from which the copy is taken. Processing options are indicated by various PIP parameters, enclosed in square brackets ([]), following the source.

The second command form, PIP cr, causes the PIP program to read command lines directly from the console, prompted by an asterisk (*), until an empty command line (a single "cr") or a period (.) is typed. A sequence of copy operations can be executed in this way.
To transfer files between disks on a one-drive system, use the TRANSFER program (see 4.1.7). To copy an entire diskette, irrespective of the number of disk drives, use the BACKUP program (see 4.3.2).

Note the following general rule: Two files with the same name cannot exist on the same disk.

Examples

```
A>PIP DOC.TXT=DOC.BAK cr          ;copies the file (unambiguously)
                                  ;named DOC.BAK on the disk in
                                  ;drive A and names the copy DOC.TXT

A>PIP B:Z.ASM=A: cr               ;copies the file (unambiguously)
                                  ;named Z.ASM from the disk in drive
                                  ;A to the disk in drive B

A>PIP B:COPY1.BAK=FILE1.TXT cr    ;copies the file (unambiguously)
                                  ;named FILE1.TXT from the disk in
                                  ;drive A to the disk in drive B and
                                  ;names the copy COPY1.BAK

A>PIP B:=DOC?.* cr                ;copies any and all files whose
                                  ;primary names match DOC? (e.g.
                                  ;DOC1, DOC2, and DOC3) and with any
                                  ;extension from the disk in drive A
                                  ;to the disk in drive B

A>PIP B:=*.COM [V] cr             ;copies any and all files with the
                                  ;COM extension from the disk in
                                  ;drive A to the disk in drive B and
                                  ;verifies the copy

A>PIP LST:=B:FILE2 cr             ;copies the file (unambiguously)
                                  ;named FILE2 on the disk in drive B
                                  ;to the list device

A>PIP cr                          ;a sequence of copy operations
*FILE2=TEST2 cr
*LST:=FILE2 cr
*B:=PROG.ASM cr
*cr
A>
```

Note that using PIP to list a file on the printer is faster than using the TYPE command and the PRINT key.

Note also that, because PIP copies a file on adjacent sectors of the disk, the copied file may possibly be accessed faster (by ED and similar programs) than the original file.

See further ref. [1], 1.6.4.

4.1.7 TRANSFER

4.1.7

RC855 transient command,
the form of which is: TRANSFER cr

The TRANSFER program is used to transfer files between disks on systems with one disk drive. TRANSFER transfers a file in portions of 32K bytes: first it reads up to 32K bytes from the source file into main memory, then it asks the user to swap disks, and finally it writes the memory contents to the destination file. This sequence is repeated until the transfer is complete.

The format of both the source and the destination disk must be specified as either single-sided, single-density (SS) or double-sided, double-density (DD). It is possible to transfer files from the single-sided, single-density format to the double-sided, double-density format of the CP/M system.

The source and destination file may have the same name, as they normally reside on different disks. Note that a source file larger than 32K bytes will be destroyed, if it is written to the same disk (possibly because the user forgot to swap disks) under the same name.

TRANSFER prompts the console for commands, with interaction as shown below.

Example

The following example shows how to transfer a file named PIP.COM from a double-sided, double-density diskette to a single-sided, single-density diskette. The source file contains less than 32K bytes.

```
A>TRANSFER cr
RC855 TRANSFER
Disk formats: 1 - 8" Single Sided/Single Density
              2 - 8" Double Sided/Double Density
Select source disk format (1/2) 2
Select destination disk format (1/2) 1
Source filename: PIP.COM cr
Destination Filename: PIP.COM cr
Insert SOURCE DISK in drive A, then press <return> cr
Insert DESTINATION DISK in drive A, then press <return> cr
TRANSFER completed
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

4.1.8 ED

4.1.8

Standard transient command,
the form of which is: ED ufn cr

The ED command loads and executes the CP/M system context editor, which allows the user to create a file on disk, modify the contents of an ASCII text file, or prepare an assembly language source file. The unambiguous filename, ufn, specifies the file on which ED is to operate. A secondary name (extension) must be supplied.

The ED program creates a buffer in which the user can modify text. First, ED deletes any existing backup file whose primary name matches that of the source file, i.e. X.BAK is deleted when X.TXT is the source. Then, ED prompts the console with an asterisk (*) for editing commands. The user can now append text from the source file to the buffer, insert or delete text in the buffer, and perform other editing functions. The user can also write text to a temporary file, X.$$$, as he edits. When ED is terminated, it writes the buffer contents and any remaining text in the source file, X.TXT, to X.$$$, which now constitutes a revised version of X.TXT. ED then changes the name X.TXT to X.BAK, and X.$$$ to X.TXT.

Examples

```
A>ED SAMPLE.TXT cr          ;creates a file (unambiguously)
NEW FILE                    ;named SAMPLE.TXT on the disk in
*                           ;drive A

A>ED B:FILE3.TXT A: cr      ;specifies the source file as
*                           ;FILE3.TXT on the disk in drive B
                            ;and the revised source file as a
                            ;file on the disk in drive A
```

See further ref. [1], 1.6.5, pp. 23-24 and particularly ref. [1], chapter 2.

4.1.9 CAT

RC855 transient command,
the forms of which are: CAT options cr
CAT afn options cr

The CAT command lists on the console one or more filenames in the directory of the disk in the currently logged drive. The filenames are listed in alphabetical order followed by the number of unused directory entries and the amount of free disk space.

The available options are:

1) $SYS - if this option is used the listing will include files with the SYS attribute. They will be listed in parentheses.

2) $R/O - if this option is used, all listed files with Read-Only status will be followed by an asterisk (*).

Note that no options need be specified in the command line. If one or more options are specified and the afn is omitted, the first option must be preceded by 2 blanks.

Examples

```
A>CAT *.COM cr          ;lists all files with extension
                        ;COM, except files with the SYS attribute.

A>CAT *.COM $SYS cr     ;lists all files with the extension
                        ;COM. Files with the SYS attribute will
                        ;be listed in parentheses.

A>CAT PROG.* $R/O cr    ;lists all files with the primary name
                        ;PROG except files with the SYS attribute.
                        ;Files with the R/O attribute will be
                        ;marked with an asterisk (*).

A>CAT $SYS $R/O cr      ;lists all files on the default drive.
                        ;Files with the SYS attribute will be
                        ;listed in parentheses. Files with the R/O
                        ;attribute will be marked with an asterisk
                        ;(*).

A>CAT B: cr             ;lists all files on disk B except
                        ;those with the SYS attribute.
```

4.1.10 FILEX

RC855 transient command,
the forms of which are:

FILEX cr
FILEX destination=source cr

The FILEX command (either form) loads and executes a program that transfers a file between two computers via the line port (see appendix F.2).

FILEX may only be used in conjunction with two computers that have been connected with an appropriate cable (see app. I). It is furthermore required that the line ports of both computers use

the same linespeed (baud rate) and character format (use the CONFI command, 4.3.10, to make sure that this is the case).

The FILEX command may be entered on either computer, so the user must first decide which computer he wishes to operate from. This computer will be referred to as the local station. The other computer will be called the remote station.

Before operating from the local station, it is necessary to enter the command line

A>FILEX REMOTE cr

on the computer chosen as the remote station. This will put it into the remote mode.

The FILEX command can then be entered at the local station in one of two ways:

FILEX can be entered as a single-line command using the format: FILEX destination=source cr . A destination or source must include a drive name (e.g. A or B) followed by a colon and an unambiguous file-name. To make it possible to distinguish between the local drives A and B and the remote drives A and B, the remote drive names must be preceded by the letter R. (Thus RA: and RB: refer to the remote drives A and B respectively.)

The other command form, FILEX cr, causes the FILEX program to read command lines directly from the console, prompted by an asterisk (*). A command line must have the format: destination=source cr. One file can be transferred per command line. FILEX will continue to prompt the user until an empty command line (a single "cr") is typed.

When the local station has finished executing FILEX, the other computer will exit from the remote mode. If this is undesirable, the user should type NOEND between source and "cr" in the filex command line, e.g. A>FILEX destination=source NOEND cr.

Examples

```
A>FILEX REMOTE cr                    ;The remote station is ini-
                                     ;tialized.

A>FILEX A:PAP.COM=RB:PIP.COM cr      ;The file PIP.COM is copied
                                     ;from the remote station's
                                     ;B-drive to the local sta-
                                     ;tion's A-drive under the
                                     ;name PAP.COM.

A>FILEX RB:=A:OLD.TXT NOEND cr       ;The file OLD.TXT is copied
                                     ;from the local station's
                                     ;A-drive to the remote sta-
                                     ;tion's B-drive under the name
                                     ;OLD.TXT. The NOEND option
                                     ;prevents the remote station
                                     ;from exiting from the remote
                                     ;mode.
```

4.2 Program Handling Commands 4.2

This group of commands comprises SUBMIT, XSUB, ASM, LOAD, DUMP, DDT, and SAVE.

4.2.1 SUBMIT 4.2.1

Standard transient command,
the form of which is: SUBMIT ufn p1 p2 .. pn cr

The SUBMIT command allows CP/M commands (including SUBMIT itself) to be batched together for automatic processing.

The unambiguous filename, ufn, specifies the primary name of a file on the disk in the currently logged drive (A or B only). The secondary name of this file is assumed to be SUB and is therefore not specified. A file with the SUB extension contains CP/M prototype commands, with possible parameter substitution.

SUB files are created using ED (see 4.1.8) with interspersed formal parameters of the form

$1 $2 ... $n

corresponding to the number of actual parameters to be included when the SUB file is submitted for execution.

When the SUBMIT program is executed, it substitutes the actual parameters p1 p2 ... pn in the command line for the formal parameters $1 $2 .. $n in the prototype commands of the SUB file.

SUBMIT creates a temporary file of substituted commands named $$$.SUB on the disk in drive A. When the system reboots on the termination of SUBMIT, the CCP reads $$$.SUB as a source of input, rather than the console.

SUBMIT allows the user to submit a file of programs for execution. This facility is extended by XSUB, which provides input for such programs (see 4.2.2).

Example

```
DIR $1.*                    ;prototype commands in the file
PIP $2:=$1.BAK              ;WEE.SUB
ERA $1.BAK

A>SUBMIT WEE PROG B cr      ;WEE.SUB submitted with actual
                            ;parameters

DIR PROG.*                  ;substituted commands in the file
PIP B:=PROG.BAK             ;$$$.SUB, which are executed
ERA PROG.BAK                ;in sequence by the CCP
```

See further ref. [1], 1.6.7, pp. 25-27.

4.2.2 XSUB

Standard transient command,
the form of which is: XSUB

The XSUB program extends the SUBMIT facility (see 4.2.1) to provide input to programs executed in the SUB file.

When XSUB is included as the first command line of a SUB file, it relocates to the memory area directly below the CCP in order to process the remaining command lines of the SUB file, and thereby provides buffered console input to the programs executed within the submit operation. The programs that read such input, and can therefore receive their input directly from the SUB file, include PIP, ED, and DDT. If a program within the SUB file performs a system reboot (warm boot), the message '(xsub active)' is displayed to indicate the presence of XSUB. XSUB remains active until the SUB file is exhausted or a system boot (cold boot) is performed.

Example

```
XSUB                          ;prototype commands in the file
DDT                           ;NOVUS.SUB
I$1.HEX
R
GO
SAVE 1 $2.COM

A>SUBMIT NOVUS HIC ILLE cr    ;NOVUS.SUB submitted with actual
                              ;parameters

                              ;substituted commands in the file
                              ;$$$.SUB, which are executed
                              ;in sequence by the CCP:

XSUB                          ;XSUB is loaded
DDT                           ;DDT is loaded
IHIC.HEX                      ;input to DDT from XSUB
```

```
R                          ;input to DDT from XSUB
GO                         ;input to DDT from XSUB
SAVE 1 ILLE.COM            ;input to the CCP from XSUB
```

See further ref. [1], 1.6.7.

4.2.3 ASM

4.2.3

Standard transient command,
the form of which is: ASM ufn cr

The ASM command loads and executes the CP/M 8080 assembler. The unambiguous filename, ufn, specifies the primary name of a source file containing assembly language statements. The secondary name of this file is assumed to be ASM and is therefore not specified.

The assembler generates a file of the type PRN, which contains a listing for the user with diagnostics, and a file of the type HEX, which contains "hex" format machine code (see LOAD, below).

Example

```
A>ASM B:ALPHA cr           ;specifies that the source file is
                           ;ALPHA.ASM on the disk in drive B,
                           ;and that ALPHA.PRN and ALPHA.HEX
                           ;shall be placed on the same disk
```

See further ref. [1], 1.6.2, and particularly ref. [1], chapter 3.

4.2.4 LOAD

4.2.4

Standard transient command,
the form of which is: LOAD ufn cr

The LOAD command causes generation of a memory-image file, of the type COM, which can subsequently be executed as a transient pro-

gram. The unambiguous filename, ufn, specifies the primary name of an object file containing "hex" format machine code (see ASM, above). The secondary name of this file is assumed to be HEX and is therefore not specified.

Example

```
A>LOAD B:ALPHA cr        ;specifies that the file ALPHA.HEX
                         ;shall be read from the disk in
                         ;drive B, and the file ALPHA.COM
                         ;placed on the disk in drive A

A>ALPHA cr               ;loads the file ALPHA.COM into the
                         ;TPA and executes the code
```

See further ref. [1], 1.6.3.

4.2.5 DUMP

4.2.5

Standard transient command,
the form of which is: DUMP ufn cr

The DUMP command causes the file specified by the unambiguous filename, ufn, to be displayed at the console. The contents of the file are listed in hexadecimal (base 16) form, sixteen bytes at a time, with the absolute byte address of each line at the left in hexadecimal.

Note that an "H" is often used in descriptions to denote the 16 subscript (e.g. 10H stands for 10_{16}).

Note also that console output can be copied to the list device by pressing the PRINT key.

Examples

```
A>DUMP ANON.COM cr       ;displays the contents of the file
                         ;ANON.COM
```

```
A>DUMP B:SCRATCH.HEX cr        ;displays the contents of the file
                               ;SCRATCH.HEX on the disk in drive
                               ;B
```

See further ref. [1], 1.6.8.

4.2.6 DDT

4.2.6

Standard transient command,
the form of which is: DDT ufn cr

The DDT command loads and executes the CP/M debugger, which can be used to load, alter, and test programs or to load a file in order to save a memory image of it (see SAVE, below). The unambiguous filename, ufn, specifies the file, of the type COM, HEX, or SYS, on which DDT is to operate. The secondary name must be specified.

The DDT program temporarily replaces the CCP in memory, and loads the specified file into the TPA. DDT has its own commands for inserting values, displaying memory locations, saving comments, setting breakpoints, and other debugging functions.

DDT also displays, in hexadecimal, the NEXT address (following the last address in the loaded file) and the PC (program counter) address.

Example

```
A>DDT CPM56.COM cr             ;loads DDT, which in turn loads
DDT VERS 2.2                   ;the file CPM56.COM from the disk
NEXT  PC                       ;in drive A, then displays the
3E00  0100                     ;NEXT and PC values, and finally
                               ;prompts the console with a dash
                               ;(-)
```

See further ref. [1], chapter 4.

4.2.7 SAVE

Built-in command,
the form of which is: SAVE n ufn cr

The SAVE command creates a memory-image file, specified by the unambiguous filename, ufn, of whatever is currently in the TPA (from memory address 0100H). The decimal number n specifies the number of TPA pages to be placed on the disk.

A page is a block of 256 bytes. The number of pages, n, can be calculated as follows:

1) Bring the relevant file into the TPA by means of DDT (see DDT, above) and note the NEXT value.

2) If the NEXT value ends in two zeroes, subtract 1 hexadecimal, and convert the first two digits to decimal. For example:

   NEXT is 1200.
   1200 - 1 = 11FF
   11 hexadecimal is 17 decimal (i.e. 17 pages).

3) If the NEXT value does not end in two zeroes, convert the first two digits to decimal. For example:

   NEXT is 1205.
   12 hexadecimal is 18 decimal (i.e. 18 pages).

Examples

```
A>SAVE 61 CPM56.COM cr      ;saves memory from 0100H through
                            ;3DFFH (NEXT was 3E00) and places
                            ;it in the file CPM56.COM on the
                            ;disk in drive A

A>SAVE 10 B:PROG.COM cr     ;saves memory from 0100H through
                            ;0AFFH (NEXT was 0B00) and places
```

```
;it in the file PROG.COM on the
;disk in drive B
```

See further ref. [1], 1.4.4.

4.3 Device Handling Commands 4.3

This group of commands comprises FORMAT, VERIFY, HDINST, BACKUP, STORE, RESTORE, COPYSYS, SYSGEN, AUTOEXEC, CONFI, ASSIGN, USER and HDFORM.

4.3.1 FORMAT 4.3.1

RC855 transient command,
the form of which is: FORMAT cr

The FORMAT program is used to format diskettes on a one-drive or a two-drive system. FORMAT will erase any and all data on the diskette. Several diskettes can be formatted in succession.

All factory-fresh diskettes should be formatted by FORMAT before use, even if the diskettes are preformatted.

5.25 inch diskettes must be double sided, double density. 8 inch diskettes may be either single sided, single density (8 inch standard file exchange diskette) or double sided, double density (RC855 System Diskette). All diskettes must be soft sectored.

The diskette formats are further described in appendix E.

FORMAT prompts the console for commands, with interaction as shown below.

Example

; Formatting a 5.25 inch diskette

```
A>FORMAT cr
RC855 FORMAT
Disk format: 5.25" Double Sided/Double Density
Select drive (A/B) B
Insert disk to format, then press <return> cr
Format disk in drive B (y/n) ? Y
Number of formatted tracks 080
Format completed
Format another disk (y/n) N
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

; Formatting an 8 inch diskette

```
A>FORMAT cr
RC855 FORMAT
Disk formats: 1 - 8" Single Sided/Single Density
              2 - 8" Double Sided/Double Density
Select disk format (1/2) 2
Select drive (A/B) B
Insert disk to format, then press <return> cr
Format disk in drive B (y/n) Y
Number of formatted tracks 077
Format completed
Format another disk (y/n) N
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

4.3.2 VERIFY

RC855 transient command,
the forms of which are:

VERIFY cr
VERIFY d: cr

The VERIFY command is used to check for bad sectors on the disk in the specified drive.

As the drive name (d above) the user may specify any drive in the current configuration. If no drive is specified VERIFY will prompt for a drive name.

If bad sectors are found, VERIFY will indicate the total number of blocks in which they appear and display the following prompt:

Write dummy file to hide the bad blocks? (y/n)?

If the bad sectors are on a logical disk, reboot and verify the disk again. If bad sectors are found again, see 4.3.13.

If the bad sectors are on a diskette, then proceed as follows:

If there are files on the diskette,

- Answer by pressing N.
- Reboot and make a copy of files to be saved.
- Format the diskette (see 4.3.1).
- Use the VERIFY command again.

If there are no files on the diskette, answer by pressing Y. VERIFY will then create a dummy file called BLOCKS.BAD making it possible to use the disk in spite of the bad sectors. Subsequently the command ERA *.* should be avoided, as it will erase BLOCKS.BAD thus freeing the bad sectors.

VERIFY prompts the console for commands, with interaction as shown below.

Example

```
A>VERIFY cr
RC855 VERIFY
Select drive: A
Insert formatted disk in drive A, then press <return> cr
Verifying CP/M block no. 561
No bad sectors found
Verify another disk? (y/n) N
Insert CP/M System Disk in drive A, then press <return> cr
A>

A>VERIFY cr
RC855 VERIFY
Select drive: B
Insert formatted disk in drive B, then press <return> cr
Verifying CP/M block no. 561 (Bad sector encountered)
1 Block(s) found with bad sectors
Write dummy file to hide the bad blocks? (y/n) Y
WARNING! This may overwrite existing files
Ok to write dummy file? (y/n) Y
Created dummy file 'BLOCKS.BAD'
  2 Kbytes lost
Verify another disk? (y/n) N
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

4.3.3 HDINST 4.3.3

RC855 transient command,
the form of which is: HDINST cr

HDINST is used to configure (or reconfigure) the hard disk (see 2.4).

A call of HDINST will result in one of four hard disk configurations.

Before using HDINST, consult appendix G, where the configurations are described, and choose a suitable configuration.

In response to the HDINST question:

Copy system to hard disk? (y/n)

press Y if you want to be able to cold boot from the hard disk. Otherwise press N.

WARNING: Any files on the disk prior to reconfiguration will be erased.

HDINST prompts the console for commands, with interaction as shown below.

Example

```
A>HDINST cr
RC855 Hard Disk Installation
New configuration on hard disk? (y/n) Y
WARNING! All files on the hard disk will be erased. Ok? (y/n) Y
The following configurations are possible:

1: C = 1124 Kb   D = 8992 Kb
2: C = 1124 Kb   D = 4480 Kb   E = 4480 Kb
3: C = 1124 Kb   D = 2240 Kb   E = 2240 Kb   F = 4480 Kb
4: C = 1124 Kb   D = 2240 Kb   E = 2240 Kb   F = 2240 Kb   G = 2240 Kb

Select configuration (1/2/3/4) 3

C = 1124 Kbytes                          ;; the new configuration
D = 2240 Kbytes
E = 2240 Kbytes
F = 4480 Kbytes

Configuration ok? (y/n) Y                ;; press Y if the
                                         ;; configuration is ok
```

```
Copy system to hard disk? (y/n) Y          ; pressing Y makes it
                                           ; possible to cold boot
                                           ; from the hard disk.

Insert CP/M System Disk in drive A, then press <return> cr
Cold-booting system to initiate new configuration
                                           ; the system resets and
                                           ; loads the new
                                           ; configuration

RC855  56k CP/M 2.2
Hard disk online

A>
```

4.3.4 BACKUP

4.3.4

RC855 transient command, BACKUP cr
the forms of which are: BACKUP FAST cr

The BACKUP command is used to copy an entire 8 inch or 5.25 inch diskette on a one or two drive system. 8 inch diskettes may be single sided, single density or double sided, double density. 5.25 inch diskettes must be double sided, double density. The diskette formats are further described in appendix E.

All factory-fresh diskettes should be formatted by the FORMAT program before use (see 4.3.1).

The BACKUP command will normally copy the entire source disk and then verify the copy. If the option FAST is used, however, it will copy the source disk without verifying.

If the RC855 system includes a hard disk, the logical disk drive C may be used as a source or destination disk drive.

BACKUP prompts the console for commands, with interaction as shown below.

Example

```
; Copying the disk in drive A to the disk in drive B

A>BACKUP cr
RC855 BACKUP
Source drive (A/B/C): A
Destination drive (A/B/C): B
Insert SOURCE disk, then press <return> cr
Insert DESTINATION disk, then press <return> cr
Verifying copy
BACKUP complete
Insert CP/M System Disk in drive A, then press <return> cr
A>

; Copying the disk in drive A to the logical disk
; drive C. The copy is not verified.

A>BACKUP FAST cr
RC855 BACKUP
Source drive (A/B/C): A
Destination drive (A/B/C): C
Insert SOURCE disk, then press <return> cr
BACKUP complete
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

Recovery from read or write errors that may occur during copy operations is described in chapter 5.

4.3.5 STORE

RC855 transient command,
the forms of which are: STORE iden d: fns cr
STORE iden d: cr

The STORE command is used to copy files from a logical disk to a diskette. If a file will not fit onto a single diskette, it will be copied onto 2 or more.

Iden is any user chosen name of 8 characters or less. It is a label used to recopy files to a logical disk (see RESTORE, 4.3.6).

The logical disk drive (d above) is any one of disks C - G and must be followed by a colon.

The files to be copied (fns) are specified as a list of one or more filenames (ambiguous or unambiguous). Filenames must be separated by a space.

If the filenames are omitted, STORE will prompt the user to enter the name of an input file containing one or more file names. The input file must have the form:

file name 1
file name 2
.
.
.
file name n

(i.e. one file name per line). A maximum of 100 file names are allowed.

Note that STORE and RESTORE do not use the same file format as CP/M. A diskette which has been used by STORE must be reformatted in order to be used as a CP/M diskette.

STORE prompts the console for commands, with interaction as shown below.

Example

A>STORE JCS C:WP.COM cr
RC855 STORE
Destination drive A/B)? B
Date and clock (yymmdd.hhmm): 830516.1330 cr

Insert formatted diskette labelled:
JCS serial No.: 01 in drive B, then press <return> cr

```
Saving-
  WP       .COM

STORE finished
Insert CP/M System Disk in drive A, then press <return> cr
A>
```

4.3.6 RESTORE

RC855 transient command,
the forms of which are: RESTORE iden d: fn cr
RESTORE iden d: fn CHECK cr

Files placed on diskette with STORE (4.3.5) may be recopied to a logical disk with RESTORE.

Iden must be the label attached to the flexible disk by the STORE command.

The logical disk drive (d above) may be any one of disks C - G and must be followed by a colon.

As a file name (fn) the user must specify either an unambiguous file name or *.*.

If *.* is chosen, ALL files on the diskette(s) labelled iden will be copied to the logical disk.

If the CHECK option is used, the file or files in question will be checked but not copied.

Note that RESTORE may only be used on files placed on diskette by STORE (see 4.3.5).

RESTORE prompts the console for commands with interaction as shown below.

Example

```
A>RESTORE JCS C:WP.COM cr
RC855 RESTORE
Source drive (A/B) B
Insert JCS serial No. 1 in drive B, press <return> cr

Diskette identification... JCS      - Serial No. 1
Created..................... 830516.1330

Catalog of disk B - origin, file name:
  A:: WP       .COM

Restore  C:WP       .COM  (Y/N)? Y

Insert CP/M System Disk in drive A, then press <return> cr

A>
```

4.3.7 COPYSYS

RC855 transient command,
the form of which is: COPYSYS cr

The COPYSYS program is used to create a new system diskette. COPYSYS may be used on a one or two drive system to copy the operating system (CCP, BDOS and BIOS) and whatever files the user specifies. The diskette must be double-sided, double-density (512 bytes per sector).

The files to be copied must be specified in a text-file named SYSTEM.SYS. A text editor (e.g. ED) may be used to alter the text file to suit the needs of the individual user. When altering the file, the user should observe the following rules:

- Only unambiguous filenames are allowed.
- The text file may only contain one filename per line.
- No more than 45 filenames are allowed.

COPYSYS prompts the console for commands, with interaction as shown below.

Example

```
A> COPYSYS cr
RC855 COPYSYS
Select source drive (A/B) A
Select destination drive (A/B) B
Insert SOURCE DISK, then press <return> cr
Insert DESTINATION DISK, then press <return> cr
COPYSYS completed
Insert CP/M System Disk, then press <return> cr
A>
```

Note: If one of the files to be copied already exists on the destination disk, the file will be overwritten unless it has R/O status (see STAT 4.1.5). In the latter case a warning is printed on the console and the file is not copied.

If there is no text-file with the name SYSTEM.SYS on the system diskette, COPYSYS will copy the operating system (CCP, BDOS and BIOS) and notify the user that it cannot find SYSTEM.SYS.

4.3.8 SYSGEN

4.3.8

RC855 transient command,
the forms of which are: SYSGEN cr
SYSGEN ufn cr

The SYSGEN command reads the CCP, BDOS and BIOS parts of CP/M into memory, either from the reserved tracks of a System Diskette or from a file.

If the user supplies a destination drive name when prompted, SYSGEN will copy the CCP, BDOS and BIOS to the reserved tracks of another diskette.

If the user presses RETURN instead, SYSGEN will terminate without copying. The user can then proceed to copy CCP, BDOS and BIOS from memory to a disk file by using the SAVE command (see 4.2.7). The final message from SYSGEN indicates the number of pages to save and suggests a filename. Once saved, BIOS may be patched with the DDT command and then rewritten to a system diskette with SYSGEN (see appendix C for an example).

SYSGEN allows the use of a period (.) instead of the RETURN key whenever user input is requested. Thus SYSGEN may be executed as a SUBMIT-XSUB job (see 4.2.1 and 4.2.2).

SYSGEN prompts the console for commands, with interaction as shown below.

Examples

```
; Copying the CCP, BDOS and BIOS from the diskette in drive A
; to the diskette in drive B

A>SYSGEN cr
RC855 SYSGEN
Source drive name (A/B or <return> to skip) A
Insert source disk in drive A, then press <return> cr
Destination drive name (A/B or <return> to skip) B
Insert destination disk in drive B, then press <return> cr
Destination drive name (A/B or <return> to skip) cr
Insert CP/M System Disk in drive A, then press <return> cr
A>

; Writing a copy of the CCP, BDOS and BIOS to a file for sub-
; sequent patching

A>SYSGEN cr
RC855 SYSGEN
Source drive name (A/B or <return> to skip) A
Insert source disk in drive A, then press <return> cr
Destination drive name (A/B or <return> to skip) cr
Insert CP/M System Disk in drive A, then press <return> cr
Ready for 'SAVE 61 CPM56.COM'
```

A>SAVE 61 CPM56.COM cr
A>

4.3.9 AUTOEXEC

RC855 transient command,
the form of which is: AUTOEXEC cr

The AUTOEXEC command modifies a CP/M System Diskette so that a user defined command line is executed automatically following a cold boot from the diskette. An AUTOEXEC option extends the facility to warm boots as well.

AUTOEXEC prompts the console for commands, with interaction as shown below.

Example

; The following example shows how to modify a CP/M system so that
; the CAT command will be executed after a cold boot.

A>AUTOEXEC cr
RC855 AUTOEXEC
Enter command line to auto-execute, then press <return>
CAT cr
When do you wish to auto-execute the command line?

1 - after each cold- and warm-boot
2 - after a cold boot only

Select option (1/2) 2
Insert CP/M System Disk to modify in drive A, then press <return> cr
Insert CP/M System Disk in drive A, then press <return> cr
A>

4.3.10 CONFI

The CONFI program enables the user to change the values of the system configuration parameters stored in the nonvolatile memory of the RC855 Work Station (see appendix H).

When CONFI is started, the following menu is displayed:

A>CONFI cr

RC855 CONFI

Keyboard alpha-lock:	Off
Cursor presentation:	Block
Printer port:	1200 Baud 7 Bits/char 1 Stopbit Even parity
Line port:	1200 Baud 7 Bits/char 1 Stopbit Even parity Asynchronous
Floppy motor timeout:	5 seconds
Secondary address:	0

Press <h> to display help menu

Operation

1) Move the cursor to the parameter value to be changed (use the CURSOR UP (↑) key or the CURSOR DOWN (↓) key.

For help at any time press the H key.

2) Press the CURSOR RIGHT key (→) or the CURSOR LEFT key (←) until the desired value appears.

3) When all changes have been made in this manner, press the PRINT key to obtain a hard copy of the display screen image.

4) If necessary start again with the original values by pressing the CLEAR key.

5) Terminate CONFI by pressing either the S key to save the new parameter values or CTRL-C to abandon them.

4.3.11 ASSIGN

4.3.11

RC855 transient command, the forms of which are:

ASSIGN cr

ASSIGN D:=ff cr

The ASSIGN command assigns a format to an 8 inch diskette drive. The drive specified (d) must be A or B. The format specified (ff) must be SS (single sided, single density - 8 inch standard file exchange diskette format) or DD (double sided, double density - RC855 System Diskette format).

The assigned format will apply until a new format is assigned or until a subsequent cold boot is performed.

8-inch diskette drives are always set to double sided, double density format following a cold boot.

The ASSIGN command has no effect when 5.25 inch diskette drives are used.

ASSIGN prompts the console for commands, with interaction as shown below.

Examples

; Assigning the single-sided, single-density format to drive B.

```
A>ASSIGN cr
RC855 ASSIGN
Drive A: 8" Double Sided/Double Density
Drive B: 8" Double Sided/Double Density
Select drive to change format (A/B) B
Formats:  1  -  8" Single Sided/Single Density
          2  -  8" Double Sided/Double Density
Select format (1/2) 1
Insert 8" Single Sided/Single Density disk in drive B,
                                        then press <return> cr
A>
```

; Short form of the above example

```
A>ASSIGN B:=SS cr
RC855 ASSIGN
Insert 8" Single Sided/Single Density disk in drive B,
                                        then press <return> cr
A>
```

4.3.12 USER

4.3.12

Built-in command,
the form of which is: USER n cr

The USER facility allows the maintenance of up to 15 logical user areas within the same directory. The USER command moves the user to the area specified by the decimal number n.

All of the files on the System Diskette supplied for the RC855 Work Station are in user area 0.

On a system boot (cold boot) the user is automatically logged in to user area 0, which will remain the current user area, if he does not employ the USER command.

See further ref.. [1], 1.4.6.

4.3.13 HDFORM

RC855 transient command,
the form of which is: HDFORM cr

HDFORM is used to format the hard disk.

HDFORM should only be used if bad sectors frequently appear on the hard disk (normally due to improper handling which may misalign the read/write heads)..

Warning: A call of HDFORM will erase any files on the Hard Disk.

HDFORM prompts the console for commands, with interaction as shown below.

Example

```
A>HDFORM cr
RC855 Hard Disk Format

Format hard disk? (y/n) Y
WARNING! The entire disk will be erased. Ok? (y/n) Y

Formatting track: 319                    ; the hard disk is now
Formatting complete                      ; formatted but not
                                         ; initialized for CP/M use

Writing CP/M format (E5's), track: 319 ; initialization for CP/M
Writing complete
```

```
Verifying track: 319                    ; verification of hard
Verification complete                   ; disk

Hard disk formatted and verified        ; HDFORM is completed
Press <return> to coldboot CP/M cr      ; a cold boot must be per-
Coldbooting CP/M                        ; formed

RC855 56k CP/M 2.2                      ; CP/M signs on
Hard disk: Not configured               ; the hard disk has not
A>                                      ; yet been configured
                                        ; (use HDINST)
```

Note: Following verification, HDFORM reformats any tracks containing bad sectors and then tries again. If bad sectors still exist after the reformatting, please contact your RC855 service organization.

5. SYSTEM MESSAGES 5.

All system messages are described below: The sign-on message is described in section 5.1, BDOS messages in 5.2 and Hard Disk messages in 5.3.

For descriptions of PIP, ED, and other program messages see ref. [1], appendix H.

5.1 The Sign-On Message 5.1

Following a cold boot the sign-on message is displayed:

```
RC855 56k CP/M 2.2
A>
```

This indicates that CP/M is ready to accept a command.

Note: The sign-on message may include a Hard Disk message.

5.2 BDOS Messages 5.2

BDOS errors are reported by the system through the general error message

```
BDOS ERR ON d: message
```

where d is the disk drive name and "message" is one of the following:

```
BAD SECTOR
SELECT
READ ONLY
FILE R/O
```

Each BDOS error is described below (5.2.1 - 5.2.4).

5.2.1 BAD SECTOR Error

This error will occur if the disk drive controller cannot read or write data on the disk, which will happen

- if the diskette is worn,
- if the controller is malfunctioning,
- if the diskette was missing from the drive when the user attempted to access it, or
- if data in a file has been damaged through diskette mishandling or by a damaged and erroneous program, or
- if the hard disk is malfunctioning (Note: If bad sector errors occur frequently on logical disks (C - G), format the hard disk with the command HDFORM (4.3.13)).

This error may also occur if the user attempts to read files that were placed on the disk by a different controller than the one which he is now using.

Recovery

Reboot the system (↑C). This will abort the program or file processing and return control to CP/M.

The user may also choose to ignore the error and continue program execution or file processing by pressing the RETURN key ("cr"). It is unwise to do this, however, without adequate backup copies, for if a directory write operation is involved, the integrity of the disk may be destroyed.

A Note on COPYSYS and BACKUP

The COPYSYS program will report this error, stop copying, and return control to CP/M.

The BACKUP program will report this error through the message BAD SECTOR ON SOURCE DISK or BAD SECTOR ON DESTINATION DISK. If the user chooses to continue copying, the transferred data will probably be incorrect, and he must then determine by other means

whether the copy can be used. It may be possible to correct an error involving the destination diskette by reformatting it and then rerunning BACKUP.

5.2.2 SELECT Error

This error will occur if the user selects a non-existent disk drive, indicated by "d".

Recovery

Press the RETURN key ("cr") to reboot the system.

5.2.3 READ ONLY Error

This error will occur if the user attempts to write on a disk that has been assigned the read-only attribute through use of the STAT command (or by a program using the BDOS function).

This error will also occur if the user inserts a new diskette and attempts to write on it without having performed a system reboot (↑C).

Recovery

Press the RETURN key ("cr") and the system will reboot. Note that this will also assign the read-write attribute to the diskette.

5.2.4 FILE R/O Error

This error will occur if the user attempts to write in a file that has been assigned the read-only attribute through use of the STAT command (or by a program using the BDOS function).

Recovery

Press the RETURN key ("cr") and the system will reboot. This will abort the operation involving the file. The read-only attribute of the file can be changed to read-write by means of the STAT command.

See further ref. [1], 1.6.1, and ref. [1], 1.7.

5.3 Hard Disk Messages 5.3

Hard Disk messages have the format:

HARD DISK: message

where message is one of the following:

ON LINE
NOT CONFIGURED
BAD CONFIGURATION SECTOR
BAD IDENTIFICATION SECTOR
INVALID IDENTIFICATION

Each Hard Disk message is described below (5.3.1 - 5.3.5).

5.3.1 ON LINE Message 5.3.1

This message indicates that the hard disk is on line and configured.

In this state it is possible to reference the logical disks of the current configuration.

5.3.2 NOT CONFIGURED Message 5.3.2

This message indicates that the Hard Disk is on line but has not been configured.

In this state it is possible to reference logical disk C only.

The warning will not appear once the Hard Disk has been configured as described in 4.3.3.

5.3.3 BAD CONFIGURATION SECTOR Error 5.3.3

This error will occur if the controller cannot read the sector describing the current Hard Disk configuration.

If this error occurs repeatedly, format the Hard Disk as described in 4.3.13.

5.3.4 BAD IDENTIFICATION SECTOR Error 5.3.4

This error will occur if the controller cannot read the sector describing the physical organisation of the Hard Disk.

If this error occurs repeatedly, format the Hard Disk as described in 4.3.13.

5.3.5 INVALID IDENTIFICATION Error 5.3.5

This error will occur if the controller reads an invalid (e.g. overwritten) Hard Disk identification sector.

If this error occurs repeatedly, format the Hard Disk as described in 4.3.13.

A. REFERENCES

[1] CP/M Operating System Manual, Digital Research, 1982

[2] RCSL No 42-i2042:
RC855 Installation Manual, 1982

[3] RCSL No 42-i1686:
RC855 Work Station Operating Guide, 1982

[4] RCSL No 42-i2334:
RC874 Installation Guide, 1983

B. DISPLAY HANDLING B.

The display handling routines supported by the CONOUT procedure of the RC855 BIOS are described in this appendix (see further ref. [1], chapters 5 and 6).

B.1 X-Y Addressing B.1

The control character 6 moves the cursor to the character position (x-y address) defined by the following two characters. Three characters, then, must be sent to the console via CONOUT:

a 6 character, followed by
the vertical position + 32 (20H), followed by
the horizontal position + 32 (20H).

It is the responsibility of the programmer to ensure that the value of the x-y address does not exceed the limits

$0+32 \leq$ vertical position $\leq 24+32$
$0+32 \leq$ horizontal position $\leq 79+32$

The (vertical,horizontal) address of the upper left corner of the display screen is (0,0), and that of the lower right corner is (24,79).

Note that CONOUT, after having received the 6 character, will invariably handle the next two characters as the x-y address.

B.2 Various Functions B.2

Various functions can be performed by sending the following control characters to the console via CONOUT:

1 Inserts a line, at the line position indicated by the cursor, and scrolls the remainder of the screen image down.

2 Deletes a line, at the line position indicated by the cursor, and scrolls the remainder of the screen image up.

5 Moves the cursor one position left (back-space).

8 Performs the same function as the 5 character.

9 Moves the cursor four positions forward.

10 Moves the cursor one position down (line feed).

12 Resets the console display. The screen is erased, the display buffer (including currently assigned attributes) is cleared, and the cursor is moved to its home position (0,0).

13 Moves the cursor to position 0 on the current line (carriage return).

24 Moves the cursor one position right (forward-space).

26 Moves the cursor one position up.

29 Moves the cursor to position (0,0), i.e. the upper left corner of the display screen, which is its "home" position.

30 Erases the current line from the cursor position to the end of the line, i.e. from (x,y) to (x,79).

31 Erases the screen image from the cursor position to the end of the screen, i.e. from (x,y) to (24,79).

B.3 Attributes

A set of attributes is available for each character position on the console display. An attribute is assigned as follows:

1) Address the relevant character position (see section B.1).

2) Send a "set attribute" character to the console via CONOUT. A "set attribute" character is defined as 128 plus the value of the relevant attribute byte (see table below). The attribute will apply until a "reset attribute" character, defined as 128, is sent.

Any of the following attributes can be assigned:

Attribute	Value of Attribute Byte		
	Dec	Hex	Bin
underscore	1	01	00000001
intensified display	4	04	00000100
nondisplay	8	08	00001000
inverse video	16	10	00010000
fast flash	32	20	00100000
slow flash	96	60	01100000

Note that "fast flash" and "slow flash" must be combined with another attribute byte.

Note also that, to avoid confusion with the "printer on/off" character (decimal 16), "inverse video" should be combined with another byte value. We suggest using 16 + 64, that is to say:

binary 00010000 ("inverse video")
plus
binary 01000000 (frequency bit in "slow flash").

C. SYSTEM DISKETTE GENERATION C.

A new System Diskette is normally generated as described in section 2.3. This appendix describes how to generate a new System Diskette that contains a customized, or "patched", version of the BIOS (see further ref. [1], chapter 6). The BDOS and CCP can also be patched in an analogous manner.

1) Patch the BIOS, BDOS and/or CCP as desired (see the example below).

2) Format a diskette for the new System Diskette using FORMAT (see 4.3.1).

3) Copy the existing System Diskette using BACKUP (see 4.3.4) or COPYSYS (4.3.7). Then delete unwanted files using ERA (4.1.2).

   Alternatively, transfer the files wanted to the new System Diskette using PIP (4.1.6) or TRANSFER (4.1.7).

4) Write the patched version of BIOS, BDOS and CCP to the new System Diskette using SYSGEN (4.3.8).

Please note that SYSGEN can operate with or without a previously created file containing BIOS, BDOS and CCP. Furthermore, note that SYSGEN can only operate on files created by SYSGEN itself.

The following example shows how to patch the keyboard conversion table in the BIOS.

One can alter the standard ASCII values generated by the input conversion routine using SYSGEN, SAVE, DDT and the patch addresses for the key positions shown in appendix D.

In the example below, the PA1 key (key position 3) is patched to generate "a" (97 or 61H) in lower case and "A" (65 or 41H) in upper case.

Example

```
; copy BIOS, BDOS and CCP to memory

A>SYSGEN cr
RC855 SYSGEN
Source drive name (A/B) or <return> to skip) A
Insert source disk in drive A, then press <return> cr
Destination drive name (A/B or <return> to skip) cr
Insert CP/M System Disk in drive A, then press <return> cr
Ready for 'SAVE 61 CPM56.COM'
A>

; copy BIOS, BDOS and CCP from memory to a file

A>SAVE 61 CPM56.COM cr
A>
; the file CPM56.COM is now ready for patching using DDT
; the patch address for lower case PA1: 3C08 hex
; the patch address for upper case PA1: 3C95 hex
; see appendix D for patch addresses

A>DDT CPM56.COM cr
DDT VERs 2.2
NEXT  PC
3E00  0100
-S3C08 cr
-3C08 20 61 cr
-3C09 20 . cr
-S3C95 cr
-3C95 20 41 cr
-3C96 20 . cr
-G0 cr
A>

; save the patched version

A>SAVE 61 CPM56.COM
A>
```

```
; write the patched BIOS, BDOS and CCP to a freshly formatted
; diskette using SYSGEN

A>SYSGEN CPM56.COM cr
RC855 SYSGEN
Destination drive name (A/B) or <return> to skip) A
Insert destination disk in drive A, then press <return> cr
Destination drive name (A/B or <return> to skip) cr
Insert CP/M System Disk in drive A, then press <return> cr
A>

; perform a system boot by pressing CTRL-CLEAR to test the
; patched system
; press PA1 to check the result
```

Note on the Use of Conversion ROM's

The conversion tables used by the BIOS are stored in read-only memory (ROM). Whenever a system boot (cold boot) is performed, these tables are copied into the BIOS read/write memory (RAM).

The conversion ROM is not read, however, on a System boot from a System Diskette that contains a patched version of the BIOS. This is because SYSGEN sets a flag in the BIOS, telling the BIOS not to copy the conversion tables from the ROM. The flag is set upon completion of SYSGEN whenever the message "Ready for SAVE 61 CPM56.COM" is displayed.

D. RC855 KEYBOARD D.

D.1 National ASCII Character Sets D.1

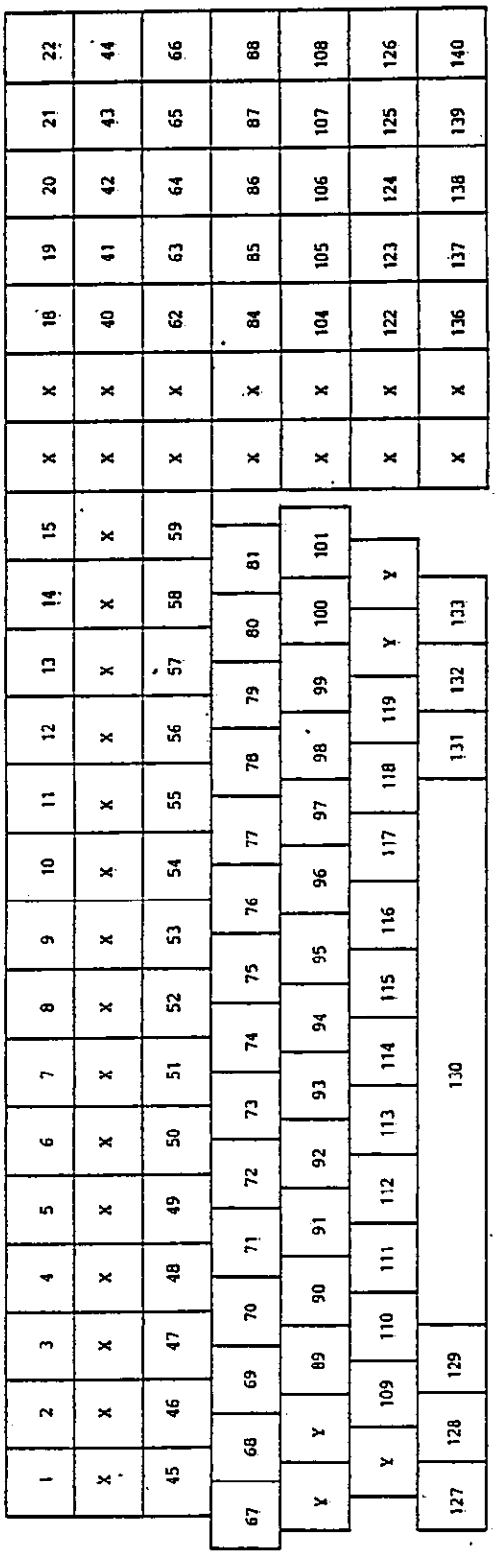
The RC855 keyboard has a number of variants, corresponding to different national ASCII character sets. The following table indicates, for each RC855 keyboard, the characters which differ from the US ASCII characters assumed by the CP/M system. The keyboards are numbered as follows:

1 = US English
2 = UK English
3 = German
4 = Swedish
5 = Danish standard
6 = Danish public sector

STANDARD ASCII VALUES				RC855 KEYBOARDS					
Bin	Dec	Hex	CP/M	1	2	3	4	5	6
0100011	35	23	#		£				§
1000000	64	40	@			§	É	ü	ö
1011011	91	5B	[			Ä	Ä	Æ	Æ
1011100	92	5C	\			Ö	Ö	Ø	Ø
1011101	93	5D	]			Ü	Å	Å	Å
1011110	94	5E	^	↑	↑	↑	Ü	↑	Ü
1100000	96	60	`				é	ä	↑
1111011	123	7B	{			ä	ä	æ	æ
1111100	124	7C	¦			ö	ö	ø	ø
1111101	125	7D	}			ü	å	å	å
1111110	126	7E	~				ü	ö	ü

D.2 Key Positions D.2

The following figure shows the number of each key position on the RC855 keyboard. An "X" indicates that the key position is not used. A "Y" indicates that the use of the key position is permanently defined.



D.3 Patch Addresses

The following table gives, for each numbered key position on the RC855 keyboard, the patch addresses in CPM56.COM for lower-case (LC) conversion and upper-case (UC) conversion (see 4.3.8 and appendix C).

KEY	LC	UC	KEY	LC	UC
Dec.	Hex.	Hex.	Dec.	Hex.	Hex.
1	3C06	3C93	54	3C3B	3CC8
2	3C07	3C94	55	3C3C	3CC9
3	3C08	3C95	56	3C3D	3CCA
4	3C09	3C96	57	3C3E	3CCB
5	3C0A	3C97	58	3C3F	3CCC
6	3C0B	3C98	59	3C40	3CCD
7	3C0C	3C99			
8	3C0D	3C9A	62	3C43	3CD0
9	3C0E	3C9B	63	3C44	3CD1
10	3C0F	3C9C	64	3C45	3CD2
11	3C10	3C9D	65	3C46	3CD3
12	3C11	3C9E	66	3C47	3CD4
13	3C12	3C9F	67	3C48	3CD5
14	3C13	3CA0	68	3C49	3CD6
15	3C14	3CA1	69	3C4A	3CD7
			70	3C4B	3CD8
18	3C17	3CA4	71	3C4C	3CD9
19	3C18	3CA5	72	3C4D	3CDA
20	3C19	3CA6	73	3C4E	3CDB
21	3C1A	3CA7	74	3C4F	3CDC
22	3C1B	3CA8	75	3C50	3CDD
			76	3C51	3CDE
40	3C2D	3CBA	77	3C52	3CDF
41	3C2E	3CBB	78	3C53	3CE0
42	3C2F	3CBC	79	3C54	3CE1
43	3C30	3CBD	80	3C55	3CE2
44	3C31	3CBE	81	3C56	3CE3
45	3C32	3CBF			
46	3C33	3CC0	84	3C59	3CE6
47	3C34	3CC1	85	3C5A	3CE7
48	3C35	3CC2	86	3C5B	3CE8
49	3C36	3CC3	87	3C5C	3CE9
50	3C37	3CC4	88	3C5D	3CEA
51	3C38	3CC5	89	3C5E	3CEB
52	3C39	3CC6	90	3C5F	3CEC
53	3C3A	3CC7	91	3C60	3CED

KEY	LC	UC	KEY	LC	UC
Dec.	Hex.	Hex.	Dec.	Hex.	Hex.
92	3C61	3CEE	116	3C79	3D06
93	3C62	3CEF	117	3C7A	3D07
94	3C63	3CF0	118	3C7B	3D08
95	3C64	3CF1	119	3C7C	3D09
96	3C65	3CF2			
97	3C66	3CF3	122	3C7F	3D0C
98	3C67	3CF4	123	3C80	3D0D
99	3C68	3CF5	124	3C81	3D0E
100	3C69	3CF6	125	3C82	3D0F
101	3C6A	3CF7	126	3C83	3D10
			127	3C84	3D11
104	3C6D	3CFA	128	3C85	3D12
105	3C6E	3CFB	129	3C86	3D13
106	3C6F	3CFC	130	3C87	3D14
107	3C70	3CFD	131	3C88	3D15
108	3C71	3CFE	132	3C89	3D16
109	3C72	3CFF	133	3C8A	3D17
110	3C73	3D00			
111	3C74	3D01	136	3C8D	3D1A
112	3C75	3D02	137	3C8E	3D1B
113	3C76	3D03	138	3C8F	3D1C
114	3C77	3D04	139	3C90	3D1D
115	3C78	3D05	140	3C91	3D1E

E. DISKETTE FORMATS E.

E.1 8-Inch System Diskette E.1

- o 8-inch diskette
- o double-sided
- o double-density
- o 512 bytes per sector
- o 15 sectors per side per track
- o 77 tracks
- o recommended type: "3M" 743-0-512

CP/M characteristics:

- o 1124K bytes drive capacity in blocks of 2K bytes
- o 128 directory entries
- o 2 reserved tracks
- o logical sector mapping with 4 to 1 interleaved sectors and zero track-to-track skew

E.2 8-Inch Files-Only Diskette E.2

- o 8-inch standard file-exchange diskette
- o single-sided
- o single-density
- o 128 bytes per sector
- o 26 sectors per track
- o 77 tracks
- o recommended type: "3M" 740/2-0

CP/M characteristics:

- o 243K bytes drive capacity in blocks of 1K bytes
- o 64 directory entries
- o 2 reserved tracks
- o logical sector mapping with 6 to 1 interleaved sectors and zero track-to-track skew

E.3 5.25-Inch System Diskette

- 5.25-inch diskette
- double-sided
- double-density
- 512 bytes per sector
- 10 sectors per side per track
- 80 tracks
- recommended type: Memorex 3201-3501

CP/M characteristics:

- 780K bytes drive capacity in blocks of 2K bytes
- 256 directory entries
- 2 reserved tracks
- logical sector mapping with 2 to 1 interleaved sectors and zero track to track skew

F. PERIPHERAL SUPPORT

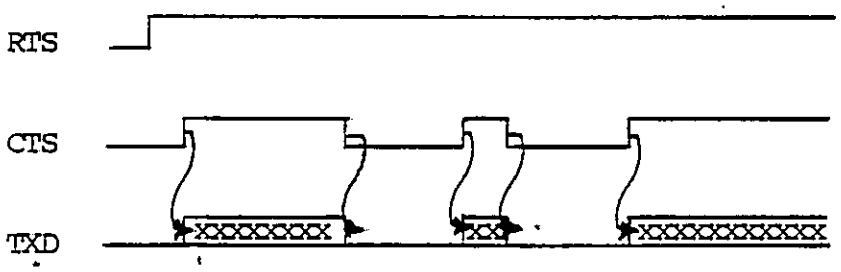
F.1 Printer

F.1.1 Interface

The RC855 printer port is supported as the CP/M ouput list device, LST (see ref. [1], 1.6.1).

The configuration parameters for the printer line speed and character format, which are described in appendix H, are taken automatically from the nonvolatile memory whenever a system boot (cold boot) occurs.

The printer port can be used to attach most printers with a serial V.24 interface and busy control. The busy handshake mechanism uses the V.24 signals RTS and CTS as illustrated below:



(Note: Whenever the RC855 attempts transmission via the printer port, RTS ("ready to send") is switched on and sent to the printer. When the printer is ready to start receiving, CTS ("clear to send") is switched on and sent to the RC855. The RC855 can transmit as long as CTS is on. Transmission takes place on line TXD.)

The ready status of the output list device can be accessed by means of the BIOS procedure LISTST (see ref. [1], 6.6).

F.1.2 Patch Addresses

For each character sent to the list device, the table below supplies the patch address in CPM56.COM for the printer conversion tables (see 4.3.8 and appendix C).

CHARACTER		ADDRESS	CHARACTER		ADDRESS
Dec.	Hex.	Hex.	Dec.	Hex.	Hex.
0	00	3A05	36	24	3A29
1	01	3A06	37	25	3A2A
2	02	3A07	38	26	3A2B
3	03	3A08	39	27	3A2C
4	04	3A09	40	28	3A2D
5	05	3A0A	41	29	3A2E
6	06	3A0B	42	2A	3A2F
7	07	3A0C	43	2B	3A30
8	08	3A0D	44	2C	3A31
9	09	3A0E	45	2D	3A32
10	0A	3A0F	46	2E	3A33
11	0B	3A10	47	2F	3A34
12	0C	3A11	48	30	3A35
13	0D	3A12	49	31	3A36
14	0E	3A13	50	32	3A37
15	0F	3A14	51	33	3A38
16	10	3A15	52	34	3A39
17	11	3A16	53	35	3A3A
18	12	3A17	54	36	3A3B
19	13	3A18	55	37	3A3C
20	14	3A19	56	38	3A3D
21	15	3A1A	57	39	3A3E
22	16	3A1B	58	3A	3A3F
23	17	3A1C	59	3B	3A40
24	18	3A1D	60	3C	3A41
25	19	3A1E	61	3D	3A42
26	1A	3A1F	62	3E	3A43
27	1B	3A20	63	3F	3A44
28	1C	3A21	64	40	3A45
29	1D	3A22	65	41	3A46
30	1E	3A23	66	42	3A47
31	1F	3A24	67	43	3A48
32	20	3A25	68	44	3A49
33	21	3A26	69	45	3A4A
34	22	3A27	70	46	3A4B
35	23	3A28	71	47	3A4C

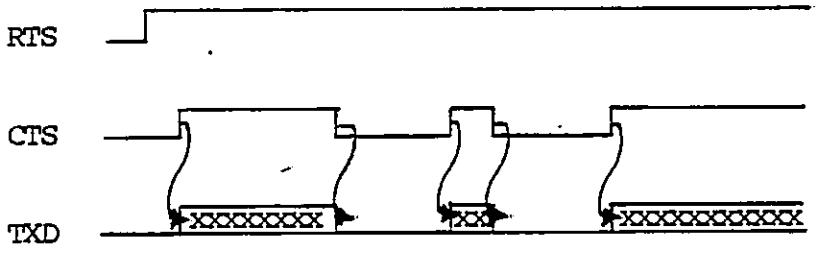
CHARACTER		ADDRESS
Dec.	Hex.	Hex.
72	48	3A4D
73	49	3A4E
74	4A	3A4F
75	4B	3A50
76	4C	3A51
77	4D	3A52
78	4E	3A53
79	4F	3A54
80	50	3A55
81	51	3A56
82	52	3A57
83	53	3A58
84	54	3A59
85	55	3A5A
86	56	3A5B
87	57	3A5C
88	58	3A5D
89	59	3A5E
90	5A	3A5F
91	5B	3A60
92	5C	3A61
93	5D	3A62
94	5E	3A63
95	5F	3A64
96	60	3A65
97	61	3A66
98	62	3A67
99	63	3A68
100	64	3A69
101	65	3A6A
102	66	3A6B
103	67	3A6C
104	68	3A6D
105	69	3A6E
106	6A	3A6F
107	6B	3A70
108	6C	3A71
109	6D	3A72
110	6E	3A73
111	6F	3A74
112	70	3A75
113	71	3A76
114	72	3A77
115	73	3A78
116	74	3A79
117	75	3A7A
118	76	3A7B
119	77	3A7C
120	78	3A7D
121	79	3A7E
122	7A	3A7F
123	7B	3A80
124	7C	3A81
125	7D	3A82
126	7E	3A83
127	7F	3A84

F.2 Line Port

The RC855 line port is supported as the CP/M reader/punch devices, RDR and PUN, (see ref. [1], 1.6.1).

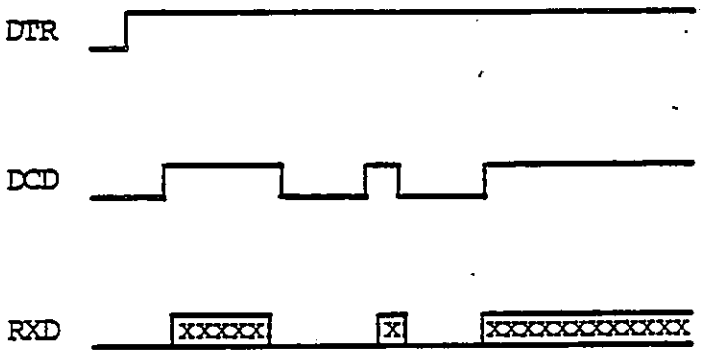
The configuration parameters for the line speed and character format, which are described in appendix H, are retrieved automatically from the nonvolatile memory whenever a system boot (cold boot) occurs.

It is possible to transmit data from the RC855 via the line port. The busy handshake mechanism uses the V.24 signals, RTS and CTS, as illustrated below:



Following a cold boot, RTS ("ready to send") is switched on and sent by the RC855 to the receiving device. When the receiving device is ready, CTS ("clear to send") is switched on and sent to the RC855. The RC855 can transmit as long as CTS is on. Transmission takes place on line TXD.

The RC855 can also receive data via the line port. The V.24 signals DTR and DCD are exchanged as illustrated below:



Whenever a cold boot takes place, DTR ("data terminal ready") is switched on and sent by the RC855 to the transmitting device. The RC855 receiver is not enabled, however, until DCD ("data carrier detect") has been sent to the RC855 by the transmitting device. RXD is the line on which the RC855 will receive data from the transmitting device.

The ready status of the reader can be accessed by means of the BIOS procedure READST (entry at BIOS+77 (4D hex)). The status is returned in register A (255 (FF hex) if a character is available).

G. HARD DISK CONFIGURATION G.

There are four possible Hard Disk configurations.

Table G.1 lists the disks and disk sizes of each configuration.

Table G.2 shows the connection between disk size, block size and number of directory entries.

G.1 Disk Configurations and Disk Capacity G.1

	Disk unit:	Disk Capacity:
Configuration 1:	C	780/1124 Kbyte (mini/maxi)
	D	8992 Kbyte
Configuration 2:	C	780/1124 Kbyte (mini/maxi)
	D	4480 Kbyte
	E	4480 Kbyte
Configuration 3:	C	780/1124 Kbyte (mini/maxi)
	D	2240 Kbyte
	E	2240 Kbyte
	F	4480 Kbyte
Configuration 4:	C	780/1124 Kbyte (mini/maxi)
	D	2240 Kbyte
	E	2240 Kbyte
	F	2240 Kbyte
	G	2240 Kbyte

G.2 Specifications of Logical Disks by Disk Size G.2

Disk Capacity:	Blocksize:	Directory Entries:
780 Kbyte	2 Kbyte	256
1124 Kbyte	2 Kbyte	128
2240 Kbyte	4 Kbyte	512
4480 Kbyte	8 Kbyte	512
8192 Kbyte	16 Kbyte	512

H. SYSTEM CONFIGURATION PARAMETERS H.

This appendix describes the system configuration parameters, the values of which can be changed by means of the utility program CONFI (see 4.3.10).

H.1 Keyboard Alpha-Lock H.1

This parameter determines whether the keyboard is to be placed in the alpha-lock mode following a system boot (cold boot). In this mode, the SHIFT key function is applied automatically to all alphanumeric keys marked with (capital) alphabetic characters.

Values: OFF
ON

H.2 Cursor Presentation H.2

The parameter determines the visual appearance of the cursor.

Values: Underline
Underline, blinking
Block
Block, blinking

H.3 Printer Port H.3

The first parameter defines the bit rate.

Values: 110 baud
300 baud
600 baud
1200 baud
2400 baud
4800 baud
9600 baud

The second parameter defines the number of bits per character.

Values: 5 bits/char
6 bits/char
7 bits/char
8 bits/char

The third parameter defines the number of stopbits.

Values: 1 stopbit
1.5 stopbits
2 stopbits

The fourth parameter defines the parity.

Values: No parity
Even parity
Odd parity

H.4 Line Port H.4

The first parameter defines the bit rate.

Values: 110 baud
300 baud
600 baud
1200 baud
2400 baud
4800 baud
9600 baud

The second parameter defines the number of bits per character.

Values: 5 bits/char
6 bits/char
7 bits/char
8 bits/char

The third parameter defines the number of stopbits.

Values: 1 stopbit
1.5 stopbits
2 stopbits

The fourth parameter defines the parity.

Values: No parity
Even parity
Odd parity

The fifth parameter defines the operating mode.

Values: Asynchronous
Synchronous

H.5 Floppy Motor Timeout H.5

This parameter determines the motor timeout for 5.25 inch flexible disk drives. The flexible disk drive motor will be stopped if no drives have been accessed for the timeout period. It is not used for 8 inch flexible disk drives.

Values:		
	5 seconds	30 seconds
	10 seconds	45 seconds
	15 seconds	60 seconds
	20 seconds	120 seconds

H.6 Secondary Address H.6

This parameter defines a unique "secondary address" for the CIRCUIT (which can interconnect as many as eight RC855 terminals in a cluster). This value is not used by CP/M.

Values:		
	0	4
	1	5
	2	6
	3	7

I. MORE ABOUT FILEX

Appendix I provides technical information concerning the FILEX utility.

I.1 describes various requirements for normal use.

I.2 describes FILEX transactions and the FILEX transmission protocol. It is intended for advanced users wanting to modify FILEX or implement a FILEX type file transfer program.

I.1 Requirements for Normal Use

The two computers on which FILEX is to run (two RC700's, two RC855's, or one of each) must be connected by means of one of the following cables:

1) CBL912 (5 meters)
2) CBL913 (12 m)
3) CBL914 (25 m)

To connect an RC700 and the RC791 Line Selector, one of the following cables should be used:

1) CBL892 (5 m)
2) CBL893 (12 m)
3) CBL894 (25 m)

Furthermore, the user should use CONFI (4.3.10) to ensure:

1) that the two computers have the same baud rate for the line port,
2) that the line mode is set to asynchronous,
3) that the line character format is set to 7 bits per character, 1 stopbit and even parity.

I.2 How FILEX Works

FILEX type file transfer takes place as follows: The local station sends a number of transactions to the remote station. Each time the remote station receives a transaction, it carries out the appropriate file operation and sends an answer back to the local station. The transactions sent depend upon whether the file is to be transferred to or from the local station (see the FILEX program listing for details).

The entire set of transactions is described in I.2.1 below.

I.2.2 explains the transmission protocol for transactions.

I.2.1 FILEX Transactions

(N.B. The effect of the file operations below is as described in ref. [1], section 5.2.)

OPEN

Request	Field	Answer
1	opcode	1
0	unused	0
0	result	result
file name (16 bytes)	name	

(N.B. For all answers, the possible result values are:
0 =ok
1 =does not exist
2 =full
3 =end of file .)

MAKE

Request	Field	Answer
2	opcode	2
0	unused	0
0	result	result
file name (16 bytes)	name	

READ

Request	Field	Answer
3	opcode	3
0	unused	0
0	result	result
	area	area (128 bytes)

WRITE

Request	Field	Answer
4	opcode	4
0	unused	0
0	result	result
area (128 bytes)	area	

CLOSE

Request	Field	Answer
5	opcode	5
0	unused	0
0	result	result

END

Request	Field	Answer
6	opcode	6
0	unused	0
0	result	result

I.2.2 Transmission Protocol

I.2.2

The transactions described in I.2.1 are sent by means of the blocked transmission protocol described below:

A block consists of the following elements:

1) Start character:
   ASCII VALUE 35.

2) Block size:
   The size defines the number of characters (N) in the string to be sent, not the number of characters necessary to send the string (2*N+8, explained below).

   The block size is a 16-bit integer (0..65535) split into four 4-bit digits. Each digit is interpreted as an integer to which 64 has been added, such that the resulting value lies between 64 and 79. These values are transmitted as characters, the

most significant part first, the least significant last.

3) Data section:
Each character in the string to be sent is split into two 4-bit digits, to which 64 is added, as above. These two integers are transmitted as ASCII values, the most significant part first.

4) Checksum:
An 8-bit number which is transmitted as two ASCII values as explained above. The checksum is calculated such that the following condition is satisfied:

((the sum of the values of the characters in the original string) + checksum) modulo 256 = 0.

5) Stop character:
ASCII value 13.

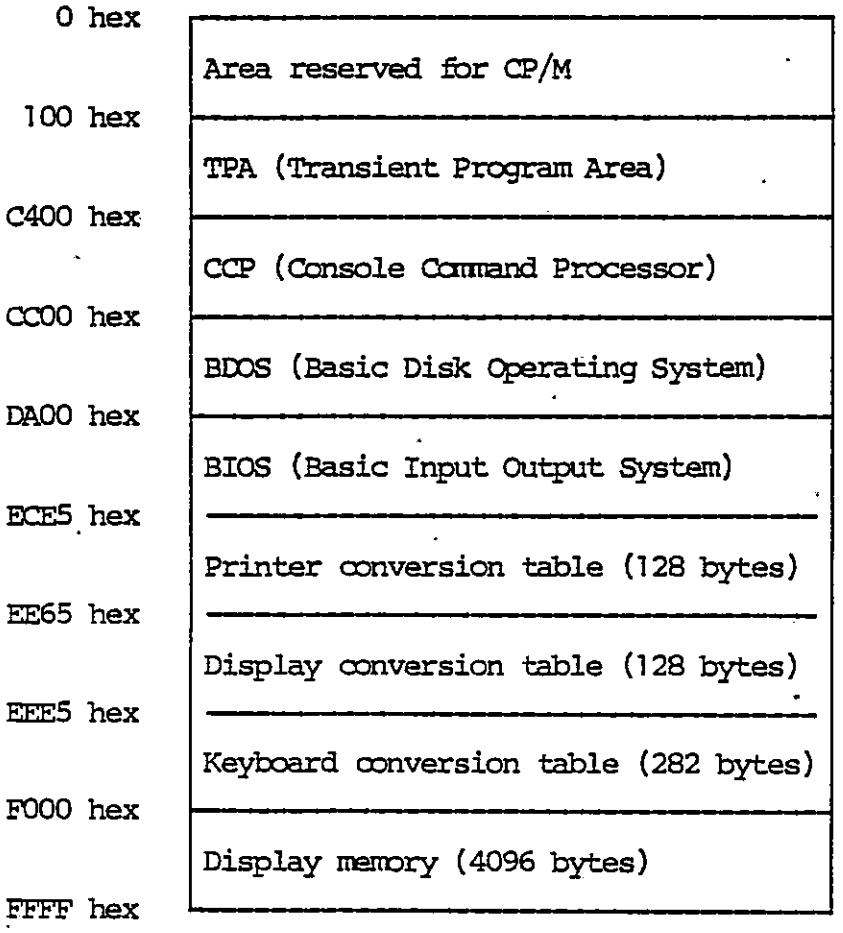
If the number of characters in the string to be transmitted is N, then the actual number of characters transmitted is:

```
1    (start character)
+
4    (block size)
+
2*N  (data section)
+
2    (check sum)
+
1    (stop character)

= 2*N+8 characters.
```

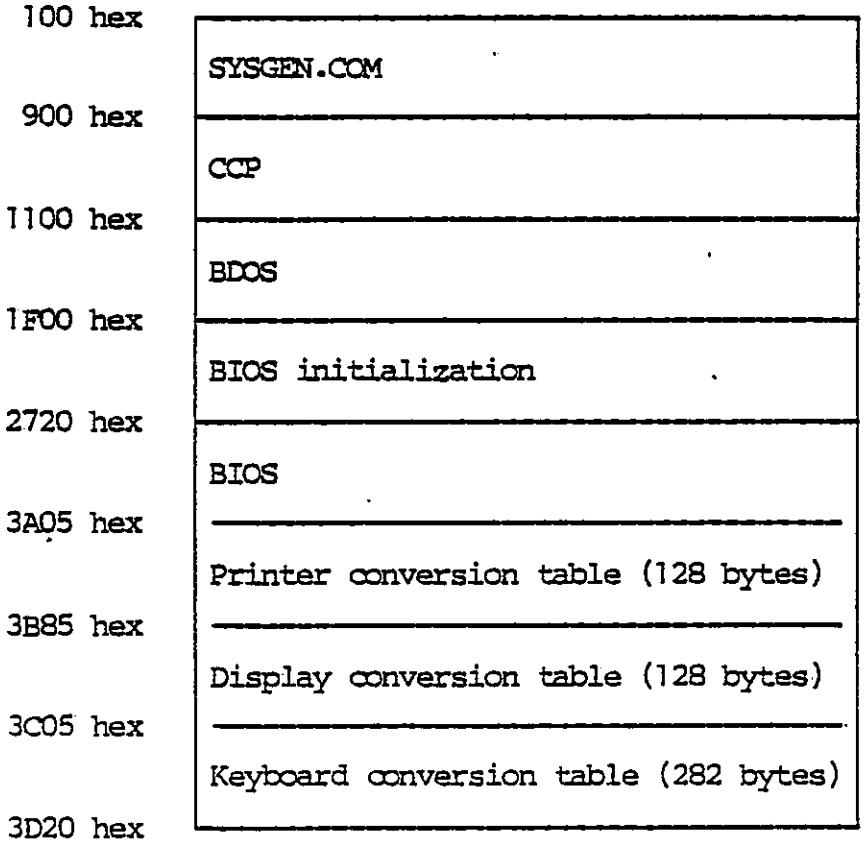
J. MEMORY MAP OF RC855 CP/M 2.2 J.

J.1 Memory Map of RC855 CP/M Rel. 2.0 J.1



Note: The map is not drawn to scale!

J.2 Memory Map During RC855 SYSGEN



Note: The map is not drawn to scale!

K. RC855 CP/M 2.2 REL. 2.0 UTILITIES K.

Name	Version	
ASM	2.0	
ASSIGN	2.0	83.05.11
AUTOEXEC	1.2	83.05.04
BACKUP	2.0	83.05.04
CAT	-	
CONFI	4.0	83.06.10
COPYSYS	1.1	83.05.11
DDT	2.2	
DUMP	1.4	
ED	-	
FILEX	1.0	83.01.19
FORMAT	2.1	83.05.05
HDFORM	2.1	83.06.27
HDINST	1.0	83.06.27
LOAD	-	
PIP	-	
RESTORE	1.2	83.04.11
STAT	-	
STORE	1.2	83.04.11
SUBMIT	-	
SYSGEN	3.0	83.05.11
TRANSFER	2.1	83.05.05
VERIFY	1.1	83.05.06
XSUB	-	

L. INDEX L.

RETURN LETTER

Title: RC855 Work Station, User's Guide RCSL No.: 42-i 2347

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