Soft Box

USERS MANUAL

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BLANK

Revision 2

T A B L E O F C O N T E N T S

Appendices

1. INTRODUCTION

The purpose of this manual is to provide an introduction to CP/M, as well as a comprehensive guide for using the SoftBox on your PET. For a detailed description of CP/M, the reader is referred to the CP/M version 2.2 User's Manual supplied by Digital Research.

CP/M is a trademark of Digital Research, Inc.

1.1. Copyright Notice

1.2. CP/M License Agreement

The CP/M operating system is sold under licence from Digital Research, Inc. on condition that each user completes and returns a software license agreement. Please read carefully the enclosed CP/M license agreement form, before using your CP/M diskette.

1.3. What is CP/M ?

CP/M is a disk operating system (DOS), a program which manages your program and data files on floppy or hard disks, and provides a standard environment for developing and running applications programs.

CP/M has been developed by Digital Research into an operating system capable of running on virtually any disk-based microcomputer which uses either the Intel 8080 or Zilog Z80 family of central processor (CPU) chip. CP/M has now been adapted for nearly all such machines, and is being used extensively because of its power and relatively low cost. Many excellent software packages are now available for it, including languages like CIS-COBOL, FORTRAN, C, APL, PL/1, FORTH and PASCAL, as well as Microsoft's extended BASIC compiler and interpreter, Cross assemblers, Macro assemblers, and hundreds of business packages such as WORDSTAR (tm) and MAGIC WAND (tm).

Irrespective of the particular hardware on which CP/M is running, its operation appears the same to the user. This hardware independence is crucial because it means that most applications written for use under CP/M will run on ANY computer system which supports CP/M, provided that sufficient memory is available (the maximum is typically 60K bytes of RAM on an 8080 or Z80 based system). Consequently a vast library of software is now available to every CP/M user, from a wide variety of suppliers.

Not surprisingly, CP/M has become the world's most popular microcomputer operating system.

Unfortunately, whilst the PET has software packages of its own, being based on the 6502 CPU and having a maximum RAM size of 32K bytes it has up until now been unable to take advantage of the much richer collection of CP/M software.

1.4. The SoftBox

The SoftBox allows you to totally overcome these twin obstacles of memory size and Z80 CPU compatibility. By purchasing the SoftBox you will greatly expand the power of your PET, and the range of high-quality software and development tools available. If you have the serial interface option, the SoftBox will also allow you to use a serial (RS232) printer or terminal with your PET. We are sure that you will enjoy using CP/M on your PET.

Design and development

The SoftBox hardware was designed and developed by Derek Rowe of Small Systems Engineering, London, England.

The software (excluding the CP/M operating system), and manual are by Keith Frewin of Unicorn Software, London, England.

1.5. Hardware requirements

To run PET CP/M you must have a 3000, 4000 or 8000 series PET microcomputer with disk drives. Series 2000 PETs may also be used but should ideally be fitted with upgrade BASIC ROMs which allow them to work with disks. However a short initialization program program may optionally be supplied on cassette for loading CP/M on old ROM PETs. 8K of PET RAM is sufficient to run CP/M.

From one to eight Commodore floppy disk units (model 2040, 3040, 4040 or 8050) may be attached in any combination, allowing up to 8 Megabytes of on-line floppy disk storage. By convention, disk drives under CP/M are labelled alphabetically from A to P, allowing a total of up to 16 drives. For the purposes of PET floppy disks, these are grouped into pairs (A and B, C and D, and so on, up to O and P). Each pair of letters represents one physical twin disk unit.

The master disk unit, which must always be present, should occupy the usual IEEE address (device #8). The right hand side (physical drive 0) becomes drive A, while the left hand drive (drive 1) becomes drive B under CP/M.

If you wish to have more than one floppy disk unit in the system, the remaining units must be set up for different IEEE addresses. Consult your PET dealer for advice on how to do this. Chapter 6 explains how to reconfigure your CP/M to expect more than one drive unit.

You will require a standard IEEE to IEEE cable to connect the SoftBox to your PET and disk drives.

1.6. Some notes on the SoftBox for CP/M users

You need not be familiar with the PET or PET BASIC to use the SoftBox.

The SoftBox gives you access to 60K CP/M version 2.2 running on a Z80 processor at 4MHz, with no wait states. This allows you to run virtually any CP/M software, with a very high processing speed.

The PET VDU and keyboard appears to CP/M as either a Lear Seigler ADM3A, Televideo 912C or Hazeltine 1500 terminal, allowing many packages such as wordprocessors which require special screen handling to be run with little or no modification.

Some changes have been made to the PET keyboard meaning. The RVS key functions under CP/M as a CONTROL key, while on 40 column PETs the STOP key functions as an ESCAPE key.

CP/M directory listings may be two columns wide instead of four (for use with 40 column PETs).

Disk drive characteristics under CP/M :

3040 and 4040 drives	capacity per drive (user) :	154 Kbytes
	block size :	2 Kbytes
	directory entries :	64
8050 drives	capacity per drive (user) :	498 Kbytes
	block size :	2 Kbytes
	directory entries :	64

Physical input/output devices :

CRT: is the PET keyboard and screen.
TTY: is the optional serial interface (for RS232 printer or terminal)
LPT: is the PET printer, if any (IEEE address is user defined).
UL1: is a user defined IEEE list device using ASCII codes (such as a daisywheel printer)
PTR: is a user defined IEEE input device
PTP: is a user defined IEEE output device

CP/M logical input/output devices :

```
CON:  (console device) can be CRT: or TTY:
LST:  (list device)    can be CRT:, TTY:, LPT: or UL1:
RDR:  (reader device)  can be PTR: or TTY:
PUN:  (punch device)   can be PTP: or TTY:
```

2. Running up CP/M on your PET

2.1. Setting up the SoftBox.

Firstly you need to connect the SoftBox to the PET and disk drives (and to the PET printer if required). Using a standard IEEE to IEEE connector cable, plug one end into the IEEE socket at the back of the SoftBox. The other end may be piggy-backed onto some convenient socket on the PET IEEE bus, for example at the back of the floppy disk unit.

2.2. Loading CP/M from cold.

Power up the SoftBox, PET and disk drives. The lights on the drive will flicker on briefly as usual and should then go out (3040 or 4040 drives), or else a green light in the centre of the drive will stay on (8050 drives). Once this has happened you can proceed to load CP/M as follows. The PET should be displaying the usual sign-on message (depending on the PET model and BASIC version number), for example :

```
### Commodore BASIC ###
31743 bytes free
Ready.
```

In fact the PET and disk drives will function normally until the CP/M diskette is loaded. This allows you to run all the standard PET software as though the SoftBox were not present.

To load CP/M, simply insert the CP/M diskette in drive 0 (the right hand drive). This drive will become CP/M drive A. If you have an 8K PET with early ROMs then load CP/M by running the CP/M initialization cassette, otherwise type :

```
LOAD "*",8
```

followed by a carriage return. The drive motor will then start. (As always with older PET drives, it is advisable to wait until the motor actually starts spinning to close the drive door, to ensure that the diskette is correctly centralized). The PET will reply with :

```
searching for "*"
loading
ready.
```

Type :

```
RUN
```

followed by a carriage return. The message :

```
Loading CP/M...
```

will appear while the CP/M operating system is being loaded from the disk, followed typically by the CP/M sign-on message :

```
60K PET CP/M Version 2.2
(c) 1981 Keith Frewin

A>
```

Note - if you have a PET with BASIC version 4 and disk drives with DOS version 2 then an alternative, easier way to load CP/M from the disk is to simultaenously press the SHIFT and RUN keys on the PET keyboard.

The CP/M prompt "A>" tells you that you are currently on drive A and that CP/M is awaiting a keyboard command. Try typing :

```
dir
```

followed by a carriage return. This command will give you a directory listing of the current drive (drive A). Your directory listing will look something like :

```
A: PIP      COM : STAT     COM
A: FORMAT   COM : NEWSYS   COM
A: DDT      COM : ED       COM
A: BACKUP   COM : ASM      COM
A: DUMP     COM : LOAD     COM

[etc.]
```

Each directory entry is the name of a CP/M "file" on the disk (much more about CP/M files later).

2.3. Making backup copies of CP/M.

Now, having loaded CP/M for the first time, you should make at least one back-up copy of your CP/M master diskette.

IMPORTANT - KEEP YOUR CP/M MASTER DISKETTE WRITE-PROTECTED AT ALL TIMES (KEEP THE WRITE-PROTECT NOTCH AT THE EDGE OF THE DISKETTE COVERED UP). IT CONTAINS SERIALIZED SOFTWARE WHICH CANNOT BE REPLACED.

To make a back-up copy, with the master disk still in drive A (the right hand drive), put a blank disk in drive B (the left hand drive) and type :

```
backup b=a
```

Followed, as with all CP/M commands, by a carriage return. The BACKUP program will ask :

```
Disk on drive B: will be erased.
Press RETURN to continue,
Press the SPACE BAR to abort :
```

Press RETURN to confirm your intentions. If you are using a 3040 or 4040 drive, wait till the left-hand drive starts spinning before closing the drive door. The entire contents of disk A will be copied onto disk B, destroying any previous information on disk B. The copying operation takes several minutes, during which both drive lights remain on. When complete, the drive lights will go out and the CP/M command prompt

```
A>
```

will be redisplayed.

3. Introduction to CP/M file handling

Having loaded CP/M and made back-up copies of your system disk, you are now ready to explore the file handling capabilities of CP/M.

IMPORTANT - PUT YOUR CP/M MASTER DISKETTE IN A SAFE PLACE. IN GENERAL, ALWAYS STORE A DISKETTE IN ITS PROTECIVE JACKET, AWAY FROM HEAT, DUST, DAMPNESS OR STRONG MAGNETIC FIELDS. NEVER TURN THE POWER ON OR OFF WHILE A DISKETTE IS STILL IN THE DRIVE. ALWAYS KEEP BACKUP COPIES OF ANY DISKETTES WHICH CONTAIN VALUABLE SOFTWARE OR DATA.

As CP/M is already loaded, there is no need at this stage to reload it from cold. To reset the drive you can do a warm start instead. Place a copy of the CP/M disk in drive A, and type a CONTROL-C. This is done by holding down the RVS key while typing a "C". (If you are using 3040 or 4040 drives, wait till the drive motor starts before losing the drive door). The RVS key on the PET keyboard becomes a "CONTROL" key under CP/M, which is used in conjunction with any one of the letters A to Z to provide special keyboard functions known as CONTROL CHARACTERS. The control-C character is often written as ^C. When typed at the beginning of a line of keyboard input, it performs a CP/M warm start (also called a "re-boot"). It is often used as a means to exit from applications programs running under CP/M, returning the user to the CP/M command mode.

3.1. CP/M line editing

When entering CP/M commands, you may erase the last character you typed by pressing the CUSROR LEFT key, or alternatively the DELETE key. You may erase the whole line by typing either CONTROL-U or CONTROL-X.

3.2. Files and file names

If, for example, you want to save a program on a floppy disk, you do not normally need or want to know exactly which sectors are being written to on the disk. For this reason, programs and data are stored by CP/M in named disk "files". A directory on each disk tells CP/M which files are stored where. A CP/M file name can have up to eight letters (or numbers or any other character, but don't use '?', ':', '.' or '*' as these have a special meaning to CP/M). The filename may also be qualified by a "file type" of up to three charaters. By convention the file name and type are separated by a full stop when you type them. For example :

STAT.COM

Is a file called STAT with file type COM.

MAGIC!

Is an example of a file name with no file type. To avoid ambiguity, only one file may exist on each disk with any given file name and type. A file may have any (or no) file type, although some applications programs such as language compilers expect certain file types. The file type "COM" is the only one recognized by CP/M as a special case. A command file such as "STAT.COM" may be loaded into memory and run by typing "STAT". Some common file types are :

.COM	CP/M command
.CBL	COBOL source file
.FOR	FORTRAN source file
.PAS	PASCAL source file
.BAS	BASIC source file
.C	C source file
.PLI	PL/1 source file
.ASM	Assembler source file
.HEX	Intel hex format object file
.REL	Microsoft relocatable format object file
.TXT	Text file
.BAK	Editor backup file
.INT	Intermediate object code file (CIS-COBOL)
.SUB	"SUBMIT" command file
.$$$	Temporary file

3.3. Selective directory listings

Try typing the command :

```
dir *.com
```

This will list all files with file type COM on the current drive.

Similarly,

```
dir s*.*
```

will list all files beginning with the letter S.

```
dir *
```

will list all files which have no file type. There are no such files so CP/M replies with the message :

```
NO FILE
```

The wildcard character "*" will match zero or more characters in a file name. The "?" character has a similar function but matches one and only one character. So FE?T will match FEAT and FEET but not FEAST.

3.4. The TYPE command

The TYPE command tells CP/M to type the contents of a disk file containing ASCII character data on the screen. Thus the command:

```
type dump.asm
```

will produce a listing of the file DUMP.ASM, which is in fact an example assembly language program referred to in the CP/M Assembler User's Guide. If you try TYPEing a non-ASCII file, such as a CP/M command (.COM) file, you will get garbage on the screen, and control characters present in the file may affect the VDU operation (for example the cursor may be turned off).

To freeze any console output while you examine part of it, press CONTROL-S (The S key with RVS held down). Don't hold the key down as it will auto-repeat. To continue the listing, simply type another CONTROL-S. To abort a TYPE command, press any other key.

You can get listings on the PET printer by pressing CONTROL-P. All output to the console will then also appear on the printer (for example the output from a TYPE command or a directory listing). This facility is turned off by typing another CONTROL-P, or by a CP/M warm start.

3.5. Making CP/M files

One way to create a file under CP/M, for the purpose of experimenting with file names, is to use the SAVE command :

```
save 3 test
```

Saves three pages of memory (one page being 256 bytes), in a file called TEST. The block of memory saved always starts at location 100 hex, the starting location for CP/M applications programs. Do not worry about what information TEST contains. There are ways to find out what is in the file you saved, but it will be some random power-up pattern left in the memory, as we have not yet used this part of memory. Type :

```
dir
```

to check that the file TEST is now in the directory. Once a file has been created, you are allowed to rename it, provided that the new name does not already exist in the directory. For example :

```
ren freddie=test
```

If you type DIR now, you will no longer see the file TEST. It has become FREDDIE. Finally, to remove the file FREDDIE, you can type the command :

```
era freddie
```

Take care when using wildcard file specifications with ERA. You may erase more files than you thought! In fact the special case

```
era *.*
```

causes CP/M to ask for confirmation before deleting all the files on the disk :

```
ALL FILES (Y/N) ?
```

Typing any key other than Y will cause CP/M to ignore your ERA command. Take care when using '?' to match single characters at the end of a file name - due to the way in which CP/M stores filenames in the directory,

```
era te??
```

will erase TEST but will also erase TEN and TEA. This is because the second question mark has matched one of the spaces CP/M uses to pad file names. If in doubt, you could first type :

```
dir te??
```

to find out which files would be deleted.

3.6. User numbers

There is just one more intrinsic CP/M command - the user command. To see it in action, type :

```
user 1
```

now type

```
dir
```

Don't panic! The directory has not gone - you have just switched user numbers. Each user (numbered 0 to 15) can own separate files in the directory. This can be useful for keeping different groups of files for different jobs on the same disk. At the moment, user 1 has no files. To revert to normal operation, type :

```
user 0
```

3.7. Transient commands

DIR, TYPE, SAVE, REN, ERA and USER are the six built-in CP/M commands, which are automatically available whenever CP/M is running. All other CP/M "commands" are in fact programs held in disk files, of file type COM, which are loaded into memory when the command is typed. CP/M does not distinguish between these and other applications programs. This means that you can rename, modify or delete them, as well as inventing your own commands. Type :

```
stat
```

followed by a carriage return. There will be a pause while the STAT program is loaded into memory. STAT will print out the disk status (read only or read/write) and the amount of free space left on the disk, for example :

```
A: R/W, Space: 56K
```

STAT can also be used with a file name, for example :

```
stat *.*
```

This gives a rather more verbose listing than the DIR command, with the file size (in kilobytes, in 128-byte records, and the number of disk extents) and also the file status (read only or read/write), while the command :

```
stat dsk:
```

displays some disk drive characteristics.

CP/M has four logical input/output devices - the console (CON:), the list device (LST:), the reader device (RDR:) and the punch (PUN:) which may be assigned to different physical input/output devices such as terminals or printers. To find out the current logical device settings, type :

```
stat dev:
```

STAT will reply with :

```
CON: is CRT:
LST: is LPT:
PUN: is PTP:
RDR: is PTR:
```

CRT: is the PET keyboard and screen, LPT: is the PET printer (if any), ULl: is an ASCII printer device, TTY: is the optional RS232 serial interface, PTP: and PTR: are user defined IEEE devices (see chapter 6). To set the list device to be the serial port instead of the PET printer, for example, you would type :

```
stat lst:=tty:
```

Other uses of STAT include setting files to be read-only, or to be invisible to directory listings (SYSTEM files). See the CP/M User's Manual for further details. Type

```
stat val:
```

to get a list of STAT command options.

4. Running applications packages under CP/M

The main application for your SoftBox will most likely be to run one or more of the commercially available CP/M software packages. When you receive the manual and diskette for the package, you will naturally be anxious to try the package out. However you should resist the temptation to do so until you have first made a back-up copy of the master disk for the package. This may be done as follows : firstly, with CP/M loaded and a CP/M system disk in drive A, place a new disk in drive B. You will need to format the disk in drive B, to do this type :

```
format
```

The FORMAT program will ask :

```
Format disk on which drive
(A to P, or RETURN to reboot) ?
```

Reply with the drive name :

```
B
```

followed by a carriage return. Because the FORMAT program destroys any data on the disk being formatted, it will first ask you if you are sure :

```
Disk on drive B is to be formatted
Press RETURN to continue, ^C to abort :
```

If you typed the wrong drive name by mistake, you could return to CP/M command mode by typing CONTROL-C. Otherwise, press RETURN to confirm that you want to format the disk.

A DISK MUST BE FORMATTED USING THE SOFTBOX "FORMAT" PROGRAM BEFORE ANY CP/M FILES ARE COPIED ONTO IT, OR BEFORE IT IS USED BY A CP/M APPLICATION.

When formatting is complete, the FORMAT program will then again ask you for a drive name, so that you can format another disk if you wish. To leave the FORMAT program, press RETURN.

Having formatted your backup diskette, you should next copy a CP/M system onto it. To do this type :

```
newsys
```

NEWSYS will ask :

```
Source drive (A to P) ?
```

Type :

```
A
```

followed by a carriage return. NEWSYS will read the CP/M system off drive A. When this is done NEWSYS will display a menu of commands. Use the SAVE command :

```
s
```

Followed by a carriage return. NEWSYS will next ask :

```
Save on which drive (A to P) ?
```

Press B <return> to tell NEWSYS to save the system onto drive B. When this is done use the Q command to exit from NEWSYS. Finally you need to copy all the files from your software package diskette. This is done using PIP (which stands for Peripheral Interchange Program). With your CP/M system diskette still in drive A type :

```
pip
```

followed by a carriage return. PIP will respond with a prompt :

```
*
```

Next remove your CP/M diskette from drive A and insert the diskette containing the software package (it is as well to ensure that this is write-protected). now type :

```
b:=*.*[o]
```

this PIP command will copy all files from drive A to drive B. The O option (in square brackets) is important, in case any of the files being copied are binary "object" files instead of containing ASCII text. The PIP program is somewhat complicated to cover fully in this manual, but a complete list of options is given in the CP/M User's Manual. The options available when copying files include removing tabs, converting to upper or lower case, etc.

When the copying is complete, PIP will give you another asterisk prompt. Remove the master disk from drive A, and re-insert your CP/M system disk. Then type a CONTROL-C to do a CP/M warm start. You can check that all the files have been copied onto the new disk by typing the command :

```
dir b:
```

This will list all files on drive B. Alternatively you can type :

```
stat b:*.*
```

In general, prefixing a CP/M filename by a drive letter followed by a colon tells CP/M that the file is on that drive, rather than the current drive. To change the current drive (which starts off as drive A), reply to the CP/M prompt

```
A>
```

with the command

```
b:
```

The prompt will now change to

```
B>
```

to remind you that the current drive is now B. Now the straight "dir" command will list all the files on drive B. To list files on drive A you would need to type :

```
dir a:
```

To revert to drive A: simply type :

```
a:
```

Having copied your software package, you are now ready to try it out. Note that although CP/M commands may be typed in either upper or lower case, certain software packages, such as CIS-COBOL require you to type in upper case only. To avoid excessive use of the shift key you may use the command :

```
set upper
```

to force upper case keyboard input. You can also make CP/M default to upper case mode on power-up. See chapter 6 on the NEWSYS command.

Remove the disk from drive A and insert the new disk you have made instead. Type a CONTROL-C to log in the new disk. Your "A" disk has a copy of software package, and a CP/M system which enables you use it for cold and warm starts.

ALWAYS PERFORM A CP/M WARM START (CONTROL-C) WHENEVER YOU PHYSICALLY CHANGE A DISK. THIS IS NECESSARY TO ENSURE THAT THE NEW DISK IS CORRECTLY LOGGED IN, SINCE CP/M HOLDS ALLOCATION INFORMATION ABOUT THE DISK IN RAM. FAILURE TO DO SO WILL RESULT IN A "READ-ONLY" ERROR WHEN YOU TRY TO WRITE TO THE NEW DISK.

WITH 3040 OR 4040 DISK DRIVES, WHENEVER YOU CHANGE A DISK IT IS ADVISABLE TO WAIT UNTIL THE DRIVE MOTOR ACTUALLY STARTS SPINNING ON THAT DRIVE BEFORE CLOSING THE DRIVE DOOR. THIS WILL ELIMINATE ANY PROBLEMS WITH DISK CENTRALIZATION.

5. More SoftBox utilities

The following utility programs are supplied on your CP/M master disk :

5.1. SET Set the PET display mode.

There are a number of uses for this command :

```
set upper       (or set u)
set lower       (or set l)
```

sets the terminal to upper case only, or lower-and-upper case mode (normal).

```
set text        (or set t)
set graphics    (or set g)
```

sets the terminal to text mode (normal), or to graphics mode (spacing between lines compressed).

```
set p=DN
set a=DN
set r=DN
set n=DN
```

sets the PET printer (LPT:), ASCII printer (UL1:), reader (PTR:) or punch (PTP:) device respectively to be IEEE device number DN.

```
set d=1
set d=2
set d=4
```

sets the number of columns for directory listings (DIR command). Use 1 or 2 columns on 40-column PETs to avoid screen wrap-around.

```
set v=adm3a
set v=tv912
set v=hz1500
```

sets the PET VDU to appear like a Lear Seigler ADM3A, Televideo 912 or Hazeltine 1500 terminal.

```
set e=escape
set e=tilde
```

sets the escape (lead-in) character for Hazeltine terminal emulation.

5.2. TIME examine or set the PET clock.

there are two forms of this command :

```
time
```

displays the current time on the screen, for example

```
time is 12:04:58
```

while to set the clock you would type, for example :

```
time = 3 46 07
```

You will then be asked to press any key to start the clock.

5.3. COLD Cold start PET BASIC.

The command :

```
cold
```

resets the PET, the SoftBox and the disk drives, reverting to 6502 mode and PET BASIC.

5.4. BACKUP Make a duplicate copy of a disk

This command copies an entire disk. The syntax is :

```
backup D=S
```

where D is the name of the destination drive, and S is the name of the source drive. Any existing data on drive D will be lost, so be sure to get the drives the right way round! Both the source and destination drives must be on the same drive unit, and the source disk must have been created using the same version of COMMODORE DOS. To copy files from one unit to another, or to another DOS format, use the PIP command.

5.5. FORMAT Format a disk for use with CP/M

This command is described in the previous chapter.

5.6. STAT Display or alter status information

This usage of this command is partially described in chapter 3, and fully described in the CP/M User's Manual.

5.7. PIP Peripheral Interchange Program

This command allows you to transfer files from disk to disk, concatenate several files, or transfer data between disk files and input/output devices. It is fully described in the CP/M User's Manual.

5.8. READ load CP/M files using the RS232 port

This command only applies if you have the serial interface option. It may be used to transfer files from another CP/M computer using an RS232 link. To download software using READ you will need to type in the the machine language program SEND.COM on the other computer. Assembly language listings for READ and SEND are included in this manual (appendix C). These programs use the Clear to Send (CTS) output of the RS232 port on the SoftBox, which is pin 5. This should be wired to the Data Terminal Ready (DTR) input of the other computer, which is normally pin 20 of the RS232 connector. This handshaking line is necessary to avoid losing data while the file is being transferred. Be sure that the SoftBox baud rate setting matches that of the sending computer. See chapter 6 for details of how to alter the baud rate on the SoftBox.

To download any CP/M file simply type on the PET :

```
read filename
```

Where FILENAME is the name of the destination file, specified in

the usual way. Wait for the READ program to reply with the prompt :

ready to receive

Now on the other computer type the command :

send filename

Where FILENAME is the name of the file you want to send. The READ program will output a dot on the screen for every 128 bytes transferred. Checksums are inserted in the data to make sure that it is correctly transferred. If any checksum errors occur then READ will inform you and reboot. You will then need to transfer the file again.

5.9. MEMTEST perform a SoftBox memory test

To invoke the memory test, type :

memtest

MEMTEST will perform a complete cycle of tests on the 60K bytes of internal RAM in the CP/M box. Ten different tests are performed, and after each cycle a cumulative error count is printed. After the tenth pass, the whole cycle is repeated until a hardware reset is performed. If any errors occur, the cumulative address range of the faulty locations and a data byte indicating the faulty bit positions with 1's will be displayed, for use by your dealer or service engineer.

5.10. XFER transfer files between PET DOS and CP/M

This command can be used to transfer files between a standard PET format disk on one drive and a PET CP/M disk on another drive. The command is invoked by typing :

xfer filename

Where FILENAME is either the name of the CP/M file to be transferred to a PET DOS sequential file, or the name of the CP/M destination file to which a PET BASIC program or data file may be copied. BASIC programs will be converted into ASCII format for use with Microsoft extended BASIC, for example. The XFER program will then ask which of the three types of copying operation you require, and prompt you for drive and file name of the PET DOS file.

ALWAYS USE THE XFER COMMAND WHEN TRANSFERRING DATA FROM PET DOS FORMAT TO PET CP/M FORMAT. This is necessary because data is stored differenly in the two formats. Copying files directly using the PET DOS commands or the CP/M PIP command will not work, and you will destroy other data on the disk.

5.11. SUBMIT and XSUB submit a batch of CP/M commands

See the CP/M User's Manual for details of these commands.

5.12. LOAD Make a command file from a hex file

This command is for use with the CP/M assember. See the CP/M User's Manual.

5.13. DUMP Display the contents of a file in hex

The syntax is :

dump FILENAME

This will give a hexadecimal display of the specified file on the console. To get a listing on the printer, type a CONTROL-P first.

5.14. ED The CP/M text editor

A line-oriented text editor which may be used to create program source files, or to alter other ASCII text files. See the ED User's Manual for details.

5.15. ASM and DDT Assembler and debugging tool

These utilities support the development and debugging of assembly language programs written in Intel 8080 source code. See the ASM and DDT User's Manuals for instructions on their use.

6. Re-configuring CP/M

The NEWSYS program supplied on you CP/M master disk allows you to re-configure CP/M for your particular requirements. NEWSYS may also be used to patch CP/M itself (see appendix D). You may alter certain PET VDU and RS232 interface characteristics, as well as the disk drive assignments. You may also insert an "autoload" command, which will automatically be performed every time the CP/M system is started from cold. YOU ARE STRONGLY ADVISED HOWEVER, NOT TO ALTER THE COPY OF CP/M ON THE MASTER DISK ITSELF. ALWAYS SAVE THE RE-CONFIGURED SYSTEM ON A DIFFERENT DISK. Make sure that the destination disk has been formatted under CP/M. It may contain CP/M files, which will not be destroyed. However any CP/M system on the destination disk will be overwritten. Type :

newsys

The NEWSYS program will ask you to enter the name of the source disk, containing the CP/M system which you wish to modify. This will normally be drive A. Then the source system will be loaded into memory so that you can modify it. NEWSYS will display a menu :

A - Autoload command

D - Disk drive assignment

I - I/O assignment

P - Pet terminal parameters

R - RS232 assignment

S - Save new system

E - Execute system

Q - Quit this program

Pressing A <RETURN> allows you to insert an autoload command into your new CP/M system. The current autoload command is displayed, if any. NEWSYS will ask you if you wish to change (or remove) the autoload command. If you do not, then just press RETURN to return to the main menu. If you do wish to insert a new autoload, then press Y <RETURN>. You will be asked to enter the new autoload command, just as it would be typed in reply to the CP/M prompt.

For example you could enter :

dir

to print out a directory listing each time the system is loaded from cold. Or you could make CP/M come straight into say a BASIC interpreter, or your own turn-key application program, at power up.

Pressing D <RETURN> allows you to examine the disk drive assignment (CP/M drive names versus drive type and device number). Then NEWSYS asks you which drive unit you wish to alter, for example to create a system having more than one disk unit. To leave the current assignment unaltered, just press RETURN.

Press I <RETURN> to look at the input/output device assignment. NEWSYS will display the default list (LST:), reader (RDR:) and punch (PUN:) devices, and the IEEE device numbers for the PET printer (LPT:), ASCII printer (UL1:), and the physical reader and punch (PTR: and PTP:). The default logical device settings may be overridden by using the STAT command, and the device numbers may be changed by SET.

Press P <RETURN> to examine or alter the interrupt clock setting (this is necessary if you have a 60Hz PET), the default terminal type, and the number of directory columns in DIR listings. Also, you may force the system to power up with the PET keyboard and screen in "upper case only" mode, for personal preference or because the software you are using requires it. You will be asked to specify which, is any, of these features you wish to alter. To return to the main menu, simply press RETURN. These defaults may be overridden using the SET command.

Press R <RETURN> to examine and/or alter the RS232 interface setup - character length, parity, number of stop bits and baud rate.

S <RETURN> allows you to save the new CP/M system on a disk (NEWSYS will ask you which drive you wish to save the re-configured system on).

E <RETURN> allows you to run the re-configured system without having to save it on a disk and boot up from cold. This is useful for making temporary modifications to, say, the baud rate setting.

Q <RETURN> returns you to CP/M command mode (still under the old CP/M system). To run the re-configured system you must either have used E to exit, or saved the new system on a disk (S command) and re-booted from cold, placing the new system disk in drive A.

7. ROM routines callable from CP/M

These routines are specific to the SoftBox and are not part of standard CP/M. They allow the user to communicate over the IEEE bus, clear the console screen, etc. Jump vectors F003 to F030 inclusive are ROM entry points corresponding to the BIOS routines (Basic Input/Output System - see the CP/M version 2.2 alteration guide). There then follow jump vectors to routines used internally by the SoftBox, some of which may be useful to the user :

F003 WBOOT - Perform CP/M warm boot.

F006 CONST - Test console keyboard status (FF returned in accumulator if character is ready, 0 returned otherwise).

F009 CONIN - Read next character from console into the accumulator, without parity.

F00C CONOUT - Output a character from register C to the console

F00F LIST - Output a character from register C to the list device.

F012 PUNCH - Output a character from register C to the punch device.

F015 READER - Read the next character from the reader device into the A register.

F018 HOME - Seek to track 00

F01B SELDSK - Select drive

F01E SETTRK - Set track number

F021 SETSEC - Set sector number

F024 SETDMA - Set DMA address

F027 READ - Read CP/M sector

F02A WRITE - Write CP/M sector

F02D LISTST - List device status - always returns A=0.

F030 SECTRAN - Perform sector translation

F033 LISTEN - Send a "listen" command to device D, secondary address E. For no secondary address, make E negative.

F036 UNLISTEN- Send an "unlisten" command to bus.

F039 TALK - Send a "talk" command to device D, secondary address E. For no secondary address, make E negative.

F03C UNTALK - Send an "untalk" command to bus.

F03F RDIEEE - Input data from bus into accumulator.

F042 WRIEEE - Output data from accumulator to bus. The carry flag is set if no listening device is present on the bus.

F045 WREOI - Output a character to bus with EOI low.

F063 CLEAR - Clears the console screen.

F066 EXECUTE- Causes the PET CPU to execute a routine at PET memory address HL. The routine may return by using the RTS instruction.

F069 POKE - Copies BC bytes from SoftBox address HL to the PET memory, address DE.

F06C PEEK - Copies BC bytes from the PET memory (address DE) to the SoftBox memory, address HL.

F06F STIME - Set the PET clock. H=hours, L=minutes D=seconds

F072 GTIME - Read the PET clock. H=hours, L=minutes D=seconds, E=jiffies. Also A, B and C contain the contents of a separate jiffy clock. Each jiffy represents 1/60 second.

F07B WRATN - Write an IEEE command to the bus (ATN is set low first). If no device is present, the carry flag is set to indicate an error.

F07E RDIMM - Read a byte from the IEEE bus, but time out after BC milliseconds and set the carry flag if no data is received.

F081 RESCLK - Reset the jiffy clock (but does not affect the hours, minutes and seconds clock)

8. Error messages

BDOS error messages

These messages are generated by the CP/M Basic Disk Operating System. They have the form:

BDOS err on drive d: error message

D is the name of the drive which was being accessed. The error message is one of :

SELECT - An attempt to access a drive that CP/M doesn't know about (not in the range A to P, or not configured into the system. Hit any key to re-boot.

R/O - CP/M has detected an unexpected change of diskette, and so to prevent possible corruption of data the drive in question has been set to "read-only". CP/M stores certain disk information in RAM for efficiency, so whenever you change a disk you MUST do a CP/M warm start (control-C) to log in the new disk. To recover from a R/O error, press any key to re-boot.

FILE R/O - Attempt to write to or delete a file which has the "read-only" attribute set. This attribute is set or removed by the STAT program. Hit any key to re-boot.

The remaining BDOS errors are hardware disk errors and give you the option of re-booting (control-C), or ignoring the error (any other key except '?'). The latter course is not advisable if the

error occurred during a directory write operation. Typing a question mark first will display the actual contents of the drive unit error channel, in the usual format :

error code, error message text, track, sector

Refer to the CBM Floppy Disk Drive User's Manual for details.

WRITE PROTECTED - You can't write to a disk which has the write protect notch covered up. If you wish to proceed, uncover the notch and replace the disk, then press RETURN. Otherwise type a CONTROL-C to reboot.

DISK NOT READY - No disk in drive, door not closed, or bad diskette. Ensure disk is correctly inserted, close the door and press RETURN to proceed. Or you can re-boot by typing CONTROL-C.

COMMODORE DOS BUG - The drive unit sometimes gets confused if, for example you try to log in a badly formatted disk. Insert a good disk and reboot (control-C).

UNKNOWN ERROR CODE - An unexpected error has arisen on the disk drive. Press the '?' key for more error information.

WRONG DOS FORMAT - Occurs under PET DOS version 2 if you try to write to or duplicate a DOS version 1 disk. See the PET disk drive manual for the rules about DOS format compatibility.

MISSING HEADER, MISSING DATA BLOCK, LONG DATA BLOCK, CHECKSUM ERROR IN HEADER, CHECKSUM ERROR IN DATA, BYTE DECODING ERROR, OR WRITE VERIFY ERROR.

These errors may be caused by :

No diskette in drive.
Drive door not closed properly.
Badly centralized diskette.
Unformatted diskette.
Diskette with wrong DOS format.
Badly aligned drive.
Faulty diskette media.

Pressing CONTROL-C will reboot. Pressing any other key will skip the faulty sector.

A. VDU Control codes

When running under CP/M, in normal mode (emulating a Televideo 912 terminal) the following special codes are recognised by the PET screen.

Hex	Keybd.	Meaning
00	CTRL-@	Null
01	CTRL-A	Enable graphics chars (bit 8 set)
02	CTRL-B	Disable bit 8 (see below)
03	CTRL-C	Reserved for future use
04	CTRL-D	Set tab position
05	CTRL-E	Clear tab position
06	CTRL-F	Clear all tabs
07	CTRL-G	Ring the bell (80 column PETs)
08	CTRL-H	Cursor left
09	CTRL-I	Tab
0A	CTRL-J	Line feed
0B	CTRL-K	Cursor up
0C	CTRL-L	Cursor right
0D	CTRL-M	Carriage return
0E	CTRL-N	Reverse on
0F	CTRL-O	Reverse off
10	CTRL-P	Cursor on
11	CTRL-Q	Insert line
12	CTRL-R	Delete line
13	CTRL-S	Erase to end of line
14	CTRL-T	Erase to end of screen
15	CTRL-U	Upper case only mode
16	CTRL-V	Lower and upper case
17	CTRL-W	Graphics mode
18	CTRL-X	Text mode
19	CTRL-Y	Cursor off
1A	CTRL-Z	Clear screen
1B	ESCAPE	Special screen functions (see below)
1C	CTRL-\	Insert character
1D	CTRL-]	Delete character
1E	CTRL-^	Cursor home

After issuing a control-A, any character with bit 8 set will be displayed as a graphics character. This facility is turned off by control-B.

Televideo 912 control codes

These codes are prefixed by the ESCAPE character (1B hex). Codes marked "*" also apply to the Lear Seigler ADM3A

2A	*	Clear the screen
2B	+	Clear the screen
31	1	Set tab position
32	2	Clear tab position
33	3	Clear all tabs

3C	:		Clear the screen
3B	;	*	Clear the screen
3D	=	*	Set cursor position (must be followed by the row number and then the column number, both with an offset of +20 hex. Row and column numbers start at zero).
45	E		Insert line
51	Q		Insert character
52	R		Delete line
54	T		Erase to end of line
57	W		Delete character
59	Y		Erase to end of screen
5A	Z		Clear the screen
6A	j		Reverse on
6B	k		Reverse off
74	t		Erase to end of line
79	y		Erase to end of screen

Hazeltine 1500 terminal codes

These codes are preceeded by a lead-in character which may be set to either TILDE (7E hex) or ESCAPE (1B hex), using the NEWSYS or SET utilities.

0B	CTRL-K	Cursor up
0C	CTRL-L	Cursor right
0F	CTRL-O	Erase to end of line
11	CTRL-Q	Set cursor (followed by X address then Y)
12	CTRL-R	Cursor home
13	CTRL-S	Delete line
17	CTRL-W	Erase to end of screen
18	CTRL-X	Erase to end of screen
1A	CTRL-Z	Insert line
1C	CTRL-\	Clear screen
1D	CTRL-]	Clear screen

B. Input/output ports

The following I/O ports in the SoftBox may be addressed :

Hex	Device	Function
08	8251A	USART data port
09	8251A	USART control port
0C	COM8116	Baud rate generator control port
10	8255 #1	Data port A (IEEE data in)
11	8255 #1	Data port B (IEEE data out)
12	8255 #1	Data port C
13	8255 #1	Control port
14	8255 #2	Data port A (IEEE control in)
15	8255 #2	Data port B (IEEE control out)
16	8255 #2	Data port C (Corvus status in)
17	8255 #2	Control port
18	Optional	data port for Corvus drive

Corvus status inputs - bit 4 = controller ready, bit 5 = active

The IEEE control signals are :

ATN bit 0
DAV bit 1
NDAC bit 2
NRFD bit 3
EOI bit 4
SRQ bit 5
REN bit 6
IFC bit 7

The IEEE input and output drivers on the SoftBox are inverting. This means that a bit set on one of the 8255 ports corresponds to a low signal on the IEEE bus line.

IEEE connections :

Data bits 1-8	pins 1,2,3,4,13,14,15,16
ATN	pin 11
DAV	pin 6
NDAC	pin 8
NRFD	pin 7
EOI	pin 5
SRQ	pin 10
REN	pin 17
IFC	pin 9
Signal ground	pins 18 to 24
Safety ground	pin 12

RS232 connections :

Data in	- pin 2
Data out	- pin 3
RTS out	- pin 4
CTS out	- pin 5
BRK out	- pin 6 (SYNDET in Synchronous Mode)
Signal ground	- pin 7
SYNC RX clock in	- pin 15 (Link option in Sync. Mode)
SYNC TX clock in	- pin 17 (Link option in Sync. Mode)
DTR in	- pin 20

For further information on the operation of these I/O ports, you are advised to consult the appropriate integrated circuit data sheets (Intel 8251A and 8255, and Standard Microsystems COM8116).

C. SEND and READ program source

These programs are given in Intel 8080 format and may be assembled directly using the standard CP/M assembler ASM.

SEND - the program on the following pages should be keyed into the remote computer and assembled into a CP/M command file SEND.COM.

```
bdos    equ     5       ; BDOS call entry point

        org     100h

        lxi     d, 5ch  ; address of file control block
        mvi     c, 15   ; open the file
        call    bdos
        inr     a       ; any error ?
        lxi     d, errmsg
        mvi     c, 9
        jz      bdos    ; print message - no such file
        mvi     a, 7fh  ; clear junk from receiver
        call    send
        mvi     a, 7fh  ; by sending two DELETE characters
        call    send
nxtblk: lxi     d, 5ch  ; address of file control block
        mvi     c, 20   ; read next data block (128 bytes)
        call    bdos
        ora     a       ; end of file ?
        mvi     a, '#'  ; yes - send EOF and exit
        jnz     send
        mvi     a, ':'  ; else send block marker
        call    send
        lxi     h, 80h
        xra     a       ; clear checksum
nxtbyt: sub     m       ; update checksum
        push    h       ; save buffer pointer
        push    psw     ; save checksum
        mov     a, m    ; get data byte from buffer
        call    sndhex  ; send byte in hex
        pop     psw     ; get checksum back in A
        pop     h       ; get buffer pointer back
        inr     l       ; finished ?
        jnz     nxtbyt  ; no
        call    sndhex  ; yes - send checksum
        jmp     nxtblk  ; back for next block

errmsg: db      'File not found.$'

; Send a hex byte to the RS232 port

sndhex: push    psw     ; save value to send
        rar             ; get high nibble
        rar
        rar
```

```
        rar
        call    sndnib  ; send high nibble
        pop     psw     ; send low nibble
sndnib: ani     0fh     ; want lower 4 bits only
        adi     30h     ; convert to ASCII hex.
        cpi     3ah
        jc      send
        adi     7


; Send a byte from accumulator to the RS232 port.
; This routine uses the CP/M list device but may be replaced by
; your own driver routine if necessary.

send:   mov     e, a    ; send a char (user patch)
        mvi     c, 5
        jmp     bdos    ; send to list device
        end



;
; READ - SoftBox file transfer program
; There is no need to key in this program as it will already be
; on your PET CP/M master disk.
;
        org     100h
bdos    equ     5

        lxi     h, 5ch+12
        mvi     c, 21
clrfcb: mvi     m, 0    ; clear the file control block
        inx     h
        dcr     c
        jnz     clrfcb
        lxi     d, 5dh  ; check for file name
        ldax    d
        cpi     20h
        rz              ; none - return
        mvi     c, 11
chkwld: ldax    d       ; check no wild cards
        inx     d
        cpi     '?'
        rz
        dcr     c
        jnz     chkwld
        lxi     d, 5ch  ; none - ok to delete file
        mvi     c, 19
        call    bdos
        lxi     d, 5ch
        mvi     c, 22   ; create new file
        call    bdos
        inr     a       ; check for directory error
        jz      error
        lxi     d, ready
```

```
        mvi     c, 9     ; ready to receive
        call    bdos
sync:   call    read     ; synchronize with sender
        cpi     7fh
        jnz     sync
nxtblk: call    read     ; read a character
        cpi     7fh
        jz      nxtblk   ; RUBOUT - ignore
        cpi     '#'      ; end of file ?
        jz      eof
        cpi     ':'      ; data block ?
        jnz     chkerr   ; no - signal an error
        lxi     h, 80h   ; yes
        mvi     b, 0     ; clear checksum
nxtbyt: push    h
        push    b
        call    rdhex    ; read next byte
        pop     b
        pop     h
        mov     m, a     ; save in buffer
        add     b        ; update checksum
        mov     b, a
        inr     l
        jnz     nxtbyt   ; not finished
        push    b
        call    rdhex    ; finished - read checksum
        pop     b
        add     b
        jnz     chkerr   ; checksum error ?
        mvi     e, '.'
        mvi     c, 2     ; output a dot to screen
        call    bdos
        lxi     d, 5ch   ; write data block to file
        mvi     c, 21
        call    bdos
        ora     a
        jz      nxtblk   ; disk full ?
error:  lxi     d, errmsg ; yes - complain to user
        mvi     c, 9
        call    bdos
        jmp     exit

chkerr: lxi     d, chkser
        mvi     c, 9
        call    bdos     ; print "Checksum error"
eof:    lxi     d, 5ch
        mvi     c, 16    ; close file
        call    bdos
exit:   mvi     a, 37h
        out     9        ; release handshake
        jmp     0        ; and re-boot CP/M

ready:  db      0dh, 0ah, 'Ready to receive', 0dh, 0ah, '$'
errmsg: db      0dh, 0ah, 'Disk write error$'
chkser: db      0dh, 0ah, 'Checksum error$'
```

```
rdhex:  call    rdnib   ; read high nibble
        add     a       ; multiply by 16
        add     a
        add     a
        add     a
        push    psw     ; save
        call    rdnib   ; read low nibble
        pop     b
        add     b       ; add to high nibble * 16
        ret

rdnib:  call    read    ; read one ASCII character
        sui     30h     ; convert to a binary nibble
        cpi     10
        rc
        sui     7
        ret

read:   call    0f006h  ; call CONST vector
        ora     a
        jz      nokey
        call    0f009h  ; key pressed - call CONIN
        cpi     3       ; control-C ?
        jz      eof     ; yes - abort
nokey:  mvi     a, 37h  ; else assert CLEAR TO SEND signal
        out     9
wait:   in      9       ; wait for character
        ani     2
        jz      wait
        mvi     a, 17h  ; remove CLEAR TO SEND signal
        out     9
        in      8       ; read the character into A
        ret

        end
```

D. Some RAM locations within the SoftBox

The following locations are given so that they may be manipulated by user programs if required. They are normally set up using the NEWSYS program.

0003 The CP/M IOBYTE, which determines which physical devices correspond to the CON:, LST:, RDR: and PUN: logical devices. See the CP/M Interface Guide.

IEEE device numbers :

EA61	LPT:	Device number
EA62	PTR:	Device number
EA63	PTP:	Device number
EA66	UL1:	Device number

Terminal emulation :

EA68	VDU control code lead-in character
EA69	Cursor X, Y addressing order (0 = Y then X, 1 = X then Y)
EA6A	Cursor row (Y) address offset
EA6B	Cursor column (X) address offset
EA6C	IEEE control inputs are saved here during RDIEEE. In particular, ANDing this value with 10 hex gives the status of EOI during the read.

EA80 to EABF

Screen control code table. This table consists of pairs of bytes, the first byte being a control code of the terminal being emulated (with bit 8 set if it is to be preceeded by a lead-in character). The second byte is the corresponding PET VDU code (as given in the table in Appendix A, for example 1A hex is "clear screen"). The table is terminated by a zero byte.

SoftBox CP/M locations may be modified using the NEWSYS program. Firstly run NEWSYS to load the system from the source drive, then type CONTROL-C to exit from NEWSYS. The system is loaded starting at hex location 4000, so that DDT (or SID) may be run without destroying it. When the system has been patched, run NEWSYS again, but this time just press RETURN in reply to the source drive prompt, to avoid re-loading the system from disk. You will then be able to save the modified version of the system on disk. The following table gives the location of the various CP/M modules within the NEWSYS buffer :

module	final address	NEWSYS address
CCP	D400	4000
BDOS	DC00	4800
BIOS	EA00	5600

E. Corvus hard disk interface

An optional hard disk interface on the SoftBox will drive a Corvus 5, 10 or 20 megabyte hard disk. For convenience, because CP/M only supports drives up to 8 Megabytes, the Corvus drive is divided up into logical drives of about 5 Megabytes each. SoftBox operation using a Corvus drive is similar to operation using floppy disks. The setup procedure for a new drive is as follows : firstly, using the NEWSYS program, create a system in which one drive pair (say C and D) is the hard disk. For a 20 megabyte disk, four consecutive logical drives will be required (A, B, C and D, E, F, G and H, I, J, H and L or M, N, O and P). The "device number" specified in the NEWSYS

program refers for a Corvus drive to the physical drive number, not an IEEE device number. This drive number should normally be 1, unless several Corvus drives are to be connected using a multiplexer.

Next use FORMAT to initialize all directories on the hard disk (C and D in the above example). Now you should be able to read and write CP/M files on the hard disk. To use the Corvus as the main system drive, use NEWSYS to create a system with the Corvus defined as drives A and B (or A, B, C and D for a 20 Megabyte drive). Save this system on the lowest Corvus logical drive, drive C in our example (which will become drive A). With the floppy drives unplugged from the system, the Softbox should now boot up from the Corvus drive from cold. Alternatively the system may be saved on floppy disk as well and cold boots may then be done from IEEE device number 8 as before, but with the Corvus drive now occupying drive A when the system is loaded, so that warm boots are done from the hard disk for increased speed.

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