

MAP 80 BIOS INSTRUCTION MANUAL

Enclosed is your MASTER DISK holding CP/M version 2.2 . It contains your license number, together with a BIOS configured to run on your system.

The system track has been initialised with MOVCPM.COM appropriate to your machine, so all that is necessary is to make any hardware modifications as described below and you will be ready to boot CP/M. Note that VFC systems leave the VFC video RAM at F800H and it is therefore possible to generate a system size of 62k maximum. If you need a full 64k system details are given later.

The diskette also holds files supplied by MAP 80 SYSTEMS LTD. and their use will be described later.

BOOTING

Power up your system. If all is well the video screen will clear and BOOTING will be displayed, very quickly followed by DISK?. This tells you that there is no disk in the drive. Insert your MASTER DISK in drive A and shut the drive door. A few seconds later the CP/M sign on message will be displayed followed by A> (the CP/M prompt). Before doing anything else make a backup up copy of your MASTER DISK using MU.COM (see notes later) and then store your MASTER DISK in a safe place. Note that it was supplied with a write protected tab fitted. This should NEVER be removed.

BOOTING ERRORS

If you insert a diskette which has not had the system tracks initialised with a valid system the message SYSTEM? will appear. Insert a properly initialised diskette and booting will then take place (It may be necessary to RESET your machine).

If the boot routine is unable to read a sector from the system track (most likely due to physical damage to the diskette) then the message ERROR will be displayed. Replace the offender with a properly initialised diskette and press RESET.

THE BIOS

The BIOS provides the low level routines to interface your computer to CP/M. It is basically a sophisticated version of the CBIOS example provided by DRI, but contains some features which make CP/M a little more friendly.

DISK ERROR MESSAGES

A BIOS normally returns an error to the CP/M BDOS if it finds that an error has occurred, when attempting to read or write a sector. This error could occur, for instance, by inserting a disk the wrong way, attempting to write to disk with a write protect tab fitted, forgetting to close the drive door, forgetting to insert a disk or because of disk damage. The BDOS responds with a unhelpful BDOS ERROR message, the MAP 80 BIOS however traps errors, tells you what has gone wrong and then prompts you for instructions. Pressing Y will cause a re-try, N will return error to the BDOS in which case the BDOS ERROR

message will appear or ^C will abort the program you are in and cause a warm boot.

POSSIBLE ERROR MESSAGES

Not Ready:

Occurs if a drive door is open or there is no disk, or an unformatted disk.

Disk Write Protected:

Occurs when an attempt is made to write to a diskette which has a write protect tab fitted.

Write Fault:

This is a fault signal provided by a drive. Drives supplied by MAP 80 do not provide this signal so this fault should never occur.

Record not found:

This fault occurs if the FDC has been unable to find a sectors address header or unable to find a sectors data marker. Retries are unlikely to cure this error; if it should occur copy as much information as possible off the offending diskette and reformat it. If the error persists the diskette will most likely have been subject to physical damage and is best discarded (or returned to your supplier if new).

CRC Error:

This error occurs when a sector has been found and loaded but a checksum shows that it is corrupt. Again retries are unlikely to resolve this but, as it is at least possible to load the sector, it may be possible to edit it with for example DDT to recover the data.

Wrong system size/ No system:

This occurs when an attempt is made to warm boot from a disk holding the wrong size CP/M or an invalid or uninitialized system track.

ON SCREEN EDITING

Normally an error in a CP/M command line which has been entered (CR has been pressed) will have to be re-typed. The MAP BIOS however provides for the on screen editing and re-entry of any line. Details of VFC video editing can be found in the VFC manual. NAS systems proceed as follows:-

To enter the edit mode press ^@ or ^SHIFT@ to obtain an entry of OOH. This informs the BIOS to enter edit mode 1. In this mode key entries will be echoed to the screen but will not be returned to CP/M.

The cursor control and screen edit keys may be used at will. When CR is pressed the entire current cursor line, with some exceptions, is returned to CP/M. Exceptions are:

- 1) Trailing blank spaces,
- 2) CP/M utility prompts *, f, - and . when they occur in the first column,
- 3) The CP/M prompt A> when > occurs in the second column.

After returning the line the BIOS returns to non-edit mode, unless whilst in edit mode 1 the edit key is pressed a second time. Then the BIOS will keep returning to the edit mode until the edit

key is pressed again. Note that the entire line is returned which means that the edit mode may be unsuitable within some programs. It should also be noted that some editing features are not available on NASCOM 1 keyboards.

VIRTUAL DISK

On COLD boot the BIOS auto searches for MAP RAM above 64k, if it is found and has not been reserved by yourself (see workspace below), a virtual disk on drive P will be set up and the sign on message will signal its availability. Use drive P as you would any other drive.

PRINTERFACING

CENTRONICS

A parallel printer routine is provided via the LIST ULI option (see the IOBYTE assignments below). Connect the Centronics data inputs of your printer to the B0 thru' B7 outputs of your PIO, connect the Centronics "BUSY" signal to A0 of your PIO and the Centronics "STROBE" to A1 of the PIO.

SERIAL

Serial output is handled via the Z80 SIO clocked by the Z80 CTC. SIO channel A is clocked by CTC channel 0 which is clocked at 2MHz. SIO channel B is clocked by CTC channel 1 which is clocked at 1Mhz, as supplied channel A is set to 1200 baud with handshake on CTS and DCD, and channel B is set to 300 baud with no handshake. Each channel is set for 8 bits, 1stop, no parity. As will be seen later in the configuration section it is possible to modify this selection.

BIOS CONFIGURATION

The BIOS has basically 4 ways of communicating with the outside world, and each one of these 4 ways can be assigned to one of 4 devices. The assignment of these devices is controlled by the value of one byte (the IOBYTE). The IOBYTE options available in the MAP 80 BIOS is shown below together with the assignment supplied.

1. CONSOLE (bits 0 and 1 of the IOBYTE)

This is the main I/O interface, i.e In via your keyboard and out via your CRT.

```
xxxxxx00 TTY Serial SIO B
xxxxxx01 CRT Screen, keyboard
xxxxxx10 BAT Serial SIO A
xxxxxx11 UC1 Serial SIO B
Supplied BIOS assigned to CRT
```

2. READER (bits 2 and 3 of the IOBYTE)

An input only, traditionally from a tape reader but now more likely used as an input from a modem for example.

```
xxxx00xx TTY Serial SIO A
xxxx01xx PTR Serial SIO B
xxxx10xx UR1 Serial SIO A
xxxx11xx UR2 Serial SIO B
Supplied BIOS assigned to PTR
```

3. PUNCH (bits 4 and 5 of the IOBYTE)

An output only, traditionally to a paper tape punch.

```
xx00xxxx TTY Serial SIO A
xx01xxxx PTP Serial SIO B
xx10xxxx UP1 Serial SIO A
xx11xxxx UP2 Serial SIO B
Supplied BIOS assigned to PTP
```

4. LIST (bits 6 and 7 of the IOBYTE)

An output only usually a printer

```
00xxxxxxxx TTY Serial SIO B
01xxxxxxxx CRT To screen
10xxxxxxxx LPT Serial SIO A
11xxxxxxxx UL1 Centronics via PIO
Supplied BIOS assigned to UL1
```

It is possible to change the IOBYTE assignment using the STAT command (see CP/M manual), but this becomes tiresome if you have to make this change every time you wish to use your serial printer. The initial IOBYTE, along with other parameters, has therefore been placed at a specific location within the BIOS and can be easily modified using DDT, obviating the need to re-assemble the BIOS. This workspace area has been placed directly above the BIOS entry jump table and will therefore always be found in either MOVCPM.COM or a CPMnn.COM starting at 2133H. A listing of each byte followed by a description of each follows.

```
; **** BIOS WORKSPACE ****
; System options
2133 D5 IOVAL: DEFB IOINIT ;Stored IOBYTE
2134 00 RESERV: DEFB VRTRK ;Reserved 4k tracks in vdisk
;Printer options
2135 B4 PPORT: DEFB PIO ;PIO/CENTRONICS enable
2136 00 LSKIP: DEFB XLSKIP ;Perforation lines skipped
2137 00 PLPAG: DEFB XPLPAG ;Printed lines per page
2138 14 CRRET: DEFB CRDEL ;Printer CR delay
;VFC options
2139 04 INITM: DEFB 04 ;Non auto boot, inverse video
213A LEAVE: IF F800
213A F1 DEF B OF1H ;Leave VRAM at F800
ELSE
DEF B 0 ;Page out VRAM completely
ENDIF
;VFC workspace
213B VFCW:
213B 00 VFCST: DEFB 0 ;Initial status of VFC
213C 0000 LASVR: DEFW 0 ;Last screen address
213E 0000 CURSR: DEFW 0 ;Cursor address
2140 0000 MLOCK: DEFW 0 ;Top of screen
2142 0000 KPOS: DEFW 0 ;Current send position
2144 0000 PRGKEY: DEFW 0 ;Address of programmable key table
2146 0000 CURTYP: DEFW 0 ;Normal cursor
2148 00 STATE1: DEFB 0 ;Option bits
2149 00 KCHR: DEFB 0 ;Key character store
214A 00 SEND: DEFB 0 ;Number of characters during send
```

```

214B 0000 SPARE:    DEFW 0      ;Key repeat counter
214D 00 ESCST:    DEFB 0      ;ESC status
214E 00 ESCTYP:   DEFB 0      ;ESC type
214F 00 EDCHR:    DEFB 0      ;Character to initiate editing
2150 00 ROW:      DEFB 0      ;Row store
2151 00 PIXEL:    DEFB 0      ;Pixel store

;Programmable key table
2152 00 PRGTAB:   DEFB 0
2153 00 PRGEND:   DEFS 100-(PRGEND-PRGTAB),0 ;Leave at least 100 byte tab
le

;Get to 10H boundary
21B6 00 WPOS:     DEFS (((WPOS-BIOS) AND OFFFOH)+10H)-(WPOS-BIOS),0

;Interrupt vectors, these must all be on the same 100H page
21C0 00 INTVEC:
;MPI SIO, This must occur on a 10H boundary
21C0 0000 MPSIOV:   DEFW 0
21C2 0000          DEFW 0
21C4 0000          DEFW 0
21C6 0000          DEFW 0
21C8 0000          DEFW 0
21CA 0000          DEFW 0
21CC 0000          DEFW 0
21CE 0000          DEFW 0
;On board SIO
21D0 0000 CFSIOV:   DEFW 0
21D2 0000          DEFW 0
21D4 0000          DEFW 0
21D6 0000          DEFW 0
21D8 0000          DEFW 0
21DA 0000          DEFW 0
21DC 0000          DEFW 0
21DE 0000          DEFW 0
;MPI CTC
21E0 0000 MPCTCV:   DEFW 0
21E2 0000          DEFW 0
21E4 0000          DEFW 0
21E6 0000          DEFW 0
;On board CTC
21E8 0000 CPCTCV:   DEFW 0
21EA 0000          DEFW 0
21EC 0000          DEFW 0
21EE 2462          DEFW KEYINT ;Read keyboard
;On board PIO
21F0 0000 CPPIOV:   DEFW 0
21F2 0000          DEFW 0
21F4 0000          DEFW 0
21F6 0000          DEFW 0

;Port initialisation table
;First byte defines port location of device
;Second bytes indicates how many bytes to send
;On board CTC channel 0, include interrupt vector here
;This is clocked at 2Mhz, to provide clock for SIO channel A

```

```

21F8 B8      CPCTC0:    DEFB CPCTC      ;CTC port
21F9 03      DEFB C2-C1
21FA E8      C1:        DEFB LOW CPCTCV ;Interrupt vector
21FB 47      DEFB 01000111B ;Counter mode, Count follows, Reset
channel
21FC 68      DEFB 104       ;Divisor, 1200 baud (16* mode)
21FD
C2:          ;This is clocked at 1Mhz, to provide clock for SIO channel B
21FD B9      CPCTC1:    DEFB CPCTC+1 ;CTC port
21FE 02      DEFB C4-C3
21FF 47      C3:        DEFB 01000111B ;Counter mode, Count follows, Reset
channel
2200 34      DEFB 52       ;Divisor, 300 baud (64* mode)
2201
C4:          ;On board CTC channel 3
;Provides interrupt control for keyboard
2201 BB      CPCTC3:    DEFB CPCTC+3 ;CTC port
2202 02      DEFB C8-C7
2203 D7      C7:        DEFB 11010111B ;Interrupts, Counter, Count follows,
Reset
2204 01      DEFB 1       ;Divisor
2205
C8:          ;Fast channel with handshake
;On board SIO channel A
2205 BE      CPSIOA:    DEFB CPSIO+2 ;Channel A command register
2206 07      DEFB S2-S1
2207 18      S1:        DEFB 18H      ;Reset the channel
2208 04      DEFB 4       ;Register 4
2209 44      DEFB 01000100B ;X16 clock, 1 stop, no parity
220A 03      DEFB 3       ;Register 3
220B E1      DEFB 11100001B ;8 bits, Auto enables, Rx enabled
220C 05      DEFB 5       ;Register 5
220D EA      DEFB 11101010B ;DTR, 8 bits, Tx enabled, RTS
220E
S2:          DEFS 13-(S2-S1),0 ;Max count

;Slow channel, no handshake
;On board SIO channel B, include interrupt vector here
2214 BF      CPSIOB:    DEFB CPSIO+3 ;Channel B command register
2215 09      DEFB S4-S3
2216 18      S3:        DEFB 18H      ;Reset the channel
2217 02      DEFB 2       ;Register 2
2218 D0      DEFB LOW CPSIOV ;Interrupt vector
2219 04      DEFB 4       ;Register 4
221A C4      DEFB 11000100B ;X64 clock, 1 stop, no parity
221B 03      DEFB 3       ;Register 3
221C C1      DEFB 11000001B ;8 bits Rx enabled
221D 05      DEFB 5       ;Register 5
221E EA      DEFB 11101010B ;DTR, 8 bits, Tx enabled, RTS
221F
S4:          DEFS 15-(S4-S3),0 ;Max count

```

IOVAL

Initial IOBYTE assignment. Change this to provide your normal I/O requirements according to the IOBYTE description above.

RESERV

Enter the number of 4k blocks of MAP RAM you wish to reserve for yourself. Reservation will start from page 1, and will obviously have no affect on systems not using MAP RAM above 64k. Note if you excercise the VBOOT option the first two 4k blocks will be used to store the BDOS and CCP.

PPORT

This byte, when set non-zero enables your PIO for Centronics output. If you wish to use your PIO for another purpose insert 00 here and the PIO setup routine will be skipped.

LSKIP and PLPAG

These provide automatic paging for printers. LSKIP defines the page margin lines and PLPAG the printed lines per page. If you do not want auto paging reset PLPAG to 00.

CRRET

This byte causes a delay after a CR has been sent to a non-handshaking printer. The byte delays in 10s of millisecs e.g insert 0FH for 150ms delay. If reset to 0 no delay takes place.

INITM

This byte defines the normal operating mode of the VFC. Bits 0 and 1 should switch VRAM and VSOFT off, bits 2 and 3 should select your character generator requirements, bits 4,5,6 and 7 should all be reset (see VFC manual for full details).

LEAVE

As supplied your BIOS leaves the VFC video RAM at F800H when VSOFT isn't being used. This means that you can only generate a maximum system of 62k, but it leaves the video RAM as a chunk of memory mapped RAM to be used easily by, for instance, Wordstar. To leave VRAM in the memory map set bit 0 of this byte, and use bits 4,5,6 and 7 to address the 4k block to wherever you want to leave it. To run a full 64k system reset this byte to 00

VFC WORKSPACE

After the user changeable workspace comes the VFC workspace, this is put here so as to be at a known location relative to the base of the BIOS and therefore accessable in order to read the cursor position and the PIXEL test returned value. The cursor position is stored in the 16 bit word at BIOS+0BOH, and the pixel test value in the 8 bit byte at BIOS+0C3H. Note that the cursor address is an absolute address depending on where the VFC was brought in when VSOFT was used, to obtain a cursor location relative to the top left of the screen you will need to strip the 5 most significant bits. The base of the BIOS can be found in the usual way by subtracting 3 from the address at 0001H.

PRGTAB

This is a 100 byte programmable key table for use with the VFC. This table is pointed to after any Cold or WARM boot (see the VFC manual for table format). Note this is only available on VFC systems using a VFC keyboard.

INTVEC

The CPU keyboard port is supplied with the keyboard strobe connected to CTC channel 3, in the BIOS this feature is used to generate an interrupt via the CTC whenever the keyboard strobe goes active, the interrupt routine puts the key character into a buffer to be read at a later date by CONIN. An interrupt structure is therefore established within the BIOS, vectored mode 2 interrupts are used so that additional interrupt handling can be included. INTVEC is the head of the interrupt vector table and assigment within the table is as follows:-

MPSI0V external SIO (e.g MAP MPI SIO)
CPSI0V CPU onboard SIO
MPCTCV external CTC (e.g MAP MPI CTC)
CPCTCV CPU on board CTC (CTC 3 is set for keyboard operations)
CPPIOV CPU onboard PIO

Only the CPU on board CTC vector is committed

PART INITIALISATION

The tables providing data for CTC and SIO come next, namely:-

CPCTCO CTC channel 0, clocked at 2Mhz, provides clock for SIO CH A
CPCTCI CTC channel 1, clocked at 1Mhz, provides clock for SIO CH B
CPCTC3 CTC channel 3, provides keyboard interrupt control
CPSIOA SIO CH A, clocked by CTC channel 0
CPSIOB SIO CH B, clocked by CTC channel 1
CTC channel 2 is uncommitted

The format of the table is:- 1)Port address 2)Number of bytes sent to port 3+)Byte stream sent to port, full details on programming the appropriate devices can be found in the MOSTEK or ZILOG data sheets.

Modifying the user changeable workspace is quite straight forward. For example, to reassisgn the initial IOBYTE LIST device to TTY proceed as follows:-

```
DDT MOVCPM.COM
NEXT PC END
3700 0100 B9FF
£S2133
2133 D5 15
2134 4B .
£GO
SAVE 54 MOVCPM.COM
```

The modifications above can provide for most requirements, but the more experienced programmer can make comprehensive BIOS modifications due to the unique files provided by MAP 80. The BIOS source code is in two parts; CPU.MAC holds equates and options and CBIOS.MAC which is the main BIOS source, make changes to these files according to your needs and then uses the SUB file CPM.SUB to produce a new MOVCPM.COM. You will require:-

M80.COM The MICROSOFT assembler
L80.COM The MICROSOFT linker
ZSID.COM Z80 version of DDT.COM (DDT would probably work)
(The above software is available at competitive rates from MAP 80)

CPM.SUB uses M80 to assemble CBIOS.MAC, (CBIOS.MAC INCLUDEs CPU.MAC)

it then uses L80 to produce two HEX files organised at different locations, next it loads CPM.SYS. This is a bare CP/M with its re-locating bit map and NO BIOS. It also contains a MAP 80 MOVCPM configuration routine. The HEX files are then loaded and the configuration routine is executed, MOVCPM is configured, the BIOS is inserted and a bit map produced. The new MOVCPM.COM is then saved on disk. Note that the SUB files are the working files used by MAP 80 and they expect to find the MAC files on drive F, and that the INCLUDE statement in CBIOS.MAC expects to find CPU.MAC on drive F, also note in the L80 command lines "L80 /P: etc" that the /P: does NOT refer to drive F.

THE MAP 80 MULTI-UTILITY PROGRAM

On your MASTER DISK you will find a file called MU.COM. This program enables you to FORMAT, COPY and VERIFY a diskette. Run the program by entering:-

MU<CR>

You will be greeted by the command prompt. Enter one, two or all the commands in any order according to your requirements..F C V. Commands will be executed in the order FORMAT COPY VERIFY regardless of the order in which they are entered. Having selected the commands you require press CR to continue.

If you selected F you will now be prompted for a sector skew. To optimise disk access time sectors are laid down on the disk in a staggered sequence. For a general purpose disk use a skew of 2. A CR is not required.

If you selected C you will be prompted for the drive which will hold the disk which is to be copied. A CR is not required.

You will then be prompted for the drive or drives to be FORMATTED and/or COPIED TO and/or VERIFIED. Enter the the line followed by CR.

You will then be prompted to insert the appropriate disks into the appropriate drives.

Where a single drive system is being used it is possible to copy a disk in drive A to another disk in drive A. In this case the copy routine will halt and prompt you when it is necessary to change disks. It would be advisable to put a write protect tab on the disk to be copied to avoid possible mix ups.