

XTAL CP/M

For The SHARP NZ80K Computer

1. STARTING UP

Switch on the MZ80K, the interface box and the disc drive(s) (and also the printer if used).

Insert the system disc supplied into drive 1. In all future discussion, the disc drives will be referred to by letters in place of the numbers, i.e., drive 1 becomes drive A, drive 2 becomes drive B, and so on.

Type `FD` followed by the `'CR'` key. The system should respond with `BOOT DRIVE?` and you should just hit `'CR'`. This will then boot the system and, after a few seconds, you should see the copyright notice and the prompt `A>`.

Now type `DIR` and `'CR'` so that you can see the files on your disc.

2. MAKING A BACKUP COPY

The first task is to create a backup copy of your system disc. Once made, use this copy instead of the supplied disc, which should be stored away in a safe place. Two programs are required to do this: `FORMAT.COM` and `COPY.COM`.

With the system disc in drive A, take a blank disc and place it in drive B, ensuring that both drive doors are closed.

To format the new disc, type `FORMAT 'CR'`. On being asked for the drive number, type B. This will cause the response:

`DISC ON B, HIT 'CR' TO CONTINUE`

On typing `'CR'`, the disc on drive B will be formatted. This process takes about three minutes, since each track on the disc is verified, and any errors found reported on the screen.

On completion, the user will be prompted for another disc to format. If no more discs are to be formatted, type a control-C (by typing the `BREAK` and `C` keys together) or just a `'CR'` key. The disc on drive A will then reboot.

To actually make a copy, now type in `COPY 'CR'`. The following will appear:

`MASTER DISC DRIVE? (Type in A 'CR')`
`SLAVE DISC TO COPY ONTO? (Type in B 'CR')`

A list of options will then be displayed. This is because the disc is divided into two parts: the system tracks which contain the `CP/M` operating system which is read into memory when booting or rebooting the system -- this takes up tracks 0 to 4 inclusive. The other part is that which contains the directory and files, i.e., the rest of the disc (128K, plus 2K for the directory

2. track), and the options allow for either (S or F) or the whole disc (W) to be copied.

In this case, type W 'CR' to copy the whole disc -- this again takes about three minutes, and each track is verified after copying.

On completion, the user may make another selection for copying, or hit control-C to reboot. Mark up your newly-created system disc with a soft pencil or felt-tip pen and store away the supplied disc.

Note that rebooting always occurs on drive A, even if you are working on files on another disc. It is therefore not necessary to copy the system tracks onto every disc that you create, as long as it does not reside in drive A (although it is probably advantageous, since you do not gain space by not having the system present!).

3. THE KEYBOARD AND CHARACTER SET

4. We have tried, as far as possible, to achieve compatibility with the existing layout on the NZ80K, while making what we consider to be some standardisations and improvements on the facilities offered by the keyboard and VDU. First, the standard upper- and lower-case ASCII character set is used, with extensions to allow the use of the SHARP graphic symbols. In particular, lower-case letters take their normal values (e.g. 61H for 'a' and not A1H, as is given in the SHARP manual). All of the symbols on your keyboard will still appear as shown, however, and characters such as ', ' , '. ' , '/' etc., will work in both upper- and lower-case. Figure 1 shows the layout of the character set as supported by Ital CP/M.

CP/M makes much use of 'control characters' and, as the NZ80K does not have a CTRL key to be found on most terminals, we use the BREAK key for that purpose. So, to do a 'control-C' (hereafter to be shown as '␣'), depress first the BREAK key and, while still holding that key, depress the C key too. Pressing SHIFT and BREAK together has no effect.

The SNL/CAP key now has a 'toggle' effect, i.e. hit it once to go to lower-case, and hit it again to return to upper-case.

The ESC code (1BH) common on many terminals may be achieved by means of a 'shift-SNL/CAP'.

A full list of control-characters is shown below, together with their effects if printed from within programs, as implemented in Ital CP/M 2.21. You will note that most of these do not function when typed at the keyboard since it would be most undesirable for them to do so when entering a line. Instead, they appear as the control-letter preceded by the '↑' symbol or, as in the case of DEL, for example, perform some other function.

- '→' or ↑P (06H) -- Cursor right.
- ↑G (07H) -- Ring bell.
- '←' or ↑H (08H) -- Cursor left.
- '↓' or ↑J (0AH) -- Cursor down.
- '↑' or ↑K (0BH) -- Cursor up.
- CLR or ↑L (0CH) -- Clear screen, or Form feed on printer.
- CR or ↑M (0DH) -- Carriage Return without Line Feed.
- ↑N (0EH) -- Clear to end of line.
- ↑O (0FH) -- Clear to end of screen.
- ↑Q (11H) -- Line-to-line space reduction on printer.
- ↑R (12H) -- Double-size characters on printer.
- ↑X (18H) -- Cancel special modes on printer.
- HOME (1EH) -- Home cursor on screen, or Form-feed on printer.
- INST (1FH) -- Insert character into 40-character line.
- DEL (7FH) -- Delete character from 40-character line.

4. INPUT & OUTPUT

Location 0003H, called IOBYTE, contains a special code (see the CP/M Alteration Guide pp. 15-16), which can be altered by the user to invoke different peripheral devices. Referring to the above manual, the following physical devices are supported:

CRT: SHARP MZ80K VDU and keyboard.

LPT: SHARP MZ80-P3 printer.

TTY: Xtal Serial Card No.1 (see below)

UC1: Xtal Serial Card No.2

PTP:, PTR:, UL1: Same as for UC1.

UP1:, UP2:, UR1:, UR2: Not implemented on version 2.21, but behave as TTY: for convenience.

The Xtal Serial Card is, as far as we know, the first bi-directional serial interface to be made available for the SHARP MZ80K which may be plugged into the MZ80-I/O Interface Box. It offers link-selectable baud rates from 150-2400 baud (adjustable from 110-9600 baud) and is RS232 compatible, meaning that it will interface nearly all standard terminals and serial printers. Two such interfaces have been allowed for under Xtal CP/M 2.21 .

If two are used, one could be used to drive an 80-column VDU terminal, while the other could drive a slow printer, for instance. This is by no means the only combination, of course.

The default code for IOBYTE is 81H, which sets the following (do a STAT DEV: command to see this):

CON: = CRT:

RDR: = TTY:

PUN: = TTY:

LST: = LPT: -

The IOBYTE may altered directly by changing location 0003H, but it is recommended that the appropriate BDOS routines (see CP/M Interface Guide p.11) be invoked, or a STAT command used (see CP/M features & facilities, pp13-16).

In version 2.21, cassette I/O is performed by means of TAPE (see under 'Utilities in Xtal CP/M').

5. USING THE SHARP MZ80-P3 PRINTER

Under normal use, the default listing device (LST:) is the SHARP

printer, which may be invoked most simply by means of a ?P typed in a command line. The character set is as in Figure 1, the only differences being that certain characters are not in the printer's character generator and will thus not work: 60H, 92H, 9AH, 9CH and A1H.

If an attempt is made to use the printer when it is out or switched off, an error message will appear at the VDU screen, and the system will reboot. Similarly, messages will appear if the printer is jammed or out of paper.

The various special characters described in the printer instruction manual (pp 4-5) are all implemented, but some codes differ:

- Line-to-line space reduction ?Q (11H),
- Double-size characters ?R (12H),
- Clear (Cancel) above modes ?X (18H),
- Home (Form-feed) is performed by either HOME (1EH) or CLR (0CH).

6. UTILITIES IN Ital CP/M

Most of the transient commands described in the CP/M manuals work fine on the MZ80K, but one or two modifications have been made as follows:

DDT -- An extra command has been added: E = Exchange mode. The D (Dump) command will normally display hexadecimal code in lines of 8 bytes at a time, but, after typing E, will display at 16 bytes per line. This is very useful if you wish to dump a large amount of code to a printer, for example (or to an 80-column terminal), with a consequent saving of paper. It also affects the layout of the X (Register display) command. A further E command will return to the 40-column mode.

MOVCPM -- This feature has been removed, since it is not at present intended to offer a version of CP/M to run in any other size memory system on the MZ80K.

SYSGEN -- Has not been modified, and may seem to some users to be a bit superfluous, since system tracks may be copied by using COPY. However, it is included so that users may, if they wish, get a copy of the system into memory, for subsequent debugging. Simply type 'CR' when asked for the DESTINATION DRIVE, and, after rebooting has occurred, do a SAVE 48 CPM.COM (or call it what you will!). You may then do a DDT CPM.COM, to examine the file (see section on Memory map & BIOS routines).

The following utilities have been added to increase the facilities of Ital CP/M 2.21:

FORMAT.COM These are both described in the section 'Making a backup copy
COPY.COM of your disc'.

EXIT.COM -- Simply returns the user to the SHARP Monitor SP-1002, for use of SHARP BASIC, Ital BASIC 2.2S, or SHARP Disc programs, etc.

TIME.COM -- This allows the user to set and read the current time of day, utilising the MZ80K real-time clock. To read the time, just type:

TIME 'CR'.

To set the time to say, 1427 and 35 seconds, type:

TIME 142735 'CR', without spaces between the figures.

Trailing zeroes may be left out, e.g.

TIME 1105 sets 11:05:00, and

TIME 21 sets 21:00:00.

In all cases, the current time will then be displayed on the console. If no time has been set, **TIME** tells you how long it has been since the last **COLD START**.

TAPE.COM -- Allows the user to load tape files from the cassette recorder onto disc, or to load disc files to save on tape.

To load a program from tape, type **TAPE LOAD <filename> 'CR'**, and you will be prompted to press **PLAY**. The <filename> can be up to 16 characters in length, in the usual format for the **SHARP MZ80K** tape system, except that an optional disc drive name may also appear in front of the name, giving the disc on which the file is to be stored. Put in a tape, press **PLAY** and watch the file being loaded and saved to the specified disc. The file name will be truncated to 8 characters, and any spaces removed, to produce a legal **CP/M** filename (e.g. **XTALBUG 1.1** becomes **XTALBUG1**).

File types are assigned automatically, being one of the following three types:

.OBJ -- machine code program. Preferable to **.COM**, since file will not, in general, be executable straightaway.

.BAS -- **SHARP BASIC** or **Ital BASIC** program.

.TXT -- Any data file (created by **WOPEN** statements, etc.).

Of course, the file may be easily **RENameD** by the user, if the name given is not to his/her satisfaction.

To save a disc file to tape, type **TAPE SAVE <filename> 'CR'** and the disc file will load into memory. The prompt 'Press **RECORD & PLAY**' will then appear, and the user should then start the cassette in the usual way. The file type will be 'stripped off' and the tape file type stored internally, any type apart from **.BAS** or **.TXT** being stored as **.OBJ**.

In both cases, rebooting will occur as soon as the operation is complete, accompanied with a bell and the message 'COPIED'.

Examples:

1. **TAPE LOAD B:XTAL BASIC 2.2** loads the file **XTAL BASIC 2.2** from tape and saves it to drive B: (as **XTALBASI.OBJ**).
2. **TAPE SAVE EXAMPLE.TXT** saves the file **EXAMPLE.TXT** from the current default disc to tape (as **EXAMPLE**). Note that **.TXT** files are saved in separated 128-byte blocks, whereas **.OBJ** and **.BAS** files are saved as one block. Note that tape files are displayed throughout preceded by a "T:", indicating

the tape drive.

AUTOGEN.COM -- CP/M allows the insertion of a command line into the CCP, so that this line will be executed whenever the system reboots. This can be used to create a 'turn-key' system, and is thus a most useful facility. The catch is that the user normally has to make a 'patch' to the CP/M system tracks in order to implement it! However, AUTOGEN allows us to do this without going through this heartache. Just type AUTOGEN 'CR', and the program will ask for the disc drive containing the disc to be updated.

The user is next prompted for the command line to be inserted (e.g. do TIME 'CR'). The insertion is made, and the system reboots. On booting the modified disc, the new command line will be executed before allowing the user to type anything in, so that, in this example, assuming that TIME.COM exists on that disc, the time will be displayed every time the system is rebooted.

AUTOGEN may be used again to change this command line, or to remove it.

MUSIC.COM -- Allows the creation and playing of tunes on the NZ80K. As an example, try MUSIC MUSICBOX 'CR'. This looks for MUSICBOX.TUN, and, upon loading, immediately plays it. Upon finishing the tune, the system will reboot.

Creation and modification of your own tunes is performed by means of ED (or any of the other editors currently available under CP/M such as WORDMASTER). The layout of the tunes is broadly similar to that under SHARP or Ital BASIC, with the following notes (take a look at MUSICBOX.TUN, for inspiration!):

Upper and lower octaves are represented by ' and . respectively, instead of the graphic codes used in SHARP or Ital BASIC.

Tempo may be set up by means of a 'T' followed by a number from 0 to 7 (cf. TEMPO statement in the SHARP BASIC manual).

Anything between a pair of double-quotes (") is treated as a comment. Anything between a pair of '\$' symbols is printed to the output device, and thus may be used to display, say, the words of the tune as it is being played.

The symbols ':' and ';' are placed around a passage of music that is to be repeated once, the ':' being placed at the start of the passage. Any control characters, spaces or 'CR LF' symbols, etc., will be ignored.

7. BIOS ROUTINES

The *CP/M Alteration Guide* gives a list of jump vectors at the start of the BIOS which are used by the CP/M BDOS (and can be used in certain applications programs too) to call the various input/output routines. Xtal CP/M offers a few more routines, to control the sound generator and the real time clock. The BIOS vectors start at B300H, and the extra jumps are as follows:

RTIME = B234H. Reads the current time of day from the real-time clock, into the DE register pair. The time is given in seconds. The AM/PM indicator returns in the A register, 0=AM, 1=PM.

SETTIME = B237H. Given the AM/PM indication in A, and the time in seconds in the DE register pair, this sets up the real-time clock to that time.

PLAY = B23AH. Causes speaker to oscillate at a pitch related to the value of the HL register pair, the higher the value, the lower the note.

SPKROFF = B23DH. Turns off speaker.

Figure 1 -- ASCII character set for
Xtal CP/M 2.21

MSD \ LSD	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	SP	0	@	P	~	p	↓	⊙	⊠	H	SP	⊠	⊠	□
1	!	1	A	Q	a	q	⊕	⊞	⊟	□	■	⊠	♠	●
2	"	2	B	R	b	r	□	⊟	⊠	U	■	⊠	□	□
3	#	3	C	S	☆	s	⊟	⊟	⊠	⊠	□	⊠	⊠	♥
4	\$	4	D	T	d	t	⊟	⊟	⊠	⊠	□	□	⊠	□
5	%	5	E	U	e	u	□	⊠	⊠	⊠	□	■	□	⊠
6	&	6	F	V	f	v	□	⊠	⊠	⊠	→	□	⊠	⊠
7	⊠	7	G	W	g	w	□	●	⊠	⊠	□	□	□	⊙
8	(8	H	X	h	x	⊟	☺	⊙	⊠	■	□	□	♣
9)	9	I	Y	i	y	⊟	⊟	⊠	⊠	⊠	□	⊠	□
A	*	⊠	J	Z	j	z	□	⊟	⊠	⊙	□	□	⊟	◆
B	⊕	⊠	K	⊠	k	⊙	⊟	⊟	⊠	⊠	⊠	⊠	⊟	⊠
C	⊟	⊠	⊠	⊟	⊠	⊟	⊟	⊟	⊠	⊟	⊙	⊟	□	↓
D	⊠	⊠	M	⊠	m	⊟	⊟	⊟	⊠	⊟	⊟	⊟	⊟	⊟
E	⊙	⊟	N	↑	n	⊟	⊟	⊟	⊠	⊟	⊟	⊟	⊟	⊟
F	/	?	⊙	←	⊙	⊠	⊟	⊟	⊟	⊟	□	⊟	□	⊟

Figure 2
Memory map for SHARP MZ80K under CP/M

Note: Free area is
 actually from 0100H
 to A3FFH = 41788 bytes.

