I N T R O D U C T I O N

This document describes the SB180FX system utilities provided with the Micromint single board computer using the Hitachi HD64180 high-integration microprocessor.

The suite consists of the programs described on the following pages. Detailed information concerning ZCPR3 is contained in the book ZCPR3: The Manual and ZRDOS is described in the booklet ZRDOS Programmer's Guide.

Executable system utilities have either built-in help for usage and syntax, or are user-prompted and menu-driven. Most tools and utilities will display a brief help screen if they are invoked with two slashes in the parameter field (e.g. SYSGENFX //).

FVCFX

Parameters: None.

Description:
The Format, Verify, Copy program will format and verify a 5.25" disk in any of six formats and an 8" disk in any of three formats. In addition, it will make track-to-track copies of any of the three double-sided 5.25" formats. Both the source disk and destination disk must be of the same format for the copy function to work.

MDSKFX I

Parameters:
I - initialize the M: RAM disk

Description:
Memory DiSK will initialize the M: RAM disk when it is invoked with the 'I' parameter. Any other parameters will cause a help screen to be displayed.
The M: RAM disk consists of all of the unused memory between physical addresses 50000H and 7FFFFH and is 192k bytes. To access this "disk drive," simply use 'M:' as the drive designator.

NDSKFX I

Parameters:
I - initialize the N: RAM disk

Description:
The N: RAM disk is nearly identical to the M: RAM disk (see description above). The N: RAM disk consists of all the memory installed beyond the base 256k (which is used by Z-System and the M: RAM disk). If there is only 256k of memory on the SB180FX, NDSKFX will appear to function properly, but the BIOS won't allow any accesses to the N: disk and will flag any attempts with an error.

CONFIGFX

Parameters: None.

Description:
This utility is used to CONFIGure assorted system parameters such as baud rate, drive step rate, and motor on time. It is fully menu-driven and takes advantage of the TCAP (terminal capabilities) feature of ZCPR3. If you haven't selected a terminal type using TCSELECT, then the information presented by CONFIGFX will be unformatted, but still readable.

Changes saved to memory will take effect immediately, but will be lost the next time the computer is booted. Changes saved to disk are permanent, but don't take effect until the next time the computer is booted.

SYSGENFX [ufn.typ]

Parameters:
ufn.typ - optional name of a file containing an operating system image.

Description:
SYSGENFX allows reading and writing the system tracks of an SB180FX disk. If a filename isn't given, the program will prompt for the letter of the source drive followed by the letter of the destination drive. If a file is specified, the program will read the operating system image from the file and will prompt for the letter of the destination drive. SYSGENFX must be used before a disk can be used to boot the computer.

HDINITFX

Parameters: None.

Description:
The Hard Disk INITialize program performs all that's necessary to configure your system and hard disk drive to your specifications. It is fully menu driven and, in most cases, self explanatory. If you ever have a doubt as to how to answer a question, simply press return. The default answer (shown in parentheses in most cases) will be used by the program.
(Note: When verifying the hard disk, a bad sector will cause the verify function to abort. If this occurs, use the public domain program FBAD to find and mark all the bad sectors. See the public domain section for more details on FBAD.)

CDC c

Parameters:
c = H - hard disk context
F - floppy disk context

Description:
Change Disk Context. It is often useful to be able to map drive A: to the hard disk instead of to a floppy. This allows the system to warm boot from the hard disk, resulting in faster warm boots and freeing you from keeping a boot disk in the first floppy drive.
CDC is used in one of two ways. The command 'CDC H' will set up the system so the hard disk drive is drives A: through D:, depending on how the drive is partitioned. (If, for example, it is partitioned into three logical drives, they will be known as

drives A: through C:.) The floppies are then known as drives E: through H:, depending on how many floppy drives are connected.

Before the CDC H command is issued, however, you must have written a system image to the system tracks of the hard disk drive. If this isn't done, the computer won't be able to do a warm boot after the CDC command has finished, and the system will hang. The procedure for writing to the hard disk's system tracks is described in the installation section of the SB180FX user's manual.

The other valid usage is 'CDC F'. This simply undoes the CDC H command. The floppies revert back to A: through D: and the hard disk becomes E: through H:.

Another side effect of the CDC command is that some system utilities designed to run on a floppy-only system will continue referring to the floppies as drives A: through D:, regardless of the current disk context. Two examples of this are FVCFX and SYSGENFX. Suppose you want to format a disk in the first floppy drive, but you have already run CDC so that the first drive is drive E:. FVC won't accept E as a valid drive, so you must enter A. (Don't worry, FVCFX will never attempt to format your hard disk drive.)

A variation of this is CONFIGFX. While it correctly recognizes the current disk context, it only accepts A through D as a valid drive. Therefore, if you want to use CONFIGFX to change the parameters on a disk in, say, the first floppy drive, the system must be in the floppy context so you can refer to that drive as drive A:. Issue the CDC F command to put the system in floppy context.

PUTSFX ufn.typ

Parameters:

ufn.typ - name of the file containing a system image.

Description:

This command reads a system image from the given file and writes the image to the system tracks of the hard disk. See the system generation section for more details on the usage of this command.

PUTSYSFX

Parameters: None.

Description:

Similar to PUTSFX, this command already contains the system image, so doesn't have to read it from disk. Typing 'PUTSYSFX' places the system image onto the hard disk's system tracks.

An alternate use for this file is to use it with SYSGENFX to place the system image onto a floppy's boot tracks. The command 'SYSGENFX PUTSYSFX.COM' will use just the system image portion of

the PUTSYSFX.COM file to write the image to the specified floppy. See the system generation section for more details on creating the PUTSYSFX.COM file after changes to the BIOS or ZCPR3.

TIME [o]

Parameters:

o = R - display Wallclock repeatedly
S - set the Wallclock
C - clear the Real Time Clock to zeros
X - display the Real Time Clock

Description:

TIME is a simple utility which demonstrates the use of the interrupt-driven real time clock built into the BIOS. There are actually two timers available. One is called the Wallclock and keeps track of the time of day. The other is call the Real Time Clock and keeps track of elapsed time since it was last cleared. Both timers are cleared whenever the computer is turned off or cold booted.

When called without any parameters, TIME displays the current setting of the Wallclock. The 'R' parameter will cause the Wallclock to be displayed repeatedly until a key is pressed. The 'S' parameter is used to set the Wallclock. The 'C' parameter is used to clear the Real Time Clock and the 'X' parameter is used to display it.

The Real Time Clock might be used to automatically time the execution of a program down to the nearest second. The command line "TIME C;name of program to be timed;TIME X" will display the time elapsed from the start of your program to when it's done.

Public Domain Software

Very often, when a task needs to be performed, but the tool or utility necessary to perform the task isn't provided, there is a public domain utility which fits the bill. The following public domain software has been found by us to be useful in the everyday operation of a system with a hard disk and is included at no extra cost to the user. However, since it is public domain, we can't guarantee its operation or provide support if bugs are found.

FBAD d:

Parameters:

d: - drive containing disk to be checked. May be a floppy or hard disk.

Description:

Find BAD will find and mark all the bad sectors on a disk, either floppy or hard. The program keeps track of any bad sectors it finds, creates a dummy file called [UNUSED].BAD, and allocates the bad sectors to that dummy file. The dummy file doesn't contain any information, but since it is supposedly using the bad sectors, other files are prevented from using them. You may want to use SFA to make [UNUSED].BAD a system file so it doesn't show up in a normal directory and to make it a read-only file so it can't be accidentally erased. (The command line is 'SFA [UNUSED].BAD /SYS,R/O'.)

BU

Parameters: None.

Description:

This utility will BackUp the files on your hard disk drive to floppy drive. The program prompts for all the information it needs and is very easy to use. (A printer is required, however.) Please see the documentation file provided on the disk for more information on its usage. Note that the source file provided is an .ASM file and must be converted before assembling with ZAS.

MDM740

Parameters: None.

Description:

MoDeM740 is a popular communications program used to communicate with other computers or a modem. It has been customized to use the auxiliary serial port on your SB180 and allows the SB180 to be used in terminal mode or to transfer files between systems using the XMODEM protocol. It was customized by

SB180-owner Ken Taschner and full source is available on the Circuit Cellar BBS (203-871-1988) in the MODEM: directory in the file MDM180V2.LBR. The program has full on-line help and is very easy to use.

MLOAD [outfil=]file1[,file2...] [bias]

Parameters:

outfil - optional output file.
file1, file2, ... - input files.
bias - optional bias address.

Description:

While not truly public domain, MLOAD can be freely copied and distributed. MLOAD will create executable code (.COM file) from a .HEX file. It will also combine a number of .HEX files into one .COM file, or overlay a preexisting binary file with a converted .HEX file. Type 'MLOAD' with no parameters for more details. Note that the source file provided is an .ASM file and must be converted before assembling with ZAS.

System Files

The remaining sections assume a working knowledge of assembly language and systems programming. Beginners should consult a good reference on assembly language programming before attempting any of the procedures outlined here.

BIOS

The BIOS is the interface of the Z-System (combined ZCPR3 and ZRDOS) to the hardware environment of the SB180FX. The BIOS supports six 5.25" diskette formats:

SB180 1 (double-sided, double-density, 48 tpi)
SB180 2 (double-sided, double-density, 96 tpi)
Hitachi QC-10 (double-sided, double-density, 48 tpi)
Kaypro II (single-sided, double-density, 48 tpi)
Osborne 1 (single-sided, double-density, 48 tpi)
Ampro (single-sided, double-density, 48 tpi)

The BIOS also supports three 8" disk formats:

IBM single-sided, single-density (CP/M standard)
CCS/Compupro single-sided, double-density (8*1024)
CCS/Compupro double-sided, double-density (15*512)

Disks with either SB180 format can be used as system disks. Disks with the other formats may be used freely in drives other than A, the system drive. Format selection is automatic when logging in the drive.

The BIOS implements the otherwise unused remainder of RAM as two disk emulators. One (drive M:) is 192k bytes large and the other (drive N:) uses the rest of the installed memory. (If there is only 256k installed, drive N: is disabled.) These "disks" may be used as high-speed scratch disks for any general purpose. The utilities MDSKFX and NDSKFX initialize the "disks" by clearing their directories to 0E5H. Warm boot operations do not affect the contents of memory.

An interrupt-driven timer is implemented as a real-time clock. The timer maintains ten contiguous bytes in memory as follows: Real Time (four bytes) as Tenths, Seconds, and Hours; Wallclock (three bytes) as Seconds, Minutes, and Hours; General-Purpose Timer (two bytes) a sixteen-bit down-counter which can be set by the user to any value and then checked for zero. The GPT decrements every 100 milliseconds. The last byte is the drive

motor timer and is not normally accessed by the user. The user obtains a pointer to the timer string in HL by a call to BIOS+36H. The ten bytes are allocated in memory as follows:

```
REALTIME:
     DS   1          ; TENTHS (100 MILLISECONDS)
     DS   1          ; SECONDS
     DS   1          ; MINUTES
     DS   1          ; HOURS
WALLCLOCK:
     DS   1          ; SECONDS
     DS   1          ; MINUTES
     DS   1          ; HOURS
GPTIMER:
     DS   2          ; 100 MILLISECOND DOWN COUNTER
MOTIME:
     DS   1          ; MOTOR ON TIME (SECONDS)
```

The user should take care to disable interrupts before making multiple byte accesses to the timer string so as not to have the bytes change due to an intervening interrupt.

ZCPR3.Z80

This is the source code of the ZCPR3 command processor. It has been modified slightly to allow: 1) assembly with a relocating assembler and 2) creation of a binary file exactly 800h bytes long to permit linking with other system modules (ZCPR3 and ZRDOS). No further changes need be made to this file. ZCPR3 configuration options are chosen from Z3HDR.LIB and requires the presence of Z3BASE.LIB during assembly.

Z3HDR.LIB

Z3HDR.LIB is the configuration library for ZCPR3. Editing this library allows customization of ZCPR3 to the system programmer's specific tastes.

Z3BASE.LIB

Z3BASE.LIB is a set of system equates which define the availability and the addresses, as well as the length, of various ZCPR3 system segments and buffer areas. This file is required for the assembly of ZCPR3 and the system segments. If Z3BASE.LIB equate addresses are changed, ZCPR3 and the system segments must be reassembled and the entire system regenerated.

PORTS.LIB

This library of equates defines addresses of various internal ports of the HD64180 as well as addresses of the floppy disk controller and the parallel printer port. It is included in the assembly of all system utility programs.

NCRIO.LIB

This library of equates defines addresses of the NCR53C80 ports as well as numerous mask bytes used for checking individual bits within the chip's registers.

BOOT

The boot loader resides in sector one of track zero and is read into memory at 8000h by the monitor ROM and control passed to it. The boot loader will then read the rest of track 0 and all of track 1 into high memory and transfer control to the cold boot entry of the BIOS. The boot loader will read both 48 tpi and 96 tpi SB180 system disks.

MOVZ

MOVZ is the basis of the MOVZSYS program. It is used with MKZSYS.ZEX to create a new MOVZSYS.COM when changes have been made to ZCPR3 or to the BIOS.

MKZSYS.ZEX

After changing and reassembling any of the system modules, this batch file may be used with ZCPR3 ZEX.COM to create a new version of MOVZSYS.COM. Examination of this file will tell the programmer which files are needed for MOVZSYS regeneration. Command line: ZEX MKZSYS<cr>.

GENHEX.COM

This utility is used to create an interim .HEX file with a specified load point. It is used in conjunction with GENSPR.COM to create a relocatable system module for inclusion in MOVZSYS.COM.

GENSPR.COM

This utility is used to create an .SPR relocatable system module from two .HEX files created with GENHEX.

INIT

The BIOS implements the Z-System Input/Output Package (IOP). INIT.Z80 represents a 'dummy' IOP which is used to create INIT.IOP. The package may be loaded with ZCPR3 LDR.COM to effectively remove a previously loaded IOP. INIT.Z80 may also be used as the basis of a custom IOP written by the user. (Several preconfigured IOPs are available, ready to run, from Echelon.)

Programming Notes

The SB180FX system software package is written in Zilog/Hitachi Assembly Language and assembled, linked, and loaded with Echelon ZAS and ZLINK. In general, all programs and system segments are written without ORG statements defining their beginning. They are assembled as code relative segments (the default condition of ZAS) with starting address 0000h. The linker, ZLINK, is then used to create the desired object file.

The .REL files created with ZAS are easily relocated by ZLINK to run at any location. Study the ZAS manual supplied for further details of assembler and linker usage.

System Generation

With all of the compile-time options available in ZCPR3, the user may not be happy with the way his system was set up by Micromint. To modify any of these options, however, requires the user to change one or more files, reassemble the modified portions, and regenerate the operating system. While not difficult, there are certain files which must be present and steps must be done in a certain order. The process of modification and regeneration will be described here. Further details may be obtained from the book ZCPR3: The Manual.

1. System regeneration is required only when modifications are made to the BIOS or to ZCPR3. Files such as FVCFX.Z80 or SYSRCP.Z80 aren't integrated into the system, so may be changed independently. To be reassembled, BIOS.Z80 needs the library files PORTS.LIB, Z3BASE.LIB, SYSENV.LIB, and NCRIO.LIB. ZCPR3.Z80 needs Z3BASE.LIB and Z3HDR.LIB. You should never have to make changes to the ZCPR3.Z80 file directly since all the user selectable options are contained in the Z3HDR.LIB file.

2. Copy all the files you will need to a fresh disk. This should include source files, associated library files, your text editor, and a copy of ZAS. (Most of these are already on disk 5 of the SB180-30 software.)

3. Make your changes to the source (or library) files. Assemble them with ZAS to create .REL files (either BIOS.REL, ZCPR3.REL, or both).

4. ZDMH must be configured before it can be used in the generation process. Run ZDMH and tell it how wide your screen is as well as how many lines it has. Be careful, it expects these values in hexadecimal. A new file, called ZDIH.COM, is then created and the program stops. Rename this file to ZDM.COM so it can be used later.

5. Now it's time to generate a new system. Simply type 'ZEX MKZSYS'. This batch file links together a new system and creates the file MOVZSYS.COM. Next, type 'MOVZSYS 53' to actually create the system image in a file called ZSYSTEM.MDL. To place the new system on the boot tracks of a floppy disk, put a copy of SYSGENFX.COM on this disk, type 'SYSGENFX ZSYSTEM.MDL', and follow the instructions that appear on the screen. To put a copy of the new system on the system tracks of the hard disk, put a copy of PUTSFX.COM on this disk and type 'PUTSFX ZSYSTEM.MDL'. Boot the new floppy and you are running your new system.

6. It is possible to create a new PUTSYSFX.COM file so the ZSYSTEM.MDL file isn't needed to put a system image onto the hard disk's system tracks. The command:

```
MLOAD PUTSYSFX.COM=ZSYSTEM.MDL,PUTSFX.HEX
```

will create the new file.

READ ME FIRST

Z-System Usage Notes

for the SB180, SB180FX, and BCC180/60

Release 1.00
8/14/89

Micromint, Inc.
4 Park Street
Vernon, CT 06066

This document contains helpful hints and suggestions for using the Z-System operating system software more effectively with the SB180, SB180FX, and BCC180/60 computers. When a paragraph deals with only one or two of the computers, the computers to which it applies are listed at the end of the paragraph. Utilities specific to the SB180FX often have "FX" appended to the end of the utility name. When such utilities are referenced in this document, the "FX" is placed in parentheses to show that the equivalent utility for all three computers is being discussed. For example, the configuration utility is called "CONFIG" on the SB180 and BCC180/60 computers, but is called "CONFIGFX" on the SB180FX. The utility is referenced as "CONFIG(FX)" in the following paragraphs.

1) The system provided must be booted on a double-sided, double-density 48-tpi 5¼" disk drive. The system may later be copied to 96-tpi or 3½" disks for booting.

2) If the system is allowed to automatically boot after reset without first entering the monitor, the boot disk assumes that the terminal is running at 9600 baud. If another baud rate is being used on the terminal, open the door on drive A:, press reset, and press Return on the terminal to enter the monitor. Doing so will tell the monitor what baud rate you're actually using. Put a copy of the boot disk in drive A: and type "Z" Return to boot the disk. It will boot up at whatever baud rate you used to enter the monitor. To make the baud rate the new default, run CONFIG(FX) and type "M" to get the parameters from memory, "N" for no more changes, "D" to save to disk, and "A" to save it to the A: drive. Be sure you're saving the changes to a copy of the system master and <u>not</u> the original. (SB180FX and BCC180/60 only)

3) To configure a 96-tpi (or 3½") disk so it can be booted, hook up a 48-tpi 5¼" drive in position A: and a 96-tpi (or 3½") drive in position B:. Boot the system and type "FVC(FX)" Return. Press "F", "2", "B", and Return to format a disk in B:. When that's done, press "Q" to exit FVC(FX). Now type "SYSGEN(FX)" Return. Answer "A" Return for source drive and "B" Return for destination drive. Press Return again to leave SYSGEN(FX). Use MCOPY, AC, or VFILER to copy any files you want from drive A: to B:. Power down the system and reconfigure it so the 96-tpi (or 3½") drive is in position A:. The system may now be booted using the disk just created.

4) If there is a printer plugged into the system, be sure the power to the printer is turned on before booting the system. If the printer is off when the computer is turned on, the system may hang and refuse to boot until the printer is either unplugged from the computer or turned on. (SB180 and SB180FX only)

5) As distributed, the system has the CMDRUN facility turned on. (For more information about the CMDRUN facility, see the book ZCPR3: The Manual.) As a result, if the file CMDRUN.COM is located along the search path, any error handler which has been previously installed won't be invoked when a bad command is typed. In order to use any of the error handlers (e.g., ERROR1.COM, VERROR.COM), simply remove CMDRUN.COM from the path.

6) If you plan to mount your board in an enclosure, be sure to use nylon or plastic washers between any metal hardware and the circuit board. Any metal allowed to touch the board may cause a short circuit and prevent the board from operating properly.

7) As provided, the system uses a floppy disk drive head step rate of 10 milliseconds. A faster step rate may be used with most drives to increase the overall disk access rate (and often quiets down the drive). Check your drive's manual to determine if a faster step rate can be used. For example, the Teac FD-55B drives can use a 6-ms step rate. Run CONFIG(FX) to make this change.

8) The system has also been optimized for drives without head load solenoids. If your drive does have a head load solenoid, you will have to use CONFIG(FX) to change the head load parameter to match your disk drives. Many drives with head load solenoids require at least 36 ms, but check your drive's manual. If you're not sure whether your drive has a head load solenoid, don't change this value unless you experience frequent read errors. If you do get errors, try changing the value to 36 ms and see if it makes a difference.

9) Whenever the FDC9266 selects 8" operation, the chip's overall clock frequency is doubled. As a result, any time-dependent parameters (step rate and head load time) are divided by two when 8" drives are selected. Be aware that when CONFIGFX shows a step rate of 6 ms, the system uses 6 ms on any 5¼" drives connected, but uses 3 ms when referring to any 8" drives. (SB180FX only)

Drive Jumpering for the SB180/SB180FX/BCC180

Tandon 65-2 and Canon 211 drives don't work with these boards.

5¼" 48-tpi drives:

TEAC FD-55B-20-U	: ML,UR,DSx
TEAC FD-55B-01-U	: HM,SM,UR,PM,DSx
TEAC FD-55B-01-U (other one)	: HM,ST,DSx
TEAC FD-55BV-06-U	: HL,RY,DSx
TEAC FD-55BV-36-U	: HL,RY,DSx
Matsushita JA-551-3	: DSx,DS,+WP,MM,IU
Matsushita JA-551-045	: DSx,DS,WP,MM,DR,RD,RY
Shugart SA450	: DSx,DS,MM,IU
Shugart SA455-3CAE	: DSx,DS,+WP,MM,IU
Mitsubishi M4851-112U	: DSx,2S,MM,HM

5¼" 96-tpi drives:

TEAC FD-55F-03-U	: HM,SM,UR,PM,DSx
TEAC FD-55GFV-17-U	: RY,U2,LG,I,FG,DSx

3½" drives:

TEAC FD-35F PS-07-U	: M1,FG,DSx

8" drives (SB180FX only):

Shugart SA851	: DSx,850,2S,Z,A,B,I,R,IW, S2,IT,C,RS,HLL,M,NF

The following configurations were submitted by SB180 users and have not been verified by Micromint:

5¼" 48-tpi drives:

Qume 542	: HM,DSx,HL

5¼" 96-tpi drives:

Mitsubishi M4853	: HM,MM,H2,R3,DSx
Mitsubishi MF504A	: 2S,IR,RR,ND,SS,DSx (TD on last drive)

8" drives (SB180FX only):

Shugart SA801	: DSx,800,A,B,C,Y,DS,L
Shugart 860-1	: DSx,MS,Z,MD,SR,S2,2S,B,A
Siemens (no model)	: cut G,install F,select B,C,or D
Qume DT8	: DSx,2S,A,B,C,D,Y,R,I,S2
Qume 842	: DSx,2S,A,B,C,D,Y,R,I

Notes:

1) The DSx entry used throughout signifies the appropriate drive select option for the location of the drive in your system. Most drives have either DS0,DS1,DS2,DS3 or DS1,DS2,DS3,DS4.

2) The terminator pack, if present, should be installed on the drive physically at the end of the cable only. It should be removed from all other drives on the system.

Creating A Work Disk

Users new to Z-System are often overwhelmed by the volume of tools and utilities found on the distribution disks. They want to condense the information down to a manageable form by putting together a work disk containing the most useful tools, but since everything is so new, they don't know where to begin.

In his document "What's the Word on the Z-System?", Richard Conn makes some suggestions concerning what should be on such a work disk and gives several examples. The following sample directories are adapted from Rick's suggestions and may be used as a guideline until a working knowledge of Z-System can be obtained. Keep in mind, though, that these are just suggestions. You may find that some of the files listed are useless to you, where others that have been excluded may actually be indispensable.

1. A "reasonable" system disk:

XDIR III, Version 2.0 Vertical Listing by File Type/Name
Disk: C User: 15, File Attributes: Non-System

Filename.Typ	Size K	Filename.Typ	Size K	Filename.Typ	Size K
VFILER .CMD	2	FINDF .COM	2	START .COM	2
AC .COM	6	FVC .COM	6	SUB .COM	4
ALIAS .COM	4	GOTO .COM	2	UNERASE .COM	2
CD .COM	2	HELP .COM	2	VALIAS .COM	8
CLEANDIR.COM	2	LDR .COM	4	VERROR .COM	4
COMP .COM	4	MCOPY .COM	6	VFILER .COM	14
CONFIG .COM	6	MDSK .COM	2	VMENU .COM	8
CPSEL .COM	2	MENU .COM	6	VTYPE .COM	6
CRC .COM	6	MKDIR .COM	6	WHEEL .COM	2
DEV .COM	2	PATH .COM	2	XD .COM	4
DIR .COM	4	PRINT .COM	6	XDIR .COM	8
DPROG .COM	4	PWD .COM	2	ZDM .COM	6
DU3 .COM	12	RENAME .COM	4	ZEX .COM	6
ECHO .COM	2	SAK .COM	2	SYS .ENV	2
ERASE .COM	4	SH .COM	4	SYS .FCP	2
ERROR3 .COM	2	SHCTRL .COM	2	SYS .NDR	2
ERRORX .COM	2	SHOW .COM	8	SYS .RCP	2

51 Files Using 214K, 51 Files on Disk and 172K Left

2. A "more reasonable" system disk:

```
XDIR III, Version 2.0    Vertical Listing by File Type/Name
 Disk: C  User:  15, File Attributes:  Non-System
Filename.Typ Size K  Filename.Typ Size K  Filename.Typ Size K
------------ --- ------  -------- --- ------  -------- --- ------
VFILER   .CMD      2  FVC      .COM      6  SUB      .COM      4
AC       .COM      6  GOTO     .COM      2  UNERASE  .COM      2
CLEANDIR.COM       2  HELP     .COM      2  VALIAS   .COM      8
COMP     .COM      4  LDR      .COM      4  VERROR   .COM      4
CONFIG   .COM      6  MDSK     .COM      2  VFILER   .COM     14
CPSEL    .COM      2  MENU     .COM      6  VMENU    .COM      8
CRC      .COM      6  PATH     .COM      2  XD       .COM      4
DEV      .COM      2  PRINT    .COM      6  ZEX      .COM      6
DIR      .COM      4  SAK      .COM      2  SYS      .ENV      2
DPROG    .COM      4  SH       .COM      4  SYS      .FCP      2
ERROR3   .COM      2  SHCTRL   .COM      2  SYS      .NDR      2
ERRORX   .COM      2  START    .COM      2  SYS      .RCP      2
   36 Files Using   140K,    36 Files on Disk and   246K Left
```

3. Two "minimum" system disks:

```
XDIR III, Version 2.0    Vertical Listing by File Type/Name
 Disk: C  User:  15, File Attributes:  Non-System
Filename.Typ Size K  Filename.Typ Size K  Filename.Typ Size K
------------ --- ------  -------- --- ------  -------- --- ------
VFILER   .CMD      2  GOTO     .COM      2  VALIAS   .COM      8
CLEANDIR.COM       2  LDR      .COM      4  VERROR   .COM      4
CONFIG   .COM      6  MDSK     .COM      2  VFILER   .COM     14
DEV      .COM      2  MENU     .COM      6  XD       .COM      4
DIR      .COM      4  PRINT    .COM      6  ZEX      .COM      6
DPROG    .COM      4  SAK      .COM      2  SYS      .ENV      2
ERROR1   .COM      2  START    .COM      2  SYS      .FCP      2
ERROR3   .COM      2  SUB      .COM      4  SYS      .NDR      2
ERRORX   .COM      2  UNERASE  .COM      2  SYS      .RCP      2
   27 Files Using   100K,    27 Files on Disk and   286K Left
```

```
XDIR III, Version 2.0    Vertical Listing by File Type/Name
 Disk: C  User:  15, File Attributes:  Non-System
Filename.Typ Size K  Filename.Typ Size K  Filename.Typ Size K
------------ --- ------  -------- --- ------  -------- --- ------
VFILER   .CMD      2  MDSK     .COM      2  XD       .COM      4
DEV      .COM      2  START    .COM      2  SYS      .ENV      2
DIR      .COM      4  UNERASE  .COM      2  SYS      .FCP      2
ERRORX   .COM      2  VERROR   .COM      4  SYS      .NDR      2
LDR      .COM      4  VFILER   .COM     14  SYS      .RCP      2
   15 Files Using    50K,    15 Files on Disk and   336K Left
```

ERRATA

The following replaces sections 2.14 and 2.14.1 of the SB180FX manual.

2.14 Using a Hard Disk with the SCSI Interface

The SB180FX has a general-purpose SCSI interface. Most users will use the interface to attach a hard disk, so the BIOS assumes that if the SCSI interface is present (the NCR 53C80 is installed), a hard disk is attached. The BIOS requires either a Xebec 1410 or an Adaptec ACB4000 hard disk controller be used with any ST506 drive up 32 MB in size and an appropriate power supply and case. There is also a pre-configured selection designed for a 10 Megabyte Xebec Owl hard disk drive. The installation instructions assume that you have successfully booted up the SB180FX as a floppy disk based system first.

2.14.1 Installation

1. Connect a 50-pin cable between your hard disk controller board and the SB180FX's 50-pin connector J1. Pay careful attention to the pin 1 markings on the cable and connectors.

2. On both the Xebec 1410A and the Xebec Owl, there is a three-pin jumper header labeled 'SS' with the option of placing the jumper next to a '2' or a '5'. The sector size ('SS') that the BIOS uses is 512 bytes, so the jumper should be placed next to the '5' (512-byte sectors) instead of the '2' (256-byte sectors).

3. The BIOS expects the hard disk controller board to be set up for a target ID of zero. Consult your controller board's manual to find out how to jumper the board for an ID of zero.

4. Boot up the system normally with a copy of the system disk. If there is no response when power is applied, turn the power off and recheck the orientation and seating of the connector cables.

5. The next step is to initialize the hard disk. Place the "Utilities" disk in drive B: and type 'B0:;HDINITFX'. The default configuration followed by a menu of commands will be displayed. To use the configuration that is displayed, simply choose to format the disk (option 2). If a different configuration is desired, select option 1. The program will prompt you for all the information it needs. If you are unsure of what to answer for a particular question, just press RETURN and the default value in parentheses will be used. You may have to consult the manual that came with your hard disk drive to find answers for all of the questions. When you are satisfied with the configuration that is displayed, format the disk (option 2).

6. Now verify the disk (option 3). The program will display the cylinder it is verifying and will display any bad sectors found on the disk. If the disk checks out OK, go on to the next step. If there is an error, try the verify again. If the error persists, format and verify the drive again. If the error continues to occur, press ESC to leave the program and use the FBAD utility to find and tag the bad sectors. Be sure to run FBAD for each logical drive that is defined. For example, if you selected two partitions, the hard disk would be formatted as two logical drives, E: and F:. You would therefore issue 'FBAD E:' followed by 'FBAD F:' to check the whole disk. See the description of the FBAD utility for more details.

7. You should now have an error-free formatted hard disk. This step will place the operating system image onto the hard disk's system tracks. This system image is used whenever the computer does a warm boot during normal operation. Type 'PUTSYSFX' and answer 'Y' to the question. The hard disk is now completely functional.

8. You may now operate your system in either of two disk contexts. If you prefer floppy disks as your regular working media, the system defaults to this mode. Known as the floppy context, the floppies remain drives A: through D: and the hard disk is accessed as drives E: through H:.

It is recommended that you run the program to change the disk context with the 'H' option and operate under the hard disk context. The command 'CDC H' swaps drive assignments between the hard disk and the floppies. The floppies are now mapped to drives E: through H: and the hard disk is mapped to drives A: through D:. (The highest drive letter allowable is dependent on the number of floppies you have and the number of partitions you've defined.)

SB180/SB180FX Packaged System
Start-up Instructions

This system is equipped with a Seagate ST138N hard disk drive, which is a 3.5", 30-megabyte drive with a built-in SCSI interface. While the software in the standard SB180-20 or SB180-30 package supports certain SCSI drives, the ST138N is not one that is supported. However, a replacement BIOS, called XBIOS, marketed by Xsystems Software for the SB180/SB180FX does support the ST138N drive. As a result, we have provided you with a complimentary copy of XBIOS (with DateStamper) for use on your system.

Since XBIOS can be difficult to install for the inexperienced user (and often for the experienced user!), we have also provided a boot disk which has been customized for your system. The hard disk drive has already been formatted and checked, so all that should be left for you to do is connect a terminal, insert the boot disk, power up the system, and start using your computer.

The following sections detail which portions of the XBIOS manual are important for your setup, special considerations that ust be kept in mind while using XBIOS, and how we configured our system should you need to reconfigure any portion of it in the future.

Getting Started

As mentioned above, all that you have to do to get your system up and running is connect a serial terminal to the terminal connector on the back of the system, insert the customized boot disk in drive A, and power the system up.

Before you continue any further, however, you should review certain sections of the XBIOS manual to become familiar with some of the differences between a system that uses XBIOS and one that uses our regular software.

Chapter 1 lists several utilities that are found on the SB180-20 and SB180-30 disks that should be avoided. CONFIG (CONFIGFX), FVC (FVCFX), MDSK (MDSKFX), TIME, and SYSGEN (SYSGENFX) are all found on disk 1 of the SB180-20 (SB180-30) software and should be replaced with their counterparts from the XBIOS distribution disk (as described in Chapter 1). CDC and HDINIT may be found on the COMM180 disk if you have an SB180 system. If you have an SB180FX system, CDC is on disk 1 of the SB180-30 software and HDINITFX is on disk 4. CDC is not needed, and HDINIT (HDINITFX) should be replaced by HDIAS from the XBIOS disk.

The only other piece of software that will not work with XBIOS is UniForm from MicroSolutions. Those users who need the ability to read and write IBM PC format disks can instead use a utility called DosDisk, available from Plu*Perfect Systems, 410 23rd St., Santa Monica, CA 90402.

Be sure to read the rest of Chapter 1 for an overview of XBIOS and the rest of the manual.

Chapter 2 should be reviewed just to become familiar with the various files on the XBIOS distribution disk. All sections dealing with installing XBIOS can be ignored at this time since it has already been done for you.

Chapter 3 details each of the utilities and how they are used, and should be thoroughly reviewed.

Chapter 4 and the remainder of the manual can be skipped at this time, but will be necessary should you ever want to make changes in the configuration of the system or install Date-Stamper.

Seagate ST138N Specifications

Formatted Capacity (megabytes):	32
Sectors per Drive:	63,139
Access Time (msec):	28
Read/Write Heads:	4
Data Cylinders:	615
Step Pulse Range (µsec):	3-200
Power (watts):	12

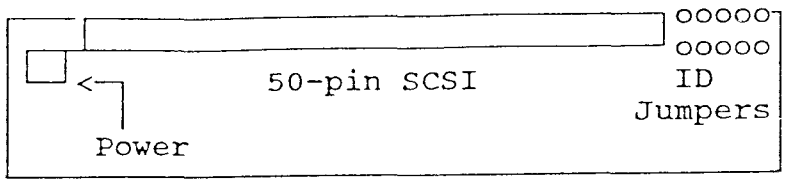
Note that some of the numbers above don't exactly match those used to configure the system. There are a number of tracks reserved by the drive as spares to replace known defects, so total usable storage is somewhat less than 32 megabytes.

Head Parking

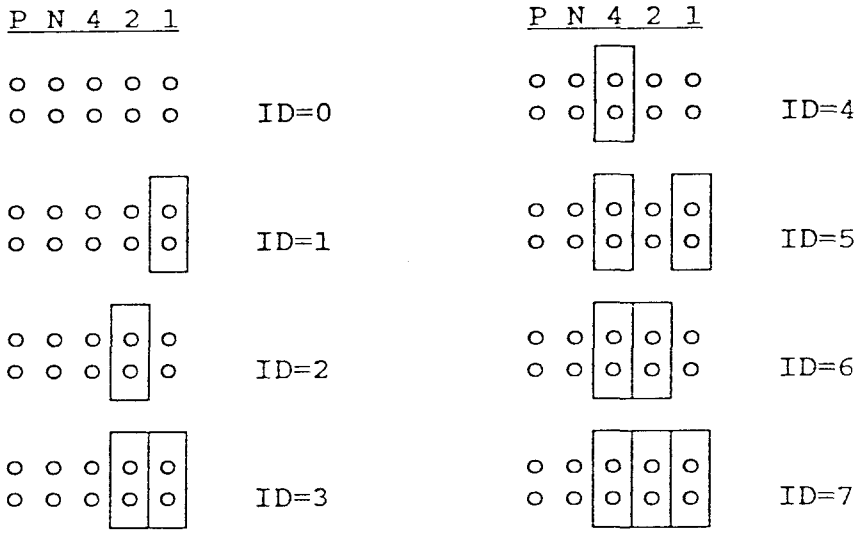
The ST138N drive automatically parks its heads in the shipping zone every time power is removed. It is not necessary to manually park the drive's heads with a park utility.

Drive ID Selection

Your drive has been set up as SCSI ID 0. Should it ever be necessary to change the ID, the following diagram shows how to set the jumpers:



Back View



A jumper is installed on "P" to enable parity. Parity is never used with an SB180/SB180FX. "N" has no connection.

System Configuration

The SYSBLD utility is completely menu driven and has a hierarchical structure to the menus. Selecting "2" from the main menu selects menu 2. Once in menu 2, selecting "4" brings up menu 2.4. From that menu, selecting "2" brings up menu 2.4.2, and so on. On the following pages, we list each of the menus and submenus for SYSBLD to show how each parameter is set for the custom boot disk supplied with your system. Be sure to note the hierarchical structure and it will be much easier to follow the menus.

SB180FX with 512K

The first set of menus is for an SB180FX system with 512K of memory.

```
SYSBLD Vers 1.12 System Configuration Utility for XBIOS System

Main Selection Menu  (Menu 0)
1.  Sysbld Files.
2.  Change System Parameters.
3.  Change Disk Parameters.
4.  Change Zsystem Parameters.

File Selection Menu  (Menu 1)
1.  Console Command Processor: ZCPR3.REL
2.  Disk Operating System:     ZRDOS17 .REL
3.  BIOS (Upper Memory):       XBIOS10 .REL
4.  BIOS (Banked):             XBIOSB11.REL
5.  System Image:              XSYSTEM .MDL

System Parameter Selection Menu  (Menu 2)
1.  T System Clock Is 9.216 Megahertz.
2.    Auxiliary Board Configuration.
3.    Logical Device Assignment.
4.    HD64180 Parameters.
5.    Memory Allocation Parameters.

Auxiliary Board Configuration Menu.  (Menu 2.2)
1.  T Main Board: SB180FX.
2.  T ETS180IO+ board Not Configured.
3.  T SCSI Port Address For SB180FX.

Logical Device Assignment Menu.  (Menu 2.3)
1.  T CONIN:  HA1, HD64180 ASCI Port 1.
2.  T CONOUT: HA1, HD64180 ASCI Port 1.
3.  T LST:    SCN, SB180 Centronics Port.
4.  T RDR:    HA0, HD64180 ASCI Port 0.
5.  T PUN:    HA0, HD64180 ASCI Port 0.
6.  T Clock:  HDC, HD64180 Interrupt clock.

HD64180 Parameter Menu.  (Menu 2.4)
1.    Port 0 (DTE) 1,200 Baud
2.    Port 1 (DCE) 9,600 Baud
3.  T 2 Memory Wait States.
4.  T 3 I/O Wait States.
5.    Centronics Port Configuration.

Serial Port 1 (DCE) Menu  (Menu 2.4.1) Port "HA0"
1.  T 1,200 Baud.
2.  T 8 Data Bits.
3.  T 1 Stop Bits.
4.  T Xon/Xoff Handshaking (Output) Not Enabled.
5.  T Eight Bit Input Stream.
6.  T Eight Bit Output Stream.
7.  T Non-Buffered Input.
8.  T Non-Buffered Output.
```

```
Serial Port 1 (DCE) Menu  (Menu 2.4.2) Port "HA1"
1.  T 9,600 Baud.
2.  T 8 Data Bits.
3.  T 1 Stop Bits.
4.  T Xon/Xoff Handshaking (Output) Not Enabled.
5.  T Eight Bit Input Stream.
6.  T Eight Bit Output Stream.
7.  T Buffered Input.
8.  T Buffered Output.
9.  T DTR Handshaking (Output) Not Enabled.

Centronics Port Configuration Menu  (Menu 2.4.5)
1.  T Eight Bit Output Stream.
2.  T Non-Buffered Output.

Memory Allocation Parameter Menu  (Menu 2.5)
1.  T Total Memory 128 Segments (512k bytes).
2.  T OS Memory 6 Segments (24k bytes).
3.    Ram Disk Memory 105 Tracks (420k bytes).

Disk Configuration Menu  (Menu 3)
1.  Define Floppy Disk Drives (Physical).
2.  Define SCSI (Hard Disk) Controllers (Physical).
3.  Define SCSI (Hard Disk) Drives (Physical).
4.  Define Logical Disks 'A' Through 'H'.
5.  Define Logical Disks 'I' Through 'P'.

Floppy Drive Configuration Menu  (Menu 3.1)
1.  Drive 0:  Configured, 5/3 inch (48tpi), Double Sided,
                                                Double Density.
2.  Drive 1:  Configured, 5/3 inch (48tpi), Double Sided,
                                                Double Density.
3.  Drive 2:  Configured, 5/3 inch (96tpi), Double Sided,
                                                Double Density.
4.  Drive 3:  Not Configured.
5.  Motor On Time 10 Seconds.

Floppy Drive Configuration Menu  (Menu 3.1.1)  Drive 0
1.  T Configured.
2.  T 5/3 inch.
3.  T Double Sided.
4.  T Double Density.
5.  T Step Rate 4 ms.
6.  T Head Unload 32 ms.
7.  T Head Load 4 ms.
8.    Spin-up Time 800 ms.
9.  T 48tpi.

Floppy Drive Configuration Menu  (Menu 3.1.2)  Drive 1
1.  T Configured.
2.  T 5/3 inch.
3.  T Double Sided.
4.  T Double Density.
5.  T Step Rate 4 ms.
6.  T Head Unload 32 ms.
```

```
7.  T Head Load 4 ms.
8.    Spin-up Time 800 ms.
9.  T 48tpi.

Floppy Drive Configuration Menu  (Menu 3.1.3)  Drive 2
1.  T Configured.
2.  T 5/3 inch.
3.  T Double Sided.
4.  T Double Density.
5.  T Step Rate 4 ms.
6.  T Head Unload 32 ms.
7.  T Head Load 4 ms.
8.    Spin-up Time 800 ms.
9.  T 96tpi.

Floppy Drive Configuration Menu  (Menu 3.1.4)  Drive 3
1.  T Not Configured.

SCSI Controller Menu  (Menu 3.2)
1.  T SCSI Address 0: Seagate ST225N Controller.
2.  T SCSI Address 1: Not configured.
3.  T SCSI Address 2: Not configured.
4.  T SCSI Address 3: Not configured.
5.  T SCSI Address 4: Not configured.
6.  T SCSI Address 5: Not configured.
7.  T SCSI Address 6: Not configured.
8.  T SCSI Address 7: This System.

SCSI (Hard Disk) Configuration Menu  (Menu 3.3)
1.  Device 1: SCSI Address 0, SCSI Device 0.
2.  Device 2: Not Configured.
3.  Device 3: Not Configured.
4.  Device 4: Not Configured.
5.  Device 5: Not Configured.
6.  Device 6: Not Configured.
7.  Device 7: Not Configured.
8.  Device 8: Not Configured.

SCSI (Hard Disk) Configuration Menu  (Menu 3.3.1)  Device 1
1.  T Configured.
2.    SCSI Address 0.
3.    SCSI Device 0.
4.    Number of Heads: 4.
5.    Number of Cylinders: 605.
6.    (Logical) Sectors per Track: 104.
7.  T Physical Sector Size 512.
8.  T Step Pulse Rate 3 ms.
9.    Rest of Parameters

SCSI (Hard Disk) Configuration Menu (Cont.)  (Menu 3.3.1.9)  Device 1
1.    Reduced Write Current Cylinder 615.
2.    Increase Write Precomp. Cylinder 615.
3.  T Maximum ECC Data Burst 0.
```

```
Logical Disk Assignment Menu  (Menu 3.4)
1.  Disk A:  Floppy Disk, Device 0.
2.  Disk B:  Floppy Disk, Device 1.
3.  Disk C:  Floppy Disk, Device 2.
4.  Disk D:  Not Configured.
5.  Disk E:  SCSI Disk, Device 0, SCSI Address 0.
6.  Disk F:  SCSI Disk, Device 0, SCSI Address 0.
7.  Disk G:  SCSI Disk, Device 0, SCSI Address 0.
8.  Disk H:  SCSI Disk, Device 0, SCSI Address 0.

Logical Disk Assignment Menu  (Menu 3.4.1) Disk A
1.  T Floppy Disk.
2.  T Device Number 0.
3.  T Primary Device.
4.    Disk Type: DEFAULT.

Logical Disk Assignment Menu  (Menu 3.4.2) Disk B
1.  T Floppy Disk.
2.  T Device Number 1.
3.  T Primary Device.
4.    Disk Type: DEFAULT.

Logical Disk Assignment Menu  (Menu 3.4.3) Disk C
1.  T Floppy Disk.
2.  T Device Number 2.
3.  T Primary Device.
4.    Disk Type: DEFAULT.

Logical Disk Assignment Menu  (Menu 3.4.4) Disk D
1.  T Not Configured.

Logical Disk Assignment Menu  (Menu 3.4.5) Disk E
1.  T SCSI (Hard) Disk.
2.    SCSI Address 0.
3.    SCSI Disk, Device 0,
4.    Tracks Before Directory 2.
5.    Tracks for Data 603.
6.    Number of Directory Entries 1024.
7.  T Allocation Block Size 2048.
8.    Display Disk Map.

Partitions for Hard Disk SCSI 0 Device 0.
Total Tracks Available 2420
Disk E:      2 -   604 (603 tracks).
Disk F:    605 -  1209 (605 tracks).
Disk G:   1210 -  1814 (605 tracks).
Disk H:   1815 -  2419 (605 tracks).
```

```
Logical Disk Assignment Menu  (Menu 3.4.6) Disk F
1.  T SCSI (Hard) Disk.
2.    SCSI Address 0.
3.    SCSI Disk, Device 0,
4.    Tracks Before Directory 605.
5.    Tracks for Data 605.
6.    Number of Directory Entries 1024.
7.  T Allocation Block Size 2048.
8.    Display Disk Map.

Logical Disk Assignment Menu  (Menu 3.4.7) Disk G
1.  T SCSI (Hard) Disk.
2.    SCSI Address 0.
3.    SCSI Disk, Device 0,
4.    Tracks Before Directory 1210.
5.    Tracks for Data 605.
6.    Number of Directory Entries 1024.
7.  T Allocation Block Size 2048.
8.    Display Disk Map.

Logical Disk Assignment Menu  (Menu 3.4.8) Disk H
1.  T SCSI (Hard) Disk.
2.    SCSI Address 0.
3.    SCSI Disk, Device 0,
4.    Tracks Before Directory 1815.
5.    Tracks for Data 605.
6.    Number of Directory Entries 1024.
7.  T Allocation Block Size 2048.
8.    Display Disk Map.

Logical Disk Assignment Menu  (Menu 3.5)
1.  Disk I:  Not Configured.
2.  Disk J:  Not Configured.
3.  Disk K:  Not Configured.
4.  Disk L:  Not Configured.
5.  Disk M:  Memory Disk.
6.  Disk N:  Memory Disk.
7.  Disk O:  Not Configured.
8.  Disk P:  Not Configured.

Logical Disk Assignment Menu  (Menu 3.5.5) Disk M
1.  T Memory Disk.
2.    Tracks Before Directory 64.
3.    Tracks for Data 41.
4.    Number of Directory Entries 64.
5.    Display Ram Disk Map.

Logical Disk Assignment Menu  (Menu 3.5.6) Disk N
1.  T Memory Disk.
2.    Tracks Before Directory 0.
3.    Tracks for Data 64.
4.    Number of Directory Entries 64.
5.    Display Ram Disk Map.
```

```
Z-System Parameter Menu  (Menu 4)
1.    Auto Command (Cold Boot), "START".
2.    Initial Path: M0 A0 A15
3.    Input/Output Package Buffer     EC00-F1FF.
4.    Resident Command Package Buffer F200-F9FF.
5.    Flow Command Package Buffer     FA00-FBFF.
6.    Display Environment Map.
7.    Input .ENV or .Z3T file.
```

Input/Output Package	EC00-F1FF	1536 bytes
Resident Command Package	F200-F9FF	2048 bytes
Flow Command Package	FA00-FBFF	512 bytes
Named Directory Buffer	FC00-FCFB	252 bytes
Shell Stack	FD00-FD7F	128 bytes
Message Buffer	FD80-FDCF	80 bytes
External File Control Block	FDD0-FDF3	36 bytes
External Path	FDF4-FDFD	10 bytes
Environment Descriptor	FE00-FEFF	256 bytes
Command Line Buffer	FF00-FFCB	204 bytes
External Stack	FFD0-FFFF	48 bytes

SB180FX with 256K

An SB180FX system with only 256K of memory is set up exactly as above, but with the following differences:

```
Memory Allocation Parameter Menu  (Menu 2.5)
1.  T Total Memory 64 Segments (256k bytes).
2.  T OS Memory 6 Segments (24k bytes).
3.    Ram Disk Memory 41 Tracks (164k bytes).

Logical Disk Assignment Menu  (Menu 3.5)
1.  Disk I:  Not Configured.
2.  Disk J:  Not Configured.
3.  Disk K:  Not Configured.
4.  Disk L:  Not Configured.
5.  Disk M:  Memory Disk.
6.  Disk N:  Not Configured.
7.  Disk O:  Not Configured.
8.  Disk P:  Not Configured.

Logical Disk Assignment Menu  (Menu 3.5.5) Disk M
1.  T Memory Disk.
2.    Tracks Before Directory 0.
3.    Tracks for Data 41.
4.    Number of Directory Entries 64.
5.    Display Ram Disk Map.

Logical Disk Assignment Menu  (Menu 3.5.6) Disk N
1.  T Not Configured.
```

SB180 with 256K

An SB180 system is set up exactly the same way as a 256K SB180FX system, but with the following differences :

Auxiliary Board Configuration Menu. (Menu 2.2)
1. T Main Board: SB180.
2. T ETS180IO+ board Not Configured.
3. T SCSI Port Address For COMM180/ETS180IO+.

SB180FX
Computer/Controller

DESCRIPTION

The MICROMINT SB180FX is an upwardly compatible performance extension to Micromint's existing SB180 computer. The SB180FX, only 5.75" by 8", offers a Z-80 compatible CPU running at 6, 9 or 12MHz, 512K bytes of RAM, up to 32K bytes of ROM, two 38.4Kbaud serial ports, a parallel printer port, peripheral expansion bus, three bi-directional parallel ports, an industry standard 765A-compatible disk controller for up to four disk drives (any combination of 3 1/2", 5 1/4", or 8" drives), and an SCSI expansion bus for direct connection to a hard disk drive or additional computers. Whether you use the SB180FX as the basis for a complete disk based computer system or use its 32K of ROM space for a battery-powered dedicated controller application program, you will appreciate its ability to run standard 8080/8085 and Z-80 software at many times the speed of a Z-80.

The SB180FX uses the most powerful of the new generation 8 bit CPUs - the Hitachi HD64180. The HD64180 advanced CMOS processor provides the benefits of high performance, reduced system cost, and low power operation while maintaining complete compatibility with the large base of standard CP/M and Z-System software. Stellar performance of the HD64180 results from its high clock speed, instruction pipelining, and an integrated Memory Management Unit (MMU) with 512K bytes directly addressed memory space. The instruction set is a superset of the Z80 instruction set; twelve new instructions include hardware multiply and a SLEEP instruction for low power operation.

Because the SB180FX's function is compatible with the Z80 instruction set, it can run CP/M 2.2, CP/M Plus, Z-System, MP/MII, TurboDOS, and Oasis operating systems. These operating systems can be custom configured to make use of the 512K bytes of on board memory for enhanced performance. And popular program development tools for these operating systems - BASIC, FORTRAN, Pascal, PL/1, C, Forth, assembler, etc. - are widely available; thousands of proven application programs will work, too.

TECHNICAL SPECIFICATIONS

PROCESSOR

* Hitachi HD64180, an 8-bit CPU in a 68 pin PLCC package
* Superset of Z-80 instruction set, including hardware multiply
* Integrated Memory Management Unit with 512K bytes address space
* Dynamic RAM refresh
* Wait state generator
* Clocked serial I/O port
* 2 channel Direct Memory Access Controller
* 2 channel Asynchronous Serial Communication Interface
* 2 channel 16-bit Programmable Reload Timer
* 12 interrupts
* Dual bus interface to 68xx and 80xx support chips
* 6.144MHz, 9.216MHz, and 12.288 MHz system operation

MEMORY

* 512K bytes dynamic RAM on board
* Memory externally expandable to 4 Mbyte RAM
* Either an 8K 2764, 16K 27128, or 32K 27256 EPROM usable
* Full function 8K ROM resident monitor

INPUT/OUTPUT

* Console RS-232 serial port with auto-baud rate select to 38,400 baud
* Peripheral RS-232 serial port, full handshaking, 150-38,400 baud
* Line printer parallel I/O port
* 24 bits bi-directional parallel I/O
* 19-bit address decoding, I/O port decoding, and dual bus interface brought out to expansion bus connector
* Can be directly attached to GT180 640 x 480 color graphics adapter
* Fully implemented SCSI hard disk and communications bus interface

FLOPPY/HARD DISK INTERFACE

* Uses Standard Microsystems 9266 disk controller
* Compatible with NEC 765A controller
* On-chip digital data separator
* Can control 3 1/2", 5 1/4", and 8" floppy disk drives - up to 4 in any combination
* Handles both FM encoded (single density) and MFM encoded (double densi data
* NCR 53C80 SCSI bus controller for hard disk or network communication.

POWER SUPPLY REQUIREMENTS

* +5 volts +/- 5% @ 1A (fully populated)
* +12 volts +/- 20% @ 25 mA (plus disk drive requirements)

DIMENSIONS AND CONNECTIONS

* 5.75" by 8" board with mounting holes for 5 1/4" drive
* 20 pin DIP header for RS-232C serial console I/O
* 20 pin DIP header for RS-232C serial peripheral port
* 20 pin DIP header for parallel line printer
* 34 pin header for 3 1/2" or 5 1/4" floppy disk
* 40 pin header for SB180 XBUS expansion bus
* 26 pin header for three bi-directional parallel ports
* Two 26 pin headers for memory expansion bus
* 50 pin header for SCSI bus
* 50 pin header (unpopulated) for 8" floppy disks

OPERATING CONDITIONS

* Temperature: 0-50 C (32-122 F)
* Relative humidity: 10-90% relative humidity, non-condensing

THE MICROMINT SB180FX ROM MONITOR

The ROM monitor provided with the SB180FX is a complete set of utilities and debugging aids in an 8K byte EPROM which supports four I/O "devices":

CON: - Console RS-232 serial port
CEN: - Centronics parallel printer port
AUX: - Auxiliary RS-232 serial port
DSK: - Floppy disk storage device

Monitor Commands include:

A - ASCII table	I - Input port	S - Set memory
B - Bank select	K - Klean disk (format)	T - Test system
C - Copy disk	M - Move memory	U - Upload hex file
D - Display memory	N - New command	V - Verify memory
E - Emulate terminal	O - Output port	W - Write Disk
F - Fill memory	P - Printer select	X - Examine CPU registers
G - Goto program	Q - Query memory	Y - Yank I/O registers
H - Hexmath	R - Read Disk	Z - Z-System boot

Z SYSTEM DISK OPERATING SYSTEM

The Z-System is an enhanced 8-bit operating system which is a complete replacement for CP/M 2.2 from Digital Research. Any of the thousands of application programs, languages, or utilities which run under CP/M will also run under Z-System. Z-System is a more advanced, more convenient operating environment than CP/M, with many utility programs which give the user more consistent, easier access to its features. Named directories are provided rather than disk drive designators and user areas. Multiple commands may be entered on the command line. A sophisticated "search path" is implemented for programs and files. Input/output redirection is supported. Password protection for directory access is available, and user privilege levels for commands can be provided. Z-System has been customized to make use of the SB180FX's expanded instruction set, making it very fast and extremely efficient.

Comparison of the SB180FX's Z-System, CP/M-80, and MS-DOS

FEATURE	Z-System	CP/M	MS-DOS
Software compatible with CP/M 2.2	*	*	
No warm boot required when changing disks	*		*
Multiple commands per line	*		
Named directories	*		*
Password protection for directories	*		
Dynamically variable user privilege levels for commands	*		
Searching of alternate directories for invoked programs and files	*		p
Terminal-independent video capabilities	*		
Input/output redirection	*		*
Conditional testing and execution at the operating system level (IF/ELSE/ENDIF)	*		
Shells and menu generators with shell variables	*		
Tree-structured on-line help and documentation subsystem	*		
512 megabyte file sizes, 8 gigabtye disks	*		
Complete error trapping with recovery, customizable messages and prompts	*		
Screen-oriented file manipulation and automatic	*		

archiving and backup
Full screen command line editing with previous command recall and execution *

* = Yes P = Partial

PART #	DESCRIPTION	PRICE
SB180FX-1	SB180FX 6.144 MHz computer board populated w/256K bytes RAM, 8Kbyte ROM monitor, without SCSI chip.	$409.00
SB180FX-1A	SB180FX 6.144 MHz computer board fully populated w/512K bytes RAM, 8Kbyte ROM monitor, and SCSI chip.	$499.00
SB180FX-1-3	SB180FX-1 computer board as described above with Z-System software including ZRDOS, ZCPR3, editor, utilities, ZAS assembler, and ZDM debugger, BIOS and ROM monitor sources, and BIOS for SCSI hard disk. Supplied on five 5 1/4" SB180 format DSDD disks.	$499.00
SB180FX-1A-3	SB180FX-1A computer board as described above with Z-System software including ZRDOS, ZCPR3, editor, utilities, ZAS assembler, and ZDM debugger, BIOS and ROM monitor sources, and BIOS for SCSI hard disk. Supplied on five 5 1/4" SB180 format DSDD disks.	$599.00
SB180FX Borland Turbo Modula-2	Borland International has written a special version of Turbo Modula-20for the SB180 and SB180FX computers. It takes full advantage of the expanded 64180 instruction set for faster program execution.	$69.00

Expansion memory boards, higher speed processors, color graphics adapters, and expansion I/O peripherals are also available for the SB180FX. Call for price and delivery.

ORDER TOLL FREE
1-800-635-3355

In Connecticut call: 1-871-6170

To order or for more information, call TOLL FREE or write:

MICROMINT, INC
4 Park Street, Vernon, CT 06066

The SB180FX

My original intention when I designed the SB180 was to present a small computer that, coupled with a 3 1/2" disk drive, would serve as

a suitable "buried controller" or cost effective second system. Much to my delight and amazement I missed the boat entirely. From the information I've received, the majority of SB180's have either been installed and expanded to the same physical proportions as the dinasaurs I had intended to replace or, again expanded and dedicated to use in specific data acquisition or control applications (an SB180 was in the 4th place race car at the Indy 500, for example).

Since it appears that everyone has felt it necessary to add to what I had thought was an end in itself, I decided to aid the process by presenting an additional 64180 based computer, the SB180FX, which has more of what everyone seems to be adding. The following is a comparison description of the SB180 and the SB180FX:

SB180 FEATURES	SB180FX FEATURES
Processor and Onboard Memory	
HD64180 CPU (64 pin shrink dip) 6.144 MHz Operation	HD64180 CPU (68 pin PLCC) 6.144, 9.216 or 12.288 MHz (Depends on Xtal)
256K Onboard DRAM 8K, 16K, or 32K EPROM socket w/8K ROM Monitor	512K Onboard DRAM 8K, 16K, 32K, EPROM socket w/8K ROM Monitor
Onboard I/O	
2 Serial Ports 1 Parallel Printer Port	2 Serial Ports 1 Parallel Printer Port 4 Bit Memory Extension Address 8255 PIO w/24 Bits Parallel I/O
Mass Storage	
SMC 9266 Disk Controller Supports 4 Floppy Disk Drives (3.5", 5.25", and 8")	SMC 9266 Disk Controller Supports 4 Floppy Disk Drives (3.5", 5.25", and 8") NCR 53C80 SCSI Controller (PLCC) w/BIOS for 32 MEG HARD DISK
Memory Expansion	
none	Optional off Board Expansion to: 2M byte using 256K by 1 DRAM
I/O Expansion	
32 ports of 256 available on 40 pin header (SB180 XBUS)	32 ports of 256 available on 40 pin header (SB180 XBUS) Facility for 64 additional ports
Physical Dimensions	
4" x 7" w/mounting holes for 3.5" disk drive	5.75" x 8" w/mounting holes for 5.25" disk drive

SB180FX 5.75"x 8" single board computer, accomodates 512K bytes memory, 2 serial ports, 1 parallel ports, parallel printer port, floppy disk controller, SCSI controller, ROM monitor, 6 Mhz 64180.

Comes with ZRDOS, ZCPR3, hard disk bios, and user's manuals. Populated w/265K memory, less 53C80 SCSI controller chip.

SB180FX board alone .....order SB180FX-1 ..... $409.00
SB180FX board with software .order SB180FX-1-30 .... $499.00

Full SB180FX board and all software w/512 Kbytes and SCSI
order SB180FX-1A-30 ... $599.00

The SB180FX is software and hardware compatible with the SB180 with the exception of the additional connectors that support the added features.

If you are presently using or are building an SB180 and would like to know the differences between it and the "FX", write to me and I'll send you a schematic of the new board.

Steve