LAPSIZE PC

USER'S MANUAL

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RADIO INTERFERENCE

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may causes interference to radio and television reception. It has been designed to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

WARNING 1

This equipment has been certified to comply with the limits for a class B computing device, pursuant to Subpart J of Part 15 of FCC Rules.

WARNING 2

The user is warned that the shielded cables provided with this equipment must be used. A failure to use shielded cables may result in excessive radio-frequency emissions in violation of FCC rules, for which the user would be responsible. If any extension cables are used, they must also be shielded and the shields connected by means of metal shell connectors so that there is a full 360 degrees of connection; digital connection is not good enough for radio frequencies.

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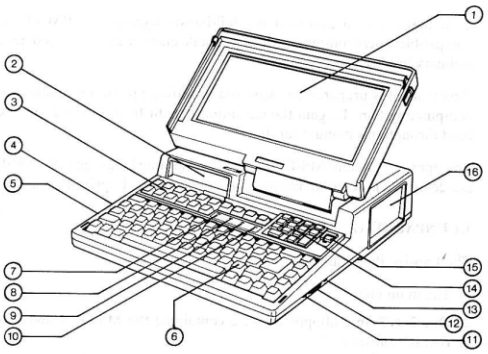
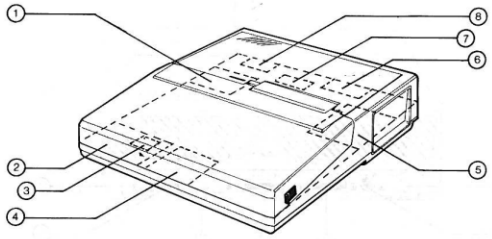
IMPORTANT NOTE

The system disk of your computer has a README.HLP file which contains information that was not available in time to be printed with the rest of this manual. To run this program, type README after the system prompt and press RETURN.



1. **SUPERTWISTED LCD DISPLAY**
   Displays 80- or 40-column text and up to 640 x 200 dot graphics
2. **FLOPPY DISK DRIVE (ON HARD DISK VERSION ONLY)**
   3 1/2" microfloppy disk drive with 720 kilobyte storage capacity
3. **FUNCTION KEYS**
   "Soft" keys for single key entry of software-specific commands
4. **TELCO JACK**
   Modular telephone jack for connecting computer to telephone wall outlet
5. **TELSET JACK**
   Modular telephone jack for connecting computer to telephone handset
6. **ALPHANUMERIC KEYS**
   Standard typewriter keys for entering textual and numeric data
7. **OFF HOOK INDICATOR**
   Lights up when internal modem is "off hook"
8. **CAPS LOCK INDICATOR**
   Lights up whenever keyboard is in upper-case mode
9. **"A" DRIVE ACTIVE INDICATOR**
   Lights up when Drive A is in use
10. **"B" DRIVE/HARD DISK ACTIVE INDICATOR**
    On Dual Floppy Version: Lights up when Drive B is in use
    On Hard Disk Version: Lights up when Hard Disk Drive is in use
11. **BACKLIGHT SWITCH**
    Controls power to electro-luminescent panel behind LCD screen
12. **CONTRAST KNOB**
    Turn to adjust contrast of screen
13. **CLOCK SPEED SWITCH**
    Use to switch between 4.77 and 8 MHz clock speeds
14. **NUMERIC KEY PAD**
    Calculator-style keyboard for easy number entry
15. **HARD DISK BUTTON**
    On Hard Disk Version: Controls power to hard disk
    On Dual Floppy Version: No function
16. **DISK DRIVE**
    On Hard Disk Version: Winchester hard disk drive with 20 megabyte formatted capacity
    On Dual Floppy Version: Dual microfloppy disk drives, each with 720 kilobyte formatted capacity

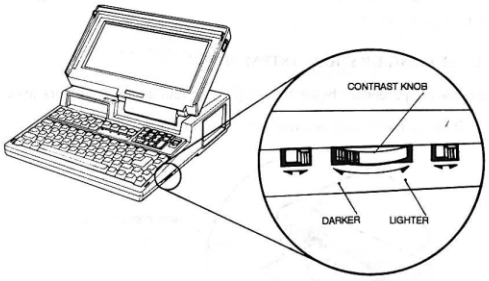


1. **MODEM**
   1200 bps full-duplex modem for intercomputer telecommunication
2. **SYSTEM MEMORY**
   One megabyte of user RAM for data and program storage
3. **8087 SOCKET (ON BOTTOM OF PCB)**
   IC socket for installing optional 8087-2 math coprocessor
4. **80C88 CPU**
   High speed, low-power version of the 16 bit 8088 microprocessor
5. **VIDEO CONTROLLER**
   Standard CGA video interface for output to LCD screen or external display unit
6. **PRINTER INTERFACE**
   Parallel printer interface for output to Centronics compatible printers
7. **REAL-TIME CLOCK**
   Battery backed up internal clock for date and time stamping files
8. **SERIAL INTERFACE**
   Programmable serial interface for full-duplex RS232C communication

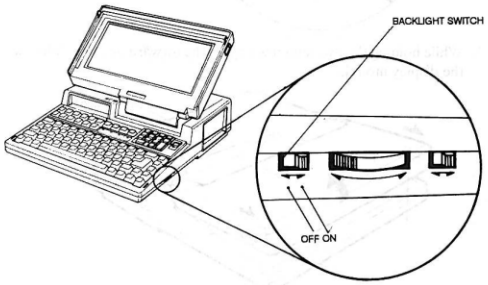
2.2 ADJUSTING THE DISPLAY

Once you've turned on your Lapsize PC, follow these instructions to adjust the display for optimal viewing.

1. Adjust the angle of the display module so that the text on the screen is clearly visible from where you're sitting.
2. Adjust the contrast of the screen.



3. If light conditions are poor, switch on the backlight.

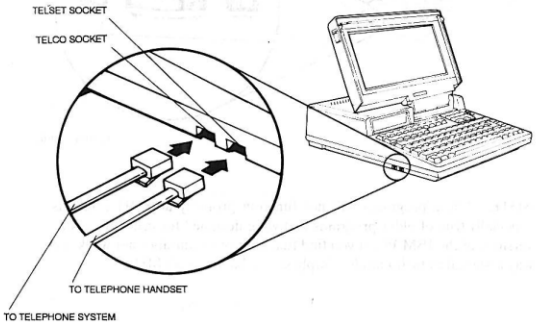


CAUTION: The backlight increases the system power consumption by as much as 15%. Therefore, when your computer is running on the battery power, the backlight should be used sparingly.

2.3 CONNECTING THE MODEM TO THE TELEPHONE SYSTEM

Whenever you want to make use of the Lapsize PC's built-in modem, follow the procedure below to connect it to the telephone system.

1. Switch off your computer system.
2. Disconnect the telephone handset from the wall socket.
3. Connect one end of the provided telephone cable to the TELCO socket on the left hand side of the computer and the other end to the wall socket.



4. Link the telephone handset to the TELSET socket of your computer.

2.6 USING BATTERY POWER

The Lapsize PC contains a lead acid rechargeable battery from which it can draw power when an AC power source is not available.

When fully charged, the battery can supply power to the computer for two to six hours of continuous operation, depending on the following factors.

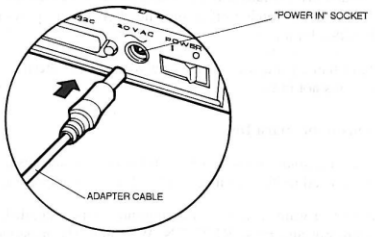
FACTOR	EFFECT ON BATTERY LIFE
Hard Disk Usage	Up to 50% reduction
Backlight Usage	Up to 15% reduction
8MHz Operating Speed	Up to 15% reduction
Frequent Floppy Disk Drive Usage	Up to 5% reduction

2.6.1 Recharging the Battery

When the battery charge is low, the POWER LED will flicker indicating that your computer requires recharging.

To recharge the battery:

1. Store any information currently in RAM on disk, then switch off the computer.
2. Connect the adapter to the socket on the back of the computer.



3. Plug the adapter into any unoccupied AC power outlet.

   CAUTION: Be sure the power input of the adapter matches the power output of the outlet.

It will take about 12 hours to fully charge the battery.

NOTE: It will take considerably longer to replenish the battery if the power is left on during charging.

2.6.2 Checking the Battery Level

You can check the charge level of the battery by running the SETUP utility program. All you need to do is type "setup" after the system prompt and press RETURN.

The following is a typical status report.

Current battery capacity: 50 %
Battery status : Fair

NOTE: The adapter should be disconnected when the reading is taken.

2.7 USING AC POWER

You can leave the transformer connected continuously as long as your computer is within reach of an AC power outlet. However, to avoid power wastage and prolong component life, it is advisable to unplug the transformer from both the computer and the wall outlet when the computer is not in use.

CHAPTER 3
PERIPHERALS

This chapter describes how to expand the capability and utility of your computer system by adding peripherals.

The following peripherals can be connected to your computer system:

- An RGBI color monitor
- A composite monochrome monitor
- A Centronics parallel printer
- An external 5 1/4" or 3 1/2" floppy disk drive
- Any device with an RS232C interface
- An 8087-2 math coprocessor

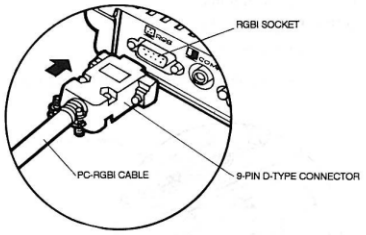
CAUTION: Before carrying out any of the procedures in this chapter, be sure that your computer and any peripherals you intend to connect it to are turned off.

3.1 HOW TO CONNECT AN RGBI MONITOR

You'll need:

- An IBM PC compatible digital RGBI monitor
- A standard PC-RGBI cable (usually provided with the monitor)
- A flat-blade screwdriver (optional)

Use the PC-RGBI cable to link your computer with the RGBI monitor.



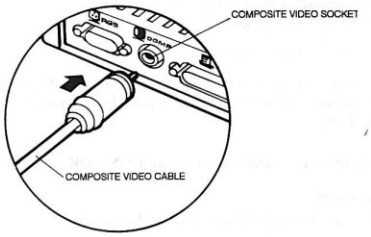
If you intend to leave the monitor connected for a long period of time, fasten the screws on the connector with a flat-blade screwdriver.

3.2 HOW TO CONNECT A COMPOSITE MONITOR

You'll need:

- An NTSC composite monochrome monitor
- A standard composite video cable

Use the video cable to link your computer with the composite monochrome monitor.

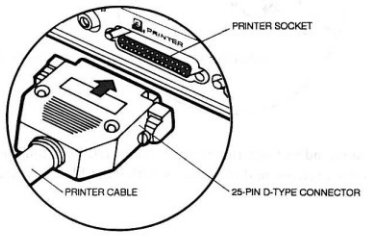


3.3 HOW TO CONNECT A PRINTER

You'll need:

- A Centronics-type parallel printer
- A standard IBM PC printer cable
- A flat-blade screwdriver (optional)

Use the PC printer cable to link your computer with the Centronics printer.



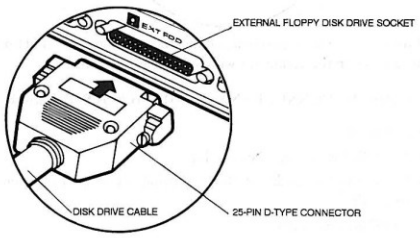
If you intend to leave the printer connected for a long period of time, fasten the screws on the connector with a flat-blade screwdriver.

3.4 HOW TO CONNECT AN EXTERNAL FLOPPY DISK DRIVE

You'll need:

- Either the BW112B 5 1/4" minifloppy disk drive or the BW113 3 1/2" microfloppy disk drive
- A flat-blade screwdriver (optional)

Use the cable provided with the disk drive to link your computer with the disk drive.



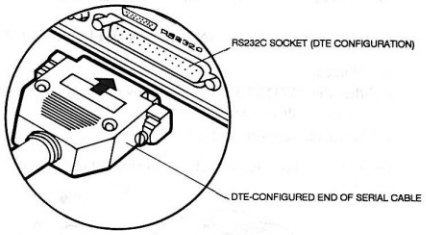
If you intend to leave the drive connected for a long period of time, fasten the screws on the connector with a flat-blade screwdriver.

3.5 HOW TO CONNECT AN RS232C DEVICE

You'll need:

- A device with an RS232C interface
- A DTE-DTE or DTE-DCE configured RS232C cable (depending on the configuration of the device)
- A flat-blade screwdriver (optional)

Use the DTE-DTE or DTE-DCE configured RS232C cable to link your computer with the RS232C device.



If you intend to leave the device connected for a long period of time, fasten the screws on the connector with a flat-blade screwdriver.

3.6 HOW TO CONNECT AN 8087-2 MATH COPROCESSOR

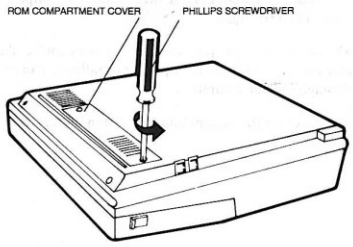
You'll need:

- An 8087-2 math coprocessor chip
- A flat-blade screwdriver (for removing the chip if it is improperly installed)
- A Phillips screwdriver

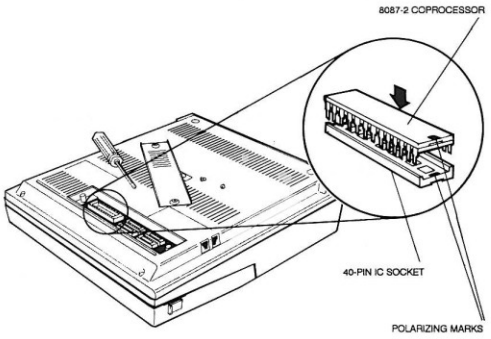
Follow the instructions below to install an 8087-2 coprocessor on the Lapsize PC's PCB.

1. Switch off the power of the computer, close the display module, and turn the system over.

2. Remove the cover at the bottom front portion of the computer.



3. Align the polarizing notch of the chip with that of the socket; then taking care not to bend the pins, insert the chip into the IC socket. Gently apply pressure to the center of the chip to insure it is fully seated.



The Lapsize PC fully supports the EMS standard. Its RAM is configured to comply with EMS specifications, and the CONFIG.SYS file on the provided MS-DOS system disk contains the EMS driver EMM (Expanded Memory Manager).

Whenever you run an EMS compatible program, the Lapsize PC's extra 384 kilobytes will automatically be available as expanded memory.

4.3 UTILITY PROGRAMS

This section describes the hardware-specific utility programs not covered in the MS-DOS User's Manual.

4.3.1 KEYBxx.COM

Purpose: Loads a keyboard program which replaces the keyboard program resident in the ROM BIOS. The xx in the command represents one of the seven keyboard programs provided on the DOS diskette. Each command increases the resident size of DOS in memory by about 2 kilobytes.

Syntax:

KEYBFR
or KEYBGR
or KEYBIT
or KEYBSP
or KEYBSW
or KEYBDM
or KEYBUK

Remarks: These commands load a program into memory that replaces the ROM BIOS keyboard program. Only one keyboard program should be loaded after starting MS-DOS. The program remains resident in memory until you perform a system reset or turn off the computer. If you load a second keyboard program, it will gain control of the keystrokes you type. The earlier program will still be in memory but cannot be returned to.

You can change from the KEYBxx program to the United States keyboard format and back again at any time by pressing CTRL-ALT-F1 to change to United States format or CTRL-ALT-F2 to return to the selected memory resident keyboard program.

If you want to load one of the keyboard programs whenever the system is booted up, create an auto-execute batch file "AUTOEXEC.BAT" that contains the "KEYBxx" command.

The table below lists the keyboard programs and the languages they support.

COMMAND	LANGUAGE
KEYBFR	French
KEYBGR	German
KEYBIT	Italian
KEYBSP	Spanish
KEYBSW	Swedish
KEYBDM	Danish
KEYBUK	British English

Should you insert the chip incorrectly, use a flat-blade screwdriver to remove it. To avoid damaging the pins, alternately raise the chip a few millimeters on one side and then the other until it is completely clear of the socket. Then try again.

CAUTION: Do not turn on your computer unless you're absolutely sure the chip is properly installed. Improper installation can cause permanent damage to your computer.

4. Replace the cover on the system unit and fasten all screws.

CHAPTER 4
OPERATION

This section documents the software operations not covered in the standard MS-DOS User's Manual.

4.1 USING YOUR LAPSIZE PC WITH HAYES-COMPATIBLE PROGRAMS

The Lapsize PC's built-in modem fully emulates the functionality of the Hayes modem. All the popular Hayes compatible communication programs written for the PC—such as, CrossTalk, PCTalk, and SmartCOM—will work with the Lapsize PC.

To use your Lapsize PC with a Hayes-compatible program:

1. Follow the instructions in Chapter 2 of this manual to connect the Lapsize PC to the telephone system.
2. Check the program's manual to see which communication port—COM1 or COM2—it supports. If the program only works with COM1, run the SETUP utility program to switch from COM2, which is the default setting, to COM1. Just type

   SETUP MODEM=COM1

   and press RETURN.
3. Load the communication program.
4. Follow the instructions in the manual of the communication program.

For your reference, a summary of Hayes commands and result codes is included in the Appendix C of this manual.

4.2 USING YOUR LAPSIZE PC WITH EMS PROGRAMS

Jointly developed by Lotus, Intel, and Microsoft, EMS (Expanded Memory Specification) is a memory management standard which allows compatible software to make use of random-access memory above the PC's 640 kilobyte addressing limit.

EMS compatible programs currently on the market include Lotus 1-2-3, Symphony, Framework II, SuperCalc 3.0, Javelin, Thinktank 2.1, Ready, Poly Windows, and Microsoft Windows.

4.3.2 EMM.SYS

Purpose: EMM.SYS is an installable character device driver which is linked to the MS-DOS system by adding a line to the CONFIG.SYS file on the system boot disk. This supporting software provides a hardware independent interface between application software and the expanded memory. This software is designed to be compatible with the Lotus/Intel/Microsoft Expanded Memory Specification. On the system disk which comes with the Lapsize PC, the EMM.SYS file is already included in the CONFIG.SYS file.

Syntax: DEVICE=EMM.SYS [Mx] [Ia] [Ib] [Ic] [Id]

where Mx defines the page frame location

X	PAGE FRAME LOCATION
0	C4000 - D3FFF
1	C8000 - D7FFF
2	CC000 - DBFFF
3	D0000 - DFFFF
4	D4000 - E3FFF
5	D8000 - E7FFF
6	DC000 - EBFFF
7	E0000 - EFFFF

and Ia defines the I/O port address of the first set of page mapping registers

Ib defines the I/O port address of the second set of page mapping registers

Ic defines the I/O port address of the third set of page mapping registers

Id defines the I/O port address of the fourth set of page mapping registers

A,B,C,D	I/O PORT ADDRESS
0	208 Hex
1	218 Hex
2	228 Hex
3	238 Hex
4	248 Hex
5	258 Hex
6	268 Hex
7	278 Hex
8	288 Hex
9	298 Hex
A	2A8 Hex
B	2B8 Hex
C	2C8 Hex
D	2D8 Hex
E	2E8 Hex
F	2F8 Hex

Remarks: If no parameters are entered, frame address will be D0000 to DFFFF. On the Lapsize PC, the I/O port addresses of mapping registers have already been hardwire-fixed to 268 Hex. As a result, no parameters are required if this driver is used on the Lapsize PC.

4.3.2 EMM.SYS

Purpose: EMM.SYS is an installable character device driver which is linked to the MS-DOS system by adding a line to the CONFIG.SYS file on the system boot disk. This supporting software provides a hardware independent interface between application software and the expanded memory. This software is designed to be compatible with the Lotus/Intel/Microsoft Expanded Memory Specification. On the system disk which comes with the Lapsize PC, the EMM.SYS file is already included in the CONFIG.SYS file.

Syntax: DEVICE=EMM.SYS [Mx] [Ia] [Ib] [Ic] [Id]

where Mx defines the page frame location

X	PAGE FRAME LOCATION
0	C4000 - D3FFF
1	C8000 - D7FFF
2	CC000 - DBFFF
3	D0000 - DFFFF
4	D4000 - E3FFF
5	D8000 - E7FFF
6	DC000 - EBFFF
7	E0000 - EFFFF

and Ia defines the I/O port address of the first set of page mapping registers

Ib defines the I/O port address of the second set of page mapping registers

Ic defines the I/O port address of the third set of page mapping registers

Id defines the I/O port address of the fourth set of page mapping registers

A,B,C,D	I/O PORT ADDRESS
0	208 Hex
1	218 Hex
2	228 Hex
3	238 Hex
4	248 Hex
5	258 Hex
6	268 Hex
7	278 Hex
8	288 Hex
9	298 Hex
A	2A8 Hex
B	2B8 Hex
C	2C8 Hex
D	2D8 Hex
E	2E8 Hex
F	2F8 Hex

Remarks: If no parameters are entered, frame address will be D0000 to DFFFF. On the Lapsize PC, the I/O port addresses of mapping registers have already been hardwire-fixed to 268 Hex. As a result, no parameters are required if this driver is used on the Lapsize PC.

4.3.5 SHIPDISK

Purpose: Parks the read/write head of the hard disk drive in the landing zone.

Syntax: SHIPDISK [<d:>]

Remarks: The parameter defines the drive number to park. Drive C is assumed if no parameters are specified. It is a good practice to park the head in the landing zone before transporting the computer.

Messages:

1. Parking succeeded.

or 2. Can't park drive <d:> !

or 3. Invalid drive specification.

APPENDIX A
SPECIFICATIONS

MICROPROCESSOR
80C88, 4.77 or 8MHz (switch selectable)
8087-2 numeric data coprocessor socket

MEMORY
BIOS Monitor ROM: 8 kilobytes
Character ROM: 4 kilobytes
Static Video RAM: 16 kilobytes
User RAM: 640 kilobytes
Extra RAM Support: 384 kilobytes (LIM EMS standard)

DISPLAY
Supertwisted LCD, high contrast
Electro-luminescent backlight
External view angle adjustment
80 x 25 text display
640 x 200 dot graphic display
Standard PC character set
Software-selectable display mode

DISK DRIVES
Dual Floppy Drive Version
Two 720 kilobyte 3 1/2" microfloppy disk drives
- Double side, double density
- One-inch high
- Low power consumption

Hard Disk Version
One 720 kilobyte 3 1/2" microfloppy disk drive
- Double side, double density
- One-inch high
- Low power consumption

One 20 megabyte Winchester 3 1/2" hard disk drive
- Low power consumption
- Separate power switch

KEYBOARD
95 keys, PC type
Low-profile key tops
10 function keys
Separate numeric key pad

REAL-TIME CALENDAR/CLOCK
Battery back up
Time-of-day clock and calendar
Automatic end of month recognition
Automatic leap year compensation
32 bytes of nonvolatile RAM for storing system configuration

MODEM
Extended Hayes-compatible command set
Bell 103/CCITT V.21 and Bell 212A/CCITT V.22 standard
0-300 or 1200 bps transmission rate
Software selectable communication standard and transmission rate
Full duplex operation
Automatic and manual dial
Automatic and manual answer
Two telephone modular jacks
Telecommunication supporting software

I/O INTERFACES
Standard RS232C serial interface with D25 male connector
Centronics parallel printer interface with D25 female connector
Interface and D25 female connector for external 3 1/2" or 5 1/4" disk drive
RGBI video interface with D9 connector
NTSC composite video port

INDICATORS
First drive active indicator
Second floppy/hard disk drive active indicator
Power low indicator
Telephone line status indicator
CAPS lock indicator

SWITCHES
Backlight ON/OFF
LCD contrast control
System power ON/OFF
Hard disk power ON/OFF (Hard Disk Version only)
CPU speed selector

SYSTEM POWER
Built-in sealed lead acid rechargeable battery
AC power adapter
Power status software

PC COMPATIBILITY
Hardware and software are designed to obtain maximum PC compatibility
Able to execute all popular PC-compatible software, including Lotus 1-2-3, Symphony, DBase II and III, Flight Simulator, Framework, GEM, SideKick, Multimate, WordStar, and PFS series software

BUNDLED SOFTWARE
MS-DOS version 3.21
GW-BASIC Interpreter version 3.2
Utility programs

ACCESSORIES (SOLD SEPARATELY)
External 3 1/2" microfloppy disk drive
External 5 1/4" minifloppy disk drive
Standard RS232C serial communication cable (DTE-DCE or DTE-DTE)
Centronics parallel printer cable
Leather carrying case

NET WEIGHT
Dual Floppy Disk Version: 6Kg (13.2lbs)
Hard Disk Version: 7Kg (15.4lbs)

DIMENSIONS
89mm(H) x 346mm(L) x 305mm(W)
3.5"(H) x 13.6"(L) x 12"(W)

APPENDIX B
SYSTEM DISKETTE FILES

FILENAME		FUNCTION
APPEND	COM	To set a search path for data files
ASSIGN	COM	To assign a drive letter to a different drive
ATTRIB	EXE	To set or to display attributes of a file
ANSI	SYS	Device driver for ANSI Escape Sequence
BACKUP	EXE	To back up files from one disk to another
COMMAND	COM	To process an internal MS-DOS command
CHKDSK	EXE	To scan the directory of the default or designated drive and to check for consistency
DEBUG	EXE	Debugger
DISKCOMP	EXE	To compare disks
DISKCOPY	EXE	To make a copy of a disk
DRIVER	SYS	Device driver for external drives
EDLIN	EXE	Line editor
EXE2BIN	EXE	To convert executable files to binary format
EMM	SYS	Device driver for EMS
FC	EXE	To compare files
FDISK	EXE	To configure a hard disk for MS-DOS
FIND	EXE	To search for a constant string of text
FORMAT	EXE	To format a disk to receive MS-DOS files
GRAFTABL	EXE	To load a table of graphics characters
GRAPHICS	EXE	To prepare MS-DOS for printing graphics
GWBASIC	EXE	Basic interpreter
HFORMAT	SYS	To format hard disk drive physically
IO	SYS	Hardware-operating system interface (hidden file)
JOIN	EXE	To join a disk drive to a pathname
KEYBFR	COM	French keyboard command
KEYBGR	COM	German keyboard command
KEYBIT	COM	Italian keyboard command
KEYBSP	COM	Spanish keyboard command
KEYBSW	COM	Swedish keyboard command
KEYBDM	COM	Danish keyboard command
KEYBUK	COM	UK keyboard command
LABEL	EXE	To label disks
LINK	EXE	Linker
MSDOS	SYS	MS-DOS operating system (hidden file)
MODE	EXE	To modify screen, communication port, and printer parameters
MORE	COM	To display output one screen at a time
PRINT	EXE	To print files

FILENAME		FUNCTION
RECOVER	EXE	To recover a bad disk or file
REPLACE	EXE	To replace previous versions of files
RESTORE	EXE	To restore backed up files
RAMDRIVE	SYS	Device driver for RAM disk
SHARE	EXE	To install file sharing and locking
SORT	EXE	To sort data forward or backward
SUBST	EXE	To substitute a string for a pathname
SYS	COM	To transfer MS-DOS system files from one drive to the drive specified
SETUP	COM	To initialize the real-time clock and to specify the default display and the number of floppy disk drives installed
SHIPDISK	COM	To park the read/write head of the hard disk drive in the landing zone
TREE	EXE	To display directory and file names
XCOPY	EXE	To copy files and subdirectories

APPENDIX C
MODEM COMMANDS AND RESULT CODES

COMMAND SUMMARY

COMMAND	DESCRIPTION (Notes 1 and 2)
PREFIX, REPEAT AND ESCAPE COMMANDS	
AT	Attention prefix: precedes all command lines except + + + (escape) and A/(repeat) commands
A/	Repeat last command line (A/ is not followed by carriage return)
+ + +	Escape code: go from on-line state to command state (one second pause before and after escape code entry; + + + is not followed by carriage return)
DIALING COMMANDS	
D	Dial
P	Pulse*
T	Touch-tone
,	Pause
!	Flash
/	Wait for 1/8 second
@	Wait for silence
W	Wait for second dial tone
;	Return to command state after dialing
R	Reverse mode (to call originate-only modem)
OTHER COMMANDS	
A	Answer call without waiting for ring
B/B0	CCITT V.22 mode (Note 3)
B1	Bell 103 and 212A mode*
C/C0	Transmit carrier off
C1	Carrier on*
E/E0	Characters not echoed
E1	Characters echoed*
F/F0	Half duplex
F1	Full duplex*
H/H0	On hook (hang up)
H1	Off hook, line and auxiliary relay
H2	Off hook, line relay only
I/I0	Request product ID code (130)
I1	Firmware revision number
I2	Test internal memory

COMMAND	DESCRIPTION (Notes 1 and 2)
OTHER COMMANDS	
L/L1	Low speaker volume
L2	Medium speaker volume*
L3	High speaker volume
M/M0	Speaker always off
M1	Speaker on until carrier detected*
M2	Speaker always on
O	Go to the on-line state
O1	Remote digital loopback off*
Q2	Remote digital loopback request
Q/Q0	Result codes displayed*
Q1	Result codes not displayed
Sr?	Requests current value of register r
Sr=n	Sets register r to value of n
V/V0	Digit result codes
V1	Word result codes*
X/X0	Compatible with Hayes-type 300 modems*
X1	Result code CONNECT 1200 enabled
X2	Enables dial tone detection
X3	Enables busy signal detection
X4	Enables dial tone and busy signal detection
Y/Y0	Long space disconnect disabled*
Y1	Long space disconnect enabled
Z	Software reset: restores all default settings

Notes: 1. Default modes are indicated by *

2. Commands entered with null parameters assume 0 - X is the same as X0.

3. The Turbo's modem has CCITT V.21 as well as V.22 modes. When the ATB command is used, in the answer mode, the modem will automatically invoke either the V.21 mode or the V.22 mode, depending on the response from the remote modem. In the originate mode, the modem will sense if the baud rate is set at 300 or 1200 bits per second and will adjust itself accordingly.

RESULT CODES

DIGIT CODE	WORD CODE	DESCRIPTION
0	OK	Command executed
1	CONNECT	Connected at 300 or 1200 bps
		Connected at 300 bps, if result of X1, X2, X3 or X4 command
2	RING	Ringing signal detected (Note 1)
3	NO CARRIER	Carrier signal not detected or lost
4	ERROR	Illegal command
		Error in command line
		Command line exceeds buffer (40 characters, including punctuation)
		Invalid character format at 1200 bps.
5	CONNECT 1200	Connected at 1200 bps. Results from X1, X2, X3 or X4 commands only
6	NO DIALTONE	Dial tone not detected and subsequent commands not processed. Results from X2 or X4 commands only.
7	BUSY	Busy signal detected and subsequent commands not processed. Results from X3 or X4 commands only.
8	NO ANSWER	Silence not detected and subsequent commands not processed. Results from @ command only.

Note 1. When the modem detects a ringing on the telephone line, it sends a RING result code. However, the modem will answer the call only if it is in auto-answer mode or is given an A command.

APPENDIX D
IN EVENT OF DIFFICULTY

GENERAL RULES

1. Read the relevant sections of this user's manual carefully.
2. Be sure all the peripherals are properly installed.
   Consult the respective operation manuals of the peripherals if necessary.
3. Refer to the trouble-shooting chart below if you still have problems.
4. If the problem persists, consult your dealer and have your system checked.

TROUBLE-SHOOTING CHART

PROBLEM	CAUSE(S)	SOLUTION(S)
No power	▪ Power Switch is OFF ▪ No power supply ▪ Improper installation	▪ Turn on Power Switch ▪ Use an electrical appliance to make sure power outlet is working ▪ Check installation
Blank screen	▪ No power ▪ Screen control needs adjustment	▪ Turn on power ▪ Adjust Contrast Knob
Continuous beeping	▪ Improper keyboard connection ▪ Key is depressed by some objects	▪ Connect keyboard properly ▪ Remove any object resting on the key
Keyboard error	▪ Improper keyboard connection	▪ Connect keyboard properly
Disk error	▪ Unformatted disk ▪ Write-protected disk ▪ Scratched disk	▪ Format disk ▪ Remove write-protection tab ▪ Change disk
Device-checking error	▪ Improper installation ▪ Self test fails	▪ Check installation ▪ Cold-boot computer and reset devices

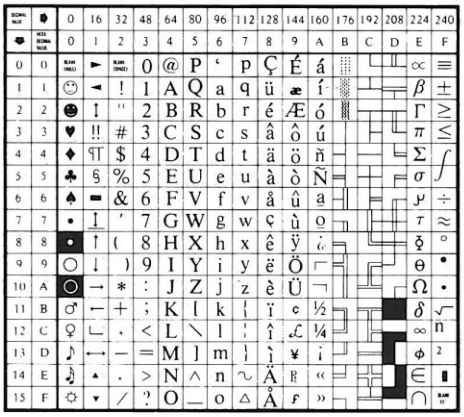
APPENDIX E
GW-BASIC INTERPRETER 3.2 LIMITATIONS

Your computer does not support the following GW-BASIC commands:

- MOTOR
- CLS with parameter
- Any commands concerning light pen
- Any commands using function keys F11 and F12

APPENDIX F
CHARACTER SET

CHARACTER SET QUICK REFERENCE SHEET



APPENDIX G
SYSTEM MEMORY MAP

ADDRESS (HEX)	USAGE
00000 - 9FFFF	640K, system RAM
A0000 - B7FFF	Reserved
B8000 - BBFFF	16K, color/graphic memory
BC000 - C7FFF	Reserved
C8000 - C9FFF	8K, fixed disk control
CA000 - CFFFF	Reserved
D0000 - DFFFF	64K, expanded memory frame
E0000 - FDFFF	Reserved
FE000 - FFFFF	8K, BIOS ROM

APPENDIX H
I/O ADDRESS MAP

ADDRESS (HEX)	USAGE
000 - 00F	DMA controller 8237
020 - 021	Interrupt controller 8259
040 - 043	Timer 8253
060 - 063	PPI 8255
080 - 083	DMA page register
0Ax	NMI mask register
268 - 269	Expanded memory page mapping register
2F8 - 2FF	Asynchronous communication (secondary)
320 - 32F	Fixed disk
340 - 34F	Configuration registers
350 - 35F	Real-time clock
378 - 37F	Printer
3D0 - 3DF	Color/graphic
3F0 - 3F7	Floppy diskette
3F8 - 3FF	Asynchronous communication (primary)

APPENDIX I
8088 INTERRUPT LISTING

SOFTWARE INTERRUPT VECTOR LISTING

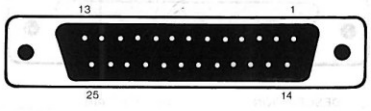
ADDRESS (HEX)	INTERRUPT NUMBER	NAME	BIOS ENTRY
0 - 3	0	Divide by Zero	D11
4 - 7	1	Single Step	D11
8 - B	2	Nonmaskable	NMI_INT
C - F	3	Breakpoint	D11
10 - 13	4	Overflow	D11
14 - 17	5	Print Screen	PRINT SCREEN
18 - 1B	6	Reserved	D11
1D - 1F	7	Reserved	D11
20 - 23	8	Time of Day	TIMER_INT
24 - 27	9	Keyboard	KB_INT
28 - 2B	A	Real-Time Clock	D11
2C - 2F	B	Communications	D11
30 - 33	C	Communications	D11
34 - 37	D	Fixed Disk	D11
38 - 3B	E	Diskette	DISK_INT
3C - 3F	F	Printer	D11
40 - 43	10	Video	VIDEO_IO
44 - 47	11	Equipment Check	EQUIPMENT
48 - 4B	12	Memory	MEMORY_SIZE_DETERMINE
4C - 4F	13	Diskette/Disk	DISKETTE_IO
50 - 53	14	Communications	RS232_IO
54 - 57	15	Cassette	CASSETTE_IO
58 - 5B	16	Keyboard	KEYBOARD_IO
5C - 5F	17	Printer	PRINTER_IO
60 - 63	18	Reserved	
64 - 67	19	Bootstrap	BOOT_STRAP
68 - 6B	1A	Time of Day	TIME_OF_DAY
6C - 6F	1B	Keyboard Break	DUMMY_RETURN
70 - 73	1C	Timer Tick	DUMMY_RETURN
74 - 77	1D	Video Initialization	VIDEO_PARMS
78 - 7B	1E	Diskette Parameters	DISK_BASE
7C - 7F	1F	Video Graphics Chars	0

HARDWARE INTERRUPT PRIORITY LISTING

INTERRUPT	DEVICE
NMI	Parity
0	Timer
1	Keyboard
2	Real-Time Clock
3	Secondary Asynchronous Communication (COM2)
4	Primary Asynchronous Communication (COM1)
5	Fixed Disk
6	Disk
7	Parallel Printer

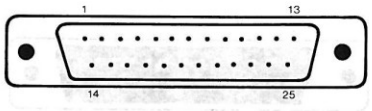
APPENDIX J
I/O PORT PINOUTS

CENTRONICS PARALLEL PRINTER PORT



	SIGNAL NAME	ADAPTER PIN NUMBER	
Printer	-Strobe	1	Centronics Parallel Printer Port
	+Data Bit 0	2	
	+Data Bit 1	3	
	+Data Bit 2	4	
	+Data Bit 3	5	
	+Data Bit 4	6	
	+Data Bit 5	7	
	+Data Bit 6	8	
	+Data Bit 7	9	
	-Acknowledge	10	
	+Busy	11	
	+P.End (out of paper)	12	
	+Select	13	
	-Auto Feed	14	
	-Error	15	
	-Initialize Printer	16	
	-Select Input	17	
	Ground	18-25	

RS232 SERIAL COMMUNICATION PORT



DESCRIPTION	PIN
NC	1
Transmitted Data	2
Received Data	3
Request to Send	4
Clear to Send	5
Data Set Ready	6
Signal Ground	7
Received Line Signal Detector	8
NC	9
NC	10
NC	11
NC	12
NC	13
NC	14
NC	15
NC	16
NC	17
NC	18
NC	19
Data Terminal Ready	20
NC	21
Ring Indicator	22
NC	23
NC	24
NC	25

Serial Device

RS232 Serial Communication Port

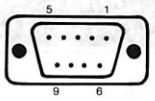
EXTERNAL DISK DRIVE PORT

DESCRIPTION	PIN
+12V	1
+5V	2
+5V	3
Index	4
Drive Select 1	5
Direction	6
Step	7
Write Data	8
Write Gate	9
Track 00	10
Write Protect	11
Read Data	12
Side Select	13
+12V	14
+12V	15
+5V	16
Drive Select 0	17
Motor On	18
Ready	19
Ground	20
Ground	21
Ground	22
Ground	23
Ground	24
Ground	25

External Disk Drive

External Disk Drive Port

RGBI PORT



AT STANDARD TTL LEVELS

IBM Color Display or other Direct-Drive Monitor	Ground	1
	Ground	2
	Red	3
	Green	4
	Blue	5
	Intensity	6
	Reserved	7
	Horizontal Drive	8
	Vertical Drive	9
Color/Graphics Direct-Drive Adapter		

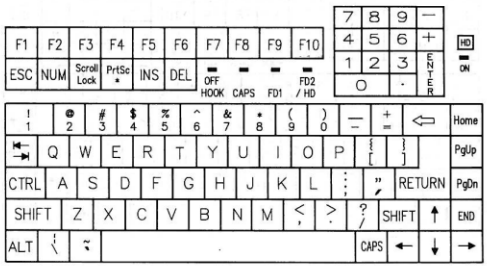
COMPOSITE PORT

COMPOSITE VIDEO SIGNAL OF APPROXIMATELY 1.5 VOLTS

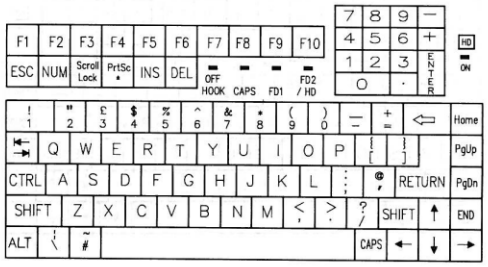
Video Monitor	Peak to Peak Amplitude	1
	Chassis Ground	2
Color/Graphics Composite Jack		

APPENDIX K
KEYBOARD LAYOUTS

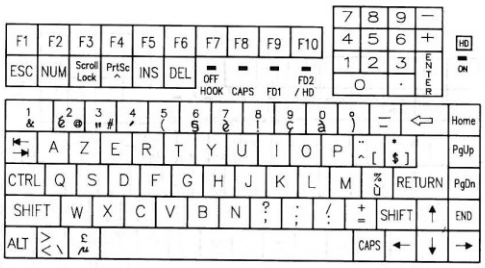
US KEYBOARD LAYOUT



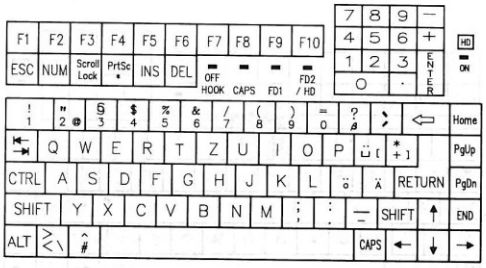
UK KEYBOARD LAYOUT



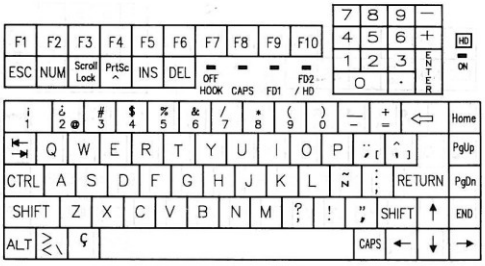
FRENCH KEYBOARD LAYOUT



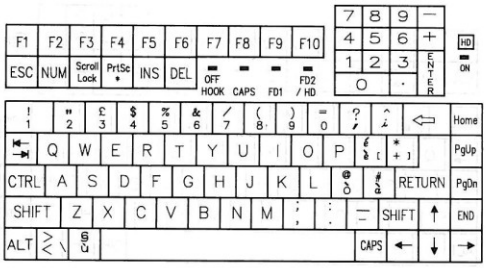
GERMAN KEYBOARD LAYOUT



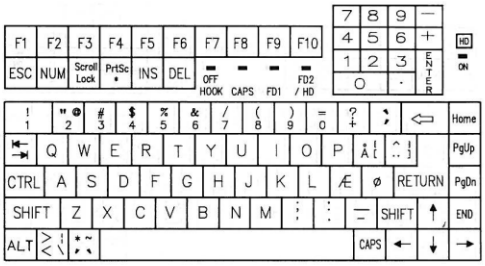
SPANISH KEYBOARD LAYOUT



ITALIAN KEYBOARD LAYOUT



DANISH KEYBOARD LAYOUT



SWEDISH KEYBOARD LAYOUT