USER'S GUIDE

Installation Guide &
VGA Utility Guide

COPYRIGHT NOTICES

FCC COMPLIANCE STATEMENT FOR AMERICAN USERS

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one or more of the following measures:

— Reorient or relocate the receiving antenna.

— Increase the separation between the equipment and receiver.

— Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

— Consult the dealer or an experienced radio/TV technician for help.

NOTE: Peripherals used in conjunction with this equipment must have SHIELDED interface cables only. A SHIELDED power cable must also be used to connect this equipment to 120VAC.
Use of non-shielded cables may result in interference to radio and TV reception, and may void the users right to operate the equipment.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

INTRODUCTION

This manual is an installation guide and general introduction to the operating devices and software package.
This guide is divided into six sections and seven appendices.

SECTION 1. INSTALLATION
This section describes how to unpack and set up the system with a monitor and keyboard. Read this section, then complete the instructions for installing your system.

SECTION 2. OPERATIONS
This section offers general operating instructions for the system. It includes a check list to be completed before initial power-on.

SECTION 3. THE SETUP PROGRAM
This section describes the procedures for setting the system configuration.

SECTION 4. UTILITY DISKETTE
This section describes the usage of the UTILITY program.

SECTION 5. RECONFIGURING THE SYSTEM
This section provides step-by-step procedures for opening the system unit, installing option boards, installing FDD, installing HDD, and installing math co-processor.

USER'S GUIDE

USER'S GUIDE

INSTALLATION GUIDE
& VGA GUIDE

TABLE OF CONTENTS

SECTION 1. INSTALLATION

This section describes how to unpack and install the basic system when it includes a monitor and a keyboard.

IMPORTANT

Complete the system check list in SECTION 2 before powering on the system.

1.0 SYSTEM OVERVIEW

This system is a self-contained, fully integrated desktop computer. It is designed to meet the growing needs of business for increased processing speeds and data storage while maintaining compatibility with the IBM standard. The system is compatible with the IBM AT and runs IBM PC and AT software. It is expandable, with option slots that can fulfill your business needs for many years without becoming obsolete.

The fully configured system contains the following standard equipment.

- System unit — the system chassis houses the main board, bus board, power supply, back-up battery, and the system options.
- System Options — these include the hard disk, high density floppy disk drive, and double density floppy disk drive.

- Main board — the main board contains the 80386SX microprocessor, 1 serial port, 1 parallel port, 1 PS/2 compatible mouse port, adapter logic for Embedded Hard Disk Drive, Floppy Disk controller, VGA, ROM BIOS (Read Only Memory Basic Input Output System) and RAM memory expandable up to 8 Megabytes.
- Bus board — the bus board has 3 expansion slots: slots have two connectors for PC-AT-compatible cards.

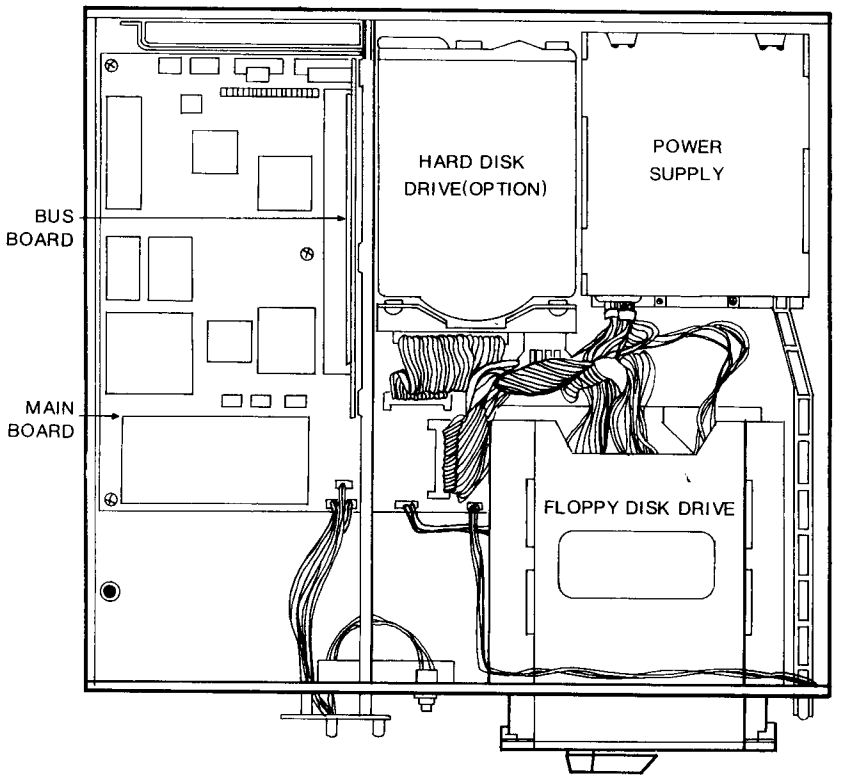


Figure 1-1. A system unit with all options present.

PHYSICAL MEASUREMENTS

SYSTEM UNIT		
	U.S.	**International**
Dimensions		
Height	3.86 inch	98 mm
Depth	15.47 inch	393 mm
Width	15.55 inch	395 mm
Weight (net)		
1 FDD	17.2 lb	7.8 kg
2 FDD	19.8 lb	9 kg
1 FDD, 1 HDD	19.4 lb	8.8 kg
2 FDD, 1 HDD	22 lb	10 kg
Power Supply		
Operating Voltage	115V, 60Hz	230V, 50Hz
Peak Power	118W	118W
Steady-State Power	100W	100W
Fuse (slow blow)	3A	3A
Temperature Range		
Operating	50° to 89.6°F	10° to 32°C
Nonoperating	50° to 113°F	10° to 45°C
Relative Humidity (Noncondensing)		
Operating	20% to 80%	20% to 80%
Nonoperating	5% to 90%	5% to 90%

1.1 SYSTEM UNIT

1. Place the system unit on a level surface, preferably the table or workstation where it is to be used.
2. If the disk drive lever is not already open, gently rotate it counter-clockwise to the open position.

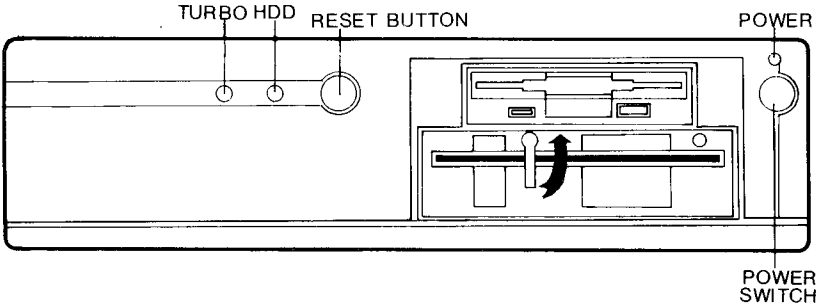


Figure 1-2. Rotating the disk drive lever to the open position.

3. Remove the shipping insert from each disk drive. Save them for later use in shipping or moving the unit.

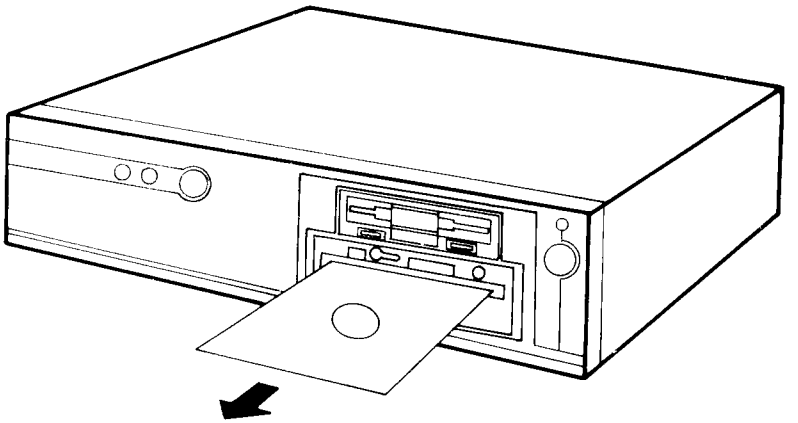


Figure 1-3. Removing the cardboard insert.

4. Position the system unit to make the rear connectors accessible.

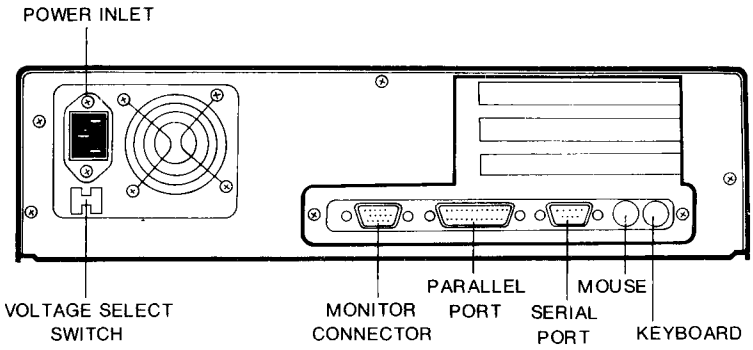


Figure 1-4. Rear view of system and rear connectors.

5. Before turning your system on, check the 115V-230V selector switch to make sure it is set for the proper voltage in your country.

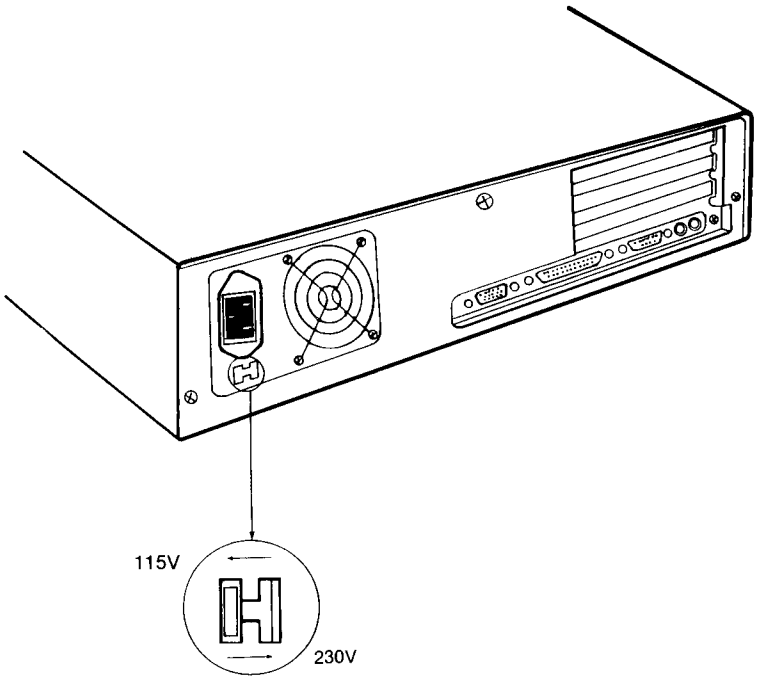


Figure 1-5. Checking the 115V-230V selector switch.

IMPORTANT

If the selector switch is set to the wrong position, slide the switch to the proper setting before turning on your system.

6. Insert the 3-prong power cable into main power connector on the back of the system unit. Plug the other end into a grounded 3-prong outlet.

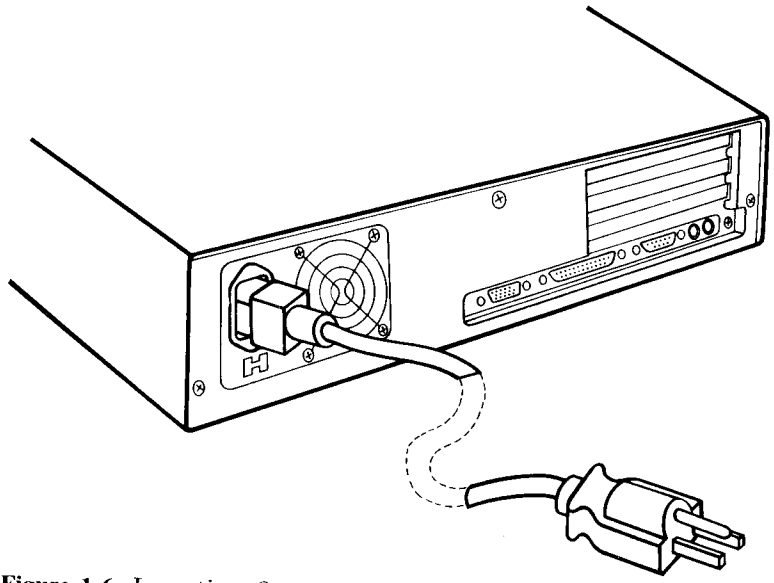


Figure 1-6. Inserting 3-prong plug into main power connector.

7. Make sure the ON/OFF switch on the system unit is in the OFF position. The power LED indicator lights when the system unit is receiving power.

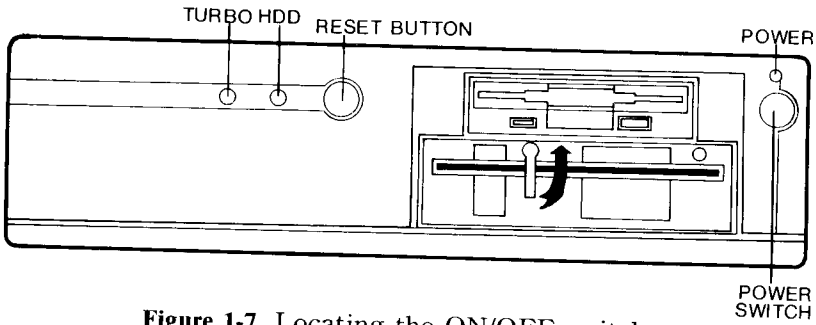


Figure 1-7. Locating the ON/OFF switch.

When you want to change AC input voltage, you must use the power cord suitable for that. For operating your system at 230 VAC, you should attach the 230 VAC power cable.

If you plan to operate your system in any European country you must use a 230V power cable. This cable is an electric line, 18 AWG cord, with 3 conductors and is shielded.

Connect the 230V power cable in the same way you would a 115V power cable.

1.2 ATTACHING A KEYBOARD

Your system's standard keyboard is an PS/2 style keyboard with connecting cable. The keyboard must have a connecting cable that terminates with a 6-pin miniature DIN plug.

1. Locate keyboard connector on the rear of the system unit and plug the keyboard's 6-pin miniature DIN plug into the keyboard connector.

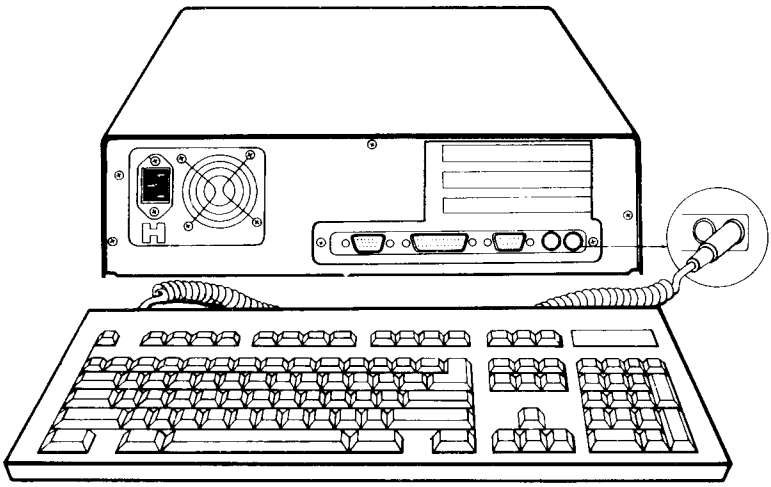


Figure 1-8. Rear view of connecting the 6-pin miniature DIN plug.

1.3 ATTACHING A MONITOR

The built-in VGA supports analog PS/2 fixed frequency monitors as well as compatible analog multi-frequency displays.

If you are using a multi-frequency monitor, you may need a special 15-pin PS/2 compatible adapter cable, and you will need to make sure that your multi-frequency monitor is configured properly for a PS/2 compatible analog VGA signal. Some multi-frequency displays have a switch to select "TTL" or "analog" operation; set this switch for "analog" Check with your display equipment dealer or display manufacturer for additional information on configuring your monitor.

Attaching the monitor involves the following steps:

1. Check your monitor type to make sure it is the proper type for your built-in VGA. Refer to APPENDIX A for more information on your built-in VGA.
2. If the monitor has its own ON/OFF switch, place it in the OFF position.
3. Locate the 15-pin D-shell display connector on the rear of the system unit.

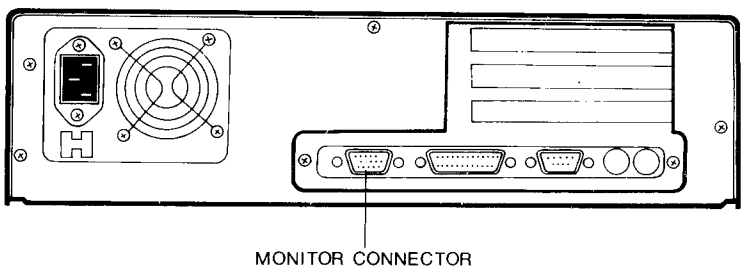


Figure 1-9. Locating the monitor connector on the rear of the system unit.

4. Place the monitor on top of the system and plug the monitor cable into the monitor and into the display connector on the rear of the system unit. (identified in Figure 1-9).

5. Plug the monitor's power cable into the properly grounded 3-prong wall outlet.

1.4 COMPLETING INSTALLATION

You are new finished connecting the basic system. Continue with Section 2, Operations.

CAUTION: Do not attempt to power-on the system without completing the check list in Section 2.1.1.

SECTION 2.
OPERATIONS

2.0 OVERVIEW

Your computer system is a durable piece of equipment, but any equipment lasts longer when you provide proper protection for it. Avoid exposing your system to undue dirt, pollutants, and electrical shock. Dust-free environments are extremely rare, but don't install your system where dust is a constant problem. Cover the keyboard when not in use.

2.1 SYSTEM POWER-ON

Before running any program on your computer you must power-on your system. Section 2.1.1 provides a checklist for preparing your system for power-on. Section 2.1.2 describes the self-test performed each time power is turned on or the system is reset.
Appendix D describes the ways of resetting the system without turning power on and off.

2.1.1 Power-on Checklist

Use the following checklists to turn power on for the first time. This checklist is also useful for trouble-shooting if you turn power on and the system does not respond as expected.

1. Check the 115V-230V selector switch to make sure it's set for the proper voltage for your country. If set in the wrong position, you may damage your equipment.

NOTE: If it is necessary to change the voltage setting, slide switch into proper setting before turning on your system.

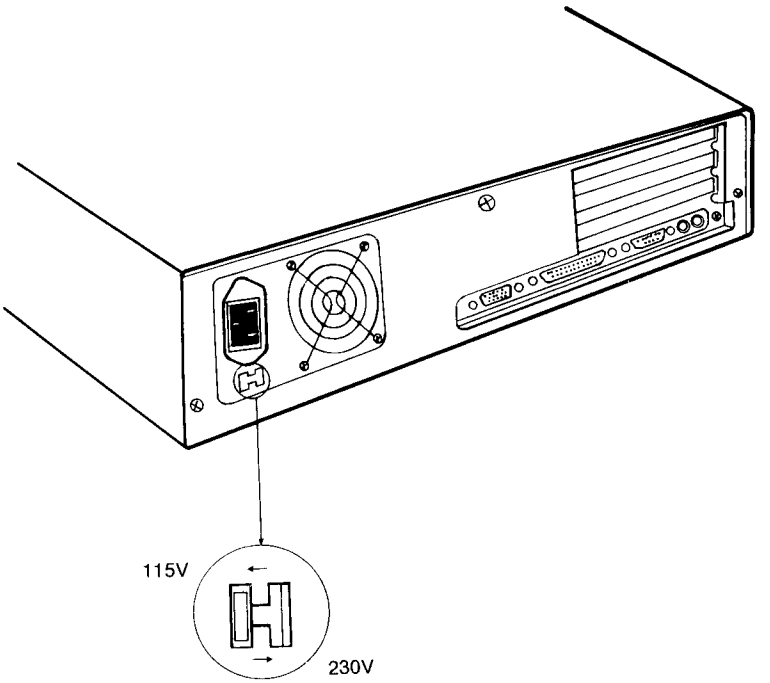


Figure 2-1. Rear view locating the 115V-230V voltage switch.

2. For future reference, write down information concerning any internal options you have installed, such as memory expansion, hard disk storage size, monochrome or color controllers, etc.
3. Make sure all external devices are securely attached, including the keyboard and monitor.
4. Plug the power cord into a grounded AC power outlet.
5. Locate the ON/OFF switch for the system unit and turn it ON. If necessary, also locate the power switch for your monitor or console terminal and turn it ON.

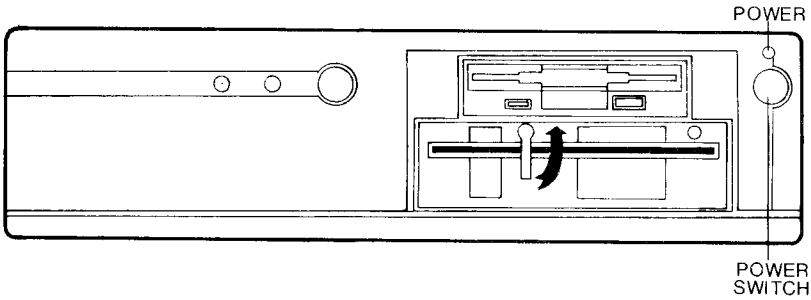


Figure 2-2. Locating the system ON/OFF switch.

2.1.2 Power-On Self-Test

IMPORTANT

If the display screen remains blank after powering on the system, review all steps in the checklist in Section 2.1.1. If this trouble continues, contact your Authorized Dealer.

Every time your system is turned ON with the ON/OFF switch it performs a self-test to determine that memory and related circuits are operating properly.
If the system detects an error during its self-test, a status or error message will be displayed. Then refer to Appendix C for the POST error message and follow the recommended action.
If a message, Invalid configuration information ..., is displayed, press <F2> to run SETUP program. Refer to section 3 for the information on the SETUP program.

SECTION 3.
THE SETUP PROGRAM

The SETUP program defines your equipment configuration to the system software. It must be run before you can operate your computer for the first time. It must also be run each time you change an internal or external option. SETUP lets your computer know what options are attached, how much memory has been installed, which display screen (color or monochrome) is the default, and so on.
The SETUP program is provided in the ROM BIOS (Read Only Memory Basic Input Output System). Once SETUP has been run, it need not be run again unless the system changes. The choices made using SETUP are stored in a small amount of battery-operated RAM on the main board.

NOTE: The sample messages and menus in this section are intended as a guide. The messages on your computer may be slightly different.

3.1 LOADING SETUP

When the present system configuration is different from the current setting saved in the CMOS during the Power On Self Test (POST), the following message will appear.

- Invalid configuration information
- Please run the SETUP program
- Strike the F2 key to run the SETUP utility
- Strike to F1 key to continue.

If you press the F2 key, this message will be displayed.

Errors have been found during the power on self test your computer. The errors were;

- Incorrect configuration data in CMOS
- Hit any key to continue:

- If you press any key, you can enter the SETUP program.
- If you press the F1 key, the system will try to continue, ignoring the invalid configuration.

But your system can not run properly.
Although the system is adjudicated normal by the POST, when the system is turned on or reset, the following message will be displayed for a few seconds.

Strike the F2 key to run the SETUP utility.

If you press the F2 key within this time, you can enter the SETUP program.
When you enter the SETUP program, the System Configuration Setup screen will appear.
The following sample SETUP screen shows the basic SETUP options.

```
Phoenix Technologies Ltd.
System Configuration Setup V4.02

Time: 15:25:49
Date: Mon Jun 05, 1989

Diskette A:          3.5 Inch, 1.44MB
Diskette B:          5.25 Inch, 1.2MB    Cyl  Hd  Pre  Lz   Sec  Size
Hard Disk 1:         Type 17             977  5   300  977  17   40
Hard Disk 2:         Not Installed
Base Memory:         640 KB
Extended Memory:     1024 KB
Display:             VGA/EGA
Cpu Speed:           Fast

EMS Control:         Disable
BIOS Shadow Area:    System & Video
Memory Relocation:   Disable

Coprocessor:         Not Installed

Up and Down Arrow to select entries.
Left and Right Arrow to change entries.
F1 for help. Esc to reboot.
```

3.2 USING THE SYSTEM CONFIGURATION SETUP MENU

At the bottom of the System Configuration SETUP screen, you will find directions for using specific keys to configure the menu options.
The following table explains the purpose of these keys.

Keys	Description
Up and Down Arrow to select entries	Use the Up and Down arrow keys on your numeric keypad to move from one field to another (for example, from Diskette A: to Diskette B:). The value in a field when you leave it will be used by SETUP to configure the appropriate feature or subsystem.
Left and Right Arrow to change entries	Use the left and right arrows on your numeric keypad to change a setting. If you change the entry to a value you don't want, use the opposite arrow key to change it back to the correct value.
F1 to get help on current entry	F1 displays an explanatory message for each field, if it is enable and recognized by SETUP.
Esc to reboot the system	Reboots the system, causing all of the changes you made to your system configuration to take effect immediately.

3.3 STEPS FOR SETUP

STEP 1 — Set the Time and Date
SETUP begins by highlighting the Hour field of the TIME line. Use the right arrow key to advance the Hour setting or the left arrow key to move the setting backwards.

Press the down arrow key to save the Hour setting and highlight the Minute field. Set the Minute and Second fields in the same manner. Press the down arrow key to advance to the Date line.

The Month field will be highlighted when you first enter the Date line. Select the correct month, date, and year using the left and right arrow keys. The Day cannot be highlighted but is set automatically when you set the date.

Once the time and date are set, press the down arrow key to save your settings and advance to the Diskette A line.

NOTE: The time and date will be maintained and updated by the Real Time clock in your system, even when your machine is off.

STEP 2 — Configure Diskettes
The Diskette A line will be highlighted.

There are five diskette options:

- 5.25 inch, 1.2MB,
- 5.25 inch, 360K,
- 3.5 inch, 1.44MB,
- 3.5 inch, 720K, and
- Not installed.

Use the left and right arrow keys to scroll through the selections available to your system. If you are configuring a non-standard drive, such as a 160K, 180K, or 320K drive, select the 5.25 inch, 360K option.

If you configure Diskette A as Not installed and the BIOS and SETUP are configured to suppress diskette error messages, the BIOS will not display an error message if it finds drive A: missing. If you select Not installed but there is a diskette drive in slot A, it will operate properly. Pressing the down arrow key will highlight the Diskette B line and save the Diskette A setting. Repeat the process yo used to configure drive A in configuring Diskette B.
If your system does not have a second diskette drive, configure the Diskette B line as Not installed.

NOTE: Be sure to properly specify drive types when configuring your system. It is possible to not configure your drives properly. Configuring the drives improperly may cause their operation to fail.

STEP 3 — Configure Hard Disk Drives
Press the down arrow key to highlight the Hard Disk 1 line. The correct Hard disk type may already appear.

Selecting the Correct Hard Disk Type
If the correct Hard disk type is not displayed, you will need to know the following specifications for your disk drive in order to configure it:

- Number of cylinders,
- Number of heads,
- Write precompensation,
- Landing zone, and
- Number of sectors

The following is a partial list of potential sources for the specificatios above.

- Check the manufacturer's report that was shipped with hard drive.
- Read the information printed on the disk drive label,
- Read the documentation provided with the drive, or
- If none of the above is available, call the manufacturer of your computer or Hard disk drive.

2. Configure the drive by selecting the correct process below.

If...	Then...
The correct Hard disk type is shown on your screen	Press the down arrow key to save this value and move to the next line.
Your Hard disk drive type is not shown on the SETUP screen	(A) Press the F1 key twice to access the SETUP Hard disk help screens. (See next page for information about using disk help screens) (B) Find the Hard disk drive type that matches your hard disk specifications. (C) Return to the SETUP menu by pressing any key. This will enable you to specify and confirm your drive type. (D) Move the left or right arrow key on the SETUP main menu screen to select the correct drive type and press the down arrow key to move to the next line.
None of the drive types on the hard disk help screens match your disk drive specifications	Make sure you have the proper drive specifications and enter configuration information in hard drive type 48 (and in drive type 49, if you have two drives) through the SETUP menu screen.

HARD DISK DRIVE TYPES

Type	Drive	Cylinder	Heads	Write Precomp	Landing Zone	Sectors
1	IBM 5.25" 10MB	306	4	128	305	17
2	IBM 5.25" 20MB Seagate ST-225 CDC Wren II 9415-5-25 Miniscribe 8438F	615	4	300	615	17
3	IBM 5.25" 30MB	615	6	300	615	17
4	IBM 5.25" 62MB	940	8	512	940	17
5	IBM 5.25" 46MB	940	6	512	940	17
6	IBM 5.25" 20MB Miniscribe MS 8425 Seagate ST 4026 Tandon TM 262 Tandon TM 702AT	615	4	1	615	17

Type	Drive	Cylinder	Heads	Write Precomp	Landing Zone	Sectors
7	IBM 5.25" 30MB	462	8	256	511	17
8	IBM 5.25" 30MB	733	5	-1	733	17
	Seagate ST-4038					
	CDC Wren II 9415-38					
	Tandon TM 703AT					
9	IBM 5.25" 112MB	900	15	-1	901	17
10	IBM 5.25" 20MB	820	3	-1	820	17
11	IBM 5.25" 35MB	855	5	-1	855	17
12	IBM 5.25" 49MB	855	7	-1	855	17
13	IBM 5.25" 20MB	306	8	128	319	17
14	IBM 5.25" 42MB	733	7	-1	733	17
15	DRIVE TABLE ENTRY					
	NOT USED					
16	IBM 5.25" 20MB	612	4	0	663	17
17	IBM 5.25" 40MB	977	5	300	977	17
	IDE TYPE 3.5" 40MB					
18	IBM 5.25" 56MB	977	7	-1	977	17
19	IBM 5.25" 59MB	1024	7	512	1023	17
20	IBM 5.25" 30MB	733	5	300	732	17
21	IBM 5.25" 42MB	733	7	300	732	17
22	IBM 5.25" 30MB	733	5	0	733	17
23	IBM 5.25" 10MB	306	4		336	17
24	DRIVE TABLE ENTRY					
	NOT USED			0		
25	(205M CONNER)	683	16	0	683	38
26	(33M micropolis)	1024	4	-1	1023	17
27	(42M micropolis)	1024	5	-1	1023	17
28	(67M micropolis) (45)	1024	8	256	1023	17
29	(33M quantum)	512	8	615	512	17
30	SQ312RD	615	2	0	615	17
31	CDC Wren II HH	989	5	0	989	17
32	Available	1020	1	-1	1024	17
33	Conner CP-3204*	1366	8	0	1366	38
34	Conner CP-3104	776	8	0	776	33
35	ST4096	1024	9	1024	1024	17
36	Miscrosci HH 1050	1024	5	512	1024	17
37	Toshiba 70M	830	10	-1	830	17
38	Available	823	10	256	824	17
39	(20M NEC) (25)	615	4	128	664	17
40	NEC	615	8	128	664	17
41	NEC	917	15	-1	918	17
42	NEC	1023	15	-1	1024	17
43	NEC	823	10	512	823	17
44	Seagate 251	820	6	-1	820	17
45	(67M micropolis) (28)	1024	8	-1	1024	17
46	CDC	925	9	-1	925	17
47	Available	699	7	256	700	17
48	USER ENTRY					
49	USER ENTRY					

* DOS does not support more than 1024 cylinders. This drive drive type can only be used by software whid allows more than 1024 cylinders, Unix for example.

NOTE: If your system does not have another hard dirve, configure the line as Not installed.

Troubleshooting Hard Disk Drive Selection

The tables below provide information that can help if you have problems configuring the system's hard disk drive(s). The diversity of drives and controllers makes it impossible to predict when happens in every case, but the following conditions are generally true when configuring the system's drives.

Specification	If your drive's specification is greater than the one on the help screen	If your drive's specification is less than the one on the help screen...
Head	System will not operate.	System will not operate.
Sector	System will not operate.	System will not operate.
Cylinder	Hard disk error results.	Some loss of storage capacity but system should operate.
Landing Zone	Hard disk error results.	May lose data is machine is moved when head is parked.
Megabytes	No effect on operation.	No effect on operation.

Specification	If your value = 1 and does not match table...	If your value = 0 and does not match table...	If your value is > 0 and does not match table...
Write precomp ensation	System should work in all cases but read/write operations may be slowed somewhat.	Intermittent data errors may occur.	Data error may occur, depending on the specific controller and low much the numbers differ.

- The write precompensation operation compresses data so that iw will fit in the smaller section on the inner cylinders of the disk. When configured to −1, the disk controller compresses the writes for all sectors. A zero configuration means that no write precompensation take place. A value that is approximately half of the total number of cylinders per disk side indicates the cylinder where write precompensation begins.

STEP 4 — BASE Memory
The next line is the Base Memory line. Use the numeric keys on your keyboard to type in the correct amount of RAM installed on your system board.
You cannot use the left and right arrow keys at this line to find the base memory size. The correct value may already appear on the screen.

Type the conventional memory size (512K or 640K).
The maximum base memory configuration is usually 640K. You can select 512K when total memory size is 512K (0.5MB).
Press the down arrow key to advance to the Extended Memory line.

STEP 5 — Extended Memory
Enter the amount of memory above 1024K on the Extended Memory line.
You can add memory expansion cards at any time. However, you must run the SETUP utility again, change the Extended Memory line, then press Esc to reboot your system and store the data before the system can use the extra memory. System will generate error messages if you try adding to extended memory without using SETUP. For now, press the down arrow key to save your selection and continue configuring your system.

STEP 6 — Configure the Display
The Display line is highlighted next. Scrolling through the setting with the right and left arrow keys reveals the following settings:

- MONO (Monochrome display adapter),
- VGA/EGA (VGA or EGA color display adapter),
- CGA40 (40 column CGA display adapter),
- CGA80 (80 column CGA display adapter), or
- Not installed.

In most cases, the proper display will appear on your screen. If you select the Not installed feature, the BIOS will not report an error if it finds the display missing when the system boots. If you select Not installed and your system has a display, it will still operate properly. Press the down arrow key to save your selection and continue configuring your system.

STEP 7 — Set CPU Speed

The speed you specify in the CPU Speed line is the speed set every time you boot your computer.
Only two settings are available for the CPU Speed line:

- Fast, and
- Slow

Older software that runs under a copy protection scheme may require you to use a slower speed for proper operation.

STEP 8 — EMS Control

Your computer can have a maximum memory of 8MBytes on the main board. Basically, the amount of memory above 1MBytes is Extended Memory. But several specific application programs require Expanded Memory related to EMS (Expanded Memory Specification). You can change Extended memory into Expanded Memory.
Type the size of Expanded Memory if you need it. The size must have multiple of 64KBytes. Then, you must decrease Extended Memory size as much as Expanded Memory size. Repeat STEP 5 to do so.
Type 0 to disable EMS function.
Refer to APPENDIX F for more information on EMS.

STEP 9 — BIOS Shadow Area

The system's BIOS Shadow Features make it possible for the BIOS to copy video and BIOS ROM-based system software into RAM. This procedure is called shadowing. The BIOS transfers the contents of 16K ROM blocks into RAM. Copying system software from lower-speed ROM to high speed RAM improves system performance.
The BIOS Shadow Area line is highlighted next. Scrolling through the setting with the right and left arrow keys reveals the following settings:

- None
- System BIOS
- Video BIOS
- System & Video

This feature causes the BIOS ROM or video ROM to be copied into Shadow RAM.
Shadow video RAM is the area of conventional RAM between C0000h and C7FFFh.
Shadow BIOS RAM is the area of conventional RAM between F0000h and FFFFFh.

NOTE: Some video boards have the area of Memory mapped I/O between C0000h and C7FFFh. In this case, you must disable shadow video function.

STEP 10 — Memory Relocation
You can enable Memory Relocation function when total memory size is 1024K (1M), 2048K (2M) and the shadow function is disabled. In any other case, there is no meaning of this function. Enables or disables relocation of unused system memory between 640KB and 1024KB for use as extended memory. When memory relocation is enabled, the amount of relocation memory added to memory above 1MB, 2MB conventional memory makes extended memory size in System Configuration SETUP menu.
The table below provides the amount of relocation memory.

Base Memory	Total Memory	Shadow Function	Amount of Relocation Memory
640KB	1024KB (1MB)	DISABLE	384KB
640KB	2048KB (2MB)	DISABLE	384KB
ANY OTHER CASE			0KB

Coprocessor setting

You don't need to select the coprocessor setup option. It is automatically detected during your SETUP program. If you install a numeric coprocessor, the system will change the setting itself.

STEP 11 — Restart the System

Press the Esc key to reboot the system with the new configuration you specified.

NOTE: The changes you specified have been made in CMOS and will take effect when you reboot the system.

SECTION 4.
UTILITY DISKETTE

The utility diskette is included with your system. It contains two programs which are useful in operating this computer. This chapter describes the program functions on the utility diskette. Though you may need to run the utility programs only once, you should keep the utility diskette in a safe place and make a backup copy as soon as possible. The utility diskette includes the following programs.

HDFORM.EXE: Hard Disk Formatting Utility Program. This program prepares the hard disk for reading and writing.

HDPARK.EXE: Hard Disk Parking Utility Program. When you change the position of system, the hard disk surfaces may be damaged on account of head movement. To prevent this damage, this program shifts the head to the safe place with no data.

4.1 LOADING UTILITY DISKETTE

1. Insert the DOS diskette into drive A and rotate the disk drive lever clockwise to the closed position.
2. Turn the system power on.
3. When the current date displayed on your screen is not correct, enter the current date. When it is correct, press the <ENTER> key.
4. When the current time displayed on your screen is not correct, enter the current time. When it is correct, press the <ENTER> key.
5. You will find DOS prompt A> on your screen. Remove the DOS diskette:

4.2 HDFORM — HARD DISK FORMATTING

This Hard Disk FORMAT (HDFORM) program prepares the drive for use with various operating systems supported on this computer. It writes a set of addresses that enable the hard disk controller to locate areas on the hard disk for reading and writing data and programs.

Because the format information is written on the disk just like data, it can occasionally fail. However, reformatting always restores the disk to its original state: blank and ready to be partitioned using the FDISK program.

Formatting destroys all information on the drive, including programs, dasta and partitions. If your hard disk already contains useful data or programs, you must backup its contents before formatting it. Procedures for copying the data and programs on your hard disk into the floppy diskettes are described in the reference manual for your operating system.

Once started, formatting requires no input from the user. However, the HDFORM program must know certain physical details about the hard disk drive. These are called drive characteristics, bad track numbers, and interleave factor. Drive characteristics are automatically supplied to the FDISK program based on the drive type entered during SETUP. If you are installing or replacing a drive, you will need to know its characteristics in order to select the correct drive type using SETUP.

Drive characteristics are usually described in the manual that accompanies the drive. If these are not correct, select a different drive type from hard disk drive types table in Section 3.3 This must be done before you continue with formatting the hard disk drive.

Hard disk formatting procedure is as follows.
Loading HDFORM

NOTE: On a system with no hard disk drives HDFORM is not needed and may not be used.

1. Insert the Utility diskette into drive A and rotate the disk drive lever clockwise to the closed position.

2. Key in "HDFORM" after DOS prompt and press <Enter> key.

   A>HDFORM <Enter>

3. You will find the following message. Enter 1 for drive 1 or 2 for drive 2.
   HDFORM — A low level hard disk format and interleave optimizer.
   Version 2.12
   Copyright <C> 1986, 1987 Phoenix Technologies, Ltd.
   All rights reserved.

   Enter hard disk drive you wish to format (1 or 2):—

4. Observe the following hard disk drive characteristics. These are the values set during SETUP operation. Answer the question with <Y> (Yes) or <N> (No).

Drive	1
Drive type	17
Number of heads	5
Number of cylinders	977
Number of sectors	17

   Are these correct?—

   Key in <Y> to continue. A <N> response gets DOS prompt A> to appear.
   If so, you can change these values during SETUP operation.

5. The following messages will appear.

   Formatting MAY cause loss of data on drive 1.
   If you want to save your data you should back up your system.
   Do you want to continue?—

   Answer the question with <Y>

Update Bad Track Numbers

Some hard disks may have microscopic defective areas that can cause the loss of data. These defects, called bad tracks, can even "crash" the system if the computer tries to execute a program written to a defective area. Therefore, you should report these bad tracks to this program so that the system won't attempt to use these tracks.

Your hard disk may have a sticker attached which lists tracks identified as bad by the hard disk manufacturer. A separate sheet sometimes contains this information. If you do not have any record of known bad tracks, you may have to run the Hard Disk Exerciser program to find its bad tracks. Any repair center can do this, or you may ask your supplier for a copy.

The computer needs the cylinder and head numbers of the portion of the disk containing the bad tracks in order to skip over those parts, otherwise the computer will not be able to read or write on the hard disk.

CYLINDER No.:

A hard disk is a set of platters. Each platter has series of concentric circles, like the individual tracks of a phonograph record. The cylinder number identifies the track where the defects exist.

HEAD No.:

Each platter has its own read/write head. The head number identifies the head that accesses the portion of the hard disk containing a bad track.

If you are adding or replacing a hard disk, you must update the information on the bad tracks. This is done by the following procedure.

1. Now, choose one of the following options:

   Formatting MAY cause loss of data on drive 1.
   If you want to save your data you should backup your system.
   Do you want to continue? y

   Now choose one of the following options:

   1. All bad track numbers will be entered by the user.
   2. The format program will locate the previously entered bad tracks and the user will be given the opportunity to add additional bad track numbers.

   Choice:

2. For the first option, press <1>. Answer the ensuring question with <Y>. Following message will be appeared.

   Your hard disk may have a sticker attached which lists tracks which have been identified as bad by the hard disk drive manufacturer.
   If so, you should report these tracks to this program so that the system won't attempt to use these tracks.

   Do you wish to enter any information about bad tracks?—

3. Enter the cylinder and head numbers of the bad tracks.
   Key in the cylinder number and press <Enter>.
   Key in the head number and press <Enter> and ontinue this procedure until all the appropriate numbers have been programmed.

4. Press <Esc> when finished. Answer the following question with <Y> or <N>.

   Do yo wish to change any entries?—

   In case of <N>, see the next section.

Optimum Interleave Factor

The interleave factor allows your hard disk controller to interface effectively with the hard disk drive. The number entered for the interleave factor depends on the type of hard disk controller installed in your system. This program can calculate optimum interleave factor automatically. You had better use this value. Entering an incorrect interleave factor may cause the system to function more slowly. Many PC-compatible controllers use an interleave factor 1.

1. Answer the question wity <Y>.

   The timing for the optimum interleave factor takes place on a test cylinder on the specified drive. No DOS data is normally stored there.

   Do you want the optimum interleave factor calculated using the test cylinder?—

   A No response will use the default interleave factor.

2. The following message will be displayed.
   Calculating optimum interleave factor, please wait.
   Cylinder 614 head 0 is being used for interleave factor timing.

   Now, the computer will report the calculated optimum interleave factor automatically.

3. The following message will appear. Answer the question with <Y>, and enter the number of interleave factor. A <N> response will use the default interleave factor.
   The calculated optimum interleave factor is 2.
   If you choose to modify this value, system performance may be severely impacted.
   Do you wish to change the optimum interleave factor Y.
   Please enter new interleave factor: range 1-17—

Complete Formatting

1. The following message will appear. Answer the question with <N>.
   Do you want to format this disk using SAVEDATA option?

   If you choose this option, it is STRONGLY recommended that you have backed up your disk previously. If you do not choose this option, all data will be lost.

2. There will be a warning and beeps. Answer the question with <Y>, and formatting of the hard disk will start.
   THIS IS YOUR FINAL WARNING!
   Formatting WILL cause loss of data on drive 1
   If you want to save your data you should back up your system.
   Do you want to continue? Y
   Formatting cylinder 614 head 0—

3. When format is complete, the complete sign and DOS prompt will appear.

   Format complete
   A>

4.8 HDPARK-HARD DISK PARKING

If you move this system, the head of Hard disk drive may erase the contents. Therefore, when you want to move this system, use "HDPARK" for positioning the head of the Hard disk drive into a safe place, where there is no data.

Make sure that HDPARK.EXE is in current drive and directory, then enter "HDPARK", and you will find this message.
A>HDPARK <Enter>

WARNING: After the successful execution, the system will halt to ensure the fixed disk heads are correctly positioned.

proceed? <Y/N>—

At this time if you press <N>, the program is terminated and the DOS prompt will appear.

A>

If you press <Y>, the program is executed and the following message will appear.

Head Positioning ..... OK!
* * * System Halted * * *
Turn power off before moving.

When this message appears, you cannot interrupt the program. If you want to use the computer again, you must reset it.

4.4 SPDCHG — SPEED CHANGE

After you load a keyboard program, keyb.com, you can not use <Atrl> — <Clt> — <—> for speed change.
If you want to use the function, you must use this utility file.

Instructions:

1. Make sure that SPDCHG.COM is in current drive and directory, then enter "SPDCHG".

SECTION 5.
RECONFIGURING THE SYSTEM

5.0 OVERVIEW

Your system is expandable. Three slots are available for additional circuit boards (cards); three compartments are available to hold internally mounted peripherals.

Printed circuit cards can be installed in any of the three expansion slots on the bus board.

The right front portion of the system unit is reserved for the standard and optional peripherals. A mounting bracket provides three compartments which can be used for one half-height 5-1/4 inch peripheral, one half-height 3.5 inch peripheral and one 3.5 inch hard disk drive.

About SIO (Serial Input Output) Port

Your system's built-in SIO port is hardware and software compatible with most PC and AT equipment. The port has a 9-pin connector.

The built-in SIO port is configured as COM1: You can not reconfigure the address to COM2:.

If you have installed an option card which has SIO port, it must be configured as COM2:

If the option card SIO port is configured as COM1: your system's built-in SIO port is disabled automatically. Then you can not use the system's built-in SIO port.

About PIO (Parallel Input Output) Port

Your system's built-in PIO port is hardware and software compatible with most PC and AT equipment. The port has a 25-pin connecter like that found on many parallel printer adapter card.

The built-in PIO port is configured as LPT1:. You can not reconfigure the address to LPT2:

If you have installed an option card which has PIO port, it must be configured as LPT2:

If the option card PIO port is configured as LPT1: your system's built-in PIO port is disabled automatically. Then you can not use the system's built-in PIO port.

About IDE Interface Logic

Your system is designed for using special type hard disk drive which is so called IDE (Intergrated Device Electronics) or Embedded Drive.
Therefore your system has built-in IDE interface logic.

If you have installed an option card which has HDC (Hard Disk Controller), your system's built-in IDE interface logic is disabled automatically.
Then you can not use the system's built-in IDE interface logic.

About FDC (Floppy Disk Controller)

Your system's built-in FDC can support two floppy disk drives.

If you have installed an option card which has FDC and HDC (Hard Disk Controller) your system's built-in FDC and built-in IDE itnerface logic are disabled automatically.

If your option card has only FDC (without HDC) your system can not operate.

About Built-in VGA

Your system's built-in VGA can be enabled or disabled via switches on the main board. The switches are DIP (Dual In-line Pin) switches that can be easily set with a ball point pen.

Refer to the Appendix A for more information.

5.1 REMOVING AND REPLACING THE COVER

Removing the Cover

The system cover must be removed to install internal options.

1. Turn your system unit's power OFF.
2. Turn OFF all attached peripherals (monitor, printer, etc.).
3. Unplug the system's power cord from the wall outlet.
4. Using a screwdriver remove the three cover mounting screws on the rear of the system unit.

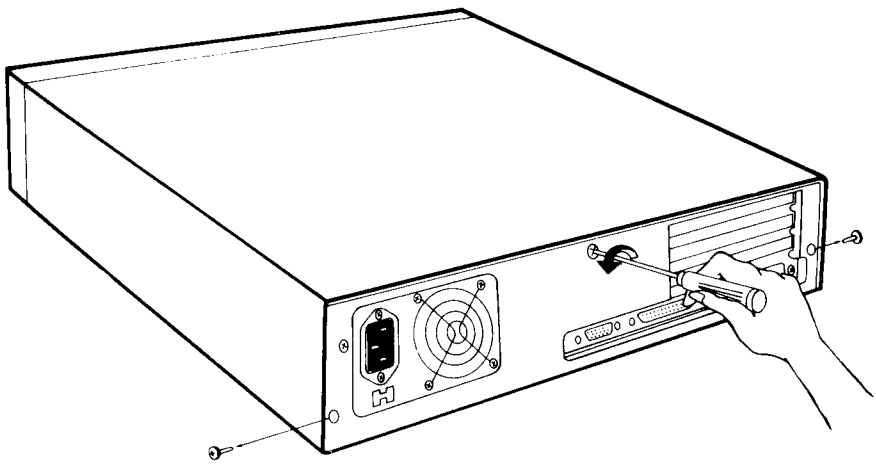


Figure 5-1. Rear view locating the cover mounting screws.

5. Pull the cover forward then lift the cover straight up, away from the system unit.

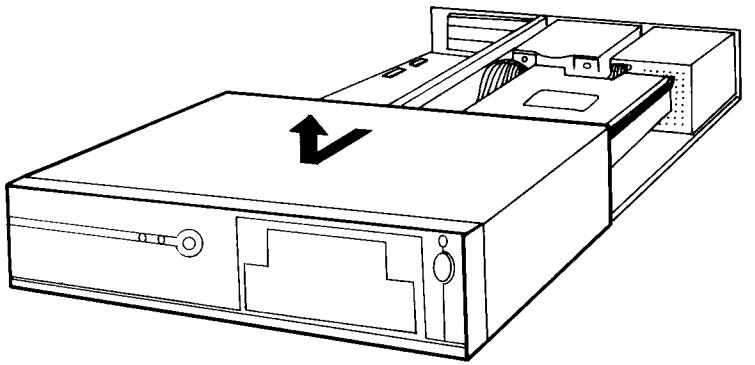


Figure 5-2. Removing the cover.

It is now possible to work inside the system.

Replacing the Cover

1. Place the cover on top of the system unit, then slide it back until it completely encloses the system unit.
2. Replace the three mounting screws.

5.2 CARD INSTALLATION

Options available for your system include the following cards.

Hard disk controller
Memory expansion
Video board, etc.

In addition to or in place of these options, you may add third-party and feature cards supplied by other manufacturers. It is technically feasible to install PC-compatible option cards in any of the system's three expansion slots.

5.2.1 Installing and Removing Cards

This section describes the procedure for inserting and removing cards from expansion slots. This procedure is used to add new option cards.

It is occasionally necessary to remove a card in order to install another option, or to rearrange the location of cards already installed. This section provides instructions which contain the additional steps needed to complete installation.

Inserting Option Cards

1. Use a screwdriver to remove the rear panel cover screw from the expansion slot.
   Save this screw to hold the option card in place.

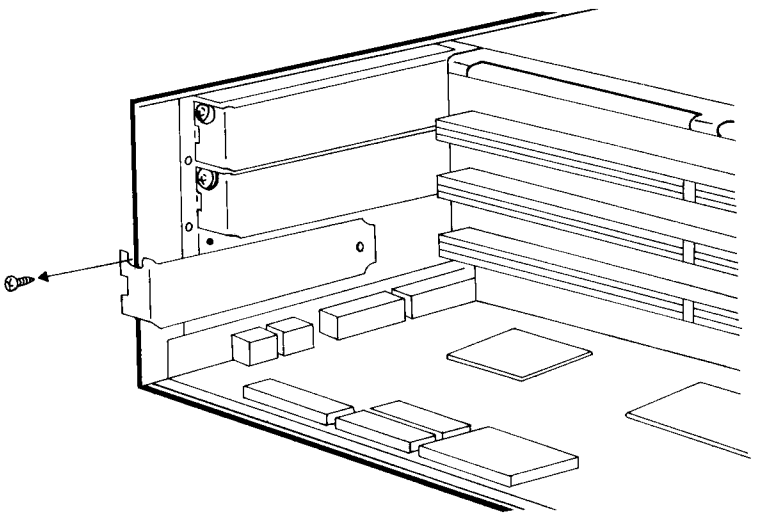


Figure 5-3. Removing the rear cover screw.

IMPORTANT

Next to dirt, static electricity is a computer's worst enemy. Always ground yourself by touching any unpainted metal surface on the system unit before handling electronic components.

2. After grounding yourself remove the option card from the antistatic wrapping. Hold the card by the edge only and avoid touching components and connectors.
3. Insert the option card, using the rear support brackets as a guide. Holding the card by its top edge or upper corners push it gently into the expansion slot.

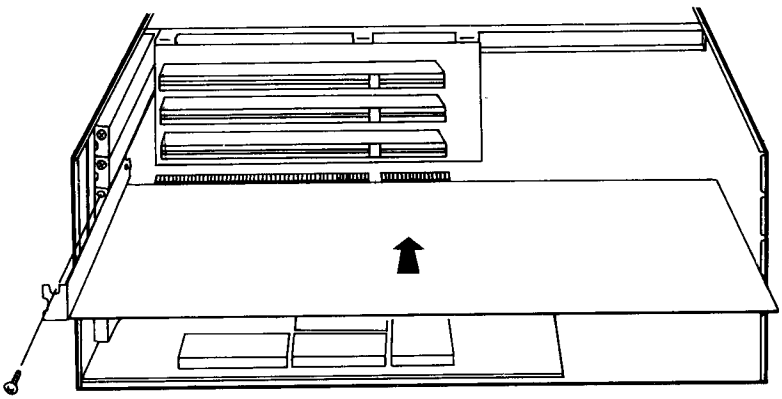


Figure 5-4. Side view of inserting the option card.

CAUTION: There are three slots in the Bus Board. In the lowest slot, do not install any option card which touches the memory module.

4. Replace the rear panel screw to secure the option card.

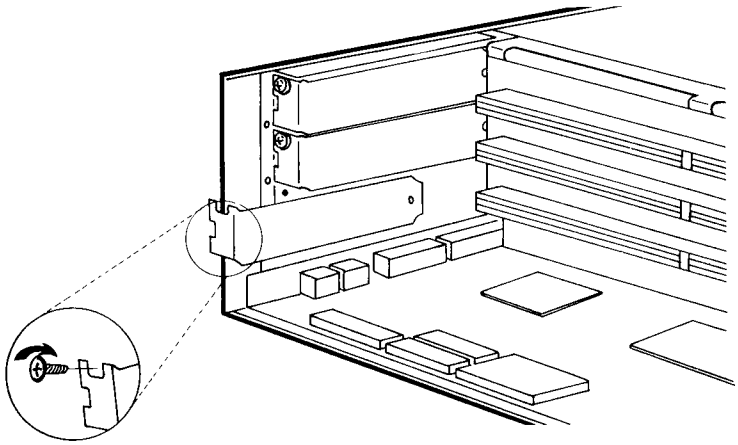


Figure 5-5. Replacing the rear panel screw.

Removing Option Cards

This section describes the procedure for removing most option cards.

1. Remove any cables attached to connectors extending through the slot on the rear panel of the system unit.
2. Remove any cables attached to the connectors on the card itself.
3. Loosen and remove the screw securing the card to the rear panel.

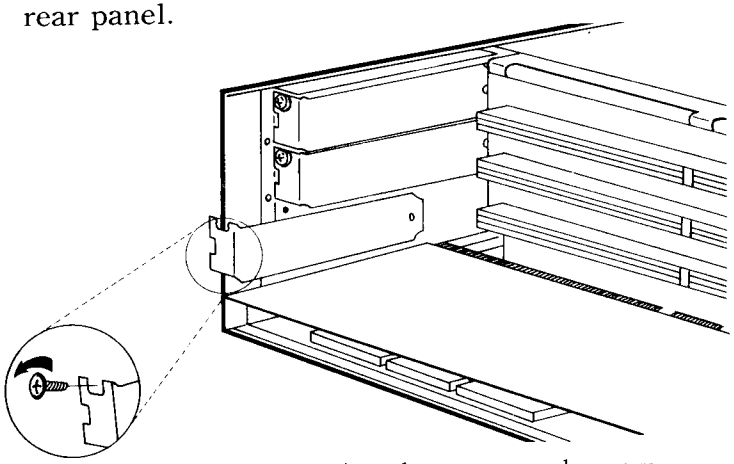


Figure 5-6. Removing the rear panel screw.

4. Gently slide the card out of the expansion slot.

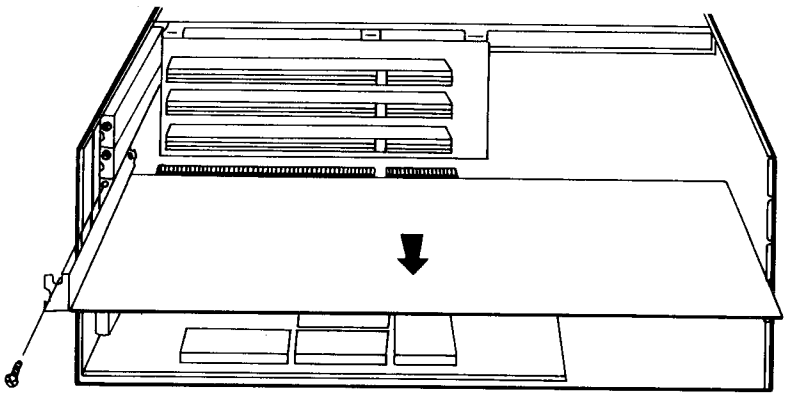


Figure 5-7. Removing a card

5. If no card will be installed in that slot, reinstall the rear panel cover.

5.3 HARD DISK DRIVE INSTALLATION

This system has originally a high density (1.2MB or 1.44MB) floppy disk drive. If you want to add a hard disk drive to this system, it can be installed. This system is designed for using special type hard disk drive which is so called IDE (Integrated Device Electronics) or Embedded Drive. You can also use general hard disk if you install any other HDC (Hard Disk Controller).

Installing a Embedded Hard Disk Drive

Using the following procedure, you can install a hard disk drive.

1. There is an empty compartment at the rear center of your computer's interior, which is designed to receive a hard disk drive.

Note that at the bottom of this compartment is a mounting bracket that is about "6×4" in size. This bracket is held in place by one screw. Remove the screw and then lift out the mounting bracket.

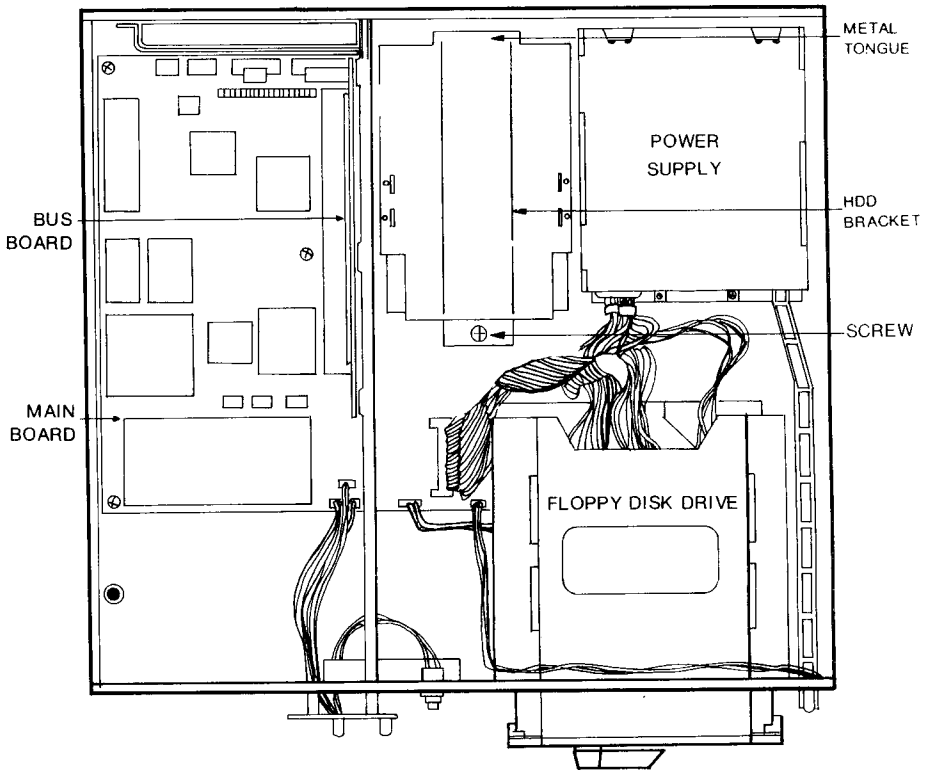


Figure 5-8. Locating the screw

2. With screws, attach the bracket to the bottom of the hard disk drive.

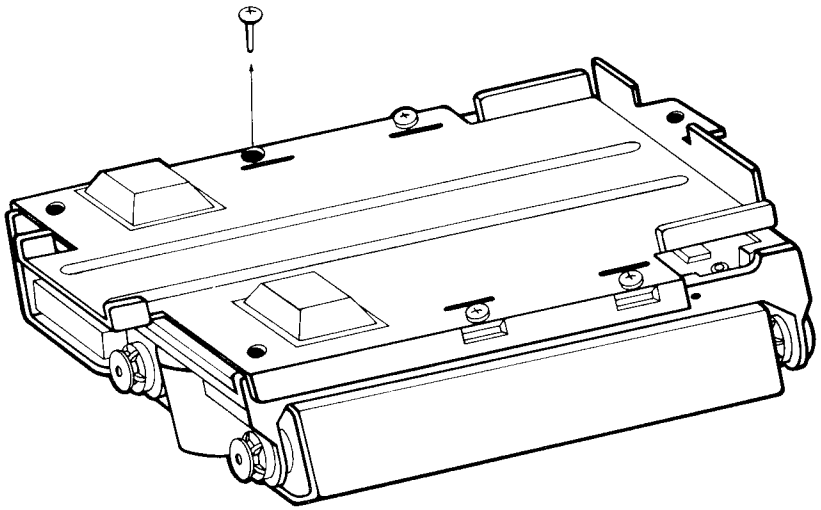


Figure 5-9. Attaching the bracket

3. Connect the 4-pin auxiliary power cable to the hard disk. Two corners of the connectors are cut diagonally to ensure correct insertion.
4. Lower the hard disk drive into its compartment and slide the protruding metal tongue on the rear of the bracket into the slot at the back of the HDD compartment.
5. Replace the screw to secure the HDD mounting bracket.
6. Connect the 40-pin interface cable to the hard disk. The red or blue line should be inserted where the connecter is marked "1" or "2".

IMPORTANT

After changing any disk drive option you must run SETUP. Instructions for running SETUP are provided in Section 3.

5.4 FLOPPY DISK DRIVE INSTALLATION

Your system supports two FDD and it has two compartments in the right portion.
If your system has only one FDD you can install another one. To install new FDD, you will need brackets, which will be supplied by manufacturer.

To install an additional floppy disk drive, use the following procedure:

1. Look at the sides of your new floppy drive. You will see that there are several holes that can receive mounting screws. Now look at the guide rail and the spring-type brackets which is supplied with your computer.
   You will note that they have mounting holes.
2. Using the provided screws, mount one guide rail and spring-type bracket on each side of your new floppy disk drive.

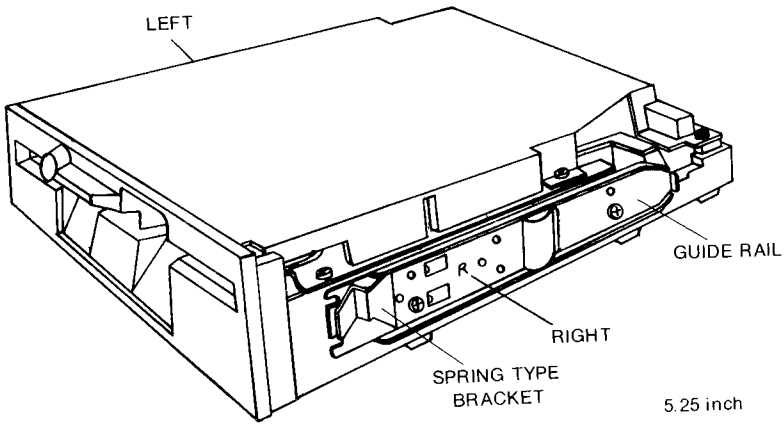


Figure 5-10. Guide Rail and Bracket mounted on side 5.25 inch FDD

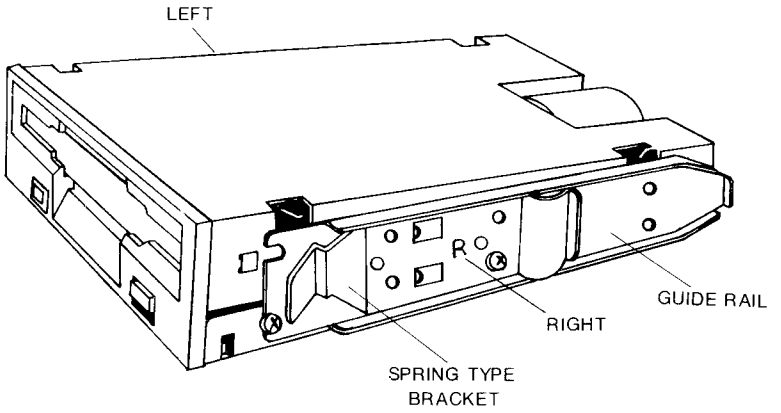


Figure 5-11. Guide Rail and Bracket mounted on side of 3.5 inch FDD

3. Remove the system cover as described in Section 5-1.
4. If a 3.5 inch FDD has already been installed in your computer and you want to install a 5.25 inch FDD as well, you will at this point need to remove the 3.5 inch FDD before installing the 5.25 inch FDD. First, disconnect the interface cable and the power cable from the rear of the 3.5 inch FDD.
   Next, pressing the spring-type brackets that are on both sides of the front of the 3.5 inch FDD,remove the FDD.
5. Now align the guide rails that you have mounted on your new FDD with the tracks for FDD.
6. Slide the floppy disk drive into its slot until the spring-type brackets snap into their locking position.
7. Connect the 4-pin auxiliary power cable to the Floppy disk drive. Two corners of the connectors are cut diagonally to ensure correct insertion.
8. Connect the 34-pin interface cable to the FDD.
   The red or blue line should be inserted where the connection is marked "1" or "2".

9. If you are installing a new 3.5 inch FDD in your computer, then you will now need to replace the 5.25 inch FDD that you just removed. Slide it into place the reconnect the power connector and the interface cable.

10. Replace the cover on your computer.

IMPORTANT

After changing any disk drive option you must run SETUP. Instructions for running SETUP are provided in Section 3.

5.5 MATH CO-PROCESSOR INSTALLATION

The central processor in your system is the advanced 80386SX. The optional 80387SX math co-processor is an integrated circuit (IC) that used with the 80386SX, speeds up the execution of arithmeticintensive applications.

The socket for your math co-processor is located on the main board.
The procedure for doing this is described in this section.

Installing the Math Co-processor

IMPORTANT

Next to dirt, static electricity is a computer's worst enemy. Always ground yourself by touching any unpainted metal surface before handing electronic component.

1. Remove the system cover as described in Section 5.1.
2. Remove the math co-processor from its packing.

IMPORTANT

The pins on a co-processor bend easily. They must be properly aligned before insertion into the socket or damage can result to both the co-processor and the system.

3. Locate the empty math co-processor socket U15 on the main board.

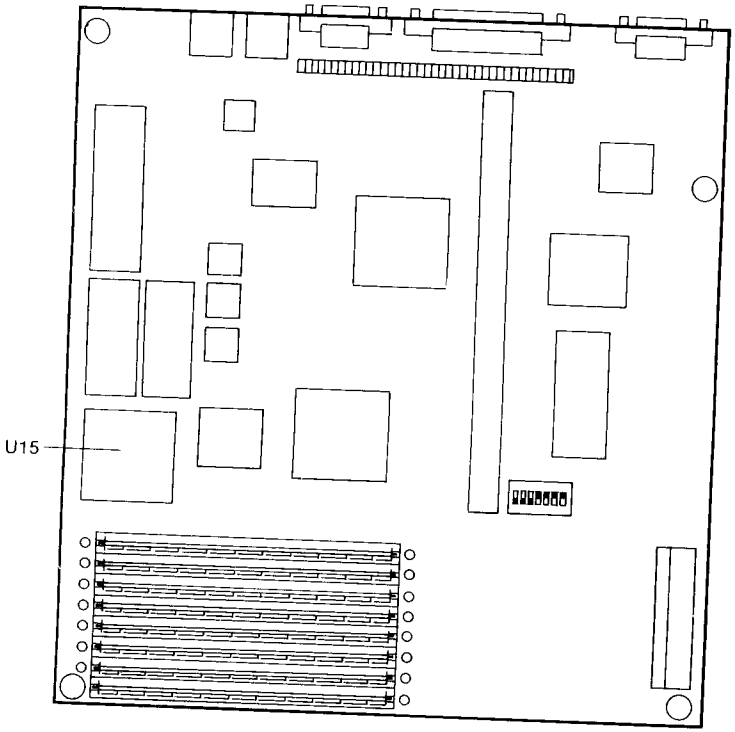


Figure 5-12. Locating math co-processor socket U15

4. A corner of the co-processor and the socket are cut diagonally to ensure correct insertion. carefully align with the connecting socket and press the co-processor into place.

5. If you are done working in the system, replace the system cover as described in Section 5.1.

IMPORTANT

Some software offer math co-processor emulation if the actual co-processor is not installed.
Emulation may perform the same function as the integrated circuit, but emulation is considerably slower. Consult your software documentation to determine whether the program can detect the presence of the co-processor or whether you must specifically reinstall the software.

5.6 MEMORY EXPANSION

Four memory banks are provided on this computer and each bank consists of 2 DRAM Modules. You can use 256K×9 Bits fast page mode 80ns SIMM Memory Modules, 1M×9 Bits page mode 80ns SIMM Memory Modules. Your system supports 10 memory configuration and one special case.

These configurations are shown on the next page.

DRAM MEMORY MAPS SUPPORTED

Bank 0	Bank 1	Bank 2	Bank 3	Total Memory	Remark
256K				512KB (0.5MB)	
256K	256K			1024KB (1.0MB)	NOTE
256K	256K	256K		1536KB (1.5MB)	
256K	256K	256K	256K	2048KB (2.0MB)	
1M				2048KB (2.0MB)	NOTE
256K	256K	1M		3072KB (3.0MB)	
1M	1M			4096KB (4.0MB)	
256K	256K	1M	1M	5120KB (5.0MB)	
1M	1M	1M		6144KB (6.0MB)	
1M	1M	1M	1M	8192KB (8.0MB)	

NOTE: This is a special case of the 1M, 2M memory map where the 384K of memory above 640K can be mapped between 1M and 1.384M, 2M and 2.384M as extended memory through SETUP. Refer to Section 3 for SETUP.

IMPORTANT

After changing the memory configuration you must run SETUP. Instructios for running SETUP are provided in Section 3.

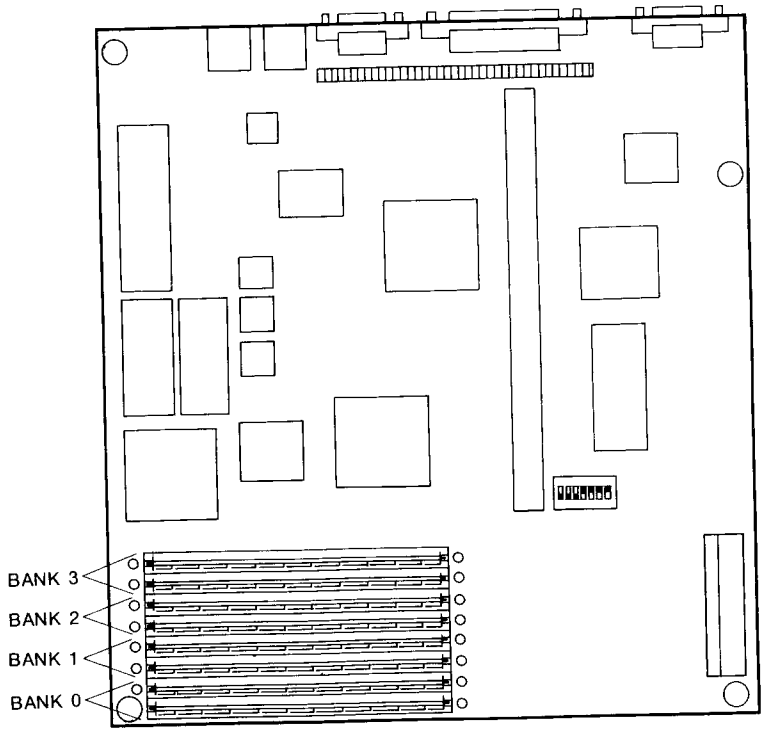


Figure 5-13. Locating memory banks on the main board

5.7 BATTERY REPLACEMENT

The backup battery is attached to the bottom of the system inside. During the system power off, the backup battery supplies power to the CMOS RAM where system configuration information is recorded. Then, the battery is discharged during the system power off. The battery's life is about 2 years if you use this system for 8 hours in a day.

The system configuration information recorded in CMOS RAM will disappear if the battery is exhausted. Then, contact your dealer.

The dealer will exchange the used battery with a new battery.

You must run the SETUP program as described in Section 3, after changing the battery.

CAUTION: Danger of Explosion if Battery is incorrectly replaced. Replace only with the same or Equivalent Type Recommended by the Manufacturer. Discard used Batteries According to the Manufacturer's Instruction.

ADVARSEL!

Lithiumbatteri — Eksplosionsfare ved fejlagtig handtering.
Udskiftning ma kun ske med batteri
af samme fabrikat og type.
Lever det brugte batteri tilbage til leverandøren.

ADVARSEL

Lithiumbatteri — Eksplosjonsfare.
Ved utskifting benyttes kun batteri som
anbefalt av apparatfabrikanten.
Brukt batteri returneres apparatleverandøren.

VARNING

Explosionsfara vid felaktigt batteribyte.
Använd samma batterityp eller en ekvivalent
typ som rekommenderas av apparattillverkaren.
Kassera använt batteri enlight fabrikantens
instruktion.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu.
Vaihda paristo ainoastaan laitevalmistajan suosittelemaan
tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden
mukaisesti.

APPENDIX A:
SWITCH SETTINGS

The switches on the main board are set as follows. Before working in your main board you should become familiar with the DIP switch location below.

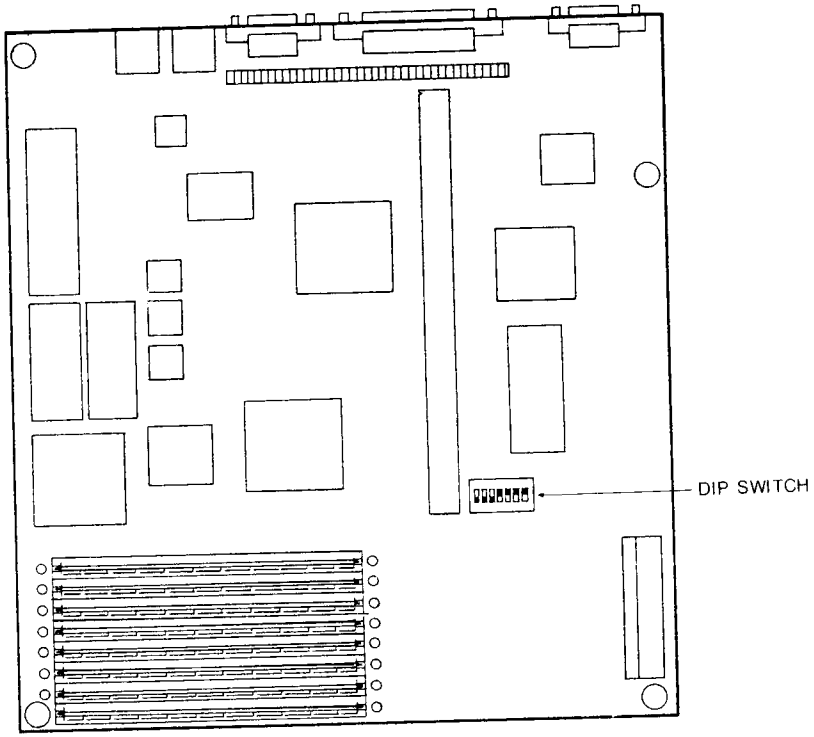


Figure A-1. Main board DIP switch location

1. Built-in VGA Selection

	DIP Switch Setting	Remark
Built-in VGA enable Built-in VGA disable	1,2 on 3 off 1,2 off 3 on	Factory set

2. Monitor Type

	DIP Switch Setting	Remark
Older multi-frequency display timing	7 ON	
Standard PS/2 compatible fixed frequency display timing (i.e.: NEC Multisync 2A, IBM 8503, 8512 and 8513)	7 OFF	Factory set

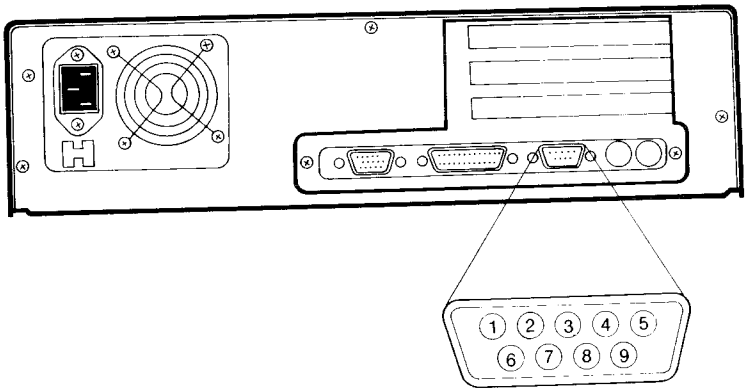
3. VGA Mode Switching Implementation Type

	DIP Switch Setting	Remark
PS/2 style-all VGA modes available on any monitor	6 ON	Factory set
PC/AT style-color modes on color monitors, monochrome modes on monochrome monitors	6 OFF	

4. Switch 4: ON: Write Buffer Mode Enable
OFF: Write Buffer Mode Disable (Factory Set)
Notice: When Setting Switch 4 ON, Some Application S/W may Meet Slight Problem Occasionally.

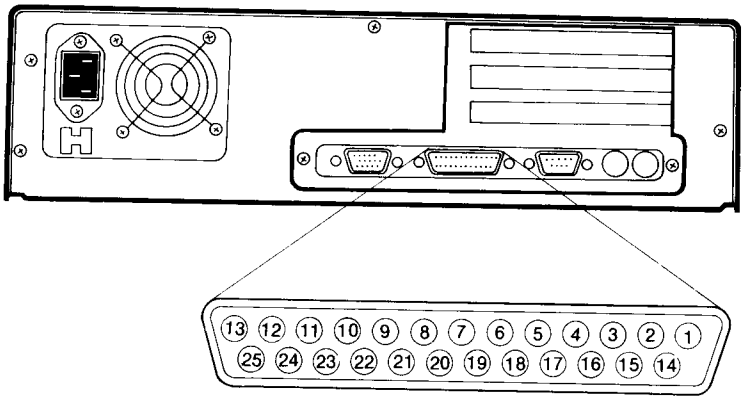
5. Switch 5: ON: 16 Bit Mode
OFF: 8 Bit Mode (Factory Set)

APPENDIX B:
SPECIFICATION OF CONNECTORS



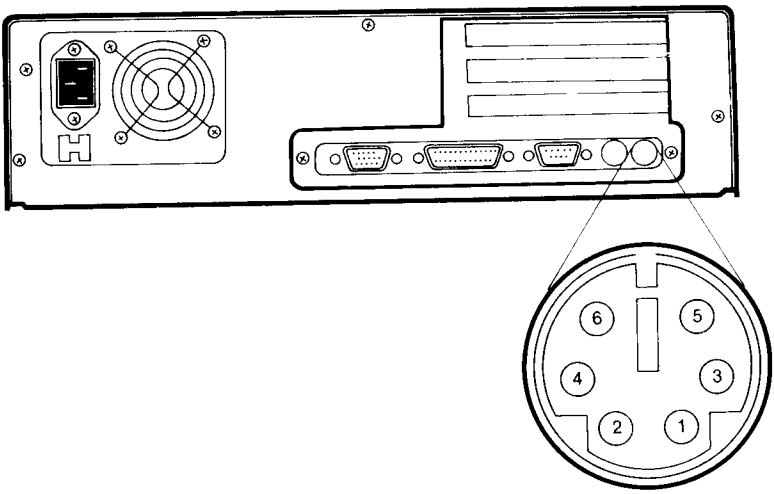
9 PIN SIO PORT

Pin	Signal
1	Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to send
8	Clear to send
9	Ring Indicator



PARALLEL (PRINTER) PORT

Pin	Signal
1	Strobe
2	Data Bit 0
3	Data Bit 1
4	Data Bit 2
5	Data Bit 3
6	Data Bit 4
7	Data Bit 5
8	Data Bit 6
9	Data Bit 7
10	Acknowledge
11	Busy
12	Paper End
13	Select
14	Auto Line Feed
15	Error
16	Initialize Printer
17	Select In
18	Signal Ground
19	Signal Ground
20	Signal Ground
21	Signal Ground
22	Signal Ground
23	Signal Ground
24	Signal Ground
25	Signal Ground



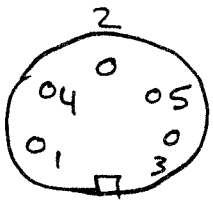
KEYBOARD CONNECTOR

Pin	Signal
1	Data
2	Reserved
3	Ground
4	+5VDC
5	Clock
6	Reserved

Clavier HP Vectra.

DIN 5 Broches

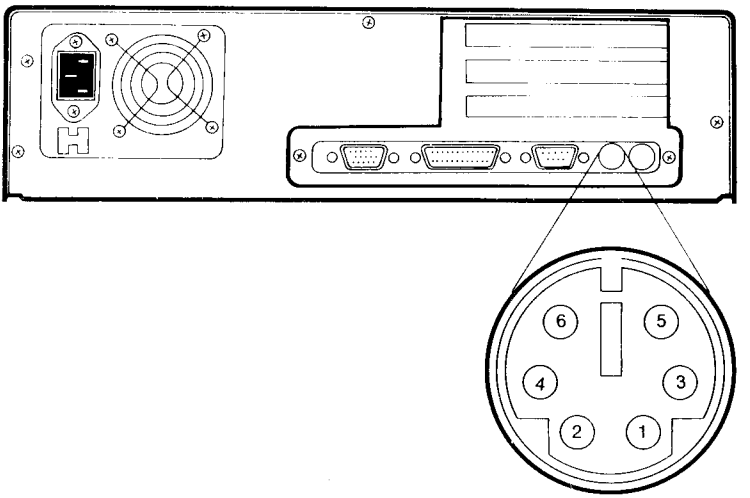
DIN	fil	clavier
1	jaune	→ 5
2	noir	→ 4
3	vert	→ 6
4	bleu	→ 2
5	rouge	→ 3
blindage	blanc	→ ⏚



coté soudure

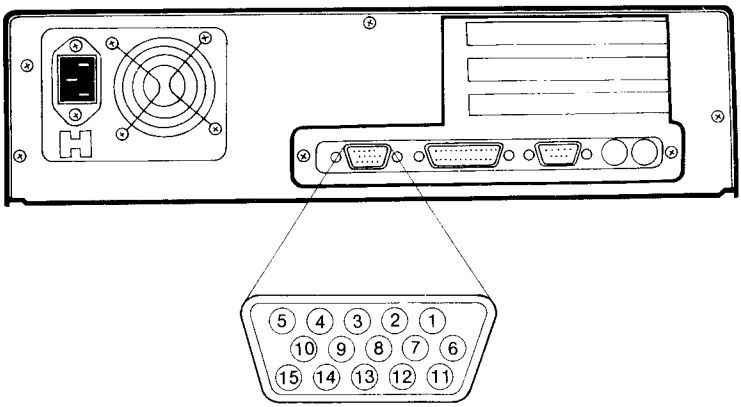
1 . ? . 3

4 . 5 . 6



AUXILIARY DEVICE CONNECTOR
(IBM PS/2 COMPATIBLE MOUSE CONNECTOR)

Pin	Signal
1	Data
2	Reserved
3	Ground
4	+5VDC
5	Clock
6	Reserved



DISPLAY CONNECTOR

Pin	Signal	Monochrome	Color
1	Red	No Pin	Red
2	Green	Mono	Green
3	Blue	No Pin	Blue
4	Reserved	No Pin	No Pin
5	Digital G	Self Test	Self Test
6	Red Rtn	Dummy Pin	Red Rtn
7	Green Rtn	Mono Rtn	Green Rtn
8	Blue Rtn	No Pin	Blue Rtn
9	Plug	No Pin	No Pin
10	Digital G	Digital G	Digital G
11	Reserved	No Pin	Digital G
12	Reserved	Digital G	No Pin
13	Hsync	Hsync	Hsync
14	Vsync	Vsync	Vsync
15	Reserved	No Pin	No Pin

Cable DB 9 / DB 15 Pour Ecran multifrequence NEC

VGA -> EGA		couleur	mono
1	2	red	—
2	3	green	mono
3	5	blue	—
13	4	H Synch	H SYNCH
14	5	V synch	V SYNCH
6	6	Red Rtn	Dummy Pin
7	7	Green Rtn	Mono Rtn
8	8	blue Rtn	
4, 11	9	Reserved	(DB9 : 5 4 3 2 1 / 9 8 7 6)

APPENDIX C: POST AND RUN-TIME ERROR MESSAGES

1. POST ERROR MESSAGES

Message	Possible Cause	Solution
Diskette configuration error	The specified configuration is not supported.	Change the configuration.
Diskette drive reset failed	The diskette adapter has failed.	Contact Dealer.
Diskette drive 1 seek failure	The B: drive failed or is missing.	Check the B: drive.
Diskette drive 0 seek failure	The A: drive failed or is missing.	Check the A: drive.
Diskette read failure-strike F1 to retry boot	The diskette is either not formatted or defective.	Replace the diskette with a bootable diskette and retry.
Display adapter failed; using alternate	• The color/monochrome jumper is set wrong.	• Change the switch to correct setting.
	• The primary video adapter failed.	• Check the primary video adapter.
Errors found disk X failed Initialization	POST reports fixed disk configuration information is incorrect.	Rerun SETUP and enter correct fixed disk information.
Errors found; Incorrect configuration information memory size miscompare	POST reports the size of base or expansion memory does not agree with configuration information.	Rerun SETUP and enter correct memory size.
Gate A20 failure	Protected mode cannot be enabled.	Contact Dealer.
Fixed disk configuration error	The specified configuration is not supported.	Correct the fixed disk configuration.

Message	Possible Cause	Solution
Fixed disk controller failure	The controller card has failed.	Contact Dealer.
Fixed disk failure	Bad disk.	Retry boot. If that doesn't work, replace the fixed disk.
Fixed disk read failure-strike F1 to retry boot	The fixed disk is defective.	Retry boot. If that doesn't work, replace the fixed disk.
FDD controller failure	Disk and diskette controller failed.	Contact Dealer.
FDD A is not installed	Can not find diskette controller for diskette drive A.	Contact Dealer.
FDD B is not installed	Can not find diskette controller for diskette drive B.	Either install or replace the controller card
Invalid configuration information-please run SETUP Program	• Memory size is incorrect • Display adapter is configured incorrectly. • Wrong number of diskette drives.	Run the SETUP utility.
Keyboard clock line failure Keyboard data line failure	Either the keyboard or the keyboard cable connection is defective.	Make sure the keyboard cable and keyboard are connected properly.
Keyboard controller Failure	The keyboard controller firmware has failed.	Check the keyboard controller.
Keyboard stuck key failure	A key(s) is jammed.	Try pressing the key(s) again.
Memory address line failure at *hex-value*, read *hex-value*, expecting *hex-value*	Circuitry associated with the memory chips has failed.	Contact Dealer.
Memory data line failure at *hex-value*, read *hex-value*, expecting *hex-value*	One of the memory chips or associated circuitry has failed.	Contact Dealer.

Message	Possible Cause	Solution
Memory high address line failure at *hex-value*, read *hex-value*, expecting *hex-value*	Circuitry associated with the memory chips has failed.	Contact Dealer.
Memory double word logic failure at *hex-value*, read *hex-value*, expecting *hex-value*	Memory chips circuitry failed.	Contact Dealer.
Memory odd/even logic failure at *hex-value*, read *hex-value*, expecting *hex-value*	Circuitry associated with the memory chips has failed.	Contact Dealer.
Memory parity failure at *hex-value*, read *hex-value*, expecting *hex-value*	One of the parity memory chips has failed.	Contact Dealer.
Memory write/read failure at *hex-value*, read *hex-value*, expecting *hex-value*	One of the memory chips has failed.	Contact Dealer.
No boot device available — strike F1 to retry boot	Either diskette drive A;, the fixed disk, or the diskette itself is defective.	Retry boot. If that doesn't work, replace the diskette or the fixed disk.
No boot sector on fixed disk — strike F1 to retry boot	The C: drive is not formated or is not bootable.	Format the C: drive, make it bootable.
Not a boot diskette — strike F1 to retry boot	The diskette in drive A: is not formatted as a bootable diskette.	Replace the diskette with a bootable diskette and retry boot.
No timer tick interrupt	The timer chip has failed.	Contact Dealer.
Hex-value optional ROM bad checksum = *hex-value*	The peripheral card containes a defective ROM.	Contact Dealer.
Shutdown failure	The keyboard controller or its associated logic has failed.	Contact Dealer.
Time-of-day clock stopped	The CMOS Time-of-day clock chip has failed.	Run the SETUP utility.

Message	Possible Cause	Solution
Time-of-day not set — please run SETUP program	Clock not set.	Run the SETUP utility.
Timer chip counter 2 failed	Chip failed.	Contact Dealer.
Timer or interrupt controller bad	Either the timer chip or the interrupt controller is defective.	Contact Dealer.
Unexpected interrupt in protected mode	The non-maskable interrupt (NMI) port can't be disabled.	Contact Dealer.

2. RUN-TIME MESSAGES

Run-time messages are displayed if an error occurs after the boot procedure is complete.

Message	Possible Cause	Solution
I/O card parity interrupt at *address*. Type (S) hut off NMI, (R) eboot, other keys to continue.	The peripheral card has failed.	Type (S) hut off NMI **NOTE:** This will only temperarily allow you to continue the peripheral card.
Memory parity interrupt at *address*. Type (S) hut off NMI, (R) eboot, other keys to continue.	A memory chip(s) has failed.	Type (S) hut off NMI. **NOTE:** This will only temperarily allow you to continue the memory chip(s).
Unexpected HW interrupt *interrupt* at *address* Type (R) eboot, other keys to contine.	This could be any hardware-related problem **NOTE:** Not displayed if the extended interrupt handler is not enabled.	Check the hardware.
Unexpected SW interrupt *interrupt* at *address* Type (R) eboot, other keys to continue.	There is an error(s) in the software program. **NOTE:** Not displayed if the extended interrupt handler is not enabled.	Try turning the machine off and then on again. If that doesn't work, check the program.
Unexpected type 02 interrupt at *address*. Type (S) hut of NMI, eboot, other keys to continue.	There is an error(s) in the software program. **NOTE:** Not displayed if the extended interrupt handler is not enabled.	Try turning the machine off and then on again. If that doesn't work, check the program.

APPENDIX D:
RESETTING THE SYSTEM

A system reset causes a complete reinitialization of the computer's hardware and software. It is similar to powering the system off, then on again.
A system reset aborts all running programs and causes the loss of all disk files not saved to disk prior to the reset. It should not harm files that already exist on disk. A system reset can be safely done under MS-DOS whenever you see the " > " prompt and may be the only way to recover from program bugs or device failures.

IMPORTANT

Reset must be used with care as it can harm the file system of multi-user operating systems such as XENIX.

Several different types of system reset are provided for the system, depending on the operating system you are running.

Power-OFF/ON

Turning the power switch OFF, then ON always effects a complete system reset. The ROM based POST (Power-On Self-Test) is always executed when the system is powered on.

Reset-Switch Reset

Pressing the reset switch on the front panel for a moment is equivalent to a power-OFF/ON. If a terminal, not a keyboard and monitor, is being used as the console, this is the only way to effect a reset. Using the reset-switch is the only way to reset a system running XENIX, which doesn't recognize key combinations.

CTRL-ALT-DEL

Pressing these keys performs the system reboot described above, but skips the memory diagnostics portion of the POST which results in a faster reboot operation.

APPENDIX E.
CHANGING THE CPU SPEED

Your system CPU runs at multiple speeds. Use the keyboard to change the CPU speed at any time. The CPU speed is at turbo mode and at non-turbo mode.
Older software that runs under a copy protection scheme may require you to use a slower speed for proper operation.
Pressing a three key combination, <CTRL> - <ALT> - <—>, toggles the CPU speed. If the current CPU speed is turbo mode, it will be forced to non-turbo mode. If the current system speed is non-turbo mode, it will be forced to turbo mode.

APPENDIX F.
EMS

General EMM Information

The EMM provides expanded memory according to the LIM EMS 4.0 specification. It creates a pool of 16K expanded memory pages (with a maximum size selected by the end-user) upon initialization; these are called logical pages. Applications can then request some or all of these pages from the memory manager. An application can then direct the EMM to place one or more of its own pages at 16K windows (these are also called physical pages) in the first megabyte of address space, where the application can access them. The application can direct the EMM to swap the pages appearing in the windows and in this manner access large amounts of on board memory except 1MB in real mode using only small portions of memory below 1MB.

User Instructions

The EMM is installed in the user's system by adding the following line at the beginning of the /CONFIG.SYS file on the boot drive:

DEVICE = PEMM. EXE

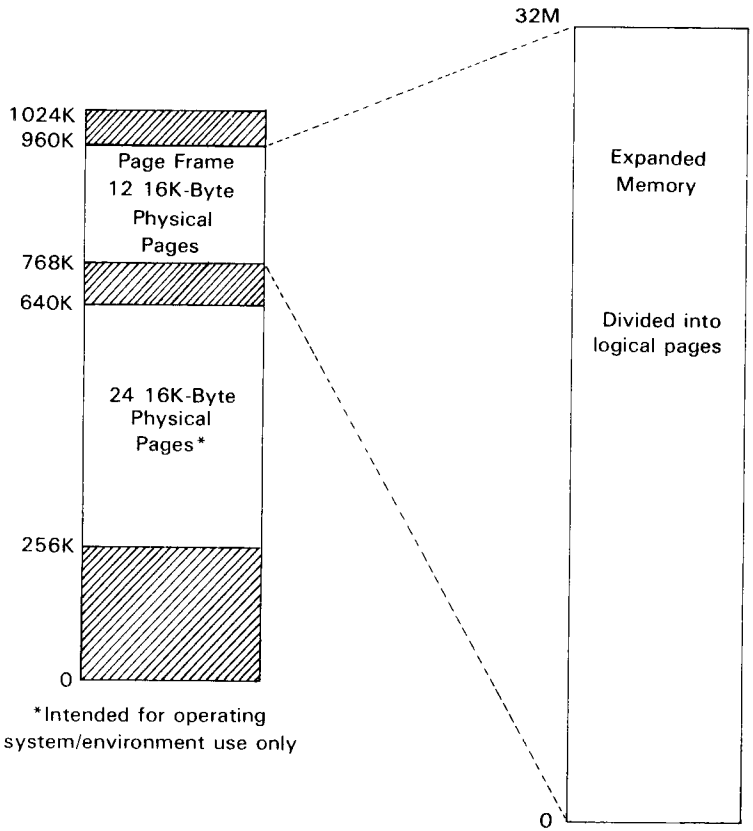
When EMM will be initialized, the default window segment address is at EC00h and next four contiguous 16K pages are allocated by EMS Driver. (E000h, E400h, E800h, EC00h)

NOTE: The PEMM.EXE file is located on the Utility diskette.

EMS 4.0

— LOTUS /INTEL /MICROSOFT EXPANDED MEMORY SYSTEM (L/I/M EMS) 4.0

EMS 4.0 manages the expansion memory. The expanded memory is memory beyond the DOS 640KB limit that can be accesse by applications and utilities such as RAM disks and print spoolers. This expanded memory requires special software so that the computer can manage it. The EMS 4.0 supports the 32MB of expanded memory.



EMS

Associated with the window is a page-selected I/O port. The application program loads that I/O port with the address of the physical pages memory it must access. Then when the application program wants to access data in the selected page, it simply refers to the window's address space (still within the address space of the processor), and the paged memory hardware maps the reference onto the selected page.
The EMS adds two differences to this technique.
First, it provides multiple independent windows rather than just one into the page memory, which is called "expanded" memory.
Second, it calls for Expanded Memory Manager (EMM software that provides application programs with the services needed to manager expanded memory.
Multiple windows in the expanded memory facilitate high-speed manipulation of the multiple parallel data structures. Rather than dealing with one structure, changing the contents of a paging register, and dealing with another structure, an application program can set several structures at the same time. Since overhead is reduced, the application has more time to manipulate the data.
In order to create the windows, the specifications requires a minimum 64KB region of the computer's address space in "high memory"; somewhere between 784KB and 960KB. This region is called the page frame and includes multiple, independently addressable 16KB windows.
The pageframe is within the 8088 processor's address space (0 to 1024KB), but it is beyond the memory that DOS uses for applications (0 to 640KB).
The application program uses services provided by the EMM to control which pages of the expanded memory are in the page frame at any one time.
EMM is a DOS driver that allows concurrently running programs to request a page of memory. The EMM adheres to DOS's protocol for device drivers and therefore is compatible with current and future versions of DOS.

When a program requires expanded memory, the request is handled by EMM, which allocates pages accordingly. The program can use other EMM services to map any one of the allocated pages into any of the four windows.
When one program is finished using expanded memory, the EMM can de-alocate the space it used, freeing that area of the expanded memory for other programs.
The EMM also allows multiple programs, such as RAM disks, print spoolers and terminate and stay resident (TSR) programs, to concurrently share expanded memory, along with applications. In contrast, DOS does not provide a memory manager for expanded memory in the IBM AT. Consequently, only ane application can use the expanded memory at a time. But, EMM ensures that each concurrently running application's use of expanded memory is distinct from that of other applications.

Expanded Memory

Expanded memory is divided into segments called pages. These pages are typically 16KB of memory. Your computer accesses logical pages through a physical block of memory called a page frame. The page frame contains multiple physical pages, pages that the microprocessor can address directly.

Physical pages are also typically 16KB of memory. This page frame serves as a window into expanded memory. Just as your computer screen is a window into a large spread-sheet, so the page frame is a window into the expanded memory. A logical page of expanded memory can be mapped into (made to appear in) any one of the physical pages in the page frame. Thus, a read or write to the physical page actually becomes a read or write to the physical page. One logical page can be mapped into the page frame for each physical page.

The page frame is located above 640KB. Normally, only video adapters, network cards, and similiar devices exist between 640K and 1024K.

If a user installs several expanded memory boards in one computer, the memory is spooled by te memory manager and is accessed through the same page frame, allowing access of up to 32MB of expanded memory in one computer. If you want more information, refer to the EMS specification sheet which has been developed by Lotus, Intel, and Microsoft.

APPENDIX G.
USING U.K VERSION POWER CABLE

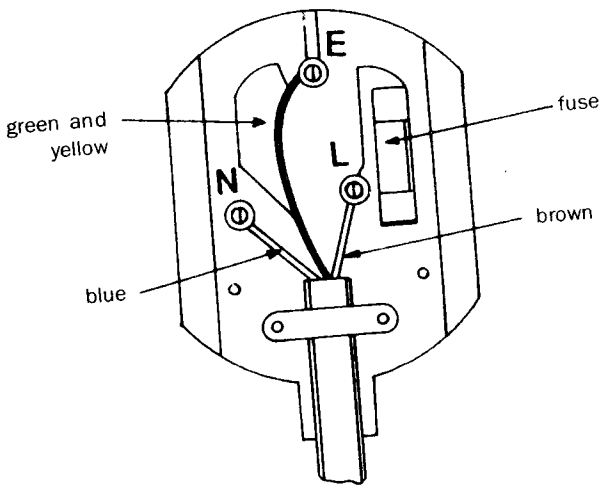
NOTE: The wires in this main lead are colored in accordance with the following code.

Green-and-yellow : Earth

Blue : Neutral

Brown : Live

As the coloures of the wires in the main lead of this appliance may not correspond with the colour-mark identifying the terminals in your plug, proceed as follows. The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked with the letter "E" or by the earth symbol or coloured green or green and yellow. The wire which is coloured blue must be connected to the terminal which is marked with the letter "N" or coloured BLACK.



The wire which is coloured brown must be connected to the terminal which is marked with the letter "L" or coloured RED.
This appliance must be protected by a 3A fuse if Min 13A (BS1363) plug is used, or if any other type of plug is used, by a 5A fuse either in the plug or adapter.

VGA USER'S GUIDE

VGA USER'S GUIDE

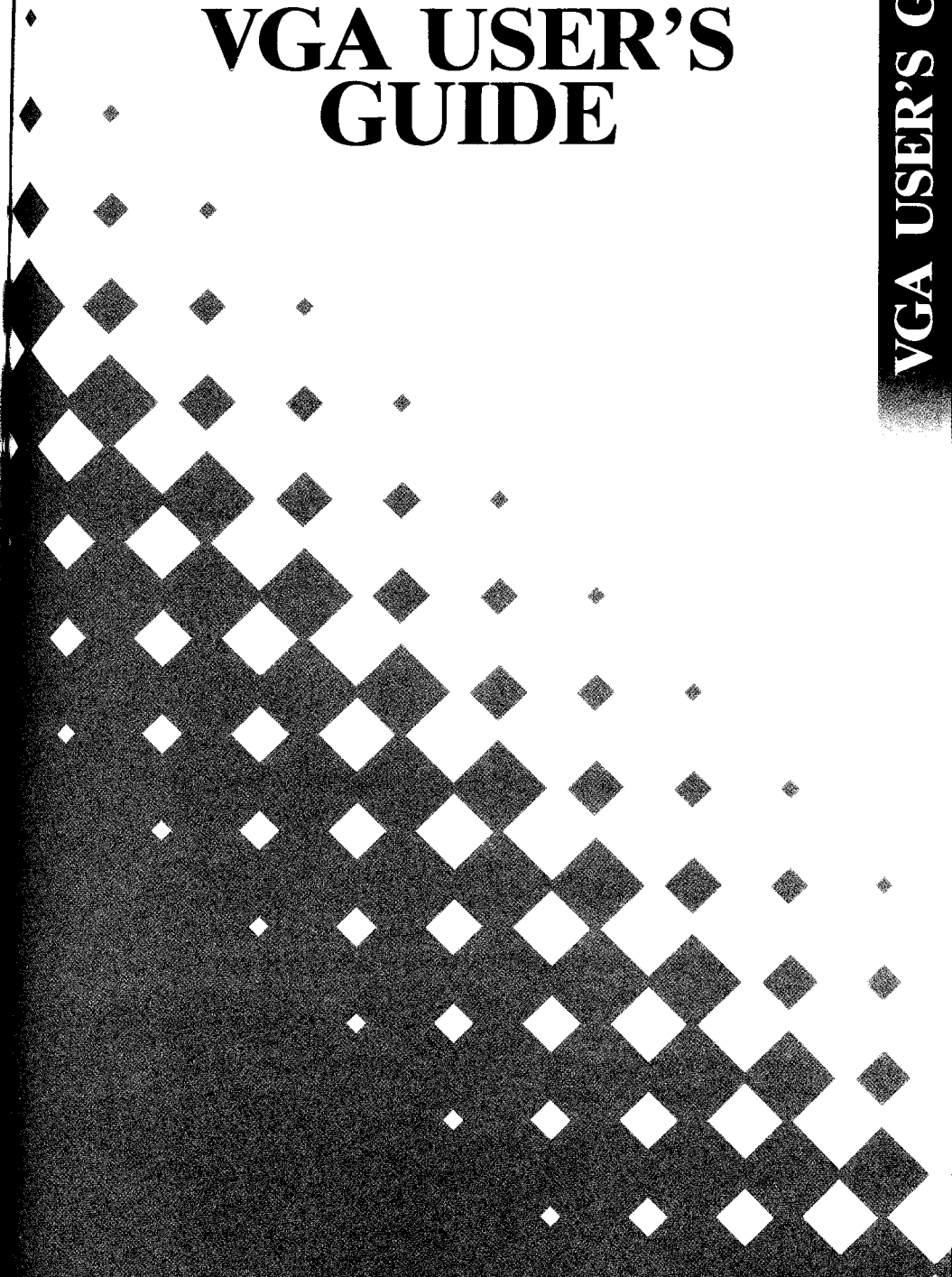


TABLE OF CONTENTS

SECTION 1. INTRODUCTION

1.0 OVERVIEW

This system has one analog video connector and supports analog PS/2 fixed frequency monitors as well as compatibility with analog multi-frequency displays.
This VGA is 100% hardware compatible with IBM's VGA, 100% hardware compatible with EGA, and 100% hardware compatible with CGA, MDA, Hercules Graphics, AT & T model 6300.

The Built-in VGA can be enabled or disabled via DIP switch on the main board.

1.1 FEATURES

- All the capabilities of IBM's Personal System/2 VGA Display adapter including full VGA compatibility at the hardware level.
- Software level compatibility with the IBM MCGA video standard of the IBM PS/2 Model 25 & 30.
- Hardware level compatibility with the IBM EGA standard on an analog monitor.
- Full hardware compatibility with software written for the IBM Color/Graphics Adapter, the Hercules Graphics Card and the IBM Monochrome Display Adapter on an analog monitor.
- 1024 × 768 resolution mode providing 16, 4 and 2 color interlaced support on 8514 and compatible multi-frequency displays.
- Supports 800 × 600 dot Super VGA extended resolution, 256 and 16 color graphics with supporting software drivers on multi-frequency displays.

- 132 column text modes and supporting software drivers.
- 640×400 dot enhanced graphics with 256 simultaneous colors from a palette of over 262,000 possible colors.
- The capability to drive the IBM Personal System/2 analog video displays, models 8503, 8512, 8513 and 8514, as well as equivalent compatible displays and analog multi-frequency displays.
- Supports 640×480 dot Super VGA extended resolution, 2, 16 or 256 color graphics with supporting software drivers on multi-frequency displays.

NOTE: If you hope to use high resolution graphics (640×480 256colors/800×600 256colors/1024×768 16 colors), you should expand your VIDEO memory up to 512KB by installing two 256K by 4bit DRAMs (access time must be equal to or faster than 80ns).

1.2 MONITOR AND SOFTWARE COMPATIBILITY

The built-in VGA provides support for the IBM Personal System/2 analog displays, models 8503, 8512, 8513 and 8514 and compatibles, as well as analog multi-frequency and dual frequency monitors.
Your built-in VGA is compatible with software written for the following video standards:

- VGA : the built-in video function of the IBM PS/2 Models 50, 60 and 80 and the IBM Personal System/2 Display Adapter.
- MCGA : the built-in video function of the IBM PS/2 Model 25 and Model 30,
- EGA : the IBM Enhanced Graphics Adapter,
- CGA : the IBM Color/Graphics Adapter,
- MDA : the IBM Monochrome Display Adapter,
- Hercules graphics: the Hercules Graphics Card.

The built-in VGA can run software written for any of the display standards listed above on any supported analog display type. This means you can run "Monochrome" software and "color" software on the same monitor.
Additionally, built-in VGA provides the following special modes:

- 132 column text modes: 132 columns by 25 and 43 lines,
- 1024 by 768 graphics with 16, 4 and 2 colors,
- 800 by 600 graphics with 256 and 16 colors,
- 256 color graphics at a resolution of 640 by 400 pixel,
- 640 by 480 graphics with 2, 16 and 256 colors.

NOTE: If you hope to use high resolution graphics (640 × 480 256 colors/800 × 600 256 colors/1024 × 768 16 colors), you should expand your VIDEO memory up to 512KB by installing two 256K by 4bit DRAMs (access time must be equal to or faster than 80ns).

Your built-in VGA supports extended resolution 1024 by 768 interlaced graphics modes on any 8514 or 8514 compatible analog monitor, as well as 800 by 600 pixel graphics modes on multi-frequency analog monitors.
Many new multi-frequency monitors are also 8514 compatible and will display 1024 by 768 interlaced resolution satisfactorily. Please check with your monitor manufacturer or dealer if you are unsure what capabilities your multi-frequency monitor has. You may need a special 15pin PS/2 compatible connector adapter.

If you are using an older multi-frequency monitor you may want to set lever one of the main board's DIP switch to the ON position as described in the installation instructions later in this manual. This switch tells the software that an older multi-frequency monitor is connected and will allow the built-in VGA to compensate for the differences between PS/2 fixed frequency displays and some multi-frequency display. You may want to experiment between the two settings to determine the best results for your display.

NOTE: The 800 × 600 graphics mode is not supported on the IBM PS/2 8503, 8512, 8513 or 8514 monitor or equivalent fixed frequency displays.

Color and Monochrome VGA Mode Switching

The built-in VGA supports a number of different modes originally designed for different video boards and monitor types. The built-in VGA is engineered to support these modes on a single monochrome or color analog monitor with the following restriction on using color VGA modes on monochrome monitors and monochrome VGA modes on color monitors.

The VGA standard has two different ways of supporting color and monochrome modes. The VGA on the IBM PS/2 Models 50, 60, 70 and 80 allows software written for monochrome modes or color modes to run without restriction at any point. This is the PS/2 style VGA mode switching implementation.

The VGA supported by IBM's PS/2 Display Adapter add-in card for the PC/AT is slightly different in the way it handles switching between color and monochrome VGA modes. Since the video system is designed for PC/XT and AT systems it must be able to support a second non-VGA video board. Because of this requirement the PC/AT implementation of VGA will not allow software written for monochrome modes to operate on color monitors or software written for color modes to operate on monochrome monitors without first switching the board from color operation to monochrome operation or vice-versa. This is the PC/AT type VGA mode switching implementation. The software required to switch the board to color or monochrome VGA operation is part of the included VGA1024C.EXE utility.
Instructions are provided in the operation section later in this manual.

The built-in VGA will support either of these two methods of VGA mode switching.
The PS/2 style VGA implementation is easier to use since fewer steps are required to run all your programs. The PC/AT type implementation is identical to and thus fully compatible with IBM's PS/2 Display Adapter add-in card. You can choose which type of implementation you wish by setting lever two of the DIP switches on the main board as provided in the installation section of this manual.

Tip: If all this seems confusing, do not worry. The recommended setting is to use the PS/2 type VGA implementation since it is designed to be easier to use and will not affect compatibility under almost all circumstances.

The following table lists the various modes and resolutions available on the built-in VGA.

Mode	Resolution	Simultaneous Colors(1)	Mapping(2)
Monochrome Text	80 columns by 25 rows	—	Monochrome
Color Text	80 columns by 25 rows	16	color
	40 columns by 25 rows	16	color
132 Column Text	132 columns by 25 rows	16	color
	132 columns by 43 rows	16	color
	132 columns by 25 rows	—	Monochrome
	132 columns by 43 rows	—	Monochrome
CGA graphics	320 by 200 (3)	4	color
	640 by 200 (3)	2	color
Hercules	720 by 348 (5)	—	Monochrome
Graphics	320 by 200 (3)	16	color
EGA Graphics	640 by 200 (3)	16	color
	640 by 350	16	color
	640 by 350	—	Monochrome
	320 by 200 (3)	256	color
VGA Graphics	640 by 480	2	color
(including	640 by 480	16	color
MCGA)	640 by 480	256	color
	1024 by 768 (6)	2	Monochrome
	1024 by 768 (6)	4	color
	1024 by 768 (6)	16	color
Extended	800 by 600 (4)	16	color
Graphics	800 by 600 (4)	256	color
	640 by 400	256	color

NOTES:

(1) Simultaneous colors refers to the number of colors or shades that can be displayed at one time from 262,144 possible colors on color displays or from 64 shades of gray on monochrome displays.

(2) This refers to the type of old style display and video board for which the mode was originally designed. All modes except 800×600 and 1024×768 are available on all analog displays.

(3) 200 line vertical resolution modes are double-scanned to display 400 lines on screen on analog monitors.

(4) 800×600 graphics mode requires a multi-frequency monitor.

(5) Hercules and hardware compatible CGA and MDA modes require the use of the VGA1024C.EXE utility.

(6) 1024 by 768 interlaced graphics mode requires an 8514 or equivalent compatible monitor.

NOTE: If you hope to use high resolution graphics (640×480 256 colors/800×600 256 colors/1024×768 16 colors), you should expand your VIDEO memory up to 512KB by installing two 256K by 4bit DRAMs (access time must be equal to or faster than 80ns).

1.3 EXTENDED MODES

1024×768 Graphics

The built-in VGA is capable of supporting a 1024 by 768 graphics modes with 2, 4 or 16 colors from a palette of more than 262,000 possible colors. This high resolution mode is interlaced and requires the use of an IBM 8514 or equivalent interlaced monitor.

Software is included with your system which enables popular software to run in this resolution.

800×600 Grphics, 132 Column Text and 256 Color Graphics

The built-in VGA fully supports multi-frequency monitors with extended graphics at a resolution of 800 dots horizontal by 600 dots vertical with 16 or 256 simultaneous colors from a palette of more than 262,000 possible colors. This extended mode is designed to run on multi-frequency monitors only.

Additionally built-in VGA can support text modes 132 columns wide. These text modes provide screen formats of 132 characters across by 25 or 43 lines.
This is in contrast to the standard text format of 80 columns by 25 lines.

The built-in VGA supports an extended resolution imaging graphics mode with a resolution of 640 by 400. This mode can display 256 simultaneous colors on screen from a range of 262,000 possible colors.
This video mode supports display of photograph-like quality images on all supported display types.

Software is included with your system to enable popular application software to support these extended modes. Please refer to the VGA Utilities manual for information about software that can use these modes.

Limitations of the Extended Modes

The extended graphics modes and 132 column text modes of your built-in VGA require the use of special software drivers either provided with this product or provided with the application. Please refer to the VGA Utilities manual for complete information. The 800×600 graphics mode is not supported on the IBM PS/2 8503, 8512 or 8514 monitors or equivalent fixed frequency displays.

SECTION 2.
PREPARE YOUR BUILT-IN VGA

Your built-in VGA contains all of the features that are found on the IBM PS/2 Display Adapter and requires very little configuration. All you need to do is set the DIP switches.

Set the DIP Switch on the Main Board

Switch 7 tells the built-in VGA to use special timing for older multi-frequency monitors or to use standard VGA timing for fixed frequency PS/2 monitors and newer multi-frequency displays. The multi-frequency monitor setting will allow video to be displayed on some brands of multi-frequency monitors using a larger screen area than standard PS/2 timing will allow.
You may want to experiment with the two settings to determine the best results for your particular brand of multi-frequency display.

Switch 6 selects the manner in which the built-in VGA handles switching between color and monochrome VGA modes. You will normally want to set switch 6 to the ON position to select the PS/2 style VGA implementation. Please refer to the discussion earlier in this manual regarding restrictions on color and monochrome modes for more information on setting this option.

DIP Switch Settings on the Main Board

1. MONITOR TYPE

	Switch Setting	Remark
Older multi-frequency display timing	7 ON	
Standard PS/2 compatible fixed frequency display timing (i.e.: IBM 8503, 8512 and 8513)	7 OFF	Factory set

2. VGA MODE SWITCHING IMPLEMENTATION TYPE

	Switch Setting	Remark
PS/2 style all VGA modes available on any monitor	6 ON	Factory set
PC/AT style color modes on color monitors, monochrome modes on monochrome monitors	6 OFF	

SECTION 3. OPERATION

3.0 USE OF THE BUILT-IN VGA

If you have followed the installation instructions in this manual, you are now ready to use your built-in VGA. Most software that is compatible with IBM's Personal System/2, VGA or EGA will run automatically on your system using the built-in VGA. Just turn on your computer system and install your application package for "PS/2 model 50, 60, 70 or 80 video," "VGA," or "EGA" as instructed by the software manufacturer.

3.1 CONFIGURE YOUR APPLICATION SOFTWARE

Many application software packages include an installation or configuration program to prepare them for operation on the particular hardware that comprises your system. Most newer software will be able to run in the default VGA configuration of your built-in VGA.

However, since some software packages are written specifically for certain non-VGA or non-EGA video hardware, it may be necessary to configure your built-in VGA to behave identically to the video board needed by this software. For this purpose your system includes a utility program to configure your built-in VGA to behave identically to each of the standard video board. This utility is called VGA1024C.EXE and is described in the following section.

The table below lists the fully hardware compatible video standards supported by the built-in VGA and the video modes and resolutions that are available under each video standard.

Standard Mode	Resolution	Simultaneous Colors(a)	Mapping(2)
VGA, PS/2 Display Adapter including MCGA and EGA modes *(default)*			
Monochrome Text	80 columns by 25 rows	—	Monochrome
Color Text	80 columns by 25 rows	16	color
	40 columns by 25 rows	16	color
132 Column Text	132 columns by 25 rows	16	color
(4)	132 columns by 32 rows	16	color
	132 columns by 25 rows	—	Monochrome
	132 columns by 43 rows	—	Monochrome
Graphics	320 by 200 (3)	4	color
	640 by 200 (3)	2	color
	320 by 200 (3)	16	color
	640 by 200 (3)	16	color
	640 by 350	16	color
	640 by 350	—	Monochrome
	320 by 200 (3)	256	color
	640 by 480	2	color
	640 by 480	16	color
	640 by 480	256	color
Extended	1024 by 768	2	Monochrome
Graphics (4)	1024 by 768	4	color
	1024 by 768	16	color
	800 by 600 (4)	16	color
	800 by 600	256	color
	640 by 400	256	color
CGA, Color/Graphics Adapter			
Color Text	80 columns by 25 rows	16	color
	40 columns by 25 rows	16	color
Graphics	320 by 200 (3)	4	color
	640 by 200 (3)	2	color
Hercules Graphics card including MDA modes			
Monochrome Text	80 columns by 25 rows	—	Monochrome
Graphics	720 by 348	—	Monochrome

NOTES

(1) Simultaneous colors refers to the number of colors or shades that can be displayed at one time.

(2) This refers to the type of old style display for which the mode was originally designed.

NOTE: 800 by 600 graphics modes require a multi-frequency monitor and 1024 by 768 graphics modes require an 8514 or equivalent compatible monitor.

(3) 200 line vertical resolution modes are double-scanned to display 400 lines on screen on analog monitors.

(4) These modes require use of application specific driver with your system.

NOTE: If you hope to use high resolution graphics (640×480 256 colors/800×600 256 colors/1024×768 16 colors), you should expand your VIDEO memory up to 512KB by installing two 256K by 4bit DRAMs (access time must be equal to or faster than 80ns).

Here are a few software installation tips:

- The best looking display can usually be achieved by installing your application software packages for the highest resolution mode available.
- Some applications automatically detect what type of video card and monitor combination is installed and configure themselves to take best advantage of the available hardware.
- install your software for VGA, PS/2 or EGA if possible. This will allow your software to run on your built-in VGA in the system's startup configuration.
- If your software does not specify a VGA, PS/2 or EGA option and you are using a color analog monitor, try installing the software for "color," if available. Usually this will work in the built-in VGA's default color mode on color monitors.
- If your software still does not display video properly, try using the VGA1024C.EXE utility to set the built-in VGA to a completely hardware compatible video standard that may be supported by your software such as CGA or Hercules.The VGA1024C.EXE utility is described in the following section.

NOTES:

- The only way that the built-in VGA will run software that will not run on VGA hardware is to configure the built-in VGA to operate in another mode such as CGA or Hercules by way of the VGA1024C.EXE utility.
- Hercules compatible software and some CGA compatible games will require using the VGA1024C.EXE utility to set the built-in VGA to the appropriate video standard.

- Software that requires a specific video mapping may require using the VGA1024C.EXE utility to set the built-in VGA to color or monochrome VGA mode as needed. The setting of the switch 6 on the built-in VGA will determine if all VGA modes are automatically available on either monochrome or color monitors or not. For example, if the built-in VGA is set for a PC/AT style VGA implementation per the DIP switch and the built-in VGA is connected to a color monitor, you may need to use the VGA1024C.EXE utility to switch modes to run software which will only run in monochrome text mode. If the built-in VGA is set for a PS/2 style VGA implementation via the DIP switch then the monochrome text mode will be automatically available.

The default mapping of your built-in VGA depends on the type of display being used. If you are using a color display such as the IBM PS/2 Color Display model 8513 then the default mapping will be color. If you are using a monochrome analog display such as the IBM PS/2 Monochrome Display model 8503, then the default mapping will be monochrome.

3.2 BUILT-IN VGA SOFTWARE

The enclosed software disk(s) contains several programs designed to help you get the most out of your built-in VGA. Specifically:

VGA1024C.EXE allows users to select the video hardware standard of the card either from a menu or directly from the DOS prompt line.

Various drivers that let popular application software packages take advantage of your built-in VGA's extended graphics and 132 column text modes are supplied on the enclosed disks. Please refer to the VGA Utilities manual for details.

The built-in VGA Utilities may come on more than one disk depending on the type of media.

You can copy the utility programs such as VGA1024C.EXE to to your hard disk, and you should make back up copies of your VGA Utilities disks.

VGA1024C:EXE:

This program lets you control which video standard the built-in VGA is emulating. The default video standard of the built-in VGA is always VGA.VGA1024C.EXEwill let you override this setting enabling you choose between VGA, CGA, MDA or Hercules video standards as well as switch between "color" and "monochrome" VGA modes.

VGA1024C.EXE also lets you LOCK the VGA into a particular configuration in order to reboot to that configuration rather than the default VGA mode.

To invoke this program, simply start your computer system; at the DOS prompt, insert the enclosed diskette in drive A and type:

A:VGA1024C [Enter]

You will see a simple menu listing some of the options available to you.
Use the UP and DOWN arrows to select the feature you wish to access When You have selected the desired feature (highlighted and blinking), Press the [Enter] key. Choose "Exit to Operating System" or press the [Esc] key to quit.

You may also use VGA1024C.EXE from the DOS prompt line bypassing the menu. This is useful is you wish to incorporate VGA1024C.EXE commands into a batch file.

THE FOLLOWING COMMANDS WILL ALLOW YOU TO USE VGA1024C:EXE FROM THE DOS PROMPT.

VGA1024C[Enter]	Brings Up the VGA1024C.EXE Menu
VGA1024C VGA [Enter]	Sets the card to VGA operation. This is the default configuration of the built-in VGA.
VGA1024C CGA [Enter]	Sets the card to CGA operation. This mode emulates the video capabilities of the IBM Color/Graphics Adapter. A warm boot (Control-Alt-Del key sequence) will bring you back to VGA mode.
VGA1024C MDA [Enter]	Sets the card to emulate the Hercules Graphics Card with no graphics memory allocated. This configuration is equivalent to IBM's text only Monochrome Display Adapter A warm boot (Control-Alt-Del key sequence) will bring you back to VGA mode.
VGA1024C HERC0 [Enter]	Sets the card to emulate the Hercules Graphics card with one page of graphics memory allocated. This configuration is equivalent to using the Hercules HGC HALF command. A warm boot (Control-Alt-Del key sequence) will bring you back to VGA mode.
VGA1024C HERC1 [Enter]	Sets the card to emulate the Hercules Graphics Card with both pages of graphics memory allocated. This configuration is equivalent to using the Hercules HGC FULL command. A warm boot (Control-Alt-Del key sequence) will bring you back to VGA mode.

VGA1024C[Enter]	Brings Up the VGA1024C.EXE Menu
VGA1024C COLOR [Enter]	Changes the VGA to color VGA mapping as needed. Allows the built-in VGA to use video modes that require color mpaping.
VGA1024C MONO [Enter]	Changes the built-in VGA to monochrome VGA mapping as needed. Allows you to use video modes that use monochrome mapping such as monochrome text mode.
VGA1024C 13224 [Enter]	Switches the built-in VGA to color, 25 line, 132 column text mode. This mode is only for use with specific application programs that have been designed to take advantage of this mode's extended text capabilities. See the VGA Utilities manual for information on such programs.
VGA1024C 13243 [Enter]	Switches the built-in VGA to color, 43 line, 132 column text mode. This mode is only for use with specific application programs that have been designed to take advantage of this mode's extended text capabilities. See the VGA Utilities manual for information on such programs.
VGA1024C LOCK [Enter]	Locks the current video standard so that it will survice a warm boot. Can be used in conjunction with another parameter to lock that particular mode. Example: VGA1024C CGA LOCK will allow the built-in VGA to survice a reboot with the VGA configured as a color/graphics adapter.

VGA1024C.[Enter]	Brings Up the VGA1024C.EXE Menu
VGA1024C REBOOT [Enter]	Locks and reboots the currently selected video standard so that the system will re-initialize in the current video standard. This command is equivalent to the VGA1024C LOCK command followed by a soft reboot (Ctrl-Alt-Del sequence). Can be used in conjunction with another parameter to lock and reboot that particular mode. Example: VGA1024C HERC1 REBOOT will switch the VGa to Hercules mode and reboot the system in Hercules mode. The built-in VGA will be locked in the selected mode until the VGA1024C.EXE utility is used again to select a different mode. This option should be used for changing the video standard when sophisticated drivers or TSR utilities are loaded into system memory. (See note below.) When the system reboots these drivers or utilities will need to be re-loader the selected mode.

Any specific video mode command such as VGA1024C CGA will unlock the card unless used with the LOCK or REBOOT parameter. If you make a mistake in typing the VGA1024C command, the program will give you the option of using the VGA menu or returning to DOS.

Note to Microsoft and IBM PS/2 mouse users: If you are installing your mouse driver by way of a program such as MOUSE.COM or have your mouse driver installed through the CONFIG.SYS file, you may have problems when using the VGA1024C.EXE utility to switch for non-VGA Hercules, CGA or MDA modes.

When using the Microsoft Mouse driver (version 6.1 or later) or the IBM PS/2 Mouse driver you will need to use a special procedure when switching from VGA mode to Hercules or CGA modes. Rather than choosing.
"Set Hercules Mode" then "Exit to DOS," you should choose "Set Hercules Mode" then execute the menu option to "Reboot System in Current Mode. This option will allow your system to reinitialize in the selected video mode. At this point you should reinstall your mouse, or if your mouse is installed in CONFIG.SYS, it will reinstall automatically. You may also choose the option to "Reboot System in Current Mode" from the DOS command line with the statement VGA1024C REBOOT.

APPENDIX A:
TWO MONITOR SYSTEMS

Your built-in VGA may be used in conjunction with another video board and monitor combination. The second video card and monitor pair must be either a monochrome display. Adapter and a monochrome monitor or a color/graphics adapter and RGB color monitor. These are the only multiple monitor and video card installations that will work with your built-in VGA.

NOTES

- When you install the built-in VGA with another video adapter, you are restricted in the use of your VGA card in modes that do not conflict with those of the complimentary video board. IBM and compatible computer systems will only allow one video card to be mapped as a monochrome card and one to be mapped as a color card.
- Thus, if you use your built-in VGA in conjunction with a monochrome display adapter and monochrome monitor, the built-in VGA will be limited to color mapped modes. The monochrome VGA modes, Hercules graphics and MDA modes will not be available on the built-in VGA.
- If you are using the built-in VGA in conjunction with a color/graphics adapter and RGB monitor, the built-in VGA will be limited to monochrome operation-color modes will then not be available on the built-in VGA.
- The PC/AT vs. PS/2 style VGA mode switching (normally selected via DIP switch 6) always default to PC/AT style mode switching in two monitor systems.

- The built-in VGA is always the primary video display adapter. When the system boots or re-boots, the built-in VGA is always the default display.
- Use the DOS MODE command to switch between the two video cards.
- You cannot use your built-in VGA in conjunction with EGA card or another VGA card of any type.

APPENDIX B.
SYNC SIGNALS

FIXED FREQUENCY MONITOR (DIP SWITCH 7 OFF)

Display Mode	Horizontal Sync Frequency	Horizontal Sync Polarity	Vertical Sync Frequency	Vertical Sync Polarity
350 lines	31.5MHz	+	70.1KHz	–
"200 lines"	31.5KHz	–	70.1KHz	+
400 lines	31.5KHz	–	70.1KHz	+
480 lines	31.5KHz	–	59.9KHz	–
132 column	31.5KHz	–	70.0KHz	+

MULTI-FREQUENCY MONITOR (DIP SWITCH 7 ON)

Display Mode	Horizontal Sync Frequency	Horizontal Sync Polarity	Vertical Sync Frequency	Vertical Sync Polarity
350 lines	31.5KHz	+	62.3Hz	–
"200 lines"	28.0KHz	–	62.3Hz	+
400 lines	31.5KHz	–	62.3Hz	+
480 lines	31.5KHz	–	59.9Hz	–
132 column	27.6KHz	–	61.5Hz	+
600 lines*	35.2KHz	–	56.6Hz	–
768 lines†	35.5KHz	+	86.9Hz	+

* 800×600 graphics

† 1024×768 interlaced graphics

VGA UTILITIES MANUAL

VGA UTILITIES MANUAL

TABLE OF CONTENTS

NOTE: The *VGA Utilities* disk contains files called README. Read these files! They contain important information not necessarily in the manuals. You can display the README files on the screen by editor software

SECTION 1.
INTRODUCTION

Your Built-in VGA supports several enhanced modes beyond the VGA standard. These capabilities include the ability to display text 132 columns wide and 256 color graphics at 640 by 480 and 640 by 400 resolutions on any supported monitor. Additionally the Built-in VGA will support 800 by 600 resolution 16 or 256 color graphics on a multi-frequency monitor and 1024 by 768 resolution 2, 4 or 16 color graphics on an 8514 or equivalent compatible monitor, depending on the amount of video memory present on your Built-in VGA (256K or 512K).

In order to take advantage of these enhancements, your Built-in VGA includes software support for several popular software programs. The following sections will describe the procedures necessary to install these programs so that they can take full advantage of your Built-in VGA's enhanced capabilities.

Before you proceed, you should make a backup copy of your *VGA Utilities* if you have not already done so. Before you attempt to configure the software as described in the following pages, be sure you have correctly configured and installed your Built-in VGA. Please refer to the *VGA User's Guide* for details on the proper installation and operation.

The *VGA Utilities* may include more than one disk depending on the type of media. A program called BRIDGE.COM has been provided to allow you to use software written for any existing VGA card that uses 800 x 600 and 132 column modes. This program translates the set mode request into the modes supported by your built-in Built-in VGA.

The drivers described throughout this manual assume you are using a color VGA configuration. If you are using a monochrome VGA monitor use the VGA1024C.EXE utility to switch from monochrome VGA mapping to color mapping before using the drivers. The command VGA1024C COLOR

will set your Built-in VGA to color mapping. For more information on monochrome and color mapping and using the VGA1024C.EXE utility refer to the operation section of the *VGA User's Guide.*

1.1 EXTENDED 1024 BY 768 GRAPHICS MODE

(256K DRAM)

The Built-in VGA with 256K of DRAM (video memory) is capable of supporting a 1024 by 768 graphics mode with 2 or 4 colors from a palette of more than 262,000 possible colors. This high resolution mode is interlaced and requires the use of an IBM 8514 or equivalent interlaced monitor.

Software is included with your Built-in VGA which enables the following programs to run in this resolution:

- AutoCAD* (Release 9 & 10) in 4 colors
- Generic Cadd Level 3 in 2 and 4 colors
- Ventura Publisher* (Version 1.1 and 2.0) in 2 colors
- Windows 386 in 2 colors
- Windows Versions 2 in 2 colors

(512K DRAM)

Your Built-in VGA with 512K of DRAM is capable of supporting a 1024 by 768 graphics mode with 2, 4 and 16 colors from a palette of more than 262,000 possible colors. This high resolution mode is interlaced and requires the use of an IBM 8514 or equivalent interlaced monitor.

Software is included with your Built-in VGA which enables the following programs to run in this resolution:

- AutoCAD* (Releaes 9 & 10)
- Cadvance*
- GEM* (Version 2.1 or 2.2)

- Generic Cadd Level 3
- Ventura Publisher* (Version 1.1 and 2.0)
- VersaCAD Design Version 5.3 and 5.4
- Windows 386
- Windows Version 2

1.2 EXTENDED 800 BY 600 GRAPHICS MODE

Your Built-in VGA can drive a multi-frequency display in an extended graphics mode with 800 dots horizontally by 600 dots vertically in sixteen or 256 colors. This increased resolution will effectively allow you to have 56% more information than standard VGA modes on your display with software that supports this mode.

Your Built-in VGA includes software support for the following programs to take advantage of the Built-in VGA's increased resolution in the 800 by 600 graphics mode.

- AutoCAD* (Release 9 & 10)
- Cadvance*
- Framework* II
- GEM* (Version 2.1 or 2.2)
- Generic Cadd Level 3
- Lotus 1-2-3 & Symphony
- Ventura Publisher* (Version 1.1 and 2.0)
- VersaCAD Design Version 5.3
- Windows Version 2
- WordPerfect 5.0

NOTE: The extended resolution 800 by 600 graphics mode of your Built-in VGA requires a multi-frequency monitor. The 1024 by 768 graphics mode requires an IBM 8514 or compatible interlaced monitor.

WARNING: If your Built-in VGA has 256K of memory, you have insufficient memory to display 16 color 1024 by 768 resolution or 256 color 640 by 480 resolution. You can display 2 and 4 color in 1024 by 768 resolution, as well as 256 colors in 640 by 400 resolution. Do not attempt to display resolutions which require more memory than you have on your Built-in VGA.

The Built-in VGA's 800 by 600 graphics mode is not supported on the IBM* PS/2* 8503, 8512, 8513 or 8514 monitors or equivalent fixed frequency displays.

You may need to adjust your multi-frequency monitor to display the 800 by 600 grpahics mode properly. Use the vertical and horizontal size and position controls on your monitor to display the entire 800 by 600 graphics mode image without distortion.

1.3 EXTENDED 256 COLOR 640 BY 400 AND 640 BY 480 GRAPHICS MODES

The Built-in VGA with 512K of DRAM can display up to 256 simultaneous colors at a resolution of 640 by 480 dots. This mode gives you five times the resolution of standard VGA 256 color graphics.

Your Built-in VGA with 256K of DRAM can display up to 256 simultaneous colors at a resolution of 640 by 400 dots. This mode gives you four times the resolution of standard VGA 256 color graphics.

Your Built-in VGA includes a driver for Microsoft Windows version 2 to use this mode.

1.4 132 COLUMN TEXT MODES

Your Built-in VGA will support two 132 column text modes on either fixed frequency or multi-frequency monitors. One provides 25 rows of 132 column wide text. The second allows

43 rows of 132 column wide text to be displayed. These modes display large amounts of information at one time. Compared to standard 80 column by 25 row text modes, these two new modes allow 65% and 184% more text to be displayed at one time on your monitor.

These extended modes require specific software support to take advantage of their capabilities in software applications. Your Built-in VGA includes 132 column text mode software support for:

- Framework II
- Lotus 1-2-3 and Symphony
- WordStar* (Release 3.30)
- WordStar* Professional (Release 4.0)
- WordPerfect*

SECTION 2.
INSTALLATION PROCEDURE

2.1 INSTALLATION PROCEDURE

All the drivers and utilities provided in the diskettes must be installed by using the INSTALL program. The INSTALL program should be executed from a floppy drive because it will not allow you to install to the source drive. You also should have the command processor (command.com) in the path, or you can copy it to the current directory. Please do not use the copy or xcopy command; instead use the diskcopy command to make working copies of the utilities disk.

If the installation process fails to complete itself, follow the instructions provided in the software manual to complete the installation. The required driver(s) would have been decompressed and extracted to the directory that you specified. The directory would be created if it does not already exist, but the target drive must be accessible. This process could be verified by the following screen messages: Installing, Reading, Verifying, Writing, Decompressing.

Type "install" at the DOS prompt to start installation of any drivers/utilities. Important messages, general warnings and any late changes or updates will be displayed on the monitor. Read this information carefully. The main selection menu will display. Use the arrow, [Page Up], [Page Down], [Home] and [End] keys to move around in the menu and to access options not shown on the screen. Press [Enter] to make the selection.

When all of the selections have been made, the INSTALL program will prompt you for the target drive and directory (if applicable). Remember to select only a floppy drive as target drive. If you must run the INSTALL program from a hard disk, be sure to copy all the library files (.lif) from the diskette onto the root directory. The diskette contains two hidden files; install.dat and disk.id Unhide and copy these files to the same root directory as the library files. For example, to install 'Window 3.0' using the INSTALL program on the hard disk, copy the disk that contains the library file **win3.lif** to the hard disk – do NOT copy the other diskette if the utilities software contain more than one disk. The disk.id uniquely identifies each disk for correct location of the library files. The **install.dat** script file tells INSTALL which file(s) to extract from the library.

Follow the screen prompts to install the drivers and utilities. To avoid problems due to the variety of possible configurations, it is recommended that you first read the appropriate section in the utilities software manual. Some drivers are installed automatically allowing the application to run in the new resolution immediately after the program is installed. Other applications may require you to run a configuration program in order to recognize the new driver. While others require a complete reinstallation of the application itself.

If you install the driver(s) into the directory where the application is installed, the INSTALL program will simplify the procedure. If you choose to install the driver manually, place the driver(s) in a temporary directory. The install program may display error messages while looking for a configuration program – ignore these messages. Install the driver(s) as per instructions in the software manual for the utilities. Be sure to specify the full path name when prompted for the driver(s). Note that some applications require the driver(s) to be in the same directory as the application itself, yet others require the driver to be on a floppy disk. Simply copy the driver(s) to the appropriate directory/drive and install the driver manually.

2.2 BUILT-IN VGA SOFTWARE

The provided software disks contain several programs which will assist in getting maximum performance from the built-in VGA adapter. Specifically:

RAMBIOS.EXE or RAMBIOS.SYS can be installed in DOS systems to copy the built-in VGA video BIOS to system memory for maximum performance. RAMBIOS.EXE is a TSR (terminate and stay resident) utility that can be executed from the DOS command prompt. RAMBIOS.SYS is a device driver that can be installed in the DOS CONFIG.SYS file.

VGA1024C.EXE allows users to select the video hardware standard of the built-in VGA either from a menu or directly from the DOS prompt line.

Various drivers that allow current application software packages to take advantage of the built-in VGA's extended graphics and 132 column text modes are supplied on the enclosed disks.

Copy the utility programs such as VGA1024C.EXE to the hard disk, and be sure to make back-up copies of your VGA Utilities disks.

RAMBIOS.EXE and RAMBIOS.SYS

These files provide two different methods to load the built-in VGA's video BIOS code into DOS system memory, since, once copied there, the video BIOS provides an additional measure of higher performance. Since these utilities use system memory, there will be 32 Kbytes less memory available for DOS and other applications. Also, since these utilities copy the video BIOS to unprotected system memory, the BIOS is susceptible to memory conflicts.

RAMBIOS.EXE is a TSR version of the video BIOS copy program which may be called at any time from DOS. Insert the VGA Utilities disk in drive A: and type the following command:

A: RAMBIOS [Enter]

A prompt will indicate the BIOS has been loaded into system memory, and there will be an immediate benefit in speed executing from system RAM. To return to normal ROM based BIOS operation, it is necessary to reboot (Ctrl-Alt-Del).

RAMBIOS.SYS is a device driver version of the video BIOS copy utility, and is intended to be installed through the DOS CONFIG.SYS file. To invoke RAMBIOS.SYS, copy it from the VGA Utilities disk to the DOS boot disk or hard disk. If the DOS boot disk does not already have a CONFIG.SYS file, create one as described in your DOS user's manual. Add the following command to the beginning of the CONFIG.SYS file:

DEVICE = RAMBIOS.SYS

When restarting DOS, the built in-VGA video BIOS will be automatically copied to system memory. To disable this driver, it is necessary to change the CONFIG.SYS file on the DOS boot disk, and reboot the system or boot from a different DOS disk. The device driver and TSR versions of RAMBIOS perform identically except for their methods of installation.

SECTION 3.
INSTALLING SOFTWARE APPLICATIONS

3.1 AutoCAD BY AUTODESK, INC.

The utility disk supports display and non-display list drivers for AutoCAD 10. Expanded memory is required to use display-list drivers.

To configure AutoCAD 10 for 800 by 600 or 1024 by 768 graphics mode.

1. Use the install utility to automatically copy the file.

   Non-display list driver:
   "DS800x16.EXE" for 800 by 600 by 16 color mode,
   "DS800FF.EXE" for 800 by 600 by 256 color mode.

   "DS102416.EXE" for 1024 by 768 by 16 color mode,
   "DS1024x4.EXE" for 1024 by 768 by 4 color mode.

   Display-list driver:
   "WDVGADL1.EXE" for 1024 by 768 by 16 color mode,
   "WDVGADL8.EXE" for 800 by 600 by 16 color mode.

   from the supplied VGA Utilities disk to the AutoCAD disk or directory. The file is a program that loads an ADI driver, which allows AutoCAD to work in the built-in VGA's extended resolution mode.

2. Go into the directory to which you have just copied the file and, type:

   [file name] f[n]*
   then press <Enter> to run the driver.

   * Where [n] is the number of kilobytes of expanded memory that the display-list driver should leave free for the use of AutoCAD.
   e.g.: to leave 512 kilobytes free enter
   [filename] f512

A message like the following will display:

"--- AutoCAD Device Interface (ADI) Display Driver ---"

This indicates that the AutoCAD driver has been loaded.

3. Execute ACAD to start the AutoCAD program.

   Option: type:
   [file name] i
   to run AutoCAD with an inverted black background.

   You may need to change AutoCAD vector interrupt code to something other than the default "7A". Type:
   [file name] xx
   where xx = a two digit hexadecimal vector interrupt code.

4. Additional readme files may be automatically copied from the utilities disk for you (depending on the driver selected).

3.2 LOTUS 1-2-3 BY LOTUS DEVELOPMENT CORP.

This section describes how to configure Lotus 1-2-3 to use 640 by 480, 800 by 600 graphics or 132 column modes for the built-in VGA.

WARNING: When adding new drivers to the 1-2-3 or Symphony INSTALL program, there will be a file created called SINGLE.LBR. If using Lotus 1-2-3 Release 2.0 or Symphony Release 1.1, make sure there is not already a file called SINGLE.LBR on the Utilities/Install Disk or in the Lotus hard disk subdirectory. If there is such a file, delete it prior to running INSTALL to add the new drivers. If using 1-2-3 Release 2.1 or Symphony 1.2, it is not necessary to delete the SINGLE.LBR file.

The following instructions are used to copy files from the VGA Utilities sub directory.

1. Use the utilities to copy the following drivers to the disk or directory as your 1-2-3 program and utilities.

   "SP0_25S.DRV" for the 132 column by 25 row mode.
   "SP0_43S.DRV" for the 132 column by 43 row mode.
   "SP1_480S.DRV" for the 640 by 480 by 16 color graphics mode.
   "SP1_600S.DRV" for the 800 by 600 by 16 color graphics mode.

2. Please see your Lotus manual for installation procedures for the drivers.

   When using Lotus's INSTALL.EXE file, choose:

Advanced Options

Add New Drivers to Library — This adds the .DRV files to the SINGLE.LBR files.

Then choose:

Modify Current Drivers Set — The new drivers will now be listed on the menu.

3.3 WINDOWS 3.0 BY MICROSOFT

This section describes how to configure Microsoft Windows 3.0 to use the 640 by 480, 800 by 600 or 1024 by 768 mode with the buint-in VGA.

Prior to the configuration, you must first install Windows 3.0.

1. Go to the directory where Microsoft Windows 3.0 is installed and type: SETUP.
2. Select the DISPLAY option by highlighting DISPLAY using the Up/Down arrow keys and press <Enter>.
3. Use arrow keys to scroll to the bottom of the list and select OTHER. You will be asked to insert the Display Driver Disk (VGA utility disk) in a floppy drive.

4. Place the VGA utility disk in the drive and type the pathname to the utility disk location.

5. Select the desired driver from the list defined on the screen. When the driver has been changed, you will return to the configuration screen.

6. Choose "Accept configuration shown above" and press <Enter> to execute the "Complete Changes" process. Windows will return to DOS when the configuration has been completed.

NOTE: COLORS.EXE is a Windows program which will display the colors used with the configured driver.

3.4 VENTURA PUBLISHER BY XEROX

This section describes how to configure Ventura Publisher release 2.0 to utilize the 800 by 600 or 1024 by 768 mode with the built-in VGA.

1. Use the utilities to automatically copy:
   "800C.DAT" for 800 by 600 color or "800M.DAT" for 800 by 600 monochrome or "1KC.DAT" for 1024 by 768 color or "1KM.DAT" for 1024 by 768 monochrome,

   to the filename "CONFIG.DAT" which is in the Ventura directory on the hard disk.

2. Change to the drive and directory which contains the CONFIG.DAT file.

3. Run "INSTALL.EXE" by typing: INSTALL then press <Enter>.

4. Select Ventura 1.1 or 2.0 in the menu by highlighting the name and pressing <Enter>. Exit the utility through the menu.

5. When finished with the Install program, choose "5. Exit to DOS" and press <Enter>.

6. Go to the directory that contains the VP.BAT file (usually in the root directory).

7. Change the "DRVRMRGR..." line in this file to:
   "DRVRMRGR VP %1/S=SD_800_C.VGA" for the 800 by 600 by 16 driver.
   "DRVRMRGR VP %1/S=SD_800_M.VGA" for the 800 by 600 by 2 driver
   "DRVRMRGR VP %1/S=SD_1K_C.VGA" for the 1024 by 768 by 16 driver
   "DRVRMRGR VP %1/S=SD_1K_M.VGA" for the 1024 by 768 by 2 driver

8. Type VP and Ventura Publisher will display in the selected resolution.

3.5 GEM BY DIGITAL RESEARCH INC.

This section describes how to configure GEM to utilize the 800 by 600 or 1024 by 768 mode with the built-in VGA.

1. Use the utilities to automatically copy:
   "800C.DAT" for 800 by 600 color or "800M.DAT" for 800 by 600 monochrome or "1KC.DAT" for 1024 by 768 color or "1KM.DAT" for 1024 by 768 monochrome to the filename "CONFIG.DAT" which usually resides in the GEMapps directory.

2. Change to the drive and directory which contains the CONFIG.DAT file.

3. Run "INSTALL.EXE" by typing: INSTALL

4. Select GEM/3 in the menu by highlighting the name and pressing <Enter>. When finished with the Install program, choose "5. Exit to DOS" and press <Enter>.

5. Go back to the root directory and type GEM.

3.6 CADVANCE BY CALCOMP GROUP

To install Cadvance for use with the built-in VGA in the 1024 by 768 or 800 by 600 graphics modes, copy the appropriate file from the VGA 1024C Utilities to the Cadvance disk or directory.

NOTE: If modifying the program on a floppy disk, be sure to use a duplicate of the Cadvance disk.

Use the supplied utilities to install the Cadvance driver.

3.7 FRAMEWORK II BY ASHTON-TATE

The VGA1024C Utilities disk includes drivers for Framework II to support many different configurations with the built-in VGA in its extended capabilities. There are drivers that support 132 columns by 25 or 43 lines of text for the "desktop" as well as drivers that support the 800 by 600 graphics mode for the "desktop" and the "zoom" [F9] function.

Depending on your choice of screen formats for the "desktop" and "zoom" screens Framework II drivers can be used for the following configurations in addition to the standard IBM EGA, VGA and PS/2 configurations.

Use the utilities to extract the desired driver before using the setup procedure as described below.

Screen Format	"Desktop" Screen	"Zoom" (F9) Screen	Driver Name
1	132 column by 25 line text	640 by 480 graphics	PVGA1.SC
2	132 column by 43 line text	640 by 480 graphics	PVGA2.SC
1	132 column by 25 line text	800 by 600 graphics	PVGA3.SC
2	132 column by 43 line text	800 by 600 graphics	PVGA4.SC
3	800×600 graphics	800 by 600 graphics	PVGA5.SC

Installing Framework II Drivers

Before installing Framework II for any of these new drivers, first install Framework II with a screen driver chosen from the standard IBM Enhanced Graphics Adapter, VGA and PS/2 display drivers according to the instructions in the Framework II *Getting Started* manual. Then make sure Framework is functioning properly before proceeding with the installation of the extended mode drivers.

1. To install the new Framework II drivers, run the SETUP program on the Framework II Setup disk or from the Framework II directory if it is installed on your hard disk. Type:

   SETUP [Enter]

2. At the "Welcome to Framework II's 'Setup' program" menu, choose option 2, "All other uses of the setup program."

3. Inform the Setup Program of the location of the FWSETUP file that stores the current configuration.

   If using a floppy system, insert the *System Disk 2* in drive B: and press 1.

   If using a hard disk system, choose option 2 since FWSETUP should be in the current default directory.

4. At the "Main Menu" choose option 2 to change individual configuration settings.

5. From the "Change Configuration" menu choose 1 to change primary hardware configurations which include the screen driver.

6. Choose 1 to change the Screen driver. Then choose option 7, "I want to enter my own driver file name." Enter the name of the driver from the table below and press [Enter].

Driver Name	"Desktop" Screen Format	"Zoom" Screen Format
PVGA1.SC	132 by 25 text	640 by 480 graphics
PVGA2.SC	132 by 43 text	640 by 480 graphics
PVGA3.SC	132 by 25 text	800 by 600 graphics
PVGA4.SC	132 by 43 text	800 by 600 graphics
PVGA5.SC	800 by 600 graphics	800 by 600 graphics

For example, to choose the driver for 132 column by 43 line format for the "desktop" and 800 by 600 graphics for the "zoom" function type:

PVGA4.SC [Enter]

Be sure to type the complete driver name including the .SC extension.

7. Type M to return to the main menu.
8. At the main menu type 7 to "Save All New Settings."
9. You will then be prompted to insert the *Setup Disk* in drive A. Insert the driver disk in drive A, then press the space bar.
10. Again the Setup program will want to know where to store the FWSETUP configuration file. Follow step 3 and choose the option for your setup.

    1 - for floppy systems;
    2 - for hard disk systems.

    Then strike any key.

    You have now installed Framework II for the new drivers. Start Framework II in the normal manner, and Framework II will use the selected capabilities of your built-in VGA.

3.8 WORDSTAR RELEASE 3.3 BY MICROPRO INTL. CORP.

The following instructions are used to configure WordStar Release 3.30 for use in the 132 column text modes. This procedure will patch a copy of WordStar to increase the number of rows and columns available to the program.

Modifying WordStar to Support 132 Column Text.

WordStar 3.3 has to be installed first before running the utility disk.

1. Run utilities to copy the file WS.COM to WS132.COM on the WordStar diskette or hard disk sub-directory.
2. Copy the program DEBUG.COM from the DOS system disk to the WordSTar diskette or directory.

   COPY A: DEBUG.COM C: WS]Enter]
3. Execute the following command:

   "debug WS132.COM < ROW"

Running WordStar 3.3 in 132 Column Text Mode

1. Modify the WordStar program as described in the procedure above.
2. Use the appropriate 132 column mode switching program from the VGA1024C Utilities to switch to the correct 132 column mode. Use the chart below to determine the correct command.

To switch to:	Run the command:
132 column by 25 line text	VGA 1024C 13225
132 column by 43 line text	VGA 1024C 13243
Standard 80 column by 25 line text	VGA 1024C VGA

Run the VGA1024C.EXE utility to switch to 132 column mode prior to starting your modified copy of WordStar.

For example: If the WordStar program has been modified for 132 column by 43 line text as described above, run the following commands to start WordStar:

VGA1024C 13243 [Enter]
WS132 [Enter]

3. When exiting WordStar, run the program VGA1024C VGA to return the screen to standard 80 column by 25 line text.

NOTE: You may want to incorporate all the commands needed to start WordStar in 132 column mode in a batch file so the process of starting the program will be automatic.

Example batch file contents:

VGA1024C 13243 [Enter] {Set 132x43 mode}
WS132 [Enter] {Run WordStar}
CLS [Enter] {Clears Screen]
VGA1024C VGA [Enter] {Return to 80 column VGA mode;

3.9 WORDSTAR PROFESSIONAL BY MICROPRO INTL. CORP.

WordStar Professional Release 4.0 can make use of 132 column text modes without special modification to the software. Simply tell the software the screen size in number of rows and columns of text and the software will take advantage of the new configuration.

Installing WordStar Professional For Use in 132 Column Text Modes

Install WordStar Professional for the appropriate screen size as described in *Appendix C – Customizing WordStar* of the WordStar Professional documentation.

1. Copy WordStar Professional Release 4.0 to the working floppy disk or hard disk as directed in the WordStar Professional documentation.

2. Start WordStar's WSCHANGE installation program.

3. Type in the name of the WordStar program file.

   For example WS.EXE.

   Next you will be prompted to enter the name of the file to which you wish to save the changes. You may wish to call this file WS132.EXE.

4. At the Main Installation Menu choose option A for Console options.

5. At the Console Menu choose option A for Monitor options.

6. At the Monitor Menu choose option C for Scrren sizing.

7. At the Screen Sizing Menu choose option A for **Hight.** You will then be asked to enter the correct value for the screen format you will use.
   This should be:
   25 - for a 132 column by 25 row screen, or
   43 - for a 132 column by 43 row screen.
   You will then be returned to the Screen Sizing Menu.

8. At the Screen Sizing Menu choose option B for **Width.** You will then be asked to enter the correct value for the screen format you will use. This should be 132 for either of the 132 column text modes. You will then be returned to the Screen Sizing Menu.

9. When your choices have been made, type X to return to the Monitor Menu. Type X from the Monitor Menu to return to the Console menu. Type X from the Console Menu to return to the Main Installation menu. Type X at the Main Installation Menu to indicate that you have completed the installation. You will be asked to confirm your choices and the WSCHANGE program will modify and save the WordStar program.

   This procedure will not have to be run again unless changes to the WordStar program configuration are needed.

Running WordStar Professional in 132 Column Text

1. Use the VGA1024C.EXE utility program on the VGA1024C Utilities to switch to the 132 column mode of your choice. Use the chart below to determine the correct command.

To switch to:	Run the command:
132 column by 25 line text	VGA 1024C 13225
132 column by 43 line text	VGA 1024C 13243
Standard 80 column by 25 line text	VGA 1024C VGA

2. Start your modified copy of WordStar. The full screen capabilities of the 132 column text modes in WordStar Professional Release 4.0 are now available.

NOTE: You may want to incorporate all the commands needed to start WordStar Professional in 132 column mode in a batch file so the process of starting the program will be automatic.

Example batch file contents:

VGA1024C 13243 [Enter]
WS132 [Enter]
VGA1024C VGA [Enter]

3.10 WORDPERFECT BY WORDPERFECT CORP.

Some programs like WordPerfect version 4.2 can make use of 132 column text modes without any special modification to the software. Simply tell the software the number of rows and columns of text you can display on your monitor and the software will take advantage of the new configuration.

Running WordPerfect in 132 Column Text Mode

1. Use the appropriate 132 column mode switching program on the VGA 1024C Utilities to switch to the desired 132 column mode. Use the chart below to determine the correct command.

To switch to:	Run the command:
132 column by 25 line text	VGA 1024C 13225
132 column by 43 line text	VGA 1024C 13243
Standard 80 column by 25 line text	VGA 1024C VGA

   Run the 132 column mode switching software prior to starting WordPerfect.

2. Start WordPerfect with a /S after the name of the program to get to the Set-up Menu.

   WP/S [Enter]

3. Choose option 3 (Set Screen and Beep Options).

4. Enter the number of rows (25 or 43) and the number of columns (132). Press the [Enter] key until you return to the Set-up Menu.

5. Choose option 0 to accept the configuration and enter WordPerfect.

6. When you exit WordPerfect, run the command VGA1024C.EXE VGA to return the screen to standard 80 column by 25 line text.

   Once WordPerfect has been configured, the Set-up Menu will not need to be used again except to make configuration changes.

   When in the WordPerfect program, the margins ([shift] [F8]) can be set to be as wide as 132 characters.

NOTES:

1. You may want to incorporate all the commands needed to start WordPerfect in 132 column mode in a batch file so the process of starting the program will be automatic.

   Example batch file contents:

   VGA1024C 13243 [Enter]
   WP [Enter]
   CLS [Enter]
   VGA1024C VGA [Enter]

2. WordPerfect 5.0 supports graphics screen drivers. Use the utilities to copy WDPVGA1A. WPD to the directory where WP.EXE is located.

   Configure the WordPerfect 5.0 to use the 800 by 600 driver by:
   — typing WP,
   — entering the Setup Key (Shift + F1),
   — choosing display, and
   — selecting the 800 by 600 driver.

3.11 GENERIC CADD LEVEL 3 BY GENERIC SOFTWARE INC.

The following instructions are provided to configure Generic Cadd Level 3 for use with the 1024 by 768 and 800 by 600 graphics drivers:

1. Use the utilities to copy the driver and run CONFIG.EXE. You will be asked to press any key after the **current configuration** is displayed.
2. Select "1" for video graphics display.
3. Choose the appropriate VGA 1024C driver.
4. Exit to DOS by selecting "8".
5. Respond "Y" to save the selected rivers.

The Generic Cadd Level 3 installation is now completed for the appropriate extended mode and can be started in a normal manner to utilize the 1024 by 768 or 800 by 600 graphics mode of the built-in VGA.

NOTE: The 1024 by 768 2 and 4 color and the 800 by 600 drivers will run on either the 256 Kbyte or 512 Kbyte configuration of the built-in VGA. The 1024 by 768 16 color driver will run only on the 512 Kbyte configuration of the built-in VGA.

3.12 VersaCAD DESIGN VERSION 5.3 AND 5.4 BY VERSACAD CORP.

The instructions provided below are used to configure the VersaCAD Design Version 5.3 and 5.4 for use with the 1024 by 768 and 800 by 600 graphics mode software drivers:

1. Use utilities to copy the driver and run the ENVIRO.EXE program to set up the new screen driver.
2. Environment menu 3 is used to select the 1024 by 768 or 800 by 600 single screen drivers.
3. Depending on the resolution desired, start VersaCAD by executing:

"VCAD53 1024" for 1024 by 768 by 16 color resolution.
"VCAD53 800" for 800 by 600 by 16 color resolution.

or

"VCAD54 1024" for 1024 by 768 by 16 color resolution.
"VCAD54 800" for 800 by 600 by 16 color resolution.
"VCAD54 256" for 256 colors driver.

The VersaCAD Design Version 5.3 or 5.4 has now been installed for either the 1024 by 768 or 800 by 600 graphics driver.

SECTION 4.
ADVANCED TOPICS

VGA AND EXTENDED VGA PROGRAMMING

This section describes how to access the enhanced modes of your *Built-in VGA*. The information in this section is intended for users familiar with assembly language programming. An understanding of this information is not necessary for normal operation of your *Built-in VGA*.

The VGA standard supports a variety of video modes. These video modes can be accessed through standard video BIOS calls from assembly language as well as high level language routines. You are probably familiar with many of these video modes already. When you start up in DOS, your machine is usually in standard 80 column text or "alpha-numeric" mode. On a color system this is mode 3+. VGA 640 by 480 dot 16 color graphics is mode 12H. The following table lists the standard VGA video modes available with your *Built-in VGA*.

STANDARD VGA VIDEO MODES

Mode (hex)	Type	Colors (1)	Columns	Rows	Buffer	Char. Size (2)	Res. (3)
0	text	16/256K	40	25	B8000	8×8	320×200
0*	text	16/256K	40	25	B8000	8×14	320×350
0+	text	16/256K	40	25	B8000	9×16	360×400
1	text	16/256K	40	25	B8000	8×8	320×200
1*	text	16/256K	40	25	B8000	8×14	320×350
1+	text	16/256K	40	25	B8000	9×16	360×400
2	text	16/256K	80	25	B8000	8×8	640×200
2*	text	16/256K	80	25	B8000	8×14	640×350
2+	text	16/256K	80	25	B8000	9×16	720×400
3	text	16/256K	80	25	B8000	8×8	640×200
3*	text	16/256K	80	25	B8000	8×14	640×350
3+	text	16/256K	80	25	B8000	9×16	720×400
4	graph.	4	40	25	B8000	8×8	320×200
5	graph.	4	40	25	B8000	8×8	320×200
6	graph.	2/256K	80	25	B8000	8×8	640×200
7	text	4	80	25	B0000	9×14	720×350
7+	text	4	80	25	B0000	9×16	720×400
D	graph.	16/256K	40	25	A0000	8×8	320×200
E	graph.	16/256K	80	25	A0000	8×8	640×200
F	graph.	4	80	25	A0000	8×14	640×350
10	graph.	16/256K	80	25	A0000	8×14	640×350
11	graph.	2/256K	80	30	A0000	8×16	640×480
12	graph.	16/256K	80	30	A0000	8×16	640×480
13	graph.	256/256K	40	25	A0000	8×8	320×200

(1) Colors: Where two numbers are given, the first is the number of colors available at one time; the second number is the total number of possible colors. For mono modes this number refers to the number of attributes.

(2) Character Size: The size of the matrix that contains each text character.

(3) Resolution: all 200 line modes are "double-scanned" to display 400 lines on screen.

* EGA style text modes with 8×14 and 9×14 character sizes and 350 lines vertical resolution.

\+ VGA style text modes with 9×16 character size and 400 lines vertical resolution.

Default modes are 3+ for color monitors and 7+ for monochrome monitors.

Your *Built-in VGA* adds ten additional modes to the standard VGA modes. These modes are the 1024 by 768 and 800 by 600 extended VGA graphics modes, the 640 by 400-256 color graphics and the 132 column by 25 row and 43 row text modes. These modes have each been assigned mode identification numbers. The table below summarizs these new modes.

EXTENDED VGA VIDEO MODES OF THE VGA 1024 CARD

Mode (hex)	Type	Colors (1)	Columns	Rows	Buffer	Char. Size (2)	Res.	Equip. Flag(3)
54†	text	16/256K	132	43	B8000	7×9	924×387	color
54*	text	16/256K	132	43	B8000	8×9	1056×387	color
55†	text	16/256K	132	25	B8000	7×16	924×400	color
55*	text	16/256K	132	25	B8000	8×16	1056×400	color
56†	text	4	132	43	B0000	7×9	924×387	mono
56*	text	4	132	43	B0000	8×9	1056×387	mono
57†	text	4	132	25	B0000	7×16	924×400	mono
57*	text	4	132	25	B0000	8×16	1056×400	mono
58	graph.	16/256K	100	75	A0000	8×8	800×600	color
59	graph.	2	100	75	A0000	8×8	800×600	mono
5A	graph.	2	128	48	A0000	8×16	1024×768	mono
5B	graph.	4	128	48	A0000	8×16	1024×768	color
5D	graph.	16 (4)	128	48	A0000	8×16	1024×768	color
5E	graph.	256/256K	80	25	A0000	8×16	640×400	color
5F	graph.	256 (4)	80	30	A0000	8×16	640×480	color
6A‡	graph.	16/256K	100	75	A0000	8×8	800×600	color
6B‡	graph.	2	100	75	A0000	8×8	800×600	mono

(1) Colors: Where two numbers are given, the first is the number of colors available at one time; the second number is the total number of possible colors. For mono modes this number refers to the number of attributes.

(2) Character Size: The size of the matrix that contains each text character.

(3) Equipment Flag. Required setting of the BIOS data value at address 40:10 bits 5 and 4. (0,1 or 1,0 = color, 1,1 = mono)

(4) These modes require the 512K memory configuration in order to run on the *Built in VGA*.

‡ = VESA modes (different monitor timings from modes 58 and 59).

† = fixed frequency monitor setting.

* = multi-frequency monitor setting.

The fixed or multi-frequency monitor setting is determined by lever one of the DIP switch on the Built-in VGA.

Programming the extended modes of the *Built-in VGA* is similar to programming the standard VGA video modes of the IBM PS/2 VGA and PS/2 Display Adapter. You may wish refer to the following publications for details on programming VGA in general.

IBM Personal System/2 Display Adapter*
Technical Reference, April 1987
IBM part number 68×2251 S68X-2251-0

IBM Personal System/2 and Personal Computer
BIOS Interface Technical Reference, April 1987
IBM part number 68×2260 S68X-2260-00

Programmer's Guide to PC and PS/2 Video Systems,
by Richard Wilton, Microsoft Press, 1987.
(ISBN 1-55615-103-9)

Printed in KOREA
Code No: 98134-716-006