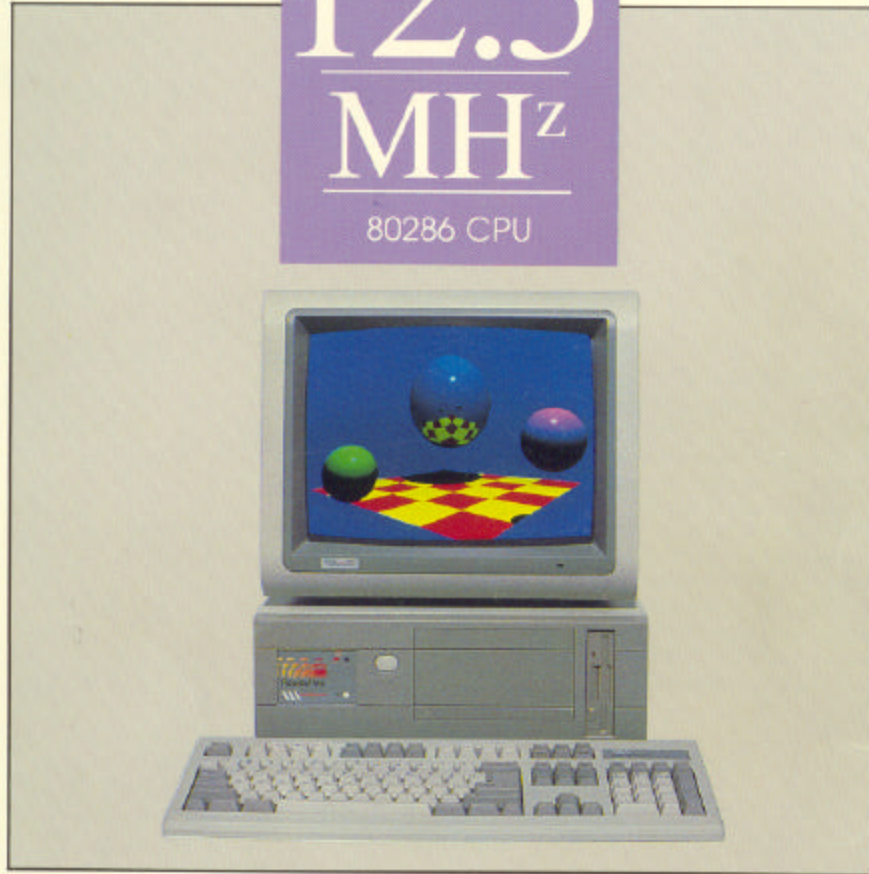


12.5
MH^z

80286 CPU



PowerFlex User's Manual

The *PowerFlex Reference Manual* provides the information necessary to operate your new PowerFlex computer manufactured by Advanced Logic Research, Inc. (ALR). This manual assumes you have some experience using IBM-type personal computers and are familiar with DOS operating systems. You should know how to use a standard keyboard and understand special keys (for example, CTRL). You can obtain background in these areas by referring to your DOS system documentation. Additional information is available in a variety of instruction manuals for IBM PC and AT systems. You can purchase these manuals at your local bookstore.

The *PowerFlex Reference Manual* is organized as follows:

Chapter 1, General Information — describes the major components of the PowerFlex system.

Chapter 2, Getting Started — explains how to set up the PowerFlex system. It lists the PowerFlex components, how to properly unpack, hook up the monitor and keyboard, and initialize the system with a DOS diskette. The SETUP program and memory features are also described.

Chapter 3, using the Utilities Diskette — discusses the hard disk formatting, EMS, and other utility programs available with the PowerFlex.

Chapter 4, Basic System Configurations — describes the configuration of the 286 motherboard. Topics covered include memory installation and configuration, motherboard pinouts, and serial and parallel port configurations.

Chapter 5, Options — explains how to configure and install optional equipment available for the PowerFlex. Optional equipment includes the PowerFlex modules, math coprocessors, graphics adapters, 3½ and 5¼-inch floppy disk drives, and tape backup systems.

Appendix A, Error Messages — lists nonfatal and fatal system board beep codes. Descriptions of various errors and solutions to nonfatal errors are also provided.

Appendix B, Hard Disk Drive Characteristics — lists the 49 drive types supported by the PowerFlex.

Conventions Used In This Manual

The following conventions are used in this manual:

<Enter> <Enter> means you press the Enter (↵) key. After you type a keyboard entry, you press the Enter key to execute the entry.

Keyboard entries Keyboard entries are BOLD. For example:

A>PROCEED WITH FORMAT (Y/N)?

A>**Y** <Enter>

After the system prompt (A>), the computer asks if you want to proceed. Your keyboard entry in this example is Y (yes).

Keyboard sequence When a key sequence is hyphenated, press the keys in the order shown. All keys must remain pressed until the sequence is complete. For example:

C > CTRL-C

means hold down the CTRL key and press the C key (CTRL-C generally ends a program).

In the following example:

C> CTRL-ALT-DEL

means you hold down the CTRL key first, then hold down the ALT key and press the DEL key. The CTRL-ALT-DEL sequence reboots the system.

Typing commands You can enter commands in either upper- or lowercase letters. For example, entering:

A>**dir** <enter> is the same as entering:

A>**DIR** <Enter>

Variables Words within < > angle brackets are variables and can have many names.

Options Words or items within square brackets [] are options. Enter only one of the options from the list provided.

Chapter 1, General Information

In the rapidly changing world of computer technology, every computer owner wonders if their system could one day become obsolete. ALR has conquered the fear of obsolescence with the introduction of the PowerFlex, a 286-based system enhanced with ALR's unique 108-pin 386/1486 Feature Connector. This unique feature currently allows you to upgrade the standard 12.5-MHz 286 PowerFlex system to a 16-MHz 386SX or 25-MHz 1486 system by plugging in either a PowerFlex 16-MHz 386SX or 25-MHz i486 Module. That's all there is to it. There are no switches to change on the 286 motherboard. When you plug a PowerFlex Module in, it simply takes over and you instantaneously attain the higher technological level that you were seeking.

Furthermore, ALR has no intention of limiting the PowerFlex to the 386SX and i486 modules. Future PowerFlex modules with even higher levels of technology are already being developed. When you're ready to move up from 286 technology, simply contact your authorized ALR dealer to learn what PowerFlex modules are being offered, and to decide which upgrade module would best suit your needs.

PowerFlex system

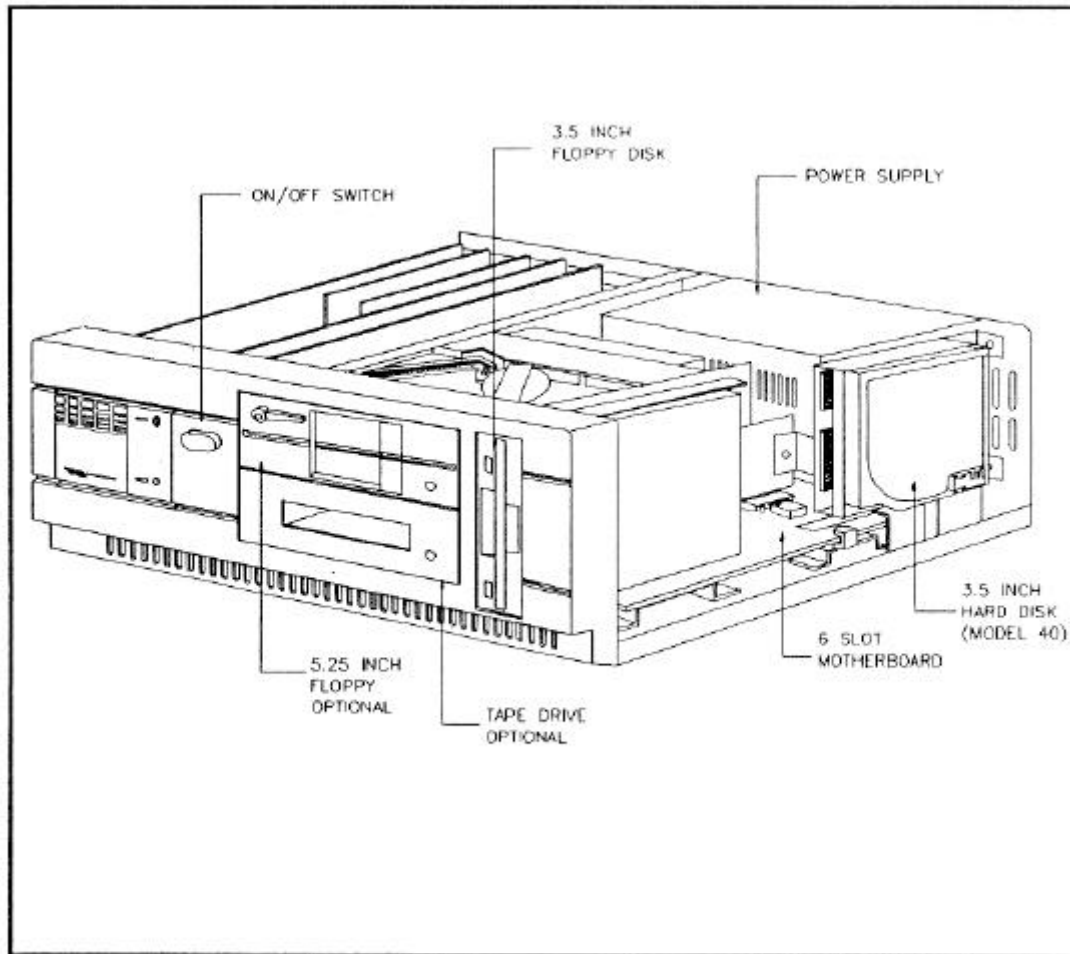
The PowerFlex is a flexible IBM AT-compatible computer. The motherboard provides embedded I/O ports, floppy and hard disk controllers leaving all six IBM PC/AT expansion slots available for individual requirements. The PowerFlex also features a unique hardware and software Expanded Memory Specification (EMS) device driver that allows the user to run extended features of many popular software applications such as Lotus 1-2-3, Ventura Desktop Publishing, and Microsoft Windows. Add to this ALR's unique 386/i486 Feature Connector, and you have a system that is almost boundless in its expansion capabilities, making the PowerFlex the ideal entry-level computer.

The standard PowerFlex is a 12.5-MHz 286 CPU system with a 3½-inch 1.44-MB floppy disk drive using the motherboard's embedded floppy controller. The embedded 40-MB < 40ms AT-style hard disk drive provides full-track buffering and 1:1 page interleave.

The chassis is ALR's specially designed small footprint AT-style desktop with a total dimension of 6" H x 15" W x 17" D which can accommodate two half-height 5¼-inch and two 3½-inch devices.

Components and performance features

Figure 1-1 shows the major components inside the PowerFlex. The following subsections describe these major components.



Memory

The PowerFlex is based on a 12.5-MHz 286 motherboard. The standard PowerFlex contains 1-MB of paged mode memory that occupies Banks 1 and 2. Banks 3 and 4 each contain two rows of Single Inline Memory Module (SIMM) connectors for mounting additional 256K x 9 or 1MB x 9 SIMMs. The maximum onboard memory is 5-MB. System memory may be expanded to 16-MB with the use of third party 16-bit memory expansion cards. See Chapter 4 of this manual for complete memory configuration and installation details.

Drives and controllers

The PowerFlex chassis accommodates two 3½-inch and two 5¼-inch devices. The floppy disk drive included with the PowerFlex is a 1.44-MB 3½-inch floppy drive. The drive is springloaded and ejects diskettes about an inch. The floppy controller, integrated on the 286 motherboard, supports up to two 3½-inch drives with 720-KB or 1.44-MB capacities or, up to two 5¼-inch drives with 360-KB or 1.2-MB capacities.

The standard PowerFlex includes a 3½-inch 40-MB (<40ms) embedded hard disk drive. This drive is a special AT-interface drive that contains controller functions; hence, the name embedded hard disk drive. In addition, the controller functions can accommodate up to two hard disk drives allowing for storage expansion.

The PowerFlex chassis can accommodate two other half-height devices. You can use these storage bays to install optional floppy drives (any combination of 3½ and 5¼-inch drives are possible), hard disk drives, or tape backup systems. See Chapter 5 for further details.

BIOS EPROM

The Basic Input/Output System (BIOS) from Phoenix Technologies Ltd. controls the input/output (I/O) devices in the system. The I/O protocol for peripheral devices such as terminals, printers, and scanners is completely IBM-compatible.

There are no switches to set on the PowerFlex as all configuration changes are made through the PowerFlex SETUP program. A special SETUP screen, dedicated solely to select Soft Switch options, is one of three SETUP screens specially designed for the PowerFlex (see Chapter 2). An additional feature of the BIOS allows you to activate the SETUP program by pressing simultaneously the **CTRL-ALT-ESC** keys at the DOS prompt, or if the system's setup configuration is incorrect, the system prompts you to press the F2 key.

Keyboard features

The PowerFlex includes an enhanced IBM AT-compatible keyboard with the added feature of audible keystrokes. Plus, you can change the operating speed by simply pressing the **CTRL-ALT-MINUS** or **CTRL-ALT-PLUS** sequences (see Chapter 2).

Standard software

The utility programs in the utilities diskette include hard disk formatting programs, drivers for two versions of Novell's NetWare, and the Expanded Memory Specification (EMS) device driver. The diskette provides separate subdirectories containing each set of utility programs. Each subdirectory includes a README file explaining the functions of the associated utility. Chapter 3 describes how to use the utilities diskette.

ALR does not provide standard DOS with the PowerFlex. However, the PowerFlex is compatible

with MS-DOS 3.3x and IBM PC-DOS version 3.3. ALR provides MS-DOS version 4.01 as an option. Note: The BASIC and BASICA software from IBM PC-DOS will not run because they require BASIC support in the BIOS and therefore will run only on IBM systems. We do include GW-BASIC in our MS-DOS option; this will provide the same function as BASICA (GW-BASIC is written by Microsoft).

Specifications

<i>Processor (CPU)</i>	16-bit 286 operating at 12.5-MHz
<i>Coprocessor</i>	Socket for an Intel 8-MHz 80287 or 12-MHz 80C287A- 12
<i>Clock Calendar</i>	IBM AT-compatible clock calendar with on board NICAD rechargeable battery (10 Year Lifetime)
<i>BIOS</i>	Phoenix, 64-KB EPROM with on board setup
<i>Expansion</i>	Available for user requirements: one 8-bit and five 16-bit slots; one dedicated 386/i486 Feature Connector
<i>Memory</i>	286 motherboard contains 1-MB of standard memory and four rows of SIMM connectors (2 rows per bank) to add an additional 4-MB
<i>On Board</i>	1-MB memory: 640-KB of real memory and 384-KB of EMS memory; optional onboard expansion to 5-MB
<i>System</i>	16-MB total system expansion using third party 16-bit memory expansion cards
<i>Floppy/Hard Disk Subsystem</i>	
<i>Floppy Drive</i>	One 1.44-MB 3½-inch floppy disk drive
<i>Hard Disk Drive</i>	High-performance 1:1 interleave 40-MB <40ms embedded AT hard disk drive with accommodations for optional second 1:1 interleave 40-MB <40ms embedded AT hard disk drive
<i>Controllers</i>	Embedded AT-interface floppy and hard disk controllers
<i>I/O Ports</i>	one serial, parallel and keyboard port
<i>Keyboard</i>	101-key, enhanced
<i>Software</i>	utilities diskette

<i>DMA Controllers</i>	Dual DMA controller, one for 8-bit transfers and one for 160-bit transfers	
<i>Interrupts</i>	<i>Interrupt</i>	<i>Function</i>
	0	Timer Channel (Time of Day)
	1	Keyboard
	2	Cascade (Interrupts 8-15)
	3	COM2 and Expansion Slots
	4	COM1 and Expansion Slots
	5	Parallel Port and Expansion Slots
	6	Floppy controller
	7	Parallel Port and Expansion Slots
	8	Calendar
	9-12	Expansion Slots
	13	80287 Math Coprocessor
	14-15	Expansion Slots
<i>Timer</i>	8254-compatible timer with 840ns resolution. Three timer channels are available:	
	<i>Channel</i>	<i>Function</i>
	0	Time of Day
	1	Refresh
	2	Speaker
<i>Dimensions</i>	6" H x 15" W x 17" D	
<i>Weight</i>	35 lbs.	
<i>Power Supply</i>	150 watts	
<i>AC Input</i>	110 VAC or 220 VAC	
<i>DC Output</i>	4.5A @ + 12V \pm 5% .3A (max) @ -12V \pm 10% 18A(max)@ +5V \pm 5% .3A (max) @ -5V \pm 10%	
<i>Temperature</i>	0 to 40° C	
<i>Humidity</i>	0 to 90% non-condensing	
<i>Altitude</i>	8,000 feet	

Chapter 2, Getting Started

Charging the system battery

This system is equipped with a Nicad rechargeable battery with a built-in trickle-charge circuit. A completely charged battery will maintain its charge for two months. Upon delivery this system battery requires an initial charging period of approximately 12 hours. Prior to complete charging, the system may power up with an error in the setup configuration. Should this occur, simply press the F2 key to run the SETUP program. Refer to the section entitled, "SETUP program," later in this chapter for further information on the SETUP program.

To charge the Nicad battery, simply plug your PowerFlex into a 3-prong, 115-volt AC surge control outlet station and turn the system ON. Leave the system running for at least 12 hours to fully charge the battery.

After charging, the Nicad battery should provide approximately a two-month backup charge without a recharge (recharging is done by running the system). The total lifetime of the battery is approximately 10 years.

Hooking up the monitor and keyboard

The monitor and keyboard are completely assembled at the factory; however, you must connect cables between the system, the monitor, and the keyboard. Figure 2-1 shows the rear of the PowerFlex chassis. This figure shows input/output (I/O) connectors for the keyboard, monitor (A.C. OUT), and optional equipment (COM1, LPT1 and Expansion Slots).

Connect your monitor and keyboard securely into the proper connectors. Most monochrome monitors have a separate ON/OFF switch and a power connector that plugs into the rear of the chassis. Refer to the appropriate manual that came with your monitor for further details.

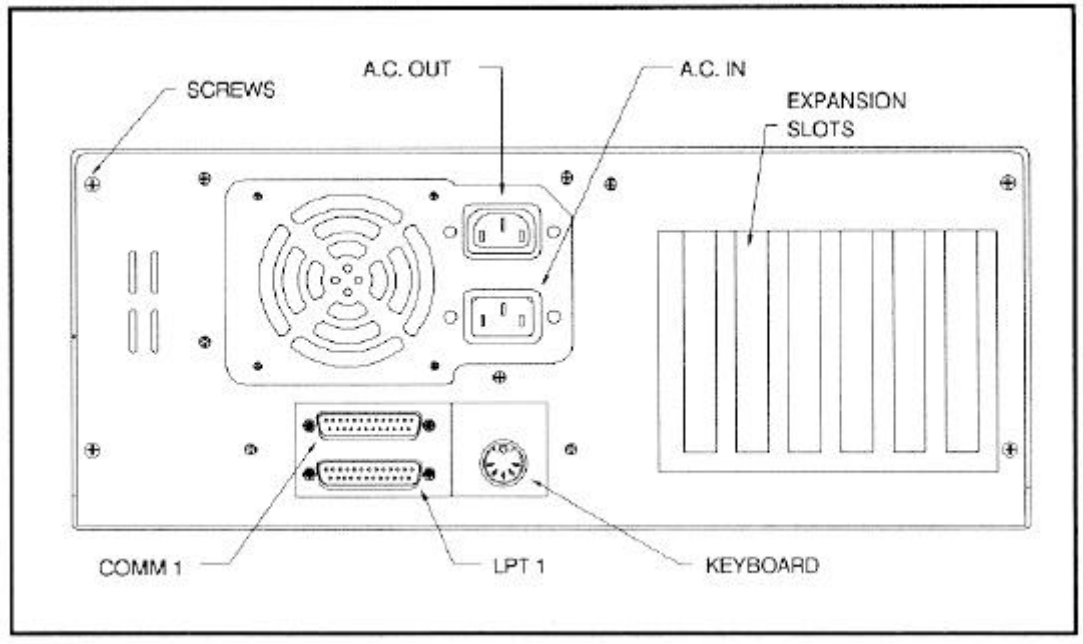


Figure 2-1: Rear of the PowerFlex

Power-up operation

Turn the power ON. The ON/OFF switch is at the front of the chassis as shown in Figure 1-2.
Turn the monitor power ON. The power LED lights if power is on.

On power-up, the PowerFlex checks its system memory. This occurs whether or not the monitor is also on. The system memory check (called the Power-On Self-Test or POST) takes from 3 to 15 seconds to complete, depending on system memory capacity. It ends with a single beep and a display of the time and date. The monitor displays the power-on message, as shown in Figure 2-2.

```

Phoenix ROM BIOS PLUS Version x.xx
Copyright (C) 1985-1986 Phoenix Technologies Ltd.
All Rights Reserved

Advanced Logic Research Inc. PowerFlex 286/386SX
<640K> Base Memory, <384K> Extended Memory

Non-System disk or disk error
Replace and strike any key when ready
  
```

Figure 2-2: Power-On Screen

WARNING: You must allow the PowerFlex POST sequence to be completed before you turn the PowerFlex off. If you turn your system off immediately after a power-up sequence, wait until your DOS or OS/2 prompt appears on the screen. Failure to do this may cause errors in the SETUP configuration requiring you to re-run the SETUP program.

If the system fails the memory test, the monitor displays an error message preceded by two beeps. If the video adapter is not initialized when the error occurs, a beep code signals the error message. Appendix A lists the power-on self-test (POST) error messages. Most messages are nonfatal or offboard failures. If a fatal error message occurs, contact ALR for field service support. Do not return any equipment to the factory without obtaining a Return Material Authorization (RMA) number.

Insert your DOS diskette in Drive A. Press F1 to reboot the system, as follows:

F1

The system responds with the following:

```
Current date is Wed 06-14-1989
Enter new date (mm-dd-yy): <↵>
Current time is 14:10:45.05
Enter new time: <↵>
```

Run the SETUP program by pressing the F2 key if the date or time is incorrect or if the system powers up with the message `INVALID CONFIGURATION INFORMATION`. The section entitled *SETUP program* later in this chapter explains how to use the SETUP program.

Initializing the hard disk drive

You must initialize (partition and format) the hard disk drive before you can run any software. To initialize the hard disk (to prepare it for DOS), use the FDISK and FORMAT commands.

NOTE: To eliminate major problems during partitioning (FDISK) or formatting (FORMAT), make sure the system is running in **LOW** speed during these operations. Refer to the next section of this chapter for information on selecting an operating speed.

Use the following procedures to partition and format the hard disk:

1. Partition the hard disk drive using FDISK.

Insert your DOS diskette in Drive A and boot the system by entering:

```
F1 (F1 = function key)
```

Partition the drive by entering:

```
A> FDISK <Enter>
```

The FDISK program displays a series of menus to help you partition your hard disk for MS-DOS. The system reboots after it completes the FDISK program. If the system does not allow you to complete the FDISK procedure, make sure the system setup information is correct. More specifically, you need to make sure the drive type is correct. A label indicating the

appropriate drive type is attached to the ALR hard drives. The PowerFlex SETUP program is described later in this chapter in the section entitled SETUP Program.

NOTE: The hard disk drive is low-level formatted at the factory —you should use the low-level format procedure only if your hard disk drive has crashed. (If your hard disk drive has crashed, you normally receive the error message, "Hard Disk Failure.")

2. Initialize the hard drive.

With the DOS diskette still inserted in Drive A, format the hard disk by entering:

```
A>FORMAT C:\S <Enter>
```

You can now boot the hard disk drive. To verify that it is bootable, open the door to Drive A and reboot the system by entering:

```
CTRL-ALT-DEL (DEL = DELETE key)
```

The DOS system prompt is displayed from Drive C as

```
C>
```

Your PowerFlex hard disk system is now ready to run DOS.

Selecting an operating speed

The system CPU clock is 12.5-MHz for the standard PowerFlex. On some occasions, you may wish to change the operating speed (for example, some software applications, such as Lotus 1-2-3, require a slower speed at installation). You can change to a slower or higher speed via a keyboard command sequence.

A keyboard command sequence changes the speed during normal computer operation. The command sequence changes the speed between low and high speed each time you enter the following commands:

```
C> CTRL-ALT-PLUS (the numeric keypad + key)
```

```
C> CTRL-ALT-MINUS (the numeric keypad - key)
```

The preceding commands change the operating speed to low speed after the MINUS sequence and to high speed after a PLUS sequence. A beep following these commands signals the speed change.

SETUP program

The PowerFlex SETUP program is located in the system BIOS ROM that sets the system configuration contents in the battery-powered CMOS RAM. The program is similar to the SETUP program on IBM's AT Advanced Diagnostics Disk. This SETUP program allows the PowerFlex to be a switchless system. The ROM SETUP program provides the following features:

- checks the extended memory and reports its capacity (only on initial setup)
- sets up basic I/O configurations
- provides Shadow ROM/RAM and EMS memory
- recalculates CMOS data and checksums
- shows the presence of a coprocessor (if installed)

Activating the SETUP program

To activate the SETUP program, press the CTRL-ALT-ESC keys at the DOS prompt. Or, if the SETUP configuration is incorrect, the system prompts you to press the F2 key which also activates the SETUP program. The PowerFlex SETUP program is displayed on three SETUP screens. When you first activate the SETUP program, the system responds with the Main SETUP Screen that lists the copyright message, time and date, and current system configurations.

WARNING: The PowerFlex is shipped with the SETUP program having no keyboard or monitor installed. On the Main Setup Screen you must change the "Display" setting to the appropriate monitor (e.g., EGA/VGA, CGA40, CGA80 or MONO), and the "Keyboard" setting to Installed. On the Third Setup Screen for Soft Switch Options, make sure you also change the "PowerFlex Default Video" setting to Mono or Color (see page 23).

Use the following keys to control the SETUP program:

- The up and down arrows to move the shaded cursor to the appropriate option.
- The right and left arrows to select the appropriate configuration.
- **F1** to get help regarding the current entry.
- **F10** to exit the SETUP program without saving
- **Esc** key to reboot the system and save the configurations you've just set. **After running the SETUP program, you must boot the system so that the configurations you've just set can be recorded in CMOS.** If you power down instead of rebooting, the data you've entered will disappear.

- **PgUp** and **PgDn** keys toggle between the main, second and third screens.

The selections available for each option are:

Time:	Hour/Minute/Second
Date:	Month/Day/Year (day-of-week is automatic)
Diskette A:	Not Installed 5.25 Inch, 360 KB 5.25 Inch, 1.2 MB 3.50 Inch, 720 KB 3.50 Inch, 1.44 MB
Diskette B:	same selections as for Diskette A
Hard Disk C*:	Not Installed Type <1-49> (<i>press F1 for a list</i>)
Hard Disk D*:	same selections as for Hard Disk C
Base Memory* *:	automatically configured
Extended Memory* *:	automatically configured
Display:	Not Installed EGA/VGA CGA40 CGA80 MONO
Keyboard:	Not Installed Installed
CPU Speed:	High Speed Low Speed
Coprocessor **:	automatically configured

* Drive types 48 and 49 are user-definable. That is, you can change the parameters according to your drive specification. For example, if you have two hard drives in your system and their parameters are not available from the table listed when you pressed F1, you can tailor both hard disks to your drive specification. To do so, perform the following:

1. Use the down arrow (↓) key to move the cursor to Hard Disk C:.
2. Press the right arrow (→) key to move the cursor to drive type and set it to Type 48.
3. Press the down arrow (↓) key to move the cursor to Cyl, Hd, Pre, LZ, Sec, and Size
4. Select the appropriate parameters according to your drive specification.
5. Perform steps 1 - 3 above to set Hard Disk D:.

* * The coprocessor's status cannot be changed directly because the system automatically detects its presence. The Base Memory and Extended Memory values are also done automatically by the PowerFlex SETUP program, however, you can also make a direct entry

EMS RAM/ROM SWAP features

The Second SETUP screen provides the EMS RAM/ROM SWAP features used to configure system memory. The keys work the same way for the second SETUP screen as they do for the main screen.

The EMS RAM/ROM Swap features have been included with the PowerFlex to give you more control over the memory in your system. DOS, the most commonly used disk operating system, is limited to a maximum usage of 640-KB of RAM. A system with DOS installed is therefore restrained to the DOS 640-KB limitation. This means that a system (such as the PowerFlex) that has 1-MB of memory, loses the use of 384-KB (640-KB + 384-KB = 1024-KB; 1024-KB = 1-MB). DOS can only access any memory over 640-KB with the use of an expanded memory driver.

The following subsections explain how the EMS RAM/ROM Swap Screen options allow you to utilize that last 384-KB of memory in the standard 1-MB PowerFlex systems, and how to create and use expanded memory.

Shadow features

Shadowing is comparable to copying a file. For example, when you enable the Shadow Video ROM, video instructions found in this file are shadowed (copied) onto the system's RAM. This in effect speeds the system up as the CPU will not have to go to the Video ROM BIOS for video instructions and then go back to the RAM for data processing. Instead all instructions will be found in the RAM and can be acted on immediately. The PowerFlex achieves its best performance level by enabling the Shadow ROM features; however, certain expansion cards may not be compatible. When enabling the Shadow features, please follow these guidelines:

- Shadowing is functional only if the 640 - 1024K Relocation feature is disabled
- ALR recommends that you turn Shadow ROM Features OFF for 1-MB memory systems to free memory for EMS features
- For systems with more than 1-MB of memory, turn the Shadow ROM Features ON. This will allow the 384-KB of RAM not accessible by DOS to be used by the Shadow BIOS ROM and the Shadow Video ROM which therefore speeds up your system. (See the README file on the Utilities diskette.)

640 - 1024K Relocation feature

The 640 - 1024K Relocation feature opens a gate to allow you access to the 384-KB of memory blocked by DOS limitations by turning it into extended/expanded memory.

Extended memory, simply put, is any memory that is above 640-KB. However, extended memory, which in the case of the standard PowerFlex is 384-KB, is in a protected mode. Only

software applications designed to use extended memory (such as UNIX and Novell) can access it. To be able to use the 384-KB of RAM in the PowerFlex with software not designed to access it, follow the guidelines below:

- If only 1-MB of memory is installed, this feature, when enabled, allows the additional 384-KB of memory to be accessed and used as EMS, or, expanded memory
- In a 1-MB system, the 640 - 1024K Relocation feature must be used in conjunction with the EMS Memory feature described below
- If you are going to have more than 1-MB of memory installed in your system, the 640 - 1024K Relocation feature must be disabled

EMS Memory feature

The EMS Memory feature reassigns extended memory as expanded memory to be used with software (such as Lotus 1-2-3) that requires more memory than 640-KB and which can support EMS. EMS is memory beyond 640-KB that is accessed through memory paging. Memory paging, or a reassignment of the memory's address, is provided in the LIM40 utility program on the PowerFlex Utilities diskette. This utility provides an EMS device driver which enables a DOS system to use expanded memory. (Please see the section entitled LIM40 subdirectory in Chapter 3.) When using the EMS Memory feature, please follow these guidelines:

- EMS Memory, if "ENABLED," must be used with a physical memory of 1-MB or more
- The 640 - 1024K Relocation feature must be DISABLED whenever the EMS Memory feature is ENABLED
- The EMS device driver in LIM40 must be activated in conjunction with the EMS Memory feature
- The EMS Memory Size feature in the EMS ROM/RAM SWAP screen must be changed (through direct entry as per the instructions in the Activating the SETUP program section earlier in this chapter) to reflect the amount of expanded memory currently resident in your PowerFlex system

EMS Memory Size feature

When you go beyond 1-MB of system memory, you must disable the 640 - 1024K Relocation feature. When you disable the 640 - 1024K Relocation feature, DOS can no longer access 384-KB of the standard 1-MB memory as described previously.

In a standard 1-MB memory configuration, you will see that the EMS Memory Size is 0.5-MB. This 0.5-MB represents the 384-KB of memory that has been converted to EMS memory as explained earlier. When you disable the 640 - 1024K Relocation feature, you lose that 0.5-MB of EMS. Therefore, when you go beyond the 1-MB of standard memory, you must adjust the EMS Memory Size configuration.

For example, if you have 2-MB of system memory, the EMS Memory Size should read “1-MB.” Remember, EMS memory is any memory above 640-KB. When you disabled the 640 - 1024K Relocation feature, you closed the gate to that extra 384-KB of memory. You therefore now have 0-MB of EMS. When you add a second megabyte of memory to your system, you have 640-KB of RAM and 1-MB of EMS, hence, you change the EMS Memory size to read 1-MB. The following statement will hold true to the maximum memory system configuration of 5-MB — your EMS Memory Size will be 1-MB less than the total system memory configuration.

Memory installation and configuration is further explained in Chapter 4 under the section entitled *Memory installation and configuration*. This section will describe how to install SIMMs onto the motherboard.

SoftSwitch options

The Third SETUP Screen is used for the Soft Switch options used to configure the floppy and hard disk controllers, 110 ports and video adapters.

The selections for each Soft Switch option are:

PowerFlex Floppy:	Enabled Disabled
PowerFlex AT Controller:	Enabled Disabled
PowerFlex Serial Port:	COM1 COM2 Disabled
PowerFlex Parallel Port:	LPT1 LPT2 Disabled
PowerFlex Default Video *:	Mono Color

* Select **Mono** for EGA, VGA or monochrome monitor systems; select **Color** for CGA systems

Logging hard disk drive characteristics

ALR recommends that you run the SETUP program to check characteristics of the hard disk installed in your system. Knowing your drive configuration helps if you must set up the system after a crash that destroys the contents of the CMOS. If your system loses its configuration information, check the label on the drive for the drive type or call your dealer.

Appendix B lists all available drive types and their associated characteristics. This list is invaluable if you install a new drive and must define its drive type.

Follow the procedure described in the previous section to display and change the system configuration. Paste a label on your system listing the configurations.

Press F10 to exit the SETUP program. If you have made any changes, make sure that you press ESC to boot the system and save the new system setup.

Chapter 3, Using the Utilities Diskette

The software programs on the utilities diskette provides tools and utilities to format the hard disk, support LIM 4.0 EMS, park the hard disk drive for transportation, provide disk caching, and more.

NOTE: The utilities diskette is updated periodically. View the README files for the latest changes to the files.

Accessing the main directory and subdirectories

Insert the utilities diskette supplied with the system. Access Drive A and view the main directory by entering:

```
A>DIR <Enter>
```

Figure 3-1 shows the main directory. The figure does not include dates and times. The diskette may include additional files and deletions. Refer to the README file for explanations.

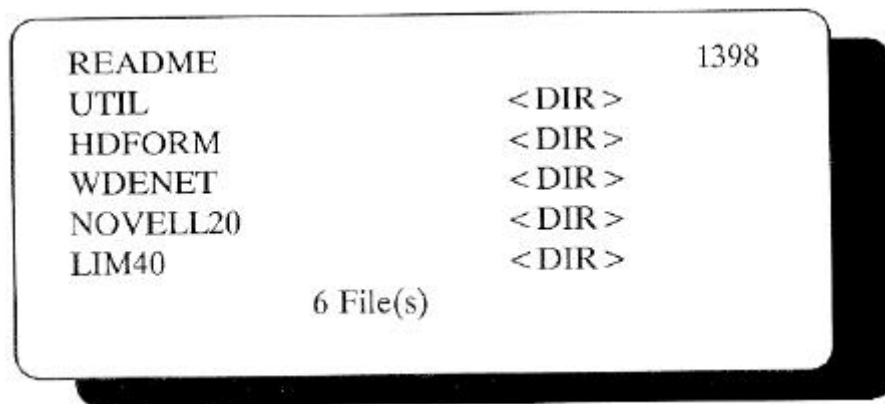


Figure 3-1: Utilities Main Directory

View the README file for a brief description of the setup and utility programs. Enter:

```
A>TYPE README <Enter>
```

The <DIR> entries in Figure 3-1 are subdirectories. Access these sub-directories by entering **CD** followed by the subdirectory name. For example, to access the hard disk formatting programs, enter:

```
A> CD\HDFORM <Enter>
```

The following sections describe the various subdirectories.

UTIL subdirectory

The UTIL subdirectory contains the hard disk Park & Ride program, **PARKIDE**, and a disk-caching program called **SpeedRead**. The following subsections describe these very important utilities programs.

PARKIDE

PARKIDE is a park and ride program designed to immobilize the hard disk's head during movement. It basically works on the same principle as a needle return on a stereo. When you use PARKIDE, you lock the hard disk's head into one position so it can't damage your data files by skipping across them during transportation. Imagine a needle bouncing across your favorite record, and you'll know why this feature has been included.

WARNING: The Park & Ride utility program must be activated every time you transport your PowerFlex. ALR recommends that you use this program regardless of the length of distance that the PowerFlex will be moved.

To activate PARKIDE, follow this procedure:

1. Insert the PowerFlex Utility Diskette into drive A:.
2. Type:

```
A>CD\UTIL <Enter>
```

```
A>PARKIDE
```

3. Turn your system OFF. DO NOT touch any keys on your keyboard as this will deactivate PARKIDE.
4. After you have moved your PowerFlex, to reactivate the hard disk, simply turn your system back on.

Speed Read

Also included in the PowerFlex subdirectory UTIL is a program called SpeedRead. SpeedRead is a disk-caching program that speeds up the hard disk access rate. As the system is used, SpeedRead monitors how often certain parts of the disk are used and copies the most recently used parts into its internal buffers. If the CPU attempts to read the data again, SpeedRead retrieves the data from its buffers instead of the disk, thus speeding the transfer of data.

To learn more about this program and how to use it, read the README file and the SR.TXT file on the PowerFlex Utilities Diskette in the subdirectory UTIL. The SR.TXT file contains a brief usage guide that will explain how to use SpeedRead. To access the README and SR.TXT files, or to print the SR.TXT file, follow the procedures below.

1. Place the PowerFlex Utilities diskette into drive A:.
2. To read the README file, type:

```
A>CD\UTIL <Enter >
```

```
A>DIR <Enter>
```

```
A>TYPE README <Enter>
```

3. To read the SpeedRead usage guide, type:

```
A>MORE < SR.TXT <Enter>
```

The above command will move you through the usage guide one page at a time. To move down to the next screen, press:

```
<Enter>
```

4. To print the SpeedRead usage guide, make sure you're in the UTIL sub-directory, then type:

```
A>PRINT SR.TXT <Enter>
```

HDFORM subdirectory

The HDFORM subdirectory contains the WDFMT program, a versatile formatting utility that performs a low-level format and surface analysis of the ALR high-performance hard disk drives.

Access the HDFORM subdirectory and view the README file by entering:

```
A>CD\HDFORM <Enter>
```

```
A>DIR <Enter>
```

```
A>TYPE README <Enter>
```

To run WDFMT you would then enter:

```
A> WDFMT <Enter>
```

The hard disk is now ready to be partitioned and formatted for DOS. See the section entitled *Initializing the hard disk drive* in Chapter 2.

WDENET subdirectory

The WDENET subdirectory contains two versions of the Western Digital (WD) Ethernet driver necessary for installing the LAN adapter boards. Version 2.0A contains the driver compatible

with Novell's NetWare v2.0a and version 2.1x contains the driver compatible with Novell's NetWare v2.11 and v2.12. The README file describes the two versions and details the procedures for using the drivers. Follow the appropriate README file for installation instructions on each version.

Access the WDENET subdirectory by entering:

```
A>CD\WDENET <Enter>
```

```
A>DIR <Enter>
```

From the WDENET subdirectory, access the V2.0A subdirectory and view the README file by entering:

```
A>CD\V2.0A <Enter>
```

```
A>DIR <Enter>
```

```
A>TYPE README <Enter>
```

Similarly, view the README file from the V2.1x subdirectory by entering:

```
A>CD\V2.1x <Enter>
```

```
A>DIR <Enter>
```

```
A>TYPE README <Enter>
```

NOVELL20 subdirectory

This subdirectory contains instructions to enable the ALR hard disk drives to run using NetWare v2.0a and v2.1. The README file contains these instructions.

Access the NOVELL20 subdirectory and view the README file by entering:

```
A>CD\NOVELL20 <Enter>
```

```
A>DIR <Enter>
```

```
A>TYPE README <Enter>
```

LIM40 subdirectory

This subdirectory contains the Expanded Memory Specification (EMS) device driver. The EMS driver is loaded at boot up by the CONFIG.SYS file. The EMS device driver must be used in conjunction with the 640K - 1024K Relocation feature and the EMS Memory feature in the

SETUP program. See Chapter 2 for further information.

Access the LIM40 subdirectory and view the README file by entering:

```
A>CD\LIM40 <Enter>
```

```
A>DIR <Enter>
```

```
A>TYPE README <Enter>
```

Chapter 4, Basic System Configurations

This chapter describes the hardware configurations for the PowerFlex 286 motherboard and embedded hard disk drive. The basic 286 configurations will remain the same when you plug in a PowerFlex 386SX or i486 Module. In fact, in an effort to keep upgrade costs as low as possible, neither of the PowerFlex 386SX or i486 Modules contain memory chips. When you upgrade to a 386SX or i486 system, the ALR PowerFlex 386SX and i486 Modules will use the memory on the PowerFlex 286 motherboard.

Opening up the system unit

Open the system unit by following the procedure below and referring to Figure 4-1.

BE SURE THAT THE POWER SWITCH IS OFF AND THE POWER CORD IS REMOVED FROM THE SYSTEM UNIT. Turn off any other equipment connected to the computer. Installing any component while the power is on can permanently damage your computer and its components.

1. Remove the four thumbscrews from the back panel by turning the screws counterclockwise. Slide the cover towards you, approximately $\frac{1}{4}$ -inch.
2. Lift the chassis cover straight up, and carefully lift it off.

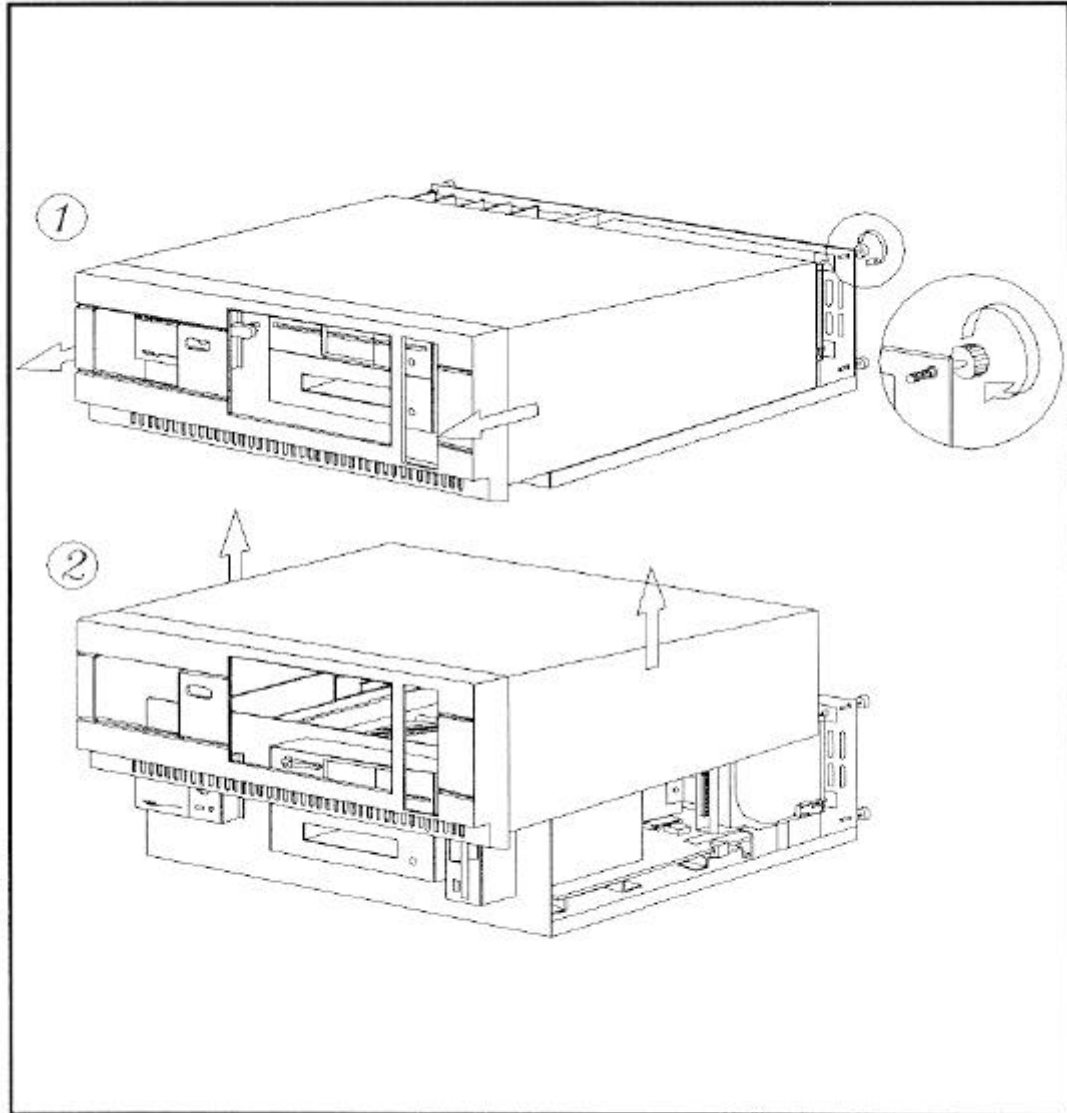


Figure 4-1: Removing the Chassis Cover

Configuring the PowerFlex motherboard

Figure 4-2 shows the location of various components on the PowerFlex 286 motherboard. This six-slot motherboard has a bus speed of 8-MHz and contains one serial port, one parallel port, and circuitry for the floppy and hard disk controllers. The following subsections describe the memory configuration and the serial port, parallel port, floppy disk and hard disk controllers.

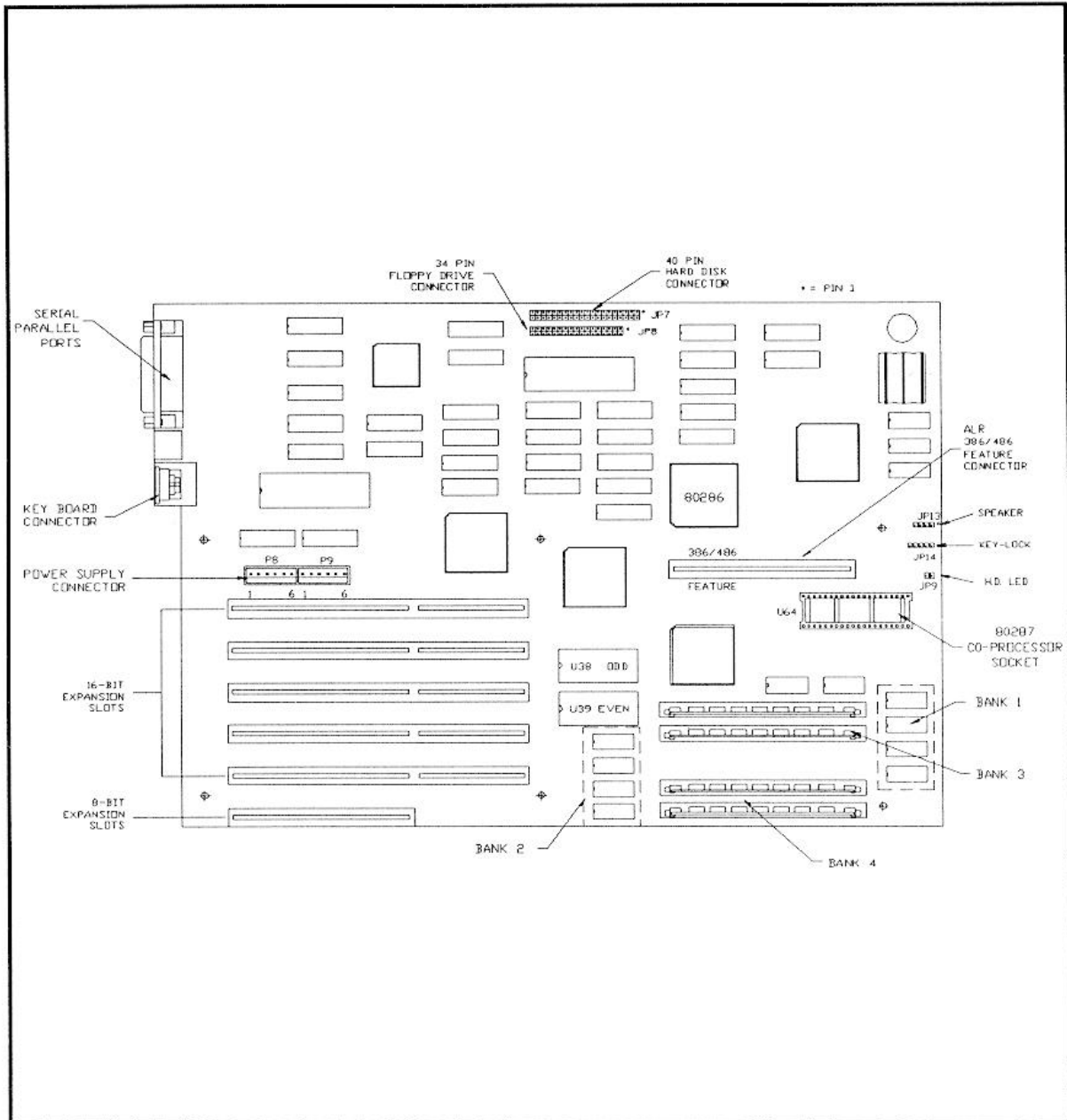


Figure 4-2: PowerFlex 286 Motherboard

Memory installation and configuration

The PowerFlex 286 motherboard can have a maximum 5-MB onboard memory. The standard 1-MB 286 motherboard consists of eight 256K x 4 DRAMs located in Banks 1 and 2. DRAMs used in the PowerFlex must be 256-KB x 4 page mode with access times of 100ns. Banks 3 and 4 consist of two rows of Single Inline Memory Modules (SIMMs) connectors each. SIMMs used in the PowerFlex must be 1-MB x 9 or 256K x 9 page mode with access times of 80ns or 100ns. Banks 1 and 2 must be filled before you can add SIMMs in Banks 3 and 4. See Figure 4-1 for bank locations and Table 4-1 for memory configurations.

Table 4-1: Standard FlexCache 286 Memory Configuration

BANK 1	BANK 2	BANK 3	BANK 4	TOTAL MEMORY
<i>DRAM Type</i>		<i>Memory Module Type</i>		
256Kx4	256Kx4	---	---	1-MB
256Kx4	256Kx4	256Kx9	---	1.5-MB
256Kx4	256Kx4	256Kx9	256Kx9	2-MB
256Kx4	256Kx4	1MBx9	---	3-MB
256Kx4	256Kx4	1MBx9	1MBx9	5-MB

DRAM chips must be page mode and have a speed of 80ns or 100ns.

Installing SIMMs

Follow the procedure below for installing additional SIMMs:

1. Open the system unit as described previously in this chapter.
2. Insert a SIMM into the proper socket (per Table 4-1) at a 60-degree angle as shown in Figure 4-3.
3. Press the SIMM firmly into the socket until it clicks into place.

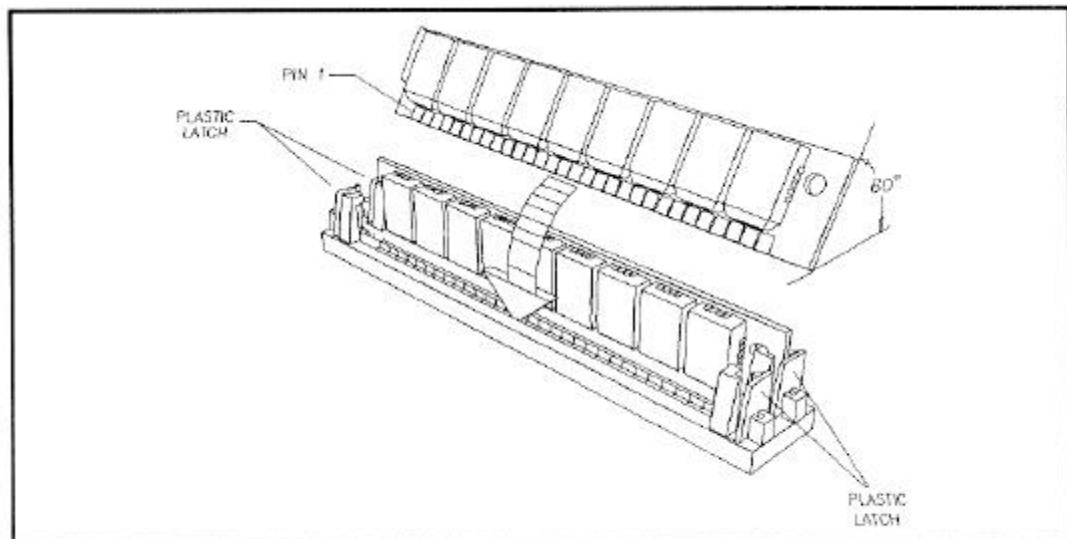


Figure 4-3: Installing a SIMM

4. Pull the plastic latches on each end outward, rotate the SIMM until it is vertical, and release the plastic latches.

NOTE: Inspect the SIMMs to make sure they are all the same depth within their sockets. If they are not, they are not properly installed and you will get an error message.

5. Repeat steps 2-4 above to install other SIMMs.
6. Once you have made the desired memory expansion, run the SETUP program as described in Chapter 2 to account for the new memory. This will be done in the EMS RAM/ROM SWAP screen and will include the following steps:
 - EMS Memory must be enabled
 - 640 - 1024K Relocation must be DISABLED
 - The EMS device driver in LIM40 must be activated
 - The EMS Memory Size must be changed

NOTE: To configure the PowerFlex beyond 5-MB of memory, you will need to purchase third-party 16-bit memory expansion cards.

Removing SIMMs

Follow the procedure below to remove a SIMM from the PowerFlex:

1. Insert a thin screwdriver blade between the SIMM and one of the latches (as shown in Figure 4-2) holding the SIMM in place.
2. Gently press the latch down and away from the SIMM. DO NOT FORCE THE LATCH AS THEY ARE FRAGILE AND MAY BREAK OFF.
3. Once all of the latches have been released, lift the SIMM out of its socket.

EPR0M configuration

The system BIOS consists of two 32-KB by eight 27256 EPROMs at locations shown in Figure 4-1. Odd addresses reside in U38 and even addresses reside in U39. The system BIOS resides in the system memory address space from 0F0000 to 0FFFFFFF. The system BIOS uses 27256 EPROMs for 64-KB of system ROM. Table 4-2 summarizes the EPROM configuration for the 286 motherboard.

Table 4-2: 286 CPU BIOS EPROM Assignments

EPROM TYPE	CODE ADDRESS ASSIGNMENTS	EVEN BIOS	ODD BIOS
64K System BIOS	0F0000*-0FFFFFFF	U39	U38
(Duplicate)	FF0000-FFFFFFF	U39	U38

* factory setting

286 motherboard connector pinouts

Table 4-3 describes the output connectors for the 286 CPU.

Table 4-3: 286 Motherboard Output Connectors

Keyboard		Speaker		Front Panel	
J8	FUNCTION	JP13	FUNCTION	JP14	FUNCTION
1	Clock	1	Speaker	1	LED
2	Data	2	N/C	2	N/C
3	N/C	3	Ground	3	N/C
4	Ground	4	+5V	4	N/C
5	+5V			5	Ground

ROM-to-RAM swapping

The PowerFlex may swap the content of the ROM BIOS into the system RAM memory for faster execution of the BIOS code. This feature is controlled in the second screen of the ROM BIOS Setup program (EMS RAM/ROM SWAP Screen).

Serial port configuration

The PowerFlex 286 motherboard includes one serial port (see Figure 4-1). The serial port is a standard DB25 male connector and is fully IBM-plug compatible. You can configure the serial port for either COM1 or COM2 via the Soft Switch Options Screen of the SETUP program (see Chapter 2 for details).

Parallel port configuration

The PowerFlex 286 motherboard contains one parallel port (see Figure 4-1). You can configure the parallel port for either LPT1 or LPT2 via the Soft Switch Options Screen of the SETUP program (see Chapter 2 for details). The parallel port is a standard DB25 female connector and is fully IBM-plug compatible.

Floppy disk controller configuration

The PowerFlex 286 motherboard includes an integrated floppy disk controller chip which contains the circuitry and control functions for interfacing to two floppy disk drives. This IBM PC/XT/AT-compatible chip supports 5¼-inch drives with 360-KB or 1.2-MB capacities and 3½-inch drives with 720-KB or 1.44-MB capacities.

Hard disk controller configuration

Like the floppy disk controller, the PowerFlex 286 motherboard also includes an integrated hard disk controller logic which contains the circuitry and control functions for interfacing to two hard disk drives. This logic supports two 3-1/2 inch AT-type embedded hard disk drives up to 528-MB.

Chapter 5, Options

This chapter describes the installation and setup procedures for options compatible with the PowerFlex. Optional boards and equipment include the following:

Hard Disk Drives. The PowerFlex comes standard with an embedded 40-MB (< 40ms) AT-interface drive with support for a second embedded 40-MB hard disk drive. Hard disk controller functions are embedded on the hard disk drive.

Floppy Disk Drives. In addition to the standard 3½-inch floppy disk drive, the PowerFlex chassis can accommodate two 5¼-inch 1.2-MB and one 3½-inch 1.44-MB floppy disk drives.

Installing new boards

You can easily install expansion boards into the PowerFlex motherboard. Remove four thumbscrews from the rear of the chassis by turning the screws counterclockwise. Figure 1-2 shows the expansion slots available for additional boards. Follow the procedure below for installing new boards:

1. Configure the boards before you install them in the expansion slots. The sections in this chapter describe the appropriate configuration for various optional boards. To prevent damage to expansion cards, always hold them by the edges. To avoid electric static build-up, never lay expansion cards on carpeting. To discharge static electricity from your body, touch the metal cabinet of any electrical equipment that is plugged into a three-prong grounded outlet.
2. Remove the screw that holds the expansion slot cover in place. Save the screw for board installation.
3. Hold the expansion board by its top edge or upper corners and insert it into the appropriate slot.
4. Make sure a full-sized board mounts firmly into the card guides at the front of the chassis.
5. Install the reserved mounting screw to secure the expansion slot plate in place.

Storage devices

The following subsections describe the installation procedures and configuration of the various storage devices available for the PowerFlex. Figure 1-2 provides an overall view showing these optional storage devices.

Hard disk drives

The PowerFlex chassis can accommodate one other embedded 40-MB hard disk drive in addition to the hard disk drive it is shipped with. If you purchase a second hard disk drive through ALR you will receive a high-performance embedded 3-1/2 inch 40-MB <40ms 1:1 interleave hard disk drive that supports one type of drive parameter configuration: 17 sectors, 5 heads, 977 cylinders.

If you choose to purchase one of these optional drives as a second hard disk drive, make sure you purchase and/or receive the following:

- An embedded hard disk drive
- Cabling for two-drive support

- A user's manual for the second embedded hard disk drive detailing its installation and configuration

Installing and configuring an embedded hard drive

If you install a second embedded 40-MB hard disk drive, both drives may be accessed via a common two-drive interface cable using the same range of I/O addresses. The drives are jumpered as drive 0 or 1 and have a master/slave relationship. Drive 0 is the master drive, and drive 1 the slave. In a single drive system, no jumper is required; the unit will default to drive 0. In a two drive system, drive 0 should be jumpered as "master" and drive 1 should be jumpered as "slave."

Figure 5-2 shows how to install an AT-interface embedded hard disk drive into a PowerFlex chassis. Connect the 40-pin ribbon cable between the hard disk drive housing and the JP7 connector on the PowerFlex 286 motherboard. Be sure to align pin 1 (same side as red piping) on the cable to pin 1 (where the notch is) on the connector. If a second hard disk drive is installed, it must be daisy-chained to the first hard disk drive via the 40-pin connector on the above mentioned cable.

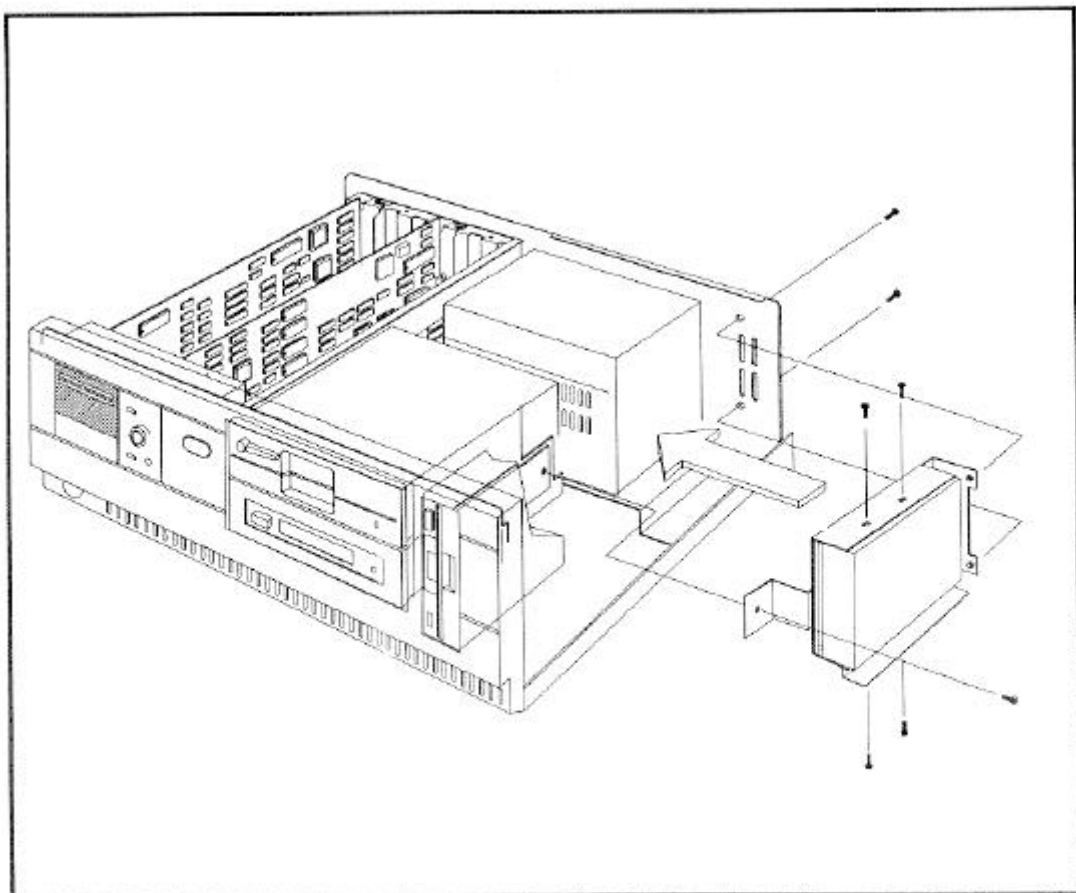


Figure 5-2: Installing an AT-Interface Embedded Hard Disk Drive

To configure the system for an embedded hard drive, run the SETUP program as described in Chapter 2 and set the drive type according to the type listed on a sticker on the drive. Thereafter, perform the FDISK and FORMAT commands, as described in the section entitled *Initializing the hard disk drive* in Chapter 2.

Installing and configuring a half- or full-height hard disk drive

Before installing a half- or full-height hard disk drive, remove the 3½-inch floppy drive that comes standard with the system. Re-install the floppy drive after installing the hard drive. See Figure 5-5 for installation procedures. Configure the system by running the SETUP program as described in Chapter 2.

NOTE: If you install a half- or full-height hard disk drive, an appropriate optional hard disk controller card will be required. Refer to the hard disk drive's user's manual for more information.

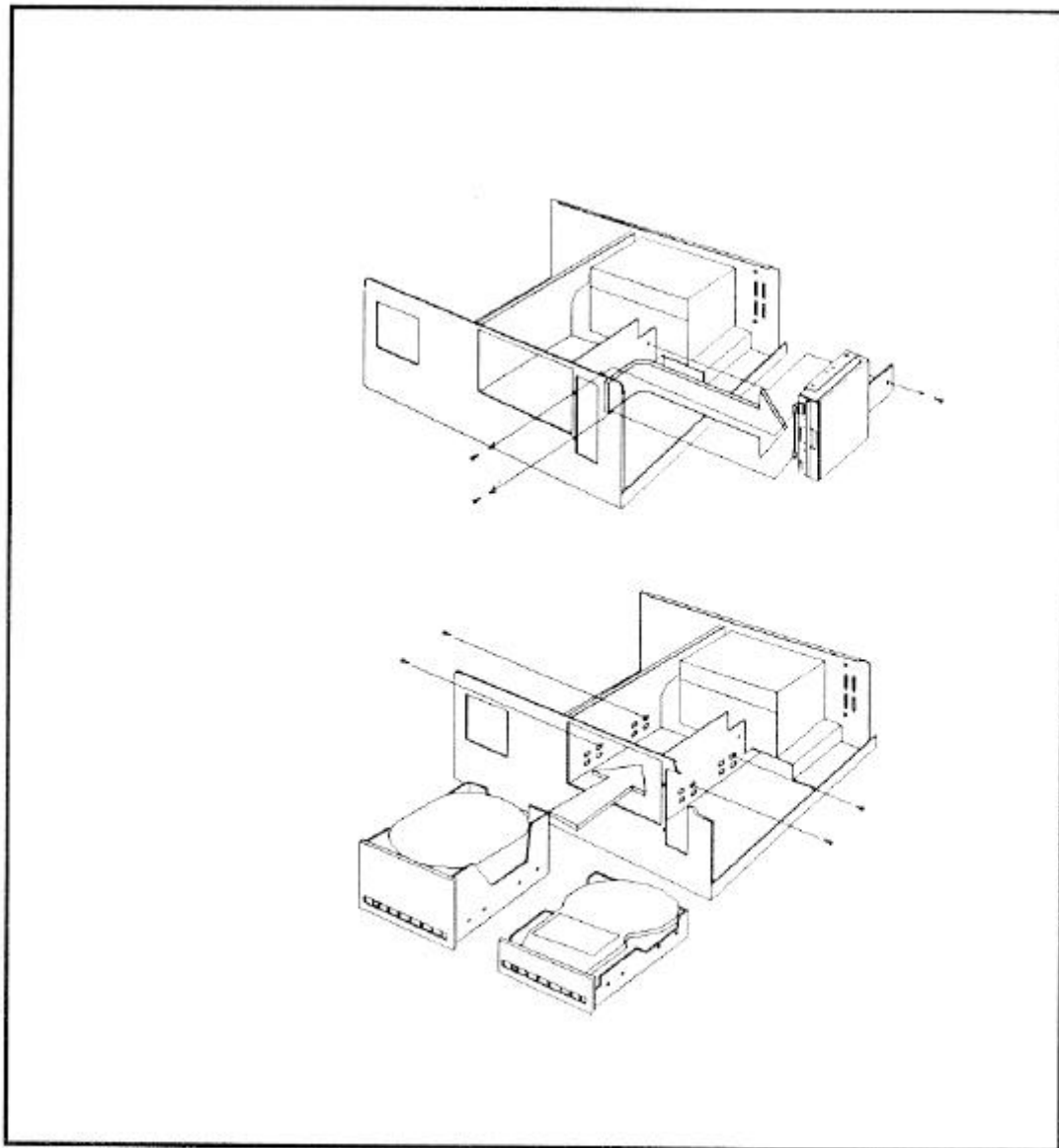


Figure 5-5: Installing a Half- or Full-Height
Hard Disk Drive

Floppy disk drives

The PowerFlex chassis can accommodate two 5¼ or 3½-inch floppy devices. The following subsections describe how to install and configure these drives.

3½-inch floppy disk drives

Figure 5-6 shows how to install a 3½-inch floppy disk drive or, refer to the manual that accompanied your 3½-inch floppy drive kit. Additionally, the 3½-inch floppy disk drive kit comes with a half-height filler plate. Figure 5-7 shows how to remove the full-height filler plate that comes with the system and how to install the half-height filler plate that comes with the kit.

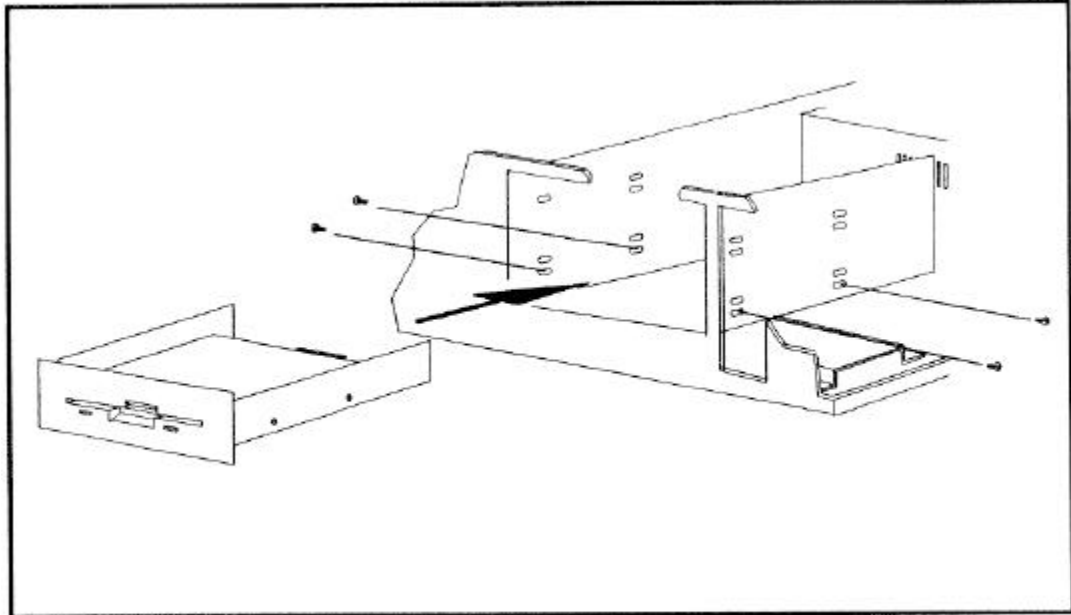


Figure 5-6: Installing a 3-1/2 Inch Floppy Disk Drive

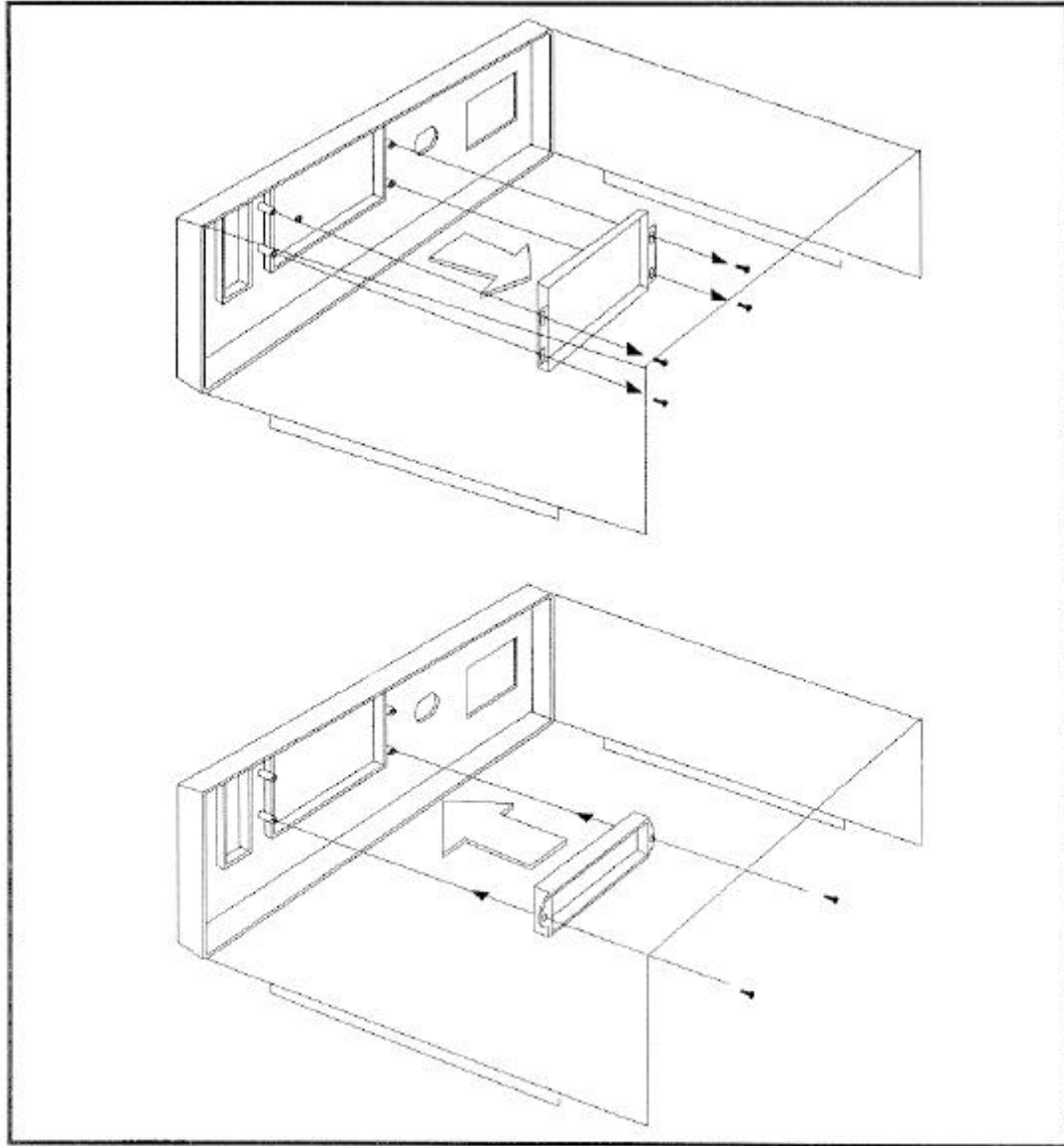


Figure 5-7: Removing a Full-Height Filler Plate and
Installing a Half-Height Filler Plate

To cable the drive, connect the floppy disk cable by aligning pin 1 (same side as the red piping) on the 34-pin ribbon cable to the 286 motherboard at JP8's pin 1 (where the notch is). Connect the other end of the cable in the same manner to pin 1 on the floppy disk drive. Connect the power cable to the power connector and plug in all other cords and cables.

Run the SETUP program and change the system configuration to include a 3½-inch floppy disk drive (see Chapter 2). The 3½-inch floppy disk drive is a 1.44-MB drive with a 2-MB media hold sensor. The drive can read/write 720-KB or 1.44-MB diskettes; however, you must use the right medium according to the SETUP configuration. Default is set for a 1.44-MB drive. For example, if you use a 1-MB diskette and format with the standard default setup, DOS format will display an error.

There are two ways to solve this formatting problem:

1. Use a 2-MB media.
2. Format DOS with 720-KB option parameters

A>FORMAT A:/T:80/n:9/S <Enter>

5¼-inch floppy disk drives

Figure 5-8 shows how to install a 5¼-inch floppy disk drive or, refer to the manual that accompanied your 5¼-inch floppy drive kit. Additionally, the 5¼-inch floppy disk drive kit comes with a half-height filler plate. Figure 5-7 shows how to remove the full-height filler plate that comes with the system and how to install the half-height filler plate that comes with the kit.

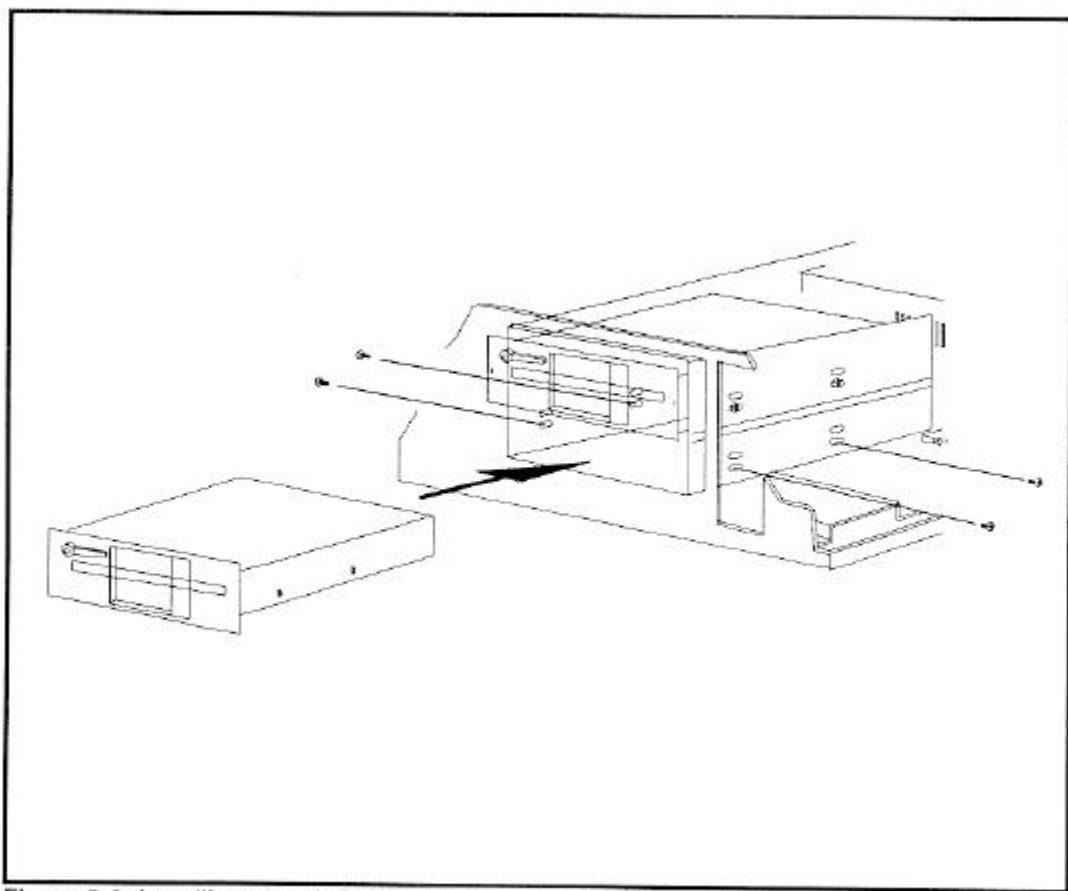


Figure 5-8: Installing a 5-1/4 Inch Floppy Disk Drive

To cable the drive, connect the floppy disk cable by aligning pin 1 (same side as the red piping) on the 34-pin ribbon cable to the 286 motherboard at JP8's pin 1 (where the notch is). Connect the other end of the cable in the same manner to pin 1 on the floppy disk drive. Connect the power cable to the power connector and plug in all other cords and cables.

Run the SETUP program and change the system configuration to include a 5¼-inch floppy disk drive (see Chapter 2).

Appendix A, Error Messages

The power-on self test displays messages when it detects nonfatal on board or off board failures. There are two types of error messages:

- Nonfatal Errors display information on your monitor
- Fatal System Board Error Beep Codes signal an error condition when a message cannot be displayed on your monitor

For recurring problems do the following:

- Call your nearest authorized ALR dealer.
- Call the ALR Technical Support at (714) 458-0863.

Remember, DO NOT send any equipment without a Return Material Authorization (RMA) and original packaging.

Nonfatal errors

This section lists messages that may be displayed when your computer boots up. Variable [xxx] items differ from message to message. Possible explanations and solutions are also provided here.

[xxx] Base Memory, [xxx] Expansion**Explanation:**

This message is for your information only.

Solution:

No action necessary.

Checking RAM on disk controller....

Error found on controller RAM at offset location 3800

[xxx] Option ROM bad checksum = [xxx]

Memory Parity interrupt at [xxx].

Type (S)hut off NMI, (R)eboot, other keys to continue Strike the F1 key to continue

Explanation:

Your setup configuration is incorrect.

Solution:

Type S at the system error prompt. Insert the utilities diskette and press F1 to reboot. Run the SETUP program as described in Chapter 2. Check the hard disk controller to make sure it is inserted in the slot properly.

Checksum error on extended CMOS.**Explanation:**

The data in extended CMOS is invalid.

Solution:

Run the SETUP program as described in Chapter 2 of this manual.

Decreasing available memory**Explanation:**

Your system's RAM chips may be defective or the pins may be bent.

Solution:

Check the RAM chips and make sure they're properly inserted into their sockets. Replace if necessary.

Diskette drive 0 seek to track 0 failed**Explanation:**

Your system's configuration is incorrect; the actual floppy drive in your system is different from that specified in your SETUP configuration. The floppy drive cable may not be properly inserted.

Solution:

Check your SETUP configuration and make sure the correct drive is selected. Make sure the floppy drive cable is properly secured.

Diskette drive reset failed**Explanation:**

Your system's configuration is incorrect. The actual floppy drive in your system does not match the one specified in your SETUP configuration or the floppy drive/cables may be defective.

Solution:

Check your SETUP configuration and make sure the correct drive is selected. Replace the drive/cable.

Diskette read failed - strike F1 to retry boot**Explanation:**

The floppy disk inserted in your drive is not a bootable disk, the jumper setting for your drive is incorrect, or the switch setting is incorrect for your controller card.

Solution:

Make sure that your boot disk contains a file called COMMAND.COM or check the jumper/switch settings for your drive or controller card, respectively. Press F1 to reboot.

Display adapter failed; using alternate**Explanation:**

The video card installed in your system is different from the video switch setting on the system board.

Solution:

Check the video switch/jumper setting, SW1, on the system board and make sure it's OFF/OUT for MGA and ON/IN for CGA.

Gate A20 failure**Explanation:**

You have an XT keyboard connected to your AT system.

Solution:

If your keyboard was not provided by ALR, check the switch at the bottom of your keyboard and make sure it is pointing to "AT." If the message persists, replace the keyboard.

Hard disk controller failure

Explanation:

The hard disk cable may not be properly secured or the hard disk controller card may be defective.

Solution:

Make sure the hard disk cable is properly secured or replace the hard disk controller card.

Hard disk failure

Explanation:

The hard disk may not have been low-level formatted, the SETUP configuration does not match the type of hard disk actually installed in your system, or the hard disk controller may be defective.

Solution:

Run the SETUP program, described in Chapter 2 of this manual, and make sure your configuration is correct. Contact your authorized ALR dealer for assistance in performing a low-level format or for replacing the controller card.

Hard disk failure - strike F1 to retry boot

Explanation:

The hard disk or hard disk controller may be defective, or the DOS FORMAT has not yet been performed.

Solution:

Press F1 to reboot. If the message persists, replace the hard disk controller card. Perform an FDISK and a DOS FORMAT as explained in Chapter 2 of this manual.

Invalid configuration information - please run SETUP program

Explanation:

The information stored in CMOS memory does not match your system's actual configuration during power-up.

Solution:

Check your system's configuration by running the SETUP program as described in Chapter 2 of this manual.

Keyboard clock line failure

Explanation:

The keyboard or a keyboard chip may be defective.

Solution:

If your keyboard was not provided by ALR, check the bottom of the keyboard and make sure it is set to "AT" mode or try another keyboard. Contact your authorized ALR dealer for assistance in replacing the keyboard chip.

Keyboard controller failure

Explanation:

A keyboard chip or the keyboard may be defective.

Solution:

If your keyboard was not provided by ALR, check the bottom of the keyboard and make sure it is set to "AT" mode or try another keyboard. Contact your authorized ALR dealer for assistance in replacing the keyboard chip.

Keyboard data line failure

Explanation:

A keyboard chip or the keyboard may be defective,

Solution:

If your keyboard was not provided by ALR, check the bottom of the keyboard and make sure it is set to "AT" mode or try another keyboard. Contact your authorized ALR dealer for assistance in replacing the keyboard chip.

Keyboard stuck key failure

Explanation:

One of the keyboard keys may be jammed.

Solution:

Push the jammed key to release it or replace the keyboard.

Memory address line failure at [xxx], read [xxx] expecting [xxx]

Explanation:

Your system's memory chips may be defective or the pins may be bent.

Solution:

Check the memory chips and make sure they're properly inserted into their sockets. Replace if necessary.

Memory high address line failure at [xxx], read [xxx] expecting [xxx]

Explanation:

Your system's memory chips may be defective or the pins may be bent.

Solution:

Check the memory chips and make sure they're properly inserted into their sockets. Replace if necessary.

Memory test terminated by keystroke

Explanation:

During power-up, a key was pressed while the system was running the memory test.

Solution:

No action necessary.

Memory write/read failure at [xxx], read [xxx] expecting [xxx]

Explanation:

Your system's RAM chips may be defective or the pins may be bent.

Solution:

Check the RAM chips and make sure they're properly inserted into their sockets. Replace if necessary. Note: Sometimes a defective video card may cause this problem.

No boot device available - strike F1 to retry boot

Explanation:

There's no bootable file on the floppy disk, the diskette or the floppy disk controller may be defective.

Solution:

Make sure the boot disk contains the COMMA ND.COM file. Check that the floppy disk controller jumper setting is set for enabling the floppy disk. Press F1 to reboot. If the message persists, replace the floppy disk controller.

No boot sector on hard disk - strike F1 to retry boot

Explanation:

There's no bootable file on the hard disk.

Solution:

Press F1 to reboot. If the message persists, format the hard disk as follows:

SYS C: <enter>

COPY COMMAND.COM C: <enter>

If the message persists, format the hard disk as follows:

FORMAT C:/S <enter>

Not a boot diskette - try F1 to retry boot**Explanation:**

There's no bootable file on the boot disk or your system's SETUP configuration does not match the actual floppy drive on the system.

Solution:

Make sure the boot disk contains the COMMAND.COM file. Press F1 to reboot. Run the SETUP program, described in Chapter 2 of this manual, to configure the correct floppy drive.

No timer tick**Explanation:**

Your system's timer circuitry or your system's BIOS chips may be defective or it's an older version.

Solution:

Contact your authorized ALR dealer for assistance.

[xxx] Optional ROM bad Checksum = [xxx]**Explanation:**

An optional BIOS card may be defective.

Solution:

Contact your authorized ALR dealer for assistance.

**Phoenix ROM BIOS Version x.xx
Copyright 198x Phoenix Technologies Ltd.****All Rights Reserved****Explanation:**

This message displays the version of the ROM BIOS installed in your system.

Solution:

No action necessary.

Shutdown failure**Explanation:**

Your system's hardware circuitry has malfunctioned.

Solution:

Contact your authorized ALR dealer for assistance.

Strike the F1 key to continue

Explanation:

The system cannot locate a bootable file from the floppy or hard disk.

Solution:

Insert a bootable DOS diskette into the floppy drive. Press F1 to continue the boot.

Time of day clock stopped**Explanation:**

A clock chip may be defective or the battery may be discharged.

Solution:

Re-run the SETUP program (see Chapter 2) to get the time of day. If the problem persists, contact your authorized ALR dealer.

Timer Chip counter 2 failed**Explanation:**

Your system's hardware circuitry has malfunctioned.

Solution:

Contact your authorized ALR dealer for assistance.

Timer of Interrupt Controller Bad**Explanation:**

Your system's hardware circuitry has malfunctioned.

Solution:

Contact your authorized ALR dealer for assistance.

Unexpected interrupt in protected mode**Explanation:**

Your system's hardware circuitry has malfunctioned.

Solution:

Contact your authorized ALR dealer for assistance.

Fatal system board error beep codes

If an error occurs when the monitor is not available to display the message, the self-test issues a series of beeps to signal the error. The self-test does not issue a beep if a test is aborted while in progress.

For example, a failure of bit 3 in the first 64-KB of RAM causes a 2-1-4 beep code (a burst of two beeps, a single beep, and a burst of four beeps). Additionally, the self-test writes a value to I/O port 08H. This code enables debugging tools to help technical users identify the failed area.

Errors are either fatal (those that halt the system) or nonfatal (those that are not serious enough to halt the system). Fatal errors contain the word “failure”.

Beep Code	Description	080H Code
none	80386 register test in progress	01H
1-1-3	Real-time clock write/read failure	02H
1-1-4	ROM BIOS checksum failure	03H
1-2-1	Programmable Interval Timer Failure	04H
1-2-2	DMA initialization failure	05H
1-2-3	DMA page register write/read failure	06H
1-3-1	RAM refresh verification failure	08H
none	1st 64-KB RAM test in progress	09H
1-3-3	1st 64-KB RAM chip or data line multi-bit	0AH
1-3-4	1st 64-KB RAM add/even logic failure	0BH
1-4-1	Address line failure 1st 64-KB RAM	0CH
1-4-1	Address line failure 1st 64-KB RAM	0CH
1-4-2	Parity failure 1st 64-KB RAM	0DH
2-1-1	Bit 0 1st 64-KB RAM failure	10H
2-1-2	Bit 1 1st 64-KB RAM failure	11H
2-1-3	Bit 2 1st 64-KB RAM failure	12H
2-1-4	Bit 3 1st 64-KB RAM failure	13H
2-2-1	Bit 4 1st 64-KB RAM failure	14H
2-2-2	Bit 5 1st 64-KB RAM failure	15H
2-2-3	Bit 6 1st 64-KB RAM failure	16H
2-2-4	Bit 7 1st 64-KB RAM failure	17H
2-3-1	Bit 8 1st 64-KB RAM failure	18H
2-3-2	Bit 9 1st 64-KB RAM failure	19H
2-3-3	Bit A 1st 64-KB RAM failure	1AH
2-3-4	Bit B 1st 64-KB RAM failure	1BH
2-4-1	Bit C 1st 64-KB RAM failure	1CH
2-4-2	Bit D 1st 64-KB RAM failure	1DH
2-4-3	Bit E 1st 64-KB RAM failure	1EH
2-4-4	Bit F 1st 64-KB RAM failure	1FH
3-1-1	Slave DMA register failure	20H

Beep Code	Description	080H Code
3-1-2	Master DMA register failure	21H
3-1-3	Master interrupt mask register failure	22H
3-1-4	Slave interrupt mask register failure	23H
none	Interrupt vector loading in progress	25H
3-2-4	Keyboard controller test failure	27H
none	Real-time clock power failure and checksum calculation in progress	28H
none	Real-time clock configuration validation in progress	29H
3-3-4	Screen memory test failure	2BH
3-4-1	Screen initialization failure	2CH
3-4-2	Screen retrace test failure	2DH
none	Search for video ROM in progress	2EH
none	Screen believed operable	30H
none	Screen believed running with video ROM	30H
none	Monochrome display believed operable	31H
none	Color display (40 column) believed operable	32H
none	Color display (80 column) believed operable	33H

Appendix B, Hard Disk Drive Characteristics

Drive Type	Cylinders	Heads	Pre-comp	Land-ing Zone	Sec-tors	Size (megs)
1	306	4	128	305	17	10.1
2	615	4	300	615	17	20.4
3	615	6	300	615	17	30.6
4	940	8	512	940	17	62.4
5	940	6	512	940	17	46.8
6	615	4	-1	615	17	20.0
7	462	8	256	511	17	30.6
8	733	5	-1	733	17	30.4
9	900	15	-1	901	17	112.0
10	820	3	-1	820	17	20.4
11	855	5	-1	855	17	35.4
12	855	7	-1	855	17	49.6
13	953	7	-1	953	34	110.0
14	733	7	-1	733	26	65.0
16	953	5	-1	953	34	79
17	977	5	300	977	17	40.5
18	977	7	-1	977	17	56.7
19	1024	7	512	1023	17	59.5
20	823	10	-1	823	34	136.6
21	733	7	300	732	17	42.5
22	971	5	-1	971	26	61.0
23	820	6	-1	820	17	40.0
24	1024	7	-1	1024	34	119
25	1022	7	-1	1022	34	118
26	1024	4	-1	1023	17	34.0
27	1024	5	-1	1023	17	42.5
28	1024	8	-1	1023	17	68.0
29	615	4	612	615	26	31.2
30	1160	7	-1	904	26	103.0
31	989	5	128	989	17	41.0
32	1020	15	-1	1024	17	127.0
33	1024	9	-1	1024	17	76.0
34	966	9	-1	966	34	144.3
35	966	8	-1	966	34	128.2
36	1024	5	512	1024	17	42.5
37	1024	5	-1	1024	26	65.0
38	611	16	-1	612	63	300.7
39	654	16	-1	1630	63	321.0

Drive Type	Cylinders	Heads	Pre-comp	Land-ing Zone	Sec-tors	Size (megs)
40	642	16	-1	1778	63	315.0
41	917	15	-1	918	17	114.1
42	1023	15	-1	1024	17	127.3
43	823	10	512	823	17	68.3
44	820	6	-1	820	17	40.0
45	1024	8	-1	1024	17	68.0
46	1024	7	-1	1024	26	91.0
47	288	16	-1	1224	63	141.0
48	0	0	0	0	0	0
49	0	0	0	0	0	0

- Drive type numbers not assigned are reserved for future use.
- Drive types 48 and 49 are user-definable. That is, you can change the parameters according to your drive specification. See Chapter 2 for details.
- To see this table during SETUP, move the cursor to Hard Disk C: and press Fl.

Appendix C, System Board Memory Map

ADDRESS	DESCRIPTION	FUNCTION
000000	640KB USER RAM	SYSTEM BOARD MEMORY
09FFFF		
0A0000	128KB VIDEO RAM	RESERVED FOR GRAPHICS
0BFFFF		DISPLAY BUFFER
0C0000	192KB I/O EXPANSION ROM	RESERVED FOR ROM ON
0EFFFF		I/O ADAPTERS and/or EMS
0F0000 - 0FFFFF	64KB ROM	SYSTEM BIOS ROM
100000	4MB USER RAM	SYSTEM BOARD 16-BIT MEMORY
4FFFFF		
500000	USER RAM	16-BIT I/O CHANNEL MEMORY
FEFFFF		
FF0000	64KB ROM	DUPLICATED CODE
FFFFFF		ASSIGNMENT AT 0F0000

PowerFlex 286 Motherboard

Appendix D, I/O Address Map

Address	Port
000-01F	DMA Controller #1
020-03F	Interrupt Controller #1
040-05F	Timer
060-06F	Keyboard
070-07F	Real-time Clock, NMI
080-09F	DMA Page Register
0A0-0BF	Interrupt Controller #2
0C0-0DF	DMA Controller #2
0F0	Clear Math Coprocessor Busy
0F1	Reserved
0F8-0FF	Math Coprocessor
107	Reserved for I/O Setup Configuration
1F0-1F8	Fixed Disk
200-207	Game I/O
278-27F	Parallel Printer Port #2
2F8-2FF	Serial Port #2
300-31F	Prototype Card
360-36F	Reserved
378-37F	Parallel Printer Port #1
380-38F	SDLC, bisynchronous #2
3A0-3AF	Bisynchronous #1
3B0-3BF	Monochrome Display and Printer Adapter
3C0-3CF	Reserved
3D0-3DF	Color/Graphics Monitor Adapter
3F0-3F7	Floppy Diskette Controller
3F8-3FF	Serial Port #1

Appendix E, Low-Level Formatting

THE HARD DISK DRIVE HAS BEEN LOW-LEVEL FORMATTED AT THE FACTORY. DO NOT PERFORM THIS PROCEDURE UNLESS YOUR HARD DISK HAS CRASHED.

The HDFORM subdirectory of the utilities diskette contains the WDFMT program which is a versatile formatting utility for performing a low-level format of the high-performance drives.

Follow the procedures below for performing a low-level format on your hard disk drive:

1. Insert the setup/utilities diskette in Drive A.
2. Access the HDFORM subdirectory and view the README file by entering

```
A>CD\HDFORM<Enter>
A>DIR <Enter>
A>TYPE README <Enter>
```

3. Execute the WDFMT program by entering

```
A>WDFMT <Enter>
```

4. Use the parameters listed in Table E-1 as responses to the menu.

Table E-1: WDFMT Parameters List

PARAMETER	ENTER THIS VALUE
	<i>Model 40</i>
Drive (0/1)	0
Cylinders	977
Heads	5
Sectors	17
Interleave	1
Precomp	300
Skew	0
Alt Sector	No

5. After the low-level format is completed, the system displays several prompts. Respond to the prompts with the bolded items, as follows, replacing the <CYD#> and <HEAD#> with the actual cylinders and heads that have been marked as bad on the label on your hard disk drive.

386/486 Feature Connector

An ALR designed 104-pin connector that when used in conjunction with the ALR PowerFlex 386SX or i486 Module, automatically upgrades the standard PowerFlex 286 system into a 386SX or i486 system.

387SX math coprocessor

A chip, supported by the PowerFlex 386SX Module, whose task is to do computations in mathematics-intensive applications so as to eliminate this activity and its associated overhead from the CPU. Applications packages must be specifically written to support the 3875X coprocessor.

80286 microprocessor

A 16-bit microprocessor used as the CPU of the PowerFlex.

80287 coprocessor

A chip, supported by the PowerFlex, whose task is to do computations in mathematics-intensive applications so as to eliminate this activity and its associated overhead from the CPU. Applications packages must be specifically written to support the 80287 coprocessor.

base memory

Memory between 0 and 640-KB in which most DOS applications are run.

byte

The basic unit of measure for computer memory. For example, a character uses one byte of memory. Each byte is made up of 8 bits.

CMOS

Complementary **M**etal-**O**xide **S**emiconductor. The memory that stores the configuration information entered when you run the SETUP program. CMOS memory uses almost no power.

CONFIG.SYS

A file on the boot disk that configures MS-DOS.

default

The way a switch or jumper is set at the factory.

directory

A list of distinct files containing the names and locations of all the files in a disk. Directories are useful for locating files.

DISKCOPY

A DOS command that copies the contents of the diskette in the source drive to the diskette in the target drive. The target diskette is formatted, if necessary, during copy.

DOS

Disk Operating System. Software used by personal computers that controls the execution of programs such as resource allocation, scheduling, input/output control, and data management. There are several versions of DOS such as MS-DOS and PC-DOS. The PowerFlex system uses MS-DOS but is also compatible with PC-DOS.

DMA

Direct Memory Access. A method of transferring data between main memory and peripheral devices without processor intervention.

EPROM

Erasable Programmable Read-Only Memory. A storage device whose contents can be changed by electrical means. EPROM's can be reprogrammed repeatedly.

expanded memory

Memory beyond the 640-KB limit that is accessed through memory paging.

extended memory

Memory above 1-MB.

FDISK

A DOS command that allows you to create, set up, display, and delete the DOS partitions on a fixed disk.

FORMAT

A DOS command that initializes the disk in the designated drive to a recording format acceptable to DOS. It also analyzes the entire disk for any defective tracks and prepares the disk to accept DOS files by initializing the directory.

interleave

The number of fixed disk drive revolutions required to read/write one track of data. How sectors are read directly affects the data transfer rate of a disk. For example, a 3:1 interleave requires at least three complete disk revolutions to read/write an entire track of data. Similarly, a 1:1 interleave can read/write an entire track of data in just one disk revolution.

I/O

Input/Output. Refers to peripheral devices such as keyboards or printers.

jumper

A wire (usually encased in plastic) that electrically connects wires on a jumper block.

jumper block

A set of bare (uninsulated) pins on a circuit board.

kilobyte (KB)

1,024 bytes

logical drive

A portion of memory or of a storage device which is perceived and treated as an independent physical drive by the computer's logic. A partition of a physical fixed disk drive or a virtual drive can be referred to as a logical drive.

low-level formatting

Synonymous with hard disk formatting. This is usually done at the factory. The hard disk drive must be low-level formatted before performing a partition (FDISK) and high-level format (FORMAT).

megabyte (MB)

1,024 kilobytes

MFM

Modified Frequency Modulation. A coding scheme which uses magnetic flux-field reversals to store data.

POST

Power-On Self Test. A test performed by the computer upon boot-up. The POST checks system integrity.

PowerFlex 386SX Module

An ALR designed module that is used to convert the standard PowerFlex 286 system into a 386SX system. This module supplies support for the 387SX math coprocessor and must be plugged into the AER 386/486 Feature Connector.

PowerFlex i486 Module

An ALR designed module that is used to convert the standard Power-Flex 286 system into an i486 system. This module must be plugged into the AER 386/486 Feature Connector.

propagation delay

The time necessary for a signal to travel from one point on a circuit to another.

protected mode

An advanced mode of 80286 and 80386 processors where extended memory (up to 16-MB) and advanced features of the chip can be accessed.

RAM

Random Access Memory. The computer's system memory onto which you can write to or read from.

RMA

Return Material Authorization. A number that you must obtain before returning any equipment to the ALR factory for repair or service.

ROM

Read-Only Memory. Permanent computer memory dedicated to a particular function. Unlike RAM, you cannot write to ROM.

SIMM

Single Inline Memory Module. This type of memory expansion holds nine 256-KB x 9 or 1-MB x 9 DRAM chips.

wait state

A condition in which a CPU halts operation and awaits a signal to continue. When the signal is received, operation continues at the point where it stopped. A zero wait state is one in which there is no delay in the operation.