AST Xformer/286™

AST
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User's Manual

AST Xformer/286™

Quick Installation Steps

## Xformer/286 Quick Installation Steps

These steps are a quick overview of the Xformer/286 installation procedure. For more detailed instructions or additional information, refer to the appropriate section within the *Xformer/286 User's Manual*.

Configuring Xformer/286

Xformer/286 is shipped from the factory with the following configuration:

Feature	Default Value
RAM	512 KB
ROM	Std. amount: 27128
	Std. address: 0F8000h-0FF000h
	Opt. amount: 27128
	Opt. address: 0F0000h-0F7000h

Math coprocessor
clock speed   8 MHz
(math coprocessor not included)

Primary display
adapter   Monochrome

If any of the factory settings listed above are inappropriate for your system, (for example, you have a color display adapter) you must change the switch setting. Refer to Section 2.1 for instructions on changing the switch settings.
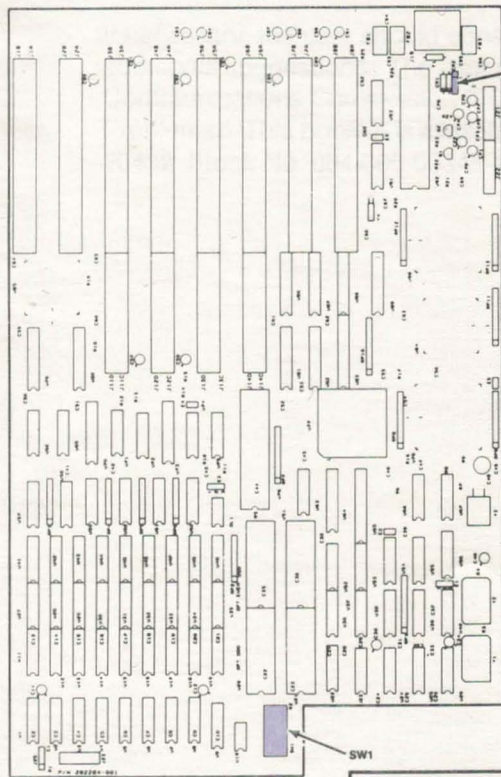

Battery
connector
pins
(jumper 24)

SW1

| O N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

RAM   ROM   Math   Video
      BIOS coprocessor
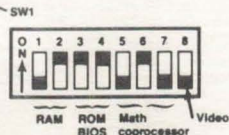
Installing Xformer/286

You need a pair of needlenose pliers and a flathead screwdriver or nut driver.

1. Turn off your system. Disconnect cables. Remove the PC XT cover.

2. Disconnect the disk cable(s) and remove the disk controller board(s). Record the location from which the cables are removed. Remove the option boards from the expansion slots.

Option
boards

Disk cable
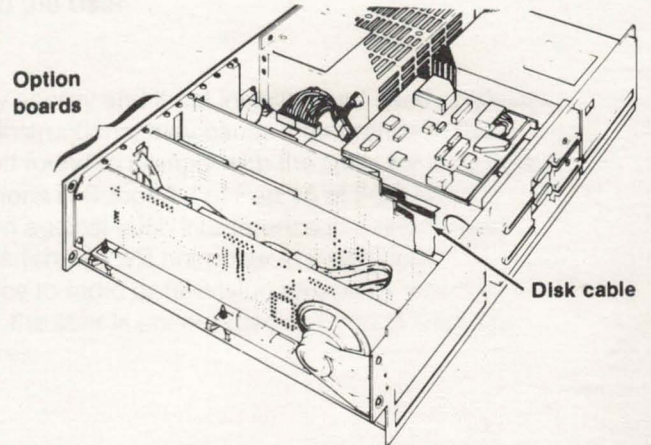
3. Unplug the power connectors (P8 and P9) from the system board. Unplug the speaker wire. Remove hex screws. Slide the PC XT system board out of the chassis.

Speaker wire

Hex screw

Hex screw

Power connectors
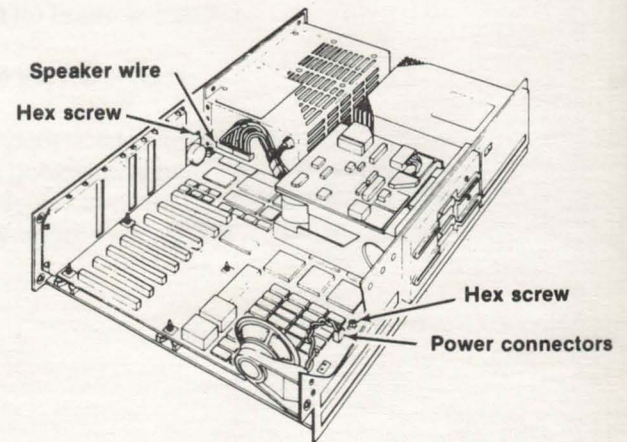
4. Place the system boards next to each other. Remove the standoffs (plastic holders keeping the system board off the chassis) from the PC XT board and place them in the same location on Xformer/286.
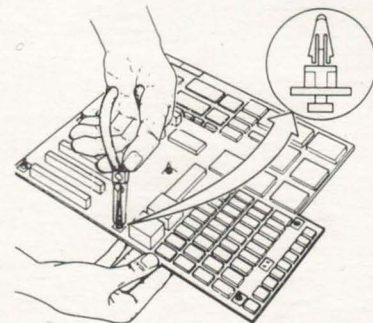
5. Slide the standoffs into the slots on the bottom of your system's chassis. Gently push Xformer/286 into place. Install hex screws.

disk

ple

6. Insert power connector P8 in P1 and power connector P9 in P2. Reconnect the speaker wire.

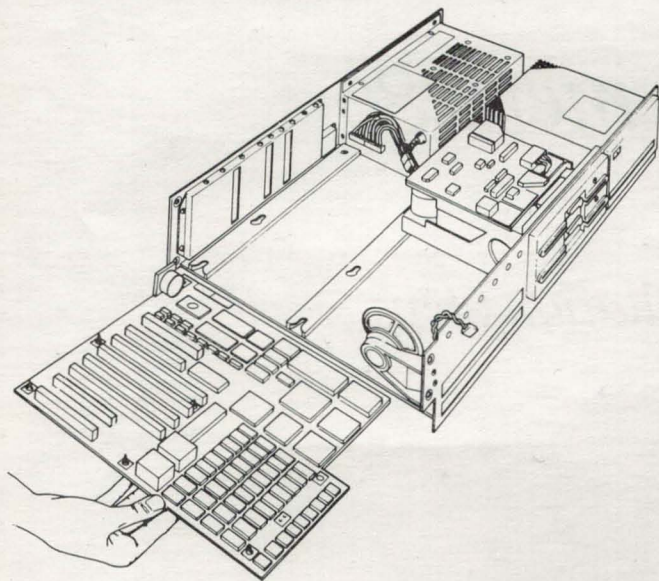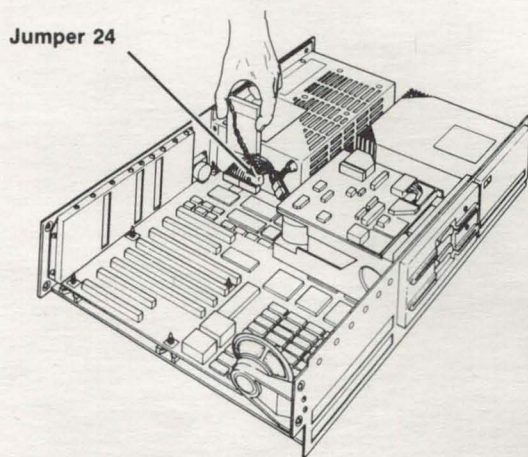Install Xformer/286's battery. Plug the battery's connector into jumper 24 (next to the power connectors). Separate the velcro strips on the battery's back. Peel the protective covering from the strip you removed. Stick the loose strip to your power supply. Use the velcro to attach the battery to the power supply.

Jumper 24

ctors

g
XT

7. Reconnect the disk cables. Reinstall the disk controller board(s).

If any of your option boards have a clock, disable it. Option board clocks conflict with the clock provided on Xformer/286. Insert your option boards into the expansion slots. Boards with two edge connectors must be installed in two-connector expansion slots. One-connector boards can be installed in one- or two-connector slots.

8. Replace your computer's cover. Connect computer components. Proceed to SETUP.

Running SETUP

SETUP writes your system configuration into memory. The memory stores your configuration and is read each time you boot the machine.

SETUP is on the diskette supplied with Xformer/286. You must run SETUP after you complete Xformer/286's hardware installation.

To start SETUP:

1. Place the Xformer/286 diskette in drive A:.

2. Type the following command at the disk operating system prompt:

A:ASTUTE

3. Select the "Run SETUP" option.

4. SETUP displays the default system configuration.

5. If the configuration is correct, press < F1 > to accept the displayed values.

If the configuration is not correct, press < Down Arrow > to access the field you want to change. Press either < Left Arrow > or < Right Arrow > to display the valid choices for the field. Press < Enter > to accept the displayed choice. If necessary, refer to Section 3 for more information on SETUP fields.

After making your changes, press < F10 >. Remove the Xformer/286 diskette. If you boot from a floppy diskette, insert the boot diskette in dirve A:. Press < F5 > to confirm the configuration. The system reboots and the new configuration is in effect.

Using Xformer/286

To change Xformer/286's processing speed to 10 megahertz (MHz), press < Ctrl > - < Alt > - < Cursor Up >.

To change the processing speed to 6 MHz, press < Ctrl > - < Alt > - < Cursor Down >.

If you have clock commands in your AUTOEXEC.BAT file for an option board clock, you should remove them.

FCC WARNING

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules. Use shielded cables to attach only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits to your computer. Operation without shielded cables or with noncertified peripherals is likely to result in interference to radio and TV reception.

Instructions to the User

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

- Reorient the receiving antenna.

- Relocate the computer with respect to the receiver.

- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

- Ensure that board slot covers are in place when no board is installed.

- Ensure that all brackets are fastened securely to the PC chassis.

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

Xformer/286™

System Board Replacement

for the

IBM PC XT and Compatible

User's Manual
000554-001 A
October 1987

AST RESEARCH, INC.
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First Edition (October 1987)

Changes are periodically made to the information contained in this manual; these changes will be incorporated into new editions.

In view of demonstrated product reliability and comprehensive warranty policies, AST Research, Inc. does not normally provide schematics or material lists. AST recognizes that some customers with a large installed base of AST products want supportive documentation for their own organizations. In such cases, customers should contact AST Research corporate offices to consider an appropriate nondisclosure agreement to obtain this documentation.

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INTRODUCING XFORMER/286

Xformer/286™ is a replacement system board for your IBM ® PC XT or compatible. The board brings the processing power and speed of a PC AT ® to your machine. Key features of Xformer/286 include:

- Ability to run OS/2. Xformer/286 may be used with current versions of PC-DOS ® , MS-DOS ® , GW-BASIC ® , and XENIX ® in addition to future releases of OS/2.

- Four, 16-bit expansion slots and four, 8-bit expansion slots. The slots are compatible with both XT and AT option boards including AST's VGA, 3G Plus series, and I/O Mini II.

- Support for both 8-bit (XT) and 16-bit (AT) disk controller cards.

- Operating speed of either 6 or 10 megahertz (Mhz) with zero wait states. Simple key combinations allow you to change from one speed to the other.

- Software programmable direct memory access (DMA).

- Automatic self-test diagnostic when power is turned on.

- Standard 512 kilobytes (KB) of random access memory (RAM). Total system board RAM is configurable at 256 KB, 512 KB, or 1 megabyte (MB).

- Up to 16 MB of directly addressable memory.

- Menu-driven program for easy set up.

- Support for 83-, 84-, 101- and 102-key keyboards.

- Math coprocessor socket. Coprocessor can run at either 5 or 8 Mhz.

- Support for color, monochrome, and enhanced graphic adapter (EGA) video types.

- Battery-powered clock/calendar.

Hardware Overview

Figure 1 is a simplified drawing of Xformer/286.
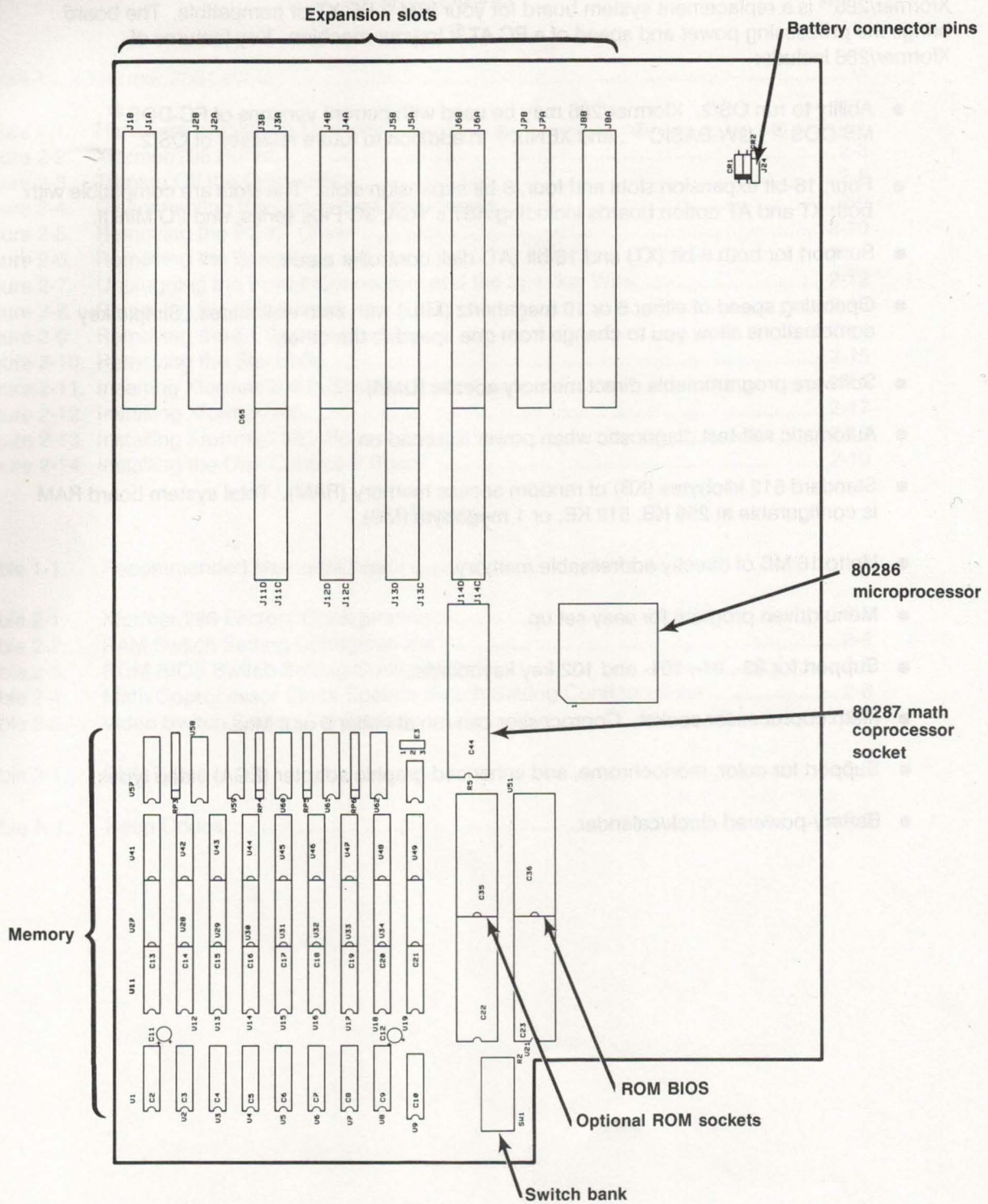
Figure 1. Xformer/286 Layout

The major hardware components of the board are:

80286 microprocessor: The 80286 microprocessor chip is the brain of your computer. The chip carries out commands issued by your software. The chip operates at either 6 or 10 MHz with zero wait states to system board memory.

80287 math coprocessor socket: Math coprocessors are specialized chips that perform arithmetic, logarithmic, and trigonometric functions. They are coprocessors because they offload the microprocessor. While a math coprocessor is not included with Xformer/286, the socket in which you can install the chip is provided.

Battery connector pins: When your system is powered off, a low-voltage battery keeps the clock/calendar and a portion of the computer's memory running. The battery is plugged into Xformer/286 on the battery connector pins.

Expansion slots: Expansion slots hold the disk controller and option boards. Option boards are added to a basic system to provide features such as video display, modem connection, disk controllers, and printer interface.

A total of eight slots are provided. Four slots are 8-bit; they have a single edge connector slot and are compatible with your XT boards. Four slots are 16-bit; they have two edge connector slots and are compatible with both XT and AT boards.

Memory: Memory is your computer's work area. Xformer/286 provides 512 KB of memory. Memory chips can be added to increase the memory to 1 MB.

Optional ROM sockets: Two optional ROM sockets, like those on the PC AT system board are provided. The sockets are reserved for future use. Currently, they have no function.

ROM BIOS: The read-only memory (ROM) basic input/output (BIOS) chip contains Xformer/286's firmware.

Switch bank: The switch bank is used to configure Xformer/286 for your system. The switches determine the amount of RAM, type and address of ROM BIOS, math coprocessor clock speed, and video display adapter type.

Software Overview

Once installed, Xformer/286 is controlled by instructions issued from an operating system such as PC-DOS, MS-DOS, or XENIX.

Programs provided on your master diskette are:

- *SETUP*: Records your system configuration (number of floppy drives, hard drives, type of disk controller, etc.) in memory so the microprocessor will know the capabilities of your system. SETUP must be run immediately after you install Xformer/286 and any time you change your system configuration.

- *ASTUTE*: A menu-driven diagnostic program used to detect location of hardware errors. ASTUTE is provided for technical users, such as engineers, programmers, and technicians.

- *SPEED:* Allows you to change the CPU speed by entering commands at the DOS prompt. The SPEED commands are as follows:

To display the current speed:	SPEED
To display the default speed established in SETUP:	SPEED D
To change the current speed to 10 MHz:	SPEED HIGH
To change the current speed to 6 MHz:	SPEED LOW

BEFORE YOU BEGIN . . .

Section 1 presents information you'll need before installing your Xformer/286. The following checklist outlines the steps you'll take to install Xformer/286.

_____ 1.   Check the README.DOC file (Section 1.1).

_____ 2.   Check package contents and hardware compatibility (Section 1.2 and 1.3).

_____ 3.   Check switch settings (Section 2.1).

_____ 4.   Install Xformer/286 (Section 2.2).

_____ 5.   Run SETUP (Section 3).

1.1 Checking the README.DOC File

The README.DOC file on the Xformer/286 diskette contains updates to this user's manual. To display the information on your PC, enter:

        TYPE drive:README.DOC<Enter>

where *drive:* is the floppy drive containing the Xformer/286 diskette.

To print out a hard copy of the README file, enter:

        COPY drive:README.DOC PRN<Enter>

where *drive:* is the floppy drive containing the Xformer/286 diskette.

1.2 Checking the Contents

Before you install Xformer/286, make sure your package is complete. In addition to this manual (AST part number 000554-001), your Xformer/286 package should include the following items:

- Xformer/286.

- One Xformer/286 software diskette.

- One battery.

NOTE

Do not discard the packing materials. If your Xformer/286 ever needs to be shipped, it must be packed in these special shock-absorbing materials. Xformer/286s returned to the factory in nonapproved containers may be refused and your warranty may be voided. Contact AST Research for replacement shipping containers.

Contact your authorized AST reseller immediately if any components are damaged or missing.

1.3 Hardware Compatibility

Xformer/286 is intended for use in an IBM PC XT or XT-compatible computer. The system board of compatible systems must have eight expansion slots and the same physical dimensions as the IBM PC XT system board.

Xformer/286 is compatible with PC XT and PC AT input/output (I/O) boards. If you want your PC XT boards with a serial port to run at PC AT speeds, you must change the universal asynchronous receiver transmission (UART) chip on the I/O board from 8250 to 16450.

AST-compatible products include AST-VGA, 3G Plus series, and I/O Mini II.

For 360-kilobyte (KB) floppy drives, both the drive and the disk controller must be the same type. For example, an XT-type floppy drive must use an XT-type disk controller. If you upgrade to an AT-type (combination) disk controller, you must also upgrade your 360-KB floppy drive to an AT-type floppy drive. (The AT-type floppy drive has line 34, the "ready" line, open. A technician can modify an XT floppy drive, or you can purchase an AT-type drive.)

The maximum amount of linear memory that can be installed on the Xformer/286 system board is 1024 kilobytes (KB). Xformer/286 includes 512 KB. Memory chips added to Xformer/286 must be 256-KB random access memory (RAM) chips with a gate access speed of 100 nanoseconds (ns) or faster. Recommended memory chips are listed in Table 1-1.

Table 1-1. Recommended Memory Chips.

Manufacturer	Part Number
Fujitsu	MB81256-10P
Hitachi	HM50256P-10
Hyundai	HY51C256L-10
Micron	MT1259-10
Mitsubishi	MSM4256P-10
Oki	MSM41256-10RS
Toshiba	TMM41256AP-10

NOTES

Section 2 shows you how to install Xformer/286. The flowchart shown in Figure 2-1 outlines the Xformer/286 hardware installation process.

```
┌─────────────────────────────────────────────────────────┐
│ Check Xformer/286 for standard configuration (Figure 2-2). │
└─────────────────────────────────────────────────────────┘
                          │
                          ▼
                     ╱─────────╲
                    ╱  Change   ╲        Yes    ┌──────────────────┐
                   ╱     the      ╲─────────────▶│ See Section 2.1. │
                    ╲ configuration?╱            └──────────────────┘
                     ╲───────────╱
                          │ No
                          ▼
            ┌────────────────────────────────┐
            │ Install Xformer/286 (Section 2.2). │
            └────────────────────────────────┘
                          │
                          ▼
            ┌────────────────────────────────┐
            │ Run SETUP program (Section 3).   │
            └────────────────────────────────┘
```
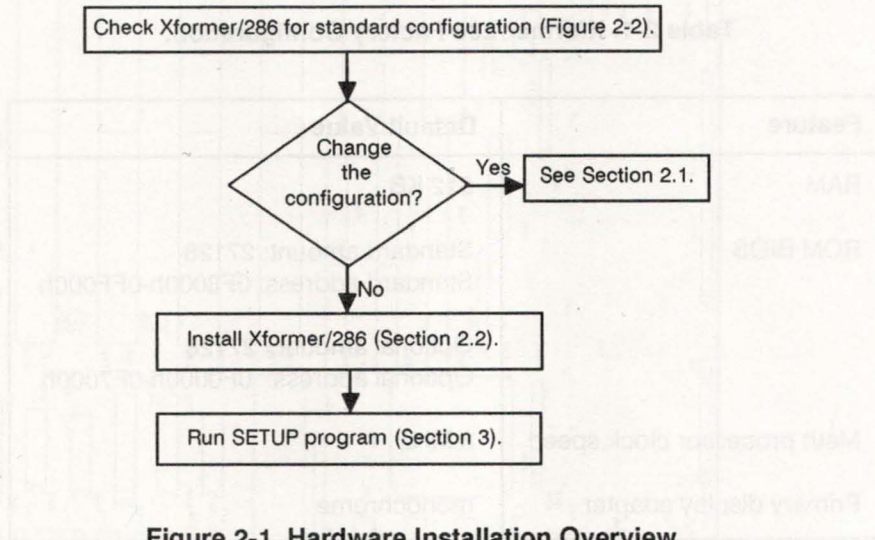
Figure 2-1. Hardware Installation Overview.

2.1 Configuring Xformer/286

Xformer/286 is shipped from the factory in the configuration summarized in Table 2-1. However, you may need to change the factory configuration. For instance, the default primary display adapter type is monochrome. If you have a color display adapter, you need to change the factory setting.

The default factory settings are shown and instructions for changing the settings are provided in Sections 2.1.1 through 2.1.4.

Table 2-1. Xformer/286 Factory Configuration.

Feature	Default Value
RAM	512 KB
ROM BIOS	Standard amount: 27128 Standard address: 0F8000h-0FF000h Optional amount: 27128 Optional address: 0F0000h-0F7000h
Math processor clock speed	8 MHz
Primary display adapter	monochrome

Figure 2-2 is a simplified layout of Xformer/286 showing the location of the switch banks used to configure Xformer/286. To change a switch setting, use a small screwdriver or other blunt instrument to slide the raised portion of the switch to either the ON or the OFF position.
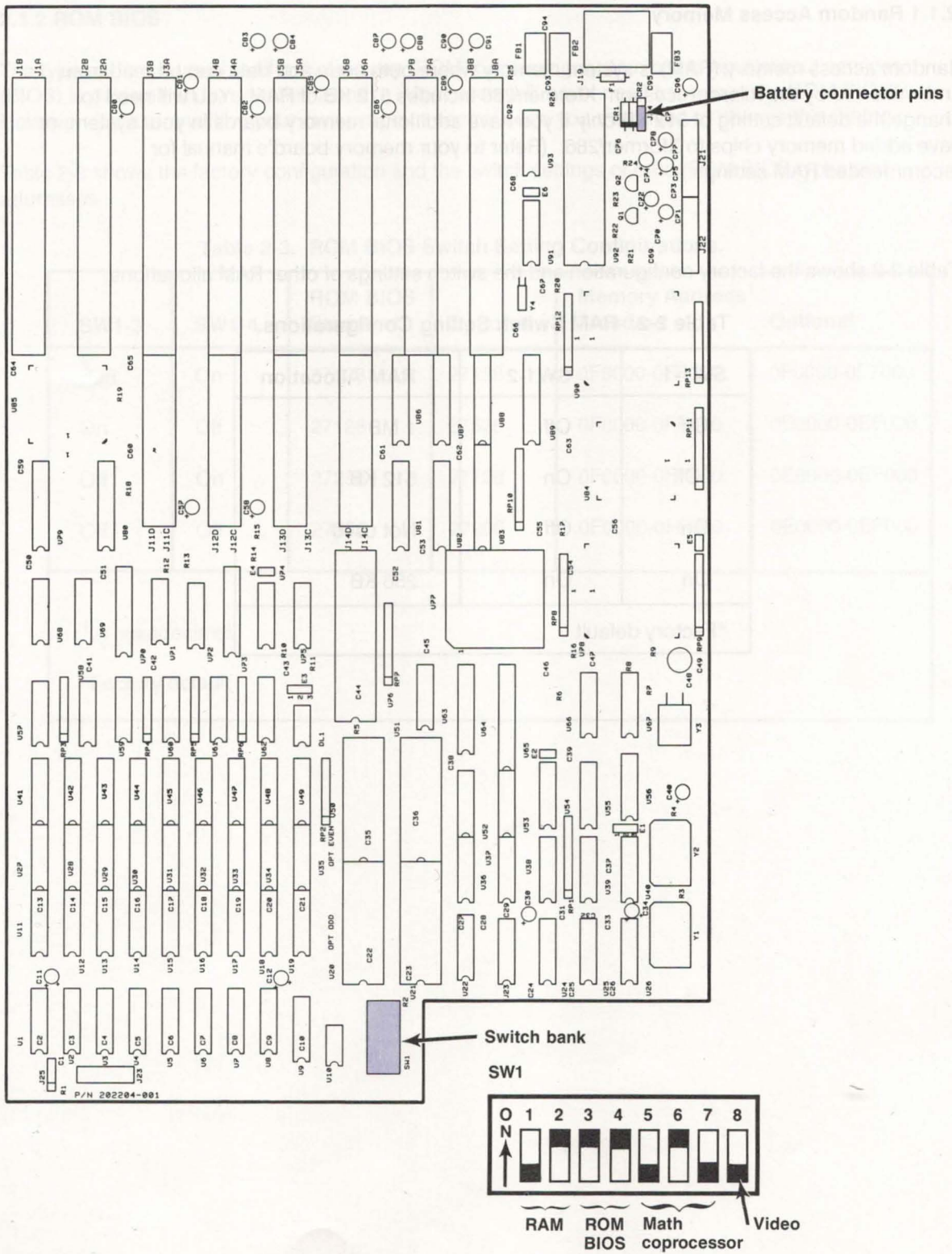
Figure 2-2. Xformer/286 Board.

2.1.1 Random Access Memory

Random access memory (RAM) is system memory where both code and data can be read from and written to by the microprocessor. Xformer/286 includes 512 KB of RAM. You will need to change the default setting of 512 KB *only* if you have additional memory boards in your system, or have added memory chips to Xformer/286. (Refer to your memory board's manual for recommended RAM settings.)

Table 2-2 shows the factory configuration and the switch settings of other RAM allocations.

Table 2-2. RAM Switch Setting Configurations.

SW1-1	SW1-2	RAM Allocation
Off	Off	1 MB
*Off	On	512 KB
On	Off	Not used
On	On	256 KB
*Factory default		

2.1.2 ROM BIOS

The type and address of read-only memory (ROM) containing system basic input/output services (BIOS) is determined by switches 2 and 3. Most users will never need to change the ROM BIOS. However, if you are writing your own program control code you may need to change the setting.

Table 2-3 shows the factory configuration and the switch settings of other ROM BIOS types and addresses.

Table 2-3. ROM BIOS Switch Setting Configurations.

SW1-3	SW1-4	ROM BIOS Standard	Optional	Memory Address[1] Standard	Optional
[2]On	On	27128	27128	0F8000-0FF000	0F0000-0F7000
On	Off	27128	27526	0F8000-0FF000	0E0000-0EF000
Off	On	27256	27128	0F0000-0FF000	0E8000-0EF000
Off	Off	27256	27256	0F0000-0FF000	0E0000-0EF000

[1]In hexadecimal

[2]Factory default

2.1.3 Math Coprocessor Clock Speed

Xformer/286 can use an 80287 math coprocessor chip that operates at a clock speed of either 5 or 8 megahertz (MHz) (regardless of whether the system board is operating at 6 or 10 MHz). Math coprocessors offset the workload of the main processor by completing arithmetic, logarithmic, and trigonometric functions. Heavy users of programs that can take advantage of numeric coprocessors may want to add one to speed their work.

A math coprocessor chip is not included on Xformer/286. However, if you add a chip, you must set the math coprocessor clock speed on the Xformer/286 board. The optimum clock speed of your math coprocessor chip should be specified in the coprocessor's manual.

Table 2-4 shows the factory configuration and the switch settings of the math coprocessor clock speeds.

**Table 2-4. Math Coprocessor Clock Speeds
Switch Setting Configurations.**

SW1-5	SW1-6	SW1-7	Speed
Off	On	On	5 MHz
*On	Off	Off	8 MHz
*Factory default			

2.1.4 Video

The video switch determines the type of primary video adapter you have -- monochrome or color. (Monochrome adapters can display only one color on your monitor.) Color includes enhanced graphic adapters (EGA). Table 2-5 shows the switch used for the video setting.

Table 2-5. Video Switch Setting Configurations.

SW1-8	Adapter Type
On	Color, EGA
*Off	Monochrome

*Factory Default

2.2 Installing Xformer/286

This section shows you how to install Xformer/286 into your IBM PC XT. The exact location and name of components (example, power connectors are P8 and P9) may vary on compatible machines.

You will need a pair of needlenose pliers and a flathead screwdriver or nut driver to perform the procedure (long drivers are easiest to use).

STEP 1
Turn off your system: Be sure the computer's power switch is off and the power cord is removed from the wall outlet. See Figure 2-3.

Turn off any other equipment connected to the computer. Installing any component while the computer is on can permanently damage your computer and its components.

Turn monitor power off

Remove power cord from wall outlet (for color monitors, remove monitor power cord from wall outlet)

Turn system unit power off
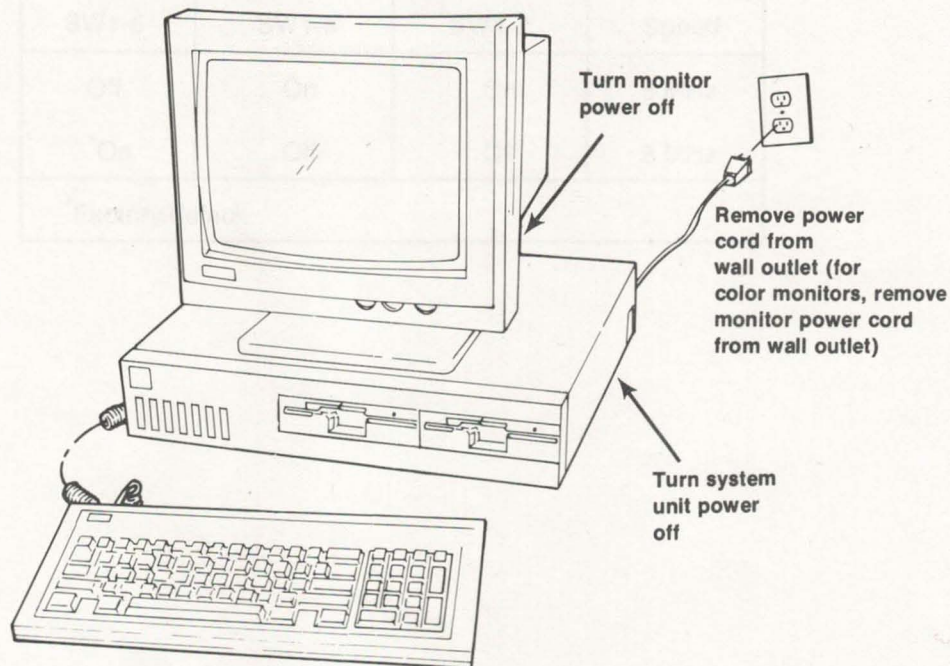
Figure 2-3. Turning Off the Computer.

STEP 2

Disconnect computer components: Disconnect the components of your computer and any other devices plugged into your system. See Figure 2-4.

For color monitor, remove from wall outlet.
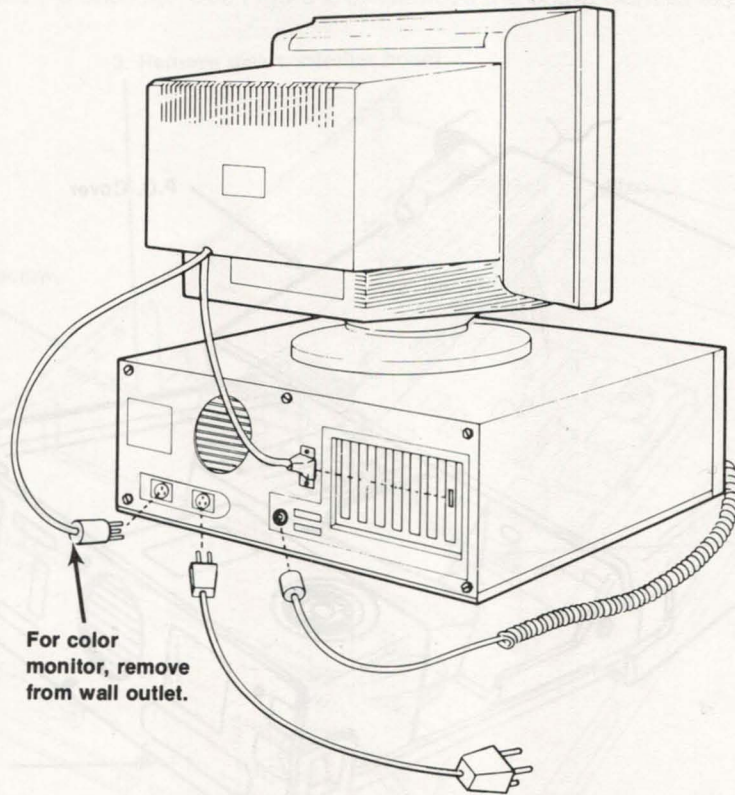
Figure 2-4. Disconnecting the Computer Components.

STEP 3

Remove the PC cover: Use a flathead screwdriver or nut driver to remove the cover mounting screws from your PC (see your PC's manual for the location of the cover mounting screws.) Pull the cover off. See Figure 2-5.

P.C. Cover

Rear Panel
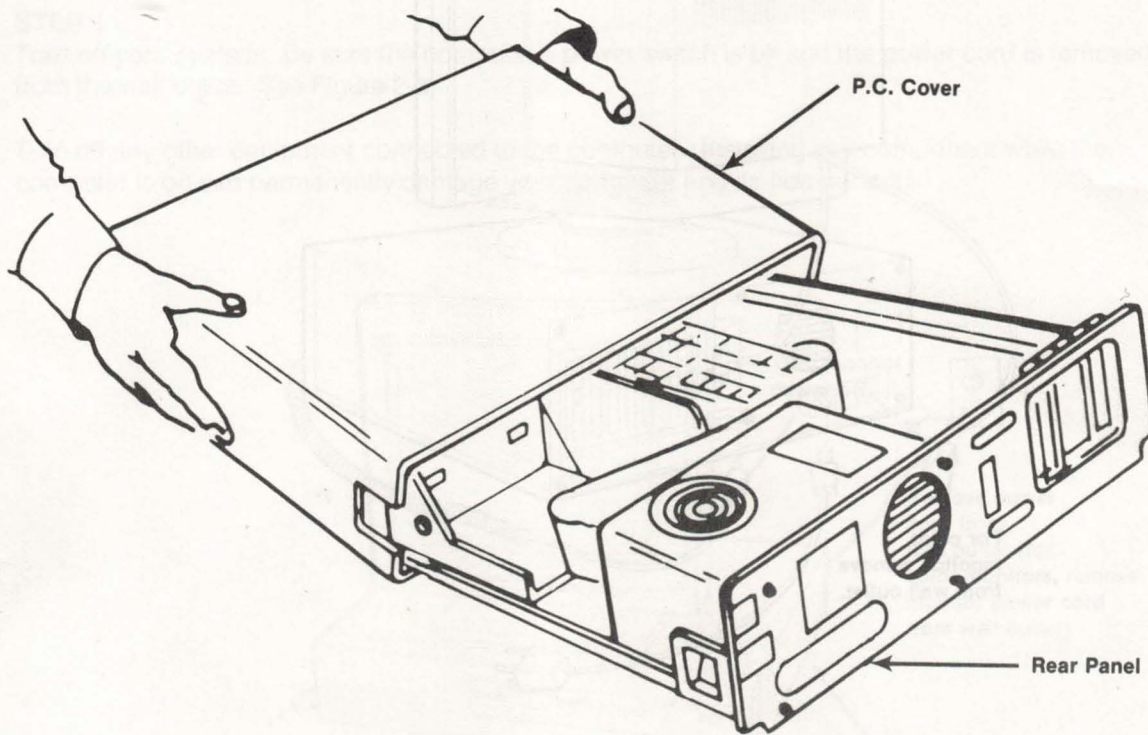
Figure 2-5. Removing the PC XT Cover.

STEP 4

Disconnect the disk cable(s) and remove the disk controller board(s): Detach all ribbon cables from the disk controller board (usually the board installed closest to the disk drives). Write down the location from which you remove the cable connectors, or you may want mark the cables with felt tip pens or masking tape to make them easy to replace. Remove the bracket retaining screw from the rear of the PC chassis. See Figure 2-6. Remove the board from its expansion slot.

3. **Remove disk controller board.**

2. **Remove bracket screw.**

4. **Remove option boards.**

1. **Disconnect disk cable.**
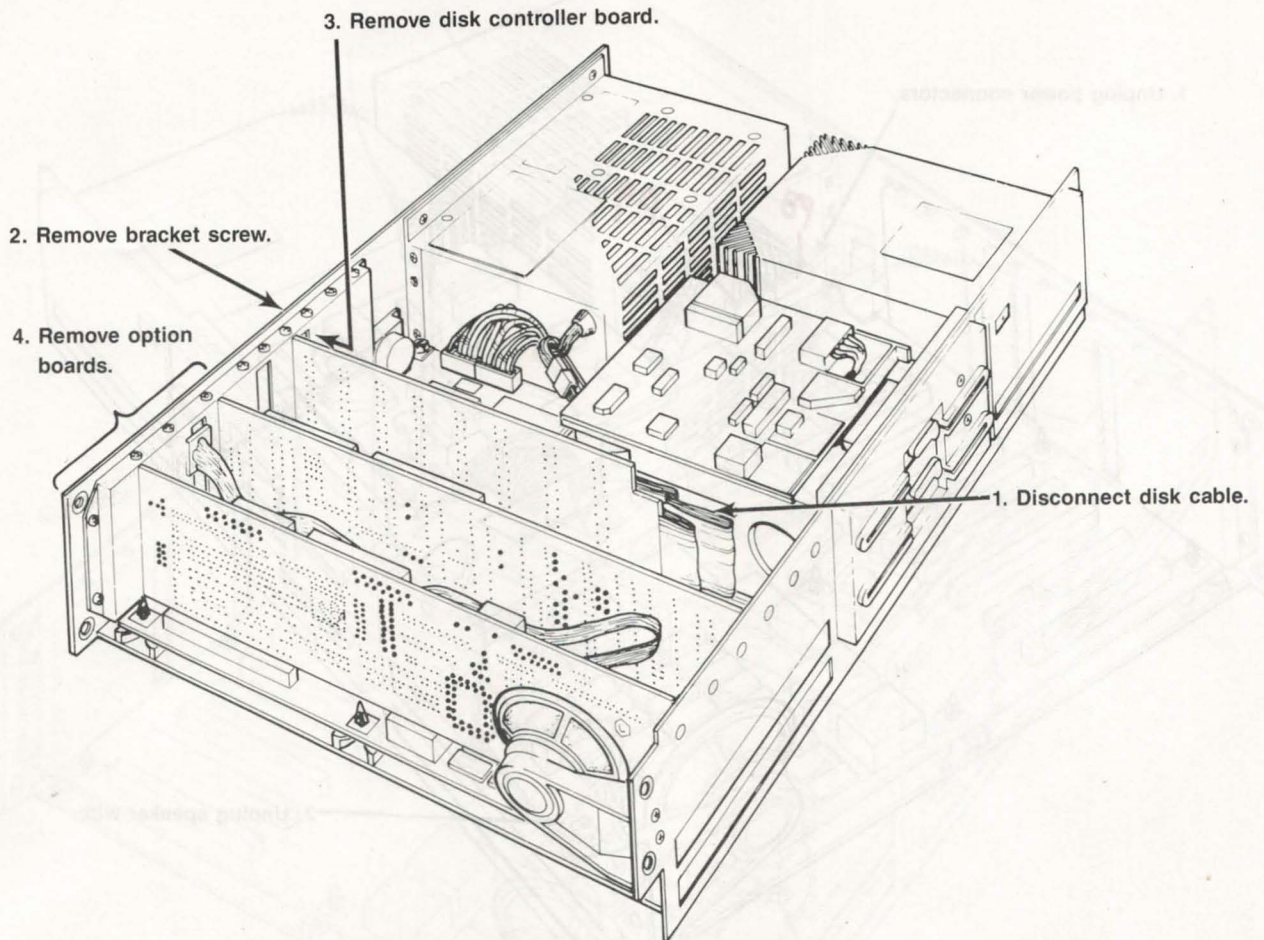
Figure 2-6. Removing the Boards.

STEP 5

Remove the option boards from the expansion slots: Option boards, if any, are seated in the expansion slots. Remove each board's bracket retaining screw from the rear of the chassis and pull the board out of the system.

STEP 6

Unplug the power connectors (P8 and P9) from the system board: P8 and P9 are next to the power supply. To unplug, press the tab facing the power supply and pull up gently. (You may want to mark the connectors.) See Figure 2-7.

1. Unplug power connectors.

2. Unplug speaker wire.
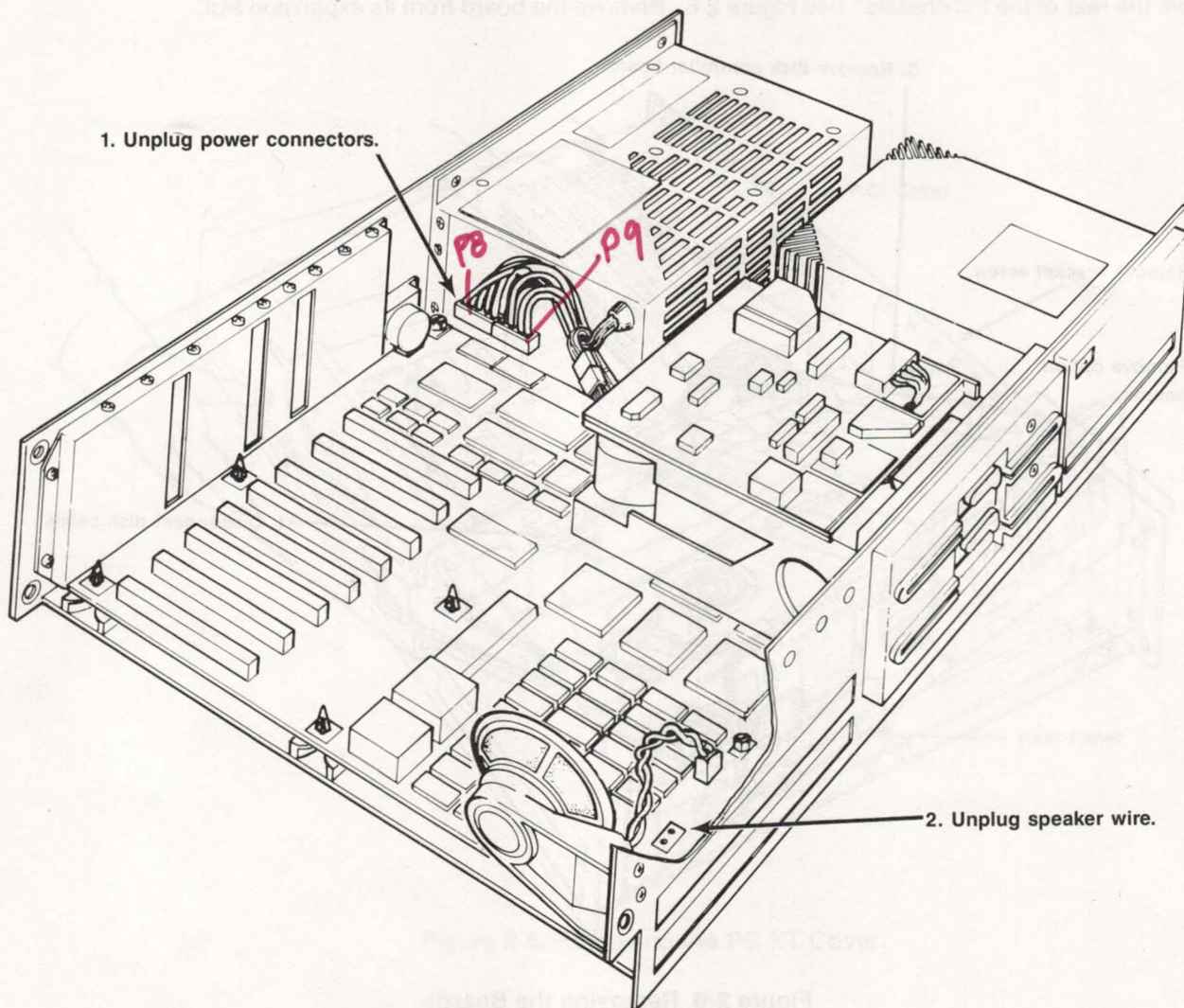
Figure 2-7. Unplugging the Power Connectors and the Speaker Wire.

STEP 7

Unplug the speaker wire: As you face your system, the speaker wire is located in the left front corner. See Figure 2-7. After unplugging the connection from the board, pull the wire to the front of the machine so it will not interfere with the installation procedure.

STEP 8

Remove hex screws: Using a flathead screwdriver, remove the two hex screws from the system board. See Figure 2-8.
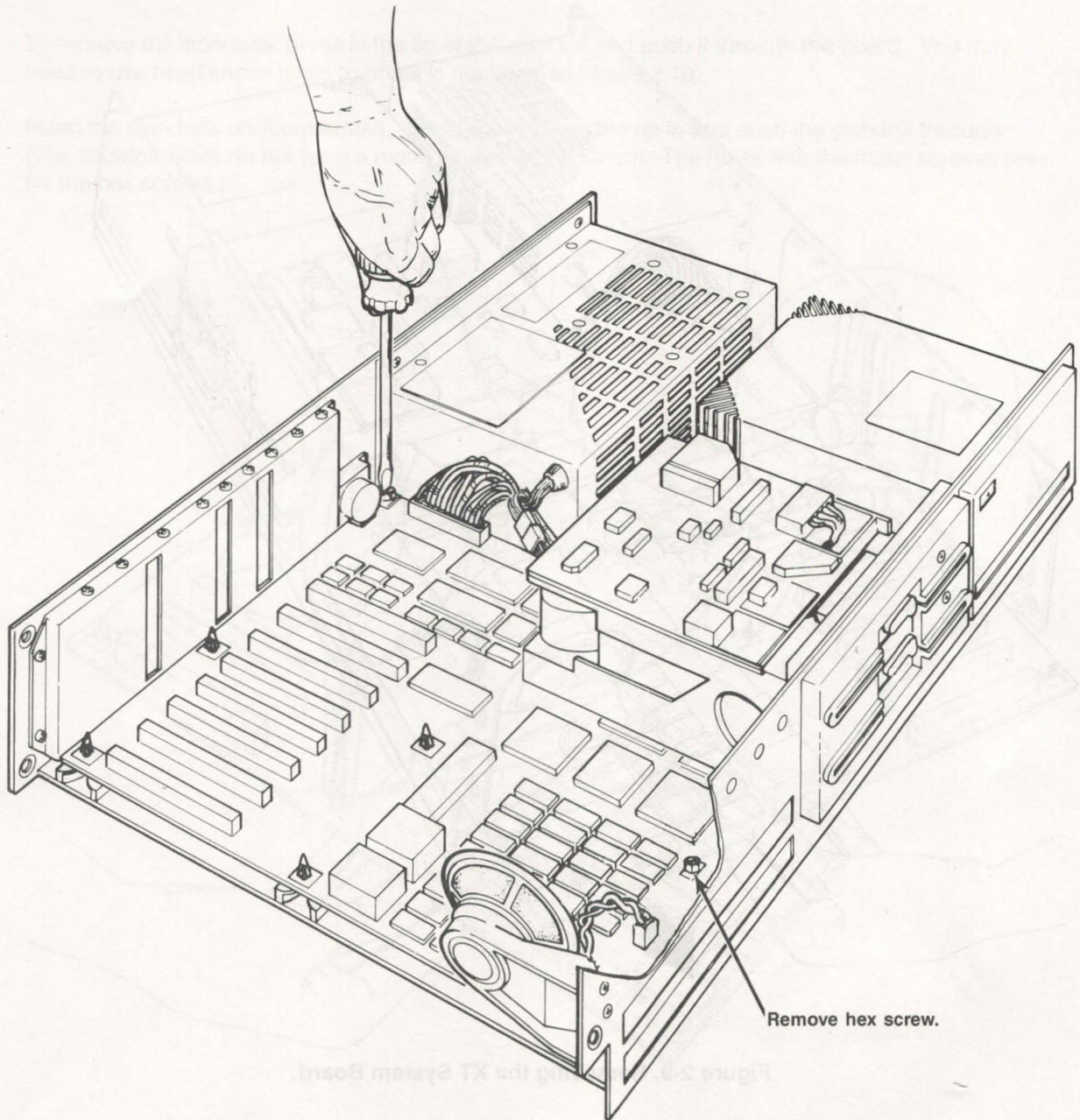
Remove hex screw.

Figure 2-8. Removing the Hex Screws.

STEP 9

Remove the XT system board: Pull the XT system board to the edge of the chassis. Lift the board out of the system. See Figure 2-9.
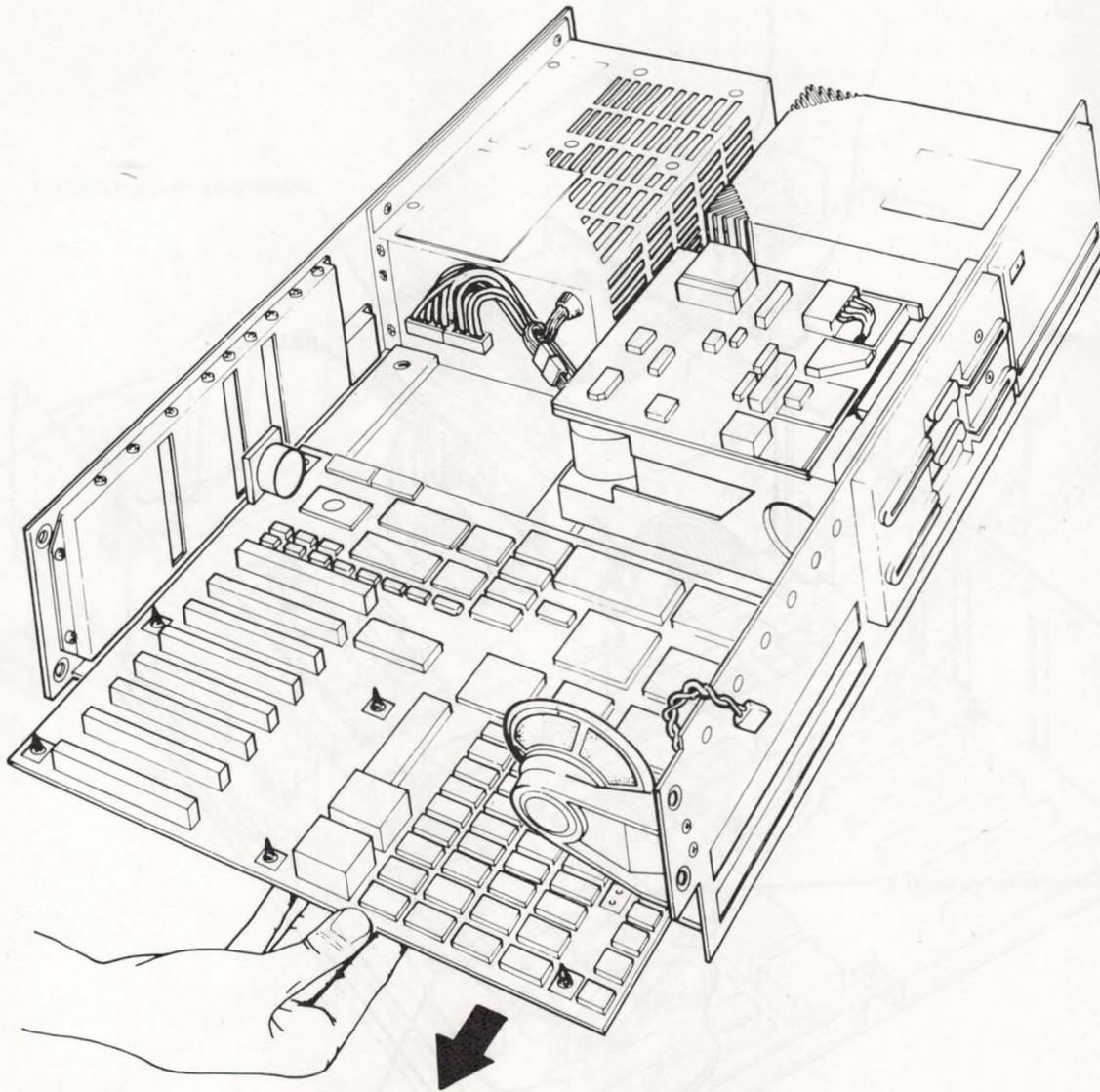
Figure 2-9. Removing the XT System Board.

STEP 10

Remove plastic standoffs from XT board. Insert standoffs on Xformer/286: Place the boards next to each other. Remove the standoffs (plastic holders keeping the system board off the chassis) from the XT board and place them in the same location on Xformer/286.

To remove the standoffs, press in the tip of the standoff and push it through the board. You may need to use needlenose pliers to press in the tip. See Figure 2-10.

Insert the standoffs on Xformer/286. Once again, press the tip in and push the standoff through. (The standoff holes do not have a metal square around them. The holes with the metal squares are for the hex screws.)
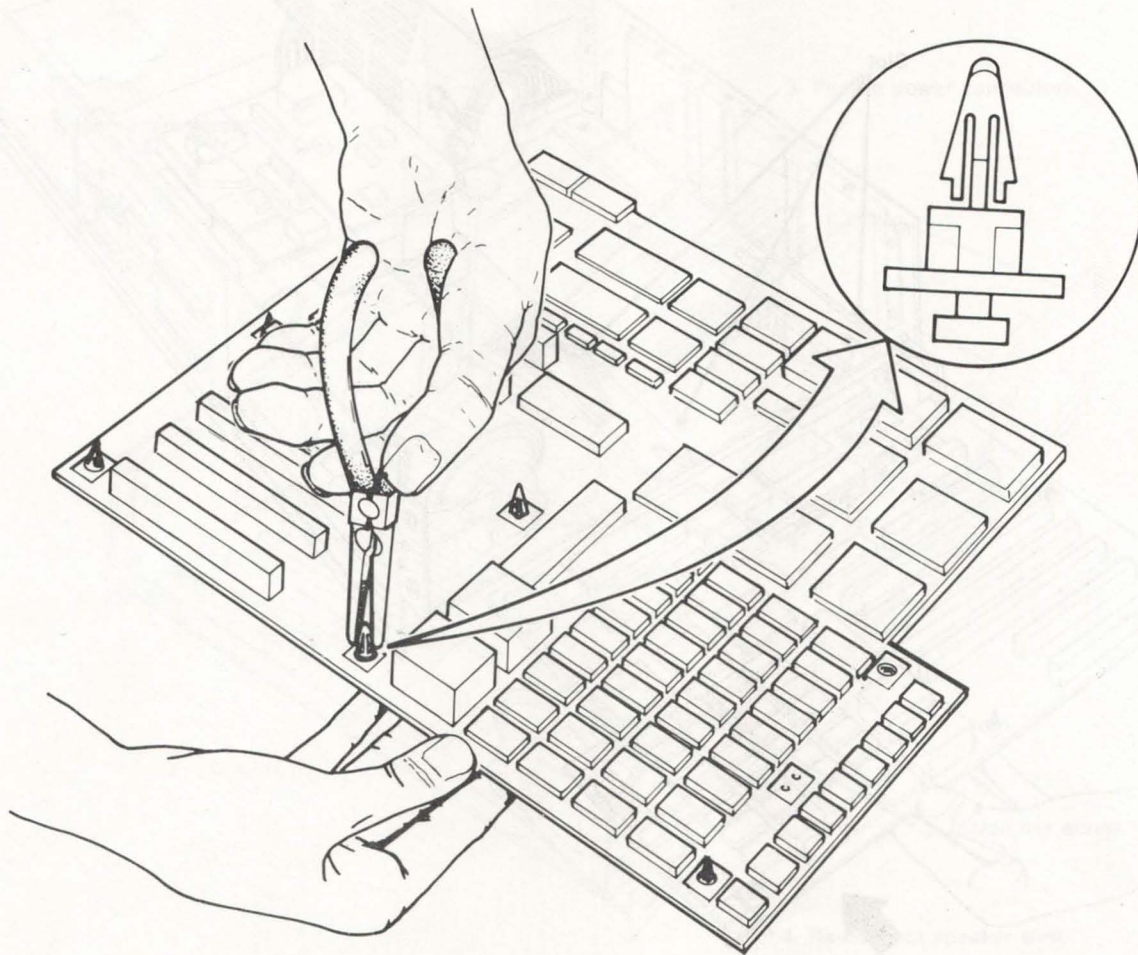
Figure 2-10. Removing the Standoffs.

STEP 12

Insert Xformer/286 in your system: Slide the standoffs into the slots on the bottom of your system's chassis. Gently push Xformer/286 into place. See Figure 2-11.

To check the placement, lift the edge of the Xformer/286 board. If the board doesn't move up, it is properly placed. If the board moves, continue to slide Xformer/286 forward until it is locked in place.
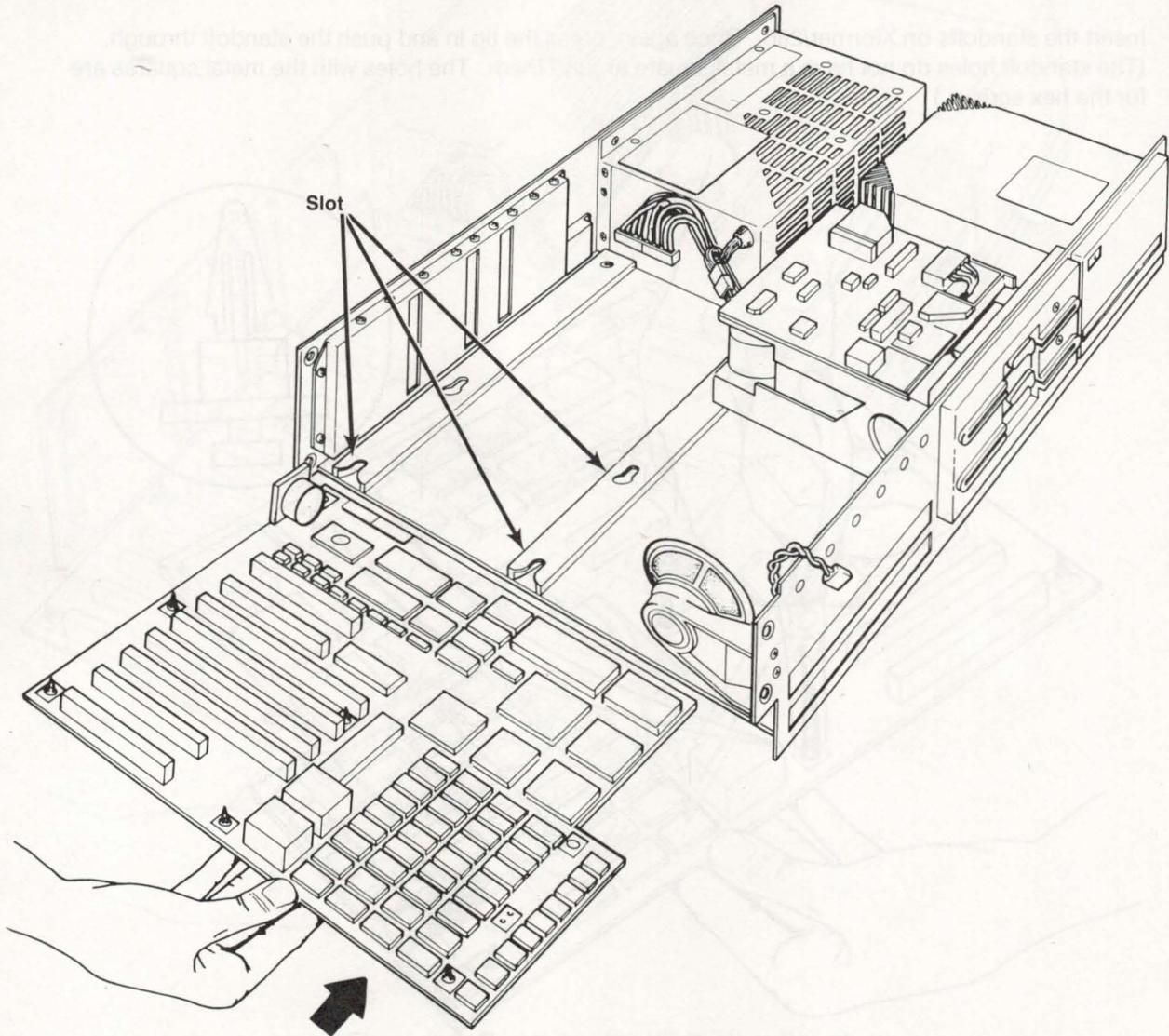
Figure 2-11. Inserting Xformer/286 into the System Chassis.

STEP 13

Install hex screws: Use a flathead screw or nutdriver to install the hex screws. See Figure 2-12.

STEP 14

Plug in the power connectors (P8 and P9) and the speaker wire: Insert P8 in P1 and P9 in P2. The tab on the connector should be toward the power supply. See Figure 2-12.

Reconnect the speaker wire. Push the wire out of the way of expansion boards. See Figure 2-12.
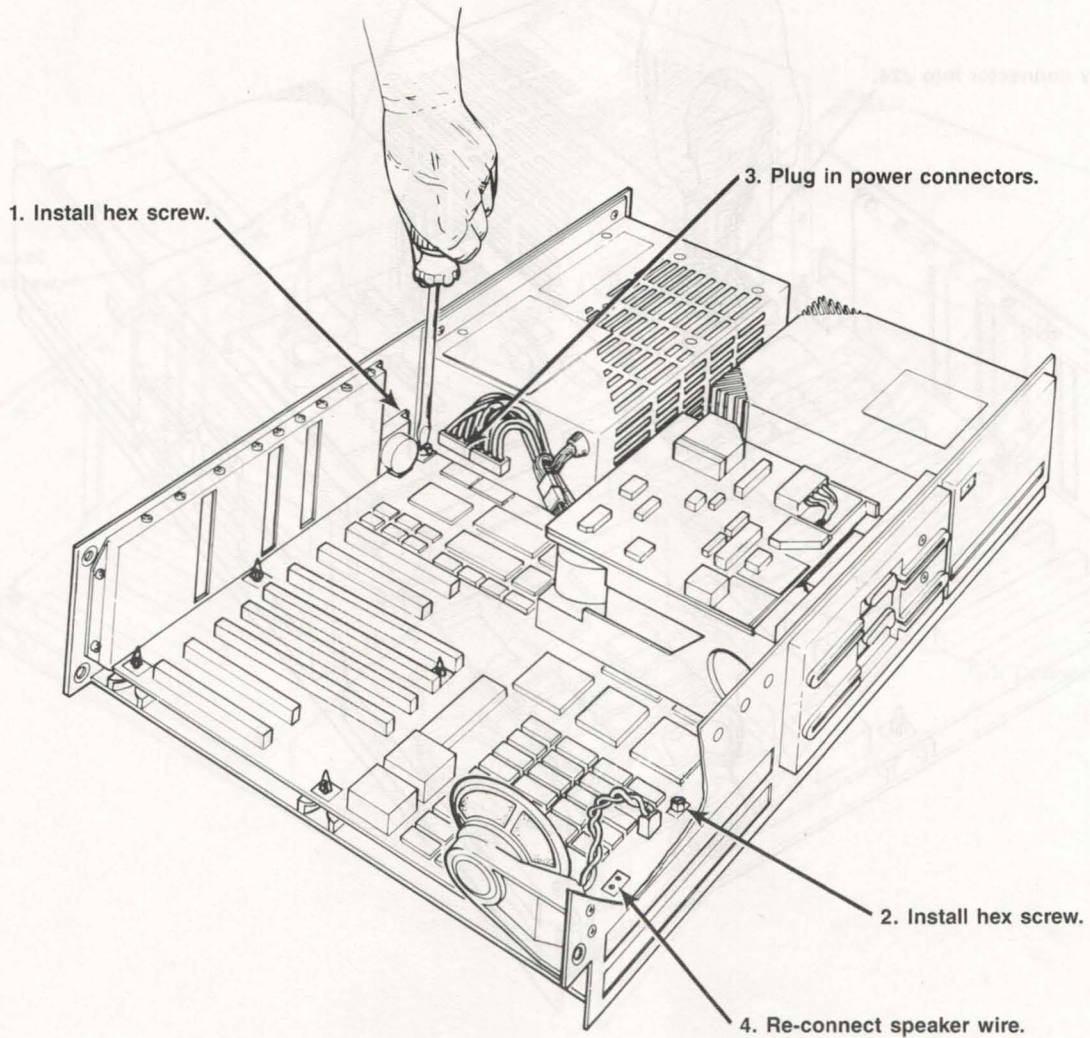
Figure 2-12. Installing Xformer/286.

STEP 15

Install Xformer/286's battery: Plug the battery's connector into jumper 24 (next to the power connectors) on Xformer/286. Separate the velcro strips on the battery's back. Peel the protective covering from the loose strip. Stick the strip to the side of the power supply. Affix the battery to the strip by putting the strips of velcro together. See Figure 2-13.

1. Plug battery connector into J24.

2. Place battery on power connector.
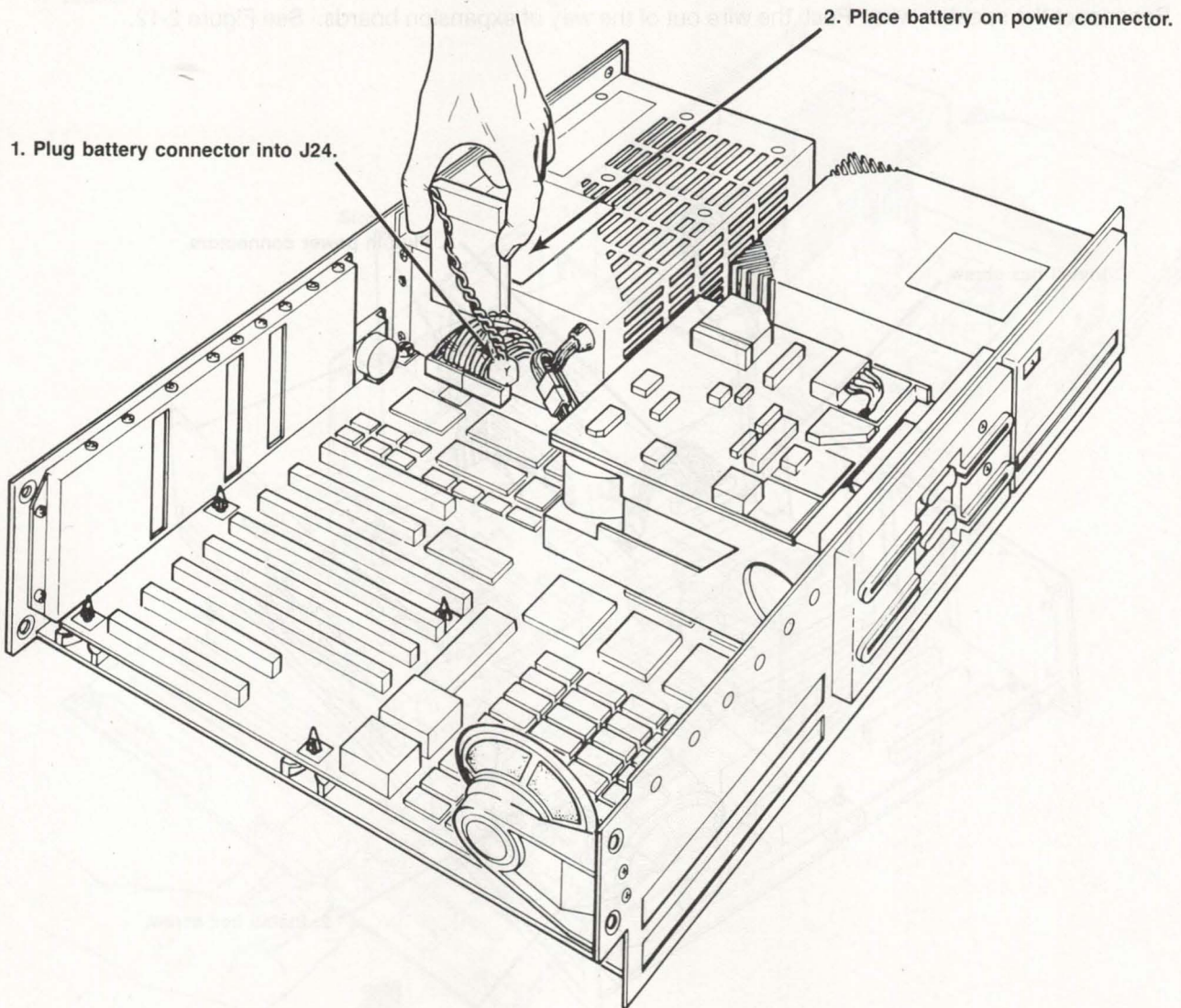
Figure 2-13. Installing Xformer/286's Battery.

2-18

STEP 16
Reinstall the disk controller board: Place the disk controller board in the appropriate expansion slot. Reconnect the cables in the locations recorded when the cables were removed. Install the bracket retaining screw. See Figure 2-14.

2. Replace disk controller board.

3. Install bracket retaining screw.

1. Connect disk cables.
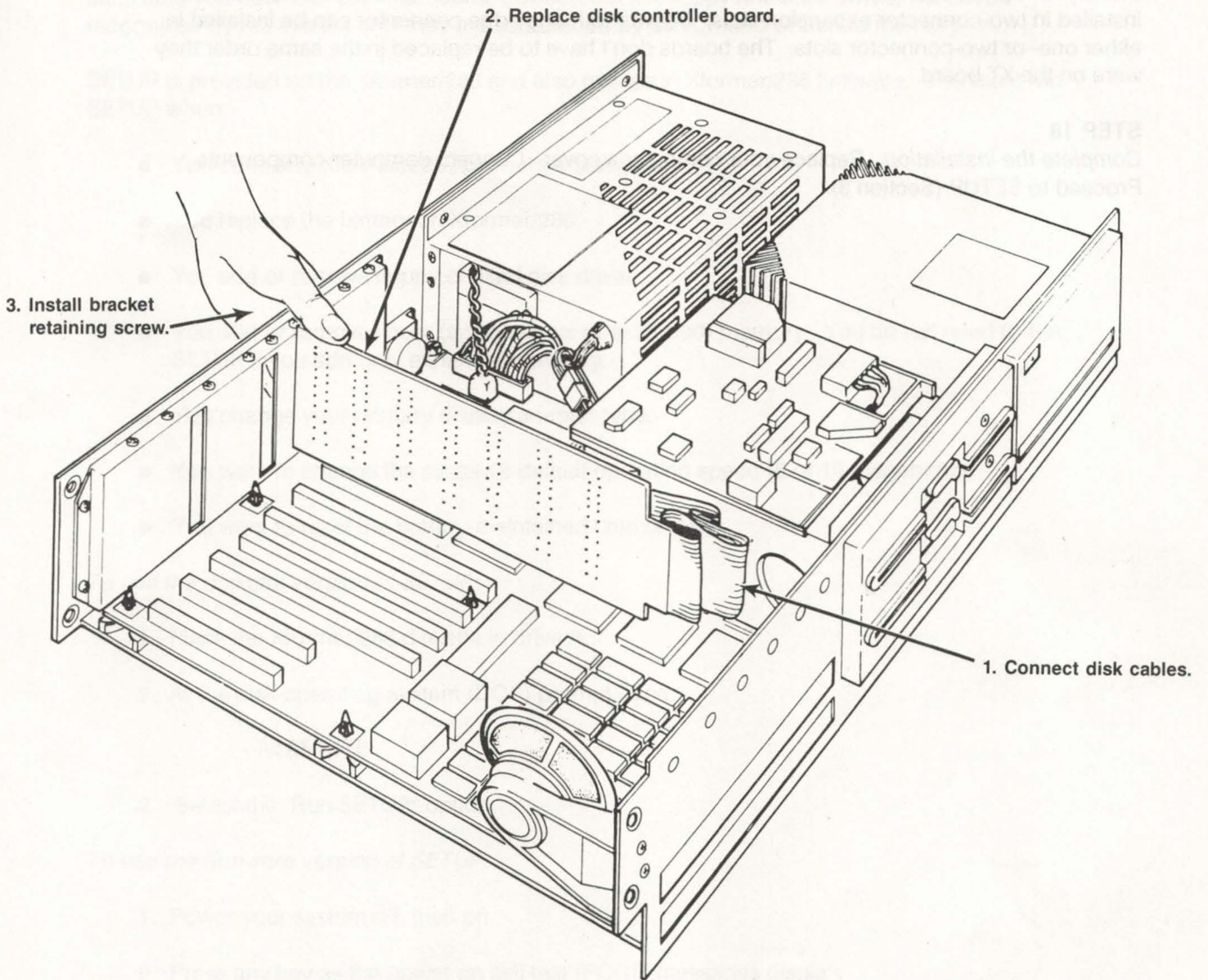
Figure 2-14. Installing the Disk Controller Board.

STEP 17

Disable option board clocks. Replace option boards: If any of your option boards have a clock, disable it. Option board clocks conflict with the clock provided on Xformer/286 and must be disabled. If you have added clock commands to your AUTOEXEC.BAT file for the option board clock, the commands should be removed after completing the Xformer/286 installation.

Insert your option boards into the expansion slots. Boards with two edge connectors must be installed in two-connector expansion slots. Boards with one edge connector can be installed in either one- or two-connector slots. The boards don't have to be replaced in the same order they were on the XT board.

STEP 18

Complete the installation: Replace your computer's cover. Connect computer components. Proceed to SETUP (Section 3).

This section tells you how to run SETUP. SETUP writes your system configuration into battery-maintained memory. Battery-maintained memory stores your configuration and is read each time you boot the machine. Some devices, such a floppy and hard drives, will not be recognized by the system until they are established by SETUP and written to memory.

SETUP is provided on the Xformer/286 and also resides in Xformer/286 firmware. You must run SETUP when:

- You complete Xformer/286 hardware installation.

- You replace the battery on Xformer/286.

- You add or remove floppy or fixed disk drives.

- You add or remove linear (conventional or extended) memory. You do not need to run SETUP if you add only expanded memory.

- You change your primary display adapter type.

- You want to change the system's default operating speed (6 or 10 megahertz).

- You want to reset the battery-maintained time or date.

To use the diskette version of SETUP:

1. Place the Xformer/286 diskette in drive A:.

2. At the disk operating system (DOS) prompt, type:

        A:ASTUTE

2. Select the "Run SETUP" option.

To use the firmware version of SETUP:

1. Power your system off, then on.

2. Press any key as the power on self test (POST) messages display.

3. After the following message displays:

        KEYBOARD ERROR OR NO KEYBOARD PRESENT
        then PRESS F1 KEY TO CONTINUE OR CTRL-ALT ESC FOR SETUP

   Press < Ctrl >-< Alt >-< Esc >.

After selecting the Run SETUP option from the Diagnostics main menu or pressing <Ctrl>-<Alt>-<Esc>, the SETUP fields display. Each field in SETUP uses the same key strokes. To move to a different field, press either <Down Arrow> or <Up Arrow>. To display valid choices for the current field press, either <Left Arrow> or <Right Arrow>. To accept the displayed value, press <Enter>. SETUP fields are described as follows:

DATE:

Enter the current date in a month/date/year format. For example, enter December 17, 1987 as 12/17/87. The date is maintained by the battery.

TIME:

Enter the current time in a hour:minute:seconds format using a 24-hour clock. For example, enter 1:00 pm as 13:00:00. The time is maintained by the battery.

XT FLOPPY CONTROLLER:

If you have an XT floppy controller, select YES. If you have upgraded to an AT-type controller, select NO.

DISKETTE 1:

Identify the type of floppy diskette drive 1. Your five choices are NONE, 360 KB (5-1/4" standard), 1.2 MB (5-1/4" high-density), 720 KB (3-1/2" standard), or 1.4 MB (3-1/2" high-density).

DISKETTE 2:

Identify the type of floppy diskette drive 2. The five choices are NONE, 360 KB (5-1/4" standard), 1.2 MB (5-1/4" high-density), 720 KB (3-1/2" standard), or 1.4 MB (3-1/2" high-density).

XT FIXED DISK CONTROLLER:

If you do not have a fixed disk controller, or if you have an XT fixed controller, select YES. If you have upgraded to an AT-type controller, select NO.

FIXED DISK 1:

This field appears only if you have selected NO in the XT fixed disk controller field. Enter the number designating the disk type of your hard drive. Valid numbers are 0 through 47. Use Table 3-1 to determine your disk type.

If you are unsure of the correct disk type number, first look at the disk type with sizes (MB) closest to the size of disk you are installing. Pick the disk type with the number of cylinders closest (less than or equal to) to your fixed disk.

FIXED DISK 2:

This field appears only if you have selected NO in the XT fixed disk controller field. Enter the number designating the disk type of your hard drive. Valid numbers are 0 through 47. (If you don't have a second hard drive, enter 0.) Use Table 3-1 to determine your disk type.

Table 3-1. Disk Types.

Type	Cylinders	Heads	Pre-Comp	Park	Sectors	Size Megs	Mfg'r Model
1	306	4	128	305	17	10.1	
2	615	4	300	615	17	20.4	Seagate ST-225
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	20.4	
7	462	8	256	511	17	30.6	
8	733	5	-1	733	17	30.4	Seagate ST-1038
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	306	8	128	319	17	20.3	
14	733	7	-1	733	17	42.5	
16	612	4	0	663	17	20.3	NEC D5126/Microsci HH825
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	733	5	300	732	17	30.4	
21	733	7	300	732	17	42.5	
22	733	5	300	733	17	30.4	
23	306	4	0	336	17	10.1	
25	615	4	0	615	17	20.4	NEC
26	1024	4	-1	1024	17	34.0	Micropolis
27	699	7	256	700	17	40.6	
28	1024	8	-1	1024	17	68.0	Micropolis
29	512	8	256	512	17	34.0	Quantum
30	615	2	615	615	17	10.2	SQ312RD
31	989	5	0	989	17	41.0	CDC Wren II HH
32	967	9	0	969	34	144.4	CDC Wren II
33	1022	5	0	1024	34	84.8	CDC Wren III
35	1024	9	1024	1024	17	76.5	
36	1024	5	512	1024	17	42.5	Microsci HH1050/Miniscribe 3053
37	830	10	-1	830	17	68.8	
38	823	10	256	824	17	68.3	
39	615	4	128	656	17	20.4	
40	615	8	128	664	17	40.8	NEC D5H6
41	917	15	-1	918	17	114.1	NEC
42	1023	15	-1	1024	17	127.3	NEC
43	823	10	512	823	17	68.3	NEC
44	820	6	-1	820	17	40.8	Seagate 251
45	1024	8	-1	1024	17	68.0	Microp 1325
46	925	9	-1	925	17	69.1	CDC 94155-86
47	1024	5	-1	1024	17	42.5	Microp 1323A

VIDEO ADAPTER:
Identify your video display adapter type. Valid types are MONO (screen displays only one color), COLOR 40 (screen display multiple colors, 40-columns wide), COLOR 80 (screen display multiple colors, 80-columns wide), or EGA (enhanced graphic adapter)/VGA (video graphics array).

CONVENTIONAL MEMORY:
Enter the amount of conventional memory from 0 to 640 kilobytes (KB). Conventional memory includes 512 KB supplied on Xformer/286 and possibly an additional 128 KB (for a total of 640) provided by additional memory chips or memory expansion boards.

If you have not added memory chips to Xformer/286 or memory boards to your system, enter 512. If you have added memory chips or have backfilled conventional memory from your memory expansion board, enter the total kilobytes (usually 640) of conventional memory. Conventional memory does *not* include extended, expanded, or video memory.

EXTENDED MEMORY:
Enter the amount in kilobytes of extended linear memory addressable above the 1-megabyte (MB) boundary. Extended memory is added to Xformer/286 with memory chips or added to your system with memory expansion boards. If you have not added memory chips to Xformer/286 or memory expansion boards to your system, enter 0. Extended memory does not included expanded or video memory.

DEFAULT SPEED:
Choose either LOW (6 megahertz) or HIGH (10 megahertz) as the default CPU speed. Most users should select HIGH. Typically, LOW speed is needed only by some application and game software.

During normal operation, you can change the processing speed either by using the SPEED commands. To change the processing speed to 10 megahertz (MHz), press <Ctrl>-<Alt>-<Cursor Up>. To change the processing speed to 6 MHz, press <Ctrl>-<Alt>-<Cursor Down>. SPEED commands, issued from the disk operating system prompt, are listed in the "Introducing Xformer/286" Section.

After completing SETUP, press <F10>. The following prompt displays:

PRESS F5 TO CONFIRM UPDATE

Remove the Xformer/286 diskette. If you boot from a floppy, insert a boot diskette in drive A:. Press <F5> to verify your responses as correct, or press any other key to return to the Date field. If <F5> is pressed, your system will automatically be rebooted with the new configuration. After rebooting, your system is ready to use.

NOTE

If you have clock commands in your AUTOEXEC.BAT file for an option board clock, they *must* be removed.

If you ever have a problem with your Xformer/286, follow these steps:

1. Consult this section for advice on how to handle operating problems or error messages.

2. Run the diagnostics (ASTUTE program on the Xformer/286 diskette).

3. Contact your authorized AST reseller for assistance if reading this section and running the diagnostics do not resolve the problem.

A.1 Operating Problems

This section tells you what to do if you ever have problems running your system. Typically, operating problems occur immediately after installing Xformer/286 and are the result of a minor oversight during the installation process.

PROBLEM: The computer doesn't do anything when you turn it on.

ACTION: Make sure everything is plugged in. Try turning on the computer again. If necessary, open your system unit and make sure all cables are properly connected and the boards are seated correctly in the expansion slots. If the power connectors were installed incorrectly, the DC fuses inside the power supply should be checked.

PROBLEM: Your monitor displays this message when you boot up your computer:

<div align="center">

EQUIPMENT CONFIGURATION ERROR -- RUN SETUP

</div>

ACTION: Run SETUP as described in Section 3.

PROBLEM: Pressing < Ctrl > - < Alt > - < Cursor Up > or < Ctrl > - < Alt > - < Cursor Down > does not change the operating speed (6 or 10 megahertz).

ACTION: Make sure the keyboard cable is properly installed between the keyboard and the connector on the back panel of the system unit.

PROBLEM: A floppy diskette drive you installed in the system does not work correctly.

ACTION: Make sure you run SETUP whenever you add or remove a floppy drive. If the floppy drive still does not work correctly, open the system unit and make sure the cable is properly installed between the disk drive and the system board. Make sure the drive power cable is attached correctly and the signal cable is not backward. Also check the manufacturer's instructions to make sure the drive is properly configured.

PROBLEM: A hard disk you installed in the system does not work correctly.

ACTION: Make sure you run SETUP (Section 3) to set the hard disk type.

If the disk still does not work correctly, open the system unit and make sure the cables between the hard disk drive and the disk controller board (the circuit board closest to the disk drives) are properly installed. Also check for proper power cable attachment. If you installed the hard disk yourself, check the manufacturer's instructions to make sure the drive is properly configured.

PROBLEM: The computer only recognizes the first 640 kilobytes (KB) of installed memory.

ACTION: Run SETUP. Otherwise, the computer can't recognize over 640 KB of linear memory (base and extended memory).

PROBLEM: Certain software programs do not work properly.

ACTION: Try installing and running the programs at a slower speed. Certain copy-protected programs will not boot at 10 megahertz (MHz). Also, some programs are not written to run at faster clock speeds. Press < Ctrl > - < Alt > - < Cursor Up > or < Ctrl > - < Alt > - < Cursor Down > to change the operation speed. If necessary, use SETUP to change the default operating speed.

A.2 Error Messages

Error messages appear when the power on self test (POST) has failed. (POST is a series of programs that test your system components. POST is "built-in" to Xformer/286 and run automatically when you turn on your system.) There are two kinds of error messages:

o *Text messages* display information on the computer screen.

o *Beep codes* communicate an error condition when an error message cannot be displayed on the computer screen.

A.2.1 Text Messages

When an error is detected during POST, an error message and the following prompt display:

then PRESS F1 KEY TO CONTINUE
OR CTRL-ALT ESC FOR SETUP...

At the prompt, you can press < F1 > and continue normal processing, or you can press < Ctrl > - < Alt > - < Esc > and rerun SETUP.

The following text messages may display during POST.

nnnn KILOBYTES MEMORY GOOD

> **Explanation:** This is an informational message. *nnnn* is the number of kilobytes (KB) of functional random access memory (RAM).

> **Action:** None required.

CMOS RAM ERROR, CHECK BATTERY/RUN SETUP

> **Explanation:** The SETUP file has been corrupted.

> **Action:** Check the system battery and replace if discharged. Rerun SETUP.

DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER

> **Explanation:** The computer could not find the required system files on the boot disk.

> **Action:** Retry the boot with a different system diskette in drive A:.

ERROR ENCOUNTERED INITIALIZING HARD DRIVE

> **Explanation:** The fixed disk, the controller board, or the cable from the board to the fixed disk might not be properly installed. The fixed disk or the controller might be malfunctioning. The hard drive type may be incorrectly identified in SETUP.

> **Action:** Rerun SETUP and verify the Disk 1 and Disk 2 fields. Retry the disk access. If necessary, reseat the fixed disk controller board in its expansion slot. Reattach both ends of the disk controller board cable. Retry the disk access.

ERROR INITIALIZING HARD DISK CONTROLLER

> **Explanation:** The fixed disk controller board or the cable from the board to the fixed disk might not be properly installed, or the fixed disk controller might be malfunctioning. The hard disk controller type may be incorrect in SETUP.

> **Action:** Verify the XT Fixed Disk Controller field in SETUP. Retry the disk access. If necessary, reseat the fixed disk controller board in its expansion slot. Reattach both ends of the fixed disk controller cable. Retry the disk access.

FLOPPY DISK CNTRLR ERROR OR NO CNTRLR PRESENT

Explanation: There is a hardware problem with the floppy disk controller, or there is no floppy disk controller present. The floppy disk controller is incorrectly identified in SETUP.

Action: Verify the XT Floppy Controller field in SETUP. Retry the disk access. If necessary, reseat the floppy disk controller board. Reattach both ends of floppy drive controller cable. Retry the disk access.

I/O PARITY ERROR -- SYSTEM HALTED or
RAM PARITY ERROR. CHECKING FOR SEGMENT ADDRESS...

followed by either:

OFFENDING ADDRESS NOT FOUND or
OFFENDING SEGMENT:XXXX

Explanation: There could be a problem with an I/O (communication) device in your computer, or there is a malfunction in computer memory.

Action: Turn off your computer. Reseat your memory boards. Check the configuration jumpers for the serial and parallel ports on each I/O device board.

KEYBOARD ERROR OR NO KEYBOARD PRESENT

Explanation: Xformer/286 is unable to verify the keyboard functions.

Action: Be sure the keyboard cable is properly installed between the keyboard and the system unit, and that none of the keys are jammed. If the problem cannot be located, replace the keyboard.

MEMORY ADDRESSING ERROR AT XXXX
MEMORY ERROR AT XXXX
WROTE 0A5A5 BUT READ XXXX

Explanation: There is a malfunction in computer memory.

Action: Reseat your memory boards. Make sure all the chips on the board are completely installed.

MEMORY SIZE ERROR -- RUN SETUP

Explanation: The amount of memory found by POST is different than the amount defined in SETUP.

Action: Run SETUP and correctly define the amount of base and extended memory.

A.3 Running the Diagnostics

If, after reading Sections A.1 and A.2, you are unable to resolve a problem, your next step is to run the diagnostics. If you are still unsure of how to solve the problem, contact you authorized AST reseller.

To run the diagnostics, insert the Xformer/286 diskette in drive A: and type:

    A:ASTUTE

The Diagnostic Main menu contains the following options:

- *System Test:* Runs test on any or all of the hardware modules installed in the system. None of the tests require your intervention once they begin. The tests take a limited amount of time, and do not destroy any information stored in your computer or on disk.

- *Test Selection:* Allows you to run specific tests on selected hardware areas, and allows you to select the number of times each test is repeated. These tests may require your intervention, and some of them can destroy information stored in your computer or on disk (if so, a warning message will be displayed).

- *Auto Sense System:* Allows you to read and display installed system components. This option redisplays the same information shown when you boot with the Xformer/286 diskette.

- *Run SETUP:* Allows you to run SETUP, which stores your system's configuration in memory. See Section 3 for more information on SETUP.

- *Park Disk:* Moves the fixed disk heads to a landing cylinder to prevent damage during moving. Run this option if you have a fixed disk in your system and are moving the computer.

- *Format Disk:* Performs a low-level (physical) format on a fixed disk installed in your system. The format should be performed using the defect list supplied with the fixed disk. Formatting without the defect list will result in errors and may corrupt data.

LIMITED WARRANTY

AST RESEARCH XFORMER/286

AST Research, Inc. (AST) warrants the original purchaser of this AST product that it is to be in good working order for a period of twelve (12) months from the date of purchase from AST or an authorized AST dealer. Should this product, in AST's opinion, malfunction during the warranty period, AST will, at its option, repair or replace it at no charge, provided that the product has not been subjected to misuse, abuse, or non-AST authorized alterations, modifications and/or repairs.

Products requiring Limited Warranty Service during the warranty period should be delivered to AST or an AST authorized service center with proof of purchase. If the delivery is by mail, the purchaser agrees to insure the product or assume risk of loss or damage in transit. The purchaser also agrees to prepay shipping charges to AST.

CAUTION: THE ORIGINAL SHIPPING CONTAINER AND SHIPPING COMPONENTS MUST BE RETAINED; SHIPPING IN OTHER THAN ORIGINAL OR FACTORY-SUPPLIED CONTAINERS AND COMPONENTS WILL VOID THE WARRANTY.

ALL EXPRESSED AND IMPLIED WARRANTIES FOR THIS PRODUCT INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO THE ABOVE 12-MONTH PERIOD. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

UNDER NO CIRCUMSTANCES WILL AST RESEARCH, INC. BE LIABLE IN ANY WAY TO THE USER FOR DAMAGES, INCLUDING ANY LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF USE OF, OR INABILITY TO USE, SUCH PRODUCT. Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation or exclusion may not apply to you.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

The limited warranty applies to hardware products only.

AST RESEARCH, INC.

Product Comment Form

We appreciate your comments regarding any problems or suggestions related to AST Research products. Please use this form to communicate any observations that you have concerning the improvement of either the product itself or the product documentation provided in this manual.

Submitter Information

Submitter's name:

Address:

Product/Manual Comments and Suggestions

Please mail this form to:

AST Research, Inc.
Attn: Product Marketing
2121 Alton Ave.
Irvine, CA 92714-4992

NOTES

FIXED-DISK USERS: IMPORTANT NOTICE

The Xformer/286™ board turns your IBM PC XT™ into a powerful 80286-based computer. As a result, some boards designed for the PC XT may not work properly in your new system.

CAUTION

AST Research strongly recommends that you back up your fixed disk before you install Xformer/286.

AST has verified the compatibility of the Xformer/286 board with most popular XT-type fixed-disk controller boards. There may be some boards, however, that will not work properly in your new system. If your fixed-disk controller cannot run at the greatly increased speed of your Xformer/286 board, data on your fixed disk may be damaged. You can prevent permanent data loss by keeping a complete and current backup of your fixed disk.

Thank you for your interest in AST.

AST offers a complete line of proven PC products. From our AST Premium AT-compatible computer systems to our multifunction boards, micro-to-mini/ micro-to-mainframe communications, local area networks, graphics products, laser printers and scanners, AST products are designed to provide the total solution to your PC needs.

All AST products are designed to provide unmatched performance, compatibility, upgradeability and expandability. And all of our products are manufactured to stringent standards, ensuring years of reliable use.

The AST name is synonymous with service and support and you can be confident the solution you select today will meet your changing needs for years to come.

We hope that the enclosed product literature you requested answers your questions. However, if you require additional or more technical information, please call our Product Information Center at (714) 863-1480.
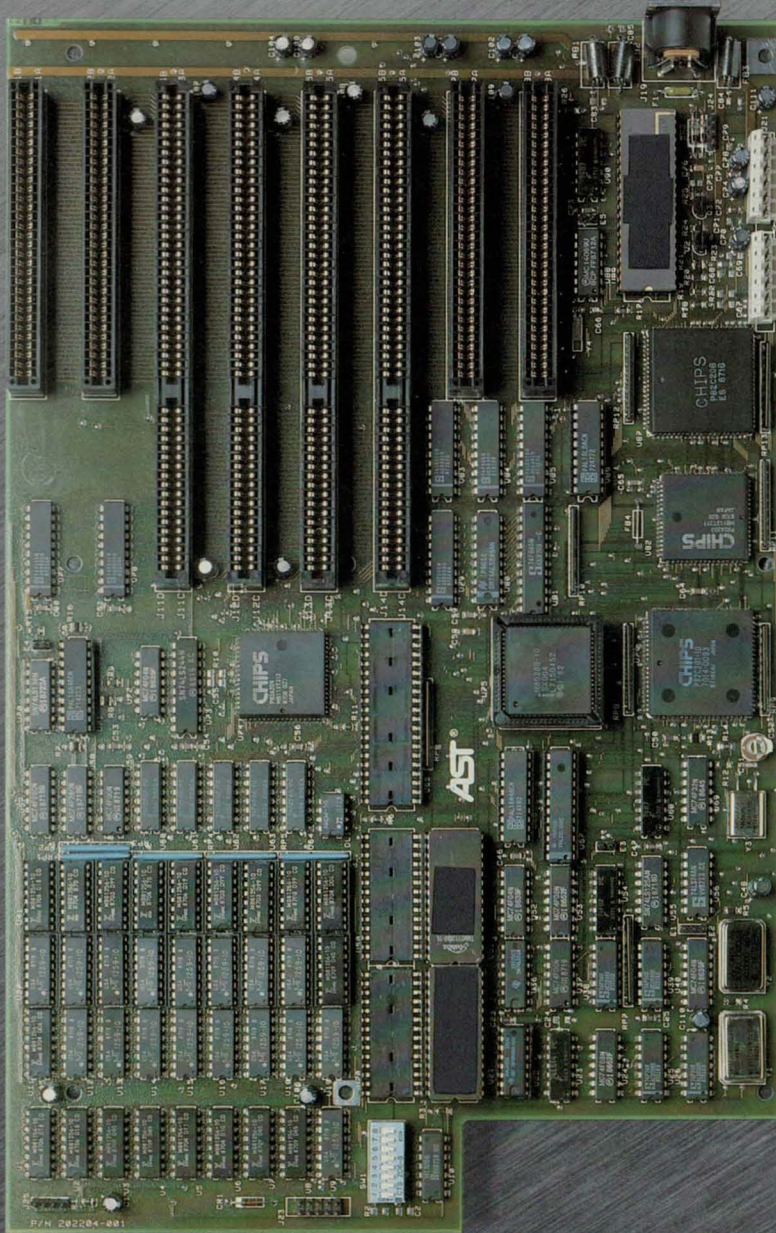
Sincerely,

Deryl R. Finney

Deryl Finney
Director, Marketing Communications

Enclosures

Xformer/286™

Replacement System Board for the IBM™ PC XT™ and Compatibles Providing 10MHz, 80286 Processing Speed and Compatibility With Protected Mode Software

AST ®
RESEARCH INC.

Compatible with
PC XT and XT/286
Enhancement Boards

Compatible with
MS-OS/2™

Provides Four,
16-Bit Memory
Interface Slots for
Faster Access Time
than a Standard PC XT

Provides Four, 8-bit
Memory Interface
Slots

Supports up to
16 MB of Memory

Increased Processing
Power with an 80286
Microprocessor

Operating Speeds of
Either 6 or 10 MHz

Automatic Self-Test
Diagnostic on
Power-Up

Provides Support
for an 80287 Math
Coprocessor

One-Year Warranty

Xformer/286™ Replacement System Board for the IBM® PC XT and Compatibles Providing 10 MHz, 80286 Processing Speed and Compatibility With Protected Mode Software

AST's Xformer/286 (pronounced "Transformer"/286) is a replacement system board that gives IBM PC XTs the processing power and speed of a 10 MHz, 80286 AT®-class computer. When it comes time for increased processing speed, or the need arises for access to extended memory, the 8088-based PC XT shows its limitations. But now, with the Xformer/286, you don't have to replace your entire computer or sacrifice the investment you've already made in enhancement boards, displays and software.

All you have to do is replace a single board. That's because the Xformer/286 not only exchanges your XT's processor for a 10 MHz, 80286 processor, it also replaces expansion slots and board-level memory. In effect, with the replacement of a single board, you're gaining all of the advantages of a new, more powerful computer.

More Available Memory
You'll be gaining a lot. Like eight expansion slots—four being AT-compatible, 16-bit slots and four compatible with your 8-bit, PC XT enhancement cards. You'll also have room for additional memory—up to a full megabyte on the Xformer/286 alone, with a possible 16 MB using memory expansion boards, such as AST's Rampage® 286.

More Features and Compatibility
There's more. You'll be assured of compatibility with MS-OS/2 as soon as it becomes available. And, there's support for an 80287 math coprocessor to speed up math-intensive programs like Lotus® 1-2-3®. Also, you'll have a built-in clock/calendar and optional ROM sockets reserved for future use. Of course, you'll also get an AST one-year warranty.

Compatibility is always an issue, but it isn't with the Xformer/286. That's because it has been designed for perfect compatibility with industry-standard hardware and software. So, if you wish to use a color, or monochrome monitor, a 83-, 84-, 101- or 102-key keyboard, or virtually any popular software package, you don't have to worry. The Xformer/286 will do the job.

One way AST has guaranteed the compatibility of the Xformer/286 is through a special feature which allows the user to switch between 6 MHz and 10 MHz operating speeds through a special software-controlled "hot-key" toggle. And, ease of use in installation is aided through a menu-driven, set-up program.

Complemented by A Full Line of Quality AST Enhancements
You'll find plenty of enhancements for your "new" computer in AST's full line of enhancement products for personal computers. The line includes multi-function boards, accelerator cards, graphics boards, micro-to-mini and micro-to-mainframe communications, local area networks, disk subsystems, laser printers and asynchronous and synchronous modems.

Specifications

Microprocessor	Intel 80286, 10 MHz, zero wait states to system board memory
Memory	Configurable RAM of 256 KB, 512 KB or 1 MB. Includes two optional ROM sockets Supports up to 16 MB of directly addressable memory
Expansion	Four, 16-bit memory interface slots Four, 8-bit memory interface slots
Disk Controller Support	Supports both 8-bit (XT) and 16-bit (AT) disk controller cards
Operating Speeds	6 or 10 MHz, user selectable
Coprocessor Support	Support for Intel 5 or 8 MHz 80287 math coprocessor for floating point and transcendental calculations
Keyboard Support	Supports 83-, 84-, 101- or 102-key keyboards
Monitor Support	Supports color and monochrome monitors
Clock/Calendar	Maintains accurate time and date, battery powered
Slot Size	IBM PC XT form factor
Warranty	One-year warranty standard