Cat. No. 25-5000

Tandy 4000

Installation and Operation Manual

TANDY®

Installation and Operation Manual

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INTRODUCTION

The Tandy® 4000 is one of the most versatile microcomputers available today, offering the latest advances in computer technology at significantly lower prices than comparable machines.

The Tandy 4000's many advanced features include:

- True IBM® AT™ software compatibility—in both the MS-DOS® single-user mode and the XENIX® multi-user mode.
- Six IBM AT compatible slots that you can use for standard peripherals and memory expansion.
- Two IBM PC/XT compatible option slots.
- One 32-bit memory expansion slot.
- A 16-Megahertz, 32-bit Intel 80386 CPU chip with on-board Memory Management and Protection.
- A standard 1 megabyte of memory that you can expand to an on-board 2M. By replacing your memory with 1M chips, you can have as much as 8M on board. Bus addressing supports up to 16 megabytes of memory.
- A Utilities diskette that contains system setup, hard disk formatting and other useful programs.
- A built-in High-Capacity, 3½-inch diskette drive with a 1.44-megabyte format. The drive also can read Standard, 720K 3½-inch diskettes.
- Three disk drive mounting channels that support the following **internal** drive configurations: two diskette drives and one hard disk drive or one diskette drive and two hard disk drives.
- An External Hard Disk Cable Kit (Cat. No. 26-4063) allows the following system configurations: 1) two internal diskette drives, one internal hard disk drive, and one external hard disk drive, or 2) two internal diskette drives and two external hard disk drives.
- The Tandy 4000 supports several optional external hard disk drives.

- A built-in real-time clock with CMOS RAM and a battery backup.
- A standard serial/parallel I/O adapter card which supports domestic and international baud rate standards.
- Internal support for an optional math co-processor (Intel® 80287).
- A 101-Key Enhanced Keyboard.
- A Keylock

PACKAGE CONTENTS

Carefully unpack your Tandy 4000, and be sure you have the following items:

System Unit, Keyboard, Power Cord, Keylock Key, *Installation and Operation Manual*, (Utilities diskette in the manual).

VIDEO CARD AND MONITOR INSTALLATION

To use your Tandy 4000, you must first install a video display card inside the system unit. This video card lets you connect a monitor to the system.

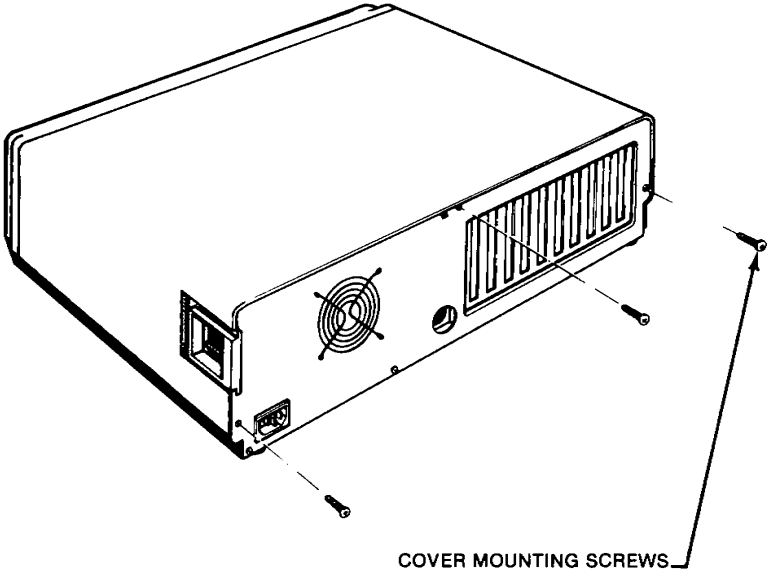
Cover Removal

To install a video display card (or any other peripheral card), you must first remove the cover of the system unit.

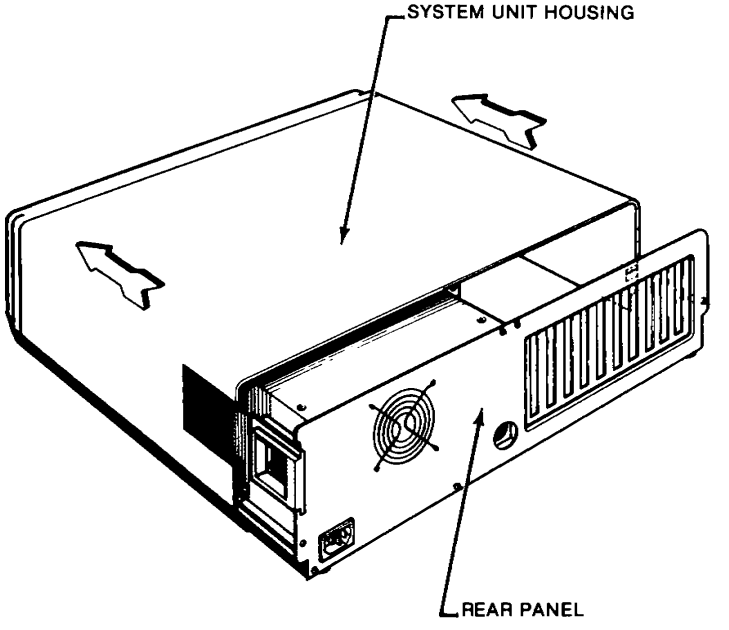
> **Note:** If you are installing a video card for the first time, you need to follow only Steps 5 and 6. If you are installing peripheral cards on an already functioning system, you must follow **all** the instructions below.

1. Be sure the power switch on the right side of the system unit is pressed to 0, (OFF), and that the keylock is in the unlocked position.
2. Turn off all external peripheral equipment (printer, monitor, modem, and so on).
3. Unplug the power cord from the wall.
4. Note the locations of all the peripheral cables connected to the rear of the unit. Disconnect the cables from the unit.

5. Remove the three cover mounting screws.



6. Remove the cover by sliding the entire housing toward the front of the machine.

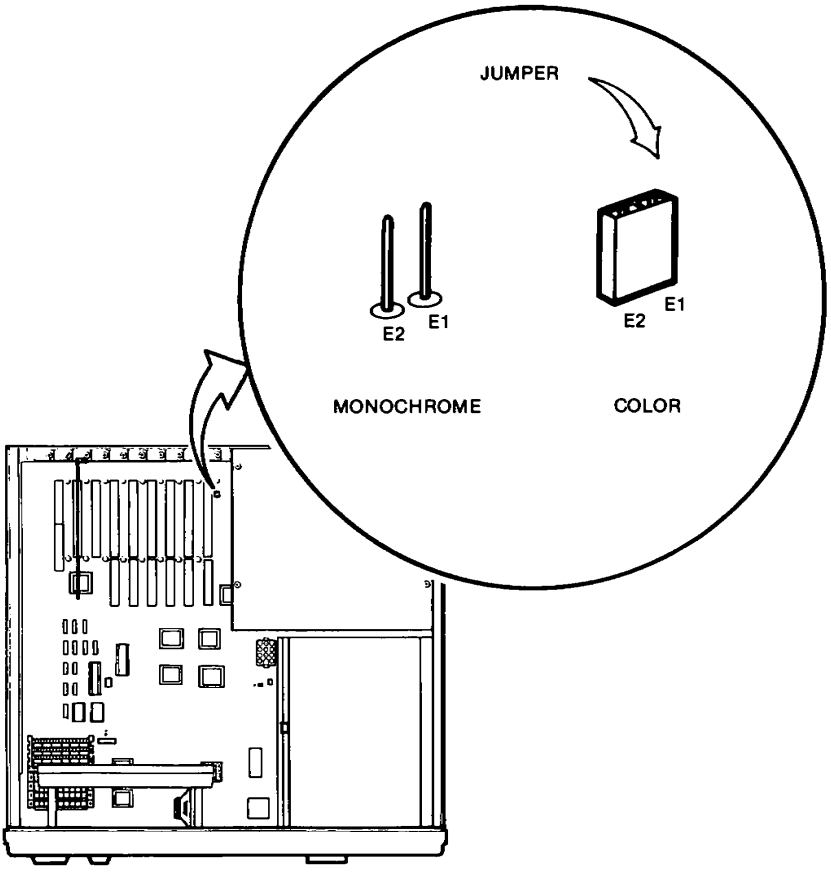


The Color/Monochrome Setting

The Tandy 4000 is set at the factory for a monochrome video display card and monitor. If you are using a monochrome card and monitor, you do not have to make the following color adjustment. Skip the rest of this section, and continue reading at the "Video Card Installation" section.

Before installing a **color** video display card, you must reposition a jumper on the computer's main board.

The color/monochrome jumper is located between the option slots and the power supply toward the back on main circuit board. Refer to the illustration for details.



You might have to move some cables out of the way to reach the color/monochrome jumper. (Do not disconnect the cables, simply lift them enough to allow access to the jumper.) The factory installs the jumper on pin E1 for a monochrome monitor. Move the jumper to connect pins E1 and E2 for a color monitor.

Video Card Installation

The Tandy 4000 supports several video display cards and most video monitors. The two video display cards used most often are:

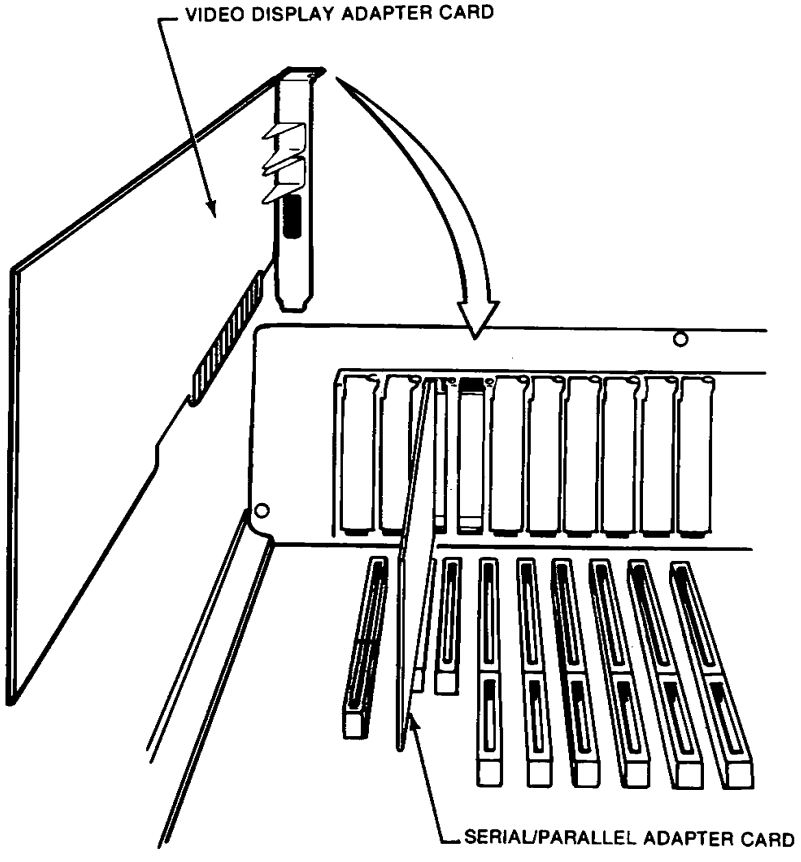
- The Tandy Dual Display Graphics Adapter (Cat. No. 25-3045) which combines monochrome text (720 x 348 pixels), color (640 x 200 pixels), and graphics capabilities on a single card. Use it with a VM-5 Monochrome Monitor (Cat. No. 25-3011), or a CM-11 Color Monitor (Cat. No. 25-1024).
- The Tandy Enhanced Graphics Adapter (Cat. No. 25-4037) which offers high-resolution (640 x 350 pixels) text and graphics. Use it with a Tandy EGM-1 Enhanced Graphics Monitor (Cat. No. 25-4035).

Always read the instructions that come with a display card before installing the card in your computer. The cards are set at the factory for most monitors. However, you might have to change settings on a card to accommodate a special type of video monitor.

After reading the peripheral card instructions and making the appropriate adjustments, you are ready to install the card in the computer.

1. Remove the screw on top of Slot Cover #3 or #4 on the back panel of the system unit.
2. Then, remove the slot cover from the panel.

3. Install the video display card on the main board in the slot connector (Slot #3 or #4) from which you removed the slot cover. Be sure that: (1) the end of the card with the metal slot cover is seated correctly in the rear panel slot, (2) the front end of the card fits into the corresponding plastic slot, and (3) the card is securely mounted in the slot connector on the main board. (See the illustration below.)



Cover Replacement

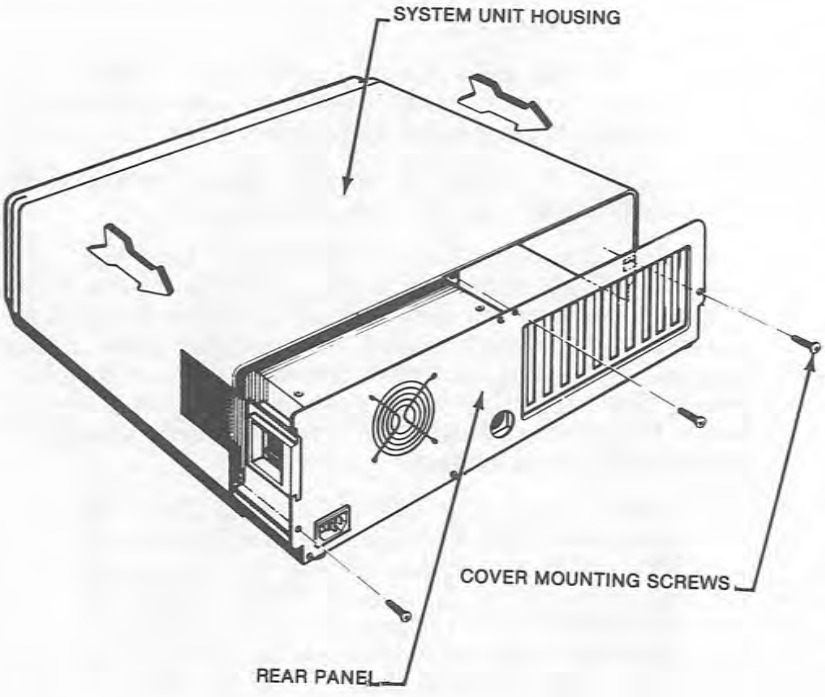
After moving the color/monochrome jumper and/or installing a video display card (and any other optional peripheral cards), follow the steps below to replace the system unit cover:

1. Be sure that all cards are seated securely on the main board and that all internal cable are connected.

2. If you have a Tandy 4000 with an internal hard disk, note the Drive Type Number and the hard disk Media Error Map on the top of the disk drive. Write these numbers on the System Worksheet located on the inside cover of this manual. **You need to know the Drive Type Number when you initialize your system, and you need to know the head and cylinder error numbers when you format your hard system.**

   > **Note:** If you later add an internal hard disk drive, the Drive Type Number and Media Error Map will be attached to the new unit. Note these numbers on the System Worksheet before you install the drive. Be sure to run the Setup program on your Utilities diskette to reset the CMOS chip memory. Refer to the "System Configuration (Setup)" section of this manual for details.

3. With the lip of the cover under the computer frame's lower rail, slide the cover toward the rear of the unit.

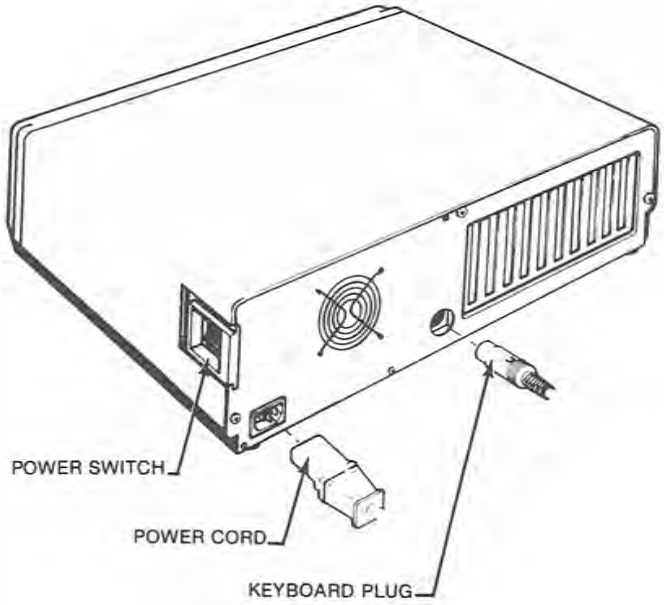


4. Replace the three cover screws.
5. Connect all peripheral cables to the appropriate peripheral cards through the slots on the back panel.

After replacing the cover, plug the monitor cable provided with your monitor into the video display card connector on the back of the system unit. Follow the instructions in your monitor manual for additional connections and adjustments.

SYSTEM UNIT OPERATION

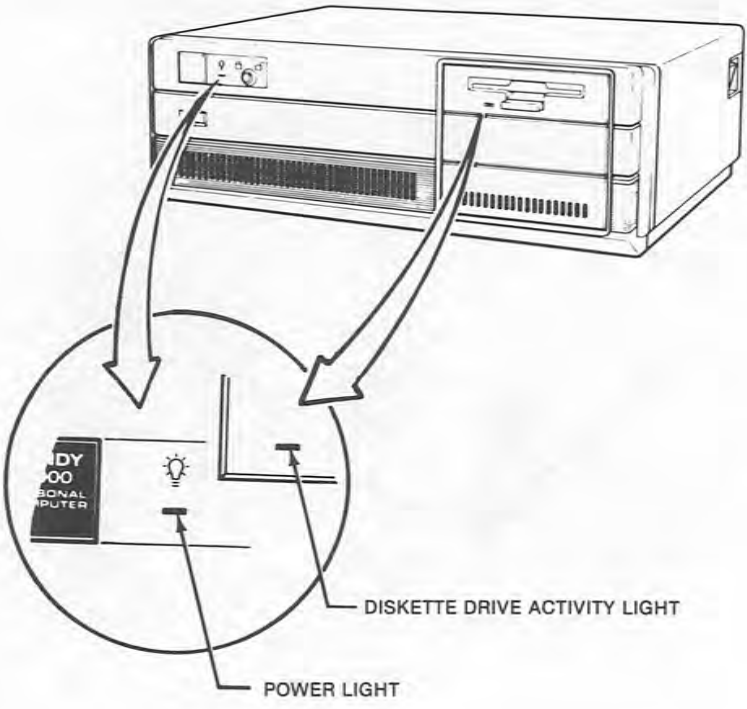
1. Plug the keyboard cable into the keyboard connector on the back of the system unit. (Refer to the illustration below.)



2. Be sure the power switch on the right side of the unit is OFF. The computer is off when the switch is at **0**; it is on when the switch is at **1**.

3. Plug the power cord into the rear of the unit. (Refer to the previous illustration.) Then, plug the other end of the power cord into a grounded, 3-prong electrical outlet. (Voltage requirements vary in different countries. See the label on your computer.) Do not use an outlet that also powers heavy machinery, copiers, office machines, and so on. If you must use an extension, use a grounded power strip, such as Radio Shack's Grounded Multiple-Outlet Power Strip.

The front panel of the Tandy 4000 has two LED indicators, a Reset button, and a Keylock. (Refer to the illustration.)



The power light is on whenever the system's power is on. Never move the unit when this light is on.

The diskette drive activity light is on whenever the diskette drive is reading from or writing to a diskette. **Never remove a diskette when this light is on; doing so might destroy the data on your diskette.**

The red Reset button on the left side of the front panel performs a cold-start reset. **When you press the Reset button, it is as if you turned the computer off and then turned it on again. This procedure erases any program stored in RAM.**

The Keylock on the left side of the front panel "locks out" keyboard entry and disables the Reset button. Whether the computer is on or off, when you lock the Keylock, nothing typed on the keyboard reaches the CPU, and pressing the Reset button has no effect.

Note the number inscribed on the Keylock Key. **It is important that you take a moment and record that number on the System Worksheet located on the inside back cover of this manual.** If you should ever lose your key, you will need this number to receive a duplicate.

The Keyboard

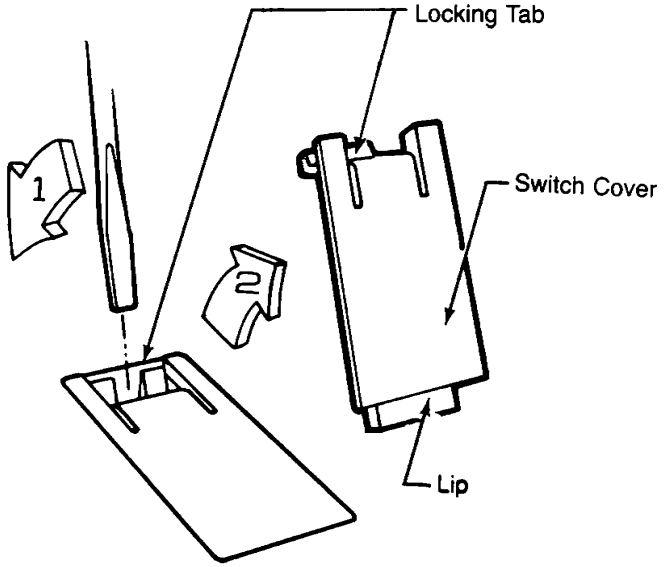
The low-profile Enhanced Keyboard is designed for optimum ease of use. The typewriter-style keyboard includes 101 keys and features auto-repeat character keys. When you hold down a character key, the keystroke repeats automatically until you release the key. The keyboard contains the usual character keys (A-Z, 0-9, and special characters) and command keys ([Backspace], [Tab], [Shift], and [Enter]). Additional Enhanced Keyboard features include:

- 12 programmable function keys.
- Software-programmable Escape, Control, and Alternate keys.
- A separate numeric keypad and a Number Lock key for extensive numeric input.
- Two special-function key clusters.
- A cursor key cluster.
- A Caps Lock key for uppercase alphabetic input.
- Number Lock, Caps Lock, and Scroll Lock indicator lights.

Setting the Keyboard Mode

Your Enhanced Keyboard can operate in two different modes; IBM® AT™, or IBM PC/XT™. The factory sets the keyboard in the IBM AT mode before shipping. You can reposition the Mode Switches, which are located on the bottom of the keyboard, if you want to change the keyboard mode. Use the following steps to set a particular keyboard mode.

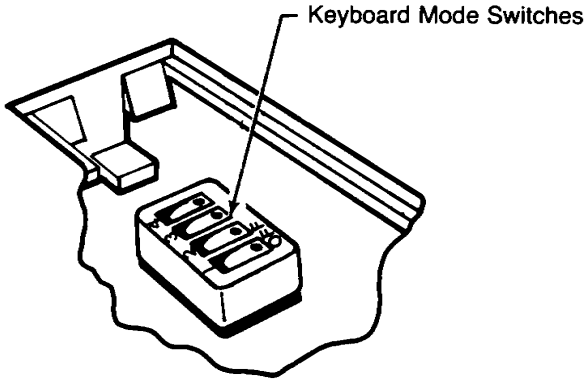
1. Locate the switch cover on the bottom of the keyboard. Use a small blade screwdriver to **gently** open and remove this cover. Place the screwdriver blade against the bottom of the locking tab, and press the tab in while using the keyboard case for leverage.



Switch Cover Removal

2. When the tab is free, lift the switch cover up and out to remove it.

3. Switches 1 and 2 are used to set the keyboard modes.



Standard Switch Configuration (AT Mode)

Set the desired mode by repositioning Switches 1 and 2 as shown in the following chart.

	S1	S2	S3	S4
AT	ON	ON	n/a	n/a
PC/XT	ON	OFF	n/a	n/a

Use a ballpoint pen or a similar pointed object to press down the appropriate end of a switch to turn it ON or OFF.

4. Replace the switch cover. Place the cover's lip under the keyboard case, and firmly press down on the tab-end of the cover to snap the cover into place.

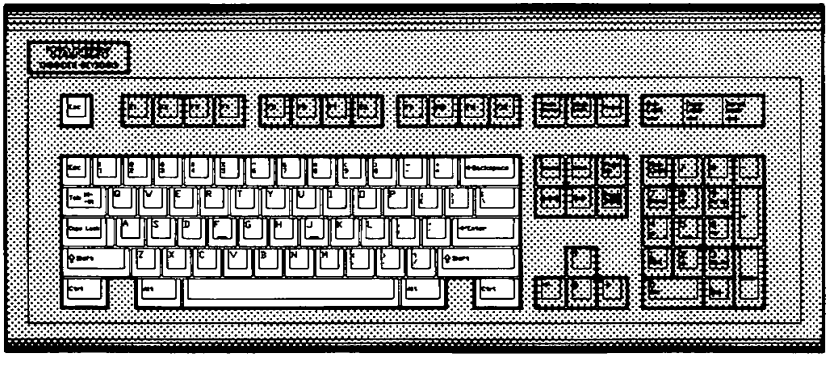
Using the Keyboard

The Enhanced Keyboard has five types of keys:

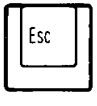
- Typewriter keys (including Esc, Ctrl, and Alt)
- Function keys
- Special-function keys
- Cursor keys
- Numeric keypad

Typewriter Keys

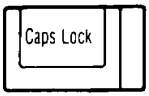
The typewriter keys section at the bottom left of the keyboard is similar to a standard typewriter keyboard. This section includes alphabetic, numeric, and special character keys as well as Backspace, Tab, and Shift keys.



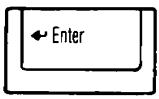
The following keys are also included in the typewriter keys section of the keyboard:



The function of the Escape key depends on the software you are using. A typical function of this key is to cancel the current operation and/or return to a previous screen or menu.

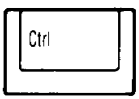


When you press the Caps Lock key, and the alphabetic (A-Z) keys produce only capital letters. Press the key once to activate caps-only mode. Press the key again to return to the normal keyboard mode. The Caps Lock light at the top right of the keyboard indicates when the keyboard is in caps-only mode.



Pressing the Enter key tells the computer to process whatever command or data you type, then move the cursor to the next line. The numeric keypad includes a duplicate Enter key.

> **Note:** Some software manuals refer to the Enter key as [Return] or [↵].



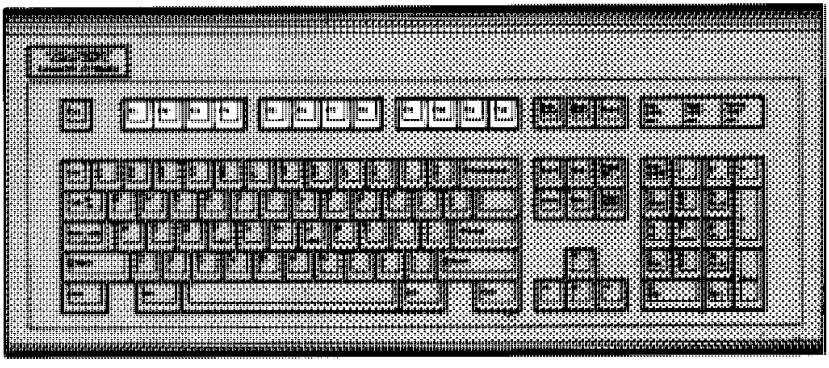
Pressing the Control key in combination with other keys performs specific operations. The combinations available and their functions are *program-specific.* Their functions depend on the program you are running. To use a Control-key combination, hold down the Control key, and press the other key. ([Ctrl] [C], for example, performs a Break or program interrupt in many programs.) The two Control keys, located at the bottom left and bottom right of the typewriter keys section of the keyboard, function identically.

> **Note:** Some software manuals refer to the Control key as [Cntrl].

Pressing the Alternate key in combination with other keys performs specific operations. The combinations available and their functions are program-specific. To use an Alternate-key combination, hold down the Alternate key, and press the other keys. ([Ctrl] [Alt] [Delete], for example, resets the computer.) The two Alternate keys, located to the left and right of the space bar, function identically.

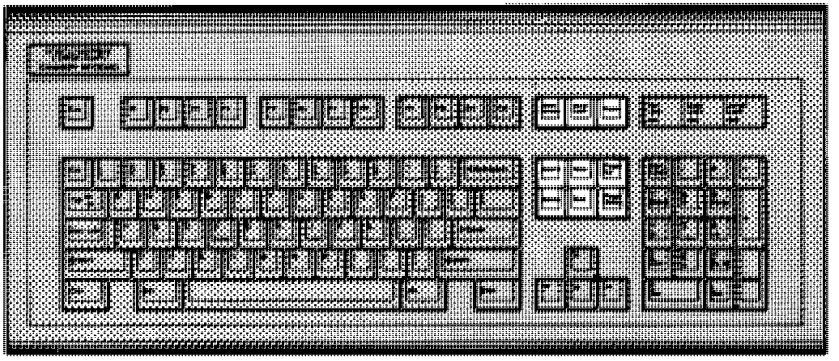
Function Keys

The function keys (F1-F12) at the top of the keyboard are program-specific. Their functions depend on the program you are running.



Special-Function Keys

The special-function keys section of the keyboard includes nine program-specific keys. This section is clustered into two groups according to the operations the keys are normally programmed to perform. The keys in the top cluster are normally programmed for file operations. The keys in the bottom cluster are normally programmed for text manipulation.



While running MS-DOS, for example, the special-function keys perform the following typical operations:

Holding down Shift and pressing the Print Screen key prints all text currently on the screen.

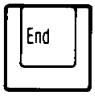
Pressing the Scroll Lock key once activates the Scroll Lock mode. In some programs when Scroll Lock is on, the screen does not scroll if you attempt to display more text than will fit on the screen at one time. In such a case, you can scroll the locked text up and down one line at a time with the ↑ and ↓ arrow keys. The Scroll Lock light at the upper right of the keyboard indicates that Scroll Lock is on. Press the Scroll Lock key again to return to the normal mode.

In some programs, pressing the Pause key temporarily halts program execution.

Pressing the Insert key activates the Insert typing mode. In the Insert typing mode, whatever you type is inserted at the current cursor position without typing over any text that follows. Press the Insert key again to return to the normal, overstrike mode. The [Insert] key in the special-function key cluster and the [Ins] key on the numeric keypad (unshifted number 0) function identically.

Pressing the Delete key erases the character at the current cursor position. The [Delete] key in the special-function key cluster and the [Del] key on the numeric keypad (the unshifted period) function identically.

In BASIC, pressing the Home key moves the cursor to the upper left corner of the screen. The [Home] key in the special-function key cluster and the [Home] key on the numeric keypad (unshifted number 7) function identically.



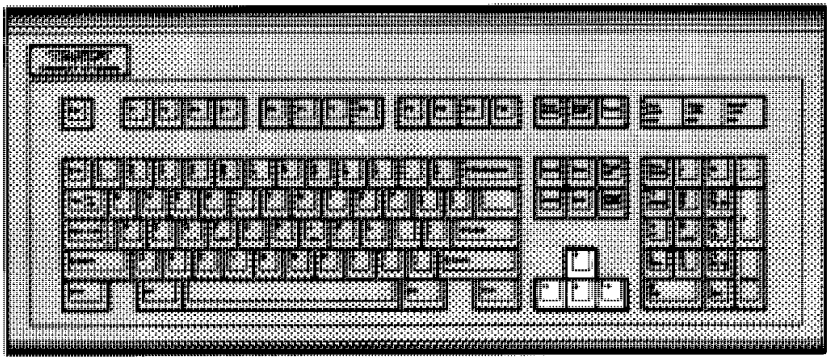
In BASIC, pressing the End key moves the cursor to the right of the last character in the current line. The [End] key in the special-function key cluster and the [End] key on the numeric keypad (unshifted number 1) function identically.

The function of the Page Up key depends on the operating system and the program you are running. The [Page Up] key in the special-function key cluster and the [PgUp] key on the numeric keypad (unshifted number 9) function identically.

The function of the Page Down key depends on the operating system and the program you are running. The [Page Down] key in the special-function key cluster and the [PgDn] key on the numeric keypad (unshifted number 3) function identically.

Cursor Keys

The cursor keys are clustered at the bottom of the keyboard, below the special-function keys section. These keys control the movement of the blinking cursor, moving the cursor in the direction of the arrow.

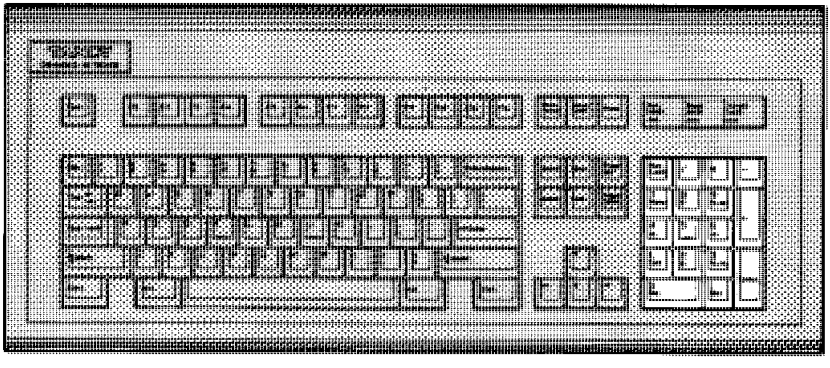


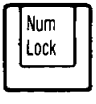
These keys and the arrow keys on the numeric keypad (unshifted numbers·2, 4, 6, and 8) function identically.

Numeric Keypad

The numeric keypad on the right side of the keyboard is arranged in the same manner as a calculator keypad. The number keys are the shifted characters on the numeric keypad. When Number Lock is not activated, press Shift along with the number key to type a number. When you turn on the computer, the keyboard comes up in Number Lock mode for easy numeric input.

In addition to the number keys, the numeric keypad also includes a period, four arithmetic operator keys (+, -, *, /), and a duplicate Enter key. The functions of these unshifted keys (0-9 and the period) are identical to the functions of the cursor keys and special-function keys to which they correspond.



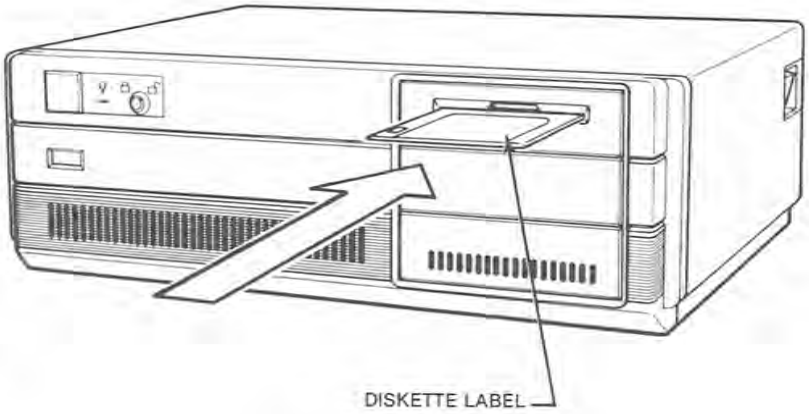


Pressing the Number Lock key turns the Number Lock mode on and off. When Number Lock is activated, the shifted and unshifted functions of the keys on the numeric keypad are reversed and you can type numbers without pressing Shift. The Num Lock indicator light at the top right of the keyboard indicates that Number Lock is on.

The Diskette Drive

Press the button on the front of the disk drive to eject the plastic shipping insert. Then, remove the insert.

To insert a diskette into an empty disk drive, gently slide it, label side up, into the drive until the diskette clicks into place.

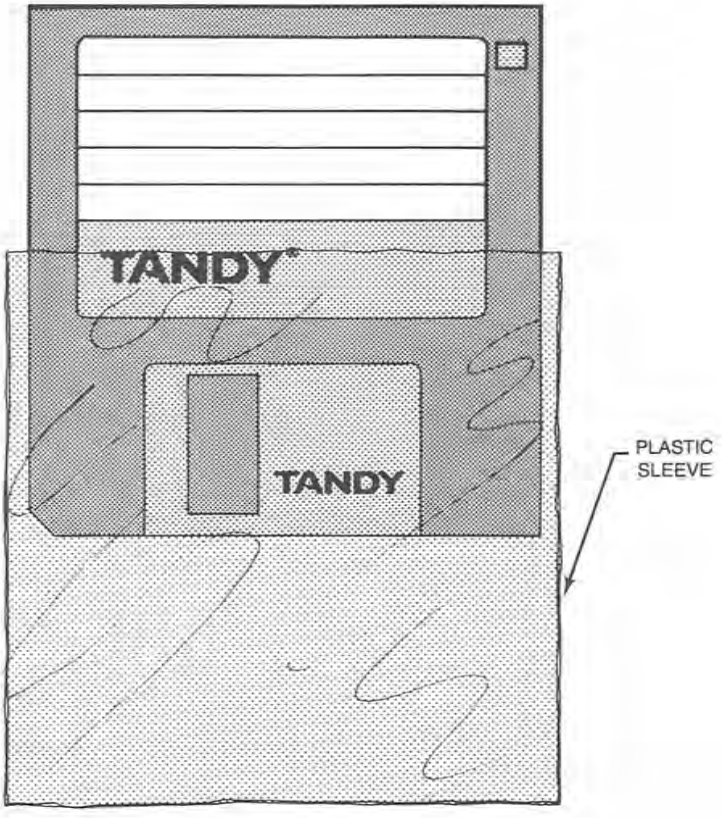


The red LED light in the diskette drive comes on whenever the computer is reading from or writing to the diskette. **Removing a diskette from a drive when the drive's activity light is on can destroy the data on the diskette.**

To remove a diskette from the drive, be sure the drive activity light is off. Then, press the button on the front of the drive. When the diskette is partially ejected, pull out the diskette.

Note: If your Tandy 4000 has an optional second diskette drive, the two drives are stacked on the right side of the system unit. The top unit is the *primary* drive, and the bottom unit is the *secondary* drive. The MS-DOS operating system refers to the primary drive as Drive A and the secondary drive as Drive B. The XENIX operating system refers to the primary drive as Drive 0 and the secondary drive as Drive 1.

Care and Handling of Diskettes



To protect your diskettes (and the information they contain) from damage, follow these guidelines:

- Keep diskettes away from magnetic fields (such as transformers, AC motors, magnets, TVs, and radios) and the computer system's console.
- Keep diskettes out of direct sunlight and away from heat.
- Keep diskettes away from cigarette ashes, dust, and other particles. In dusty areas, use filters to clean the air in the computer room.

Disk Drive and Media Types

The primary drive, diskette Drive A, is always installed at the factory as a 1.44-megabyte, 3½-inch, High-Capacity drive. (Note that the XENIX operating system refers to the primary drive as Drive 0.) You can also install optional disk drives, selected from the following drive types:

- High-Capacity, 1.44-megabyte, 3½-inch diskette drive
- Standard, 720-kilobyte, 3½-inch diskette drive
- High-Capacity, 1.2-megabyte, 5¼-inch, diskette drive
- Standard, 360-kilobyte, 5¼-inch, diskette drive
- Hard disk drive

The type of diskette you use in a diskette drive depends on the size of the drive (3½ or 5¼), type of the drive (High-Capacity or Standard), and whether or not you are writing to the diskette. See the following chart for handy reference:

	Standard Drive		High-Capacity Drive	
	Read	Write	Read	Write
Standard, 5¼-Inch Diskette	Yes	Yes	Yes	Yes*
High-Density, 5¼-Inch Diskette	No	No	Yes	Yes
Standard, 3½- Inch Diskette	Yes	Yes	Yes	Yes
High-Density, 3½-Inch Diskette	No	No	Yes	Yes

* This situation requires a special format on the diskette. See your operating system documentation for details.

Note: A Standard 5-¼-inch diskette that is written to in a High-Capacity drive might not be able to be read by a Standard drive.

Many software application programs are provided on Standard media and are formatted for use in a Standard drive. You can use the software as it is in a Standard diskette drive or you can copy it to another diskette (High-Density or Standard) for use in a High-Capacity drive.

Before you copy the information from a Standard diskette onto a High-Density diskette, format the High-Density diskette in the High-Capacity drive. (Refer to your operating system manual for instructions and restrictions.)

Before you copy the information from a Standard diskette onto another Standard diskette, for use in a High-Capacity drive, format the target diskette in the High-Capacity drive. (Refer to your operating system manual for instructions.)

Always follow the steps outlined in your operating system manual to back up your original operating system and application software diskettes, taking care to prepare the new diskettes for use in the proper drive.

> You can create a diskette in one type of drive and use it in the other. However, we recommend that you do not write directly to a diskette created or written to in another drive type. First, make a backup of the diskette **in the new drive**. Then, use the backup diskette for operations in that drive.

If possible, always back up your diskettes, and use a backup diskette to run each program. Avoid using an original application diskette to run a program. (Some application program diskettes are *copy protected.* You cannot back up such diskettes.)

You can use your computer's operating system to place files from either type diskette onto a hard disk. Refer to your MS-DOS or XENIX operating system manual for more information.

System Configuration (Setup)

The Tandy 4000 contains a battery-powered real-time clock CMOS RAM chip that stores drive and memory information about your system. **You must set the memory of this RAM chip to your individual hardware configuration for the computer to function properly.**

To record your hardware configuration into memory, use the Setup program on the system utilities diskette stored in this manual.

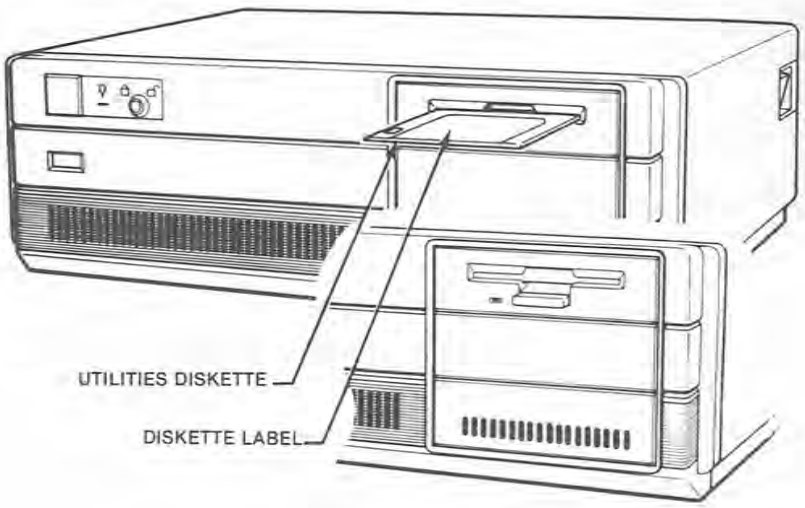
Because you can add memory and many optional peripherals to the Tandy 4000, you must run the Setup program every time you add or remove: (1) memory, (2) an optional diskette drive, (3) internal or external hard disk drives, or (4) a new video display card. You also must run the Setup program whenever you want to change the system time or date.

The computer retains the hardware configuration in memory until the battery gets weak or you change the information with the Setup program.

> **Note:** With normal system use, the battery should last three years before you need to replace it. Because the CMOS RAM chip uses the battery only when the computer is turned off, the more you use the computer, the longer the battery lasts. Storing the computer for long periods of time shortens the life of the battery. (See the "CMOS RAM Battery Removal and Replacement" section for additional information.)

To run Setup, follow these steps:

1. Insert the Utilities diskette into Drive A (the upper diskette drive) with the label facing up until the diskette clicks into place. (Refer to the following illustration.)



2. Move the power switch on the right side of the computer to the ON position.

The following prompt appears on the screen:

```
BIOS ROM version xx.xx.xx
Compatibility Software (C) 198x
Phoenix Software Associates Ltd.,
All Rights Reserved
Licensed to Tandy Corp.

00640k Base Memory, 00000k Expansion
Invalid configuration information - please run SETUP program
Strike the F1 key to continue
```

The Tandy 4000 sounds one short beep when you turn it on. It sounds a long beep or a series of short beeps as a warning signal. If the computer sounds a warning when you turn on the power **and then prompts you to run Setup**, it is signal that there is a configuration problem. The computer sounds a warning the first time you turn it on because you have not yet run Setup.

> **Note:** If, after you run Setup, the computer still sounds a warning signal and prompts you the run Setup when you turn it on, see the "Troubleshooting" section of this manual.

3. Press the [F1] function key. This message appears on the screen:

```
Phoenix Software Asc. Ltd
Configuration Setup Program Ver x.x
(C) Copyright 198x

This program is used to store system
configuration information into battery
backed memory in your computer. It is
necessary to run this program when
any memory, disk drives, or monitors
are added to or removed from your system,
or to set the battery maintained time
or date.
ERRORS FOUND -
INCORRECT CONFIGURATION INFO
MEMORY SIZE MISCOMPARE
Press <enter> to continue ...
```

4. Press [Enter]. The next two screens describe how to set the system date and time. Follow the instructions on the screens.

5. The last screen is for the hardware configuration. Because your system has never been set, answer no ([N]) at each prompt, and select the correct response from the choices offered. You need to know the following information to complete the configuration:

   - The diskette drive types for Drives A and B
   - The hard disk drive types for Drives C and D
   - System base memory.
   - Expansion memory.
   - The primary video card.

   Keep a current list of this hardware information in the "System Worksheet" section on the inside back cover of this manual.

   The following two system configurations are examples of the final setup screens for two typical Tandy 4000 configurations:

   If you have only one diskette drive, no memory upgrade, and a monochrome monitor, the setup screen should look like this when you finish making your selections:

```
Diskette Drive A: is 1.44M
Diskette Drive B: is NONE
Fixed Disk Drive C: NOT INSTALLED
Fixed Disk Drive D: NOT INSTALLED
System Base memory is 640K
Expansion Memory is 0K
Prime Video Adapter is MONOCHROME
```

If you have one diskette drive, a 20-megabyte hard disk, memory upgrade, and an 80-column color monitor, the setup screen should look like this when you finish your selections:

```
Diskette Drive A: is 1.44M
Diskette Drive B: is NONE
Fixed Disk Drive C: 2
Fixed Disk Drive D: NOT INSTALLED
System Base memory is 640K
Expansion Memory is 1024K
Prime Video Adapter is COLOR (80 COL)
```

Note: The number that you use at the `Fixed Disk Drive C:` prompt is the Drive Type Number that you noted on the hard disk drive.

6. After you answer all the configuration questions, the following prompt appears at the bottom of the screen:

```
Are these options correct
(Replay Y or N then <enter>)

?
```

If you made an incorrect selection, type `N` and press [Enter] to repeat the setup procedure. If your selections are correct, type `Y`. Then, press [Enter] to record the date, time, and hardware information in the CMOS memory.

7. Now, reboot the computer under the new hardware configuration, using one of the following two methods. (a) Press the [Ctrl] [Alt] [Del] keys simultaneously. (b) Press the red Reset button on the front panel of the System Unit. The copyright page appears on the screen.

> **Note:** If you have a Tandy 4000 with a hard disk and haven't yet formatted the hard disk, a *hard disk failure* error message might appear on the copyright page. Press [F1] to display the main menu.

You are now finished with the Setup procedure.

The next two sections describe how to use the utilities on this diskette.

The Tandy 4000 Utilities diskette programs are on a Standard diskette. You can back up your system Utilities diskette immediately after using the Setup program for the first time. See the "Copy Diskette" section for detailed instructions.

If you have a Tandy 4000 with diskette drives only, you are now ready to use the MS-DOS Operating System with your computer. Press [9] to exit the Utilities diskette. See your *MS-DOS Handbook* for instructions on how to load and use the operating system.

If you have a Tandy 4000 with a hard disk you might need to format your hard disk before using either MS-DOS or XENIX.

Many hard disks are already formatted at the factory. A factory-formatted hard disk contains documentation stating that it is factory-formatted.

If your hard disk is factory-formatted, you are now ready to install either MS-DOS or Xenix. Press [9] to exit the utilities diskette. See your operating system documentation for instructions on how to load and use the operating system.

Whether your hard disk is factory-formatted or not, if you plan to install MS-DOS **only**, press [9] to exit the Utilities diskette. Then, refer to your MS-DOS documentation.

If your hard disk is not factory-formatted, and you plan to install Xenix or more than one operating system, you must format the hard disk. Read the next section for instructions on how to format the hard disk.

Formatting the Hard Disk

The Utilities diskette contains the following programs:

```
1   FORMAT DISKETTE
2   COPY DISKETTE
3   PREPARE SYSTEM FOR MOVING
4   SETUP
5   FORMAT HARD DISK

9   END UTILITIES
```

To install an operating system on your hard disk, you must first format the hard disk.

1. Type `5` and press [Enter] to begin. The following prompt appears:

```
Which hard drive do you
want to format (C/D)
?
```

2. Type `C` and press [Enter] to format an internal hard disk drive, or type `D` and press [Enter] to format a second internal or an external hard disk drive.

After you make your selection, the following warning message is displayed on the screen:

```
All data on drive X will be DESTROYED!!
Do you want to continue (Y/N)
?
```

> **Warning:**
>
> This formatting utility erases all data from the hard disk. Use this option only when you are preparing to install an operating system on your disk for the first time.

If you ever accidentally press [5] at the main menu, press [N]. Then, press [Enter] to exit the formatting procedure and return to the main menu.

3. If you wish to continue with the format, type `Y`. Then, press [Enter]. The formatting program displays the drive type and the number of heads and cylinders of the hard disk drive (C or D) you selected in the Setup program.

4. If you made a mistake during the setup program or want to change the interleave factor from the default of 3, type N, then press Enter.

   Then, answer the prompts that follow with the correct number of heads, cylinders, and interleave factor for your hard disk drive.

5. When this information matches your hard disk drive, type Y and then Enter at the `Is this correct (Y/N)?` prompt.

6. Next, answer the following prompt:

   ```
   Do you want to flag defective tracks (Y/N)
   ?
   ```

   Refer to the hard disk Media Error Map you found with the disk drive. If the map shows no defective tracks, type N, then press Enter to begin the formatting procedure.

   If the map shows one or more defective tracks, type Y and press Enter. The following prompt appears on the screen:

   ```
   Enter next head, cylinder pair or
   press <enter> to quit.
   ?
   ```

   (For example, if your Media Error Map lists Head 4, Cylinder 100 as a defective, track, type: `4,100 <ENTER>`.)

   After you enter all the defective heads and tracks on the map, press Enter to begin the formatting procedure.

Do not interrupt the program while it is formatting the drive. When the format is complete, the program returns you to the main menu.

> **You are now ready to install an operating system on your hard disk drive. See your operating system documentation.**

Additional Utilities

In addition to the setup/configuration and hard disk formatting programs, the system Utilities diskette contains some other useful utility programs.

The following menu appears when you boot the Utilities diskette:

```
1   FORMAT DISKETTE
2   COPY DISKETTE
3   PREPARE SYSTEM FOR MOVING
4   SETUP
5   FORMAT HARD DISK

9   END UTILITIES
```

These additional utility programs let you format and copy diskettes and prepare your hard disk system for moving. The menu also includes an option for exiting the Utilities diskette and returning to the operating system. Explanation of the additional utilities follows.

Format Diskette

The Format Diskette option divides a diskette into tracks and sectors—but does not install an operating system on the diskette.

After you boot the Utilities diskette, follow these steps to use the Format Diskette utility program:

1. To choose the Format Diskette utility, type `1` at the `SELECT THE ACTION DESIRED` prompt. Press Enter.

2. Answer the prompt that asks in which drive you are formatting.

3. Insert the diskette you wish to format in the drive you specified, and press Enter.

   Note: Diskettes formatted with this procedure are not necessarily usable with MS-DOS. It is preferable to use the FORMAT command present in your operating system to format your diskettes. See your operating system documentation.

Copy Diskette

The Copy Diskette utility formats and copies a diskette exactly—including the operating system.

After you boot the Utilities diskette, follow these steps to use the Copy Diskette utility program.

1. To choose the Copy Diskette utility, type 2 at the SELECT THE ACTION DESIRED prompt. Press Enter.

2. Answer the prompts that select the *source* and *target* diskette drives you wish to use. (Copy data **from** the source diskette in the source drive **to** the target diskette in the target drive.)

   If you have only one diskette drive, select Drive A as both the source drive and the target drive for the copy.

3. After you select the drives you wish to use, insert the source and target diskettes at the appropriate prompts.

Always use the same media **type** in both drives with COPY DISKETTE. See the following chart:

Copy Diskette Utility
Drive/Media Compatibility

Source Drive	Target Drive	Media Type
Standard Drive	◊ Standard Drive	Standard Diskette
High-Cap. Drive	◊ Standard Drive	Standard Diskette
High-Cap. Drive	◊ High-Cap. Drive	High-Den. Diskette

Use MS-DOS instead of the Utilities diskette if you want to make backups from one type of media to another. For example, use MS-DOS to make backups from a 5¼-inch diskette to a 3½-inch diskette or from a High-Density diskette to a Standard diskette. See your MS-DOS documentation for details.

Prepare System for Moving

You can use the Prepare System for Moving option only when your computer system includes a hard disk drive (internal, external, or both). Normally, the hard disk drive heads are positioned over the data area of the hard disk. This utility moves the drive heads as far as possible toward the center of the hard disk. This reduces the chance of damage to the hard disk media or loss of data while moving the computer.

After you boot the Utilities diskette, follow these steps to use the Prepare System for Moving utility program:

1. To choose the utility, type 3 at the SELECT THE ACTION DESIRED prompt, and press [Enter].
2. Wait for the TURN SYSTEM OFF prompt. Then, turn off the computer.

When you turn on the system again, the heads automatically restore, and the hard disk drive once again becomes operational.

End Utilities

Press [9] at the Utilities diskette menu to exit the utilities diskette.

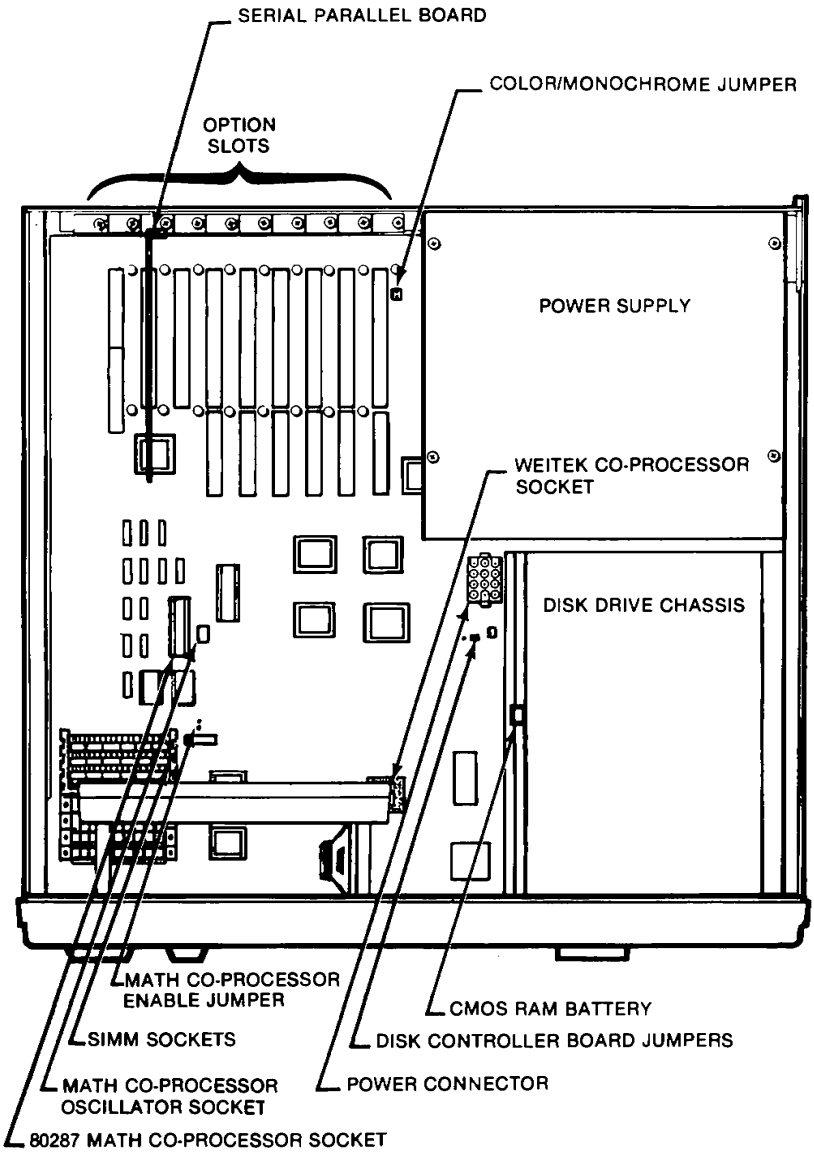
INTERNAL OPTIONS

You can expand the capabilities of the Tandy 4000 in many ways:

- Nine expansion slots let you add peripheral cards and tailor the system to your specific home or business needs.
- The main logic board contains four additional RAM expansion slots that enable you to use the 1M SIMM (single in-line memory module) DRAM UPGRADE KIT (Cat. No. 25-5031) to easily increase on-board memory to 2 megabytes. Each module adds 256 kilobytes of memory.
- An optional user-installable Math Co-Processor (Cat. No. 25-4033) speeds internal mathematical calculations and reduces computing time for many applications.

The diagram on the following page shows the internal map of the Tandy 4000 system unit. The drawing shows the location of the important sections of the system unit and the position of all of sockets, slots, and switches used in expanding the system.

Before installing any peripheral card or chip in the Tandy 4000, turn off the computer, and disconnect the power cord from the system unit.


SERIAL PARALLEL BOARD
COLOR/MONOCHROME JUMPER
OPTION SLOTS
POWER SUPPLY
WEITEK CO-PROCESSOR SOCKET
DISK DRIVE CHASSIS
MATH CO-PROCESSOR ENABLE JUMPER
CMOS RAM BATTERY
SIMM SOCKETS
DISK CONTROLLER BOARD JUMPERS
MATH CO-PROCESSOR OSCILLATOR SOCKET
POWER CONNECTOR
80287 MATH CO-PROCESSOR SOCKET

Serial/Parallel Adapter Card Settings

The Serial/Parallel Adapter Card in Slot 3 provides two input/output ports: a 9-pin RS-232C serial port and a 25-pin parallel port.

The Serial Port

Listed below are the important features of the serial portion of the card:

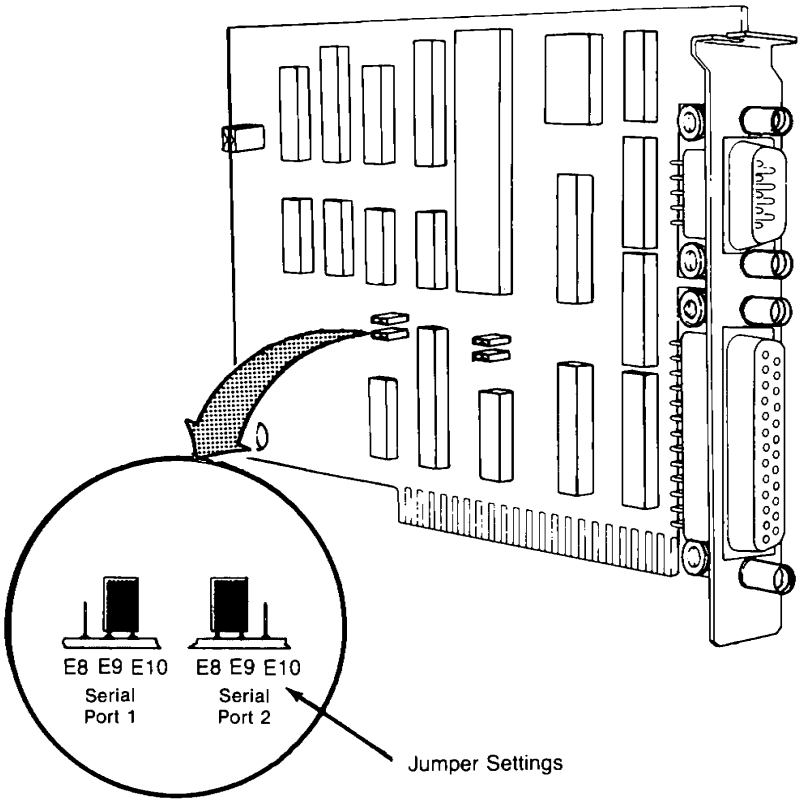
- The serial portion of the card is programmable and supports asynchronous communications (allows variable intervals between transmitted characters).
- A programmable baud-rate generator lets you set the port for baud rates ranging from 50 to 9600 baud.
- The card controller lets you add or delete standard asynchronous communication bits to or from a serial data stream.
- The card provides full double buffering and the following modem controls: CTS, RTS, DSR, DTR, RI, and CD.

The serial port can be addressed as either communications Port 1 or Port 2. The Serial/Parallel Adapter Card is set at the factory for Serial Port 1. In order to change the serial portion of the adapter card to Port 2, you must remove the Serial/Parallel Adapter Card from Slot 3.

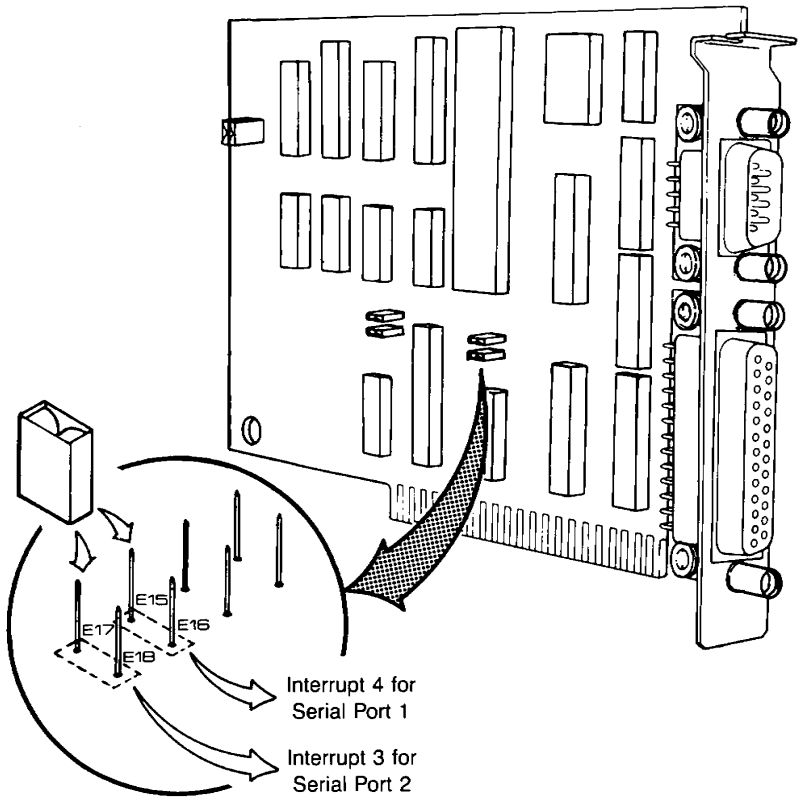
> **Note:** To remove the Serial/Parallel Adapter Card, first remove the screw that anchors the card to the slot in the back panel of the computer. Next, hold the top of the adapter card, and pull it up and out of the slot of the main board. Place the card in a safe place; you will have to reinstall it before replacing the system unit cover.

Resetting the serial port on the Serial/Parallel Adapter Card is a two-step procedure. First, you set the serial port; then, you set the appropriate interrupt for the serial port.

The jumper that connects pins **E9** and **E10** on the Serial/Parallel Adapter Card sets the card for Serial Port 1. To set the Serial/Parallel Adapter Card for Serial Port 2, move this jumper to connect pins **E8** and **E9**. (Refer to the illustration.)



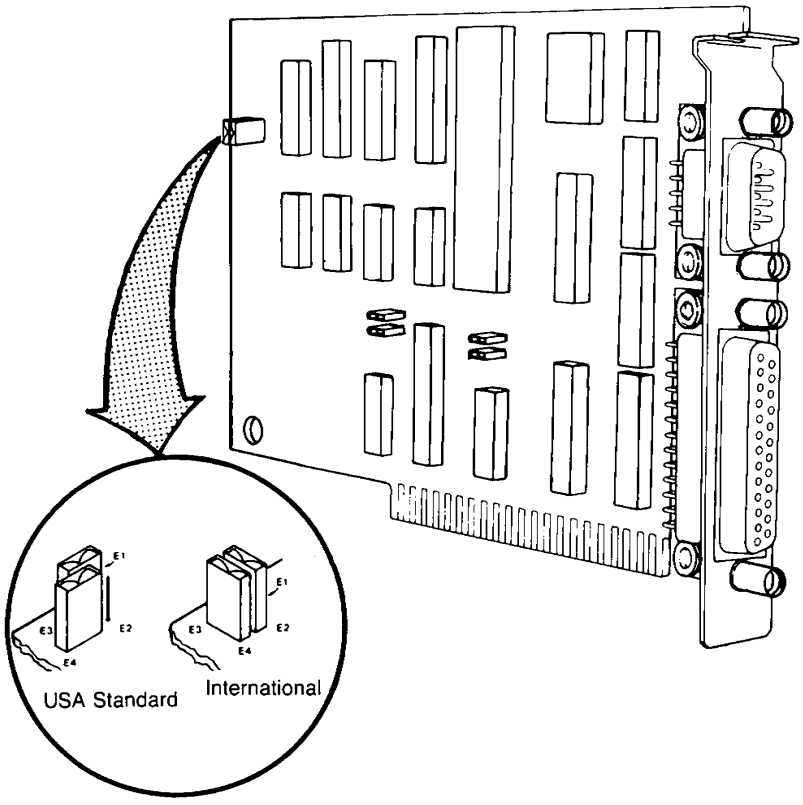
The jumper that connects pins **E15** and **E16** on the Serial/Parallel Adapter Card sets Interrupt 4 for Serial Port 1. To set Interrupt 3 for Serial Port 2, move this jumper to connect pins **E17** and **E18**. (Refer to the illustration.)



Serial port pin assignments are listed in the "Specifications" section of this manual.

The baud-rate generator on the serial portion of the card is set at the factory to the USA Standard which locks serial transmission and reception to the same baud rates. The jumper that connects pins **E1** and **E3** sets the adapter card to the USA Standard.

You can change the baud-rate generator to the International Standard setting in which serial transmission occurs at a higher baud rate than reception. This is a two-step procedure. First, move the jumper on pins **E1** and **E3** to pins **E1** and **E2**. Then, attach the unconnected jumper (on pin E4) to connect pins **E3** and **E4**. (Refer to the illustration.)



The Parallel Port

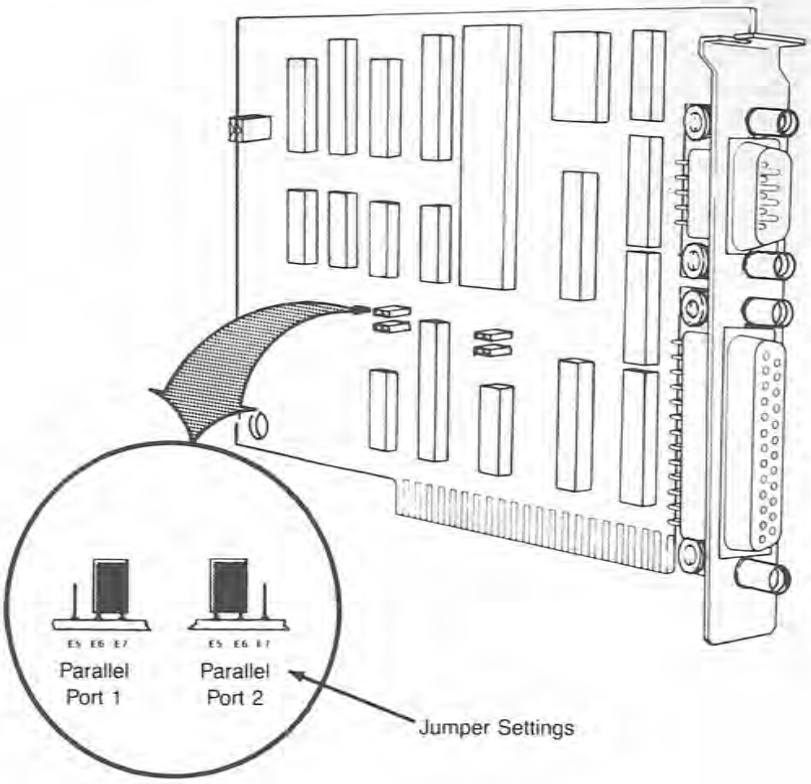
The parallel portion of the adapter card provides an input/output port that lets you attach devices (usually printers) that accept eight bits of parallel data at standard TTL levels.

The parallel port can be addressed as either Port 1 or Port 2. The Serial/Parallel Adapter Card is set at the factory for Parallel Port 1. In order to change the parallel portion of the adapter card to Port 2, you must remove the Serial/Parallel Adapter Card from Slot 3.

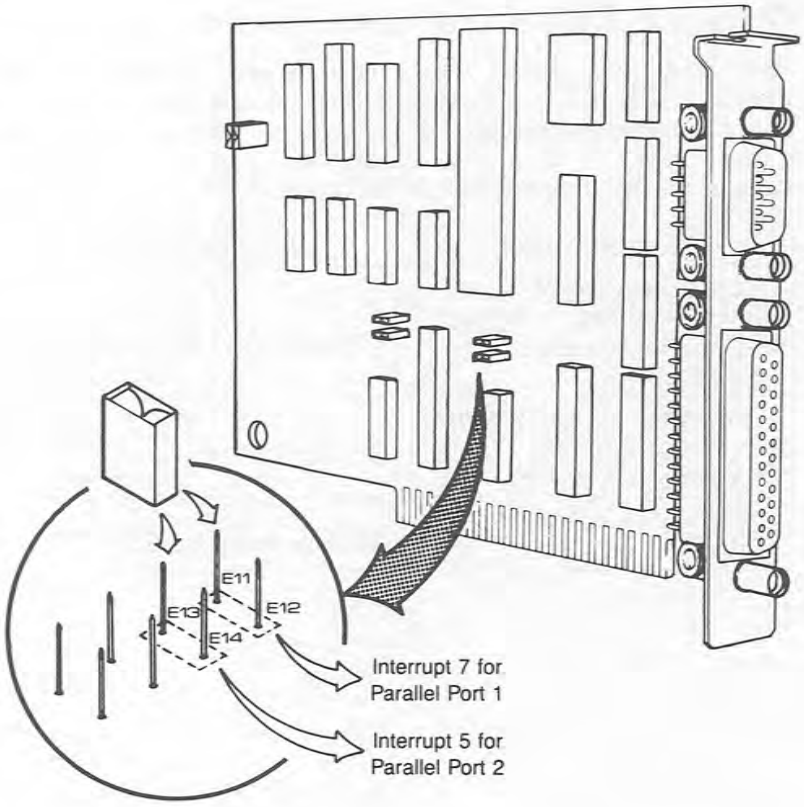
> **Note:** To remove the Serial/Parallel Adapter Card, first remove the screw that anchors the card to the slot in the back panel of the computer. Next, hold the top of the adapter card and pull it up and out of the slot of the main board. Place the card in a safe place; you will have to reinstall it before replacing the system unit cover.

Resettting the parallel port on the Serial/Parallel Adapter Card is a two-step procedure. First, you set the parallel port; then, you set the appropriate interrupt for the parallel port.

The jumper that connects pins **E6** and **E7** on the Serial/Parallel Adapter Card sets the card for Parallel Port 1. To set the Serial/Parallel Adapter Card for Parallel Port 2, move this jumper to connect pins **E5** and **E6**. (Refer to the illustration.)



The jumper that connects pins **E11** and **E12** on the Serial/Parallel Adapter Card sets Interrupt 7 for Parallel Port 1. To set Interrupt 5 for Parallel Port 2, move this jumper to connect pins **E13** and **E14**. (Refer to the illustration.)



Parallel port pin assignments are listed in the "Specifications" section of this manual.

Optional Disk Controller Boards

Your Tandy 4000 comes with a built-in disk controller. If you install an optional Disk Controller Board, you might want to disable the on-board controller if there is an address conflict. To change the port setting or to disable the on-board controller, you move or remove jumpers. See the following chart.

Configuration	Jumper settings
Floppy Disk Controller Enabled and Set as Primary Floppy Port (standard configuration)	Jumper E5 - E6
Floppy Disk Controller Enabled and Set as Secondary Floppy Port	Jumper E6 - E7
Floppy Disk Controller Disabled	Remove Jumper E5, E6, E7

CMOS RAM BATTERY REMOVAL AND REPLACEMENT

With normal system use, the battery that powers the Tandy 4000 CMOS chip should last at least three years before you need to replace it. Because the CMOS RAM chip uses the battery only when the computer is turned off, the more you use the computer, the longer the battery lasts.

> **Note:** If you are storing the computer for long periods of time, you can extend the life of the battery by unplugging it from the main board until you are ready to use the computer again.

If the battery ever fails and the CMOS memory is erased, the following prompt is displayed when you turn on the computer:

```
Invalid configuration information - please run
SETUP program
Strike the <F1> key to continue
```

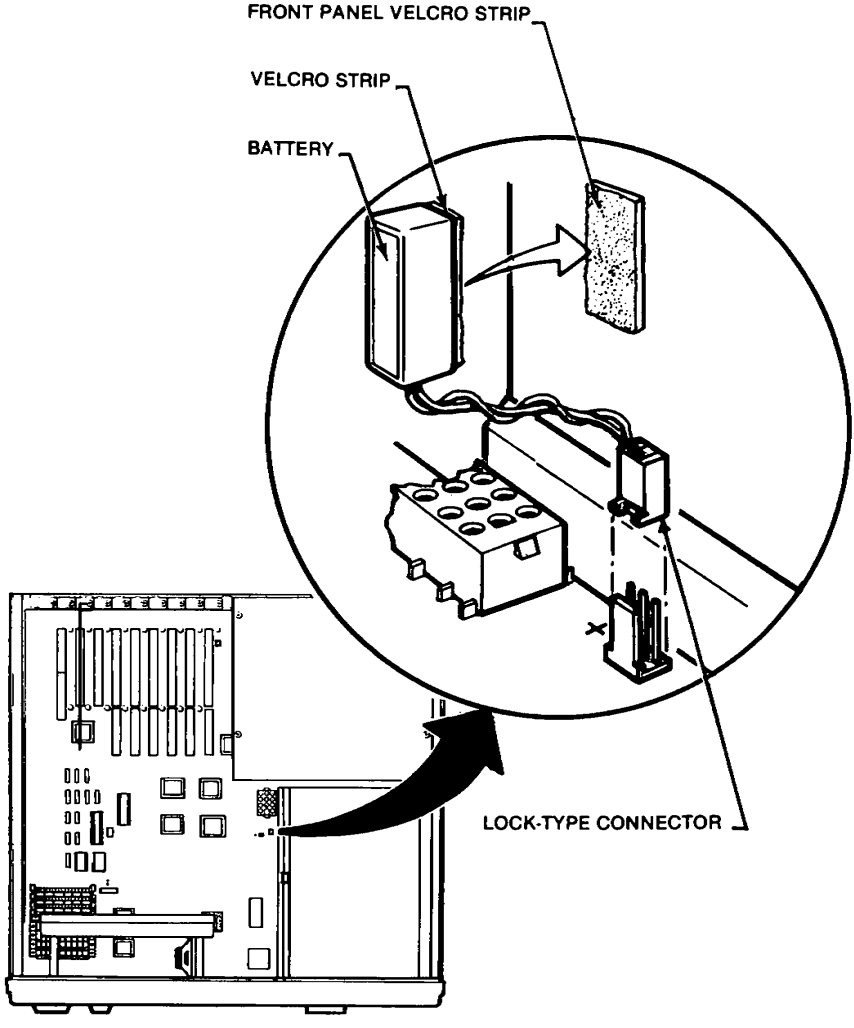
Insert the Utilities Diskette, and follow the instructions in the "System Configuration (Setup)" section of this manual.

> **Note:** If you have a battery problem that cannot be immediately corrected, you can still use the computer by running the Setup program each time you turn on the computer.

Use these steps to replace battery:

1. Remove the system unit cover.
2. The battery is located on the inside of the front chassis panel between the drives and the fan housing. Lift the clear plastic airflow covering to get to the battery, but **do not remove the plastic covering. This covering directs the cooling airflow through the power supply compartment.**
3. The battery is attached to the chassis panel with a Velcro strip. Carefully pull the battery away form the panel.
4. Follow the wires from the battery to the connector on the main board. (The connector location is J3.)

5. Remove the lock-type connector from the main board by pushing the lock-lip toward the front of the computer and, at the same time, lifting the connector. (Refer to the illustration.)



6. Be careful when disposing of this battery:

   Warning: Improper handling of this special Lithium battery can cause a fire, explosion, or severe burns. Never recharge, disassemble, or heat the battery above 100°C (212°F). Never solder directly to the cell, or expose the contents of the battery cell to water.

7. Insert the new battery's connector at the J3 location on the main board.
8. Attach the new battery to the Velcro strip on the inside of the front chassis panel.
9. Reseat the plastic airflow covering.
10. Replace the system unit cover.

TROUBLESHOOTING

If, after you run Setup, the computer still sounds a warning when you turn it on and prompts you to run Setup, check to see if one or more of the following areas is causing the configuration problem:

- loose cables
- improperly seated peripheral cards
- incorrect jumper or switch settings
- incorrect hardware information used when running the Setup program

If none of the above is causing the problem, and the configuration problem persists, call your local Radio Shack® Service Center.

SPECIFICATIONS

System Unit

Processor

Intel 80386, 16 megahertz

Size

Length:	17 15/16 in. (45.50 cm)
Width:	18 15/16 in. (48.06 cm)
Height:	6 1/8 in. (15.56 cm)

Weight

≅45 lbs. Total
(system unit, keyboard, power cord, mounting kit, manual, and packing material)
32 lbs. System unit only
(one 1.44 megabyte, 3½ in. diskette drive)

Power Requirements

105 - 130 VAC, 60 Hz (U.S.)
220 VAC, 50 Hz (International)
2.1 amps maximum current drain

Heat Output: 363 Btu/hr

Environment:

Air Temperature	
Operating	13°C - 29°C (55°F - 85°F)
Storage	−40°C - 65°C (−40°F - 149°F)
Humidity	
Operating	20% to 80% (non-condensing)
Storage	10% to 80% (non-condensing)

Peripheral Interfaces

RS-232C serial port (DB-9 connector on peripheral card)

Pin assignments:
1 - Carrier Detect
2 - Receive Data
3 - Transmit Data
4 - Data Terminal Ready
5 - Signal Ground
6 - Data Set Ready
7 - Request To Send
8 - Clear To Send
9 - Ring Indicator

Parallel I/O printer port (25-pin connector on peripheral card)

Pin assignments
1 - Strobe
2 - Data Bit 0
3 - Data Bit 1
4 - Data Bit 2
5 - Data Bit 3
6 - Data Bit 4
7 - Data Bit 5
8 - Data Bit 6
9 - Data Bit 7
10 - ACKNOWLEDGE
11 - BUSY
12 - PAPER END
13 - SELECT
14 - AUTO FEED
15 - ERROR
16 - INITIALIZE
17 - SELECT IN
18-25 - Ground

Disk drive controller for a maximum of two internal diskette drives

1.44M Diskette Drive

Unformatted Capacity	2.0 megabytes
Formatted Capacity	1.44 megabytes
Number of Heads	2
Number of Cylinders	80 per side
Average Access Time	95 ms
Track to Track	3 ms
Motor Starting Time	500 ms (700 ms max.)
Rotation Speed	300 RPM
Media	3½-inch High-Density

INDEX

SYSTEM WORKSHEET

This System Worksheet provides a convenient space in which you can keep up-to-date information about your Tandy 4000 system. Record all the hardware information you need to run the Setup configuration program. Update this list every time you add memory, hard or diskette drives, or a new video display card to your system.

In addition, the Worksheet contains a section for you to record the flawed cylinders and heads for one or two hard disks.

The Worksheet also provides a convenient place to record your Keylock number.

Hardware Configuration

Diskette Drives

Type of primary disk drive: High-Capacity

Type of secondary disk drive: _____

Hard Disk Drives

Drive type number of primary hard disk drive ____

Drive type number of secondary hard disk drive ____

Base Memory

Total memory size (used by SETUP): 640K

Expansion Memory

Total expansion memory size: _____ K

Video Adapter Card

Type of primary video adapter card: _____

Media Error Map

Primary disk drive:		Secondary disk drive:	
Flawed Heads	**Cylinders**	**Flawed Heads**	**Cylinders**

Keylock Number _____

TERMS AND CONDITIONS OF SALE AND LICENSE OF TANDY COMPUTER EQUIPMENT AND SOFTWARE PURCHASED FROM RADIO SHACK COMPANY-OWNED COMPUTER CENTERS, RETAIL STORES AND RADIO SHACK FRANCHISEES OR DEALERS AT THEIR AUTHORIZED LOCATIONS

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The FCC Wants You to Know

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and has been found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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