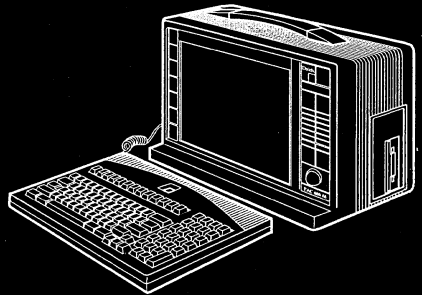


USER'S
MANUAL

PACTM
Portable Add-In Computer



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Touch Panel Users

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Part Number 85-1001-0109.a (v 1.0)

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FCC Warning

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

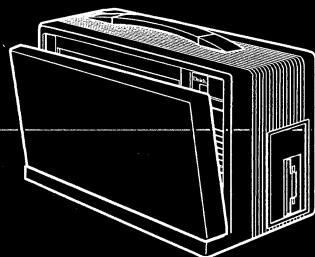
Caution

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

To meet FCC requirements, shielded cables are required to connect the device to another class B certified device.

1

SETTING UP
THE HARDWARE



THE BASICS



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SETTING UP THE HARDWARE

This chapter provides the following sections:

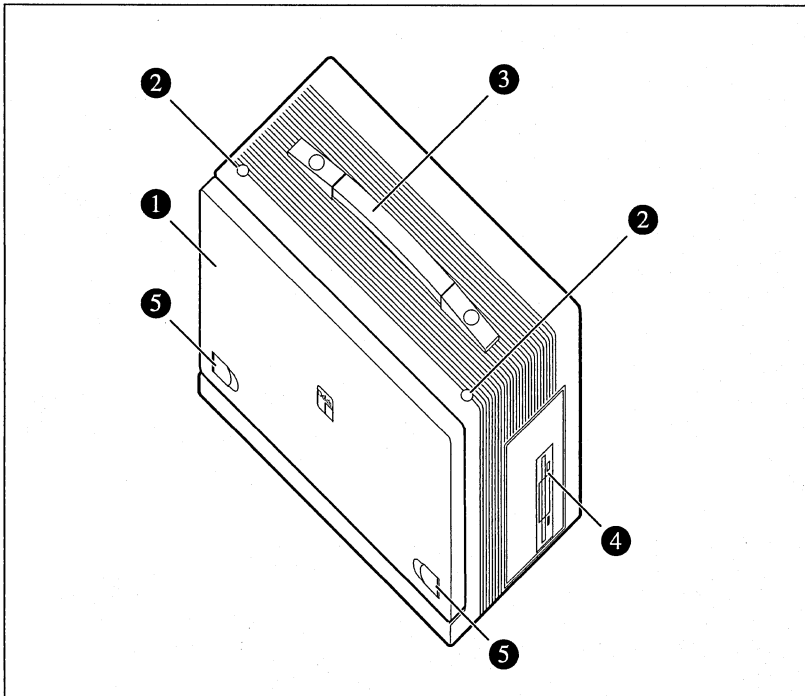
- Identifying the Components
- Setting Up
- Starting Up
- Adjusting the Display
- Connecting Devices
- Using the Keyboard

If you are new to Dolch's Portable Add-in Computers (PAC), or personal computers in general, you should read this entire chapter. If you have problems starting up, see Chapter 7, Troubleshooting, in this manual.



Identifying the Components

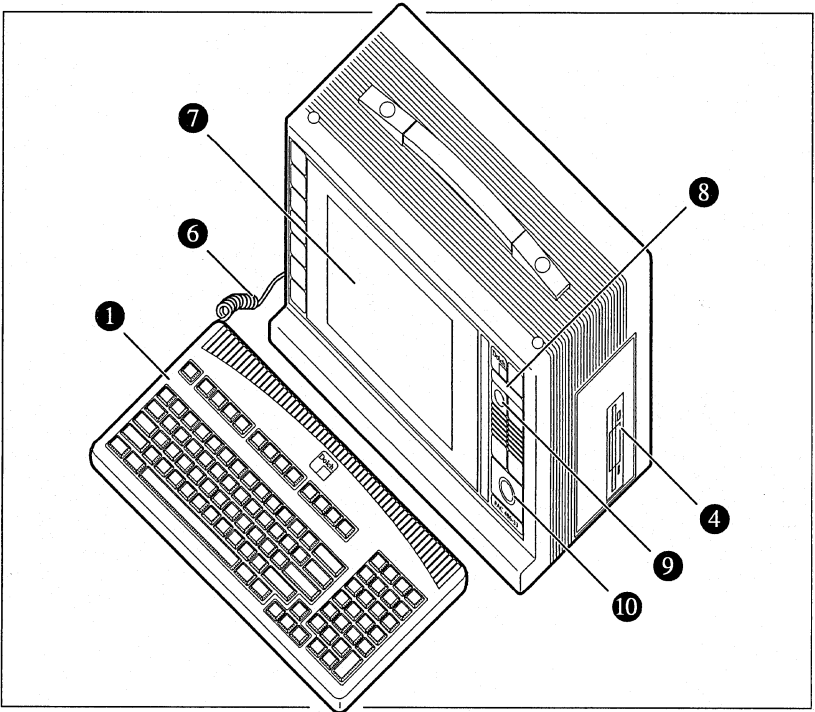
The PAC portable computer provides the power and expansion of a desktop computer in a convenient, portable package. The following figures illustrate the different components and features of your PAC system. The paragraphs which follow briefly describe the different components.



1. **Keyboard.** The PAC keyboard is available with either 86- or 101-keys with low-profile, soft touch keytops. It includes 12 enhanced, programmable function keys.
2. **Keyboard Release Buttons.** These buttons release the keyboard from the main unit.
3. **Carrying Handle**



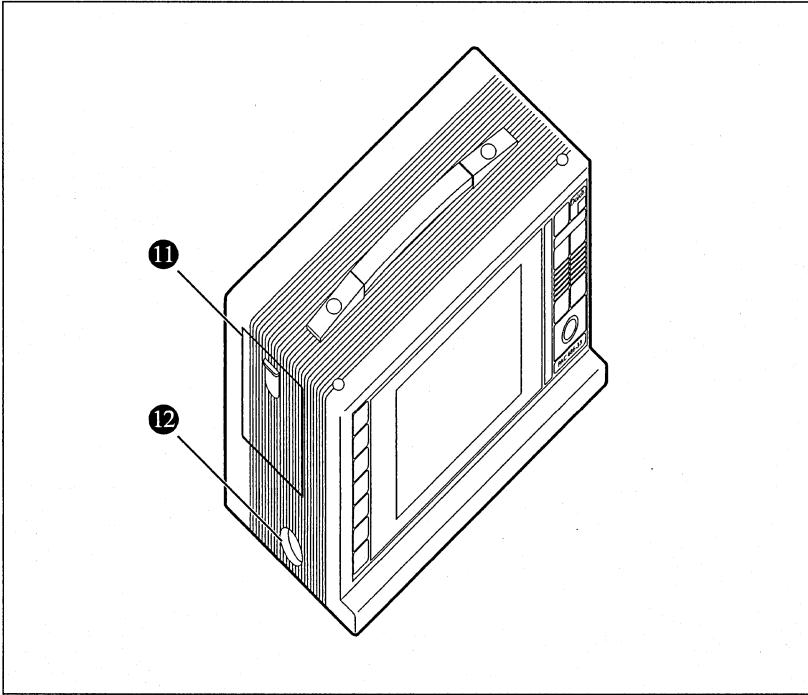
4. **Floppy Drive.** The PAC includes a 1.44 MB, 3.5-inch high density floppy drive.
5. **Keyboard Adjustment Feet.** The PAC keyboard can be adjusted for typing comfort.



6. **Keyboard Cable.** This cable connects the detachable keyboard to the cable jack on the left side of the main unit.
7. **Flat Panel Display.** The PAC is available with a variety of VGA compatible flat panel displays: gas plasma, active matrix color TFT, or dual-scan passive matrix TFT.
8. **Status Indicators.** These LEDs illuminate to indicate if the power is turned on and if the system is accessing the hard drive.

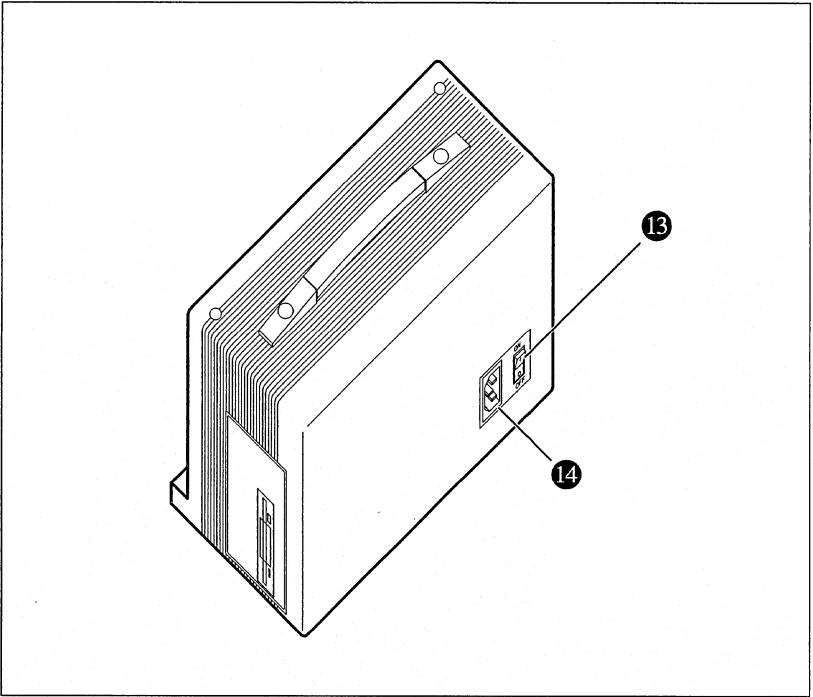
9. **Brightness Control Knob.** This control knob adjusts the overall brightness of the flat panel display.

10. **Optional Trackball.** Certain PACs are available with an integrated trackball.



11. **Expansion Slot Door.** This door accesses the I/O ports on expansion cards.

12. **Keyboard Cable Jack.** The keyboard cable connects to this jack.



13. System Power Switch. This on/off switch turns the power on to the PAC.

14. AC Power Cord Connector. This connects the PAC to an AC power source.

Setting Up

The PAC family of portable computers has hardware that must be set up before use. The keyboard and cable must be connected to the keyboard connector and a power cord must be plugged into the AC power connector and a power source.

■ **Note:** Before setting up the hardware, make sure the system power switch is in the off position, as indicated by the "O."

1. Place your PAC on a flat, sturdy surface with the carrying handle up and the system power switch to the rear.
2. Press the keyboard release buttons on the top of the unit to release the keyboard (fig. 1-1).
3. Remove the keyboard from the main unit, being careful not to drop it (fig. 1-2). Place the keyboard in front of the system.
4. The keyboard can be angled for comfort. Flip out the legs on the bottom of the keyboard.
5. Connect the keyboard's coiled cable to the keyboard jack on the left side of the main unit (fig. 1-3). If you have a 101-key keyboard, connect the other end of the cable to the socket on the left side of the keyboard. If you have an 86-key keyboard, the coiled cable is permanently attached to the keyboard.
6. There are adjustable feet on the bottom of the main unit. Use these feet to angle the unit and view the display more comfortably.

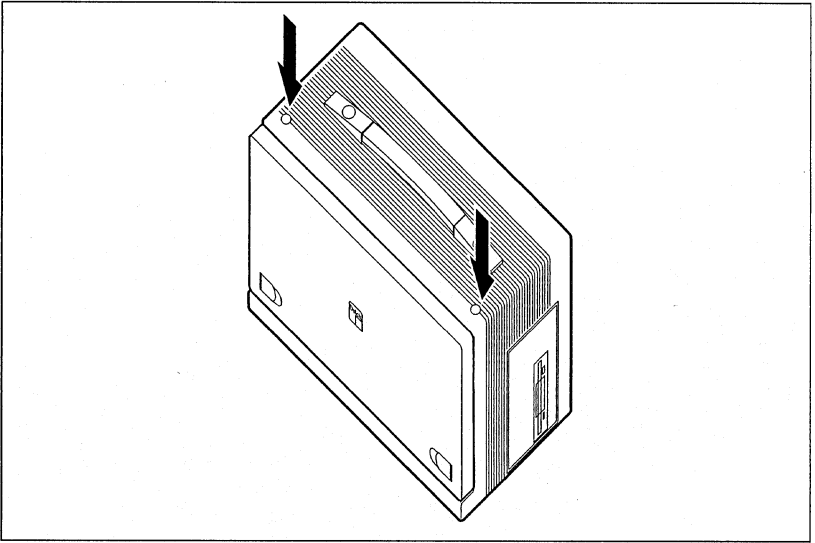


fig. 1-1

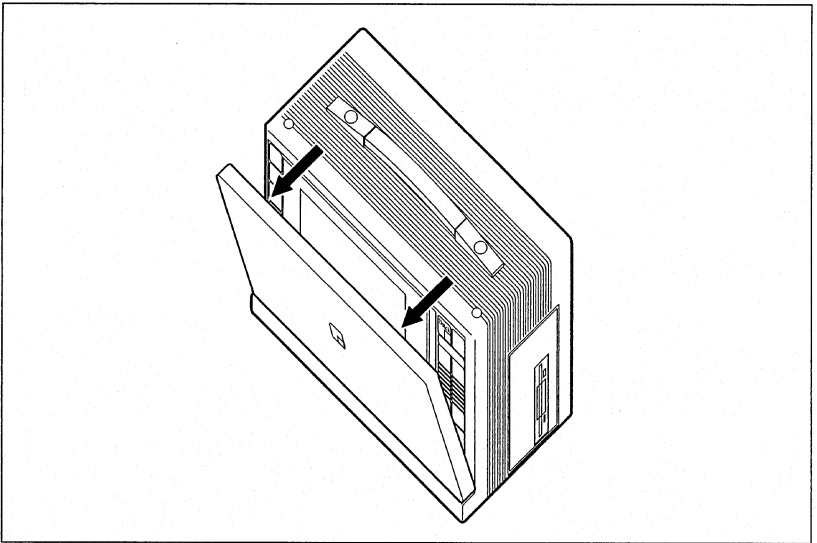


fig. 1-2

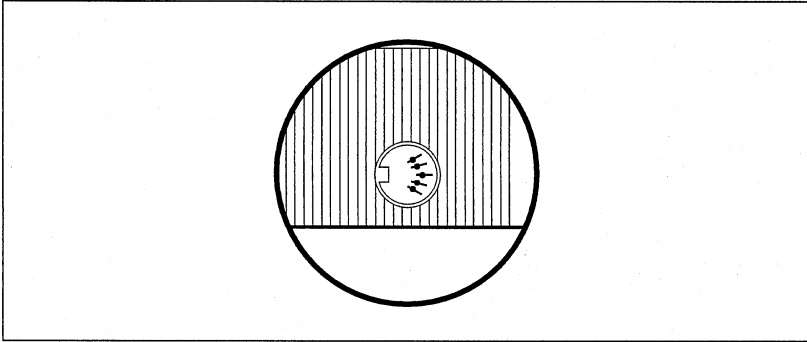


fig. 1-3

Providing Power

The PAC requires a power source to operate.

1. Insert the female end of the AC power cord into the AC power cord connector on the rear of the main unit (fig. 1-4). Plug the other end into a power outlet.

■ **Warning:** To avoid an electrical shock, insert the female AC cord plug into the PAC's AC connector *before* plugging its other end into a power outlet.

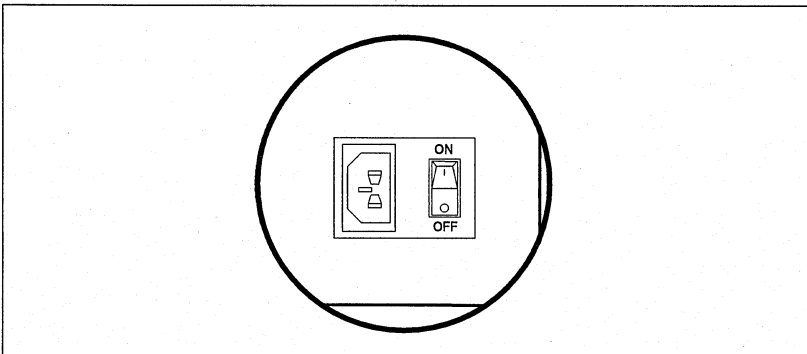


fig. 1-4

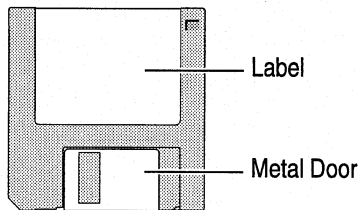
Starting Up

The PAC has an on/off switch that provides power to the system. This switch is located in the rear of the main unit, next to the AC power connector. Before turning on the PAC, determine if an operating system has already been loaded. If an operating system was loaded at the factory, you can start up and use the PAC right away. If not, you must insert a bootable DOS diskette into the floppy drive and then start up the system. You will then need to format the hard drive.

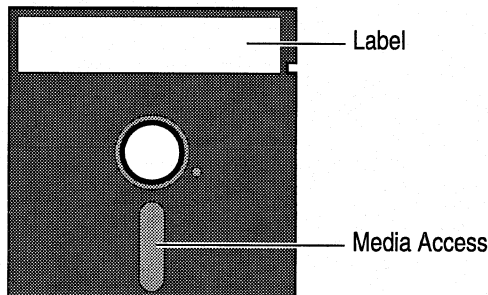
1. Press the system power switch on the rear of the unit, as indicated by the "1."

Inserting a Floppy Diskette

Your PAC portable computer is configured with either a 1.44 MB, 3.5-inch or 1.2 MB, 5.25-inch floppy drive, or both. The type of media you use with your floppy drive depends on the type of drive installed. The following figures illustrate floppy diskettes for 3.5-inch drives and 5.25-inch drives.



3.5-inch Diskette



5.25-inch Diskette

If your system includes a 1.44 MB, 3.5-inch floppy drive, slide the appropriate diskette into the drive door, metal end first (the diskette label should be facing you). When the diskette is inserted all the way, the diskette release button will pop out.

To release the diskette, press the diskette release button.

If your system includes a 1.2 MB, 5.25-inch floppy drive, turn the release lock lever on the drive vertically and slide the diskette into the drive, media opening end first (the diskette label should be facing you). Return the release lock lever on the drive to its original position.

To release the diskette, turn the lock lever vertically and pull the diskette out of the drive.

Formatting Your Hard Drive

You must format your hard drive if you get the error message, "No ROM Basic." This section explains how to format your hard drive according to MS-DOS®. If you are using a different operating system, refer to the documentation provided for formatting a hard drive.

■ **Warning:** Formatting the hard drive destroys all data on the disk.

1. Insert a bootable DOS diskette in the floppy drive.
2. Turn the power on to the system using the system power switch. This boots your system from the floppy drive instead of the hard drive.
3. At the prompt (A:>) type `FDisk<Enter>`. A disk setup program screen will appear.
4. Select **4. Display Partition Information**.

5. You will only need to format the hard drive if a partition has already been created. Otherwise, you will have to format the hard drive *and* create a partition. Select **1. Create DOS Partition or Logical DOS Drive**. Then select **1. Create a Primary DOS Partition**. Depending on the size of your hard drive, as well as personal preference, you can divide your hard drive into more than one partition.
6. Follow the instructions on the screen to format the drive and create partitions. If you divide your drive into more than one partition, you will need to go back to the FDisk screen and select **2. Set Active Partition**.
7. Hit <Esc> twice to exit the FDisk screen. When you are finished, go to the A prompt and type **Format C:/S<Enter>**. The hard drive will be formatted according to your instructions.

Bypassing the Memory Test

When your PAC is started up, the Basic Input/Output System (BIOS) performs a Power-On Self-Test (POST). The initialization POST checks such things as the hard drive, the floppy drive, and the system's memory. If you have a lot of memory installed in your system, this can be a slow process. Press the key when the following message is displayed to bypass the memory test.

Hit Key to Bypass Memory Test

Adjusting the Display

The PACs are available with several types of flat panel displays. No matter which display you have, you can adjust the viewing angle by using the tilt adjustment feet on the bottom of the main unit.

1. Lift the main unit up in front.
2. Locate the tilt adjustment feet on the bottom of the unit.
3. Snap the feet into an upright position.

Adjusting the Brightness

If the display screen appears too dark, use the brightness control knob on the front of the unit (fig. 1-5).

- **Warning:** It's a good idea to turn down the brightness if you're going to leave the system on for a while without using it. If an image is left on the display for several hours or more, it could damage the screen.

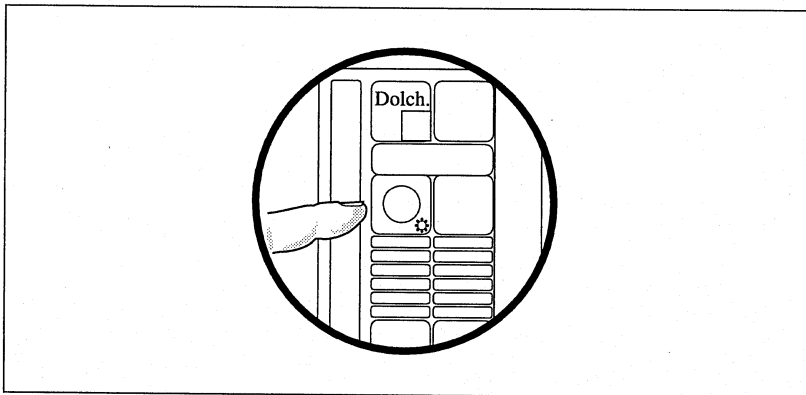
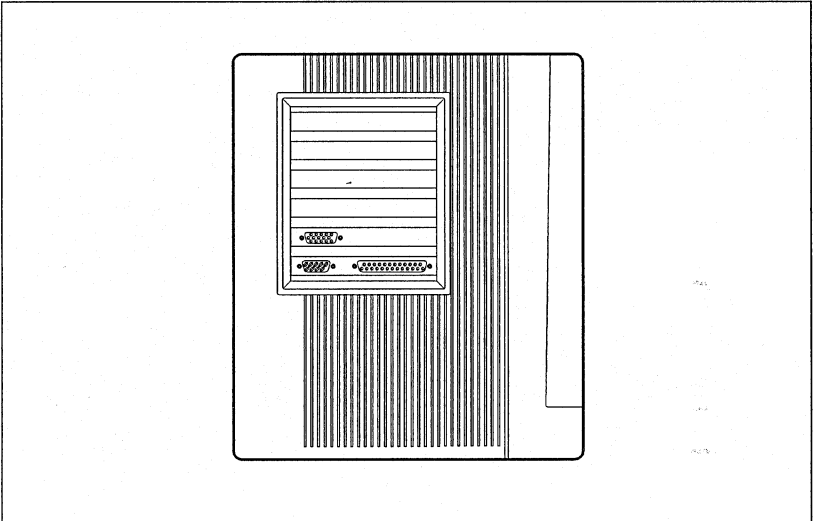


fig. 1-5

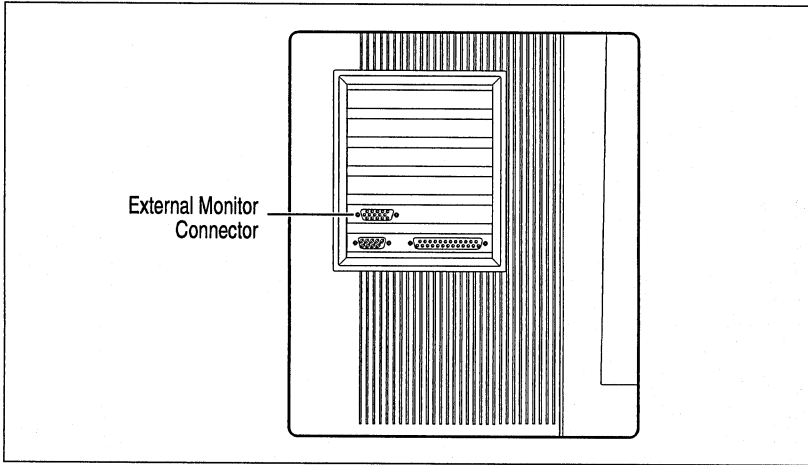
Connecting Devices

Your PAC portable computer has I/O ports for connecting external devices such as printers, pointing devices, and CRT monitors. The location of the I/O ports depends on the type of PAC you have. Most PAC portables have I/O ports on the left side of the main unit, under the expansion slot door. The serial ports and parallel port are provided by the multifunction I/O card installed in your PAC. The following figure illustrates the I/O ports.



PAC I/O Ports

The external monitor connector is provided by the video controller card installed in your system and is accessible, on all units, on the left side of the main unit, under the expansion slot door.



External Monitor Connector

Connecting a Printer

You can connect a printer to the PAC through the serial ports or the parallel port. The parallel port sends multiple data and control bits simultaneously over multiple transmission lines.

The serial ports send data and control bits sequentially over a single transmission line. There are two serial ports available with the PAC. Both serial ports are 9-pin RS232-C ports.

- **Note:** Your PAC only has one serial port installed from the factory. You must install the second serial port to use it. Refer to Chapter 5, Expanding the PAC, for information on installing the second serial port.

When connecting a printer to the PAC, always refer to the documentation provided with your printer, as well as the following general procedures. Also, check your software documentation in case you need to “configure” it for your specific printer.

- **Note:** Remember that these are only general procedures. Always refer to the documentation provided with your printer for specific installation and configuration instructions.

1. Assemble the components you need such as a printer, printer cable, and documentation. Turn the power off to the PAC using the system power switch.
2. Determine whether you are connecting your printer to the serial port or parallel port on the PAC.

3. If you are connecting the printer to the parallel port:
Insert the 25-pin connector on the printer cable to the parallel port on the PAC. Secure the connection by tightening the screws.

If you are connecting the printer to the serial port:
Insert the 9-pin connector on the printer cable to either of the serial ports on the PAC, depending on availability. Secure the connection by tightening the screws.

4. Connect the other end of the printer cable to the printer connector.
5. Plug the printer's power cord into a grounded outlet.

Connecting a Mouse

The PAC family of portable computers has up to two serial ports for connecting serial devices. You can connect a mouse to either of the serial ports, depending on availability.

- **Note:** Your PAC only has one serial port installed from the factory. You must install the second serial port to use it. Refer to Chapter 5, Expanding the PAC, for information on installing the second serial port.
- **Note:** If you have a PAC with a touch panel option, only one serial port is available.

Refer to the documentation provided with your mouse, as well as the following general procedures.

- **Note:** Remember that these are only general procedures. Always refer to the documentation provided with your mouse for specific installation instructions.

1. Make sure the mouse you have is an RS232-C mouse.
2. Insert the connector on the mouse cable into serial port 1 or serial port 2, depending on availability.

- **Note:** You can connect a PS/2 mouse to the PAC by using an adapter cable.

Connecting an External Monitor

In addition to the flat panel display on the PAC, you can connect an external monitor. To add an external monitor you simply use the external video connector on the video controller card installed in the PAC. The external video connector is a 15-pin D-type connector.

Refer to Chapter 4, Display and Video Subsystem, for information concerning the video controller card. Chapter 4 will also tell you if you need to change any jumper settings on your particular video card.

Refer to the documentation provided with your CRT monitor, as well as the following general procedures.

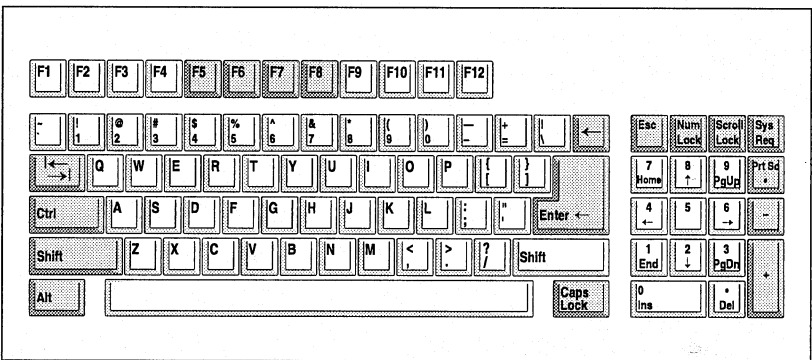
■ **Note:** Remember that these are only general procedures. Always refer to the documentation provided with your monitor for specific installation instructions.

1. Assemble the components you need such as the CRT monitor, the monitor cable, and any documentation. Turn the power to the PAC off using the system power switch. If necessary, set any jumpers on the video controller card.
2. Attach one end of the monitor cable to the monitor (refer to the documentation supplied with your monitor).
3. Attach the free end of the monitor cable to the 15-pin external monitor connector on the PAC.
4. Attach the power cord to its socket on the monitor. Plug the other end into a grounded outlet.

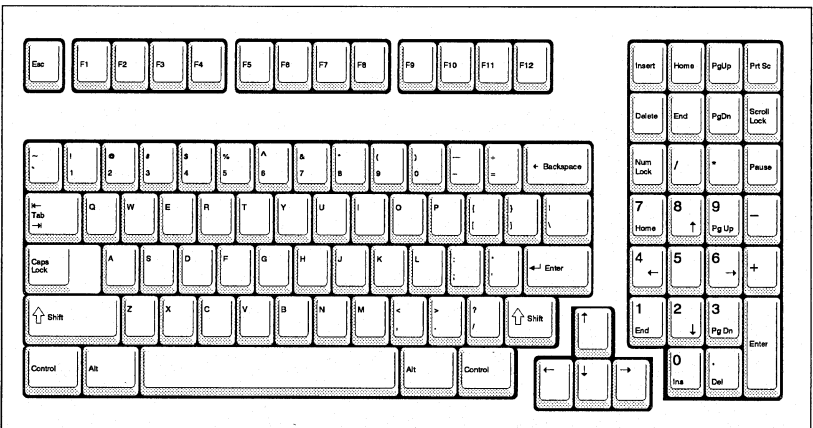
Using the Keyboard

The PAC family is available with either an 86-key or 101-key keyboard. Both keyboards have a coiled cable that connects to the 5-pin DIN connector jack on the side of the unit. The PAC keyboards have symbols that are not on a regular typewriter, and some of the characters are in different positions.

The following figures illustrate the PAC keyboard layouts.



86-key Keyboard



101-key Keyboard

The following sections define the various keys on the PAC keyboards.

Programmable Function Keys

The programmable function keys relieve you of repetitive entry of typed commands and control functions. Your operating system or application software controls their exact function.

Normally the <F11> and <F12> keys are not used, but some applications may take advantage of these keys for unique purposes. Refer to the documentation provided with your operating system or application program for specific information concerning the programmable function keys.

Numeric Keys

The numeric keys are similar to a calculator keypad, since they produce numbers and mathematical symbols. Some of these keys permit the cursor to move up, down, right, and left (as indicated by the arrows). By using the <Num Lock> key, the numeric keys operate more like a calculator keypad. When you press the <Num Lock> key, the keyboard shifts the numeric keypad into its own upper-shift mode, with each of the numeric keys generating one of the numerals 0 through 9 or a decimal point, as indicated on the top of the key. The LED indicator above the numeric keypad lights when the keypad is in the Num Lock state.

Special Keys

These keys are designed to work in alternative operating systems. In most cases, the function of these keys depends on the operating system and application program you are using. Refer to the documentation provided with your operating system or application program for more information concerning the special keys.

Insert Key

Pressing this key toggles the insert mode on and off. The insert mode allows you to “insert” text without typing over what you have already entered. Inserted text threads through the existing text starting at the cursor. Pressing the <Ins> key turns the insert mode on. Pressing the <Ins> key again turns the insert mode off.

When the insert mode is off, inserted text replaces (or types over) existing text, beginning at the cursor. Pressing an <Arrow> key or the <Enter> key turns the insert mode off.

Home Key

This key moves the cursor to the upper left-hand corner of the screen. Simultaneously pressing the <Ctrl> key and <Home> key clears the screen and moves the cursor to the upper left-hand corner of the screen.

PgUp Key

If you are using a program editor or a word processing application program, simultaneously pressing the <PgUp> key and the <Ctrl> key moves the cursor to the top of the document in the home position.

Prt Sc Key

Pressing this key prints a copy of what is currently being displayed on the screen. You must connect a printer to the PAC for this function to work. Refer to the section in this chapter entitled, “Connecting a Printer,” for information about connecting a printer to the PAC.

Del Key

This key deletes the character at the current cursor position. All characters to the right of the deleted character move one position to the left to fill in the empty space.

End Key

This key moves the cursor to the end of the logical line. Simultaneously pressing the <End> key and the <Ctrl> key erases the cursor from its current position to the end of the logical line. All screen lines are erased until a carriage return is found.

PgDn Key

If you are using a program editor or a word processing application program, pressing the <PgDn> key scrolls the display forward 25 lines. Simultaneously pressing the <PgDn> key and the <Ctrl> key deletes all text from the current cursor position to the end of the screen.

Scroll Lock Key

This key exits the Auto Line Numbering mode. Simultaneously pressing the <Scroll Lock> key and the <Ctrl> key interrupts the program execution at the next Basic instruction and returns to Basic command level.

Arrow Keys

The <Arrow> keys move the cursor position up, down, left, or right.

Up Arrow

This key moves the cursor up one display line. If the cursor is already at the top of the screen, this key has no effect.

Down Arrow

This key moves the cursor down one display line.

Left Arrow

This key moves the cursor one position to the left. If the cursor is at the left edge of the display line, pressing the <Left Arrow> key will move it to the right edge of the preceding display line.

Right Arrow

This key moves the cursor one position to the right. If the cursor is at the right edge of the display line, pressing the <Right Arrow> key will move it to the left edge of the following display line.

Esc Key

“Esc” stands for Escape. The function of this key depends on the application program you are using. Refer to the documentation provided with your operating system or application program for more information about the <Esc> key.

Caps Lock Key

The <Caps Lock> key is similar to a <Shift Lock> key on a typewriter. The <Caps Lock> key gives you capital letters when you press one of the typewriter keys (it does not give you the upper shift characters on the numeric keypad or other keys). After you press this key, you will continue to get capital letters until you press it again. You can get lowercase letters in the Caps Lock mode by first pressing and holding down one of the <Shift> keys, and then typing the desired character(s). When you release the <Shift> key, you will go back to the Caps Lock mode. The LED indicator on the keyboard indicates the Caps Lock mode.

Shift Keys

There are two <Shift> keys on the PAC keyboard. Both of the <Shift> keys access the upper case, or capital letters, on the typewriter keys, as well as the special characters above the number keys.

Ctrl Key

“Ctrl” stands for Control. The <Ctrl> key is used in combination with other keys to provide shortcuts or modify other actions, as indicated in the following figure.

| Key Combinations | Function | Result |
|-------------------------------------|-----------------|---|
| <Ctrl> - <G> | Bell | Internal speaker beeps |
| <Ctrl> - <Scroll Lock> | Break | Stops your program while it is running and identifies the line where the program stopped |
| <Ctrl> - <Num Lock> | Pause | Halts the running of the current program; the program will resume when any key is pressed |
| <Ctrl> - <Home> | Clear Screen | Removes all of the text currently on the screen and moves the cursor to the upper left corner |
| <Ctrl> - <Alt> - ¹ | System Reset | Reboots the system (also called a "soft boot") |

¹ An error will occur if a non-system diskette is loaded in the flexible diskette drive during a system reset.

Alt Key

The <Alt> key enables easy entry of BASIC statement keywords or allows input of ASCII codes for special characters. Refer to the documentation provided with your operating system or application program.

Enter Key

This key moves the cursor to the beginning of the next line (sometimes called a carriage return), or enters information into the computer.

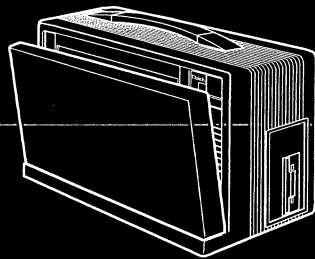
Backspace Key

The <Backspace> key on a computer keyboard behaves differently than the backspace key on a typewriter. Not only does it backspace, but it erases what you have typed as well. To avoid erasing what you have typed, use the <Left Arrow> key instead of the <Backspace> key.



2

SETTING UP
THE SYSTEM



THE BASICS

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SETTING UP THE SYSTEM

This chapter contains the following sections:

- The CMOS and the BIOS
- Using the BIOS Setup Program

This chapter explains how to use the BIOS Setup Program to configure the system's CMOS.



The CMOS and the BIOS

The system's Basic Input/Output System (BIOS) prompts the user to set up the non-volatile CMOS when a computer is started up for the first time. Until the CMOS is set up, the configuration information stored in the battery-backed CMOS random access memory (RAM) is not correct, such as what type of floppy and hard drives are installed, the current date and time, and the type of display being used, as well as other configuration information. The BIOS detects this condition and prompts the user to go through the BIOS Setup Program. Since we configure the PAC at the factory, you don't have to go through the BIOS Setup Program unless the CMOS RAM becomes corrupted, or if you add, remove, or change system peripherals.

Using the BIOS Setup Program

The BIOS Setup Program consists of the following menus.

- Standard CMOS Setup Menu
- Advanced CMOS Setup Menu
- Advanced Chipset Register Setup Menu

Perform the following procedures to access the BIOS Setup Program.

1. Turn the system power switch on. The system will go through several self-tests. After completing diagnostics, the system will prompt you to go through the BIOS Setup Program by displaying the following screen.

Press key for setup

If you don't take any action, the system continues to load the operating system.

2. Press the key to go to the Main Menu of the BIOS Setup Program. From the Main Menu you can select the Standard CMOS Setup menu or the Advanced CMOS Setup menu.

Use the <Up/Down Arrow> keys to highlight the appropriate menu selection, and then press the <Enter> key. A warning screen will appear. Press any key to go to the menu you selected.

4. Once you are in a Setup Menu, use the following keys to perform the indicated functions.

| Keys | Function |
|-----------------|----------------------------------|
| <F1> | Help |
| <F2> – <F3> | Color (changes the screen color) |
| <F5> | Old Setup Value |
| <F6> | BIOS Setup Default Values |
| <F7> | Power -on Default Values |
| <Esc> | Exit Setup Section |
| <Arrow> keys | Select Setup Item |
| <PgUp> – <PgDn> | Modify the Highlighted Item |

Standard CMOS Setup Menu

The Standard CMOS Setup Menu is the first and most important setup section that you should run.

Date (mm/date/year)

This option sets the date and time. There is a calendar on the bottom right corner of the screen. Once set, the date will be maintained by the system clock.

Time (hour/min/sec)

This option sets the system time. The time is stored in military format with 00:01:00 being 12:01 AM and 23:59:00 being 11:59 PM. To decrease the highlighted value, use the <PgUp> key; to increase, use the <PgDn> key.

Daylight Saving

Enabling this option will automatically advance or set back the system clock one hour during standard daylight savings time.

Hard disk C: type 47

This option configures the first hard drive installed. The BIOS contains a preset drive table of 15 drive types. Drive type 47 is user configurable. To select a preset drive type, press the <PgUp> or <PgDn> key to scroll through the available drive types. To enter custom parameters, scroll through the drive table until type 47 is displayed. Once displayed, use the <Right Arrow> key to move from field to field. At each field, type in the custom parameter. Once done, the calculated size of the hard drive (in megabytes) will be displayed on the right side of the custom parameters. Below is a summary of the available drive types. If you have a SCSI drive, use "Not Installed."

| Type | Cylinder | Heads | Landing | | WPcom | Sectors | Size |
|------|--------------|-------|---------|--|-------|---------|--------|
| | | | Zone | | | | |
| 1 | 762 | 4 | 762 | | 65535 | 39 | 58 MB |
| 2 | 977 | 5 | 977 | | 65535 | 17 | 41 MB |
| 3 | 776 | 8 | 776 | | 65535 | 33 | 100 MB |
| 4 | 683 | 16 | 683 | | 65535 | 38 | 203 MB |
| 5 | 816 | 15 | 816 | | 65535 | 32 | 191 MB |
| 6 | 901 | 5 | 901 | | 65535 | 53 | 117 MB |
| 7 | 762 | 8 | 762 | | 65535 | 39 | 120 MB |
| 8 | 1002 | 15 | 1001 | | 65535 | 17 | 125 MB |
| 9 | 954 | 12 | 955 | | 65535 | 36 | 95 MB |
| 10 | 894 | 15 | 895 | | 65535 | 62 | 406 MB |
| 11 | 723 | 13 | 723 | | 65535 | 51 | 234 MB |
| 12 | 987 | 16 | 987 | | 65535 | 63 | 486 MB |
| 13 | 1021 | 16 | 1021 | | 65535 | 51 | 407 MB |
| 14 | 903 | 4 | 903 | | 65535 | 46 | 81 MB |
| 16 | 751 | 8 | 751 | | 65535 | 17 | 50 MB |
| 47 | User Defined | | | | | | |
| | 1024 | 16 | 1024 | | 0 | 63 | 504 MB |

Note: Use "Not Installed" for SCSI drives.

Hard disk D: type *Not installed*

This option configures the second hard drive installed. See Hard disk C: type above.

Floppy Drive A: *1.44 MB, 3 1/2"*

This option configures the first floppy drive installed. The available options are 1.2 MB, 5.25-inch; 360 KB, 5.25-inch; 1.44 MB, 3.5-inch; and 720 KB, 3.5-inch. Your PAC computer comes standard with a 1.44 MB, 3.5-inch floppy drive installed.

Floppy Drive B: *Not installed*

This option configures the second floppy drive installed, if applicable. See Floppy Drive A: above.

Primary Display Monitor

This option configures the type of video card installed in your PAC. The available options are VGA/PGA/EGA, Color 80x25, Color 40x25, Mono-chrome, and Not Installed. Your PAC is configured with a VGA video controller card.

Keyboard

If you set this option to Installed, the system will check for the existence of a keyboard. If you set this option to Not Installed, the keyboard check is bypassed. When set to Not Installed you can still enter the BIOS Setup Program by pressing the key during boot-up.

Advanced CMOS Setup Menu

The Advanced CMOS Setup menu configures features that enhance the performance of the system, such as cacheable memory areas, system boot-up speed, Gate A20, and various system timing parameters.

Above 1 MB Memory Test Disabled

This option enables the BIOS to initiate an internal memory test of all memory above 1 MB during the power-on self-test (POST). The default for this option is "Disabled" to speed up the power-on initialization process.

Memory Test Tick Sound Enabled

This option enables the ticking sound during memory test.

Hard Disk Type 47 RAM Area 0:300

This option selects a location for the scratch RAM area. The scratch RAM area is used to save the user definable drive type 47 and translate the LOADALL function for programs like OS/2, RAMDRIVE, and so on. If shadow RAM is not enabled, the parameters of the drive must be stored in normal RAM, and the data must be write-protected from applications. If you select "0:300" the BIOS uses 100 bytes at 30h:0. If you select "DOS 1KB" the BIOS reduces the size of the base memory by 1 Kbyte.

Typematic Rate Programming Disabled
" Rate Delay (msec) 500
" Rate (Chars/sec) 15

System Boot Up Num Lock *On*

This option enables the number pad on your keyboard at boot up. If disabled, this option enables the alternate cursor functions, such as Home, End, PgUp, Ins, Del, and the arrow keys. You can override the boot up setting by pressing the <Num Lock> key on your keyboard.

Weitek Processor

This option is used if a Weitek math coprocessor is installed on the system board.

Floppy Drive Seek At Boot *Enabled*

This option enables the system to perform a seek test on the installed floppy drive to verify that it is operating properly.

System Boot Up Sequence

This option specifies the order in which the system attempts to load the system boot files. The options are A; C; or C; A;. Option A; C; boots drive A: first. If the boot files aren't located on drive A:, the system boots from drive C:.

System Boot Up CPU Speed

This option can be set to either high or low. The high setting forces the system to boot up at the installed CPU speed. The low setting forces the system to boot up at 8 to 12 MHz, depending on the speed of the installed CPU. This option is useful for running certain games or certain applications that function properly at high speed.

Cache Memory

This option enables the i486 microprocessor's internal and external cache (both), the internal cache only (internal) or neither (disabled).

Gate A20 Emulation

This option is useful for operating systems such as OS/2. If you select "Both" port 92 and fast Gate A20 will be enabled. If you select "Fast" port 92 fast CPU reset is enabled. If you select "Chipset" fast Gate A20 switching is enabled.

| | |
|------------------------------|-----------------|
| Memory Parity Error Check | <i>Enabled</i> |
| Boot Sector Virus Protection | <i>Disabled</i> |
| IDE Block Mode Transfer | <i>"</i> |
| Auto Key-Lock Timeout | <i>"</i> |

Password Checking Option

This option enables system password protection. The available options are Disabled, Setup and Always. The Disabled parameter bypasses password checking at all times. The Setup parameter only checks for a password when the CMOS Setup Menu is accessed. The Always parameter checks for a password during boot up and also during CMOS Setup menu access.

Adapter ROM Shadow

All of the Adapter ROM options enable or disable adapter ROM BIOS shadowing. When enabled, the ROM BIOS information found at the address specified is moved from slow ROM memory to fast system shadow memory. Shadowing speeds up BIOS access by copying the BIOS code to the fast 32-bit RAM area, executing it from there.

System ROM Shadow F000, 64K

This option shadows the system board's BIOS ROM.

Video ROM Shadow

These options enable or disable the video ROM BIOS shadowing. When enabled, the video ROM BIOS information is moved from slow ROM memory to faster shadow memory. Enabling this option speeds up text and graphics I/O and other programs that use video BIOS.

Advanced Chipset Register Setup Menu

The Advanced Chipset Register Setup menu should be changed with care and only if you have advanced understanding of the system. Otherwise, leave it as it is.

Automatic Configuration

This option enables automatic configuration of the CPU low speed clock, DMA address/data hold time, AT bus clock, I/O recovery time, cache read hit burst, cache write hit waitstates, DRAM page mode, and DRAM read wait states. If you want to configure these options manually, you must disable this option.

CPU Low Speed Clock

The system speed can be slowed using keyboard controls. This options allows you to change the degree of slow down, with “CLKIN/3” being the slowest choice. To set this option the Automatic Configuration option above must be disabled. Some game software only runs properly under slower speeds.

DMA Address/Data Hold Time

This option should be set to “2-3T” for 33 MHz or 33/66 MHz CPUs.

AT Bus Clock

The recommended AT bus speed is around 8 MHz. Use “CLKIN/4” for a 33 MHz or 33/66 MHz CPU. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

I/O Recovery Time Delay

This option sets the recovery time between back-to-back I/O cycles. Some slow IDE hard drive devices require longer recovery times. Normally, select “4BCLK”.

Cache Read Hit Burst

This option should be set to “3-2-2-2” for 33 MHz CPUs or higher. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

Cache Write Hit Waitstates

This option should be set to “1WS” for 33 MHz CPUs. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

DRAM Page Mode

This option should be set to “Enabled” for 33 MHz CPUs. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

DRAM Read Wait States Options

This option should be set to “2” for 33 MHz CPUs. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

Main Memory Remapping

This option remaps a portion of RAM from 640 KB to 1 MB as extended RAM.

C0000 to C3FFF, 16K Cacheable

This is the video BIOS segment. The memory at C0000–C3FFF can be cached only if the memory at C0000–C3FFF is shadowed.

C4000 to C7FFF, 16K Cacheable

This is the video BIOS segment. The memory at C4000–C7FFF can be cached only if the memory at C4000–C7FFF is shadowed.

C8000 to CBFFF, 16K Cacheable

The memory at C8000–CBFFF can be cached only if the memory at C8000–CBFFF is shadowed.

CC000 to CFFFF, 16K Cacheable

The memory at CC000–CFFFF can be cached only if the memory at CC000–CFFFF is shadowed.

D0000 to D3FFF, 16K Cacheable

The memory at D0000–D3FFF can be cached only if the memory at D0000–D3FFF is shadowed.

D4000 to D7FFF, 16 K Cacheable

The memory at D4000–D7FFF can be cached only if the memory at D4000–D7FFF is shadowed.

D8000 to DBFFF, 16K Cacheable

The memory at D8000–DBFFF can be cached only if the memory at D8000–DBFFF is shadowed.

DC000 to DFFFF, 16K Cacheable

The memory at DC000–DFFFF can be cached only if the memory at DC000–DFFFF is shadowed.

E0000 to EFFFF, 64K Cacheable

The memory at E0000–EFFFF can be cached only if the memory at E0000–EFFFF is shadowed.

F0000 to FFFFF, 64K Cacheable

This is the system BIOS segment. The memory at F0000–FFFFFF can be cached only if the memory at F0000–FFFFFF is shadowed.

Non-Cacheable Block 1

This option enables the non-cacheable region anywhere from 0 KB to 64 MB.

Non-Cacheable Block 1 Size

This option selects the non-cacheable block 1 size.

Non-Cacheable Block 1 Base

This option selects the starting address of the non-cacheable region.

Non-Cacheable Block 2

This option enables the non-cacheable region anywhere from 0 KB to 64 MB.

Non-Cacheable Block 2 Size

This option selects the non-cacheable block 2 size.

Non-Cacheable Block 2 Base

This option selects the starting address of the non-cacheable region. If an intelligent I/O card is installed on the AT bus, the DRAM area between 12 MB and 16 MB should be non-cacheable.

DMA CAS Timing Delay

Enable this option for 33 MHz CPUs. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

DMA Clock Select

Set this option to "SCLK" for 33 MHz CPUs. Please note: If your PAC has a 33/66 MHz DX2 microprocessor, configure the BIOS Setup as if it were a 33 MHz microprocessor.

Auto Configuration with BIOS Defaults

When initiated, the system loads the default values that provide the best performance. Use this option to optimize the overall system performance. If the CMOS is corrupted, the BIOS defaults will automatically be loaded.

Auto Configuration with Power-on Defaults

When initiated, the system loads the default values that provide the most stable configuration for the system. Use this option when BIOS settings have been changed that cause the system to act erratically. The options set in the Standard CMOS Setup menu will not be affected by this option.

Change Password

This option allows you to change the factory default password "AMI." The password can be up to six characters using standard ASCII characters. Be extremely careful when selecting a password. Once the option in the Advanced CMOS Setup menu "Password Checking Option" has been set to something other than "Disabled," you will be required to enter the correct password to boot the system, access the CMOS Setup menu, or both.

To set the password option, enter the Advanced CMOS Setup menu and arrow down to the Password Checking Option. This option has three settings: Disabled, Setup, and Always. Use the <PgUp> or <PgDn> key to change the setting.

Exit the Advanced CMOS Setup menu and set the system password. When selecting a password, you will be asked to enter the current password. The factory default is AMI. After entering this correctly, you will be prompted to enter the new password. After entering the new password, you will be asked to enter it again for verification. If entered correctly, the new password will be set. To save the new password, select the Write to CMOS and Exit option and answer “Y.”

Hard Disk Format Utility

This option is used to low-level format a hard drive. IDE drives are preformatted (low-level) by the drive manufacturer for maximum performance and reliability. It is not necessary to low-level format a new IDE drive. The hard disk format utility cannot be used to format SCSI drives. Normally, a format utility is either included with the SCSI drive on a diskette, or built into the BIOS itself. To low-level format a SCSI drive, refer to the documentation that accompanied the drive.

Options

When initiated, the hard disk format utility will display the current drive types selected in the CMOS Setup menu, as well as the following three options:

- **Hard Disk Format.** This option brings up the format screen. From here you can select the interleave factor, enter defect information, and start the format process.
- **Auto Interleave.** This option allows the system to test the selected drive and determine the optimal interleave factor for the drive.
- **Media Analysis.** This option conducts a low-level media scan of the selected drive and locates and flags defective sectors on the drive.

Write to CMOS and Exit

This option saves all changes made before exiting the CMOS Setup Menu.

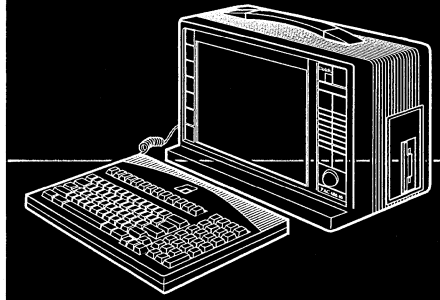
Do Not Write to CMOS and Exit

This option exits the CMOS Setup menu without saving the changes that have been made.

Keyboard Speed Switch

The system speed is switchable through your keyboard. There are two available speeds, as explained below.

| Speed | Description | Keyboard Command |
|-------------|--|--|
| Turbo Speed | Cache memory and 32-bit DRAM transfer mode are on | Press the <+> key while holding <Alt> - <Ctrl> - <Shift> |
| Slow Speed | Cache memory and 32-bit DRAM transfer mode are off | Press the <-> key while holding <Alt> - <Ctrl> - <Shift> |



3

THE SYSTEM
DESCRIPTION

B E Y O N D
T H E B A S I C S

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THE SYSTEM DESCRIPTION

This chapter contains the following sections:

- The System Board
- Jumpers and Connectors
- The Main Memory Subsystem
- The Multi-Function I/O Card

This chapter explains the system board installed in your system, jumper configurations, connector pin assignments, and memory configurations. This chapter also describes the multi-function I/O card installed in your system.



The System Board

The system board installed in your PAC provides the power of the Intel 486 DX running at 33 MHz or the DX2 running at 33/66 MHz. It also provides 256 KB of write back cache.

Features

Your PAC system includes the following features.

- **Microprocessor:** Intel's i486 microprocessor running at either 33 MHz (DX) or 33/66 MHz (DX2)
- **Cache Size:** 256 KB of write back cache
- **Cache Speed:** 25 ns
- **System DRAM:** Eight on-board DRAM SIMM sockets support up to 32 MB
- **BIOS:** 64 KB of AMI BIOS ROM with built-in setup utilities
- **Shadow RAM:** System BIOS ROM and Video ROM are relocatable to 32-bit high speed DRAM for efficient execution
- **UMC AT Chipset:** Provides DRAM page mode, software programmable DRAM wait states, concurrent refresh, hardware and software turbo clock switching, and fast reset and GATE A20 to optimize OS/2
- **AT Bus:** Provides six accessible 16-bit expansion slots

■ **Note:** The video controller card and multi-function I/O card each take up one expansion slot.

- **Footprint:** "Baby" AT form factor

The Microprocessor

The system board installed in your PAC supports the Intel i486 DX running at 33 MHz or the DX2 running at 33/66 MHz. These microprocessors are high performance 32-bit microprocessors with integrated memory management.

The i486 microprocessor includes the following features.

- 8 KB internal cache memory in a four-way set associative organization
- 32-bit address and 32-bit data interfaces
- 4 GB of physical address space
- 64 TB of virtual address space
- Object code compatible with all 8086 family of microprocessors
- Three operational modes, including:
 - Real Address Mode
 - Protected Virtual Address Mode
 - Virtual 8086 Mode
- Power-up internal self-test

Coprocessor

The i486 microprocessor has a built-in floating-point instruction execution unit. Execution speed arithmetic instructions running on the i486 are two to three times faster than when they run in a system with an i386 microprocessor and an i387 math coprocessor.

Cache Memory

Cache memory allows the microprocessor to complete transfers faster and reduces traffic on the bus. Dynamic random-access memory (DRAM) speeds have not kept pace with microprocessor speeds in the last few years. The increase in microprocessor speeds requires very fast DRAMs, or insertion into the CPU memory cycles of a lot of wait states. At this time, fast DRAMs are not available, and increasing the number of wait states causes the system's performance to decrease. Cache memory is small but very fast memory that holds code and data frequently accessed by the microprocessor. If the microprocessor data is available through the cache, the cache responds — avoiding a time-consuming external memory cycle.

The i486 microprocessors have built-in 8 KB unified code and data cache, in a four-way set associative organization. When the microprocessor accesses memory, it checks the cache. If possible, it uses the cache instead of slower main memory. This is called a cache hit situation. It is possible that 95 to 99 percent of memory accesses are cache hits, depending on the application software. An optional 256 KB of external cache memory is provided on the system board to achieve even higher performance.

System Memory Mapping

The following figure illustrates system memory mapping with cached and non-cached locations.

| Address (hex) | Function | Comments |
|--------------------|------------------------|-------------|
| 00000000-0007FFFF | 512K System RAM | Cached |
| 00080000-0009FFFF | 128K System RAM | Cached |
| 000A0000-000BFFFF | 128K Video RAM | Not Cached |
| 000C0000-000C7FFF | 32K Video BIOS | Cached |
| 000C8000-000CFFFF | 32K I/O ROM | Not Cached |
| 000D0000-000DFFFF | 64K I/O ROM | Not Cached |
| 000E0000-000EFFFF | 64K Extended BIOS | Not Cached |
| 000F0000-000FFFFFF | 64K On-Board BIOS ROM | Cached |
| 00100000-00BFFFFFF | System Memory (RAM) | Cached |
| 00C00000-00FFFFFF | System Memory (RAM) | Not Cached† |
| 01000000-BFFFFFFF | System Memory (RAM) | Cached |
| C0000000-C1FFFFFF | Weitek™ Coprocessor | Not Cached |
| C2000000-FFFDFFFF | System Memory | Not Cached |
| FFFE0000-FFFFFFF | 128K On-Board BIOS ROM | Not Cached |

† Not cached if memory mapped I/O board is used in this range.

Note: C000 is where the video BIOS starts.

AT Compatible Expansion Bus

The PAC 486C system board has six accessible AT expansion bus connectors for interfacing with all AT compatible I/O, memory, and master adapters. The video controller card and the multi-function I/O cards installed in your system each take up one expansion connector, leaving four open slots.

- **Note:** It is recommended that you utilize the 32-bit DRAM memory on the system board before using an 8- or 16-bit memory adapter on the AT expansion bus because memory operations via this bus take significantly longer.

AT Compatible Peripherals

The PAC 486C system board provides the following standard peripherals.

- Enhanced DMA functions with seven independently programmable channels
- One 74LS612 compatible DMA page register
- Two 82C59A compatible interrupt controllers
- One 82C54 compatible programmable interval timers
- One MC146818A compatible real time clock
- 64 bytes of battery-backed CMOS RAM
- One keyboard controller (Intel 8742 micro-controller)

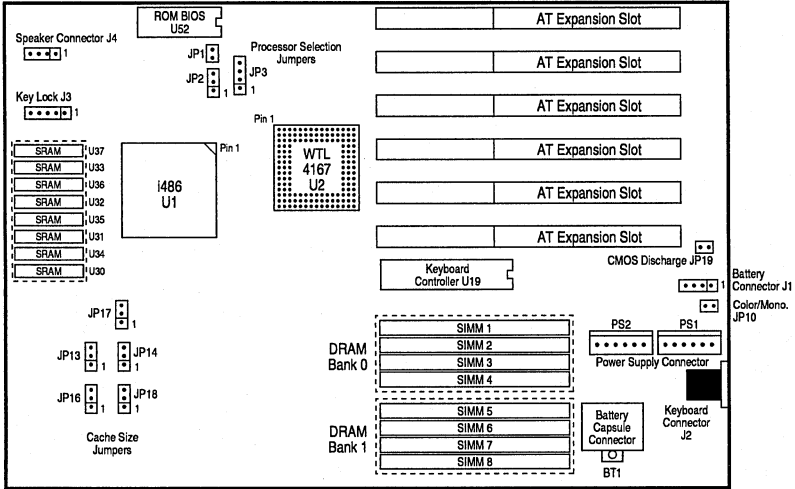
AT I/O Address Map

The following figure illustrates the AT I/O address map.

| I/O Address (hex) | I/O Device | I/O Address (hex) | I/O Device |
|------------------------------|---------------------------------------|------------------------------|---|
| 000-01F | DMA Controller 1, 8237A-5 | 378-37F | Parallel Printer Port 1 |
| 020-03F | Interrupt Controller 1, 8259A | 380-38F | SDLC, Bisynchronous 2 |
| 040-05F | System Timer, 8254-2 | 390-393 | Cluster |
| 060-06F | 8742 Keyboard Controller | 3A0-3AF | Bisynchronous 1 |
| 070-07F | Real Time Clock/CMOS and NMI Mask | 3B0-3BF | Monochrome Display and Printer Adapter |
| 080-09F | DMA Page Register, 74LS612 | 3C0-3CF | Enhanced Graphics Adapter |
| 0A0-0BF | Interrupt Controller 2, 8259A | 3D0-3DF | Color/Graphics Monitor Adapter |
| 0C0-0DF | DMA Controller 2, 8237A-5 | 3F0-3F7 | Diskette Drive Controller |
| 0F0-0FF | CPU's Internal Math Coprocessor | 3F8-3FF | Serial Port 1 (RS232-C) |
| 1F0-1F8 | Fixed Disk Drive Adapter | 6E2-6E3 | Data Acquisition Adapter 1 |
| 200-207 | Game I/O | 790-793 | Cluster Adapter 1 |
| 20C-20D | Reserved | AE2-AE3 | Data Acquisition Adapter 2 |
| 21F | Reserved | B90-B93 | Cluster Adapter 2 |
| 278-27F | Parallel Printer Port 2 | EE2-EE3 | Data Acquisition Adapter 3 |
| 2B0-2DF | Alternate Enhanced Graphic Adapter | 1390-1393 | Cluster Adapter 3 |
| 2E1 | GPIB Adapter 0 | 22E1 | GPIB Adapter 1 |
| 2E2-2E3 | Data Acquisition Adapter 0 | 2390-2393 | Cluster Adapter 4 |
| 2F8-2FF | Serial Port 2 (RS232-C) | 42E1 | GPIB Adapter 2 |
| 300-31F | Prototype Card | 62E1 | GPIB Adapter 3 |
| 360-363 | PC Network (Low Address) | 82E1 | GPIB Adapter 4 |
| 364-367 | Reserved | A2E1 | GPIB Adapter 5 |
| 368-36B | PC Network (High Address) | C2E1 | GPIB Adapter 6 |
| 36C-36F | Reserved | E2E1 | GPIB Adapter 7 |

Jumpers and Connectors

Refer to the following figure for the location of the different jumpers and connectors.



PAC 486C System Board

Jumpers

Most jumpers and connectors on the system board are labeled with proper names, and pin 1 is indicated. To avoid damaging the board, caution should be taken with the jumpers and connectors. You should use BERG type jumper chips to close the jumpers on the PAC 486C system board.

Processor Selection Jumpers

Jumpers JP1, JP2, JP3, and JP8 are used to select the microprocessor on the system board, as explained in the following figure.

| | JP1 | JP2 | JP3 | JP8 |
|---------|--------|-------|-------|----------|
| i486 | Closed | 1 – 2 | 1 – 2 | Open |
| i486 SX | Open | 2 – 3 | 3 – 4 | See Note |
| i487 SX | Closed | 1 – 2 | 2 – 3 | See Note |

Note: 468 SX/487 SX at 20 MHz, the U14 oscillator frequency can be 20 or 40 MHz. If U14 oscillator frequency is 20 MHz, open JP8. If frequency is 40 MHz, close JP8.

Cache Size Jumpers

Jumpers JP13, JP14, JP16, JP17, and JP18 are used to select the cache size. The PAC 486C system board comes standard with 256 KB of write back cache.

| Cache Size | JP13 | JP14 | JP16 | JP17 | JP18 |
|------------|-------|-------|-------|-------|-------|
| 64 KB | 1 – 2 | 1 – 2 | 2 – 3 | 1 – 2 | 1 – 2 |
| 128 KB | 2 – 3 | 1 – 2 | 2 – 3 | 2 – 3 | 1 – 2 |
| 256 KB | 1 – 2 | 2 – 3 | 2 – 3 | 2 – 3 | 2 – 3 |

Eight 32Kx8 SRAMs are installed in your system at sockets U30, U31, U32, U33, U34, U35, U36, and U37 for 256 KB cache.

Monitor Type Jumper

Jumper JP10 is used to select the monitor type, as explained in the following figure.

| Jumper | Description |
|--------|---|
| JP10 | Open selects color display monitor type Closed selects monochrome display monitor type |

CMOS Storage Discharge Jumper

Jumper JP19 is used if you have forgotten your installed security password. All system setup information stored in the CMOS (hard disk type, date/time, floppy drive type, and so on) will be destroyed after shorting jumper JP19 for a few seconds. Remember to open JP19 when you are ready to re-setup the system.



Connectors

Most jumpers and connectors on the system board are labeled with proper names, and pin 1 is indicated. To avoid damaging the board, caution should be taken with the jumpers and connectors.

Power Supply Connectors (PS1 and PS2)

The two power supply connectors, PS1 and PS2, are 6-pin AT standard power connectors. They connect power lines and power good signals from the power supply's P8 and P9 headers to the system board. The following figure provides the pin assignments for PS1 and PS2.

| Pin | PS1 Description | PS2 Description |
|-----|-----------------|-----------------|
| 1 | Power Good | Ground |
| 2 | +5 Vdc | Ground |
| 3 | +12 Vdc | -5 Vdc |
| 4 | -12 Vdc | +5 Vdc |
| 5 | Ground | +5 Vdc |
| 6 | Ground | +5 Vdc |

External Battery Connector (J1)

The external battery connector (J1) is a 4-pin keyed BERG strip. It is used to connect the +4.5 Volt external battery to the system board's real time clock and CMOS memory in case the on-board battery capsule is not installed. Pin 1 is marked next to the connector. The following figure provides the pin assignments for J1.

| Pin | Description |
|-----|-----------------------|
| 1 | +4.5 Vdc from battery |
| 2 | Key (no connect) |
| 3 | Ground |
| 4 | Ground |

Keyboard Connector (J2)

The keyboard connector (J2) is a 5-pin, circular-type DIN socket. It connects the system board's keyboard interface to the detachable AT-compatible PAC keyboards (86- or 101-key). The following figure provides the pin assignments for J2.

| Pin | Description |
|-----|-----------------------|
| 1 | Keyboard Clock Signal |
| 2 | Keyboard Data Signal |
| 3 | Not Used |
| 4 | Ground |
| 5 | +5 Volts fused Vdc |



Power LED and Keyboard Lock Connector (J3)

The power LED and keyboard lock connector (J3) is a 5-pin keyed BERG strip. It connects +5 Vdc power to the power indicator LED on the front of the PAC, as well as connects the security keyboard lock to the keyboard controller. The following figure provides the pin assignments for J3.

| Pin | Description |
|------------|--------------------|
| 1 | LED Power |
| 2 | Key (no connect) |
| 3 | Ground |
| 4 | Keyboard Lock |
| 5 | Ground |

Speaker Connector (J4)

The speaker connector (J4) is a 4-pin keyed BERG strip. It connects an external 2-inch, 8-ohm speaker to the system board, providing sound capability. The following figure provides the pin assignments for J4.

| Pin | Description |
|------------|--------------------|
| 1 | Speaker Data Out |
| 2 | Key (no connect) |
| 3 | Ground |
| 4 | +5 Vdc |

The Main Memory Subsystem

This section provides information concerning system ROM, DRAM control logic, shadow RAM feature, and DRAM SIMMs.

System ROM

The AMI BIOS ROM is provided in one 8-bit EPROM, holding up to 64 KB of code and data. It is accessible at the top of the system's 4 GB memory address space and at the top of the first megabyte if not shadowed by the system's DRAM. The BIOS ROMs support all AT compatible features. In addition, the shadow RAM feature allows the BIOS code and Video BIOS to be executed from the 32-bit system DRAM resident at the same physical address. This feature significantly improves the performance in BIOS call intensive applications.

The i486 microprocessor is reset when the power is turned on. After a reset, the microprocessor is initialized to a known internal state and begins fetching instructions out of the BIOS ROM at the reset address FFFFFFF0. This address leads to the entry point of the power-on system initialization procedure stored in BIOS ROM. The BIOS system initialization procedure consists of the following functions.

- Power-on self-tests (POST), such as BIOS check sum test, system DRAM test, and battery-backed CMOS RAM test
- Initialization of all the standard compatible I/O components
- Built-in setup program for system configuration, such as:
 - Day and time setting
 - Floppy disk and hard disk types
 - Enabling or disabling shadow RAM
 - Enabling or disabling cache

In addition to initializing the system, BIOS ROM provides BIOS interrupt calls for such functions as video access, floppy disk access, printer access, and so on.

DRAM Control Logic

The DRAM control logic is designed and optimized for the i486. Unlike most systems with a separate cache controller, the DRAM control logic is tightly coupled with the on-chip cache controller. When the CPU address becomes available, both controllers operate in parallel. At the time when the cache controller discovers it is a read miss or write cycle, the DRAM control logic is ready to generate a memory cycle.

The PAC 486C system board's on-board DRAM is configured in a 36-bit-wide arrangement, consisting of 32 bits of data and 4 bits of parity. Each parity bit is directly associated with one of the 4 bytes in the 32-bit double word.

The system board supports two on-board banks of 32-bit DRAM memory, utilizing 256Kx9, 1Mx9, or 4Mx9 DRAM SIMMs. Each bank needs 4 DRAM SIMM modules.

Total DRAM Calculation

For the following example, we are going to assume that you have installed 1 MB of DRAM on the PAC 486C system board. The first 640 KB from address 00000000 to 0009FFFF (hex) of this memory is standard system memory where programs running DOS reside. The remaining 384 KB of DRAM from address 000A0000 to 000FFFFFF is reserved for shadow RAM or remapped to the memory address range right above 1 MB, called extended memory.

If the DRAM blocks at 000A0000 to 000BFFFF, 000C0000 to 000DFFFF, and 000E0000 to 000FFFFFF are not utilized for shadow RAM, they will never be accessed. By allowing remapping of the top address to those unused locations, we can recover an additional 256 KB or 384 KB of extended memory space.

Only 256Kx9 and 1Mx9 DRAM SIMMs are allowed to be remapped.

Examples

- **Installed DRAM is 1 MB with 256 KB remapped**
Total DRAM = First 640 KB + Remapped 256 KB = 896 KB

- **Installed DRAM is z MB (z is 1, 2, 3, ..., 16) with 256 KB remapped**
Total DRAM = First 640 KB + Remapped 256 KB + $1024(z - 1)$ MB
= $1024(z - 1)$ MB + 896 KB

- **Installed DRAM is z MB with no remapping**
Total DRAM = First 640 KB + Remapped 0 KB + $1024(z - 1)$ MB =
 $1024(z - 1)$ MB + 640 KB

Installing SIMMs

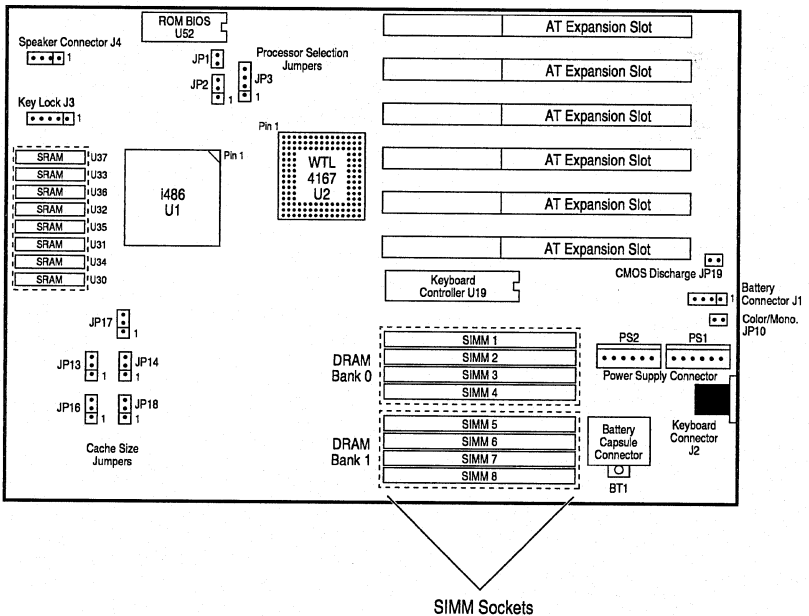
The PAC 486C system board provides two banks of four SIMM sockets. Sockets labeled SIMM1 through SIMM4 constitute Bank 0. Sockets labeled SIMM5 through SIMM8 constitute Bank 1. The minimum memory configuration requires that Bank 0 be fully loaded. Each bank is recommended to have the same type of fast-page-mode DRAM SIMMs, either 256Kx9, 1Mx9, or 4Mx9. Different capacity SIMMs on the same system board is supported so that you can mix and match from maximum flexibility. DRAM Bank 0 has to be filled before Bank 1.

The SIMM modules must be fast-page-mode with access times of 70 or 80 ns. Refer to Chapter 5, Expanding the PAC, for specific installation procedures. The following figure provides SIMM module configurations.

| Bank 0 SIMM Type | Bank 1 SIMM Type | Total |
|------------------|------------------|-------|
| 256Kx9 | None | 1 MB |
| 256Kx9 | 256Kx9 | 2 MB |
| 1Mx9 | None | 4 MB |
| 256Kx9 | 1Mx9 | 5 MB |
| 1Mx9 | 1Mx9 | 8 MB |
| 4Mx9 | None | 16 MB |
| 1Mx9 | 4Mx9 | 20 MB |
| 4Mx9 | 4Mx9 | 32 MB |

Location of SIMM Sockets

The following figure illustrates the location of the SIMM sockets on the 486C system board.



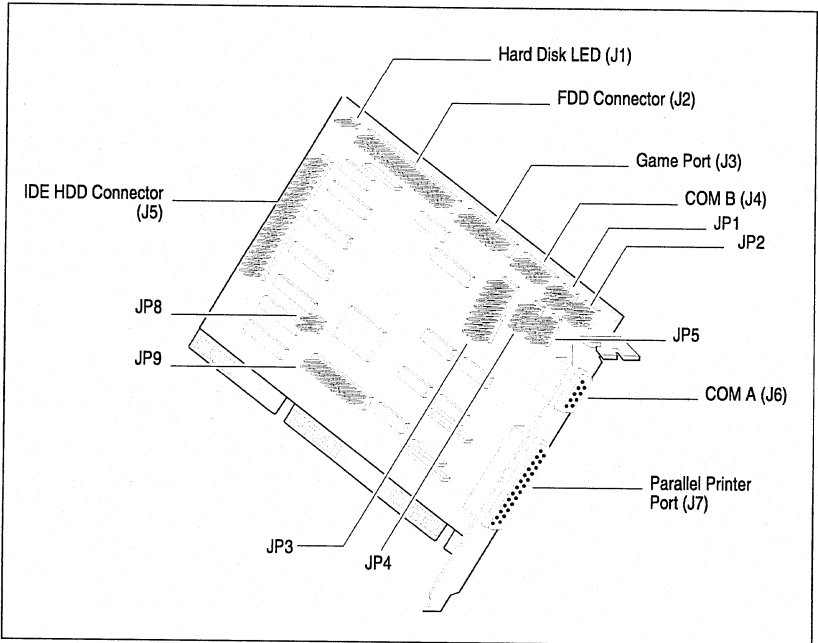
SIMM Sockets

Shadow RAM Feature

The PAC 486C system board supports the shadow RAM feature, allowing the BIOS ROM and Video ROM code to be executed from the system DRAM resident at the same physical address space. Shadowing significantly improves the system performance in BIOS call intensive applications by executing code out of DRAM instead of ROM. These features can be set through the BIOS Setup Program (see Chapter 2). BIOS ROM and Adapter Card ROM are allowed to be shadowed on the system board DRAM as long as they are resident in C0000-CFFFF, D0000-DFFFF, E0000-EFFFF, or F0000-FFFFF address ranges.

Multi-Function I/O Card

In addition to the factory-installed video controller card, the PAC 486C includes a multi-function Input/Output (I/O) card. This card contains the interface for IDE hard disk drives and flexible diskette drives. It also supports one parallel printer port, up to two RS232-C serial ports, and one game port. The following figure illustrates the multi-function I/O card layout.



Multi-function I/O Card Layout

Parallel Printer Port

The multi-function I/O card has a standard feature for interfacing your PAC to a parallel printer. This port is completely compatible with the IBM AT and uses the same female DB-25 parallel port.

The parallel printer port on the multi-function I/O card uses the following system I/O ports and addresses.

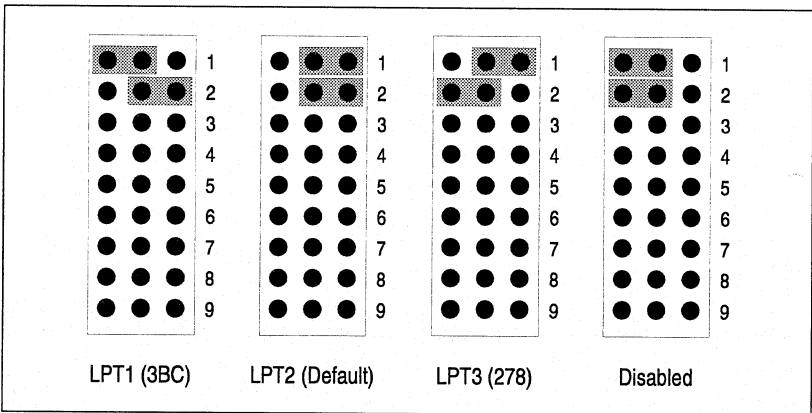
| Port Configuration | I/O Address |
|--------------------|-------------|
| LPT1 | 3BC-3BE hex |
| LPT2 | 378-37A hex |
| LPT3 | 278-27A hex |

Jumper Settings

The following sections provide jumper settings for the parallel printer port on the multi-function I/O card.

Parallel Port Configuration (JP3)

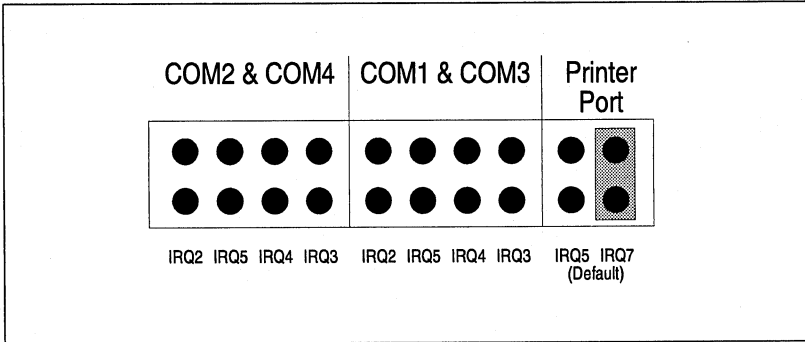
The parallel port configuration (JP3) configures the ports and connectors built into the board. Rows 1 and 2 of JP3 configure the parallel port. These set the parallel port to its desired printer port I/O address. The following figure illustrates the different jumper settings for JP3.



Parallel Port Configuration

Parallel Port IRQ Line Setting (JP9)

You must select an IRQ line for the parallel port. Set IRQ level to IRQ7 when the parallel port is configured to LPT1 or LPT2. Set the IRQ level to IRQ5 when the parallel port is configured to LPT3. The default is IRQ7 for LPT2. The following figure illustrates the jumper settings for JP9.



Parallel Port IRQ Line Setting

■ **Note:** To avoid conflicts, set LPT1 or LPT2 to IRQ7; LPT3 to IRQ5.

Serial Ports

The built-in serial ports are RS232-C, asynchronous serial communication ports that can be used with modem, serial printers, remote display terminals, and other serial devices. You can select any of the interrupt request lines supported, IRQ2 to IRQ5, by configuring jumper JP9.

Also supplied is a card bracket with a DB-9 male connector and a DB-15 female connector mounted on it. Ribbon cables attached to these connectors can be interfaced to two DIP headers on the multi-function card and the bracket mounted in one of the user available slots. The DB-9 male connector becomes a second RS232-C serial port, addressed as COM2:, and the DB-15 female connector becomes a joystick game port.

Refer to Chapter 5, Expanding The PAC, for information about adding the second serial port and game port.

The serial ports use the following system I/O addresses.

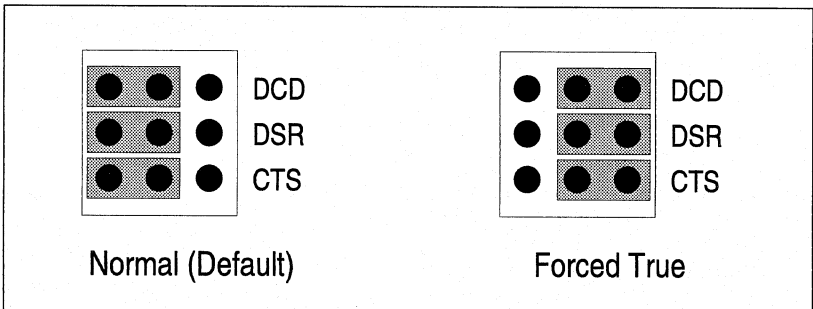
| Port Configuration | I/O Address |
|--------------------|-------------|
| COM1 | 3F8-3FF hex |
| COM2 | 2F8-2FF hex |
| COM3 | 3E8-3EF hex |
| COM4 | 2E8-2EF hex |

Primary Serial Port Jumper Settings

The following sections provide jumper settings for the primary serial port on the multi-function I/O card.

Normal or Forced True Setting (JP1)

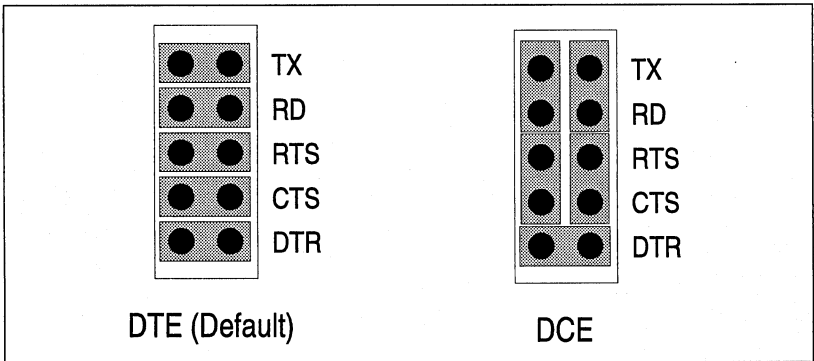
Jumper JP1 configures the primary serial port's normal or forced true setting. The default is normal. The following figure illustrates the settings.



Normal/Forced True Setting (JP1)

DTE or DCE Setting (JP5)

Jumper JP5 configures the primary serial port's data terminal equipment (DTE) or data communications equipment (DCE) setting. The default is DTE. The following figure illustrates the settings.



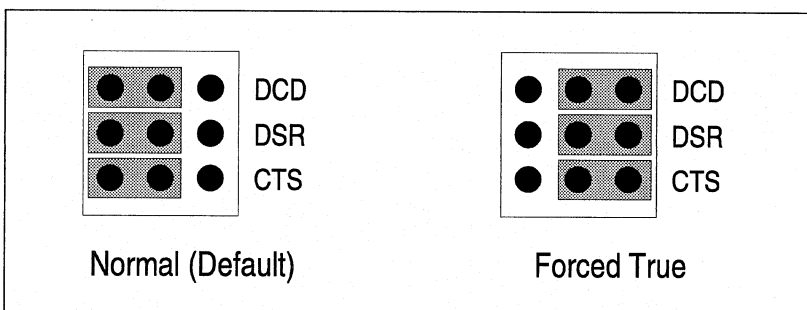
DTE/DCE Setting (JP5)

Second Serial Port Jumper Settings

The following sections provide jumper settings for the secondary serial port on the multi-function I/O card.

Normal or Forced True Setting (JP2)

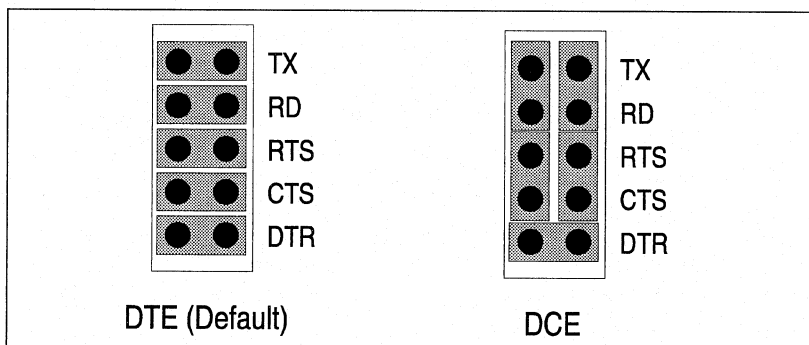
Jumper JP2 configures the secondary serial port's normal or forced true setting. The default is normal. The following figure illustrates the settings.



Normal/Forced True Setting (JP2)

DTE or DCE Setting (JP4)

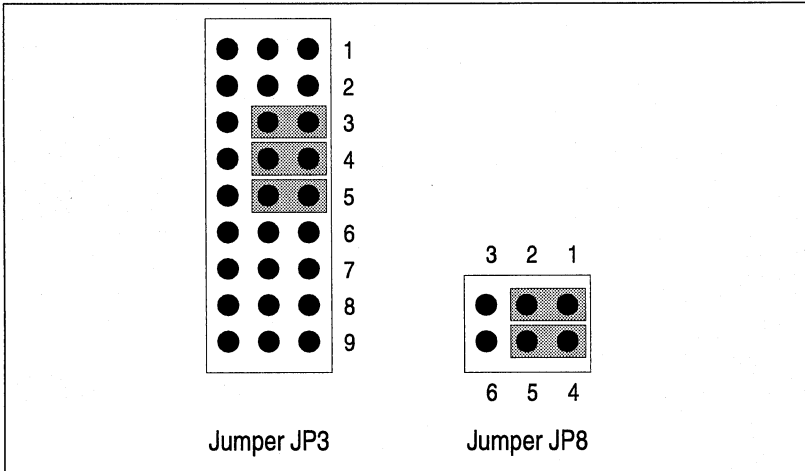
Jumper JP4 configures the secondary serial port's data terminal equipment (DTE) or data communications equipment (DCE) setting. The default is DTE. The following figure illustrates the settings.



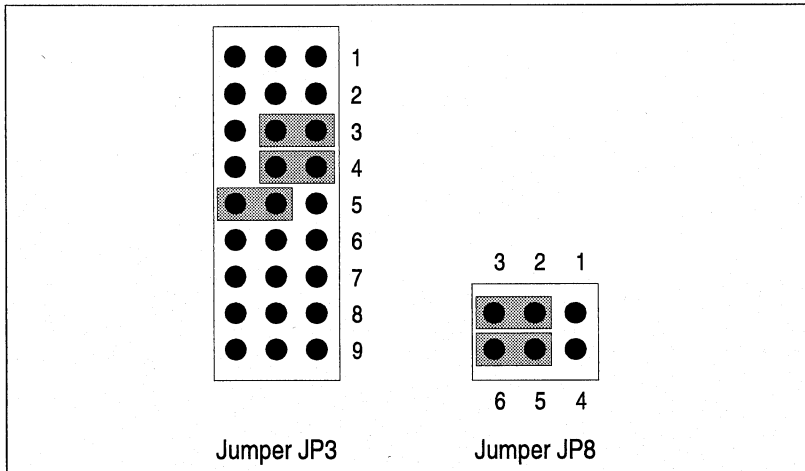
DTE/DCE Setting (JP4)

Serial Port Configuration (JP3 and JP8)

Jumper block JP3 configures the ports and connectors built into the multi-function I/O card. Jumper block JP8, in conjunction with JP3, configures the serial ports to the desired I/O addresses. Rows 3, 4, and 5 of JP3 configure the serial ports. The following figures illustrate the jumper settings.

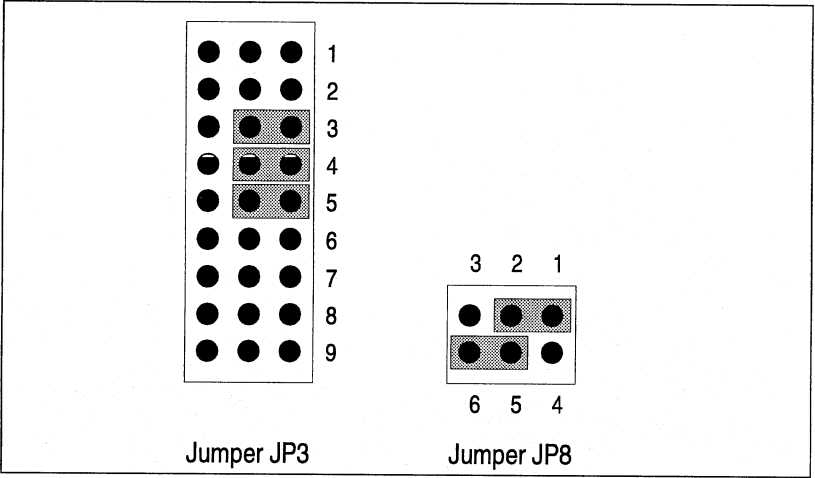


COM A: COM 1; COM B: COM 2 (Default)

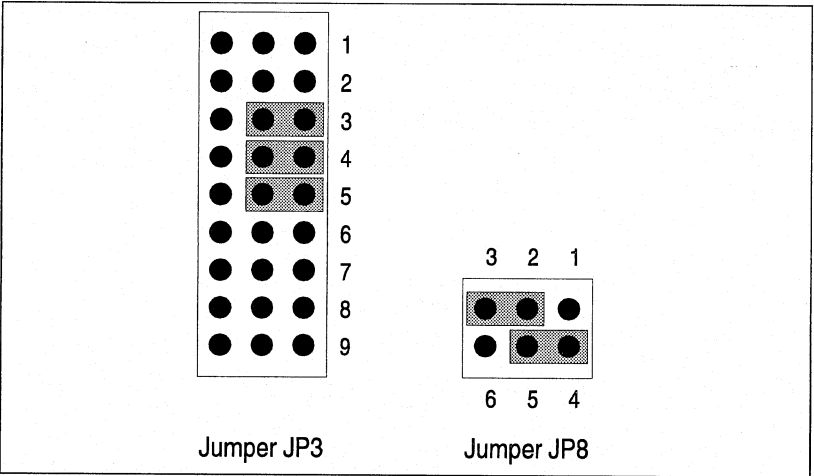


COM A: COM 2; COM B: COM 3

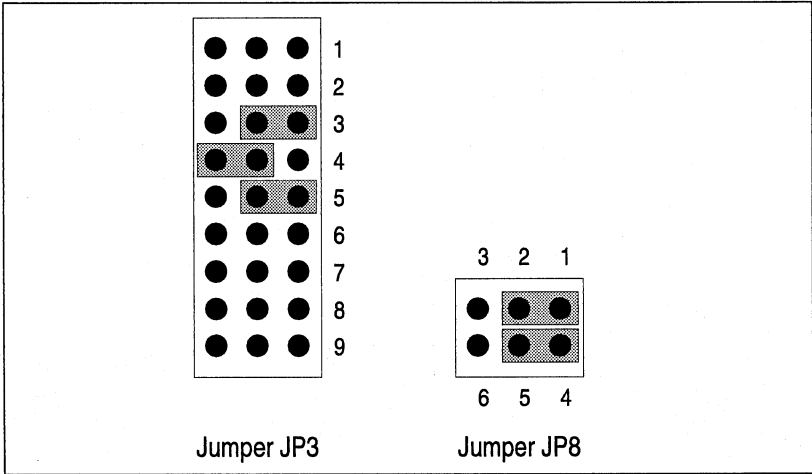




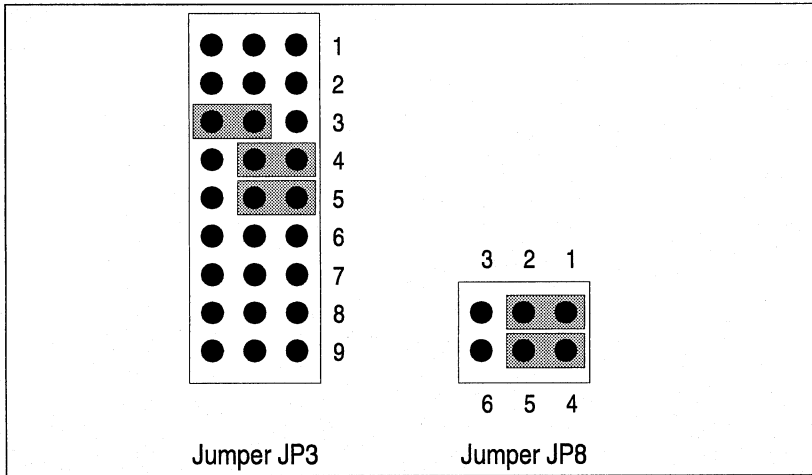
COM A: COM 1; COM B: COM 4



COM A: COM 3; COM B: COM 4

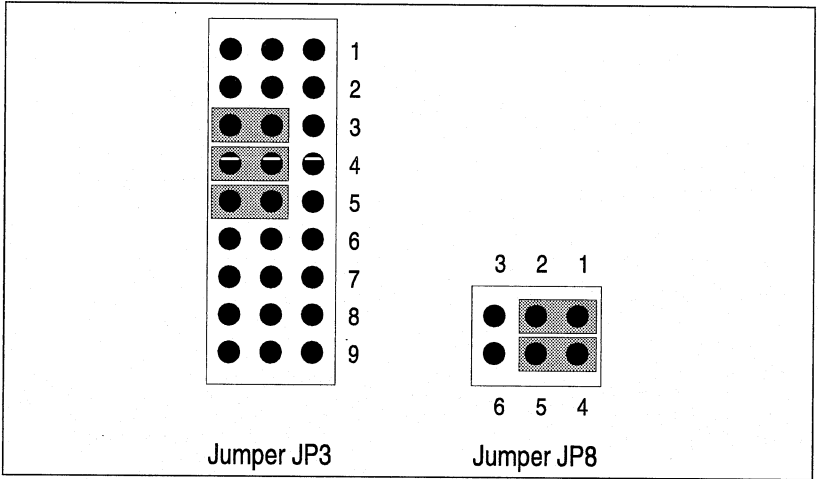


COM A: COM 1; COM B: Disabled



COM A: Disabled; COM B: COM 2

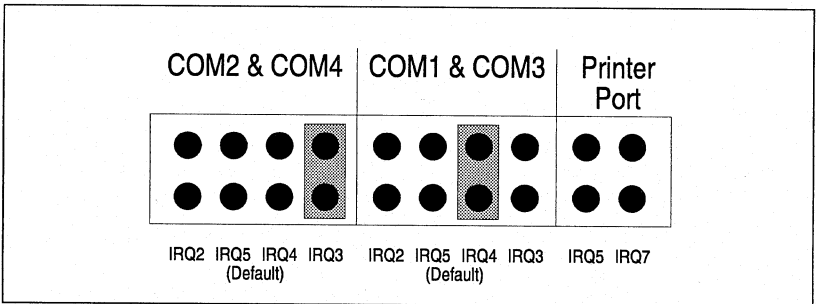




COM A: Disabled; COM B: Disabled

Serial Ports IRQ Line Settings (JP9)

The serial ports are each assigned to an IRQ line that corresponds to the I/O addresses configured to the serial ports. The default IRQ line for COM 1 and COM 3 is IRQ4; for COM 2 and COM 4 is IRQ3. The following figure illustrates the serial ports IRQ line settings.



Serial Ports IRQ Line Settings (JP9)

Floppy Drive Controller

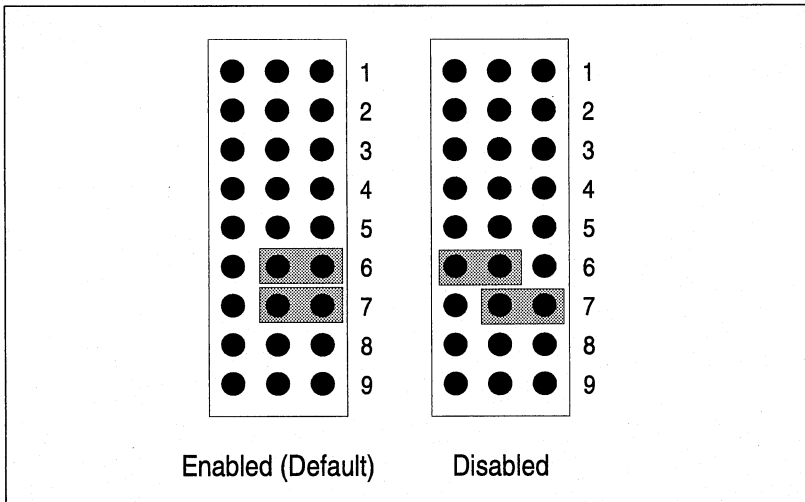
The floppy drive controller supports two standard floppy drives. You can install any 360 KB or 1.2 MB, 5.25-inch drive or 720 KB or 1.44 MB, 3.5-inch drive. The PAC family of portable computers comes standard with a 1.44 MB, 3.5-inch floppy drive.

Jumper Settings

The following section provides jumper settings for jumper JP3.

Floppy Drive Controller Enabled/Disabled (JP3)

Jumper JP3 configures the ports and connectors that are built-in to the board. Rows 6 and 7 enable or disable the floppy drive controller. If you are using another floppy drive controller, you should disable JP3 to avoid conflicts. The following figure illustrates the jumper settings.



Floppy Drive Enable/Disable (JP3)



IDE Hard Disk Interface

The multi-function I/O card can interface two integrated drive electronics (IDE) hard disk drives. An IDE drive is a hard drive with the controller electronics built into the disk assembly. The integration of the controller and the drive as a single unit increases both the reliability and performance by eliminating redundant circuitry. If you have a SCSI drive installed in the PAC, this controller is disabled, to avoid conflicts with the SCSI adapter card.

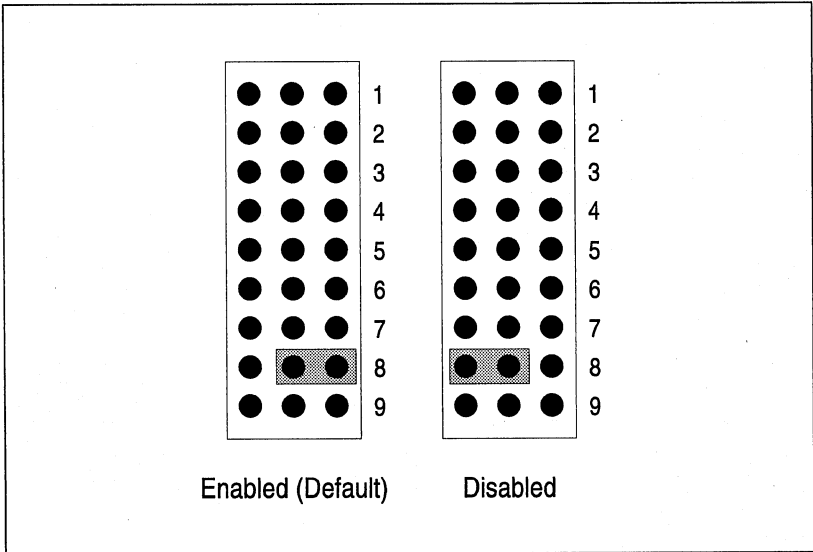
- If your PAC includes a SCSI drive, refer to the additional manual(s) provided with your PAC for information about the SCSI controller and hard disk drive.

Jumper Settings

The following section provides jumper settings for jumper JP3.

IDE Hard Disk Interface Enabled/Disabled (JP3)

Jumper block JP3 configures the ports and connectors that are built into the multi-function I/O card. Row 8 enables or disables the IDE hard disk interface. If you use another IDE hard disk interface card with the multi-function I/O card, or you have a SCSI drive installed, the IDE hard disk interface should be disabled to avoid conflicts with the other hard drive card. The following figure illustrates the settings.



IDE Hard Disk Interface Enabled/Disabled (JP3)

- If your PAC was configured at Dolch with a SCSI drive, you should refer to the SCSI Kit which was sent to you. The kit includes manuals and software for use with your SCSI drive.



Game Port

The multi-function I/O card is equipped with a game port. You can use any IBM joystick or compatibles with the I/O card. Included is a 15-pin game port cable that is connected to J3.

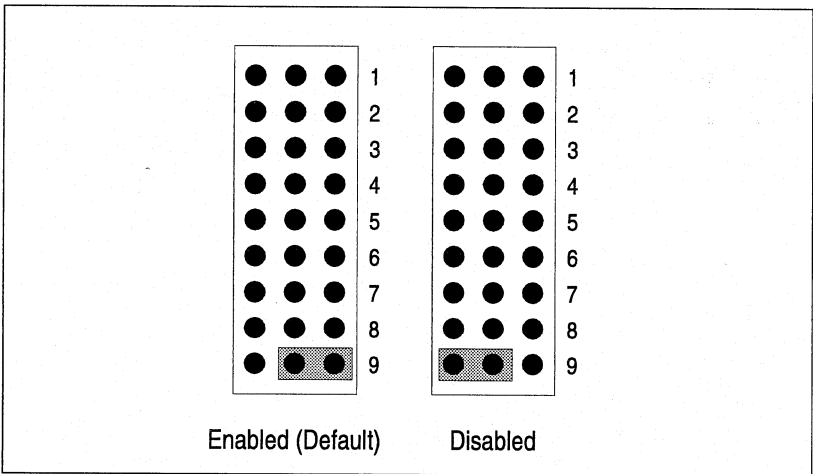
Jumper Settings

The following section provides jumper settings for jumper JP3.

Game Port Enabled/Disabled (JP3)

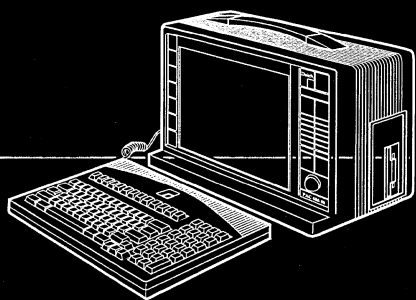
Jumper block JP3 configures the ports and connectors built into the card. Row 9 enables or disables the game port. If you use another game port card with the multi-function I/O card, the game port function on the I/O card should be disabled to avoid conflicts.

The following figure illustrates the settings for JP3.



Game Port Enabled/Disabled (JP3)

Refer to Chapter 5, Expanding The PAC, for information concerning connecting the game port cable.



4

DISPLAY & VIDEO
SUBSYSTEM

B E Y O N D
T H E B A S I C S

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DISPLAY & VIDEO SUBSYSTEM

This chapter contains the following sections:

- The Flat Panel Display
- The VGA Controller Card
- The Display Driver Package

All PAC portable computers include a VGA controller card. This chapter explains the flat panel display installed in your system, the VGA controller card, and the display driver package.

The Flat Panel Display

Your PAC portable computer includes a fully VGA compatible, color LCD screen with thin film transistor (TFT) active matrix technology. The PAC flat panel supports 640x480 resolutions. The Chips and Technologies® VGA controller chipset increases the 512 colors up to 185,193 by use of a proprietary color generation algorithm, and combines pulse width modulation and dithering. The VGA chipset also stretches lower resolution software, such as 400-line text or 256 color images, to completely utilize the 480 lines on the PAC display, allowing full screen images. The wide viewing angle of Dolch's LCD technology allows users to still see the screen up to 45° on either side of the perpendicular. The TFT display has an update time of less than 40 ms.

The LCD display on the PAC provides high visual acuity, low emissions, and non susceptibility to emissions, as well as excellent contrast over a wide range of ambient lighting. LCD displays use less power than vacuum-fluorescent, cathode-ray-tube (CRT), and plasma displays. The display has a cathode fluorescent backlight, giving bright but evenly distributed lighting across the entire screen area.

The following are characteristics of the PAC LCD display.

- Resolution: 640x480
- Color Palette: 185,193
- Contrast Ratio: 50:1
- Viewing Angle: 90°
- Refresh Rate: > 40 ms
- Shock: > 100 G
- Vibration/1 mm: 3 G
- Relative Humidity (operating): 95%

The VGA Controller Card

The VGA controller card installed in the PAC is a high-resolution card that provides concurrent viewing on an external monitor in MDA, CGA, EGA, and VGA modes. A 15-pin analog connector provides external output. The VGA controller card will interface with a wide variety of multi-frequency, color monitors.

The following are features of the VGA controller card installed in the PAC.

- Supports all display technologies with full text and graphics
- Supports simultaneous operation on a CRT and the flat panel display
- Works under UNIX®, DOS, or OS/2
- Supports the following internal LCD panel resolutions:
 - 640x200
 - 640x350
 - 640x400
 - 640x480
- Supports the following external CRT resolutions:
 - 720x480
 - 800x600
 - 1024x768
- Supports up to 185,193 colors
- Provides built-in VGA BIOS support
- Provides vertical and horizontal compensation techniques to increase the useable screen area on the PAC display
- Provides enhanced backward compatibility to EGA™, CGA™, Hercules™, and MDA™ standards

- Provides three outputs including a 15-pin analog CRT connector
- Display Driver Package extends the features of the Chips and Technologies® chipset on an external CRT, including:
 - Resolutions up to 1024x768 in graphics modes with 16 colors on external CRTs
 - Resolutions up to 800x600 in graphics modes with 256 colors on external CRTs
 - 132 column text mode in 16 colors
 - Optimal compensation of 320x200 and 640x200 resolutions (graphics) and 40x25 (text) on 640x480 displays

The Display Driver Package

Dolch provides a Display Driver Package with the PAC family of portable computers. The Display Driver Package from Chips and Technologies consists of three flexible diskettes, called *Display Driver Diskettes*, which contain application drivers and utilities. The Display Driver Package takes advantage of extended features of the VGA controller chipset on the VGA controller card. These extended features include resolutions up to 1024x768 in graphics mode with 16 colors, 800x600 in graphics mode with 256 colors, and 132 column text mode in 16 colors.

- **Note:** These extended resolutions are only available on external CRTs. The internal LCD display is not capable of displaying these higher resolutions.

The Display Driver Package supports the following software applications and environments.

- Windows Version 3.0 and 3.1
- AutoCAD and AutoCAD/386 Release 10 and 11
- CADKEY Version 3.51
- CADVANCE Version 3.50
- Framework III and IV
- GEM Version 3.0
- Generic CADD Level 3 Version 1.1
- Lotus 1-2-3 Version 2.0
- Lotus Symphony Version 1.0 and 1.1
- OS/2 Presentation Manager Version 1.21 and 1.3
- Ventura Publisher Version 2.0
- VersaCAD Design Version 5.4
- VersaCAD 386 Version 5.4
- VESA Super VGA Standard
- Word Version 5.0 and 5.1
- WordPerfect Version 5.0 and 5.1
- WordStar Version 4.0 and 5.0
- X Window (SCO Open DeskTop) Version 1.0

The following utility programs are provided on the *Display Driver Diskettes* in the Display Driver Package.

- MODETEST
- SETMODE
- SETVGA
- AUTOCOMP
- CT, FP, and SM

Driver Resolutions and Filenames

The following table provides resolutions, number of colors, and filenames for the display drivers on the *Display Driver Diskettes*.

| Environment | Resolution | Colors | Filename |
|--------------|------------------------------|---------|--------------|
| Windows | 800x600 | 16 | W3PM600.DRV |
| 3.0/3.1 | 640x480 | 256 | W3PM480.DRV |
| | 1024x768 | 16 | W3LM768.DRV |
| | 800x600 | 16 | W3LM600.DRV |
| | 640x480 Panning | 16 | W3LM480P.DRV |
| | AutoCAD | 640x480 | 256 |
| 10/11 | 1024x768 | 16 | DLVGA.EXE |
| | 800x600 | 16 | DLVGA.EXE |
| | 640x480 | 16 | DLVGA.EXE |
| | CADKEY 3.51 | 800x600 | 16 |
| CADVANCE | 1024x768 | 16 | GS768.DRV |
| | 3.50 | 800x600 | 16 |
| Framework | 132x50 (Txt) | 16 | C132X50T.DAT |
| III/IV | 132x25 (Txt) | 16 | C132X25T.DAT |
| | 800x600 | 16 | C800X600.DAT |
| | GEM/ Ventura Publisher | 800x600 | 16 |
| Generic CADD | 1024x768 | 16 | CHIPS768.VGD |
| | Level 3 | 800x600 | 16 |
| Lotus 1-2-3/ | 132x50 (Txt) | 16 | V132X50.DRV |
| Symphony | 132x25 (Txt) | 16 | V132X25.DRV |

BEYOND THE BASICS

| Environment | Resolution | Colors | Filename |
|-------------------------|-------------------|---------------|-----------------|
| OS/2 | 800x600 | 256 | PMPM600.DLL |
| Presentation Manager | 640x480 | 256 | PMPM480.DLL |
| | 1024x768 | 16 | PMM768.DLL |
| | 800x600 | 16 | PMM600.DLL |
| VersaCAD | 1024x768 | 16 | VGA768.EXE |
| | 800x600 | 16 | VGA600.EXE |
| VersaCAD 386 | 1024x768 | 16 | VGAP768.EXE |
| | 800x600 | 6 | VGAP600.EXE |
| VESA Super | 640x480 | 256 | VESA.COM |
| VGA | 640x400 | 256 | VESA.COM |
| | 1024x768 | 16 | VESA.COM |
| | 800x600 | 16 | VESA.COM |
| Word 5.0 | 1024x768 | 16 | VGA768.VID |
| | 800x600 | 16 | VGA600.VID |
| Word 5.5 | 1024x768 | 16 | VGA55768.VID |
| | 800x600 | 16 | VGA55600.VID |
| WordPerfect 5.0 | 1024x768 | 16 | CHIPS768.VID |
| | 800x600 | 16 | CHIPS600.VID |
| WordPerfect 5.1 | 1024x768 | 16 | VGA768.VRS |
| | 800x600 | 16 | VGA600.VRS |
| WordStar | 132x25 (Txt) | 16 | SETMODE.COM |
| X Window | 1024x768 | 16 | 520.XGI |
| (SCO ODT) | 800x600 | 16 | 520.XGI |

Flat Panel and CRT Modes

Some of the display drivers on the *Display Driver Diskettes* may be used in CRT, Flat Panel, or Simultaneous Display modes. Other drivers may only be used in CRT mode because the driver resolution is too large for the PAC flat panel display. If a driver does not display properly on the PAC display, you can switch to CRT mode (if you have connected an external CRT) before using it.

The CT, FP, and SM utilities are located on the *Display Driver Diskettes* in the Display Driver Package. Copy the files to the root directory or subdirectory where other utilities are located.

To turn off the PAC display and use an external CRT only, go to the directory that contains the driver utilities and type CT <Enter>. To turn off the external CRT and use the internal PAC display only, type FP <Enter>. To use the PAC display and an external CRT simultaneously, type SM <Enter>.

Before You Begin

The following procedures explain how to install the display drivers and utilities located on the *Display Driver Diskettes*. The procedures assume that you understand elementary concepts of MS-DOS® and personal computers. Before you attempt to install any driver or utility, you should know how to copy files from a flexible diskette to a directory on the hard disk, format a flexible diskette, and understand the directory structure of DOS or your particular operating system. If you are uncertain about any of these concepts, please refer to the documentation provided with DOS, Windows, or OS/2 for more information.

Before you install the display drivers and utilities, make backup copies of the *Display Driver Diskettes*. Store the original disks in a safe place.

Make sure you know the version of the software application for which you are installing drivers. Some of the application drivers on the *Display Driver Diskettes* are for different versions of the software and the driver will not operate properly unless the correct version has been installed.

Last minute changes to the drivers and utilities are documented in the Read-Me files in respective directories on the *Display Driver Diskettes*. Before you install a particular driver, check to see whether there is a Read-Me file for the driver. You can inspect the file by bringing it into your word processor or editor, or by typing the following command:

TYPE README.TXT <Enter>

Installing the Application Drivers

This section provides only general procedures for using the *Display Driver Diskettes*. The descriptions in this manual may be slightly different depending on the version of the display drivers. Follow the instructions on the screen when applicable, rather than this manual. The sections which follow these procedures provide specific instructions for application programs. In addition, refer to the documentation provided with your application program for more information.

1. Make sure the application program for which you are installing drivers is already installed. Refer to the documentation provided with the application program for specific installation procedures.
2. Insert the *Display Driver Diskette #1* in drive A. Type A:<Enter> to make drive A the default drive.
3. Type SETUP <Enter> to run the Display Driver Setup program. The Display Driver Setup Program screen will appear, asking you to press any key to continue.
4. Press any key to go to the application list and continue.
5. Using the <Up/Down Arrow> keys, highlight the application from the list that you wish to install. Press the <Enter> key to select your choice. A list of supported driver resolutions will be displayed.

6. Using the <Up/Down Arrow> keys, select the driver resolutions that are appropriate for your monitor.

■ **Note:** When installing drivers for Windows, press <Enter> to select All Resolutions. Refer to the Windows sections that follow these general installation procedures.

7. Press <End> to begin installing the application driver. You may be asked for a drive and directory to copy the driver files. If you are, enter the drive and directory that contains the installed application program. You may be asked to insert different *Display Driver Diskettes*. If the destination directory does not exist you will be asked for a confirmation.

■ **Note:** Refer to the sections which follow these procedures for application specific information.

8. When the installation is complete, press any key to go to the Application List and continue installing application drivers. To exit to DOS, press <Esc> followed by <Y>.

Windows Drivers

These drivers are designed to work with Windows Version 3.0 and 3.1 and Windows with Multimedia from Microsoft.

1. Install the Windows drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Change to the directory where Windows is installed (usually C:\WINDOWS).
3. If you are using Windows 3.0, type MIXFILES <Enter> to add the new drivers to the Windows Setup Menu. This step is not required for Windows 3.1.
4. Type SETUP <Enter> to run the Windows Setup Program. The current Windows configuration will be displayed. Using the <Up/Down Arrow> keys, select Display and press <Enter>. A list of display drivers will be shown.
5. Using the <Up/Down Arrow> keys, select one of the drivers starting with an asterisk (*) and press <Enter>.
6. Follow the directions on the screen to complete the setup. In most cases, you may press <Enter> to accept the suggested option. When the setup is done, it will return to DOS. To start Windows with the new display driver, type WIN <Enter>.

Changing Display Drivers from DOS

To change display drivers from DOS, change to the Windows directory and run the Setup Program (type `SETUP<Enter>`). You should be able to use the following standard drivers, in addition to the driver marked with an asterisk (*):

- VGA: 640x480, 16 colors
- Super VGA: 800x600, 16 colors

Changing Display Drivers from Windows

To change display drivers from Windows, select the Windows Setup icon from the Main Menu window. The current Windows configuration will be displayed. Select **Change Configuration** under the Option Menu. Click on the arrow at the end of the display line. A list of display drivers will be shown. Select the driver you want by clicking on it, and then clicking the OK button. Follow the directions on the screen to complete the setup.

Changing Color Schemes

After you change display drivers, you may notice that the color scheme used by Windows looks strange. This is because different drivers have different default colors. You can correct this by choosing a new color scheme.

Select the Control Panel from the Main Menu window. Select the Color icon. Select a new color scheme and click the OK button.

Multimedia Extensions

The 256-color display drivers include Multimedia extensions for use with Windows with Multimedia Version 3.0 and Windows Version 3.1.

AutoCAD Drivers

These drivers are designed to work with AutoCAD and AutoCAD/386, Release 10 and 11, from Autodesk, as well as corresponding versions of AutoShade. They conform to the Autodesk Device Interface (ADI) for rendering drivers and display drivers. These drivers accelerate redraw, pan, and zoom functions.

1. Install the AutoCAD drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Change to the directory where AutoCAD or AutoShade is installed. Run the Driver Installation program by typing `DLDSETUP <Enter>`. This program will configure your new driver and create a batch file called *FASTACAD.BAT*.
3. Configure the colors for AutoCAD or AutoShade. Use `COLOR16 <Enter>` for 16-color mode, or `COLOR256 <Enter>` for 256-color mode. Press the <A> key to select the standard AutoCAD ADI colors and then press the <S> key to save these colors in *DLDCOLOR.DAT*.

Refer to the section entitled "Changing Colors" for more information about the color utilities.

4. Install the display driver in the PAC's memory before starting an AutoCAD or AutoShade session. Execute the batch file by typing `FASTACAD <Enter>`. When you are finished using AutoCAD or AutoShade, remove the display driver from memory by typing `DLDVGA -U <Enter>`.

Configuring AutoCAD

You need to configure AutoCAD for an ADI display the first time you use it after installing the ADI driver. Select Configure AutoCAD from the AutoCAD Main Menu. The current configuration may be displayed. When it is, select Configure Video Display, then select ADI as your new driver (installed at interrupt 7A hex). Save the new configuration and return to the Main Menu.

Configuring AutoShade

You need to configure AutoShade for an ADI display the first time you use it after installing the AutoCAD driver. Remove the file *SHADE.CFG* by using the DOS Delete command, then run the AutoShade program. When the program asks for a display and rendering driver, select ADI for both. Indicate that you have a dual display system. A new *SHADE.CFG* file will be created when you exit the program.

Changing Colors

To change the colors that AutoCAD and AutoShade use for drawing, background, menus, and text, use the *COLOR16* or *COLOR256* utility. The *<?>* key provides help messages when running these utilities.

To change the background color used by AutoCAD in 16-color mode, run the *COLOR16* utility. Press *<O>* for object and use the *<Left/Right Arrow>* keys to move through the different objects (shown at the top of the screen) until **Graphics Area Background** appears. Press *<Enter>* to select this object. When the current color is shown at the bottom of the screen, use the *<Left/Right Arrow>* keys to move to a new color. Press *<Enter>* to select the new color.

Select the next object you want to change and then select the new color for that object.

When you are done changing objects, press *<Esc>* to exit to the Main Menu. Press the *<S>* key to save these colors in the *DLDCOLOR.DAT* file. Press the *<E>* key to exit.

CADKEY Drivers

These drivers are designed to work with CADKEY Version 3.51 from CADKEY, Inc.

1. Install the CADKEY drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Copy the *CKEY600.EXE* and *GRDEV.DAT* files to the CADKEY directory and run *CONFIG.EXE*. Select option 1, **Set Graphics Options**. Then select option 1, **Select Graphics Devices**. Then select option 8, **Chips & Technologies' VGA (16-Color)**. A list of driver resolutions will be displayed.
3. Select the desired resolution from the list and then enter the value for the following parameters:
 - Cursor size
 - Graphics marker size
 - Maximum number of horizontal and vertical grid points
 - Measurement of curve
 - Increment of sketch
 - Cursor type
 - Monitor configuration
4. Select option 3, **Return to Main Menu**, then option 8, **Exit**.

CADVANCE Drivers

These drivers are designed to work with CADVANCE Version 3.50 from ISICAD.

1. Install the CADVANCE drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Delete the *GS.DRV* file and rename the new display driver file by this same name (the new display driver file will be called *GS768.DRV* or *GS600.DRV*). CADVANCE will now be able to use the new display driver.

Framework Drivers

These drivers are designed to work with Framework III and IV from Ashton-Tate. Before installing the Framework driver, run the Framework Setup program. Choose **Option 1** for first time installation. A copy of the Framework Setup will be placed in the Framework directory (to be used in step 2 below).

1. Install the Framework drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Run the Framework Setup program again.
3. Select **All Other Uses Of The Setup Program**. Then select **Current Directory** from the next screen.
4. Select **Configuration, Primary Hardware, Screen Driver, and The Screen Driver I Need Isn't Listed Here** from the screens.
5. Select **I Want To Enter My Own Driver Filename** and type in the name of the driver file you are installing. Press the <M> key to return to the Main Menu. Save the new setup and exit the Framework Setup program. Framework will now use the new display driver.

GEM Drivers

These drivers are designed to work with GEM Version 3.0 from Digital Research. Before installing the GEM display drivers, follow the installation procedures to install GEM with the standard VGA screen driver. Start the installation by inserting the *GEM 3.0 System Master Disk* in drive A and typing **A:<Enter>**, then **GEMSETUP <Enter>**.

1. Install the GEM drivers from the *Display Driver Diskettes* and then press **<Esc>** followed by **<Y>**. Remove the *Display Driver Diskette* from drive A.
2. Create a *GEM Driver Pak Diskette* by inserting a blank diskette in drive A and typing the DOS format command **FORMAT A:/V <Enter>**. The format program will ask you for a volume label by displaying "Volume label (11 characters, Enter for none?)."

At the prompt, type in the following (in all caps):

GEM DRIVRPK <Enter>.

3. Using the DOS copy command, copy all of the files that were created to the newly formatted diskette. Make sure the files are copied to the root directory of the diskette. The diskette is called the *GEM 3.0 Driver Pak Disk*.
4. Reinstall GEM by placing the *GEM System Master Disk* in drive A and typing **A: <Enter>**, then **GEMSETUP <Enter>**.
5. Follow the installation instructions to **Change Existing Configuration**. When you are prompted for a screen driver choice, select **Other (Driver Pak)**.
6. When prompted, insert the newly created *GEM 3.0 Driver Pak Disk* in drive A and complete the installation procedure.

Generic CADD Level 3 Drivers

These drivers are designed to work with Generic CADD Level 3, Version 1.1.

1. Install the Generic CADD Level 3 drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Run the Configuration Program by typing **Config**<Enter>. Select **1**, **Select a Video Graphics Display** and then enter the appropriate number for the driver. Press <Esc> followed by <Y> to exit to DOS.

Lotus 1-2-3/Symphony Drivers

These drivers are designed to work with Lotus 1-2-3 Version 2.0, 2.1, and 2.2, as well as Lotus Symphony Version 1.0 and 1.1.

1. Install the Lotus drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Go to your Lotus directory and start the Installation Program by typing **C:<Enter>**, then **INSTALL** <Enter>.
3. The Lotus Installation Program will load and present the Installation Menu. From this menu select **Advanced Options**. From the Advanced Options Menu, select **Add New Drivers To Library**. From the Add New Drivers Menu, select **Modify Current Driver Set**. From the Modify Current Driver Set Menu, select **Text Display**. From the Text Display Menu, select one of the drivers.
4. Exit the Text Display Menu and return to the Main Installation Menu by selecting **Return To Menu**.
5. At the Main Installation Menu, select **Save Changes**.

6. The Installation Menu will prompt you for the name of your new Lotus configuration file. The Lotus program will display the default *123.SET*. You do not have to use this default name. You might want to use a filename that indicates the resolution of the driver it contains, such as *132X25.SET* or *80X50.SET*.

■ **Note:** If you decide to use a different name than *123.SET* remember to place the new filename on the command line when you start Lotus. For example, if you named your driver *132X25.SET*, type the following command to start Lotus: `123 132X25.SET <Enter>`.

7. The Lotus driver installation is now complete. Exit the Installation program by selecting **Exit**.

OS/2 Presentation Manager Drivers

These drivers are designed to work with OS/2 Presentation Manager Version 1.21 or 1.3 from Microsoft or IBM. You should configure OS/2 Presentation Manager for a standard VGA driver.

1. Before installing the OS/2 Presentation Manager drivers, insert a *DOS System Disk* in drive A and reboot the PAC.
2. Install the OS/2 drivers from the *Display Driver Diskettes*. When the Display Driver Program asks you for a drive and directory to copy the driver files, use the *C:\OS2\DLL* directory. When the installation is complete, press <Esc> followed by <Y>.
3. Type *C:* <Enter> and *CD \OS2\DLL* <Enter> to go to the directory where the files were copied. Copy the desired resolution file to *DISPLAY.DLL*. Refer to “Driver Resolutions and Filenames” in this chapter for a list of OS/2 resolutions and their filenames.
4. Remove the diskette from drive A and reboot the PAC. OS/2 Presentation Manager will now use the new display driver.

Ventura Publisher Drivers

These drivers are designed to work with Ventura Publisher Version 2.0 from Xerox.

1. Install the Ventura Publisher drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>. Remove any *Display Driver Diskettes* from drive A.
2. Copy all of the files that were created in the temporary directory onto the root directory of a formatted flexible diskette.
3. Change the default drive to your diskette and type the following command:
VPDRV2_0 <Enter>.
4. Follow the instructions for selecting drivers for the screen and the mouse.

VersaCAD Drivers

These drivers are designed to work with VersaCAD Design Version 5.4.

1. Install the VersaCAD drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Run the VersaCAD program and select the Environment option by pressing the <E> key. Now select the Screen option by pressing the <S> key. Use the space bar to sequence through the various display drivers and select either the CHIPS 1024X768 or the CHIPS800X600 driver.
3. Exit VersaCAD and edit the *VCAD54.BAT* file in the root directory. The second line in this batch file loads the display driver. Change this to either *VGA768.EXE* or *VGA600.EXE*, depending on which driver you selected.
4. Reboot the PAC to get rid of the previous display driver. VersaCAD will now use the new driver.

VersaCAD 386 Drivers

These drivers are designed to work with VersaCAD 386 Version 5.4.

1. Install the VersaCAD 386 drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Run the VersaCAD 386 program and select the Environment option by pressing the <E> key. Now select the Screen option by pressing the <S> key. Use the space bar to sequence through the various display drivers and select either CHIPS 1024X768 or the CHIPS800X600 driver.
3. Exit VersCAD 386 and edit the *VCAD386.BAT* file in the root directory. The fourth line in this batch file loads the display driver and it is probably set to EGAP. Change this line to either *VGAP768.EXE* or *VGAP600.EXE*, depending on which driver you selected.
4. Reboot the PAC to get rid of the previous display driver. VersaCAD 386 will now use the new driver.

Word Drivers

These drivers are designed to work with Word Version 5.0 and 5.5 from Microsoft.

1. Install the Word drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Copy the driver file for the desired resolution that was just installed to *SCREEN.VID*.

WordPerfect Drivers

These drivers are designed to work with WordPerfect Version 5.0 and 5.1. They support 132-column display in Editing mode, and high-resolution graphics display in PreView mode.

1. Install the WordPerfect drivers from the *Display Driver Diskettes* and then press <Esc> followed by <Y>.
2. Start the WordPerfect program and press the <Shift> and <F1> keys to enter the Setup Menu. Select D for Display and then G for Graphics Screen Type. Choose the desired VGA resolution.

Configuring WordPerfect 5.0 for 132 Columns

1. Use the SETMODE utility program from the *Display Driver Diskettes* to set 132 columns and 25 rows by typing the following command:
SETMODE 132,25 <Enter>.
2. Start the WordPerfect program. The program will detect the number of rows and columns automatically. If for some reason WordPerfect is unable to adapt to 132 columns by 25 rows, start WordPerfect with the following command: WP /SS=25,132 <Enter>.

Configuring WordPerfect 5.1 for 132 Columns

Start the WordPerfect program and press the <Shift> and <F1> keys to enter the Setup Menu. Select D for Display and then T for Text Screen Type. Select Chips 132 Columns Text.

WordStar

The PAC's VGA controller card has the capability to run WordStar Version 4.0 or 5.0 in 132 column text mode. No special driver is required to do this. However, you need to reconfigure WordStar to use this option.

1. Go to your WordStar directory. Execute WordStar's Installation Program by giving the command `WSCHANGE <Enter>`.
2. The program will ask you for the name of your WordStar program file. Type in the name (normally `WS.EXE`). The program will then ask you to name the program file where the changes for the new configuration will be saved. Type in `WS132.EXE`.
3. From the Main Installation Menu, select option A for Console. At the Console Menu, selection option A for Monitor. At the Monitor Menu, select option C for Screen Sizing. At the Screen Sizing Menu, select B for Width and then type 132. Leave the Installation program by pressing the `<X>` key to exit each menu.
4. The Installation Program will ask you whether you want to save the new configuration. Respond `YES` to the prompt. The Installation Program will save the new configuration in the file you specified in Step 1, and then exit.

Running WordStar 4.0/5.0

To run WordStar in 132 columns, you need to place the VGA controller card in 132 column text mode prior to starting WordStar. You do this by using the utility program on the *Display Driver Diskettes*. For information concerning installing utilities, refer to the section entitled "Installing the Display Utilities" in this section.

To start WordStar in 132 column text mode, type the following command: `SETMODE 132,25 <Enter>` and then `WS132 <Enter>`.

When you leave WordStar and want to go back to normal 80 column mode, type the following command: `SETMODE 80,25 <Enter>`.

X Window (SCO Open Desktop) Drivers

These drivers are designed to work with Santa Cruz Operation (SCO) Open Desktop X Window System Version 1.0. To install the drivers, perform the following steps.

1. Install SCO Open Desktop as you normally would.
2. Login SCO as root. Type the following command:
`cd/usr/lib/grafinfo <Enter>` and then `mkdir chips <Enter>`.
3. Insert the *Display Driver Diskette #1* in drive A. Type `doscp/dev/fd0:/odt/modelist <Enter>` and then `doscp/dev/fd0:/odt/520.xgi chips <Enter>`.
4. Type `mkdev graphics <Enter>`. Select **Form and Chips and Technologies, Inc. VGA**. Choose the desired resolution and then select **Accept**.

■ **Note:** To change the mouse parameters to make the cursor move smoother, type: `xset m 3 6 <Enter>`.

VESA Super VGA Drivers

The Video Electronics Standards Association (VESA) has created a standard for a Super VGA BIOS Extension. This defines a standard software interface to allow application programs to set and control extended video modes, such as 800x600 graphics on video adapters from different manufacturers.

The VESA drivers add this Super VGA BIOS Extension to the VGA BIOS. Any application program which supports the VESA standard driver interface can be used with the drivers. The VESA drivers conform to the VESA Super VGA Standard #VS891001.

1. Install the VESA Standard drivers from the *Display Driver Diskettes*. Use the **<Up/Down Arrow>** keys to select any desired VESA utilities that you want to install in addition to the VESA drivers.

- **Note:** When a default drive and directory path are displayed, use the <Backspace> key to erase this and type in a directory that is in the directory path, such as C:\BIN or C:\UTILS.

Press <Esc> followed by the <Y> key.

2. To install the VESA driver, type either VESA <Enter> or VESA+ <Enter> at the DOS prompt. The VESA+ command enables all of the available modes. Make sure that your monitor is capable of displaying these high resolution modes before enabling them.

Installing the Display Utilities

This section provides only general procedures for using the *Display Driver Diskettes*. The descriptions in this manual may be slightly different depending on the version of the display drivers. Follow the instructions on the screen when applicable, rather than this manual. The sections which follow these procedures provide specific information concerning these utilities.

1. Insert the *Display Driver Diskette #1* in drive A. Type A: <Enter> to make drive A the default drive.
2. Type SETUP <Enter> to run the Display Driver Setup program. At the prompt, press any key to continue to the Application List Screen.
3. Using the <Up/Down Arrow> keys, highlight **Utility Programs** from the list and then press the <Enter> key. A list of utilities will be displayed.
4. Using the <Up/Down Arrow> keys, select the utility you want to install and then press <Enter>.

5. Press <End> to begin installing the application driver. You may be asked for a drive and directory to copy the driver files. If you are, enter the drive and directory that is in the directory path, such as C:\BIN or C:\UTILS. You may be asked to insert different *Display Driver Diskettes*.

■ **Note:** Refer to the sections which follow for more specific utility information

6. When the installation is complete, press any key to go back to the Application List and continue installing utility drivers. To exit to DOS, press <Esc> followed by <Y>.

MODETEST Utility Program

The MODETEST utility is a diagnostic used to set and display information for each video mode.

To use the MODETEST utility, type **MODETEST <Enter>**. This will cycle through each video mode and display the following information:

- Mode Number
- Resolution (in characters if text mode, pixels if graphics mode)
- Number of Available Colors
- Vertical Scanning Frequency
- Horizontal Scanning Frequency
- Dot Clock (pixel) Frequency

The MODETEST utility will also display a set of color bars to show off the colors and put a border of changing colors around the screen.

SETMODE Utility Program

This utility program is used to provide 132 text columns in popular text-based applications, such as WordStar and WordPerfect. If you don't intend to use 132 column text mode, you don't need to install this utility.

Before installing the SETMODE utility from the *Display Driver Diskettes*, determine where you want to store the program. Locate a directory on your hard disk where you have other utility programs. For your convenience, this directory should be specified in the *PATH=* statement in your *AUTOEXEC.BAT* file.

The SETMODE utility program allows you to specify the number of rows and columns on the screen. Indicate these values to the SETMODE program by placing them after the name SETMODE on the command line. The format for the command is: SETMODE Columns, Rows <Enter>. For Example, if you want to set 132 columns with 25 rows, give the command: SETMODE 132,25 <Enter>. The following figure provides valid values for Columns and Rows.

| Columns | Rows | |
|---------|------|----|
| | 25 | 50 |
| 80 | ■ | |
| 132 | ■ | ■ |

- **Note:** To use this program with an application program (such as WordStar or WordPerfect), the application may need to be configured for the specific screen size. Refer to the application sections earlier in this manual or the documentation provided with your application program for procedures on how to configure your application.

SETVESA Utility Program

This utility is used to set the page size and the number of pages for the VESA Super VGA modes. These modes can have either one or two active windows, and the window size can be set to either 32K, 64K, or 128K. This utility is needed because the VESA Standard does not allow setting these parameters in the BIOS extension definition.

To use this utility, type **SETVESA [Page Size] [Number of Pages] <Enter>**. The page size can be either 32, 64, or 128, and the number of pages can be either 1 or 2. If the number of pages is omitted, the utility program will default to 1. If no command line options are given, the SETVESA utility will display the current settings. The following figure provides valid combinations for the page size and number of pages.

| Page Size | Number of Pages |
|------------------|------------------------|
| 32 | 2 |
| 64 | 1 or 2 |
| 128 | 1 |



SETVGA Utility Program

The SETVGA utility is used to place your VGA controller card in emulation mode. Your VGA controller can emulate, or imitate, the operation of other graphic controllers. The following graphics standards can be emulated.

- IBM® Monochrome Adapter
- IBM Color Graphics Adapter (CGA)
- IBM Enhanced Graphics Adapter (EGA)
- Hercules® Monochrome Graphics Adapter

The SETVGA utility is used to lock your VGA controller in a specific emulation mode. You can use the SETVGA utility if you have software that is specifically written for these standards and cannot run in regular VGA mode.

■ **Note:** Very few programs require the use of SETVGA. You will usually only use SETVGA with older application programs.

Before installing the SETVGA utility from the *Display Driver Diskettes*, determine where you want to store the program. Locate a directory on your hard disk where you have other utility programs. For your convenience, this directory should be specified in the *PATH=* statement in your *AUTOEXEC.BAT* file.

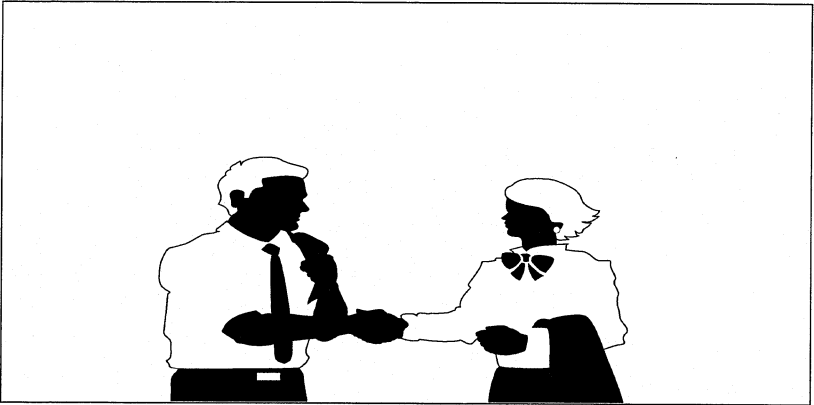
To use the SETVGA utility to lock your VGA controller in an emulation mode, indicate the emulation mode to the SETVGA program by placing it after the name SETVGA on the command line: SETVGA EMULATION MODE <Enter>.

The following figure illustrates values for EMULATION MODE.

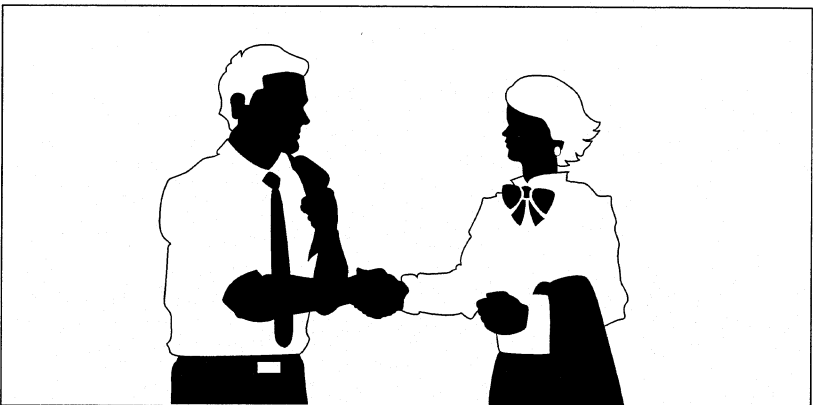
| Emulation Mode | Description |
|-----------------------|--|
| MDA | Enables and locks MDA emulation |
| CGA | Enables and locks CGA emulation |
| EGAC | Enables and locks EGA color emulation |
| EGAM | Enables and locks EGA monochrome emulation |
| HERC | Enables and locks Hercules emulation |
| VGA | Disables emulations and returns to VGA operation |

AUTOCOMP Utility Program

The AUTOCOMP utility turns on optimal compensation. Optimal compensation automatically adjusts resolutions of 320x200, 640x200 graphics, and 40x25 text so that it is optimally displayed on a 640x480 display. The following figures illustrate optimal compensation.



Without Compensation



With Compensation

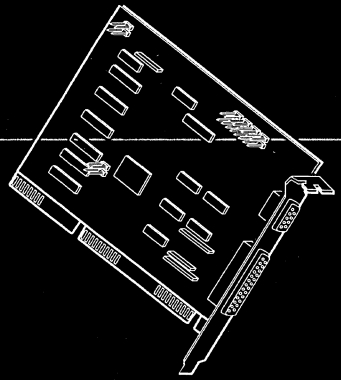
To use the AUTOCOMP utility, go to the DOS prompt. Go to the directory that contains the AUTOCOMP utility, and type `AUTOCOMP <Enter>` or `AUTOCOMP ON <Enter>`. If the cursor is not at the top left of your display after turning AUTOCOMP on, perform the following procedures.

1. Go into a graphical environment, such as Windows or something similar.
2. Exit the environment.
3. When you go back to DOS text mode the cursor will be on the top left of your display.

To turn off AUTOCOMP, type `AUTOCOMP OFF <Enter>`.

5

EXPANDING
THE PAC



EXPANSION

Contents

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EXPANDING THE PAC

This chapter contains the following sections:

- Opening Up the Unit
- Installing the Second Serial Port or Game Port
- Installing Expansion Cards
- Installing Memory Modules

The PAC family of portable computers provides ample expansion slots for high-end performance. Each PAC has at least four open expansion slots — the video controller card and multifunction I/O card taking up two slots. In addition, the PAC accepts up to 32 MB of random-access memory (RAM), for peak performance.

- **Note:** Depending on the specific configuration of your PAC, you may have less than four open expansion slots (ie. SCSI adapter card, DVI card, MPEG card, JPEG card, and so on).

Refer to the documentation provided by the manufacturer for specific devices, as well as this chapter.

Opening Up the Unit

In order to expand the PAC, you must open up the unit. Remember that the PAC family of portable computers contains components that could be damaged by electrostatic discharge. To avoid such problems, follow these precautions to minimize the electrostatic discharge.

Precautions

- Always work in a static-free area.
- Before handling the assemblies, discharge your body by touching a grounded metal object.
- Handle all cards by their edges unless otherwise required. Do not touch the components unless absolutely necessary. Avoid touching any gold edge connectors.
- If you remove any assemblies from the PAC, place them on an anti-static, padded surface.
- When possible, use electrostatic discharge wrist straps when handling sensitive components.
- Always store cards in their original anti-static packaging when they are not installed.

Procedures

1. Turn the power off to the PAC using the system power switch. Disconnect any cables or power cords.
2. Replace the keyboard, if applicable, on the main unit. Place the unit face down on a flat, sturdy surface. The bottom of the unit should be toward you.
3. Remove the three cover mounting screws using a philips-head screwdriver (fig. 5-1).
4. Pull the top of the rear cover toward you until the panel is perpendicular to the main chassis.
5. Lift the rear cover straight up and away from the main cabinet and set it aside.

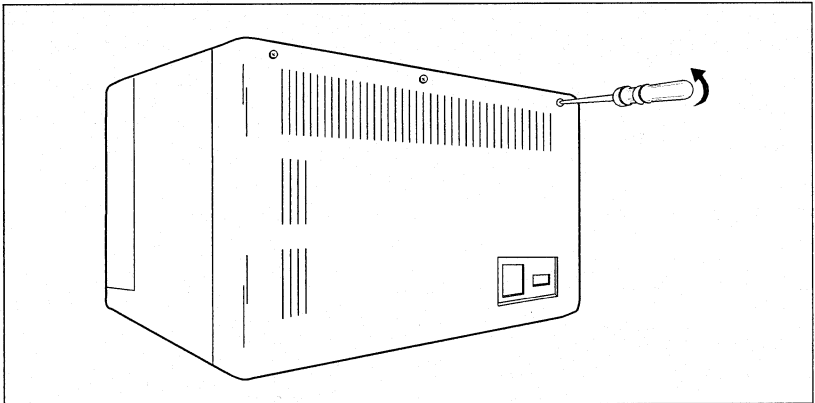


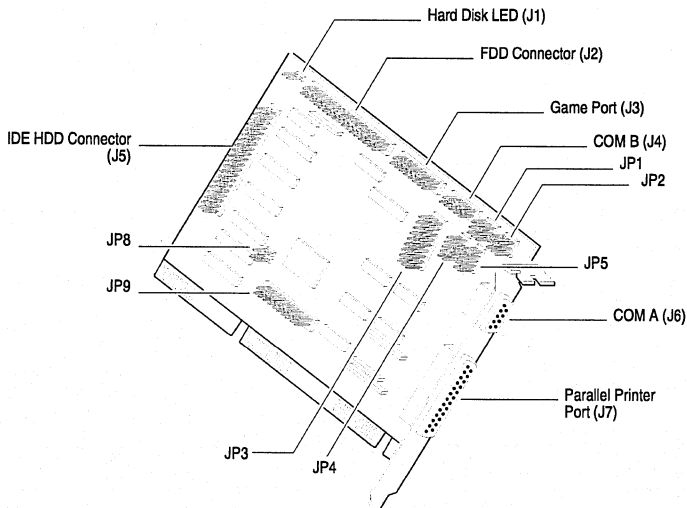
fig. 5-1

Installing the Second Serial Port or the Game Port

The multi-function I/O card in the PAC is equipped with a game port and two serial ports, but only one of these serial ports is connected from the factory. If you need a second serial port, you must connect cables to the multi-function I/O card. These cables are supplied with your PAC. The second serial port and game port each take up one expansion slot.

- **Note:** Remember that the second serial port and game port each take up one expansion slot. For this reason, make sure you need two serial ports before installing the second serial port.
- **Note:** If you have a touch panel option installed in the PAC, this second serial port is unavailable (it is already connected to the touch panel).

The second serial port, serial port 2, is a 9-pin RS232-C compatible serial port. The game port is a 15-pin connector which can connect to any IBM or compatible joystick. The following figure illustrates the layout of the multi-function I/O card installed in your PAC.



Multi-Function I/O Card

Game Port

1. Assemble the components you need such as the game port cable and this manual. Turn the power off to the PAC using the system power switch. Remove the rear cover according to the procedures provided in the section, "Opening Up the Unit," earlier in this chapter.
2. Insert the 15-pin connector on the game port cable to the game port connector (J3) on the multi-function I/O card (fig. 5-2). Make sure the colored edge of the cable is aligned to pin 1 of the J3 connector.
3. Mount the bracket with the 15-pin connector, as well as the 9-pin serial connector, in one of the empty slots in the PAC.
4. Set the jumpers on the multi-function I/O card, as necessary. Refer to Chapter 3, "Multi-Function I/O Card," for information concerning the game port jumper settings.

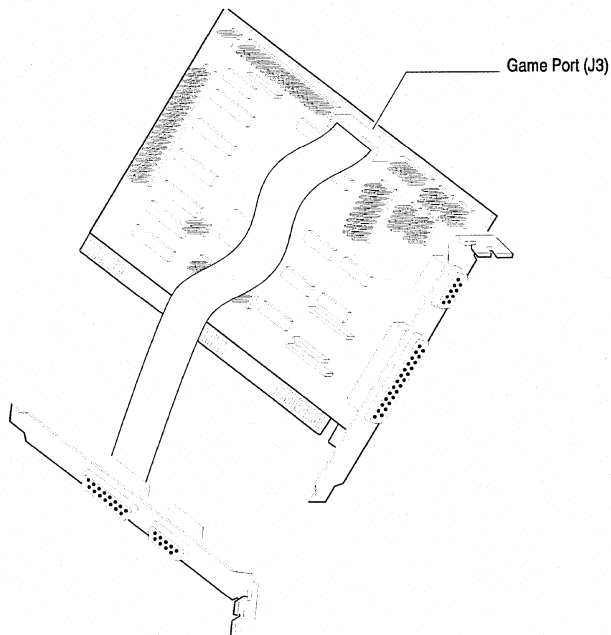


fig. 5-2

Second Serial Port

1. Assemble the components you need such as the secondary serial port cable (COM B) and this manual. Turn the power off to the PAC using the system power switch. Remove the rear cover according to the procedures provided in the section, "Opening Up the Unit," earlier in this chapter.
2. Insert the 9-pin connector on the secondary serial port cable (COM B) to secondary serial port connector (J4) on the multi-function I/O card (fig. 5-3). Make sure the colored edge of the cable is aligned to pin 1 of the J4 connector. The following figure illustrates the I/O card and the secondary serial port cable.
3. Mount the bracket with the 9-pin serial connector, as well as the 15-pin game port, in one of the empty slots in the PAC.
4. Set the jumpers on the multi-function I/O card, as necessary. Refer to Chapter 3, "Multi-Function I/O Card," for information concerning the serial port jumper settings.

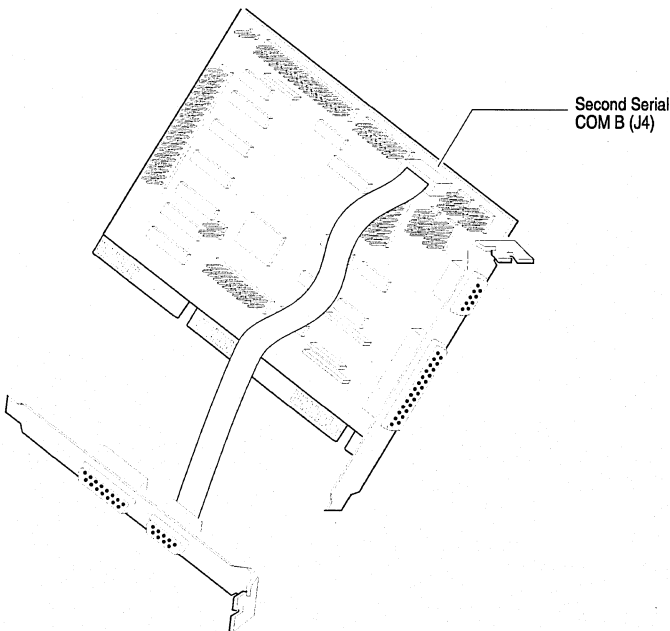


fig. 5-3

Installing Expansion Cards

Your PAC has four open expansion slots — the multi-function I/O card and video controller card each take up one slot for a total of six slots. In addition, you can add three more 16-bit ISA slots with Dolch's BackPAC expansion chassis.

- **Note:** Depending on the specific configuration of your PAC, you may have less than four open expansion slots (ie. SCSI adapter card, DVI card, MPEG card, JPEG card, and so on).

Depending on your PAC, the slots are designed to accept the edge connectors of 8-bit and 16-bit ISA bus cards or 32-bit EISA cards (you must have an EISA PAC to use EISA expansion cards). Refer to Chapter 3 for a system description specific to your PAC.

- **Warning:** Make sure the expansion card you wish to install does not conflict with any other cards installed or the configuration of your system. Make sure the combined power consumption of the expansion cards does not exceed the limit for the PAC. Exceeding the power limits of the PAC could damage the cards or the system.

Refer to the documentation provided with your expansion card, as well as the following general procedures.

- **Note:** Remember that these are only general procedures. Always refer to the documentation provided with your card for specific installation and configuration instructions.

1. Assemble components such as the expansion card and documentation. If necessary, configure any jumpers or switch settings on the card as indicated by the manufacturer.
2. Turn the power off to the PAC using the system power switch. Disconnect any cables or power cords. Remove the rear cover according to the procedures provided in the section, "Opening Up the Unit," earlier in this chapter.
3. The expansion slots are located on the right side of the system board, above the power supply (fig. 5-4). Different expansion cards are installed differently from the factory, depending on specific configurations. At the very minimum, there will be a video controller card and a multi-function I/O card installed in your system.
4. Locate an open expansion slot. The PAC is shipped with expansion slot covers. Remove the cover of the desired slot by unscrewing the screw (fig. 5-5).
5. Holding the expansion card by its edges, gently insert the gold fingers of the expansion card into the PAC edge connector. Make sure the card is fully seated in the edge connector. If the card is a full-length card, use the card guides on the left side of the system.
6. Secure the expansion card in place with the screw removed in step 4.

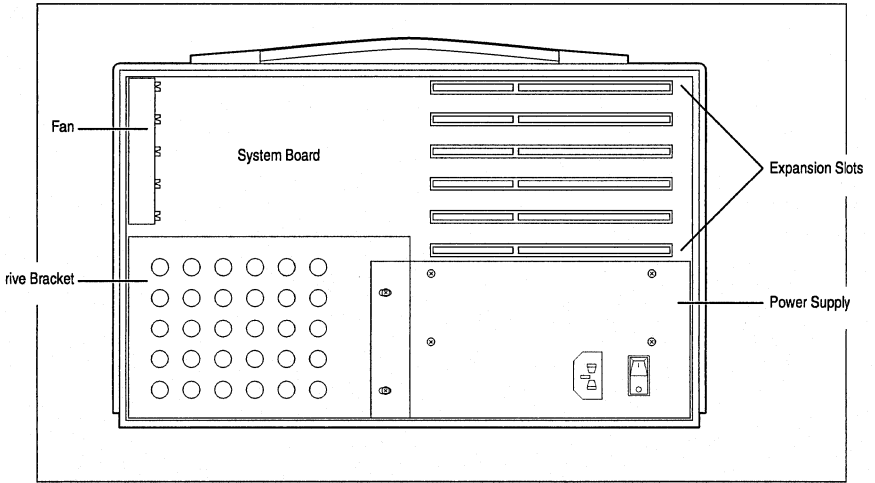


fig. 5-4

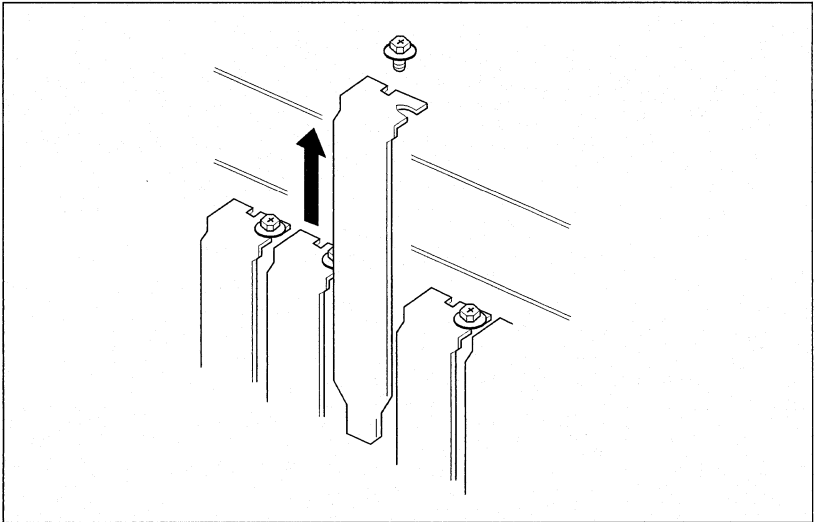


fig. 5-5

7. Replace the rear cover on the main unit by inserting the panel hinges into the system case (fig. 5-6).
8. Close the panel until it snaps shut. Make sure that the panel does not pinch any cables inside the case and that the bottom tabs are snapped tight after the cover is closed.
9. Fasten the two corner screws and the middle screw, being careful not to over-tighten the screws.
10. If you have an EISA PAC, run the EISA Configuration Utility (refer to Chapter 2, Setting Up the System).

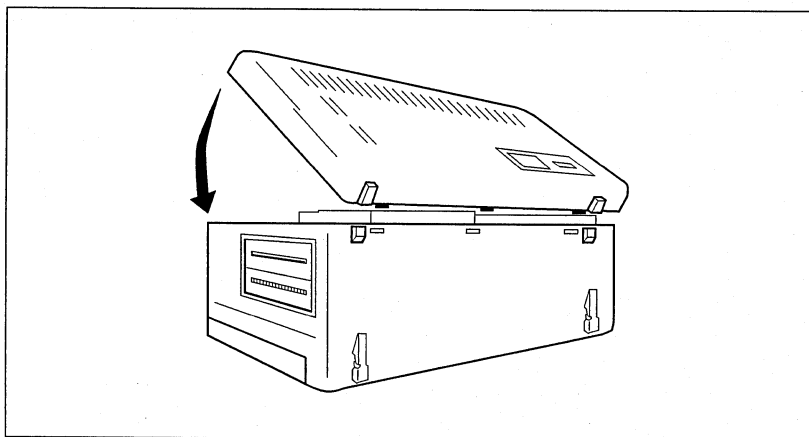


fig. 5-6

Installing Memory Modules

The PAC family of portable computers comes standard with random-access memory (RAM). The RAM in your PAC is expandable up to 32 MB. Refer to Chapter 3, *The System Board*, for memory configurations specific to your PAC, as well as the system board layout.

■ **Hint:** You may find it helpful to reconfigure the CMOS Setup for your new memory *before* installing the memory modules in your system. After powering up the system you will not get an invalid setup error. (Refer to Chapter 2, *Setting Up the System*.)

1. Determine your memory configuration (see Chapter 3) and make sure you have fast-page mode 256Kx9, 1Mx9, or 4Mx9 DRAM modules with access times of 70 or 80 ns.
2. Turn the power off to the PAC using the system power switch. Disconnect any cables or power cords. Remove the rear cover according to the procedures provided in the section, “Opening Up the Unit,” earlier in this chapter.
3. To install memory modules in the PAC you must remove the power supply. First remove the two screws on the left side of the power supply (fig. 5-7).

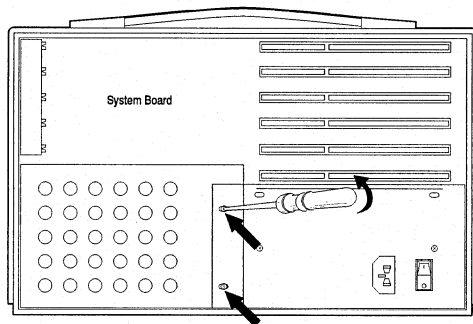


fig. 5-7

4. Then remove the two screws on the right side of the power supply (fig. 5-8). Carefully lift the power supply out, being careful not to disconnect any of the wires.

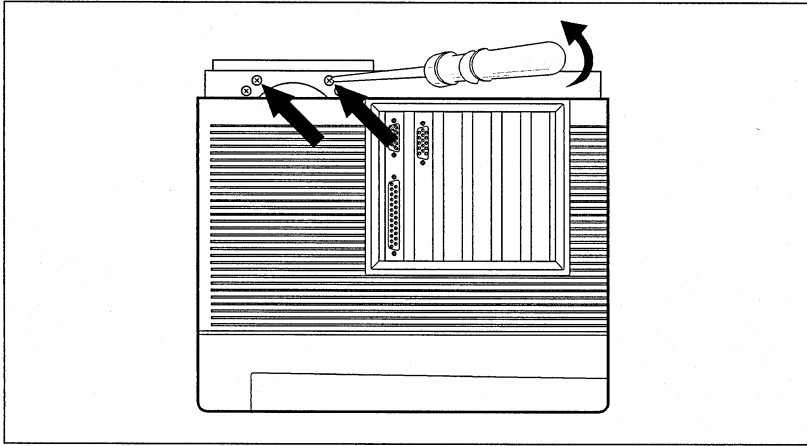


fig. 5-8

5. Locate the DRAM banks on the PAC system board. Refer to Chapter 3 for the layout of your particular system board.
6. If necessary, remove any memory modules that you are going to replace. Remove the modules by pulling the retaining brackets slightly away from the module (fig. 5-9) and rotating the memory module until it is at a 45° angle (fig. 5-10). Lift the memory module out of the socket.
7. Firmly push the new memory module into the slot at a 45° angle (fig. 5-11).
8. Rotate the memory module in its slot until the retaining brackets click in place on the memory module.
9. Repeat steps 6 through 7 for each memory module you want to install.

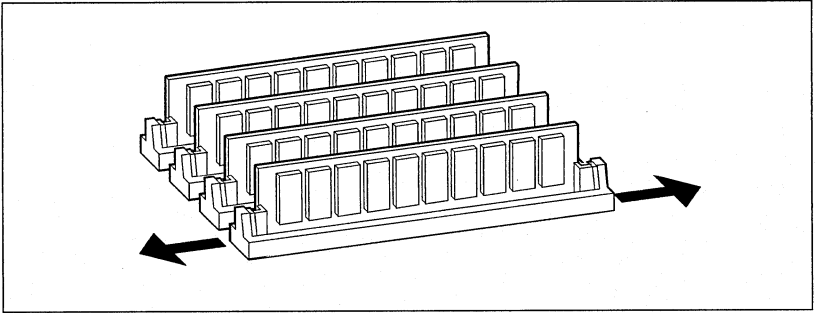


fig. 5-9

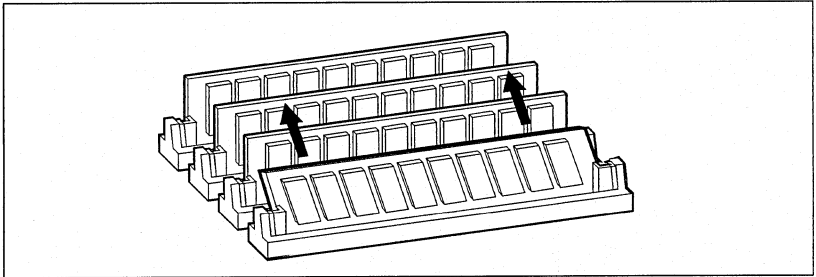


fig. 5-10

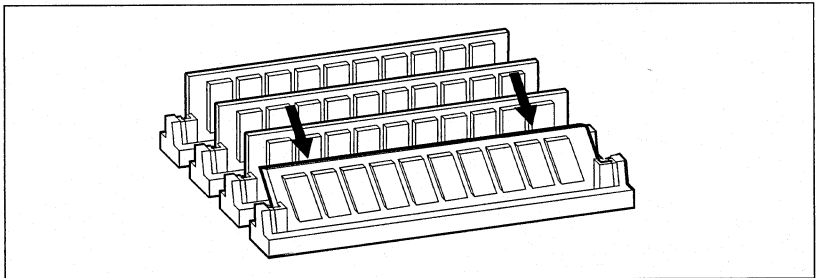


fig. 5-11



10. Replace the power supply removed earlier.
11. Replace the rear cover on the main unit by inserting the panel hinges into the system case (fig. 5-12).
12. Close the panel until it snaps shut. Make sure that the panel does not pinch any cables inside the case and that the bottom tabs are snapped tight after the cover is closed.
13. Fasten the two corner screws and the middle screw, being careful not to over-tighten the screws.

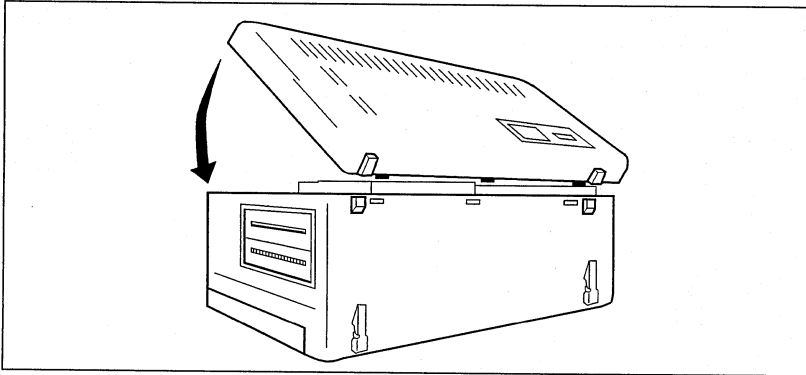
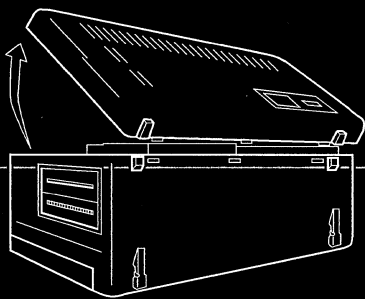


fig. 5-12

6

MAINTAINING
THE PAC

MAINTENANCE &
TROUBLESHOOTING



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| Handling the Keyboard | 6.3 |
| Cleaning the PAC and Components | 6.4 |
| Cleaning the Flat Panel Display | 6.4 |



MAINTAINING THE PAC

This chapter contains the following sections:

- Handling the PAC and Components
- Cleaning the PAC and Components

Your PAC portable computer is the ultimate in ruggedness. The internal components of the PAC are mounted in a custom-designed, alloy chassis that is suspended inside a high-impact, shock-resistant outer shell. Designed to Dolch's commercial specification, the PAC series has passed certification for use in military field applications.

The PAC is a very rugged, very reliable computer, requiring little maintenance. Any piece of electrical equipment should be handled carefully, though, and used according to its specifications.

This chapter provides general precautions when handling or cleaning the PAC and components.



Handling the PAC and Components

- Handle all computer equipment with care and make sure you place components on a sturdy, flat surface.
- Always hold a cable by the connector at one end when attaching it or removing it from a component. Don't force a connector into a socket or plug on the PAC or component. Check the orientation of a connector before attaching it to the PAC. If you can't get the pieces to join easily, consult your dealer or contact Dolch technical support.
- Turn the power to your PAC off before adding or removing any parts or components. If you add or remove a component or its cable while the PAC is on you may damage the PAC, the component, or both.
- Keep food and liquid away from the immediate area of your PAC if possible. Be extremely careful not to spill any liquid on the computer, keyboard, display, or other components.

■ **Warning:** If you have a PAC with a TFT flat panel display, do not let liquid touch the display, as it could cause discoloration or spots.

- If you do spill food or liquid into the computer, be sure to turn it off and unplug it before attempting to deal with the situation.
- Plug the power cord for the PAC into a three-pronged grounded outlet. The grounding-type plug is a safety feature; do not defeat the purpose of this plug. Disconnect the plug if it becomes frayed or otherwise damaged.

Handling the Flat Panel Display

- Use extreme care when handling the flat panel display. Since the unit is glass, it may break or crack if dropped or bumped on a hard surface.
- Be careful not to scratch the display surface.
- If you have a TFT display (passive or active matrix), do not let any liquid touch the flat panel display. Wipe off any liquid immediately as it may cause discoloration or spots.
- Turn down the brightness for the display if you leave the PAC on for an extended period of time. If the brightness is not turned down, the image on the display could “burn in” and permanently damage the display.

There are many “screen-saver” programs available to remove or vary the image on the display screen when the computer is on but idle. These programs are available from your local software dealer.

Handling the Keyboard

Be especially careful not to spill any liquid or food on the keyboard. If you accidentally spill liquid or food on the keyboard and it stops working, do the following:

- Unplug the keyboard from the main unit and turn it upside down to let the liquid drain out. Let the keyboard dry for 24 hours at room temperature. If the keyboard still doesn’t work, contact your dealer or Dolch technical support.

Cleaning the PAC and Components

- Before cleaning the PAC make sure the power is turned off and the power cord is disconnected.
- Wipe dust and fingerprints off the case. Use a cloth that has been slightly moistened with water or a mild, ammonia-based cleaning solution. Do not use spray liquids or a soaking wet cloth.
- After cleaning the PAC, make sure all the components are dry before turning them back on.

Cleaning the Flat Panel Display

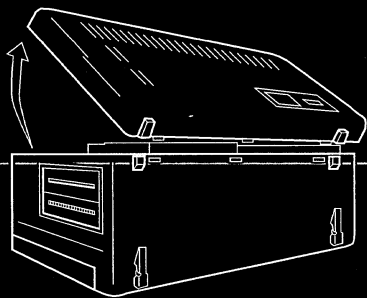
- Wipe the flat panel display with absorbent cotton or a soft cloth. If you have a gas plasma display, you may moisten the cloth with a mild, ammonia-based cleaner before wiping off the display. If you have a dual scan passive matrix display or an active matrix TFT display, do not use any type of liquid cleaners or water.

■ **Warning:** Do not let any liquid come in contact with the TFT flat panel display as it may cause discoloration or spots.

7

TROUBLESHOOTING
THE PAC

MAINTENANCE &
TROUBLESHOOTING



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TROUBLESHOOTING THE PAC

This chapter contains the following sections:

- Error Messages
- The Troubleshooting Guide

This chapter provides basic troubleshooting procedures for the PAC family of portable computers. In most cases, problems result from improper hardware or software configurations.



Error Messages

The BIOS executes Power-On Self-Test (POST) diagnostics after a power up or reset operation. These tests verify that the system board and memory are functioning properly. Errors detected during the POST are classified as fatal or non-fatal errors. The system halts if a fatal error is encountered.

If an error is encountered before the display initializes, the error is reported by a series of beeps. The following figure lists the beep codes and their meanings, as reported by the BIOS.

| Beep Count | Error Condition | Type |
|------------|------------------------------|-----------|
| 1 | DRAM Refresh Failure | Fatal |
| 2 | Parity Circuit Failure | Fatal |
| 3 | Base 64KB RAM Failure | Fatal |
| 4 | System Timer Failure | Fatal |
| 5 | Processor Failure | Fatal |
| 6 | Keyboard Controller Failure | Fatal |
| 7 | Virtual Mode Exception Error | Fatal |
| 8 | Display Memory R/W Failure | Non-fatal |
| 9 | BIOS Checksum Failure | Fatal |

If a non-fatal error is reported after the display device initializes, the error is reported as text and the operating system continues to load. These error messages are explained below.

CMOS Battery State Low

There is a battery in your PAC that stores the CMOS values. This error message indicates that this battery is low in power and needs to be replaced. Contact your local computer dealer or Dolch technical support.

CMOS Checksum Failure

After the CMOS values are saved, a checksum value is generated for error checking. If the previous value is different than the current value being read, this error message appears. To correct this error, run the BIOS Setup Program.

CMOS Display Type Mismatch

This message indicates that the type of video stored in the CMOS does not match the type detected by the BIOS. To correct this error, run the BIOS Setup Program.

CMOS Memory Size Mismatch

If the BIOS finds the amount of memory on your system board to be different from the amount stored in CMOS, this error message appears. To correct this error, run the BIOS Setup Program.

FDD/HDD Controller Failure

This message indicates that the BIOS is not able to communicate with the floppy drive controller or the hard disk controller. You might want to check the “On-Board IDE Hard Drive” item in the BIOS Setup Program before opening up the system and checking connections. If you have an IDE hard drive, the on-board IDE hard drive controller should be enabled through the BIOS Setup Program. If you have a SCSI hard drive, the on-board IDE hard drive controller should be disabled through the BIOS Setup Program.

If this doesn't solve the problem, open up the system and check all appropriate connections. You must remove the power before checking the connections.

C:/D: Drive Error

This message indicates that the BIOS is not receiving any response from the hard disk drive (C or D).

C:/D: Drive Failure

This message indicates that the BIOS cannot get any response from the hard disk drive (C or D). It may be necessary to replace the hard disk drive.

CMOS Time and Date Not Set

Run the BIOS Setup Program and set the time and date items of the CMOS.

No ROM Basic

This error occurs when a proper bootable sector cannot be found on either the floppy drive or the hard disk drive. The BIOS then tries to run ROM Basic. If it is not found, this error message appears. If you are using your PAC for the first time, it is most likely that you need to format your hard drive (See Chapter 1).

Diskette Boot Failure

This message indicates that the bootable diskette used in the floppy drive is corrupted — you cannot use it to boot up the system. Use another bootable diskette to load the operating system, and follow the instructions on the screen.

***On-board Parity Error**

This message indicates that the BIOS has encountered a parity error with the on-board system memory.

***Off-board Parity Error**

This message indicates that the BIOS has encountered a parity error with the off-board memory installed in an I/O bus slot.

***Parity Error????**

This message indicates that the BIOS has encountered a parity error with the system memory, but cannot determine the address of the error.

Troubleshooting Guide

If no errors are reported by the BIOS, but the system still fails to operate properly, use this guide to troubleshoot your system. The information is provided as typical symptoms and possible solutions.

- **Note:** We recommend removing all of the expansion cards from the system (except the video controller) during the initial troubleshooting procedures. You may then reinstall the cards one at a time and repeat the troubleshooting procedures to isolate the problem to a particular card.

System Fails to Power Up

If the system fails to power up and the power LED indicator does not illuminate, check the following:

- Make sure the power cord is properly plugged into the AC power cord connector on the PAC, as well as a grounded power source.
- If the computer is plugged into a switched, multiple outlet box, make sure the switch on the outlet box is turned on.
- Make sure the PAC's power switch is turned on.
- Make sure the AC outlet is working by plugging a different electrical device (such as a printer) into the outlet and turning it on.

System Fails to Boot From the Hard Disk

If the system fails to boot from the hard disk drive, check the following:

- If the error message “No ROM Basic” appears, you must format the hard drive. See Chapter 1 in this manual.
- Make sure the hard drive type number is configured correctly through the BIOS Setup Program. See Chapter 2 in this manual.
- If you have an IDE hard drive, make sure the IDE controller is enabled through the BIOS Setup Program. See Chapter 2 in this manual.
- If you have a SCSI hard drive, make sure the IDE controller is disabled through the BIOS Setup Program. See Chapter 2 in this manual.
- Insert a bootable diskette in the floppy drive and attempt to boot from it. If the system boots from the floppy drive, the hard disk may have corrupted boot information. Consult the troubleshooting information for your operating system to determine if the hard disk drive contains invalid boot information.
- If the system fails to boot from the floppy drive, make sure the floppy drive type number is configured correctly through the BIOS Setup Program. See Chapter 2 in this manual.
- Make sure the bootable floppy drive contains valid boot information by using it on another system. Make sure that the keyboard connector is firmly attached.
- Make sure the video controller card is installed. If you have installed additional memory in the PAC, make sure it is correctly oriented and firmly seated in the sockets. Make sure that the installed memory does not exceed the maximum permitted access time for the micro-processor speed.

On-board Memory is not Accessible

If the on-board memory is not accessible, check the following:

- Power on your system and make sure the memory size displayed during the POST equals the amount of memory installed on the system board.

■ **Note:** The number displayed during the POST does not include any expanded memory.

- If the amounts are equal, make sure the memory is installed in complete banks. If only one bank of memory is installed, make sure it is installed in Bank 0.
- Make sure the installed memory does not exceed the maximum permitted access time for the CPU speed.
- Make sure the installed memory is the correct type. Improperly intermixing memory can cause the BIOS to improperly size the RAM, reporting either too little or too much memory.

Expansion Card Fails to Function Properly

If an expansion card fails to function properly, check the following:

- If the system fails to function properly after installing an expansion card, make sure the card is properly configured. Refer to the manufacturer's documentation.
- Make sure the expansion card is not conflicting with memory interrupts or I/O addresses of any other expansion cards.

■ **Note:** Conflicts can often be isolated by removing the expansion cards one at a time. Turn the power off each time a card is removed.

Flat Panel Fails to Display

If the PAC's flat panel fails to display, check the following:

- Make sure the brightness knob is not turned all the way down.

External CRT Fails to Display

If you have an external CRT monitor connected to the video controller card and it fails to display, check the following:

- Make sure the brightness and contrast controls on the CRT are not turned all the way down.
- Make sure the CRT's cable is properly connected and secured to the VGA controller card in the PAC.
- Make sure the CRT is properly connected to a power source.
- Make sure the vertical and horizontal hold controls on the CRT are adjusted properly.

Mouse Fails to Work

If you have a mouse or other pointing device connected to the PAC and it fails to work, check the following:

- Make sure you have installed the correct mouse driver on your hard drive and that the mouse port is enabled.
- Refer to the documentation supplied with your mouse or operating system for more information.

Application does not Run Properly

If the system works but the application doesn't run properly, check the following:

- Determine the speed at which your application must operate and adjust the processing speed. Refer to the documentation supplied with your application program to determine the speed at which the computer must run.
- Make sure you have properly installed the application program.

Printer Fails to Work

If you have connected a printer to the PAC and it fails to work, check the following:

- Make sure the printer's AC power cord is plugged into a power source.
- Make sure the printer is turned on.
- If the printer is plugged into a switched, multiple outlet box, make sure the switch on the outlet box is turned on.

- Make sure the printer is on-line.
- Run the printer's internal self-test (if it has one) to make sure the printer is functional. Refer to the documentation supplied with the printer for more information.
- Make sure you have the correct interface cable for the printer. Make sure it is connected to the correct interface connector, its pins are not bent, and it is securely connected at both ends.
- Make sure you have selected the correct port setting when you configured your printer. The printer should be configured correctly for your PAC and for your application. You may need to change some switch settings.
- If you have a serial printer and are using MS-DOS®, make sure you have used the MODE command correctly.
- Make sure the port on the PAC is working properly by running another peripheral connected to the port. Make sure the port is configured the same way as the printer.
- If the printer still does not work, it may be in conflict with another card or option. Remove expansion cards and options (except the video controller) one at a time. Reinstall each card and option to isolate the conflict. Check the printer after you remove each card or option.
- If an error message is displayed on the printer, refer to the documentation supplied with the printer for more information.

Trouble Formatting a Floppy Diskette

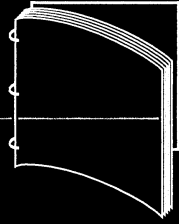
If you have trouble formatting a 3.5-inch floppy diskette, check the following:

- If you are using DOS, make sure you have used the proper commands to format the floppy diskette, as indicated below:

Enter **Format <drive>**: to format a 1.44 MB, 3.5-inch, high density diskette. Enter **Format <drive>: /t:80 /n:9** to format a 1.44 MB, 3.5-inch diskette as 710/720 KB low density diskette.

- Make sure the floppy drive type is configured correctly through the BIOS Setup Program. See Chapter 2 in this manual.

If you can't isolate or correct the problem, contact Dolch technical support.



THE APPENDIX

MANUAL EXTRAS

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THE APPENDIX

The Appendix contains the following sections:

- The Touch Panel Option
- The Card Retention Option
- Dolch Technical Support
- Limited Warranty



The Touch Panel Option

This section provides information concerning the touch panel available for the PAC as an option.

Installing the Touch Panel Software

There are two diskettes included with your PAC's touch panel option — one for DOS (TTDOS) and one for Windows (TTWIN). This manual provides information concerning TTWIN. If you are using the PAC touch panel with DOS-based applications, contact Dolch to receive a *TTDOS Operations Manual*.

■ **Note:** If you are using DOS-based applications with your touch panel PAC, contact Dolch to receive a *TTDOS Operations Manual*.

1. Start Windows.
2. Open the File Manager.
3. Insert the *TTWIN* diskette in drive A.
4. Select Run from the File menu (fig. A-1).

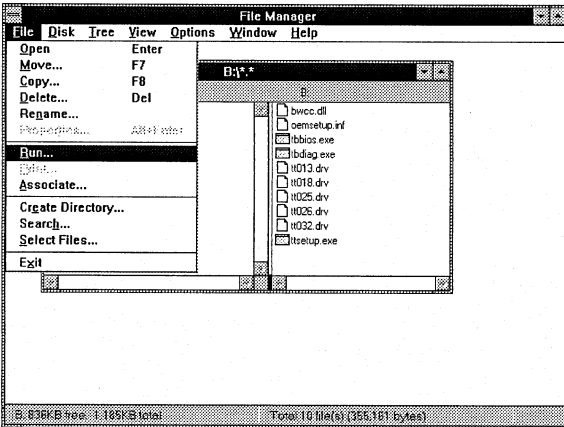


fig. A-1



5. Type `A:\ttsetup` in the command line field (fig. A-2) and click OK.

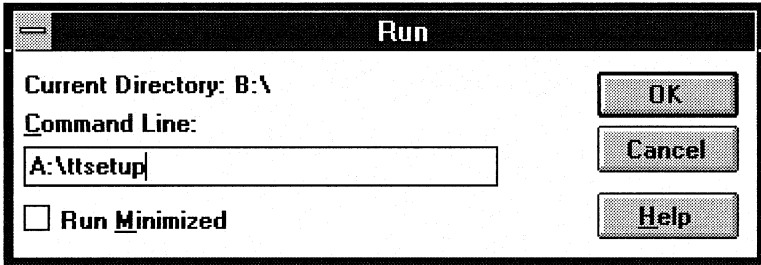


fig. A-2

6. When the TouchScreen Driver Setup screen appears (fig. A-3), enter the driver diskette drive or directory (if applicable) and click OK.



fig. A-3

- When the Driver PickList screen appears (fig. A-4), select **TTwin v3.16: Touch Technology Digitouch/AR5000** and click OK.

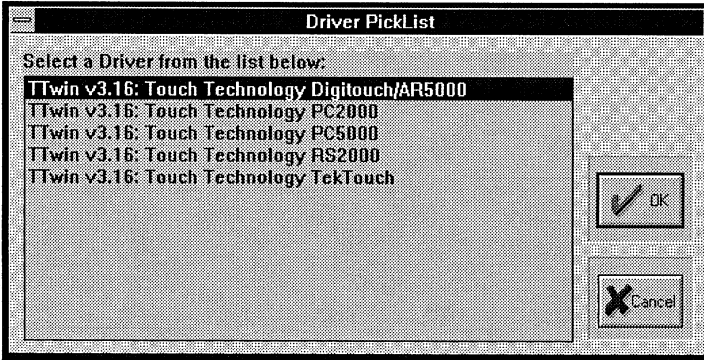


fig. A-4

- When the Hardware Controls (Serial) screen appears (fig. A-5), change any settings and click OK. The following settings must be made in the Hardware Controls screen: **Com Port: COM2; Address 2F8; IRQ: 3.**

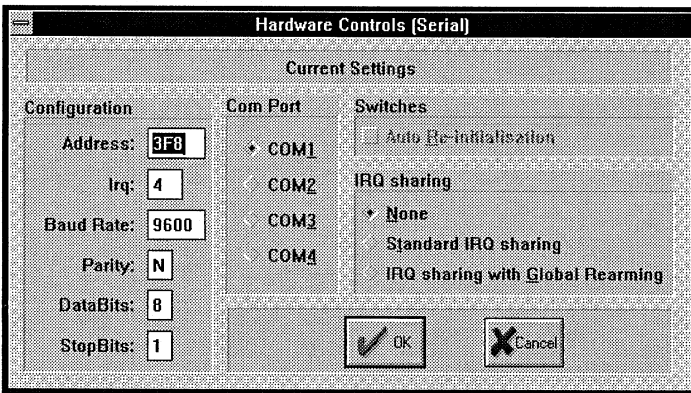


fig. A-5



9. When the Driver Switch Settings screen appears (fig. A-6), click OK.

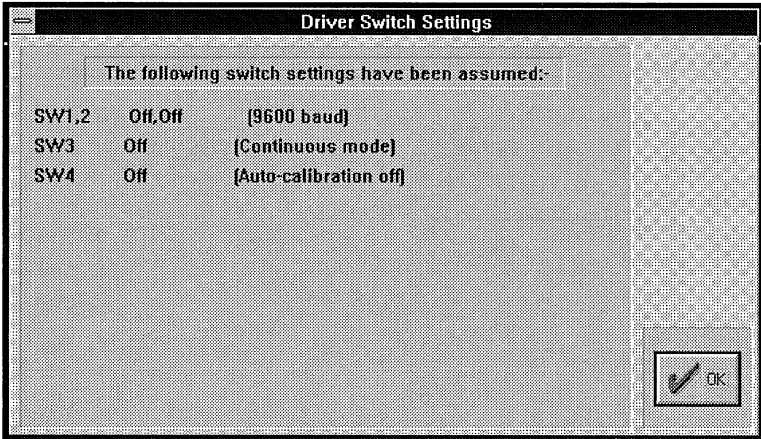


fig. A-6

10. When the driver software is successfully installed and set up, the following screen will appear (fig. A-7). Click OK and restart Windows.

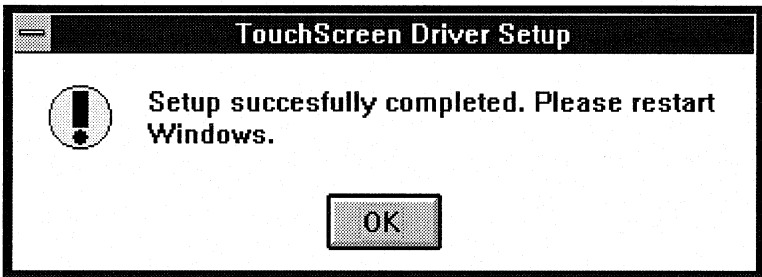


fig. A-7

Calibrating the Touch Panel

Before you use the touch panel on the PAC, you must run the calibration software, as described in the following procedures.

1. Start Windows and open TTsetup (fig. A-8).

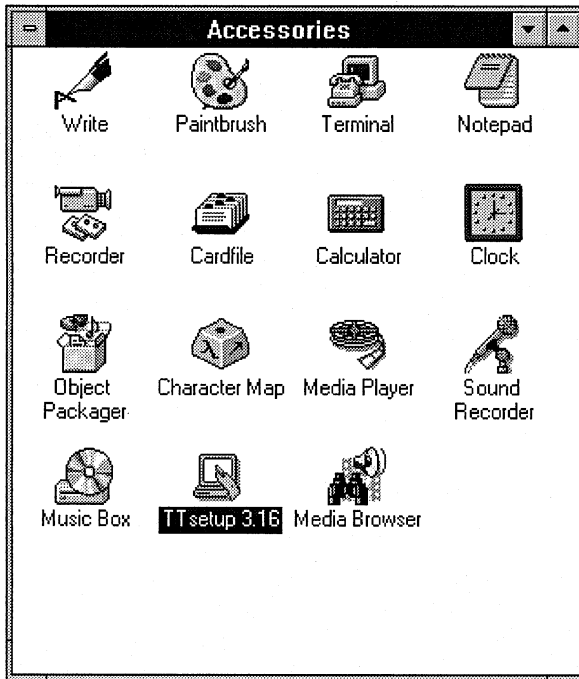


fig. A-8

2. Choose **Calibrate** from the TouchScreen Driver Setup menu (fig. A-9).

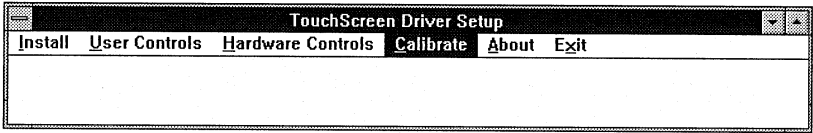


fig. A-9

3. A screen will appear asking you to press cross-marks (✕) in the lower left corner of the screen. Touch the cross-marks in the center. Then cross-marks will appear in the upper right corner of the screen. Touch the cross-marks in the center as well.

■ **Please Note:** You need to set up the PAC touch panel at COM2. If you have a integrated trackball it will be set up at COM1, otherwise you can use a mouse at COM1. If the touch panel's calibration is ever off you can use a mouse/trackball to get to the TTsetup calibration function. You can also use the keyboard to move the cursor and open TTsetup. Refer to the documentation supplied with Windows, as well as the following tables.

The following tables are taken from the Microsoft Windows User's Guide.

Switching Between Applications

| To Switch | Do This |
|--|--|
| Between applications | Press and hold down ALT or SHIFT+ALT, and repeatedly press TAB |
| To the next application | Press ALT+ESC |
| To the previous application | Press SHIFT+ALT+ESC |
| To Task List | Press CTRL+ESC |
| An MS-DOS-based application between a full screen and a window | Press ALT+ENTER |

Using Menus

| To | Press |
|---|---|
| Activate the menu bar | ALT or F10 |
| Select a menu | ALT+ the underlined character in the menu name |
| Choose a menu command | An arrow key, ENTER or the underlined character in a command name |
| Open the Control menu for an application window | ALT+SPACEBAR |
| Open the Control menu for a document window or a group window | ALT+HYPHEN |

Using Dialog Boxes

| To | Do This |
|--|----------------------|
| Move between items | See “Moving Around” |
| Carry out a command | Press ENTER |
| Choose a selected item | Press SPACEBAR |
| Open or close a selected list | Press ALT+DOWN ARROW |
| Move around and select items in a list | See “Moving Around” |
| Cancel the dialog box | Press ESC or ALT+F4 |

Moving Around

| To Move | Press |
|---|-------------------------------|
| Between menu commands, characters in a text box, or items in a list | An arrow key |
| To the next or previous dialog box item | TAB or SHIFT+TAB |
| To a dialog box item | ALT+ the character underlined |

Defining the User Controls

TTWIN provides a number of configuration options that affect the operational characteristics of the PAC's touch panel, enabling you to tailor it to your precise needs. All of the configuration options can be modified using the TTsetup.

1. Start Windows and open TTsetup (fig. A-10).

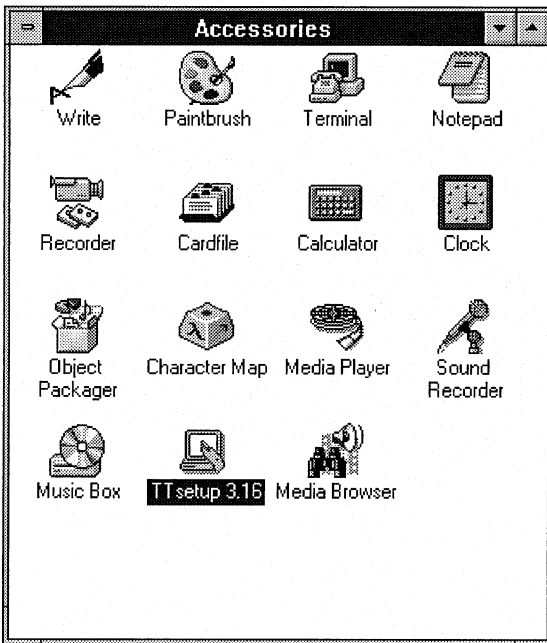


fig. A-10

2. Choose **User Controls** from the TouchScreen Driver Setup menu (fig. A-11).

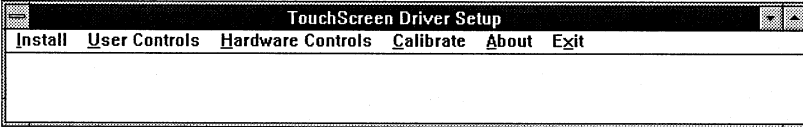


fig. A-11

The following screen will appear (fig. A-12).

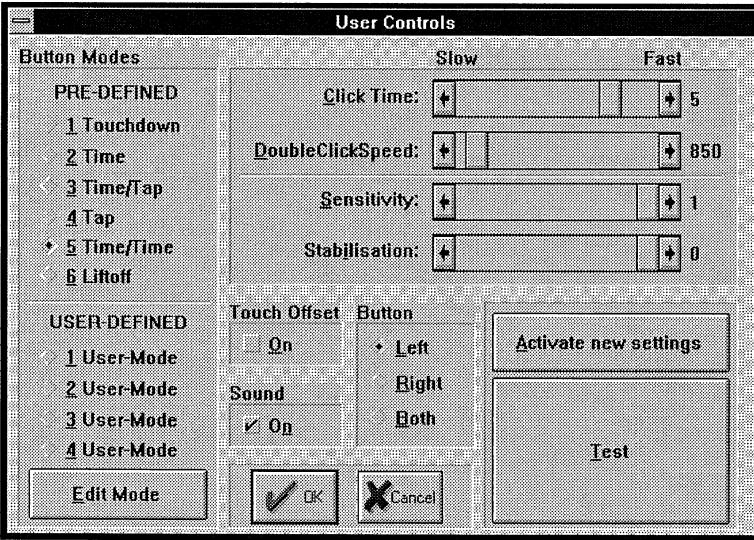


fig. 12



When you make changes to the configuration, you can press the Activate New Settings button to immediately enable your changes. You can then use the Test button to see how the button responds to touches. Pressing the OK button activates and saves your changes, and exits the User Controls. Pressing the Cancel button cancels any changes you have made, and exits the User Controls.

The User Controls menu controls the following functions:

- Button Modes (pre-defined and user-defined)
- Click Time
- Double Click Speed
- Sensitivity
- Stabilization
- Touch Offset
- Button
- Sound

Button Modes

The PAC's touch panel works like a mouse, but instead of button presses you use your finger. The button mode option in the User Controls menu determines the method used to simulate button presses and releases, and can be either pre-defined or user-defined. Both the pre-defined button modes and user-defined button modes are determined by button events and their touch triggers.

| Button Event | Description |
|---------------------|---|
| Down1 | The first mouse button press |
| Up1 | The first mouse button release |
| Down2 | The second mouse button press (for double clicks) |
| Up2 | The second mouse button release |
| Down3 | Subsequent mouse button presses |
| Up3 | Subsequent mouse button releases |

Touch triggers are assigned to the different button events, as explained below.

| Touch Trigger | Definition |
|---------------|---|
| None | The mouse button event will never occur, preventing double clicks or subsequent clicks. |
| Immediate | The mouse button event occurs immediately. This generates a mouse event immediately when it becomes possible. |
| Touchdown | The mouse button event will occur whenever a finger makes initial contact with the screen. |
| Liftoff | The mouse button event will occur whenever a finger breaks contact with the screen. A finger lift always causes the mouse button to be released if it is pressed. |
| Time | The mouse button event will occur by holding a finger stationary for a certain amount of time (defined by the Click Time option). |
| Tap | The mouse button event will occur when a finger lift (liftoff) is followed by a re-touch within a certain amount of time (defined by the Click Time option). |

Pre-Defined Button Modes

There are six pre-defined button modes available in the User Controls menu. These button modes can also be defined by the user since they are determined by the same criteria (button events and touch triggers).

1 Touchdown. The mouse cursor is moved to the point of touch, then the button is immediately pressed. You can then slide around with the button held down. The button is released when you remove your finger from the panel.

| | | | | | |
|-----------|---------|-----------|---------|-----------|---------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Touchdown | Liftoff | Touchdown | Liftoff | Touchdown | Liftoff |



2 Time. The mouse cursor is moved to the point of the touch, but the button is not pressed. You can then slide around with the button not pressed. Any time you hold your finger stationary for about half a second, the button is pressed and a beep sounds. Once pressed, you can slide around with the button pressed, and the button is only released when you remove your finger from the screen.

| | | | | | |
|-------|---------|-------|------|-------|------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Time | Liftoff | None | None | None | None |

3 Time/Tap. Time/Tap mode is similar to Time mode except that double clicks are possible. After holding stationary to generate a button press, you quickly lift your finger off the screen and then immediately touch it again. A second button press is generated immediately at the same location as the first one, and another beep sounds.

| | | | | | |
|-------|---------|-------|---------|-------|------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Time | Liftoff | Tap | Liftoff | None | None |

4 Tap. The mouse cursor is moved to the point of the touch, but the button is not pressed. Button presses are generated by quickly lifting your finger off the screen and then touching it again within a short time. Double clicks are achieved by doing this twice.

| | | | | | |
|-------|---------|-------|---------|-------|---------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Tap | Liftoff | Tap | Liftoff | Tap | Liftoff |

5 *Time/Time.* Time/Time mode is similar to Tap mode except that the second press is achieved by holding your finger stationary for a further half second after the first beep.

| | | | | | |
|--------------|------------|--------------|------------|--------------|------------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Time | Time | Immediate | Liftoff | None | None |

6 *Liftoff.* The mouse cursor is moved to the point of the touch, but the button is not pressed. When you lift your finger off the screen, the button is pressed and then immediately released again. Double clicks can be achieved by quickly touching the screen and lifting off again.

| | | | | | |
|--------------|------------|--------------|------------|--------------|------------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Liftoff | Immediate | Liftoff | Immediate | Liftoff | Immediate |



User-Defined Button Modes

TTsetup allows you to define, save, and recall up to four user-defined button modes, each with their own characteristics and behavior. These button modes allow you to specify the touch triggers which cause simulated mouse button events in a very flexible and powerful way. The user-defined button modes are similar to pre-defined except that you determine each of the touch triggers for each of the button events.

Initially, the four user-defined button modes are undefined in the User Controls menu. To define one, select 1 User Mode (fig. A-13) and press the Edit Mode button.

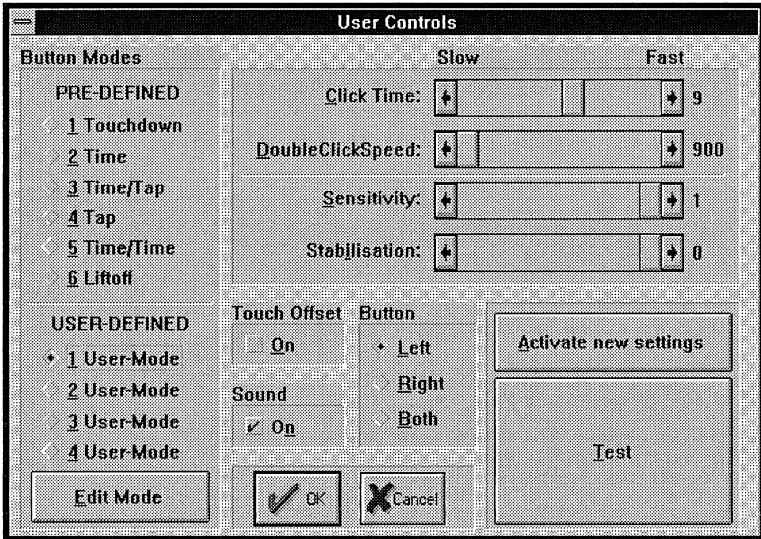


fig. A-13

The Set User Defined Mode menu will appear (fig. A-14).



fig. A-14

Tables 1-1 and 1-2 provide definitions for the button events and touch triggers used in the Set User Defined Mode menu.



Table 1-1

| Button Event | Description |
|---------------------|---|
| Down1 | The first mouse button press |
| Up1 | The first mouse button release |
| Down2 | The second mouse button press (for double clicks) |
| Up2 | The second mouse button release |
| Down3 | Subsequent mouse button presses |
| Up3 | Subsequent mouse button releases |

Table 1-2

| Touch Trigger | Definition |
|----------------------|---|
| None | The mouse button event will never occur, preventing double clicks or subsequent clicks. |
| Immediate | The mouse button event occurs immediately. This generates a mouse button event immediately when it becomes possible. |
| Touchdown | The mouse button event will occur whenever a finger makes initial contact with the screen. |
| Liftoff | The mouse button event will occur whenever a finger breaks contact with the screen. A finger lift always causes the mouse button to be released if it is pressed. |
| Time | The mouse button event will occur by holding a finger stationary for a certain amount of time (defined by the Click Time option). |
| Tap | The mouse button event will occur when a finger lift (liftoff) is followed by a re-touch within a certain amount of time (defined by the Click Time option). |

Select a touch trigger for each of the button events. You can use the Activate New Button Mode button and the Test Button to try out the button mode. Below are examples of user-defined buttons

| | | | | | |
|--------------|------------|--------------|------------|--------------|------------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Touchdown | Immediate | None | None | None | None |

This will generate an instantaneous single click (down and up) when the screen is touched. It will not be possible to drag the mouse cursor with the button pressed.

| | | | | | |
|--------------|------------|--------------|------------|--------------|------------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Touchdown | Immediate | Immediate | Immediate | None | None |

This will generate two instantaneous clicks (down, up, down, up) when the screen is touched. It will not be possible to drag the mouse cursor with the button pressed.

| | | | | | |
|--------------|------------|--------------|------------|--------------|------------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Time | Immediate | Immediate | Liftoff | None | None |

This will generate a double click when a touch is held stationary for a defined Click Time, and the button will remain down until the finger is lifted off the screen. It will be possible to drag the cursor with the button down.



| | | | | | |
|---------|-----------|-------|---------|-------|------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Liftoff | Immediate | Tap | Liftoff | None | None |

This will generate a single click (down and up) when the finger is lifted off the screen, and a second click if the screen is re-touched within the defined ClickTime. Then the button will remain down until the finger is again lifted off the screen.

| | | | | | |
|-------|------|-----------|------|-----------|------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Time | Time | Immediate | Time | Immediate | Time |

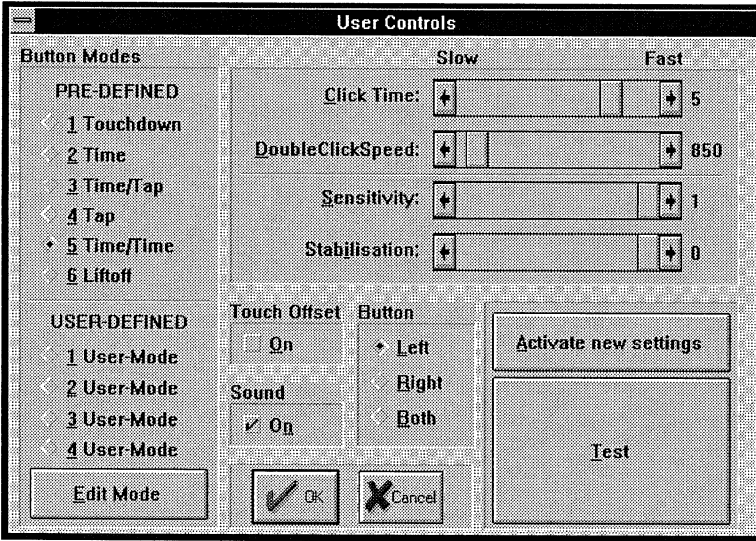
This will generate a continuous sequence of button presses as long as the finger is held stationary.

| | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|
| Down1 | Up1 | Down2 | Up2 | Down3 | Up3 |
| Touchdown | Immediate | Immediate | Immediate | Immediate | Immediate |

■ **Warning:** NOT RECOMMENDED! This will generate a continuous, never-ending button press on the first touch of the screen. TTWIN will go into a tight loop continuously pressing and releasing the button, and no other processing will be able to occur.

Touch Offset

Normally, the cursor is directly underneath your finger in TTWIN. With the touch offset option turned on, the cursor is offset directly above your finger (ten percent of the height of the panel). At the top and bottom of the panel, the cursor converges with your finger as you approach the edge. The touch offset can be very useful in applications where you need to see the precise position of the cursor, and is located in the User Controls menu.



User Controls Menu

Button

Normally, the left mouse button is simulated, although a configuration option allows the right button, or both buttons at once, to be simulated instead. The Button option is located in the User Controls menu.

Click Time

Click Time is a time interval used by TTWIN for a number of purposes, and is defined as a number of system clock ticks, there being 18.2 ticks to each second. The default value of Click Time is 9, and corresponds to about half a second. A small Click Time value corresponds to a shorter time, while a larger value corresponds to a longer time. The time and tap touch triggers (defined in the section entitled "Button Modes") are determined by the Click Time interval. Click Time also distinguishes between the first, second, and subsequent clicks, allowing each to be assigned to different types of touch triggers. The Click Time option is available in the User Controls menu.

Click Time Example

After the first click has been generated in the pre-defined button mode 3 (Time/Tap), TTWIN expects a tap event to generate a second click, but only if it occurs within the Click Time. After the Click Time, a tap will be ignored since TTWIN will then expect a first press, and will only respond to a time event. Similarly, after a second click and within the Click Time, TTWIN will expect the event defined for a subsequent button press, if any. After the Click Time, it will again start looking for the event defined for a first button press (or click).

■ **Note:** A second click of a double click must occur at the same location as the first click. This can be confusing, especially in button mode 1 (Touchdown). In an application such as the Windows Calculator, Touchdown mode is ideal for simulating the buttons of a real calculator. However, two successive clicks on two different buttons within the Click Time would be treated by TTWIN as a double click on the first button, which is incorrect in this situation. Instead, the Click Time should be reduced.

Double Click Speed

This option belongs to the Windows mouse control panel and is reproduced in the User Controls menu in the TTsetup for convenience. This option changes the speed at which Windows registers a double click. For touch panels, this normally needs to be set to the high-end of the scale.

Sensitivity

This option specifies the time interval required to register a finger lift, and uses the same units as the Click Time option. The default varies depending on the touch panel, but is the smallest value required to make the touch panel usable, typically 1, 2, or 3. In some cases you may wish to increase this time — any momentary loss of contact when sliding around will be ignored. Like the Click Time, this option is available in the User Controls menu.

Stabilization

This option sets the number of touch coordinates from the hardware that are averaged to produce stabilized values. The default varies depending on the touch panel, but is commonly 0, 2, or 3. This value may be increased if the cursor appears jittery. Specifying a higher than necessary value causes the cursor to be unnecessarily delayed in following your finger around the screen.

Sound

The sound option enables or disables the beep that accompanies a simulated button press, and is available in the User Controls menu.

Defining the Hardware Controls

All of the hardware configuration options can be modified using the Hardware Controls menus in TTsetup.

1. Start Windows and open TTsetup (fig. A-14).

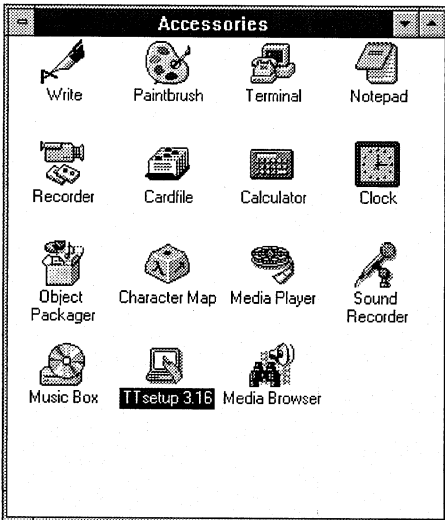


fig. A-14



2. Choose **Hardware Controls** from the TTsetup menu (fig. A-15). The Hardware Controls menu will appear (fig. A-16).

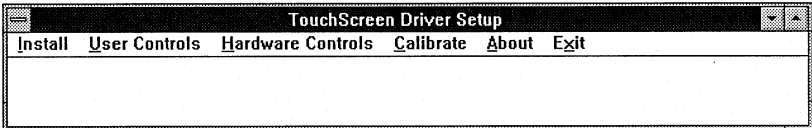


Fig. A-15

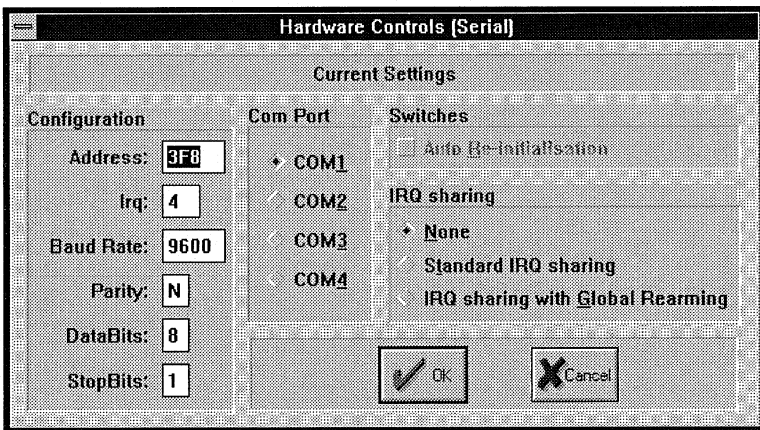


fig. A-16

3. Once you have made all your changes, press the OK button to exit and save the changes. Press the Cancel button to exit without saving your changes.
4. Restart Windows for your changes to take effect.

■ **Please Note:** Set up the touch panel at COM2. You can set up a mouse or the integrated trackball (if applicable) at COM1. This is important if the touch panel calibration is ever off. Then it will be possible to use a mouse to get to the TTsetup calibration function.

Standard COM Port Configurations

The PAC touch panel is connected to COM2 port. The default setting is COM1. The correct port address and IRQ will be assigned automatically. Table 1-8 provides the default port addresses and IRQs.

Table 1-8

| COM Port | Address | IRQ |
|----------|---------|-----|
| COM1 | 3F8 | 4 |
| COM2 | 2F8 | 3 |
| COM3 | 3E8 | 5 |
| COM4 | 2E8 | 2 |

Non-Standard COM Port Configurations

Other configurations can be configured by specifying the port address and IRQ explicitly. The port address is specified in hexadecimal.

In order for COM ports to work properly in 386 enhanced mode, the Windows Virtual COM Driver (VCD) must also know the configuration of the COM ports. Windows takes the COM port configuration from the [386enh] section of the SYSTEM.INI file, and assumes the following characteristics:

- COM1 Base = 3F8 COM1 IRQ = 4
- COM2 Base = 2F8 COM2 IRQ = 3
- COM3 Base = 2E8 COM3 IRQ = 4
- COM4 Base = 2E0 COM4 IRQ = 3

The defaults for COM1 and COM2 do not normally require overriding, but the defaults for COM3 and COM4 usually do. When you use the Hardware Controls menu in the TTsetup to select a non-standard COM port configuration, TTsetup updates the SYSTEM.INI for you.

In order to handle the port correctly in 386 enhanced mode, Windows also needs to find the port address listed in the BIOS COM port table. In many cases, non-standard COM ports will be detected by the system BIOS at boot time, so the port address will not be automatically listed in the BIOS COM port table. A small DOS utility, TBbios is provided with TTWIN, to force port addresses into the BIOS COM port table. Run this in your AUTOEXEC.BAT file. For example, "TBbios 3 3E8" will force the port address 3E8 into the entry for COM3 in the BIOS COM port table. TTsetup does not amend your AUTOEXEC.BAT file for you.

Communications Parameters

TTWIN chooses defaults for Baud Rate, Parity, Data bits, and Stop bits depending on the type of touch panel.

Shared IRQs and Global Rearming

TTWIN supports the ability for more than one COM port to share the same IRQ. For hardware reasons, this only works when the hardware is designed to support IRQ sharing, such as multiport serial adapter cards. You must have a serial adapter card with multiports in your personal computer for this to work. The global rearm IRQ-sharing mechanism is also supported.

WIN.INI

All the TTWIN configuration options are stored in the Windows configuration file WIN.INI. You may alter the TTWIN configuration by editing this file using a text editor. The syntax of the entries follows. All entries are shown with their default values, followed by the valid range of values.

[Touch-Base]

| | |
|--------------------------------|--------------------------------|
| ButtonMode=3 | 0 - 6 |
| ButtonDown1=0 | 0, 1, 2, 4, 8, 16, 32, 64 |
| ButtonUp1=0 | 0, 1, 2, 4, 8, 16, 32, 64 |
| ButtonDown2=0 | 0, 1, 2, 4, 8, 16, 32, 64 |
| ButtonUp2=0 | 0, 1, 2, 4, 8, 16, 32, 64 |
| ButtonDown3=0 | 0, 1, 2, 4, 8, 16, 32, 64 |
| ButtonUp3=0 | 0, 1, 2, 4, 8, 16, 32, 64 |
| ClickTime=9 | 1 - 20 |
| Sensitivity=1 | 1 - 20 |
| Stabilation=0 | 0 - 20 |
| Offset=Off | On, Off |
| Button=Left | Left, Right, Both |
| Sound=On | On, Off |
| ComPort=1 | 1, 2, 3, 4 |
| Address=3F8 | 0 - FFFF |
| Interrupt=4 | 1 - 15 |
| Baud=9600 | 1200, 2400, 4800, 9600 |
| Parity=N | N, O, E |
| DataBits=8 | 7, 8 |
| StopBits=1 | 1, 2 |
| IRQshare=Off | On, Off |
| IRQreArm=Off | On, Off |
| Path=.A DOS directory pathname | |
| UserMode1=n n n n n | 0, 1, 2, 4, 8, 16, 32, 64 (x6) |
| UserMode2=n n n n n | 0, 1, 2, 4, 8, 16, 32, 64 (x6) |
| UserMode3=n n n n n | 0, 1, 2, 4, 8, 16, 32, 64 (x6) |
| UserMode4=n n n n n | 0, 1, 2, 4, 8, 16, 32, 64 (x6) |
| CurrentUserMode=n | 1 - 4 |

ButtonDown1 - ButtonUp3 are only processed if ButtonMode is 0.

“Path” specifies the pathname of the calibration file. If this option is not used, the TWcalib file will reside in the Windows directory. This option may be used to locate it elsewhere.

The touch triggers for the user-defined button modes are defined by numbers, as indicated in Table 1-3.

Table 1-3

| | | |
|----|-----------|---|
| 0 | None | The mouse button event will never occur |
| 1 | Immediate | The mouse button event will occur immediately |
| 2 | Touchdown | The mouse button event will occur on touchdown |
| 4 | Liftoff | The mouse button event will occur on liftoff |
| 8 | Time | The mouse button event will occur on stationary touch |
| 16 | Tap | The mouse button event will occur on tapping the screen |

An even further range of possibilities is available here than in the control program — touch events can be ORed by adding their configuration numbers together. For example, the value 24 would define a trigger of Tap or Time.

The default baud rate, parity, data bits, and stop bits are dependent on the panel. IRQshare and IRQ rearm are mutually exclusive (only one should be on at a time).

TTWIN and Mice

TTWIN operates with the PAC's touch panel alone if you don't have a mouse attached to your computer. You can use TTWIN on a system that doesn't have a touch panel to operate a mouse. If both a mouse and the touch panel are present, TTWIN operates both.

TTWIN supports all types of Microsoft and IBM PS/2 mice, and is 100 percent hardware compatible. However, since Windows can only load one mouse driver at a time, it is not possible to provide simultaneous support for mice that require their own special Windows driver.

TTWIN and TTDOS

In Windows Real and Standard modes, TTDOS may be left resident while Windows runs. TTDOS will be disabled while Windows is running, but restored to operation when Windows terminates or executes a DOS shell.

In Windows Enhanced mode, each virtual machine is a perfect copy of the machine environment which Windows finds when it starts up, including any TSRs. Windows continues to reflect serial interrupts into TTDOS, as well as TTWIN, with the result that the Windows driver loses data and performance of the touch panel is severely degraded. For this reason, TTDOS must not be loaded when Windows is started in Enhanced mode.

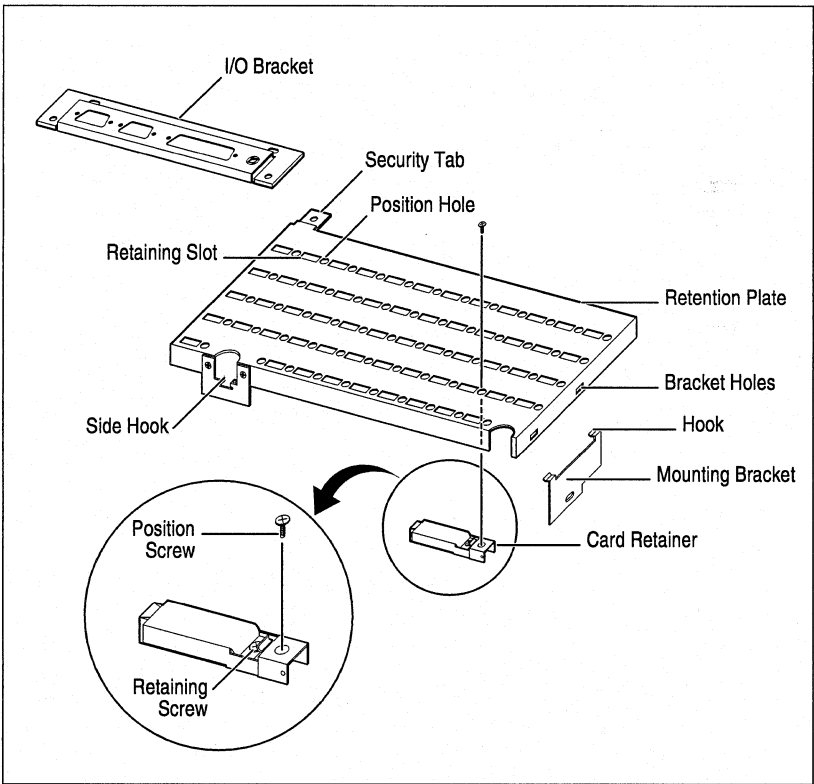
■ **Note:** If you are using TTDOS with your PAC's touch panel, contact Dolch to receive a *TTDOS Operations Manual*.

The Card Retention Option

The card retention system from Dolch Computer Systems is available as an option. The card retention system can be purchased at the time of your original order, or later as an upgrade.

Identifying the Components

The following figure illustrates the card retention system's components.



Components

Installing the System

If you purchased the card retention system when you purchased your system, it was mounted at the factory. If you purchased the card retention system as an upgrade, you must mount a few parts in your PAC in order to use it.

1. Open up the main unit according to the procedures provided in Chapter 5 of this manual.
2. Mount the I/O bracket on the power supply (fig. A-17).
3. Remove the screw securing the system fan on the side of the PAC. Insert the mounting bracket and secure it in place with this fan screw (fig. A-18).
4. The hooks on the mounting bracket fit into the bracket holes on the retention place (fig. A-19).
5. The security tab and screw bolts the retention plate into place on the I/O bracket (fig. A-20).

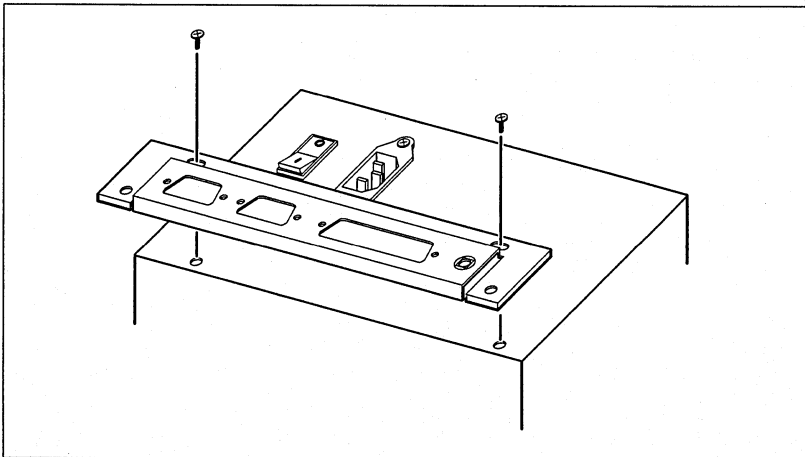


fig. A-17

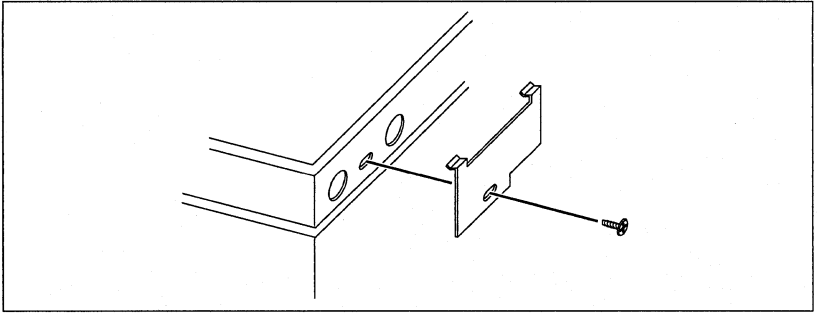


fig. A-18

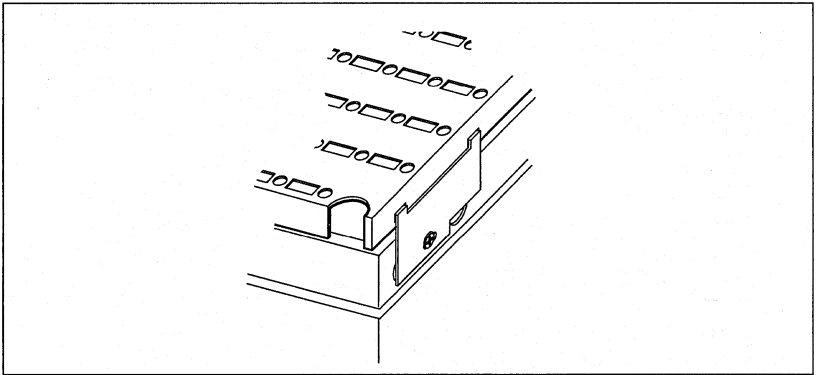


fig. A-19

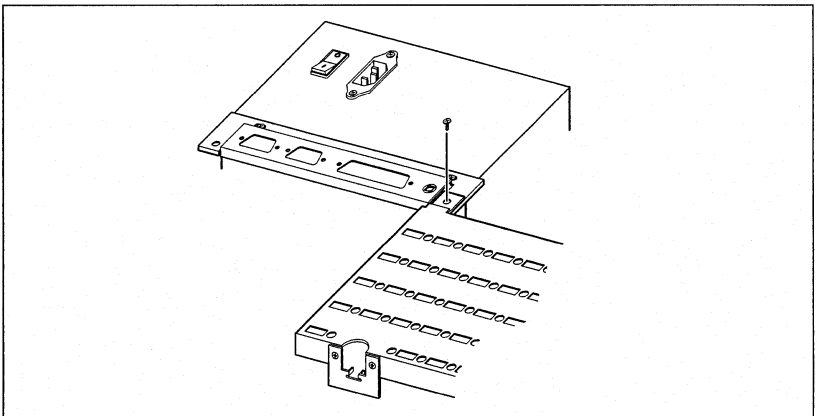


fig. A-20

Using the System

The following procedures explain how to use the card retention system.

Positioning the Card Retainers

1. Align the plastic guide of the card retainer close to the edge of the expansion card (fig. A-21).
2. Then position the card retainer in the closest position hole in the retention plate (fig. A-21).
3. Secure the card retainer in position using the position screw (fig. A-21).
4. Repeat these steps for every full-length card installed in your PAC.

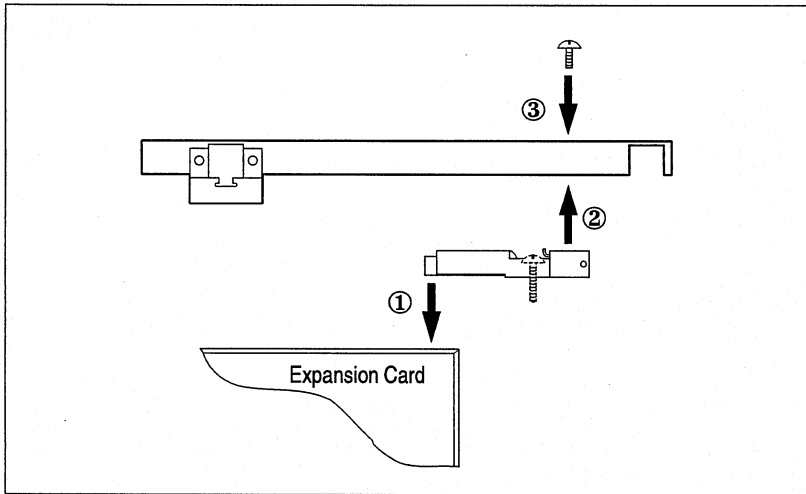


fig. A-21

Angling the Card Retainers

1. Angle the plastic guides of the card retainers downward (fig. A-22). This helps to seat the card retainers on the expansion card edges.

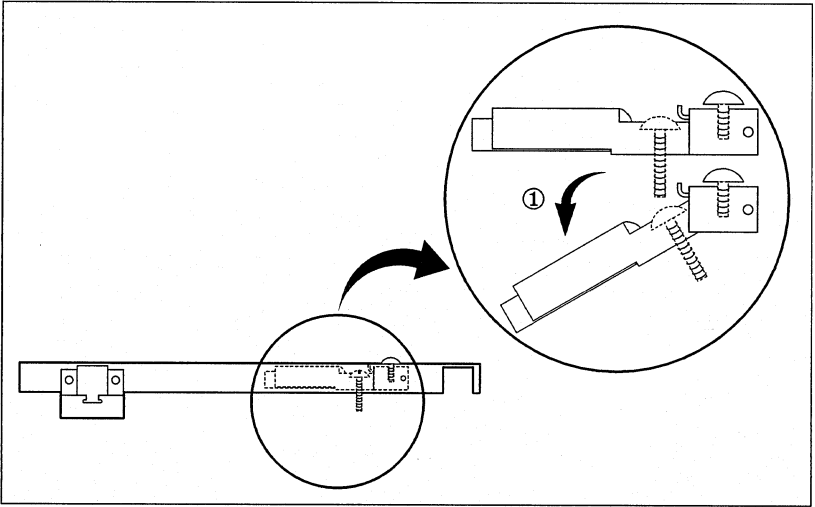


fig. A-22

Securing the Retention Plate

1. Working at an angle, align the bracket holes on the retention plate with the two hooks on the mounting bracket (fig. A-23).
2. Lower the retention plate — aligning the card retainers with their expansion cards — until the plate is parallel to the expansion cards (fig. A-23).
3. Make sure the side hooks snap into the appropriate opening on the PAC's chassis (fig. A-23).
4. Use the security tab and screw to bolt down the retention plate.

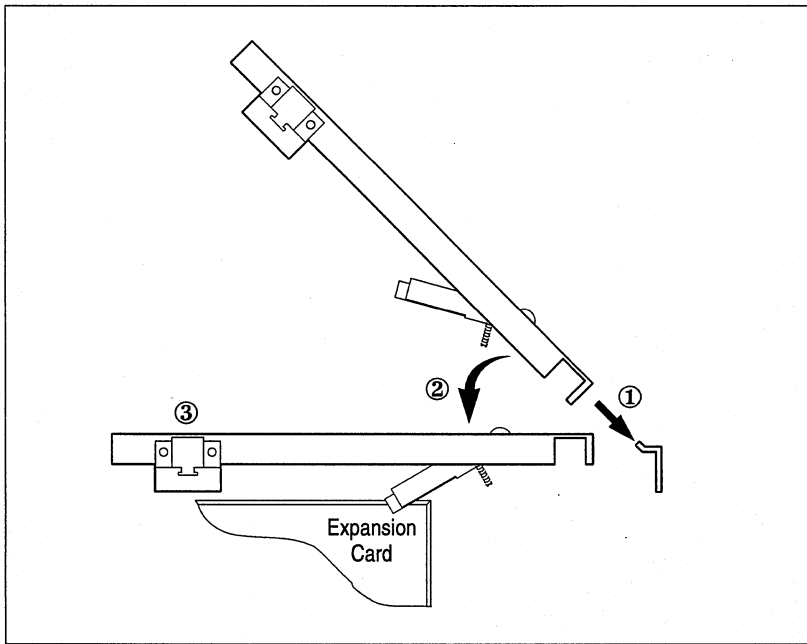


fig. A-23

Adjusting the Card Retainers

1. Adjust the card retainers by using the retention screw. You must use a screwdriver that can fit through the retaining slot on the retention plate (fig. A-24).
2. Turn the retention screw counter-clockwise to tighten the card retainer on the card. The retaining screw will push against the retention bracket for a secure fit (fig. A-24).

■ **Warning:** Once you feel resistance from the expansion card, only take two more full turns.

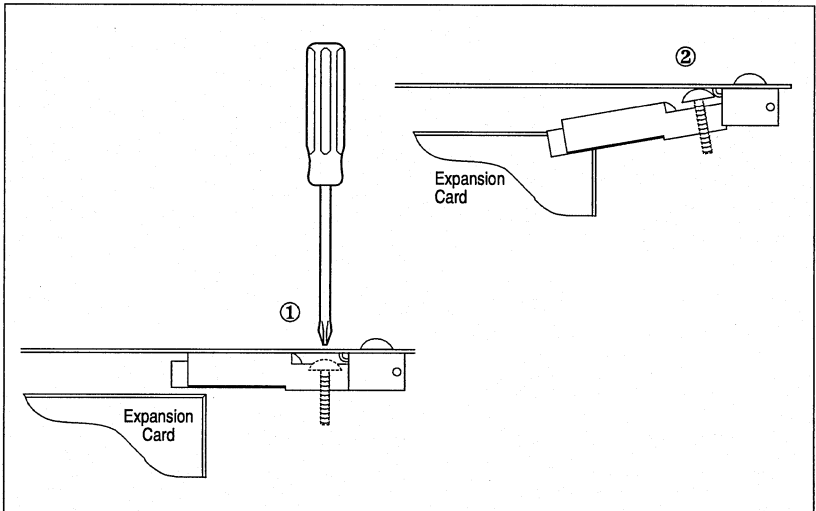


fig. A-24

Dolch Technical Support

If you are unable to obtain proper use of your PAC, contact Dolch Computer Systems for technical support.

To ensure the most efficient technical support, be prepared to operate your PAC while discussing the problem with a Dolch technical support representative. Dolch technical support lines are available as follows:

If You Purchased Your PAC in the United States

- Toll Free: (800) 538.7506, Monday through Friday, 8:00 AM to 5:00 PM pacific time (excluding holidays)
- Facsimile: (408) 263.6305

You can also use the Dolch Bulletin Board.

- Telephone: (408) 262.2073
- Modem: 9600 Baud
- Settings: N•8•1 (No Parity, 8 Bits, 1 Stop Bit)

If You Purchased Your PAC Outside of the United States

If you purchased your PAC outside of the United States, you must contact the nearest Dolch subsidiary concerning support.

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D-85521 Ottobrunn

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Netherlands

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Limited Warranty

Dolch warrants this product, provided the serial number appears on the Product and is as originally configured by the factory, against defects in material or workmanship as follows:

1. **Labor Charges.** For a period of one (1) year from the date of original purchase there will be no labor charges for repairing the defective Product. This can be extended to two (2) years for customers in the United States by completing and returning the PAC Warranty Registration Card included with your PAC.
2. **Charges for Replacement Parts.** For a period of one (1) year from the date of original purchase, Dolch will supply, at no charge, new or rebuilt replacement parts for defective parts.

If failure of the Product has resulted from accident, abuse, or misapplication, Dolch shall have no responsibility under this Limited Warranty.

Purchaser's Exclusive Remedies

During the Warranty Period, your exclusive remedy for a defective Product is the repair or replacement, at Dolch's option, of the defective part.

DOLCH'S LIABILITY TO YOU, THE ORIGINAL PURCHASER, FOR ANY CLAIM, LOSS, DAMAGE OR EXPENSES OF ANY KIND, (INCLUDING ATTORNEY'S FEES), RESULTING FROM OR IN CONNECTION WITH GOODS OR ANY DEFECT, REPAIR, REPLACEMENT, NEGLIGENCE, OR ANY OTHER CAUSE WHATSOEVER, REGARDLESS OF FORM OR ACTION, SHALL IN NO EVENT EXCEED THE ACTUAL CASH AMOUNT RECEIVED BY DOLCH FOR SAID DEFECTIVE PART.



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Extended Warranty (for U.S. Customers)

By completing and mailing the PAC Warranty Registration Card, along with a copy of your proof of purchase in the form of a bill of sale or a receipted invoice, you can extend the one year labor warranty to two years.

Dolch Computer Systems also provides extended service contracts. To find out more about these programs, contact Dolch Computer Systems.

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