

User's Guide

A4000

AMIGA

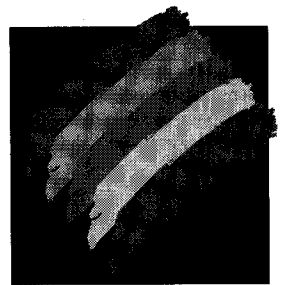


 **Commodore**

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- 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.

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This book was produced using a variety of Commodore systems by Ross Hippely, Wilson Harp, and Carina Ahren.

P/N: 368 924-01

WARNING

Installation information in this document is for reference only. All installation of internal optional devices or equipment including third-party optional devices or equipment, should be performed by an experienced and knowledgeable technician. All servicing or upgrading of original or optional devices or equipment should also be performed by an experienced and knowledgeable technician. **UNAUTHORIZED INSTALLATION, SERVICING OR UPGRADING MAY VOID YOUR WARRANTIES.**

This manual provides a general description of various product configurations and features currently planned for inclusion in Commodore's product line. The configurations and features described may not be available or otherwise apply to your particular system. Please consult your Commodore dealer with any questions.

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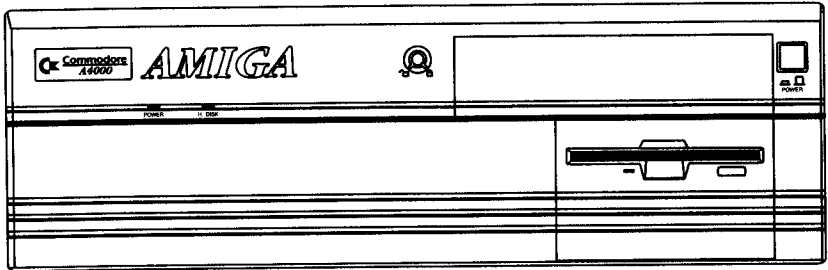
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Welcome



The hardware strengths of the Commodore™ Amiga™ family of personal computers make the Amiga the computer platform of choice for video, multimedia, 3-D modeling, and other graphics-intensive applications. The Amiga 4000 line features more sophisticated standard graphics capabilities and a modular, easily-expandable base unit for maximum flexibility.

Features

The Amiga 4000 (A4000) offers the most advanced set of features in the Amiga line. These features include:

- Motorola 68040 series microprocessor running at 25 MHz, on a removable processor module
- AA custom chipset offering graphics with 256 colors from a palette of 16.8 million in all color modes
- Up to 2 MB 32-bit "Chip" memory using SIMMs
- Up to 16 MB 32-bit "Fast" memory using SIMMs

- Four Zorro III AUTOCONFIG expansion slots
- Extended video slot
- Local-bus CPU slot
- Three PC/AT compatible bridge slots
- High-capacity (1.76 MB) floppy drive
- AT IDE hard drive interface (16-bit)
- Mounting provisions for internal 3.5-inch and 5.25-inch devices
- Four-voice stereo sound output
- Front panel keylock for security

Using this Guide

This guide is designed to help you set up your Amiga system quickly and safely. It contains information on making the necessary external connections, adding internal and external expansion options, and other hardware-related tasks. Once your Amiga system is up and running properly, you should be able to put this manual aside until such time as you add expansion hardware or need technical information.

Consult the other Amiga documentation included with your system for software information.

Document Conventions

In this and other Amiga documentation from Commodore, the following conventions are used:

- Amiga, A4000** The Amiga 4000 main unit is usually referred to as the A4000 or the Amiga.
- Key1 + Key2** Key combinations with a plus (+) sign between the keys indicate pressing the keys simultaneously. For example, Right Amiga+O means to hold down the right Amiga key and, while holding it down, press O.

- Amiga keys** These two keys on the Amiga keyboard are used for special functions. The left Amiga key is to the left of the space bar and is marked with a large solid A. The right Amiga key is to the right of the space bar and is marked with an outlined A. Unlike Shift and Alt key pairs, the two Amiga keys usually have different functions.
- Enter** Directions to "enter" something mean to type in the indicated information and then press Return.
- arrow keys** The arrow keys are the four keys in an inverted-T formation to the right of the main keyboard, with arrows on them pointing up, down, left, and right. Do not confuse these keys with others on the keyboard marked with arrows.

Related Documentation

- *Using the Amiga Workbench™*
- *Using AmigaDOS™*
- *Using ARexx™*
- *The Amiga Hard Drive User's Guide*

If you come upon terms in this book that you do not understand, look in the Glossary of *Using the Amiga Workbench*, which defines many computer and Amiga-specific terms.

Chapter 1

Quick Connect

As you unpack your system, check the items in the system box. Contact your dealer immediately if anything is damaged.

This chapter guides you through setting up your system. Read the instructions carefully.

Before You Begin

- Choose a location for your system away from heat, dust, smoke, vibration and electrical interference.
- Choose a stable work surface at least 15 cm away from a wall. The ventilation slots on the back of the main unit must not be blocked.
- Have on hand a multi-outlet power strip with surge protection. (These units are available from most computer stores.) Commodore strongly recommends that you use this type of outlet to protect your system from electrical problems.
- Make sure your equipment matches the electrical requirements for the country in which you are using the computer. For example, you can't use a 110/115 volt model in countries having a 220/240 volt system.
- Read the descriptions in this chapter to acquaint yourself with the purpose and function of each feature and connector.

As You Set Up Your System

- If possible, plug your system into a separate circuit to avoid any electrical interference. Voltage surges and drops caused by

devices such as air conditioners, fans and vacuum cleaners can cause damage to your computer data and/or to the computer itself.

- Look at your system and match the features and connectors with the illustrations in this chapter. Use the illustrations to help you identify the lights, switches, connectors and disk drive.
- Use the instructions to connect the monitor, keyboard and any optional peripherals to the system unit. All connectors are shaped so they fit only one way. Don't try to force a cable into a connector.
- Never connect or disconnect any equipment when the system power is on!
- If you have a problem, always check the instructions before proceeding, especially the illustrations. Remember, you can cause damage by not following instructions.

Main Unit

The main unit case contains the basic components that run your computer. The system motherboard, disk drives, power supply, and optional expansion boards are located in the main unit. The other parts of your computer system connect to the main unit by cables.

Figure 1-1, the front panel, identifies system features such as the key lock and floppy disk drive. The left side panel, illustrated in Figure 1-2, shows the mouse port. The rear panel, illustrated in Figure 1-3, shows you where the other parts of your system (for example, the monitor and keyboard) plug into the main unit.

Front Panel

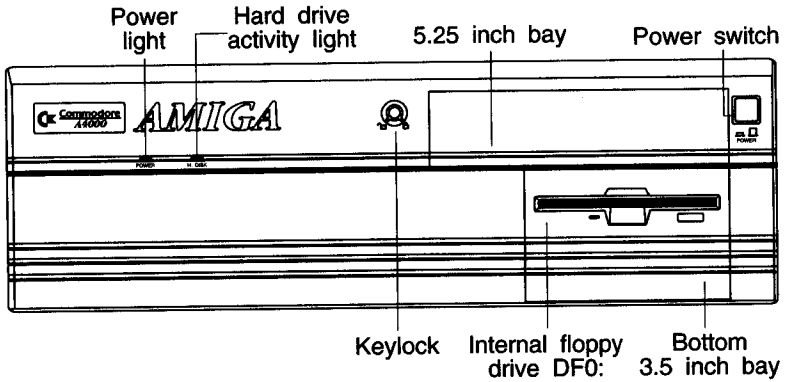


Figure 1-1. A4000 front panel

Side Panel

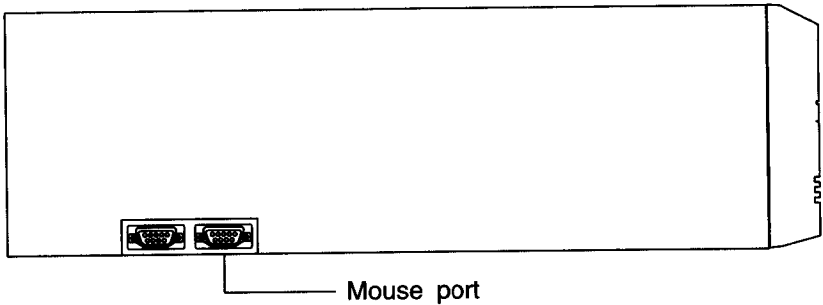


Figure 1-2. A4000 left side

Rear Panel

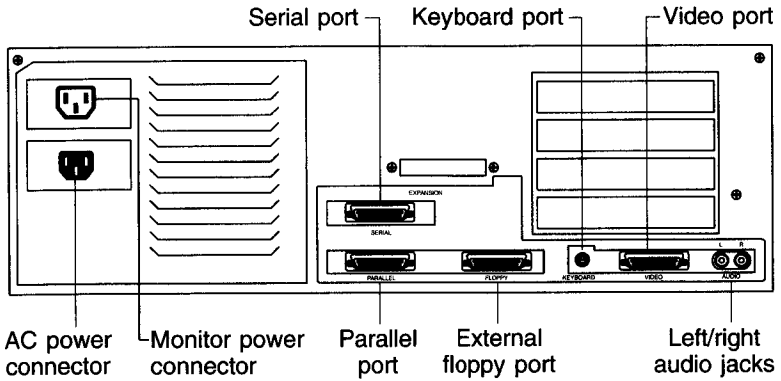


Figure 1-3. A4000 rear panel

Connecting the Basic Equipment

Begin setting up your Amiga system by connecting the keyboard, connecting the mouse, and connecting the monitor.

Attaching the Keyboard

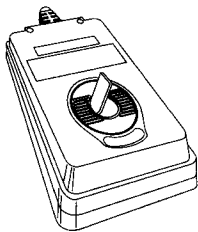


Plug the keyboard cable into the port labeled **KEYBOARD**. The indentation on the connector at the keyboard cable must be facing up.

Attaching the Mouse



To attach the mouse, plug the mouse cable into the front mouse port on the left side of the Amiga. Press firmly, but do not force. The cable connector is designed to fit snugly into the mouse port.



Leave a clear area approximately 12 inches (30 centimeters) square to the right or the left of the keyboard so that you have room to move the mouse freely. Use of a mouse pad helps keep the mouse from getting dirty and makes it respond better.

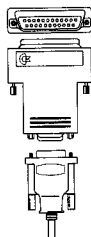
Before using the mouse, remove the packing material. Turn the mouse upside down and pull out the piece of foam that holds the mouse ball in place.

Attaching the Monitor



Plug the monitor cable into the port labeled VIDEO. If the cable has a small 15-pin VGA-style connector, connect the 23-pin to 15-pin adapter included with the A4000 to the VIDEO port, then connect the monitor cable to the adapter.

Several types of monitors can be used with the A4000. An analog RGB monitor with a 23-pin female connector, such as the Commodore 1084 or 1084S, connects directly to the A4000 VIDEO port. This monitor must be capable of a 15 KHz horizontal scan rate to accept the Amiga's standard video output. See Appendix A for more information on monitor compatibility.



By using the 23-pin to 15-pin adapter, most multiscan or VGA/SVGA type monitors can be connected. Such monitors allow use of the Amiga's higher-resolution display modes (over 15 KHz horizontal scan rate). A multiscan monitor is required if you wish to use display modes that have different horizontal scan rates.

To use additional hardware, you may need other types of display devices and/or adapters. For example:

- A very high-resolution, accelerated graphics board may require a special high-bandwidth monitor with separate red, green, and blue BNC input connectors.
- A genlock, RF modulator, or other video related device allows you to use an ordinary television or a composite video monitor for certain display modes. Such devices may have an F (coaxial) connector, antenna leads, RCA jacks, and/or BNC connectors.

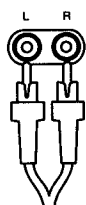
See the documentation for your graphics expansion hardware and your monitor for specific information about making the proper connections. Your dealer can help you choose the right combination of graphics hardware, monitor, and monitor cable or adapter for your use.

If you have no optional equipment to install, skip ahead to the section, "*Connecting Power and Turning On the Amiga.*" Power connection is always the final step.

Connecting Optional Equipment

If you have tested your Amiga system after making the basic connections, turn it off before connecting any other items. Never attempt to connect or disconnect anything while the power is on.

Audio Connection



Two RCA jacks (female connectors) labeled AUDIO L and R connect the Amiga's left and right sound channels to a monitor or audio equipment.

Audio Connection to a Stereo Monitor

A monitor with internal speakers allows you to hear the Amiga's sound output without other external equipment. An Amiga stereo monitor comes with a stereo cable, color-coded for the left and right channels. Insert the connectors at one end of the cable into the Amiga's left and right audio output jacks. Then insert

the cable's other connectors into the corresponding audio input jacks on the monitor.

Audio Connection to a Monaural Monitor

A monitor with monaural sound capability, can still accept both Amiga audio channels. Either use a "Y" adapter cable plugged into both Amiga audio jacks, or plug a single audio cable into one of the jacks. Insert the other end of the cable into the monitor's audio input jack. Both audio channels will be routed to the monitor speaker.

Audio Connection to Other Equipment

If your monitor does not have speakers, you can connect the Amiga's audio output to separate powered speakers, a stereo system, or other audio equipment. Use input connectors labeled Auxiliary, Aux, Audio In, CD, Tape, VCR Audio, etc. on the equipment. You need a stereo audio cable with RCA connectors at one end and the appropriate type of connector for your equipment at the other end. Audio cables and adapters are available from most electronics and stereo stores.

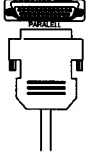
Insert the RCA connectors into the Amiga's audio output jacks and the other connectors into the equipment's audio input jacks. Consult the equipment's user manual for further instructions on using its external inputs.

Attaching an External Floppy Drive



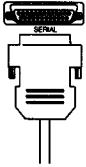
To attach an external 3.5-inch floppy drive to the Amiga, use the port labeled FLOPPY. The drive must be Amiga compatible, with a 23-pin male connector.

Attaching a Parallel Device



To attach a parallel device such as a Centronics compatible printer or a scanner to the Amiga, use the port labeled **PARALLEL**. The cable you use must have a 25-pin male connector on the Amiga end and the appropriate type of connector for the parallel device on the other end.

Attaching a Serial Device



To attach a serial device, such as a modem, MIDI interface, or serial printer, use the port labeled **SERIAL**. This connector is directly above the **PARALLEL** connector. The cable you use must have a 25-pin female connector on the Amiga end and the appropriate type of connector for the serial device on the other end.

Attaching a Joystick



To attach a joystick, light pen, or other special controller, use the rear 9-pin port on the left side of the unit. The controller's connector must be female.

Note

Refer to Appendix B for technical information on the internal and external connectors.

Connecting Power and Turning On the Amiga

Caution

Do not plug in and turn on the Amiga until you have securely connected all equipment.

When all other connections have been made, you can connect your system to power and turn it on.

1. Connect peripherals to power.
2. Plug in all peripheral equipment as described in the previous sections.
3. Attach the Amiga power cable.



In the United States and Canada the Amiga power cable is a free cable with a 3-pin female connector at one end and a standard 3-prong male power plug on the other end. The female end is attached to the lower (male) power connector. The other end of the cable may then be inserted into a three-prong grounded AC outlet.

If you have a monitor whose power connector fits into the upper (female) power connector, you can plug the monitor into it, and control power to both the Amiga and the monitor with the Amiga power switch.

Note Different countries may use other power cable designs. Be sure your Amiga matches the electrical voltage requirements in your country.

If in doubt about electrical hookup requirements consult your dealer.

4. Plug in the Amiga
5. Turn on the other equipment
6. Insert the key in the keylock

Make sure the keylock is in the unlocked position.

7. Turn on the Amiga

Press the power switch at the top right corner of the front of the main unit. The Amiga will begin to boot. Chapter 2 contains information on booting the Amiga.

Chapter 2

Getting Started

This chapter covers booting your Amiga system for the first time, and using the keylock, keyboard, and keyboard mouse equivalents.

Booting

What you see when you turn on the Amiga depends on whether you have a hard disk based system or a floppy disk based system with no hard disk.

Floppy-Based Systems

When a floppy-based Amiga system is turned on, it looks for a bootable floppy disk in the internal floppy drive, DF0:. This disk can be a copy of your Workbench disk or a bootable application disk.

If a bootable disk is not found, the Amiga prompts you by displaying a disk being inserted into a drive. When a bootable floppy disk is inserted into DF0:, the screen goes blank while the Amiga loads the system information it needs from the disk.

Booting from floppy takes about two minutes. When the process is complete, you should see a screen similar to that illustrated in Figure 2-1.

Hard Disk-Based Systems

The Amiga can boot directly from a hard disk if your system has one. You do not need to insert any floppy disks.

The Opening Screen

When the Amiga has finished booting, the Amiga Workbench screen is displayed (Figure 2-1). If you do not see a screen similar to this, the Amiga did not boot successfully and you should refer to Chapter 7, "Help with System Problems."

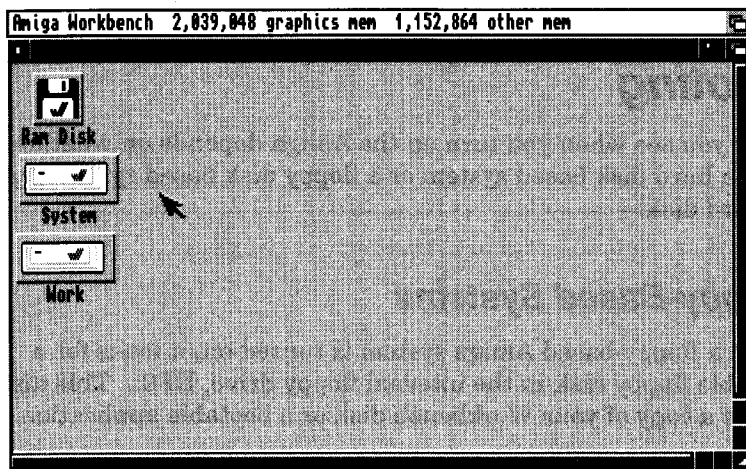


Figure 2-1. Workbench screen

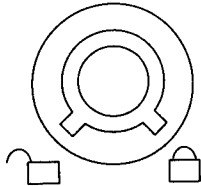
With the Workbench screen displayed, you can set up the Workbench environment as it suits you and configure the system to take best advantage of your hardware setup.

See *Using the Amiga Workbench* for complete information on:

- Booting and rebooting
- Installing and reinstalling the system software
- Setting your system up for your language and country
- Making backup copies of your system disks
- Using the Preferences editors

The rest of this guide assumes that you are familiar with basic Amiga operations and terminology.

The Keylock



The A4000 front panel keylock is designed to prevent unauthorized use of the Amiga. When the keylock key is in the unlocked position the keyboard and mouse work normally. When the key is in the locked position, the Amiga does not respond to keyboard or mouse activity. Remove the key from the lock when in the locked position, and take the key with you to prevent unauthorized access to the computer.

Note Although mouse motion has no effect when the keylock is locked, the Amiga does respond to the mouse buttons. Do not leave the mouse pointer over a gadget or icon when locking it, to prevent mouse button clicks from having an effect.

The system can still be turned off when the keylock is in the locked position.

Turning Off the Amiga

When you finish a computing session and want to turn off the Amiga:

1. Save to disk any work that you want to keep. Turning off or rebooting the Amiga erases whatever is in memory.

Important: Do not turn off or reboot the Amiga while any disk activity is in progress! Wait at least 5 seconds after all disk drive activity lights have gone out before removing floppy disks or turning off the Amiga. Also, if you are using software that automatically saves to disk periodically or which allows remote access to the Amiga's disks through a network, exit the software or disable the network connection before powering off or rebooting.

2. Remove any disks from the floppy drive(s).

3. Press the power switch on the upper right front corner of the Amiga. The power light on the left front of the Amiga will go out.
4. Turn off the monitor and any peripherals.

Note If you want to turn the Amiga on again immediately, wait at least 10 seconds after turning the machine off before turning it on again.

The Amiga Keyboard

The Amiga keyboard is similar to industry-standard computer keyboards. It has four sections:

- The main keyboard
- The numeric keypad
- The function keys
- The Del, Help, and arrow keys

Figure 2-2 illustrates the keyboard layout.

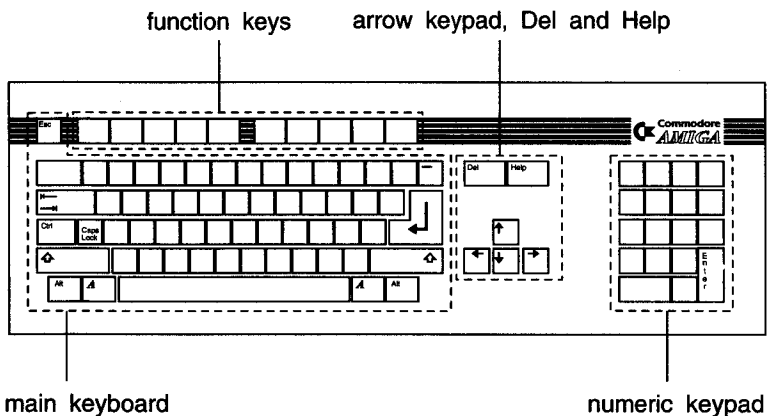


Figure 2-2. Amiga keyboard

Remember the following points when using the keyboard:

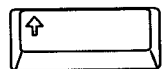
- The layout or "mapping" of characters to the keys is determined by the Preferences keymap setting. This typically varies by country.
- Keys can be redefined by an application to have special functions. If you notice unexpected responses to some keystrokes (especially when switching between windows and screens running different applications) this may be the reason. For specifics on how an application affects the keyboard, see the application's manual.
- Depending on the application, certain key combinations may have special meaning. The keys may need to be pressed simultaneously or one after the other.
- Many keys on the keyboard repeat for as long as they are held down.
- You cannot interchange the numeral "0" and the uppercase letter "O," or the numeral "1" and the lowercase letter "l."

Note International keyboards have two additional keys on the main keyboard, located near the Shift key positions. The characters they produce depend on the current keymap.

The Main Keyboard Area

The main keyboard area has standard alphanumeric typewriter keys plus special keys with computer-specific uses. Some of these are "qualifier keys," which have no effect by themselves, but are used with other keys for special functions.

Qualifier keys include the following:



Shift Keys

Two Shift keys, marked with an up arrow (↑) are located on either side of the bottom row of letters. These keys can be used the same way as the shift keys on a standard typewriter. Press either Shift key simultaneously with any alphabetic key or with any key having

two characters on the keycap to produce the uppercase or top character. The Shift keys are also often used with other keys to perform special functions.

Alt Keys



The two Alt (Alternate) keys, located at the extreme left and right sides of the bottom row of the keyboard, are often used with other keys to perform special functions.

Ctrl



The Ctrl (Control) key, located on the left side of the middle row of letters, is a program-defined key that is often used with other keys to perform special functions.

Left Amiga



The left Amiga key, located on the bottom row of the keyboard just to the left of the space bar, is used with other keys to perform special functions, particularly keyboard shortcuts for gadget selection.

Right Amiga



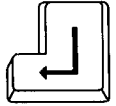
The right Amiga key, located on the bottom row of the keyboard just to the right of the space bar, is used with other keys to perform special functions, particularly keyboard shortcuts for menu selection.

Caution The key combination **Ctrl+Left Amiga+Right Amiga** reboots the Amiga. See Chapter 1 in *Using the Amiga Workbench* for details.

Other special keys include the following:

Return

The Return key, located on the right side of the main keyboard area in the middle two rows, transmits information or a command to the computer. This key is sometimes referred to by the symbol "↵" or as the Enter key.



Caps Lock

The Caps Lock key, located next to the Ctrl key, forces all alphabetic keys (A through Z) to produce uppercase (capital) letters. Other keys, however, are not affected by the Caps Lock key. To type the upper characters on the nonalphabetic keys, you must still hold down one of the Shift keys and press the key for the desired character.



When Caps Lock is active, a light on the key is illuminated. To inactivate Caps Lock, press the key again so that its light goes out.

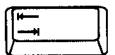
Esc

The Esc (Escape) key, located at the top left of the keyboard, is a program-defined key, often used as a shortcut to leave or enter a program or a certain program mode.



Tab

The Tab key, located on the left side of the top row of letters, can be program-defined to move the cursor to a set position. Tab is used extensively in word processing and desktop publishing programs. In addition, many Workbench programs that have several text gadgets let you use Tab and Shift+Tab to move from gadget to gadget.



Backspace

The Backspace key is the key farthest right in the top row of the main keyboard. Pressing Backspace deletes any characters to the left of the cursor and causes the cursor, and any characters to the right of it, to move to the left.



The Numeric Keypad



The numeric keypad is located to the far right of the keyboard. The keys are arranged in a calculator layout to facilitate numeric data entry. The numeric and arithmetic symbol keys on the keypad are equivalent to the numeric and arithmetic symbol keys on the main keyboard.

In many cases, you can use the Enter key on the numeric keypad just as you use the Return key on the main keyboard—that is, to transmit data and commands to the computer. The keypad may be redefined for special functions by some applications.

Note The legends on the front of many of the numeric keypad keys, such as PgDn and Home, are normally not applicable to Amiga programs. The indicated functions are available only when running MS-DOS on a PC emulator, or within certain PC-based applications.

The Function Keys



The function keys, located at the top of the keyboard and labeled F1 to F10, are programmable keys. Applications can define these keys to activate special functions or may allow you to define them.

The Del, Help, and Arrow Keys

Del



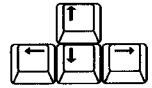
The Del (Delete) key, located just to the right of the top row of the main keyboard, deletes the character at the cursor position. Any characters to the right of the cursor move to the left.

Help



The Help key, located to the right of the Del key, is a program-defined key that applications can use to provide additional information or user assistance while a program is running.

The Arrow Keypad



The four arrow keys are grouped in a small keypad at the lower right side of the keyboard, between the main keyboard and the numeric keypad. These keys control the movement of the cursor (up, down, left, and right) on the screen. The direction in which each key moves the cursor is indicated by the direction of the arrow on the key. These keys may also have special functions with different qualifier keys, depending on the application.

Keyboard Equivalents to the Mouse

You can use the keyboard in addition to or instead of the mouse to move around the screen and select icons, gadgets, and windows.

In programs that mainly use the keyboard to enter information, this can be faster and more convenient. The keyboard equivalents are also useful if your mouse is malfunctioning, or when you need to make extremely precise pointer movements.

The following key combinations are available from any application, to let you perform mouse movement and button presses with the keyboard.

Move left	either Amiga key+left arrow
Move right	either Amiga key+right arrow
Move up	either Amiga key+up arrow
Move down	either Amiga key+down arrow
Left mouse button	Left Alt+left Amiga
Right mouse button	Right Alt+right Amiga

Note In the arrow key combinations in this table, pressing Shift at the same time as the other two keys makes the pointer move faster.

Chapter 3

Before Expanding Your System

This chapter summarizes the internal expansion options for the Amiga, and illustrates general option installation procedures. For detailed information, see the appropriate chapter in this manual and the installation manual for the option you are installing.

The Amiga can accommodate several types of internal expansion options:

- Memory expansion
- Amiga bus (Zorro III/Zorro II) expansion boards
- Processor modules
- Bridgeboard PC emulator boards
- Video expansion boards
- 3.5-inch drives
- 5.25-inch drives

Memory Expansion

The amount of random access memory (RAM) in the A4000 is expandable to 18 megabytes (18 MB) on the motherboard using single inline memory module (SIMM) sockets. All motherboard RAM is 32-bit memory directly addressable by the operating system.

The Amiga's memory consists of Chip RAM and Fast RAM. Chip RAM is memory shared by the microprocessor and the Amiga's custom chips. Fast RAM is memory used exclusively by the

processor. Up to 2 MB of Chip RAM and 16 MB of Fast RAM may be installed in the A4000's SIMM sockets.

RAM can be added quickly and inexpensively by installing standard SIMM units in the five motherboard sockets. Additional memory can be added using the Amiga bus slots, if desired. Replacement processor modules also may accommodate RAM.

Processor Expansion

The A4000 central processing unit (CPU) is mounted on a removable processor module that plugs into the 200-pin CPU expansion slot. This is a "local bus" slot provided specifically to support expansion options that must be tightly coupled to Amiga motherboard memory.

The standard processor module contains a 25 MHz Motorola 68040 series microprocessor. These processors use the Amiga's 32-bit RAM efficiently for very high speed operation.

To upgrade to a faster processor, additional high-speed memory, a digital signal processor (DSP), or other performance enhancements, the original A4000 processor module is removed and replaced.

Amiga Bus Expansion

There are four 100-pin general purpose expansion slots in the A4000. These use the Zorro III Amiga expansion bus, which yields high performance with a wide variety of expansion devices, including, for example, high resolution framebuffers, video and audio digitizers, SCSI interfaces, RAM, and multiport I/O boards—all within the main chassis of the computer.

The Zorro III slots are 100% compatible with the many Zorro II expansion boards already available for the Amiga. Use of Zorro II expansion boards does not lower the performance of Zorro III boards that may also be installed.

Bridgeboard Expansion

Three of the Amiga bus expansion slots are in line with PC/AT compatible slot connectors, enabling the use of the Commodore Bridgeboard PC emulator boards and PC expansion boards in the Amiga. A Bridgeboard is a fully functional PC compatible computer with its own microprocessor, memory, and the circuitry needed to link the PC and Amiga systems. Since the Amiga is multitasking, an Amiga equipped with a Bridgeboard can run DOS and Windows programs at the same time as Amiga programs.

A Bridgeboard is a full-length board that occupies both the 100-pin Amiga bus connector and the 98-pin PC/AT connectors that are in line with it. With a Bridgeboard installed, the other two slots with PC/AT connectors can accept most standard PC/XT and PC/AT drive controllers, VGA/SVGA video adapters, I/O boards, and other options for the Bridgeboard's use.

With a Bridgeboard installed, the Amiga expansion slots that are in line with unoccupied PC/AT slots can still be used by Amiga expansion boards.

Video Expansion

The Amiga video expansion slot accommodates internal installation of graphics and video options. Using this slot keeps all video circuitry in the metal housing of the Amiga's main unit, helping to minimize RF interference problems.

The video slot is in line with one Amiga bus expansion slot. This allows a video expansion board to incorporate, or be easily connected to, a standard Zorro III/II expansion board. This adds versatility, while enabling high-speed data transfer between the Amiga's main memory and a graphics output device.

The analog RGB output of the Amiga is compatible with worldwide television standards (both North American NTSC and European PAL). This makes the Amiga particularly well suited to video and multimedia options, such as a genlock, digitizer, composite encoder, or character generator.

The video slot connector has been extended compared with previous Amiga models to make graphics signals produced by the AA custom chip set available. Most boards produced for the earlier video slot are still electrically compatible with the newer slot. The rear bracket of video boards produced for earlier Amigas, however, may require some modification to fit the A4000 chassis.

Drive Expansion

The Amiga has ample space and mounting hardware for internal drive expansion, allowing both 3.5-inch and 5.25-inch devices.

3.5-Inch Devices

The A4000 can accommodate up to four 3.5-inch devices internally. The two front bays (one already filled by the internal floppy drive) have external access; the two in the rear position are suitable for hard drives that do not require external access.

Note In order for two devices to be installed in either the front or the rear 3.5-inch bays, both devices in either area must be low profile units (1 inch/25 mm in height). If a half-height (1.25 inch/32 mm) device is installed in either area, another device cannot be installed in that area.

The A4000 contains a built-in Intelligent Drive Electronics (IDE) hard disk controller, to which one or two devices may be connected internally via the ribbon cable included. You can use one of the Amiga expansion slots to add a SCSI adapter, which could then control additional internal and external storage equipment, such as CD-ROM drives, tape drives, scanners, and so on.

You can install a second floppy drive (DF1:) in the bottom front 3.5-inch bay, provided that the DF0: floppy drive is a low profile unit. Additional floppy drives (DF2: and DF3:) may be connected externally using the floppy drive connector on the rear of the main unit.

5.25-Inch Devices

The top front drive bay in the A4000 can accommodate a half-height 5.25-inch device such as a CD-ROM, PC floppy, tape, or removable media drive. If this is neither a standard floppy nor an IDE device, you may also need to have a controller board, such as a SCSI adapter, for the device.

When Installing Internal Options



Warning

Turn off and unplug the Amiga before you install any internal expansion device. Disconnect all cables for external peripherals from the Amiga.

Installation of internal options should be performed by an authorized Commodore dealer/service center or by a knowledgeable technician. Commodore will not be liable for any damages or injuries caused by improper installation of expansion equipment.

This section and following chapters give general information on installing options in the Amiga. Installing an option inside the Amiga always includes:

1. Turning off the Amiga and disconnecting it from the AC power outlet.
2. Disconnecting the mouse and all other external peripherals.
3. Removing the Amiga's cover.
4. Following the expansion device manufacturer's specific installation instructions.
5. Reassembling the Amiga and replacing the cover.
6. Reconnecting peripherals and power, performing any software installation or configuration that may be necessary, and testing the device for proper operation.

Note Because optional items can occasionally have unforeseen interactions, Commodore strongly recommends that new expansion devices be tested first without any other expansion devices connected. If you experience problems after installing any device, try removing any other optional items from the system, and test the new item by itself, then in various combinations with other items. Often a solution to the problem can be found when the interacting items are identified.

ESD Precautions

Integrated circuit (IC) chips are sensitive to static electricity. When handling electronic components containing IC chips, including expansion boards and RAM modules, always take precautions to reduce the chances of electrostatic discharge (ESD) harming the components.

Touching a nearby grounded metal surface before touching a component drains static electricity, reducing the likelihood of ESD damage.

Removing the Cover

To remove the Amiga's cover:

1. Use a Phillips-head screwdriver to remove the two screws at the upper corners of the rear of the main unit.
2. Grasp the cover on both sides as illustrated in Figure 3-1, and slide it backward and up.

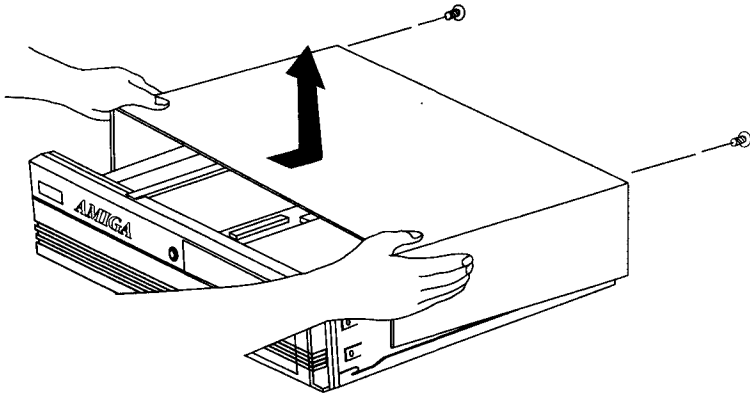


Figure 3-1. Removing A4000 main unit cover

Figure 3-2 illustrates the location of most major components in the A4000.

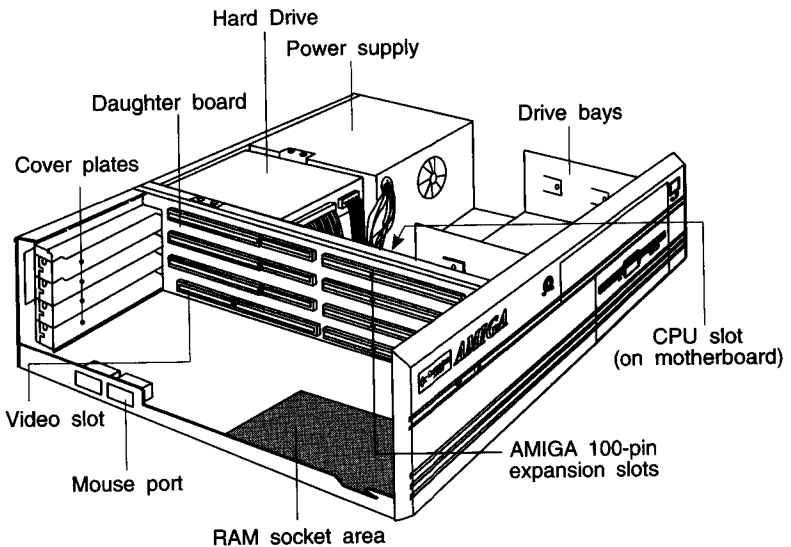


Figure 3-2. A4000 internal components

Removing Expansion Boards

To remove an installed expansion board:

1. Once you have opened the Amiga, turn it so that the daughterboard faces you.
2. Disconnect any wires, ribbon cables, etc., that may be connected to the expansion board.
3. Remove the screw securing the expansion board's rear bracket to the Amiga's chassis.
4. Grasp the expansion board firmly near either end, and pull forward. You may have to rock the board slightly from side to side—not up and down—to loosen it in the slot.
5. If not installing another expansion board in the vacant slot, replace the slot's cover plate and secure it with the screw.

Setting Jumpers

Jumpers are small components on a circuit board that control a computer's or expansion unit's hardware configuration. It is sometimes necessary to set one or more jumpers to change the default configuration of the computer, or to add an internal expansion device.

A jumper consists of a row of two or more closely spaced metal pins projecting from the circuit board and a metal-lined plastic cap that can fit over two adjacent pins. The cap connects (shorts) the two pins. When two of the pins are connected by the cap, they are "closed;" pins not connected by the cap are "open." The combination of open and closed pins is the jumper's setting, which determines a specific hardware function.

Note If all pins on a jumper must be left open, save the cap by covering only one pin of the jumper. This keeps the cap handy if you need to change the jumper's setting in the future.

Figure 3-3 shows the side and top views of a three-pin jumper in which pins two and three are closed.

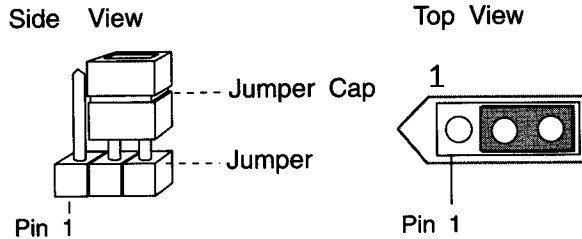


Figure 3-3. Typical jumper

To properly set a jumper you usually need to determine which pin is pin 1. The pin 1 end of the jumper may be indicated on the circuit board by either:

- A numeral 1 printed near one end of the jumper.
- A box with one pointed end printed around the jumper, with the pointed end being pin 1 (see Figure 3-3, top view).

Sometimes the meanings of the jumper positions are explicitly labeled on the circuit board. For example, the two positions of a three-pin jumper might be labeled "ENABLE" and "DISABLE".

To change a jumper setting:

1. Disconnect the Amiga and remove the system cover, as described earlier in this chapter.
2. Determine the name or number of the jumper to change.
3. Look up that jumper in the jumper table, noting its location on the circuit board and the required jumper cap position.
4. Locate the jumper on the circuit board.
5. Lift the cap off the pin(s) it currently occupies, and press it down in the new position.

Chapter 4

Installing Motherboard Options

This chapter discusses installation of options on the Amiga motherboard, including adding memory and processor options.

Figure 4-1 illustrates the location of SIMM sockets and the CPU slot on the A4000 motherboard.

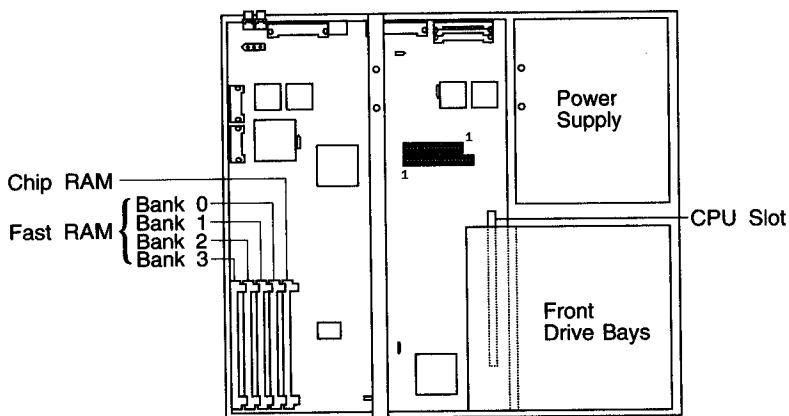


Figure 4-1. Motherboard components

Adding Memory

The five SIMM sockets provided on the motherboard give a quick and nearly foolproof way to add memory. Both of the Amiga's two

memory types, Fast memory and Chip (graphics) memory, can be increased this way.

See Appendix A for detailed information on the required parameters of acceptable SIMM modules.

Note Fast memory can also be added using Amiga bus and CPU slot boards; however, using the motherboard sockets leaves expansion slots free for other options.

The following sections explain memory options and considerations, including:

- Fast versus Chip memory
- SIMM memory size
- Fast RAM bank locations
- Page mode versus static-column mode
- Installing SIMM units
- Testing memory installation

Fast Memory

Fast memory (also called Fast RAM) is general purpose non-Chip memory that the microprocessor can access at full speed. The A4000 has four SIMM sockets for Fast RAM expansion. These are the four sockets nearest the edge of the motherboard. The fifth socket is for Chip RAM expansion, covered in a later section.

Fast RAM Banks and SIMM Size

The four Fast RAM sockets are labeled on the motherboard as Banks 0, 1, 2, and 3, and they must be filled in that order. If your Amiga already has one or more banks occupied, place additional SIMMs in the next higher numbered banks.

The Fast RAM SIMMs can be one of two memory sizes: one megabyte (1 MB) or four megabyte (4 MB). By filling the indicated banks with the appropriate size SIMMs, the following Fast RAM configurations are possible.

Table 4-1. Fast RAM configurations

Amount of Fast RAM	SIMM Size	Bank(s) Filled
1 megabyte	1 MB	0
2 megabytes	1 MB	0, 1
3 megabytes	1 MB	0, 1, 2
4 megabytes	1 MB	0, 1, 2, 3
4 megabytes	4 MB	0
8 megabytes	4 MB	0, 1
12 megabytes	4 MB	0, 1, 2
16 megabytes	4 MB	0, 1, 2, 3

Note that the two sizes cannot be mixed within the Fast RAM section. The physical packaging of Fast RAM SIMMs must be single-sided, 1 inch/2.54 cm or less in height.

SIMM Size Jumper

There is one jumper, SIMM SIZE, that is associated with Fast RAM. It must be set correctly according to the size of the installed SIMMs. Its two positions are labeled "1M" for 4 megabyte SIMMs; and "256K" for 1 megabyte SIMMs. See Appendix D for the jumper's location on the motherboard.

Chip Memory

Chip memory, also known as graphics memory or Chip RAM, stores graphics, sound, and other data that must be accessible to the Amiga custom chips. Running software that requires large amounts of this type of memory, especially when multitasking, can quickly exhaust 1 megabyte of Chip RAM. Chip RAM occupies the innermost SIMM socket on the motherboard.

Chip RAM SIMMs

An Amiga with one megabyte of Chip RAM can be upgraded to two megabytes by changing the SIMM in the Chip RAM socket to a

larger module. One-megabyte Chip RAM systems have a 1 MB module. By removing this module and inserting a 2 MB module, Chip RAM increases to 2 megabytes. This yields the following Chip RAM configurations.

Table 4-2. Chip RAM configurations

Amount of Chip RAM	SIMM Size
1 megabyte	1 MB
2 megabytes	2 MB

A 1 MB module removed from the Chip RAM socket can be installed in an open Fast RAM socket if there are no 4 MB modules in the Fast RAM section. There are no jumpers to set when upgrading Chip RAM.

Installing Memory Modules

To install a SIMM in one of the RAM sockets:

1. Disconnect the Amiga and remove the cover, as described in Chapter 3.
2. Remove any expansion boards in the daughterboard slots.
3. Locate the proper SIMM socket.
4. Remove the existing SIMM if necessary.
5. Insert the new SIMM carefully into the socket, as illustrated in Figure 4-2. Insert the connector edge of the module first, then press the opposite edge down and in to seat the module. SIMMs are notched to ensure proper orientation in the socket. Be certain that each module is fully seated and locked into place by the tabs at either end of the socket.

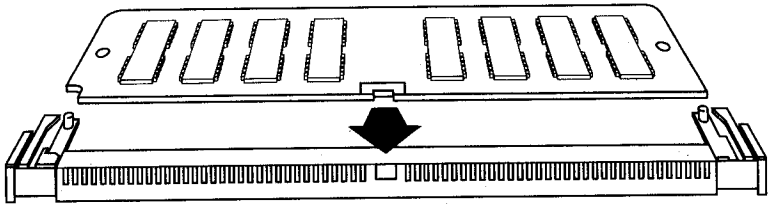


Figure 4-2. Inserting a SIMM into a socket

6. Change the setting of the SIMM SIZE jumper if necessary.
7. Replace any expansion boards you removed.
8. Replace the Amiga's cover.
9. Reconnect peripherals and power and check that the new memory is recognized.

Testing Memory Installation

After installing additional memory and replacing the Amiga's cover, check to be sure that the memory is functioning properly. Normally, any new RAM is automatically recognized by the operating system when the Amiga is turned on. The Workbench screen's title bar displays the amounts of available Chip ("graphics") and Fast ("other") memory.

If the Workbench title bar display does not reflect the amount of memory that you installed, or if the Amiga will not boot, there is a problem. Turn off the Amiga, disconnect and open it, and check that the SIMMs are all seated in the proper banks, that the SIMMs in the Fast RAM section are all of the same memory size, and that the SIMM SIZE jumper is set appropriately.

- Should you still have problems after confirming that the installation was correct, one or more of the SIMMs either is not of the proper type or is damaged.

Processor Options

The following sections discuss options related to the A4000 CPU slot, including:

- Removing and installing processor modules in the CPU slot.
- Replacing a 68EC040 microprocessor with a 68040.

The A4000 CPU slot is located on the right side of the motherboard, as illustrated in Figure 4-1. The processor module occupies this slot, mounted horizontally parallel with the motherboard. The processor module contains the Motorola 68040 series microprocessor and associated circuitry.

Removing a Processor Module

To make some modification to the processor module, such as replace the module, you must remove the module from the slot. You may need to remove the Amiga's faceplate and front drive bay assembly to reach the CPU slot. If so, see Chapter 6, "*Front Bay Installation*" in this manual for directions on how to do so.

To remove a processor module, hook your fingers under the module at either end of the slot connector, and lift, as illustrated in Figure 4-3. Do not lift elsewhere on the processor module, or you may crack the module or its connector.

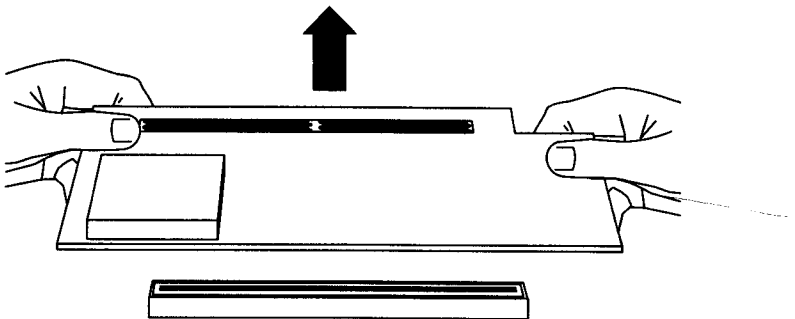


Figure 4-3. Removing processor module

Installing a Processor Module

To replace a processor module you have removed, or to install a new processor module:

1. Align the processor module so that its 200-pin connector is aligned directly over the CPU slot connector on the motherboard.
2. When it is correctly aligned, press down on the processor module directly over the connector. Do not press down elsewhere on the processor module. If it does not seat in the slot connector, it is not properly aligned.
3. If there are any other connections to be made for the processor module, make them as called for in the module's installation directions.

Upgrading a 68EC040 Microprocessor

A4000 models shipped with a 68040-level microprocessor on the processor module may have the 68EC040 variation of the chip. The EC chip omits the internal FPU and memory management unit (MMU) sections present on the full 68040. While a 68EC040 can execute math operations faster than a 68030 + 68882 FPU combination, the further performance gains of the internal 68040 FPU are dramatic. Also, some operating systems, such as UNIX, require the presence of an MMU. The 68EC040 chip is socketed so that you can remove it and replace it with a full 68040 if you require an MMU or the best possible floating point math performance.

Note When running a 68040 or 68EC040 microprocessor, the 68040.library file must be in your LIBS: directory.

68040 Chip Installation

68040 series processors are large pin grid array (PGA) chips. Removing an existing 68EC040 chip requires a suitable chip puller and a flat blade screwdriver.

Caution Do not attempt to remove or install a microprocessor without the proper tools, or you could damage both the processor module and the chip. If you do not have the proper tools or supplies, this upgrade should be performed by your Commodore dealer/service center or a trained technician.

1. Remove the processor module from the CPU slot.
2. Remove the heat sink from the 68EC040 chip by inserting a flat blade screwdriver vertically on one side of the heat sink retaining clip and twisting the screwdriver to release the clip.
3. Using the chip puller, carefully remove the chip, taking care not to bend any pins.
4. When you have removed the chip, embed its pins in a piece of conductive foam to protect them.
5. To install the 68040 chip, you must determine the location of pin 1 on the socket and on the chip you are installing. A small "1" printed on the module near one corner of the socket indicates the pin 1 location. Pin 1 on the chip is indicated by an L-shaped mark on one corner of the chip. Orient the chip so that the pin 1 locations of both match. Set the chip down in the socket, and when you are sure all pins are resting in their socket holes, press the chip firmly down in the socket, as in Figure 4-4.

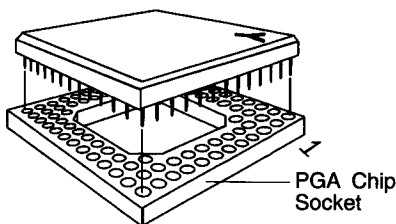


Figure 4-4. Inserting 68040 chip

6. When the chip is seated in the socket, place the heat sink on top of the chip and snap the retaining clip over it onto the chip socket tabs.

7. Replace the processor module in the CPU slot.
8. Replace the cover on the Amiga, reconnect power and peripherals, and test the system.

Internal Audio Connector

A small 3-pin connector on the A4000 motherboard enables an audio expansion device mounted internally to mix its output into the standard Amiga audio output. This way, all audio output from the Amiga passes through one audio system.

Directions on using this connector should be included with any device that attaches to it.

Chapter 5

Installing Expansion Boards

This chapter explains installation of expansion boards in the slots on the A4000 daughterboard.

The Daughterboard

Amiga bus expansion boards install horizontally, fitting into 100-pin slot connectors on a daughterboard that is mounted vertically in the Amiga (Figure 5-1). Most Amiga expansion boards can go in any slot, with these exceptions:

- A board that requires the video slot connectors must go in the bottom slot.
- A Bridgeboard and PC expansion boards must go in one of the three upper or "bridge" slots, which have PC/AT slot connectors.

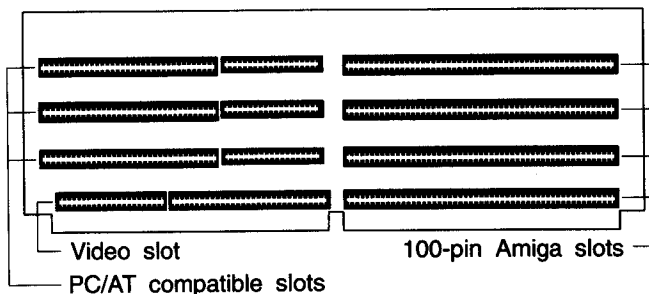


Figure 5-1. Daughterboard

The daughterboard itself is attached to the motherboard with edge connectors. The Amiga will not work properly if the daughterboard is not in place.

Expansion boards are supported by a grooved guide in front, and held in by a screw that secures the rear mounting bracket of the board to the Amiga's chassis. A plate covers the rear access port of empty slots.

Installing an Expansion Board

To install an expansion board:

1. Remove the Amiga's cover as described in Chapter 3.
2. Set any jumpers on the board that must be adjusted.
3. Turn the Amiga so that the daughterboard is facing you.
4. Remove the rear cover plate of the slot into which you are installing the board. Save the screw to secure the board. You should also keep the plate in case you need it in the future.
5. Slide the expansion board into the slot as illustrated in Figure 5-2. Make sure that the front edge of the board is in the proper grooved guide and that the edge connector(s) are aligned correctly. Press firmly, but do not use excessive force, to seat the edge connector(s) fully into the slot.
6. Reinstall the cover plate screw to hold the board in place.
7. Connect any wires, ribbon cables, etc., that may need to be attached to the board, as the board manufacturer's manual specifies.
8. Replace the Amiga's cover.
9. Reconnect peripherals and power and test the board.

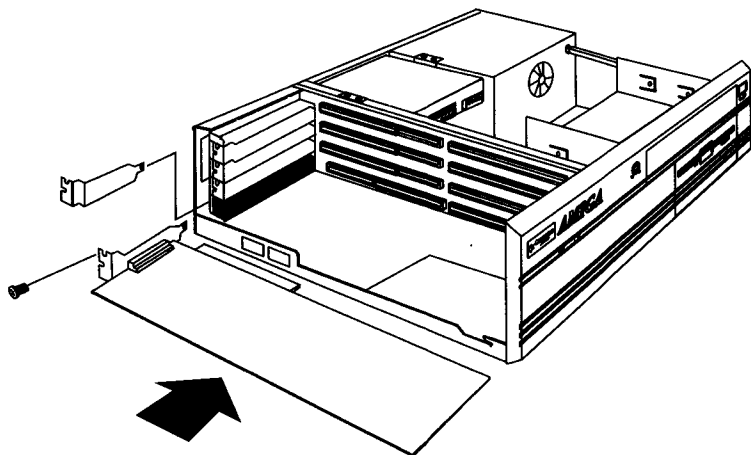


Figure 5-2. Removing cover plate and installing expansion board

Chapter 6

Installing Optional Storage Devices

This chapter discusses installation of additional internal storage devices in the Amiga, including floppy drives, hard drives, and other optional devices.

Drive Bays

The A4000 has front and rear drive bay areas. Either can be used for drives, but only the front bays have external access. A 40-wire ribbon cable is provided for installation of one or two IDE devices in the rear bays. A 34-wire ribbon cable is provided for installation of one or two Amiga floppy drives in the front bays.

Front Bays

In the front of the main unit are a 3.5-inch drive area and a 5.25-inch drive area. Both have external access, for devices such as floppy, tape, CD-ROM, and removable media drives that require it. The 5.25-inch bay accommodates one half-height (32 mm) drive. The 3.5-inch area accommodates either one half-height drive, or two low profile (1 inch/25 mm or less) drives. One of these bays is already occupied by the Amiga's internal floppy drive.

The power supply wiring harness provides four 4-pin power connectors for front-mounted devices. Two are 3.5-inch floppy drive connectors and the other two are standard full-size connectors for tape drives or other devices.

Rear Bays

In the rear of the main unit to the left of the power supply is the hard drive storage area, which can accept only 3.5-inch devices that do not require external access. This area can take one half-height drive or two low profile drives. If your Amiga came with a hard disk, a low profile drive is already there.

Two standard full-size 4-pin power connectors are provided for rear-mounted devices.

Front Bay Installation

To install a drive in one of the front bays:

1. Turn off and disconnect the Amiga.
2. Remove the Amiga's cover as described in Chapter 3.
3. Disconnect the keylock and the LED assembly wiring from the motherboard.
4. Remove the front faceplate. The faceplate has several plastic tabs that hold it to the metal chassis. Squeezing the tabs and pushing them through the chassis holes will release the faceplate. You may need a small pair of pliers to do this.
5. Disconnect the power and ribbon cables from the existing drive(s) in the front area (see Figure 6-1). Note the orientation of the connectors before you remove them so that you can replace them properly when you are done.

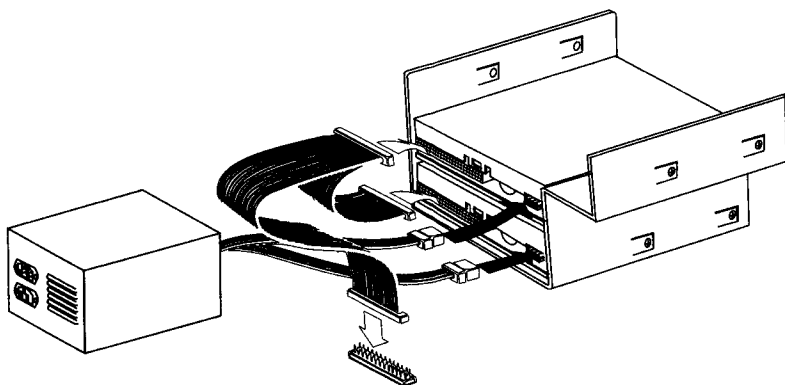


Figure 6-1. Front drive bay ribbon and power cable connections

6. Unscrew the two front mounting bracket screws and slide the bracket and drive(s) out of the main unit as illustrated in Figure 6-2.

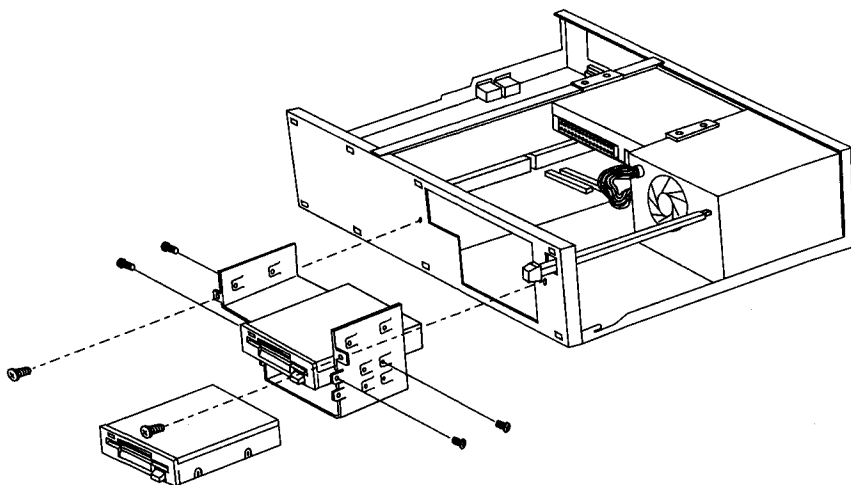


Figure 6-2. Front drive bay bracket removal

7. Slide the new unit into the bracket and secure it with screws through the side mounting holes. If any additional mounting

hardware came with the new unit, install it according to the manufacturer's directions.

8. Replace the bracket and drives in the main unit, and secure it with its two screws.
9. Connect the drives' power and ribbon cables. Be sure the orientation of both cables is correct. The pin 1 side of a ribbon cable has a colored stripe along the edge. The pin 1 end of a drive connector is usually indicated by a small "1" printed near it on the drive circuit board. The pin 1 end of the cable connector should be at the pin 1 end of the drive connector. The power connectors are shaped to prevent you from inserting them the wrong way.
10. Change any jumpers as necessary. See "*Notes on Floppy Drive Installation*" below.
11. Remove the cover panel for the bay in which you installed the new drive from the inside of the faceplate.
12. Reconnect the keylock and LED assembly.
13. Replace the faceplate on the chassis.
14. Reassemble the Amiga, reconnect peripherals and power, then test the new device.

Notes on Floppy Drive Installation

The installation of a second floppy drive may require the adjustment of a jumper on the motherboard. If the new drive is a standard double-density (880 KB) Amiga drive installed as DF1:, then the DF1: Enable jumper must be changed. See Appendix D for the location and setting of this jumper. If the drive is a high capacity (1.76 MB) drive like DF0:, no adjustment is necessary. You also may need to adjust a jumper on the drive itself. This should be explained in the drive's installation manual.

Drive DF0: is attached to the connector in the middle of the ribbon cable. Be sure that when you reconnect DF0:, you use this connector. Other Amiga models attach DF0: at the end of the floppy ribbon cable, after the small twist at the end. On the A4000, this end of the floppy cable is used for DF1:.

Rear Bay Installation

To install a drive in one of the rear bays:

1. Power down and disconnect the Amiga.
2. Remove the Amiga's cover as described in Chapter 3.
3. Disconnect the power and ribbon cables from the existing drive(s) in the rear area (see Figure 6-3). Note the connections before you disconnect a drive so that you can replace them when you are done.

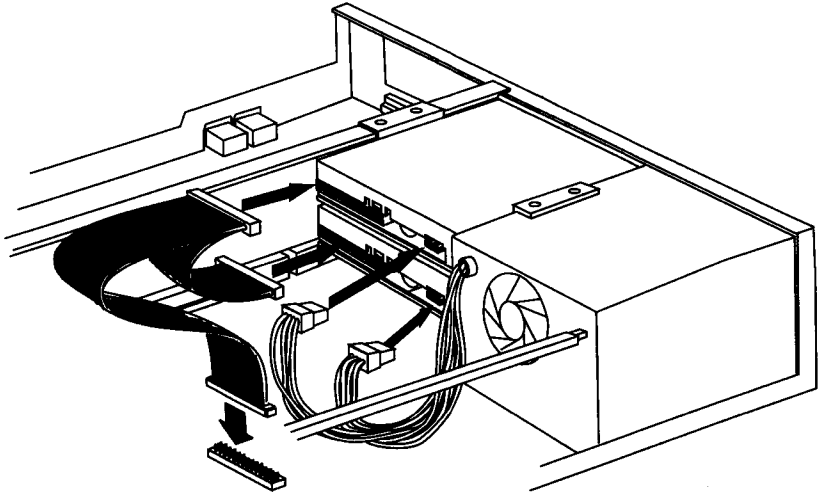


Figure 6-3. Rear drive bay ribbon and power cable connections

4. Unscrew the four mounting bracket screws and lift the bracket and drive(s) out of the main unit as illustrated in Figure 6-4.

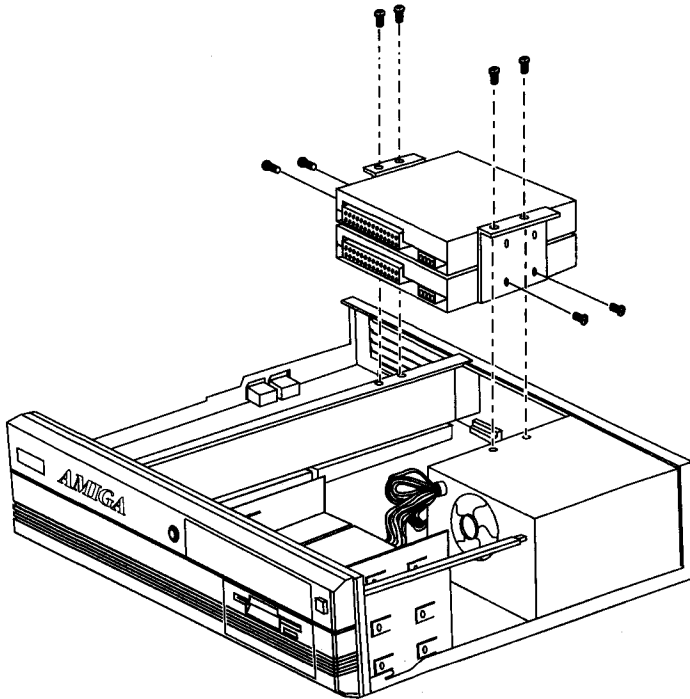


Figure 6-4. Rear drive bay bracket removal

5. If you are installing a second IDE hard drive, set its drive unit jumper for unit 1 so that it does not conflict with the existing drive, unit 0. Then set the unit 0 jumper(s) to indicate that there is a slave device present. Refer to the drive manufacturers' instructions for jumper configuration.
6. Slide the new unit into the bracket and secure it with screws through the side mounting holes. If any additional mounting hardware came with the new unit, install it according to the manufacturer's directions.
7. Replace the bracket and drive in the main unit, and secure it with its four screws.
8. Connect the drives' power and ribbon cables. Be sure the orientation of ribbon cables is correct.

9. Reassemble the Amiga, reconnect peripherals and power, perform necessary setup (see next section), and then test the new device.

Notes on Hard Drive Installation

Most new hard drives require additional setup once you have installed them before they are usable. Follow the drive manufacturer's instructions on drive setup carefully. Refer to the *Amiga Hard Drive User's Guide* for information on partitioning, formatting, and using hard drives and Commodore hard drive software on the Amiga.

Chapter 7

Help With System Problems

If you have a problem with your Amiga or experience unexpected results, there may be an easy solution. Many problems result from simple errors in setting up the system or installing expansion devices.

Caution **Commodore will not be held liable for damages or injuries resulting from improper installation or repairs attempted by unauthorized personnel.**

Although you can solve many problems yourself, others result from hardware failure and require the assistance of your Commodore dealer/service center or a knowledgeable technician. Never attempt to repair any problem involving internal damage to the Amiga yourself.

Avoiding Problems

The three most important rules to remember to prevent damage to your computer, files, and disks are:

1. Never connect or disconnect anything while the power is on!

This applies to internal and external connectors, including the mouse and keyboard. It is very easy to cause damage that requires a service call by connecting or disconnecting something without first turning the system off.

2. Never interrupt disk activity!

This applies to both floppy and hard disks. When disk activity is in progress, the drive activity light on the front of the

computer or on the drive itself is lit. Interrupting disk activity (by removing a disk from its drive, rebooting, or powering off) can cause disk errors. Always wait a few seconds after the drive activity lights seem to have stopped, to be sure all disk activity has finished.

3. **Read the documentation!**

The vast majority of problems can be avoided by carefully reading and following the instructions for the hardware and software you use.

Identifying and Solving Problems

There are several general types of problems that can appear when you use your system:

- Software problems
- Startup problems
- Disk problems
- Installation and maintenance problems

Software Problems

This chapter focuses on hardware problems and their possible solutions. For information on software-related problems, consult your Amiga software documentation.

Typical software problems include:

- New software was improperly installed.
- Preferences settings are incorrect.
- Necessary directories or files are missing from the boot volume.
- Necessary directory assignments have not been made.
- The standard Startup-sequence file has been altered.
- There is a disk error.

Problems of this type usually produce requesters or error messages that give some indication of the source of the trouble. Note this

information and consult your Amiga software documentation for guidance. *Using the Amiga Workbench* and the *Amiga Hard Drive User's Guide* have information about software installation, proper settings, and the use of programs that can help with disk problems.

Startup Problems

Problems starting up the system from a power-off state are the most common sources of confusion for new users. This most often results from simple mistakes in setting up the system. Actual hardware failure is a less frequent cause.

Check the following if your Amiga does not respond when you turn it on:

- Is the Amiga plugged in to a power source of the correct voltage?
- Is the monitor plugged in to a power source of the correct voltage?
- Is the monitor connected to the Amiga?
- Are both the monitor and the Amiga turned on?
- If the Amiga is plugged in to a multiple-outlet power strip, is the power strip plugged in, turned on, and working properly?
- Are the monitor and the monitor cable known to work correctly?
- Is the monitor of a type capable of displaying the Amiga's video output?
- Is the monitor set to accept the Amiga's default video mode?
- Is the monitor securely connected to the main unit?

For information on these basic setup questions, refer to the "About Electrical Requirements," "Connecting Power and Turning On the Amiga," and "Attaching the Monitor" sections of Chapter 1. Also see the ScreenMode sections in *Using the Amiga Workbench*, and your monitor manual.

Disk Problems

Notes on Floppy-Based Systems

If the Amiga comes on, but does not boot, check the following before suspecting a hardware problem:

- Did you insert a copy of your Workbench disk when prompted by the initial animated sequence?
- Did you insert the floppy properly into the drive?
- Is the Workbench disk you inserted an exact copy of your original Workbench disk, or a disk you know to be bootable?

If the Amiga will not boot from a given disk, try others that you know to be bootable. You should always keep your original, unmodified Workbench disk available in case of such a problem.

If the Amiga will not boot from any floppy, even those you know to be good, then it is probable that the floppy drive or the computer itself has some hardware problem.

Notes on Hard Disk Systems

If the Amiga comes on, but does not boot, check the following before suspecting a hardware problem:

- Do you have a bootable hard drive partition in the system?
- Is the partition you want to boot from enabled, and does it have a boot priority above other bootable devices or partitions?
- Does your bootable partition have all the required directories and files available on it?

If you have trouble booting from your hard disk, try booting from floppy. If you can boot from floppy, then your hard disk setup, or something on your hard disk, probably is the source of the trouble. After booting from floppy you may still be able to access your hard disk to try to determine the source of the trouble.

Typical disk drive hardware problems include:

- A drive ribbon cable connector is inserted in its drive or motherboard connector(s) improperly (see Chapter 6, "*Installing Optional Storage Devices*").
- A drive is not connected to power, or the power supply is overloaded (see Chapter 6).
- A drive ID or unit number jumper is set incorrectly (see Chapter 6).
- A drive controller board is not fully seated in its slot (see Chapter 5, "*Installing Expansion Boards*").
- The device chain is not terminated correctly (SCSI drive systems).
- A hard drive takes too long to spin up to working speed.
- A drive or controller board has the wrong ROM version.
- A drive ribbon cable is faulty.
- A drive is faulty.

For solutions to these problems, also check:

- Sections on disk use in *Using the Amiga Workbench*
- *The Amiga Hard Drive User's Guide*
- The drive's user manual

Installation and Maintenance Problems

Installation problems are most likely to appear after you have added a new drive or other hardware item to the system. If you have a problem after installing additional hardware, remove the new item and see if the problem disappears. If it does, you know the problem is in that item or its installation. Repeat the installation, following the hardware manufacturer's installation instructions carefully.

If you have several expansion devices, the problem may be an interaction between two or more items that by themselves work properly. Try running your system with different combinations of expansion devices to isolate the offending items. If the item requires its own software, consider different settings the software may offer.

Installation Problems

If the fault is not in the new hardware itself, there may be a problem with its installation. Check to be sure that:

- All SIMMs are fully seated in the proper sockets.
- All the SIMMs in the Fast RAM banks are the same size, either 1 MB or 4 MB.
- The Fast RAM SIMM SIZE jumper setting matches the type of SIMM in the Fast RAM banks.
- No other jumpers have been moved from their factory-set positions.
- The processor module and the expansion slot daughterboard are fully seated in their slots.
- All expansion boards are fully seated in their slots and connected according to their instructions.
- All peripherals were properly reconnected to the Amiga after installation.

Refer to the installation sections of Chapters 1, 4, and 5.

Maintenance Problems

- A floppy, removable media, or CD-ROM drive is dirty or out of alignment. Use a commercial drive alignment and/or cleaning product according to the drive manufacturer's directions, or have your dealer/service center look at the drive.
- The mouse ball or mouse ball rollers are dirty. Open the mouse ball cavity, remove the ball, and clean the ball and interior with a cotton swab.
- Connector pins are bent or dirty. Carefully clean and straighten the pins.

Non User-Serviceable Problems

If you still have a problem after trying the remedies suggested here, you may have a hardware problem that requires professional attention. Have your Amiga examined by your Amiga dealer/service

center or a knowledgeable technician. If the problem appears to be with a third-party device, contact its manufacturer.

Do not try to repair a damaged or malfunctioning unit yourself. This could cause further damage, possible injury, and the voiding of your warranties.

Appendix A

Technical Specifications

Clock Speed	25 MHz
Processor Module	Socketed Motorola 68040 series microprocessor
Custom Chips	AA multichip coprocessor system for video, graphics, sound, and DMA
Fast Memory	<p>Expandable using SIMM sockets on motherboard to a total of 16 MB (additional RAM above 18 MB can be added using expansion slots)</p> <p>Module specifications:</p> <p>Package: 72-pin SIMM, 1 inch/2.54 cm maximum height (single sided only)</p> <p>Speed: 80 nanoseconds or faster</p> <p>Type: page mode</p> <p>Organization:</p> <ul style="list-style-type: none">• 256K × 32 (1 MB)• 1M × 32 (4 MB) <p>Note: SIMM units with the above characteristics but 36 bits wide rather than 32 are commonly available. SIMMs of this type can also be used in the Fast and Chip RAM banks; however, the extra bits are ignored.</p>

Chip Memory	<p>Expandable using SIMM socket on motherboard to 2 MB</p> <p>Module specifications:</p> <p>Package: 72-pin SIMM, 1 inch/2.54 cm maximum height (single or double sided)</p> <p>Speed: 80 nanoseconds or faster</p> <p>Type: page mode</p> <p>Organization:</p> <ul style="list-style-type: none">• 256K × 32 (1 MB)• 512K × 32 (2 MB)
ROM	512 KB
External Interfaces	<p>Keyboard (6-pin female mini-DIN, PS/2-type)</p> <p>Mouse/Joystick (DB9 male, two)</p> <p>Serial (DB25 male, RS-232, PC-compatible)</p> <p>Parallel (DB25 female, Centronics-compatible)</p> <p>Floppy (DB23 female, standard Amiga)</p> <p>Video (DB23 male, analog RGB)</p> <p>Stereo audio (RCA, two)</p>
Internal Interfaces	<p>Amiga Zorro III/Zorro II expansion bus (four 100-pin edge connectors)</p> <p>Processor local bus (200-pin, KEL connector)</p> <p>PC/AT compatible slots (three 98-pin edge connectors, in line with Amiga slots)</p> <p>AT IDE (40-pin header)</p> <p>Floppy (34-pin header)</p> <p>Internal audio input (3-pin header)</p>
Video Slot	24-bit extended slot (36 and 54-pin edge connectors, in line with Amiga slot)
Keyboard	Detachable; 94 keys U.S./96 keys international

Disk Drives	One 3.5-inch high capacity drive standard (1.76 MB formatted maximum) Internal mounting locations for: <ul style="list-style-type: none">• Two 3.5-inch low profile hard drives• One additional 3.5-inch external-access drive (low-profile)• One 5.25-inch half-height external-access drive
External Disk Drives	Up to two compatible floppy drives
Video Display	Output type: RGB, analog and digital; interlaced or non-interlaced; up to 8 bitplanes Compliance: NTSC and PAL Color palette: 16.8 million Horizontal scan rates*: 15.6 KHz - 31.4 KHz Vertical scan rates*: 50 Hz - 73 Hz
Sound	4 independent voices configured as two stereo channels
Clock/calendar	Built-in, with battery backup
Power Supply	150 watts, with fan Accessory connectors: <ul style="list-style-type: none">• four standard 4-pin• two 3.5-inch floppy drive (mini 4-pin)
Environmental Specification	Operating: 0 - 45°C (32 - 113°F) Storage/Shipping: 0 - 60°C (32 - 140°F)

*See the Mode Properties display in the ScreenMode Preferences editor for a given display mode's exact scan rates. Compare the scan rates of modes you wish to use with your monitor specifications to determine monitor compatibility.

Appendix B

Input/Output Connector Pin Assignments

This section lists pin assignments (pinouts) for input/output connectors on the Amiga. The information in this section is technical and is intended only for those with special needs in connecting external devices to the Amiga. You should not need this information if you use cables designed specifically for the Amiga and the peripheral you want to connect.

Caution **Some pins on Amiga connectors provide power outputs and non-standard signals. Attempting to use cables not wired specifically for the Amiga may damage the Amiga or the equipment you connect.**

The descriptions that follow include specific warnings for each connector. For more information about connecting peripherals, consult your Amiga dealer or service center.

Note In the descriptions that follow, a forward slash in front of the signal name (for example, /**STROBE**) indicates a signal that is active low.

SERIAL Port

Connector type: DB25 male



In the following table, column two gives the Amiga pin assignments. Columns three and four give pin assignments for other commonly used connections; the information in these two columns is given for comparison only.

Caution Pins 9 and 10 on the Amiga serial connector are used for external power. Connect these pins **ONLY** if power from them is required by the external device. The table lists the power provided by each of these pins.

Pin 7 is the system ground. Do not connect this to shield ground on Pin 1.

Pin	Amiga	RS232	HAYES	I/O	Description
1	SHIELD	GND	GND	--	Shield Ground
2	TXD	TXD	TXD	O	Transmit Data
3	RXD	RXD	RXD	I	Receive Data
4	RTS	RTS	--	O	Request to Send
5	CTS	CTS	CTS	I	Clear to Send
6	DSR	DSR	DSR	I	Data Set Ready
7	GND	GND	GND	--	System Ground
8	CD	CD	DCD	I	Carrier Detect
9	+12V	--	--	--	+12 Volts DC (20 mA maximum)
10	-12V	--	--	--	-12 Volts DC (20 mA maximum)
11	AUDO	--	--	O	Amiga Audio out (Left)
12	n/c	S.SD	SI	--	Speed Indicate
13	n/c	S.CTS	--	--	
14	n/c	S.TXD	--	--	
15	n/c	TXC	--	--	
16	n/c	S.RXD	--	--	
17	n/c	RXC	--	--	
18	AUDI	--	--	I	Amiga Audio In (Right)
19	n/c	S.RTS	--	--	
20	DTR	DTR	DTR	O	Data Terminal Ready
21	n/c	SQD	--	--	
22	RI	RI	RI	I	Ring Indicator
23	n/c	SS	--	--	
24	n/c	TXC1	--	--	
25	n/c	--	--	--	

PARALLEL Port

Connector type: DB25 female



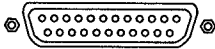
Caution Pin 14 on the Amiga parallel connector supplies +5 volts of power. Connect this pin **ONLY** if the power from it is required by the external device. **NEVER** connect this pin to an output of an external device or to a signal ground.

Pins 17-25 are for grounding signals. DO NOT connect these pins directly to a shield

Pin	Name	I/O	Description
1	/STROBE	O	Strobe
2	D0	I/O	Data Bit 0 (LSB)
3	D1	I/O	Data Bit 1
4	D2	I/O	Data Bit 2
5	D3	I/O	Data Bit 3
6	D4	I/O	Data Bit 4
7	D5	I/O	Data Bit 5
8	D6	I/O	Data Bit 6
9	D7	I/O	Data Bit 7 (MSB)
10	/ACK	I	Acknowledge
11	BUSY	I/O	Busy
12	POUT	I/O	Paper Out
13	SEL	I/O	Select
14	+5V PULLUP	--	+5 Volts DC (10 mA)
15	n/c	--	
16	/RESET	O	Reset
17	GND	--	Signal Ground
18	GND	--	Signal Ground
19	GND	--	Signal Ground
20	GND	--	Signal Ground
21	GND	--	Signal Ground
22	GND	--	Signal Ground
23	GND	--	Signal Ground
24	GND	--	Signal Ground
25	GND	--	Signal Ground

VIDEO Port

Connector type: DB23 male



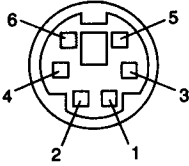
Caution Pins 21, 22 and 23 on the RGB monitor connector are used for external power. Connect these pins **ONLY** if power from them is required by the external device.

Pins 16-20 are used for signal ground. DO NOT connect these to Pin 13.

Pin	Name	I/O	Description
1	/XCLK	I	External Clock
2	/XCLKEN	I	External Clock Enable (47 Ohm)
3	RED	O	Analog Red (75 Ohm)
4	GREEN	O	Analog Green (75 Ohm)
5	BLUE	O	Analog Blue (75 Ohm)
6	DI	O	Digital Intensity (47 Ohm)
7	DB	O	Digital Blue (47 Ohm)
8	DG	O	Digital Green (47 Ohm)
9	DR	O	Digital Red (47 Ohm)
10	/CSYNC	O	Composite Sync (47 Ohm)
11	/HSYNC	O	Horizontal Sync (47 Ohm)
12	/VSYNC	O	Vertical Sync (47 Ohm)
13	GNDRTN	--	Return for /XCLKEN (e.g. digital ground)
14	/PIXELSW	O	Genlock overlay (47 Ohm)
15	/C1	O	Clock Out (47 Ohm)
16	GND	--	Video ground
17	GND	--	Video ground
18	GND	--	Video ground
19	GND	--	Video ground
20	GND	--	Video ground
21	-5V	--	-5 Volts DC (10 mA)
22	+12V	--	+12 Volts DC (100 mA)
23	+5V	--	+5 Volts DC (100 mA)

KEYBOARD Port

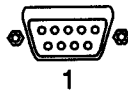
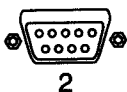
(Connector type: 6-pin female mini-DIN, PS/2-type)



Pin	I/O	Description
1	I/O	Data
2	--	n/c
3	--	Ground
4	--	+5 VDC (100 mA)
5	O	Clock
6	--	n/c

MOUSE Ports

Connector type: DB9 male



If you use a mouse to control the Workbench, you must attach it to mouse connector 1 (the front mouse connector on the left side of the Amiga). You can attach joystick controllers and light pens to either of the connectors. The following tables describe mouse, game controller, and light pen connections.

Caution Pin 7 on each of these connectors supplies +5 volts of power. Connect this pin **ONLY** if power from it is required by the external device.

Connector 1: Mouse

Pin	Name	Description
1	MOUSE V	Mouse Vertical
2	MOUSE H	Mouse Horizontal
3	MOUSE VQ	Vertical Quadrature
4	MOUSE HQ	Horizontal Quadrature
5	MOUSE BUTTON 3	Mouse Button 3 (middle)
6	MOUSE BUTTON 1	Mouse Button 1 (left)
7	+5V	+5 Volts DC (50 mA)
8	GND	Ground
9	MOUSE BUTTON 2	Mouse Button 2 (right)

Connectors 1 and 2: Game Controller (Digital Joystick)

Pin	Name	Description
1	/FORWARD	Controller Forward
2	/BACK	Controller Back
3	/LEFT	Controller Left
4	/RIGHT	Controller Right
5	n/c	
6	/FIRE	Controller Fire
7	+5V	+5 Volts DC (50 mA)
8	GND	Ground
9	BUTTON 2	Controller Button 2

Connectors 1 and 2: Light Pen

Pin	Name	Description
1	n/c	
2	n/c	
3	n/c	
4	n/c	
5	LIGHT PEN PRESS	Light Pen Switch
6	/LIGHT PEN	Capture Beam Position
7	+5V	+5 Volts DC (50 mA)
8	GND	Ground
9	n/c	

Connectors 1 and 2: Proportional Joystick

Pin	Name	Description
1	BUTTON 3	Controller Button 3
2	n/c	
3	BUTTON 1	Controller Button 1 (left)
4	BUTTON 2	Controller Button 2 (right)
5	POTX	Horizontal Control
6	n/c	
7	+5V	+5 Volts DC (50 mA)
8	GND	Ground
9	POTY	Vertical Control

FLOPPY Port

Connector type: DB23 female (external)

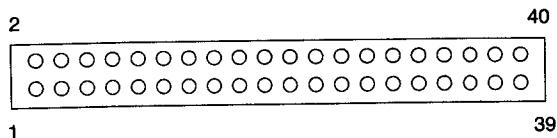


Pin	Name	I/O	Description
1	/RDY	I/O	Disk Ready
2	/DKRD	I	Disk Read Data
3-7	GND	--	Ground
8	/MTRXD	OC*	Disk Motor Control
9	/SEL3	OC*	Select Drive 3
10	/DRES	OC*	Disk Reset
11	/CHNG	I/O	Disk Removed From Drive--Latched Low
12	+5V	--	+5 Volts DC (250 mA maximum)
13	/SIDE	O	Select Disk Side--0=Upper, 1=Lower
14	/WPRO	I/O	Disk Is Write Protected
15	/TK0	I/O	Drive Head Position Over Track 0
16	/DKWE	OC*	Disk Write Enable
17	/DKWD	OC*	Disk Write Data
18	/STEP	OC*	Step The Head--Pulse, First Low, Then High
19	DIR	OC*	Select Head Direction--0=Inner, 1=Outer
20	n/c	--	no connect
21	/SEL2	OC*	Select Drive 2
22	/INDEX	I/O	Disk Index Pulse
23	+12V	--	+12 Volts DC (160 mA max., 540 mA surge)

*OC=open collector

Internal AT IDE

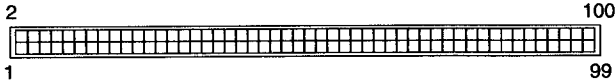
Connector type: 40-pin male (motherboard)



Pin	I/O	Signal	Pin	I/O	Signal
1	O	/RESET	21	--	n/c
2	--	Ground	22	--	Ground
3	I/O	Drive Data 7	23	O	/IOW (write strobe)
4	I/O	Drive Data 8	24	--	Ground
5	I/O	Drive Data 6	25	O	/IOR (read strobe)
6	I/O	Drive Data 9	26	--	Ground
7	I/O	Drive Data 5	27	I	IO_CH_RDY
8	I/O	Drive Data 10	28	--	n/c
9	I/O	Drive Data 4	29	--	n/c
10	I/O	Drive Data 11	30	--	Ground
11	I/O	Drive Data 3	31	I	Interrupt request
12	I/O	Drive Data 12	32	--	n/c
13	I/O	Drive Data 2	33	O	DA1 (address 1)
14	I/O	Drive Data 13	34	--	n/c
15	I/O	Drive Data 1	35	O	DA0 (address 0)
16	I/O	Drive Data 14	36	O	DA2 (address 2)
17	I/O	Drive Data 0	37	O	/IDE_CS1
18	I/O	Drive Data 15	38	O	/IDE_CS2
19	--	Ground	39	O	/ACTIVE (LED driver)
20	--	n/c	40	--	Ground

Amiga Expansion Slots

Connector type: 100-pin female edge (daughterboard)



Pin	Physical Name	Zorro II Name	Zorro III Address Phase	Zorro III Data Phase
1	Ground	Ground	Ground	Ground
2	Ground	Ground	Ground	Ground
3	Ground	Ground	Ground	Ground
4	Ground	Ground	Ground	Ground
5	+5VDC	+5VDC	+5VDC	+5VDC
6	+5VDC	+5VDC	+5VDC	+5VDC
7	/OWN	/OWN	/OWN	/OWN
8	-5VDC	-5VDC	-5VDC	-5VDC
9	/SLAVEn*	/SLAVEn*	/SLAVEn*	/SLAVEn*
10	+12VDC	+12VDC	+12VDC	+12VDC
11	/CFGOUTn*	/CFGOUTn*	/CFGOUTn*	/CFGOUTn*
12	/CFGINn*	/CFGINn*	/CFGINn*	/CFGINn*
13	Ground	Ground	Ground	Ground
14	/C3 Clock	/C3 Clock	/C3 Clock	/C3 Clock
15	CDAC	CDAC Clock	CDAC Clock	CDAC Clock
16	/C1 Clock	/C1 Clock	/C1 Clock	/C1 Clock
17	/CINH	/OVR	/CINH	/CINH
18	/MTCR	XRDY	/MTCR	/MTCR
19	/INT2	/INT2	/INT2	/INT2
20	-12VDC	-12VDC	-12VDC	-12VDC

*n=slot number

Pin	Physical Name	Zorro II Name	Zorro III Address Phase	Zorro III Data Phase
21	A5	A5	A5	A5
22	/INT6	/INT6	/INT6	/INT6
23	A6	A6	A6	A6
24	A4	A4	A4	A4
25	Ground	Ground	Ground	Ground
26	A3	A3	A3	A3
27	A2	A2	A2	A2
28	A7	A7	A7	A7
29	/LOCK	A1	/LOCK	/LOCK
30	AD8	A8	A8	D0
31	FC0	FC0	FC0	FC0
32	AD9	A9	A9	D1
33	FC1	FC1	FC1	FC1
34	AD10	A10	A10	D2
35	FC2	FC2	FC2	FC2
36	AD11	A11	A11	D3
37	Ground	Ground	Ground	Ground
38	AD12	A12	A12	D4
39	AD13	A13	A13	D5
40	reserved	reserved	reserved	reserved
41	AD14	A14	A14	D6
42	reserved	reserved	reserved	reserved
43	AD15	A15	A15	D7
44	reserved	reserved	reserved	reserved
45	AD16	A16	A16	D8
46	/BERR	/BERR	/BERR	/BERR
47	AD17	A17	A17	D9
48	/MTACK	/(VPA)	/MTACK	/MTACK
49	Ground	Ground	Ground	Ground

Pin	Physical Name	Zorro II Name	Zorro III Address Phase	Zorro III Data Phase
50	E Clock	E Clock	E Clock	E Clock
51	/DS0	/(VMA)	/DS0	/DS0
52	AD18	A18	A18	D10
53	/RESET	/RST	/RESET	/RESET
54	AD19	A19	A19	D11
55	/HLT	/HLT	/HLT	/HLT
56	AD20	A20	A20	D12
57	AD22	A22	A22	D14
58	AD21	A21	A21	D13
59	AD23	A23	A23	D15
60	BRn*	BRn*	BRn*	BRn*
61	Ground	Ground	Ground	Ground
62	/BGACK	/BGACK	/BGACK	/BGACK
63	AD31	D15	A31	D31
64	/BGn*	/BGn*	/BGn*	/BGn*
65	AD30	D14	A30	D30
66	/DTACK	/DTACK	/DTACK	/DTACK
67	AD29	D13	A29	D29
68	READ	READ	READ	READ
69	AD28	D12	A28	D28
70	/DS2	/LDS	/DS2	/DS2
71	AD27	D11	A27	D27
72	/DS3	/UDS	/DS3	/DS3
73	Ground	Ground	Ground	Ground
74	/CCS	/AS	/CCS	/CCS
75	SD0	D0	N/A*	D16

*n=slot number

Pin	Physical Name	Zorro II Name	Zorro III Address Phase	Zorro III Data Phase
76	AD26	D10	A26	D26
77	SD1	D1	N/A*	D17
78	AD25	D9	A25	D25
79	SD2	D2	N/A*	D18
80	AD24	D8	A24	D24
81	SD3	D3	N/A*	D19
82	SD7	D7	N/A*	D23
83	SD4	D4	N/A*	D20
84	SD6	D6	N/A*	D22
85	Ground	Ground	Ground	Ground
86	SD5	D5	N/A*	D21
87	Ground	Ground	Ground	Ground
88	Ground	Ground	Ground	Ground
89	Ground	Ground	Ground	Ground
90	Ground	Ground	Ground	Ground
91	SenseZ3	Ground	SenseZ3	SenseZ3
92	7M	E7M	7M	7M
93	DOE	DOE	DOE	DOE
94	/IORST	/BUSRST	/IORST	/IORST
95	/BCLR	/GBG	/BCLR	/BCLR
96	reserved	reserved	reserved	reserved
97	/FCS	not used	/FCS	/FCS
98	/DS1	not used	/DS1	/DS1
99	Ground	Ground	Ground	Ground
100	Ground	Ground	Ground	Ground

*N/A = Not applicable to this phase.

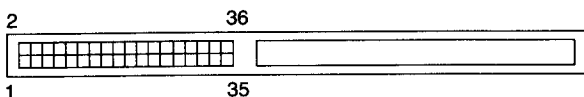
Video Slot

Connector type: 36/54-pin female edge (daughterboard)

The A4000 video slot consists of the 36-pin standard video connector and the 54-pin extended video connector. The two connectors are in line with each other, with the standard connector on the left. The extended connector has 18 pins not found on previous Amiga video slots. Note that although the pin numbers of various signals have changed, the physical locations of pins with those signals are the same.

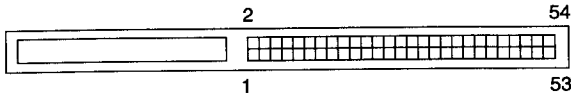
Caution DO NOT mix digital and analog grounds.

Standard Video Connector



Pin	Name	I/O	Signal
1	RGB16	O	Red Bit 0
2	RGB17	O	Red Bit 1
3	LINELF	O	Audio Line Out Left
4	LINERT	O	Audio Line Out Right
5	C28D	O	Pixel-Synchronous Clock
6	+5V	--	+5 Volts DC (main power; 1 amp)
7	ARED	O	Analog Red
8	+5V	--	+5 Volts DC (1 amp)
9	GND	--	Digital Ground
10	+12V	--	+12 Volts DC (high voltage power; 40 mA)
11	AGREEN	O	Analog Green

Pin	Name	I/O	Signal
12	GND	--	Digital Ground
13	GND	--	Digital Ground
14	/CSYNC	O	Composite Sync
15	ABLUE	O	Analog Blue
16	/XCLKEN	I	Genlock Clock Enable
17	GND	--	Digital Ground
18	BURST	O	Burst Gate
19	/C4	O	3.55/3.58 MHz Clock
20	GND	--	Digital Ground
21	GND	--	Digital Ground
22	/HSYNC	O	Horizontal Sync (47 Ohm)
23	RGB4	O	Blue Bit 4
24	GND	--	Digital Ground
25	RGB7	O	Blue Bit 7
26	/VSYNC	O	Vertical Sync (47 Ohm)
27	RGB15	O	Green Bit 7
28	BLANK	O	Video Blank
29	RGB23	O	Red Bit 7
30	/PIXELSW	O	Genlock Overlay (47 Ohm)
31	-5V	--	-5 Volts DC (negative supply)
32	GND	--	Digital Ground
33	/XCLK	I	Genlock Clock
34	/C1	O	C1 Clock
35	+5V	--	+5 Volts DC (1 amp)
36	PSTROBE	O	Printer Port Handshake

Extended Video Connector

Pin	Name	I/O	Signal
1	GND	--	Digital Ground
2	RGB20	O	Red Bit 4
3	RGB21	O	Red Bit 5
4	RGB22	O	Red Bit 6
5	GND	--	Digital Ground
6	RGB12	O	Green Bit 4
7	RGB13	O	Green Bit 5
8	RGB14	O	Green Bit 6
9	GND	--	Digital Ground
10	RGB5	O	Blue Bit 5
11	RGB6	O	Blue Bit 6
12	GND	--	Ground
13	SOG	O	Sync-On-Green Indicator
14	TBASE	O	50/60 Hz Software Clock Timebase
15	CDAC	O	7.09/7.16 MHz Clock
16	PPOUT	I/O	Printer Port Paper Out
17	/C3	O	3.55/3.58 MHz Clock
18	PBUSY	I/O	Printer Port Busy
19	/LPEN	I	Light Pen Input
20	/PACK	I/O	Printer Port Acknowledge Handshake
21	PSEL	O	Printer Port Select
22	GND	--	Digital Ground
23	PPD0	I/O	Printer Port Data Bit 0
24	PPD1	I/O	Printer Port Data Bit 1
25	PPD2	I/O	Printer Port Data Bit 2

Pin	Name	I/O	Signal
26	PPD3	I/O	Printer Port Data Bit 3
27	PPD4	I/O	Printer Port Data Bit 4
28	PPD5	I/O	Printer Port Data Bit 5
29	PPD6	I/O	Printer Port Data Bit 6
30	PPD7	I/O	Printer Port Data Bit 7
31	/LED	O	LED (audio filter bypass) Setting
32	GND	--	Digital Ground
33	RAWLF	O	Raw (unfiltered) Audio Left
34	AGND	--	Audio Ground
35	RAWRT	O	Raw (unfiltered) Audio Right
36	AGND	--	Audio Ground
37	n/c	--	reserved for future expansion
38	n/c	--	reserved for future expansion
39	GND	--	Digital Ground
40	GND	--	Digital Ground
41	n/c	--	reserved for future expansion
42	n/c	--	reserved for future expansion
43	GND	--	Digital Ground
44	GND	--	Digital Ground
45	RGB18	O	Red Bit 2
46	RGB19	O	Red Bit 3
47	RGB8	O	Green Bit 0
48	RGB9	O	Green Bit 1
49	RGB10	O	Green Bit 2
50	RGB11	O	Green Bit 3
51	RGB0	O	Blue Bit 0
52	RGB1	O	Blue Bit 1
53	RGB2	O	Blue Bit 2
54	RGB3	O	Blue Bit 3

Appendix C

Using Floppy Disks

Floppy disks are a type of portable magnetic recording media that is used to:

- transfer information from one computer to another
- install software on a system's hard drive
- make backup copies of your software and data

When you insert a floppy disk into the system's floppy disk drive, you can read the information stored on the disk and write information to the disk.

Using 3.5-Inch Floppy Disks

Your computer system comes with a 3.5-inch high capacity disk drive installed. You can use either high-density or standard double-density (880 KB storage capacity) floppy disks in this drive.

High-density disks have the advantage of storing more data than double-density disks. Although you can use double-density disks in the high capacity disk drive, high-density disks can be read only by high capacity drives. The Amiga automatically recognizes which type of disk is inserted in the high capacity drive.

Note Previous Amiga models had only double-density drives. These drives cannot sense or read high-density floppy disks. Formatted high-density floppy disks will appear to those Amiga models as unformatted disks. While it is possible to format a high-density floppy as double-density on a double-density drive, this should not be done, as such disks are not reliable.

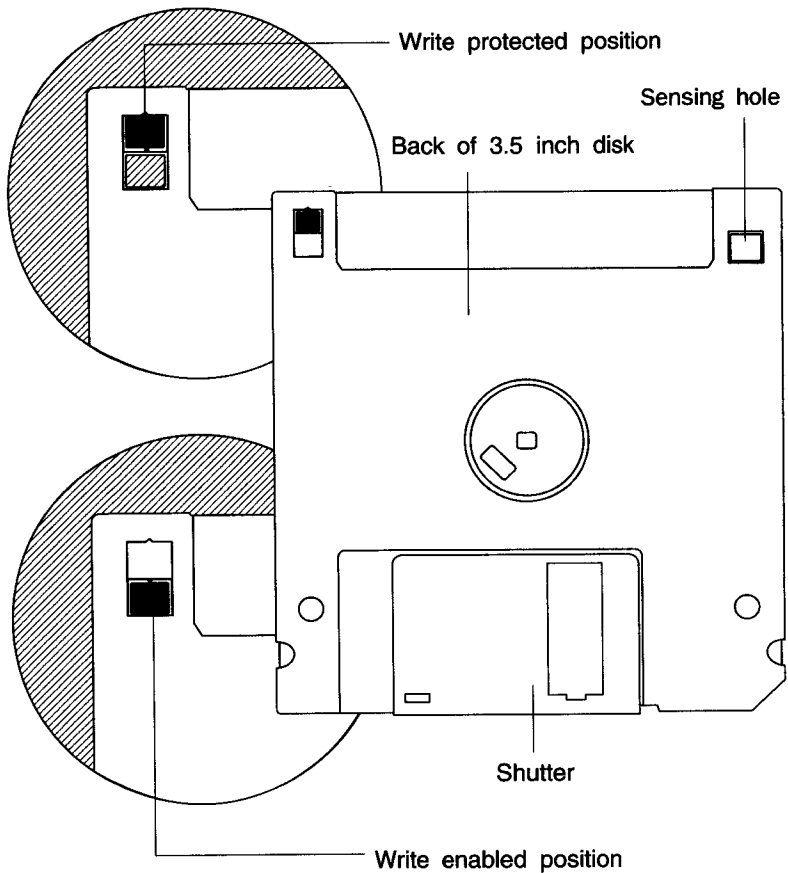


Figure C-1. High density disk

Figure C-1 illustrates a high-density disk. You can distinguish the disks by looking at the edge of the disk opposite the sliding metal panel.

- high-density disks have a write-protect tab on one side and a sensing hole on the other side.
- double-density disks have only a write-protect tab.

To write-protect either kind of disk, slide the plastic write-protect tab to uncover the hole.

Figure C-2 illustrates inserting a disk into the disk drive. When you push the disk all the way into the drive, the disk will click down into place. To release the disk, push the button on the lower right side of the disk opening.

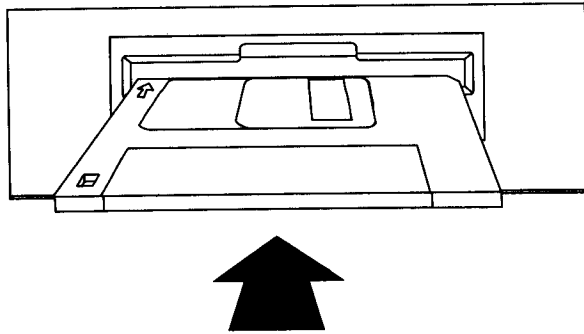


Figure C-2. Inserting a Disk

Guidelines for Using Disks

- Most important: Never remove a disk from a drive while the drive is in use. Always wait a few seconds after the drive light has gone out before removing it, rebooting, or turning the computer off, as sometimes there is some additional disk activity after a moment.

Disk errors may be caused by interrupting disk activity. These can often be repaired using a disk recovery utility. See your Amiga software documentation for more information.

- Make copies (working disks) of important disks. Work with the copies and keep the originals in a safe place for use as backups if the copies become damaged. See your Amiga software documentation for information on copying disks
- Don't touch or scratch any exposed portion of the disk's shiny surface, or allow dust or moisture to collect on the disk.
- Store disks at a temperature range between 50° and 120° F.
- Keep disks away from devices with strong magnetic fields, such as televisions, electric motors, speakers, etc.
- You must format a new disk before you use it for storing data. Before you begin the format, make sure the disk doesn't contain anything you want to save. Formatting a disk will erase all data stored on it.

Floppy disks may be formatted with the Old File System (OFS), the Fast File System (FFS), or the MS-DOS compatible CrossDOS file system. You can also format disks (OFS and FFS only) with a directory-caching option for faster response in opening disk windows and reading disk directories. This option does not greatly affect the amount of space on the disk.

You therefore have the following options in formatting disks in an Amiga high-capacity drive:

Table C-1. Floppy formatting options

Floppy Disk Type	File System	Formatted Capacity
double-density	OFS	837 KB
double-density	FFS	879 KB
double-density	DC-OFS	837 KB
double-density	DC-FFS	879 KB
double-density	CrossDOS	720 KB
high-density	OFS	1.67 MB
high-density	FFS	1.76 MB

Floppy Disk Type (cont'd)	File System (cont'd)	Formatted Capacity (cont'd)
high-density	DC-OFS	1.67 MB
high-density	DC-FFS	1.76 MB
high-density	CrossDOS	1.44 MB

Note Disks formatted with the directory-caching option cannot be read by Amigas with earlier versions of the system software. Do not format a disk with the directory-caching option if you need to use the disk to transfer files to an Amiga with Release 2 or earlier system software.

Also, you should not attempt to use standard disk repair utilities on such disks. Disk utilities not developed with the directory-caching feature in mind will not properly recognize the new disk format and could damage the data on the disks.

Appendix D

Component Locations and Settings

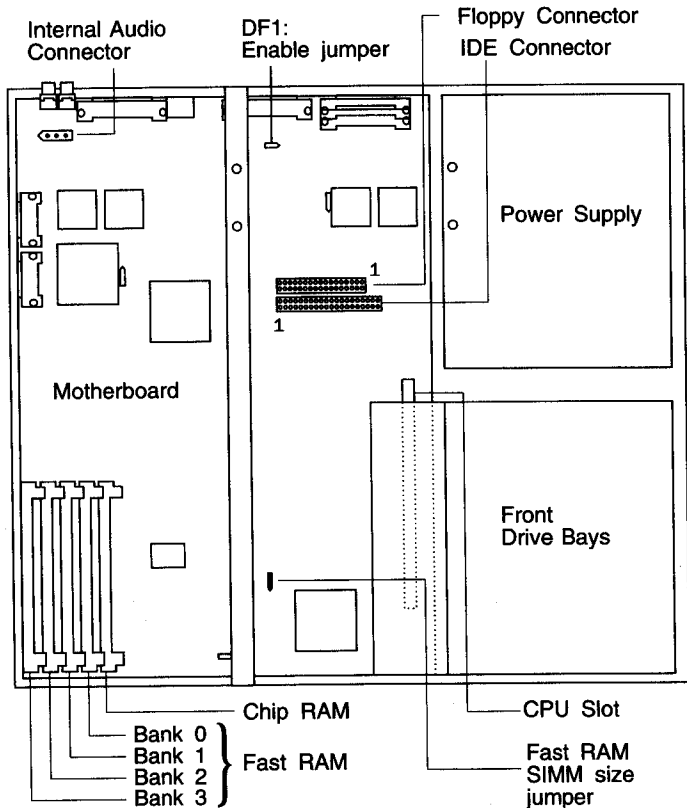


Figure D-1. A4000 motherboard layout

A4000 Motherboard Jumpers

Jumper	Function	Setting
SIMM SIZE (J852)	enable 1 MB Fast RAM modules	256K
SIMM SIZE (J852)	enable 4 MB Fast RAM modules	1M
DF1: ENABLE (J351)	enable 2nd internal floppy (880 KB) as DF1:	closed
DF1: ENABLE (J351)	no 2nd internal floppy, or 1.76 MB floppy as DF1:	open

No other jumpers on the A4000 motherboard should be changed from their factory settings by the user.

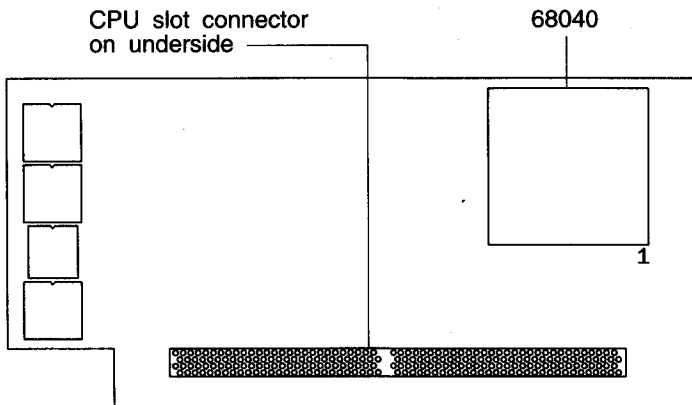


Figure D-2. 68040 processor module

No jumpers on the 68040 processor module should be changed from their factory settings by the user.

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