

Introduction to the

 **Commodore®**

**AMIGA®**

**2000**





# About This Manual

This manual is designed to let you set up and start using your Amiga 2000 with a minimum of effort. The manual includes nine chapters, a set of appendices, a glossary and an index. Here's a brief description of each part of this manual:

Chapter 1, *Introduction*, summarizes the general features and capabilities of the Amiga 2000.

Chapter 2, *Setting Up the Amiga*, shows how to put your Amiga together. If you're using an Amiga for the first time, read Chapter 3, *Getting Started*, to learn the basics.

Chapter 4, *Using the Workbench*, describes the nuts and bolts of using Workbench—to familiarize yourself with elements like icons, menus, and using the mouse.

Chapter 5, *Workbench Tools*, tells about the useful tools available through the Workbench disk, including Amiga's built-in clock, calculator, notepad, icon editor, speech synthesizer, graphic dump, and international keymap selector.

Chapter 6, *Using Preferences*, explains how to customize your Amiga by changing the settings on the Preferences utility of Workbench.

Chapter 7, *AmigaDOS and the CLI*, explains how to use the Amiga Disk Operating System by typing in commands directly, via the Command Line Interface (CLI).

Chapter 8, *Adding to the Amiga 2000*, describes printers, extra memory, disk drives, modems and other hardware peripherals available for your Amiga.

Chapter 9, *Caring for the Amiga 2000*, gives advice on how to keep your Amiga in good working order.

Appendix A, *Technical Reference*, contains technical specifications, and diagrams of input/output connectors.

Appendix B, *AmigaDOS Reference*, contains summaries of AmigaDOS CLI and screen editor (ED) commands, as well as a list of Amiga error numbers and what to do when you get the errors.

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Appendix C, *Using the Amiga 2000 Keyboard*, describes the four sections of the keyboard and tells you which keys to use to perform typical mouse functions such as moving the pointer, selecting, and using menus. This appendix also includes keymaps of Amiga 2000 keyboard configurations for different countries.

Appendix D, *Printer Escape Codes*, summarizes the escape codes the Amiga uses to communicate with printers.

Appendix E, *Amiga Bibliography*, lists the guides and reference books for the Amiga system available from publishers.

Appendix F, *Amiga Schematics*, contains detailed technical diagrams of the inner workings of the Amiga.

The *Glossary* defines important special terms. (Terms from the glossary are shown in *italics* when they first appear in the text.)

The *Index* lists the pages containing information on any specific subject.

## For More Information

The capabilities of the Amiga 2000 are so extensive that they cannot be fully covered in a single book. For more information on how the Amiga works, see the *Amiga Hardware Manual*, the *Amiga ROM Kernel Manual*, the *AmigaDOS Manual*, and *Intuition: The AMIGA User Interface*. These manuals are available from your Amiga dealer, or your local bookstore.

See Appendix E for a listing of current Amiga reference guides and other books.

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*This chapter introduces you to the Amiga® 2000 by briefly describing its capabilities and potential.*

*The first part of the chapter describes the components of the Amiga system and summarizes how they work; this section is addressed primarily to those unfamiliar with the Amiga series of computers.*

*The second part of the chapter summarizes the key features of the Amiga 2000; this section is addressed primarily to those users whose interests are more technical. Whatever your level of experience or your interests or application needs, however, you will find that the Amiga 2000 meets your computing needs.*

## **Introducing The Amiga 2000**

The Amiga 2000 offers a spectrum of capabilities so wide, so sophisticated, so versatile and so affordable as to be unrivalled in the microcomputer field. Yet all this power and sophistication have been made so accessible, so easy to control that even a computer novice can be up and running with a minimum of effort.

The Amiga 2000 retains all the features that inspired reviewers to dub the original Amiga 1000 "the Maserati of microcomputers"—high speed/high efficiency processing; superb graphic and video resources; advanced stereo sound and music capabilities; the ability to perform a number of tasks simultaneously (multitasking operation); a unique file structure that allows programs to exchange data of various types (program code, text, graphics, sound); easy expandability; and more. In the Amiga 2000, these features are enhanced and new ones are added. Here are just two examples:

- The Amiga 2000 comes equipped with a full megabyte of RAM, and you can add up to eight megabytes internally. All this RAM is directly accessible, eliminating the time that other microcomputers must spend in indirectly accessing expansion RAM (e.g., by using a RAM disk scheme or *paging*). The result is that the A2000 enjoys a considerable advantage in processing speed.
- The Amiga 2000's flexible open architecture supports the easy installation of a variety of powerful expansion options. For instance, with the optional **Bridgeboard™** (described later in this chapter) you have, in addition to full Amiga capabilities, everything required for IBM PC®-XT compatible operation. You can even combine the Amiga and Bridgeboard capabilities, integrating them under the Amiga operating system to take advantage of its unique features, such as flexible windows and multi-tasking.



Later in this chapter there is a detailed list of Amiga 2000 features, but the two items listed above should assure you that in selecting the Amiga 2000 you have chosen one of the most advanced microcomputers available today.

## The Parts of the Amiga 2000 System

The Amiga 2000 system consists of a number of separate components:



If you are new to computers in general or to the Amiga in particular, the system photo above and the capsule descriptions following will help you identify the components of the Amiga 2000, and to understand their basic functions:

- The **Main Unit** is the large boxlike component. It houses microchips containing the **CPU** (central processing unit) and other memory and processing circuitry (e.g., sound and graphics chips); expansion slots into which you can insert optional circuit cards for additional memory, co-processors, PC-compatible expansion, etc.; and a variety of **jacks, connectors or ports**, through which you can attach external equipment (e.g., printers, modems, extra disk drives).



- The **Mouse** is a small hard ball enclosed in a palm-sized housing. You use the mouse to move from place to place on the display screen in order to select Amiga functions and capabilities. The mouse is connected to one of the ports on the main unit.



- The **Keyboard** resembles that of a typewriter, with some extra keys. A coiled cord connects the keyboard to the main unit. The keyboard is used to enter commands and data and to respond to **prompts** or messages from the computer. With 94 keys (96 keys in the international version), the Amiga keyboard is among the most complete keyboards available in the microcomputer field. The number of functions available through the keyboard can be extended through the use of multi-key sequences. See Appendix C for details on keyboard layout and functions.



- The **Software Disks** are 3½ inches square and contain instructions that tell the computer what to do.





- The **Floppy Disk Drive(s)**, into which you insert the software floppy disks so that the computer can read information from them and write information to them.



- The **Monitor**, which displays information in response to actions taken by you or the computer. The monitor (which may be one of several types, and which may or may not be included as part of the Amiga 2000 package, depending on the country of purchase) is connected to the main unit.

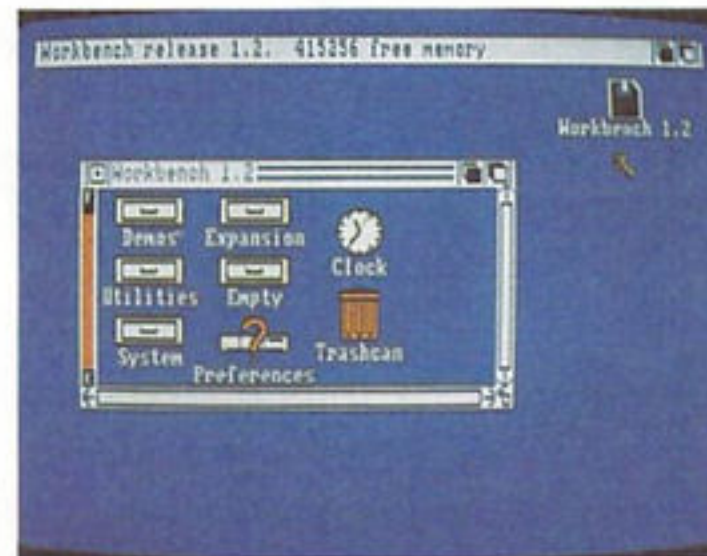


You can of course add optional peripherals like printers, modems, disk drives, etc., to your Amiga 2000 system.

The Amiga 2000 package also includes all necessary connecting cables. See Chapter 2 for setup and connection instructions.

## How the Amiga Works

The Amiga 2000 is a **window/icon/mouse/menu/pointer** type system. In general terms, this means that you use the **mouse** to move a **pointer** (shaped like a small arrow) around the display screen to point to **icons** (i.e., small pictures) that identify some item or function that you want to select. In some cases the selection involves the display of a **menu** (a list of options), from which you can choose the appropriate item. The display and selection process may also involve one or more **windows** (i.e., discrete areas of the display that can accept or display information). In working with the Amiga, you often will be using a software tool known as the **Workbench™**, which incorporates menus and windows and other Amiga items as well. For more details on how the Amiga icon-driven system works, see Chapters 3, 4, 5, 6 and 7.



*The remainder of this chapter is addressed primarily to programmers, developers and others who have a strong technical interest in the Amiga 2000. This material is not essential to setting up the Amiga 2000 and running application software.*

## General Features of the Amiga 2000

Among the key features of the Amiga 2000 are the following:

### Operating System in ROM

The Amiga 2000 has a large portion (256 Kbyte) of its operating system in ROM, which means that it is always directly accessible—you never need to take the time to load it from disk. This greatly enhances processing speed.

### Multi-tasking

Multi-tasking—i.e., handling a number of tasks simultaneously, with each task being executed according to its priority—is a capability unique to the Amiga 2000 among microcomputers in or near its price range. Part of the reason for the Amiga's high processing efficiency is the use of the multi-tasking feature in the Amiga's own operating system.



## Graphics, Windows and Sound Support for Languages

The Amiga's sophisticated graphics, windowing and sound features can be used in many programming languages such as AmigaBASIC® and C.

## Standard File Format for Easy Data Interchange

The IFF (Interchange File Format) is specifically designed for use with the AMIGA line of personal computers. This unique format provides a standard structure for files, regardless of the file content: program code, text data, graphic data or sound data. With the IFF format, the Amiga provides a totally new ability to interchange data among different programs.

## Multiple Disk Type Capability

The Amiga 2000 can use either 3½" or 5¼" floppy disks, as well as a hard disk.

## Generation of Complex Sound Waveforms

The Amiga sound system design, which features digital synthesis with a digital to analog converter, allows the generation of complex waveforms in real time without using the CPU. Other microcomputer sound systems suffer from general limitations imposed by designs that involve the CPU in sound generation.

## Direct Text-to-Speech Conversion

The ability to convert text input directly to speech output is another feature

## Unique Video Features

The Amiga 2000 permits more than one screen on a single monitor at the same time. This is not available to any other system. The A2000 also has eight sprites and the highest number of bitplanes (six). Also, the Amiga offers a bit blitter running under system software control—a highly sophisticated "next generation" feature not available on any other comparable microcomputer.

## NTSC/PAL Compatibility

The analog RGB output signals of the Amiga 2000 conform to television standards, and the coded composite signal itself is available with an optional plug-in interface. Versions are available in both the NTSC (US) and PAL (European) standard. This means that the Amiga 2000 can be connected to standard video equipment, including monitor- and projection-type television displays. No special equipment is needed. The Amiga 2000 can also work in conjunction with television studio equipment for a wide variety of tasks, such as generating graphics and titles.

## Built-In Clock/Calendar

The Amiga 2000 includes a built-in clock/calendar with a battery back-up that maintains the time and date even when the computer is turned off.



## Expandability

Among the most important attributes of the Amiga 2000 are its versatile internal expansion capabilities, which include the following.

### Microprocessor Add-ons

The Amiga 2000 has an internal CPU slot, which can be used to add system extensions such as an accelerator board, containing a Motorola 68020™ running at 14 MHz and a math co-processor. An accelerator board, inserted into the expansion slot, could replace the standard 68000 CPU, or work in parallel with it.

### Internal Memory Expansion

The Amiga 2000 is internally expandable up to 9 MBytes, and the operating system directly addresses it all. This results in a considerable speed advantage, since the A2000 does not have to resort to time-consuming indirect accessing methods, such as the RAM disk schemes used by many other microcomputers.

### Amiga Expansion Slots

In addition to CPU and video expansion slots, the Amiga 2000 provides seven additional expansion slots, including five AMIGA bus expansion slots, two of which also have PC/AT connectors. All expansion slots are controlled by a feature known as **AutoConfig**, which continuously provides complete information on the system configuration. These slots can accept memory expansions as well as I/O or interface boards or a hard disk controller.

### PC-XT/AT Compatible Expansion Slots

The Amiga 2000 provides four PC compatible slots. Two are dedicated PC/XT slots; the other two are the two joint Amiga—PC/AT slots described above for Amiga expansion. The PC slots are used in conjunction with the **Bridgeboard** option (described below).

### Video Expansion Slot

The Amiga 2000 includes a video slot that permits internal video expansions, such as a television coder or a Genlock interface. Using this slot keeps all video circuitry in the metal housing and minimizes RF problems.

### Multiple Disk Drive Expansion

The Amiga 2000 housing has mounting locations for up to three disk drives: two 3½" drives and one half-height 5¼" drive. The locations can accept either floppy disk drives or hard disk drives. The Amiga 2000 comes with at least one 3½" floppy drive installed.

### Options

There are a number of cost-effective options specifically tailored to take advantage of the extensive expansion capabilities of the Amiga 2000. These options include:

#### Hybrid Amiga Systems and the Bridgeboard

In addition to the Amiga bus, the Amiga 2000 has a secondary bus system conforming to the IBM PC XT/AT™ standard. An optional Commodore board known as the **Bridgeboard** can be used to connect the two bus systems. The Bridgeboard includes a second microprocessor (8088) and the circuitry to interface the two systems.

This hybrid architecture may be used for applications in which the PC/XT system functions as a co-processor. A dual port RAM provides a wide path for the necessary communications between the two systems. There is full access to the complete range of PC compatible add-ons including an 8087 math co-processor.



A software library for the Bridgeboard provides functions such as passing data from one side to the other and video display emulation (both color and monochrome) on the Amiga side. Special software could be written to take advantage of the combined chips: for example, you could mount a program that displays information graphically using the 68000 Amiga, while passing data for calculation by the 8088/8087.

One possible application of a hybrid Amiga system is running MS-DOS® on the Bridgeboard. In fact, the Amiga 2000 can run MS-DOS applications at the same time as native DOS software—and is the only microcomputer with this capability. Another unique feature of the Amiga 2000 is its ability to show both monochrome and color displays on the same monitor simultaneously. If the system has a hard disk drive, it can be partitioned for use by both MS-DOS and AmigaDOS.

With the Bridgeboard installed, the Amiga 2000 is fully equipped with 512k RAM and all the graphics display and printing capabilities needed to run the MS-DOS (or other PC-compatible operating system) and virtually any IBM® PC-XT compatible software packages—Lotus 1-2-3®, dBASE III®, Symphony®, etc.

## MIDI Interface

Equipped with an optional MIDI interface, the Amiga 2000 allows you to interface with and control a wide variety of sophisticated computer-compatible music components like synthesizers, drum machines, etc. By coupling these MIDI capabilities with the A2000's extremely flexible built-in multivoice stereo sound generation capabilities, you have at your disposal a state-of-the-art music and sound system unmatched in the microcomputer field.

## genlock

The Commodore **genlock** option can be connected to the A2000 either internally (via the video slot) or externally. This provides a cost-effective way to add sophisticated Amiga computer graphics, special effects and titles to videotapes, laser disk output, etc.

## Floppy Disk Drives

Available from Commodore are 3½" floppy drives (Model A1010, external; Model 2010, internal) and half-height 5¼" floppy drives (Model A1020, external; Model A2020, internal).

## Hard Disk ST506/SCSI Controller

The Commodore 2090 Hard Disk ST506/SCSI Controller Board provides high level command interpretation and controller function for two ST506 hard disk drives, and includes a built-in SCSI interface for the connection of high speed SCSI hard disk and peripherals. The board has Autoconfig and Macintosh Plus™ compatibility.

## Summary of Amiga 2000 Specifications

The following is a summary of Amiga 2000 technical specifications. For the complete specifications, see Appendix A.

<b>CPU:</b>	Motorola 68000, 16/32 Bit
<b>Clock Speed:</b>	7.14 MHz
<b>Co-Processors:</b>	3 chip co-processor system for DMA video, graphics and sound
<b>Memory:</b>	1 MB RAM standard; externally expandable up to a total of 9 MB
<b>ROM:</b>	256 KB
<b>Interfaces:</b>	Keyboard Mouse/Joystick (2); Lightpen Serial (RS 232, IBM-PC compatible) Parallel (Centronics, IBM-PC compatible) Video (RGB analog, RGBI, Composite Monochrome) Stereo Audio External Disk Drives
<b>System Slots:</b>	AMIGA system bus: 5 slots (100 pin) Secondary Bus System: 4 slots IBM PC compatible (full size, 86 pin) (2 slots are combined AMIGA-IBM PC/AT positions)



<b>Video Slot:</b>	1 video slot for internal NSTC/PAL coder
<b>Power Supply:</b>	200 watts
<b>Keyboard:</b>	Detachable, 94 keys U.S./96 keys international
<b>Mouse:</b>	Optomechanical, two button system
<b>Disk Drive(s):</b>	Standard: built-in 3½" floppy drive (capacity: 880 KB formatted) Mounting locations for: 2 3½" drives; 1 5¼" half height drive Hard disk drive: 3½" or 5¼" (half height) Hard disk capacity up to 120 MB
<b>External Disk Drives:</b>	2 AMIGA floppy disk drives 3 MS-DOS formatted floppy disk drives (if Bridgeboard is installed)
<b>Video Display:</b>	U.S.: 525 lines/vertical, frequency 60 Hz International: 625 lines/vertical, frequency 50 Hz Graphic co-processor; draw, fill, move modes Max 512 KB video memory, 4096 colors, 6 bitplanes, 8 sprites per scanline, bit blitter Text Modes: 80 Characters/25 lines 60 characters/25 lines
<b>Sound:</b>	4 independent sound channels configured as two stereo channels Sound buffer up to 400 KB nominal, maximum 512 KB
<b>Clock/Calendar:</b>	Built-in, with battery back-up
<b>System Software:</b>	Multitasking; includes: AmigaDOS; Workbench; CLI; AmigaBASIC

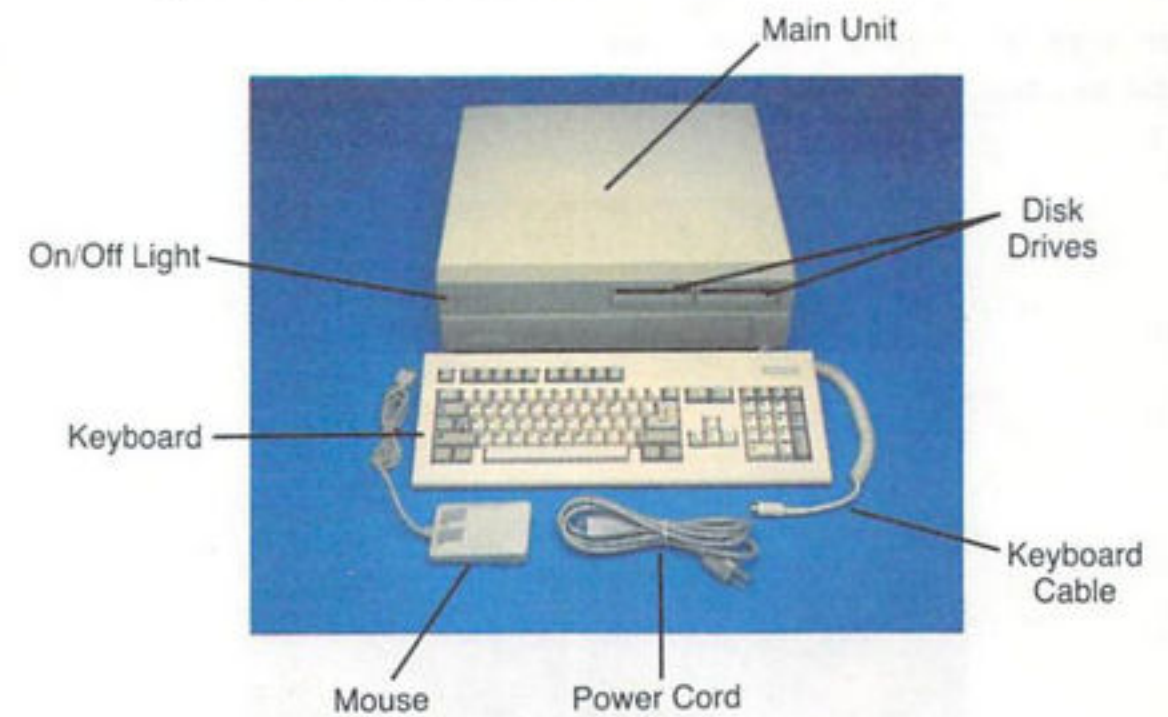
## Setting Up the Amiga 2000

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*Your Amiga 2000 takes only a few minutes to put together. Here are the things you'll find packaged with the Amiga:*

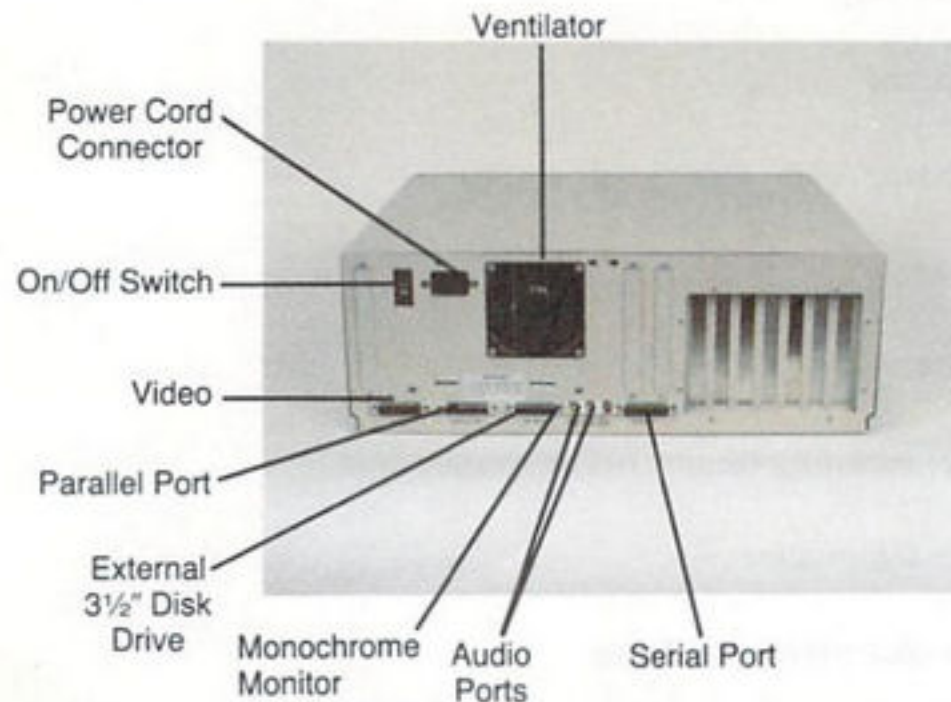
- *the main unit*
- *the power supply cord*
- *the keyboard*
- *the keyboard cable*
- *the mouse*
- *microdisks*
- *manuals, including the one you're reading now*
- *warranty information*
- *software and service brochures*



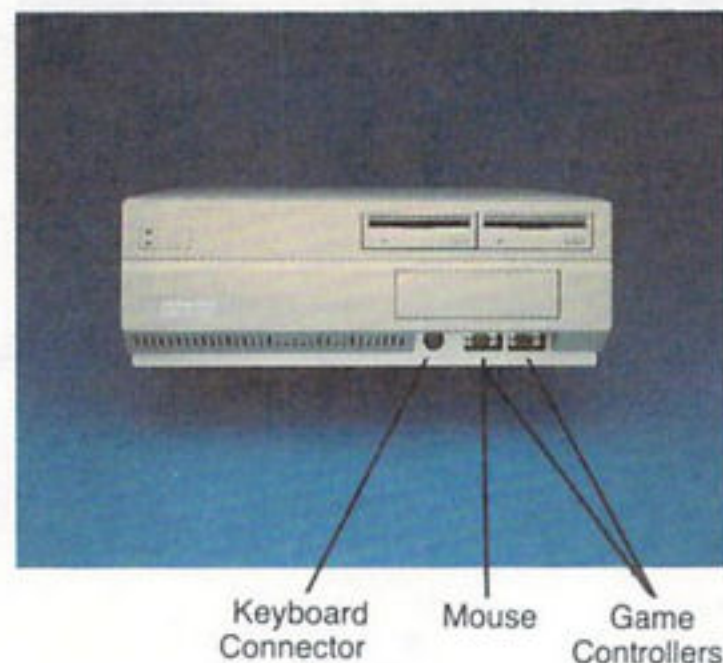


## Location of Connectors

On the back of the main unit you'll find a number of *connectors*. These are places where you attach cables and other devices:



On the front of the main unit there are three connectors: two for a mouse or joystick, and one (the one farthest left) for the keyboard cable:



## Before You Start

Before setting up your Amiga, **be sure to read each instruction carefully.** While it's not difficult to assemble the Amiga, it *is* possible to damage it if you don't follow the instructions.

**Note the cardboard sleeve in the disk drive.** Many Amiga returns occur simply because care was not taken in removing the cardboard piece protecting the disk drive. This sleeve sits inside the disk drive opening and is designed to protect the drive during shipping. Make sure you press the drive button *before* you remove the cardboard piece; this releases the cardboard piece so it slides out easily. Also, save the piece to replace in the drive unit opening for protection during transportation.

Turn the computer **off** before inserting or removing any connectors.

Note where the on/off switch is located: it's on the back of the main unit, on the right side.

Additionally, we suggest getting a multi-outlet electrical power strip from a hardware store. This would allow you to connect all the electrical plugs from your Amiga system components, and power them all on or off with a single on/off switch.

Also, when connecting cables to the Amiga, make sure you're plugging the correct cable into the proper connector. Remember, don't try to **force** a cable into a connector; double-check to make sure the cable matches that connector.

## Attaching the Mouse

Before attaching a new mouse, turn the mouse upside down and pull out the piece of foam that holds the *mouse ball* in place. (If you don't get all the foam out, see the "Cleaning the Mouse" section in Chapter 9 to find out how to uncover the mouse ball.)



To attach the mouse, just plug the end of the mouse's cable into the mouse connector on the front of the main unit. It's a tight fit; this helps keep the plug in place. Be sure to press firmly.



If you're right-handed, you'll probably want the mouse to the right of the keyboard. If you're left-handed, try putting the mouse to the left. Make sure that the place you set aside for the mouse is at least 12 inches by 12 inches (30 centimeters by 30 centimeters) and that it's clean and flat.

## Attaching the Keyboard

The *keyboard cable* is a coiled cable with a plug at the free end. Plug the free end into the keyboard connector on the front of the main unit.



You can change the tilt of the keyboard by folding down the two legs on the bottom of the keyboard. Try doing this to find which position is most comfortable for you.



For details on using the keyboard, see Appendix C.

## Attaching the Video Monitor

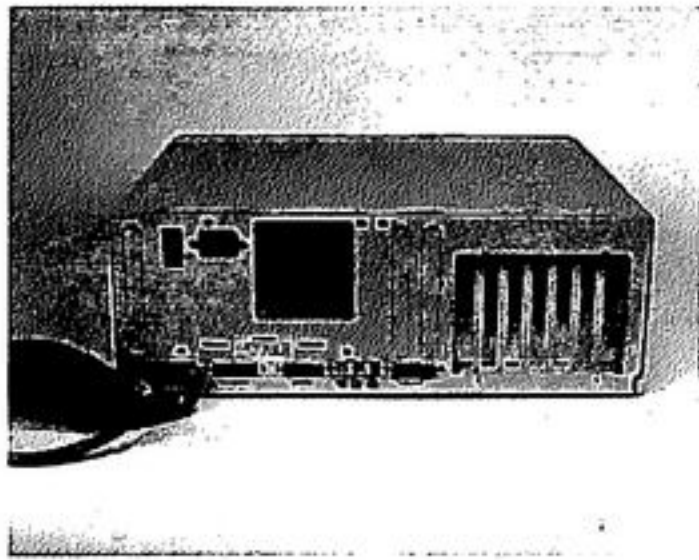
The *video monitor* displays visual information. The Amiga uses an *analog RGB color monitor*. RGB monitors normally produce the best-quality display. The Amiga 1080™ and 2002™ monitors feature an analog RGB input which allows display of the Amiga's 4,096 colors on a screen with 640 x 400 pixel resolution.

To attach the Amiga Monitor, use the *video cable* supplied with the monitor. Plug the small end of the video cable into the connector on the back of monitor:





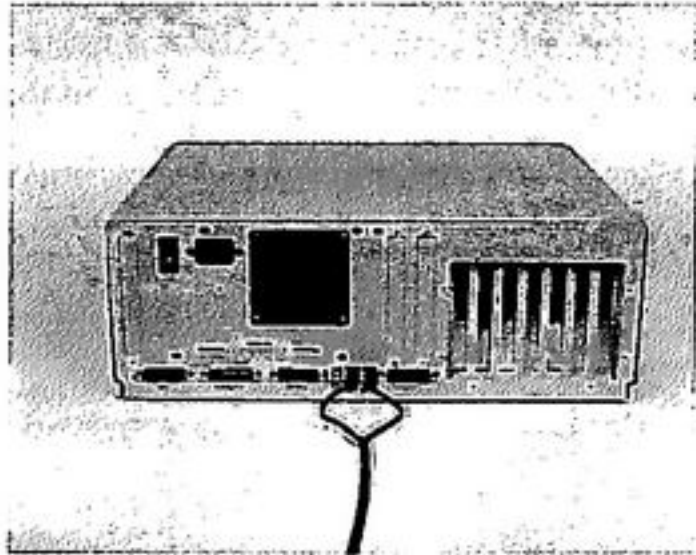
Plug the large end of the cable into the *RGB connector* on the back of the Amiga:



To attach other RGB monitors, see your Amiga dealer for the correct cable and instructions. To attach a monochrome monitor, use the RCA plug labeled *Mono Video*.

## Connecting Audio Equipment

The Amiga produces high-quality stereo sound. There are two connectors on the back of the Amiga for connecting the Amiga to audio equipment, one for the left audio signal and one for the right audio signal:



You need to connect the Amiga to either an audio system or the audio input jack (found on some but not all monitors) to hear sounds produced by the Amiga.

## Connecting the Amiga to a Stereo System

To connect the Amiga to a stereo system, you need two cables. Each cable must have a plug on one end that fits the audio input connector on your amplifier or receiver (this is most often an RCA phono plug) and on the other end have an RCA phono plug to fit into the Amiga.

On most stereo systems, there are extra inputs, often labeled "Auxiliary" or "Aux," to which you can attach the audio output cables from the Amiga cable.

## Sound Connections for Monitors

Some monitors, including the Amiga Monitor, have a built-in speaker. To connect a monitor for sound, you need:

- a "Y" adapter that converts the two stereo channels from the Amiga to a single channel
- a cable for connecting the "Y" adapter to the audio connector on the monitor

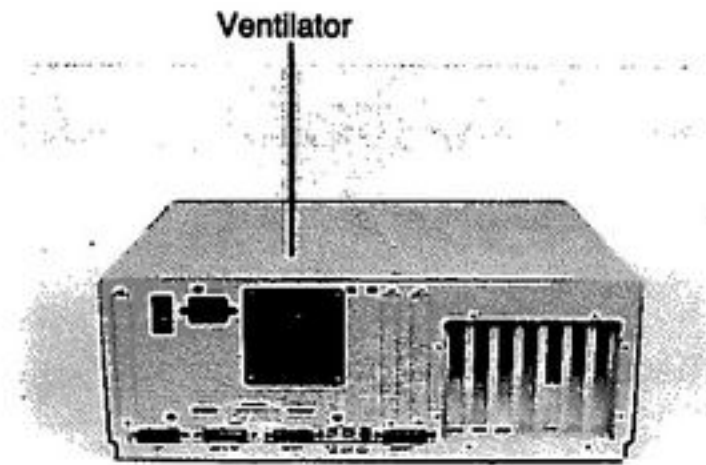
You can get "Y" adapters and connecting cables from many stores that carry radio and electronic parts.

To connect the monitor, insert the two phono plugs at the top of the "Y" into the audio connectors on the back of the Amiga. Now insert one end of the connecting cable into the connector on the monitor. Finally, connect the other end of the cable to the "Y" adapter.

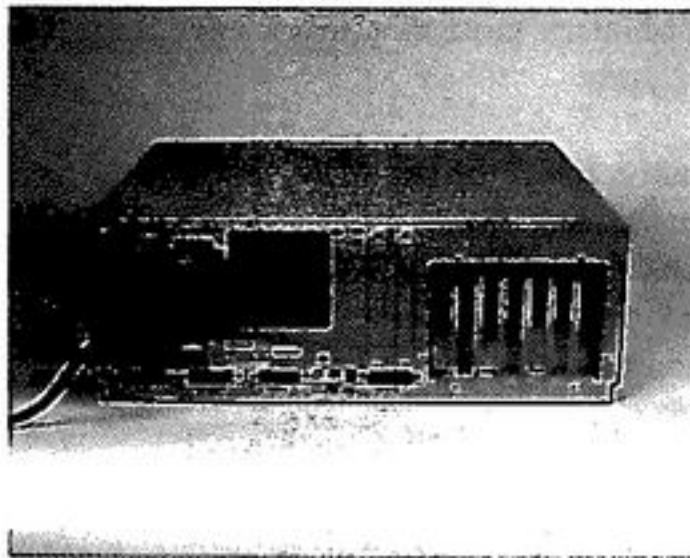


## Plugging In the Amiga 2000

Before you plug in and turn on your Amiga 2000, make sure there's nothing covering the ventilation slots on the main unit:



Remember to turn the power off before inserting the connector. Plug the power cord into the main unit:



Plug the other end of the power cord into a grounded outlet, and you're ready to start using your Amiga. Just turn on the on/off switch on the back of the main unit.

See Chapter 8 for details on adding hardware peripherals like printers, extra disk drives, modems, etc., to your Amiga 2000.

## Getting Started

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In this chapter, you'll learn the basics of using your Amiga 2000, including:

- *how to use the mouse*
- *using icons and menus*
- *using disks*

When you're done, you'll be ready to start using the tools included on your Workbench disk that let you work with the Amiga.

**NOTE:** Because of the variety of configurations available in the Amiga 2000 series, the screen displays shown in this manual may differ slightly from what shows on your Amiga 2000. This has no effect on system performance or procedures.

## A Note About the Mouse

The descriptions in this chapter (and throughout the rest of this manual) assume you're using a mouse. There are, however, certain keys on the keyboard you can use in place of the mouse. To learn how, see the section in Appendix C entitled *Using the Amiga Without a Mouse*.

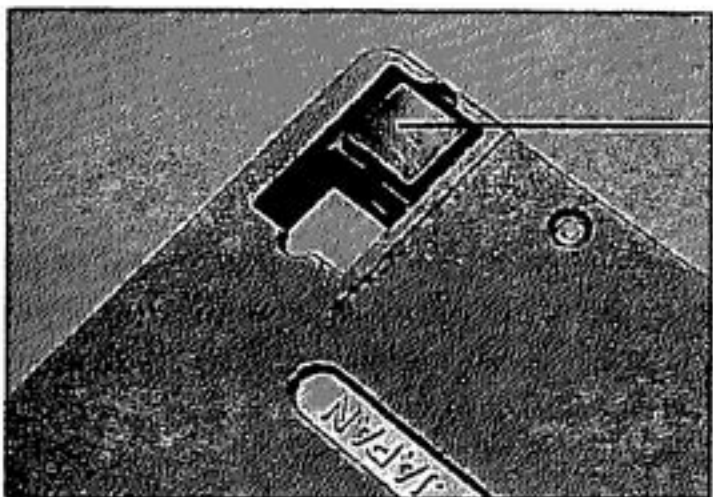
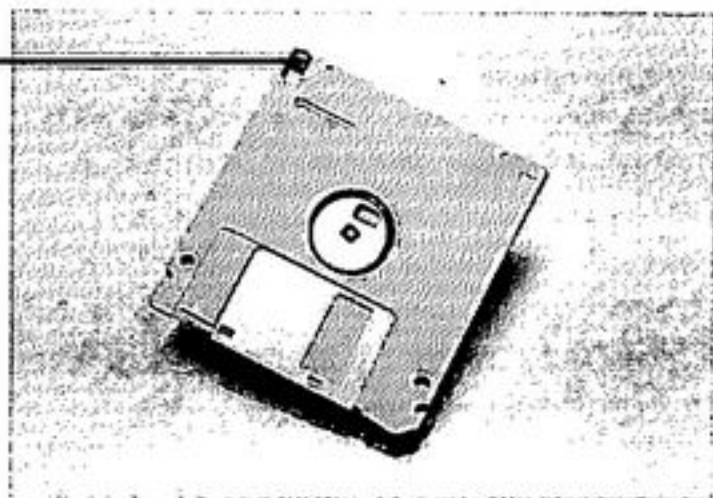
## Using Disks

Start by getting the two microdisks, the *Workbench disk* and the *BASIC disk* that came with your Amiga. These disks contain important information used by the Amiga. In addition, have two blank microdisks ready. (You can get blank microdisks from your Amiga dealer.) You'll copy the information from the original disks onto these blank disks and keep the originals in a safe place.

Your original Amiga disks may have *protect tabs*. These are small plastic tabs on the backs of the disks. If you find protect tabs on the original disks, slide each tab toward the edge of the disk until it clicks into place. When you do, you'll be able to see through a small hole in each disk:



Write-Protect Tab



Write-Protect On

By putting the protect tabs in this position, you prevent the information on the disks from being changed while they're in the Amiga.

If you want to add information to a disk, make sure that the protect tab is toward the middle of the disk, so that it covers the hole. With the tab in this position, you can add new information to a disk:



Write-Enable On

The On/Off switch is on the back of the Amiga 2000. To turn on the Amiga, press the switch and the power light on the Amiga will light up.

Power Light

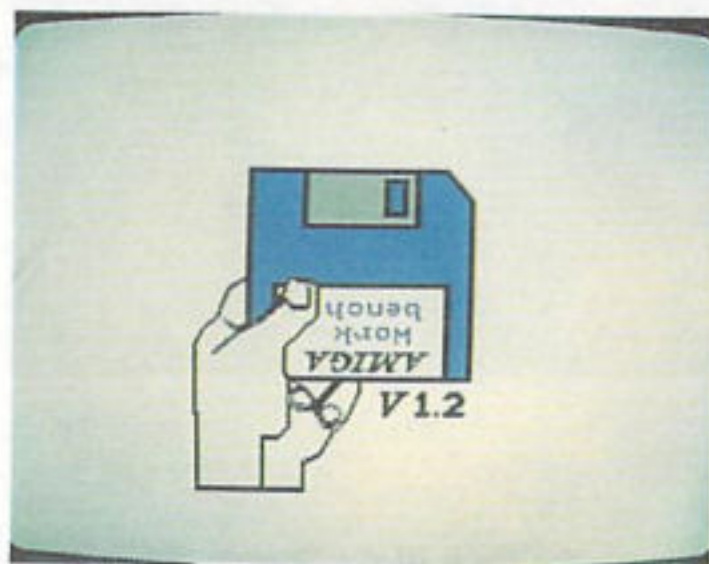


*A word of warning:*

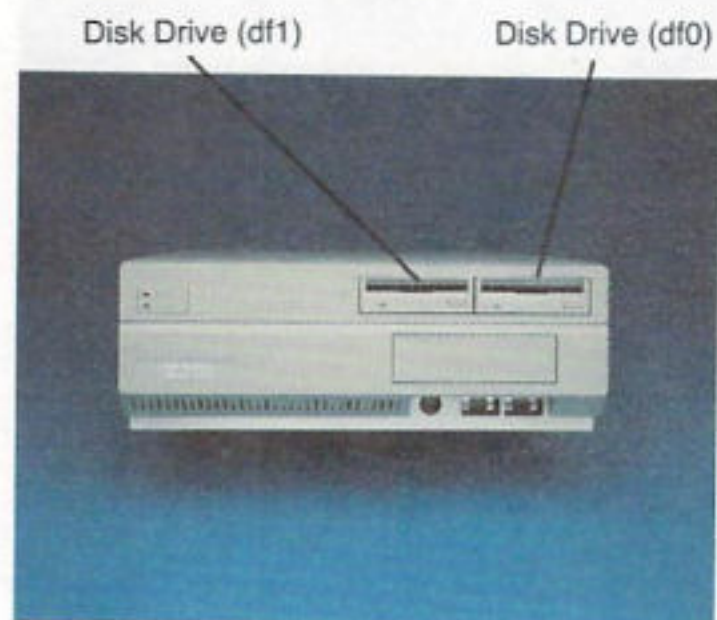
Whenever you turn off the Amiga, always wait **AT LEAST 30 seconds** before turning it on again to ensure that all data in memory has been reset. Shorter intervals may result in a "guru message", which can be reset by pressing the left mouse button.



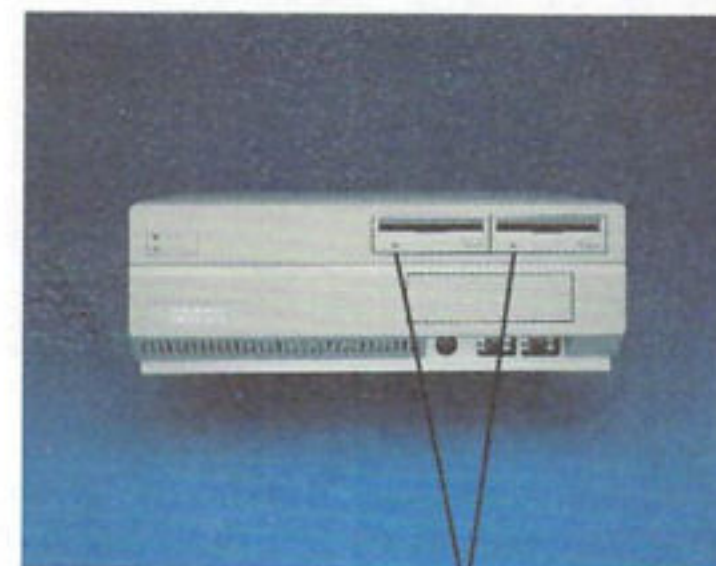
Next, turn on the monitor attached to your Amiga. In a few moments, you'll see a picture of a hand holding a disk:



Assuming that you have already removed the cardboard (or plastic) disk protector (see page 2-5), this is your cue to insert the Workbench disk metal end in, label side up into the *disk drive*, the device that reads information from disks and adds information to them. Push in the disk until it clicks into place:



After you put in the disk, you'll hear sounds from the Amiga. These are the sounds the disk drive makes as it gathers information. In less than a minute, the Amiga will get the information it needs with the help of the disk drive from the Workbench disk. Notice that while the disk drive is working, the *disk drive light* is on:



Disk Drive Lights

A word of warning:

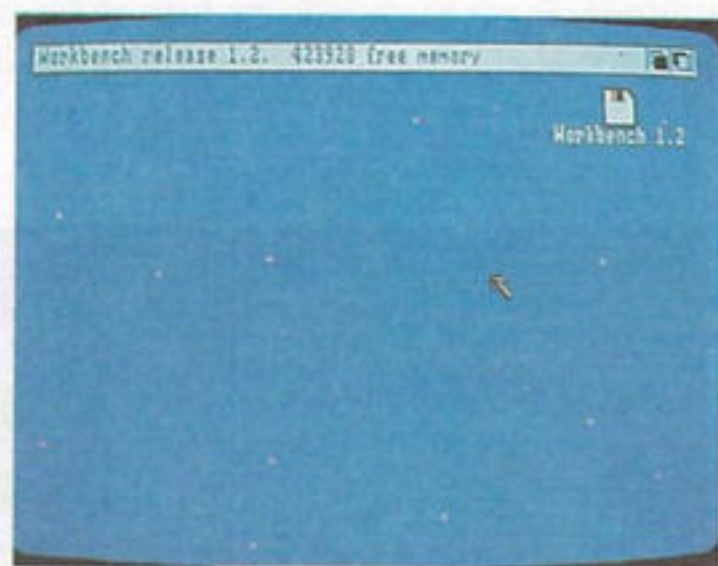
**NEVER** remove a disk when the disk drive light is on.

The disk drive light tells you that the Amiga is using the disk.

Taking a disk out too soon may make it impossible for the Amiga to finish an important task, such as reading the information from the Workbench disk. Even worse, taking a disk out too early may ruin the information on a disk. Always wait for the disk drive light to turn off before you remove a disk.



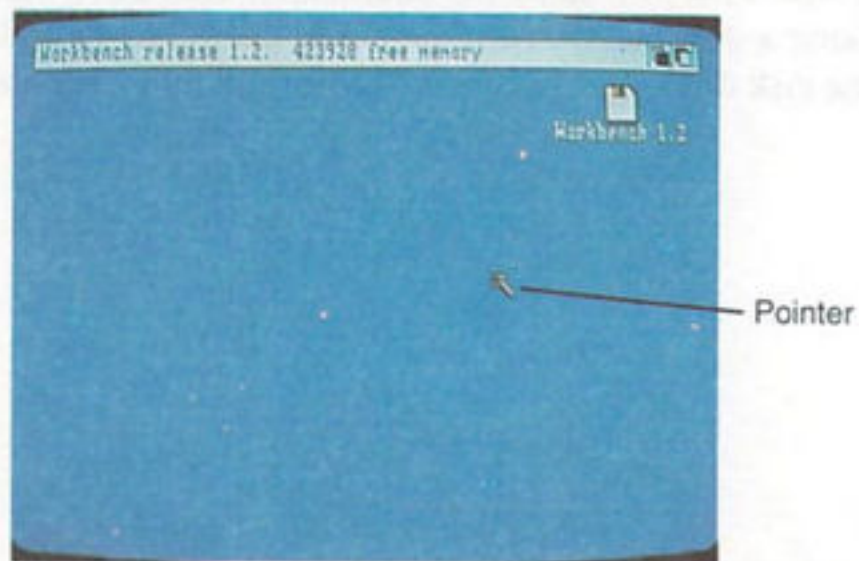
In a few moments, you'll see the *Workbench*:



At the top is a *title bar* that identifies the Workbench. On the Workbench is an *icon*, a small picture that represents the Workbench disk. You'll learn more about icons later in this chapter.

## Moving the Pointer

You use the *Pointer*, the small arrow on the display, to *point* to the things you want to work with.



Moving the mouse moves the Pointer. Without pressing either of the *mouse buttons* on top of the mouse, try rolling the mouse. Hold the mouse as shown below:



To point, move the Pointer so that its tip is over the thing you want to point to:



When you first use the mouse, don't worry if it feels a bit clumsy. Once you're familiar with it, you'll find that using the mouse is very quick and convenient.

If you run out of room for your mouse before you get the Pointer where you want it, just lift the mouse and put it down where there's more room. Lifting the mouse doesn't move the Pointer.



The pointer doesn't have to be an arrow; you can design your own pointer as any shape you like, using the Preferences option. This is explained in Chapter 6, "Using Preferences."

You can also move the pointer using the keyboard instead of a mouse. See Appendix C for details.

## Selecting Icons

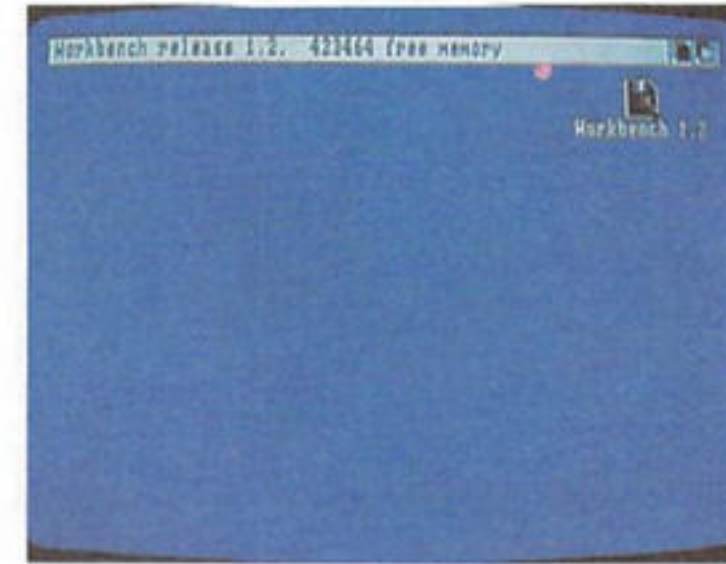
You use the *Selection button*, the left button on the mouse, to *select* icons and other features. Icons are the picture symbols on the screen. They can represent tools, projects, drawers or disks. When you want to use the item represented by the icon, you must select that item with the pointer. Try selecting the icon for the Workbench disk:

First, point to the Workbench disk icon, then *click twice* (press and quickly release) on the Selection button (the left button on the mouse).

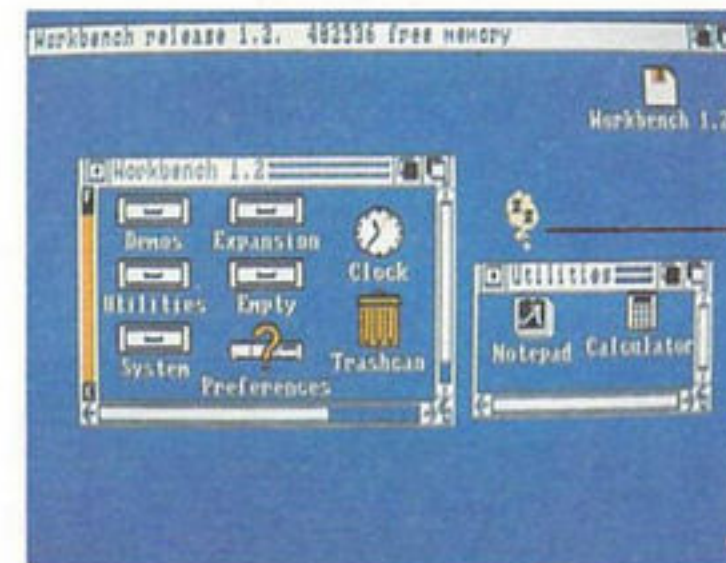


This operation, known as *double-clicking*, "opens" the selected icon.

The icon for the Workbench disk is *highlighted* (i.e., shown in a different color) at the first press of the mouse button, to indicate that it's selected.

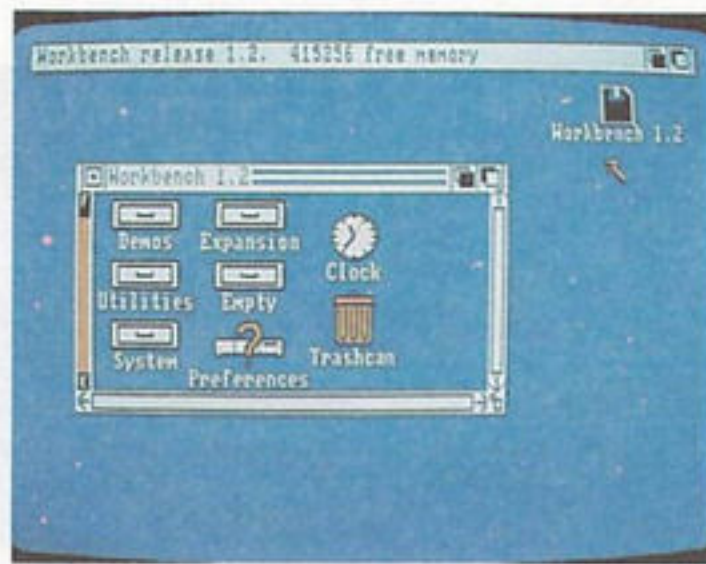


There are times when you doubleclick on an icon, but must wait for the Workbench to finish an activity before you can continue. When this happens, the Pointer changes shape and becomes a *Wait Pointer*:





When the Pointer returns to its original shape, you can continue working.

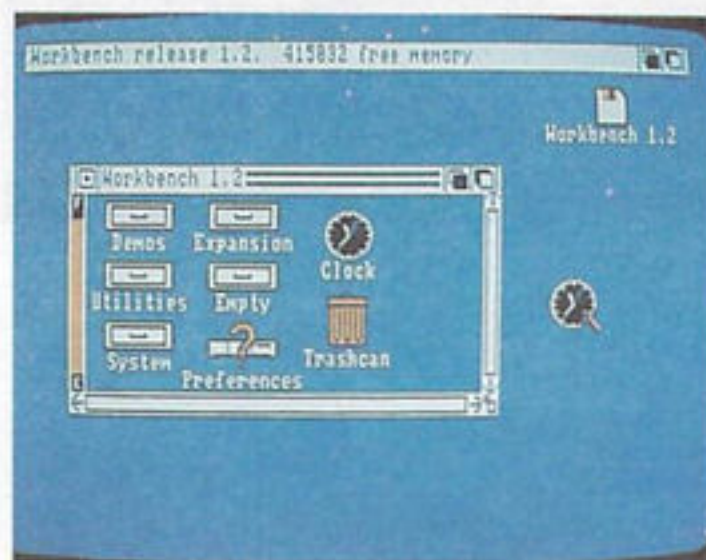


If you no longer want an icon selected, point to a place on the Workbench that isn't occupied by an icon or gadget, then click the Selection button.

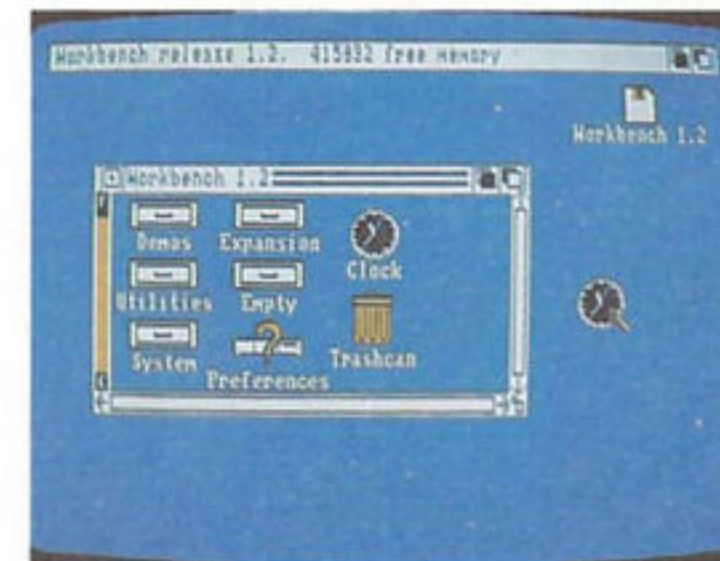
You can also select an icon by using the keyboard. See Appendix C for details.

## Dragging

You move icons, windows, and screens by *dragging* them. To drag an icon, you point to it, hold down the Selection button, and move the mouse.



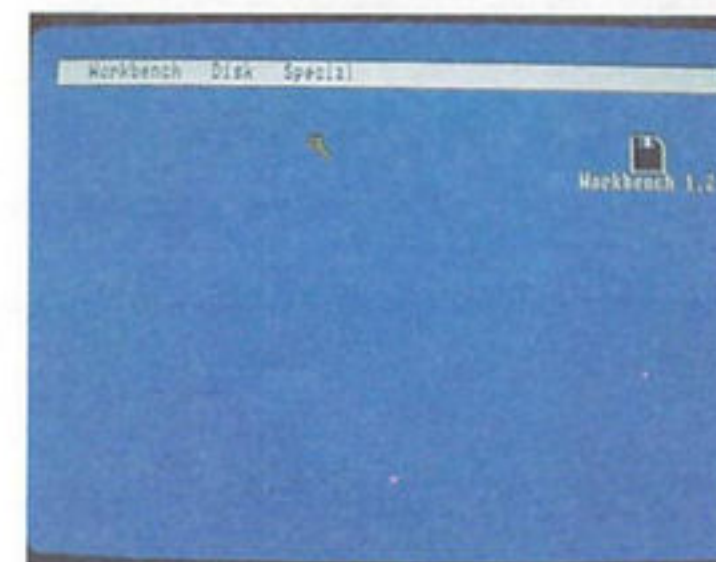
A copy of the icon moves and is repositioned at the point where you release the Selection button.



## Using Menus

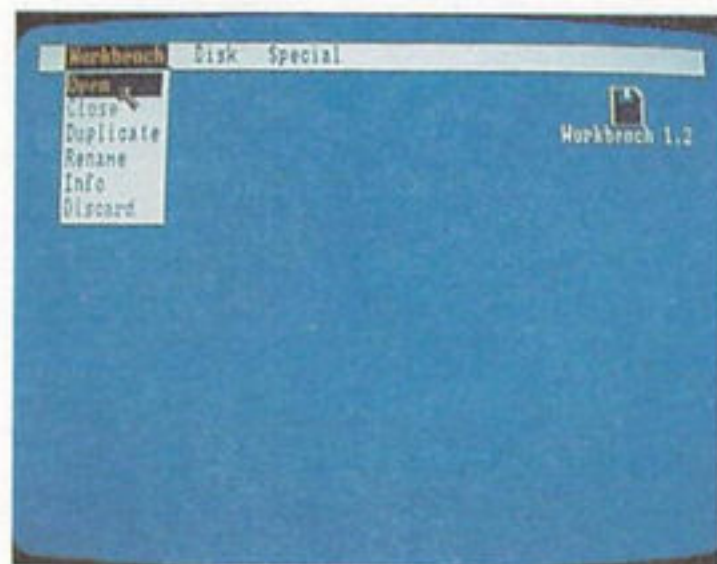
For most tools, including the Workbench, there are *menus* that list choices you can make. To use menus, you use the *Menu button*, the right-hand button on the mouse. The best way to learn how menus work is to try one:

- Select the icon for the Workbench disk if it isn't already selected.
- Press the left mouse button *only once*.
- *Hold down the Menu button (the right button on the mouse). When you do, the Menu Bar appears. In the Menu Bar are titles of menus:*





- Without releasing the Menu button, point to the title Workbench in the Menu Bar. The *Workbench menu* appears:



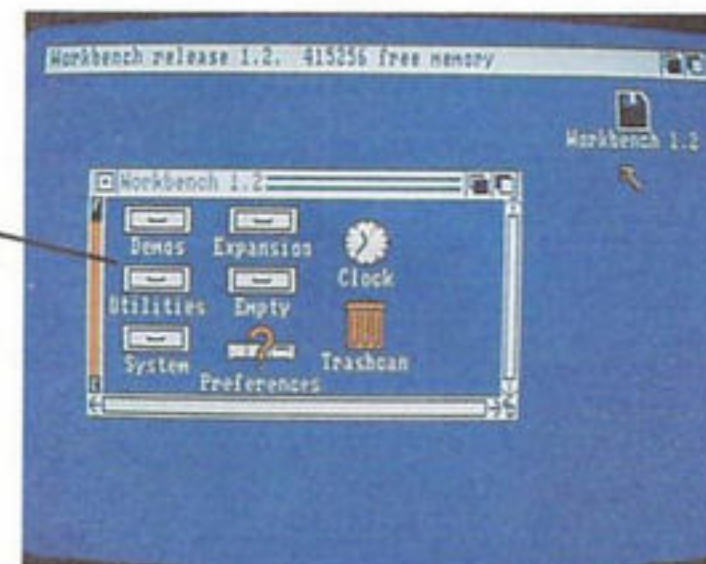
- While keeping the Menu button down, point to Open in the menu. Open is highlighted:



- Choose Open by releasing the Menu button while Open is highlighted.

By choosing the Open item from the Workbench menu, you *open a window* for the Workbench disk:

Workbench Window

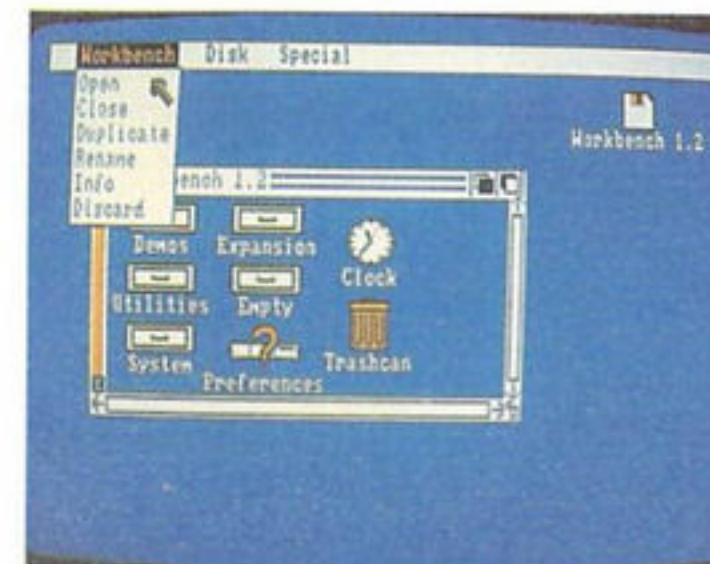


In the window, you see icons that represent the contents of the Workbench disk. This operation involving the menu is comparable to selecting an icon by double-clicking.

If you decide you don't want to choose a menu item, move the Pointer off the menu before releasing the Menu button.

To browse through a tool's menus, just hold down the Menu button while moving the Pointer along the Menu Bar. Without choosing an item, you'll get to look at the menu items that are available.

In some tools, not all menu items are available at all times. Menu items that you cannot choose appear as *ghost items*:

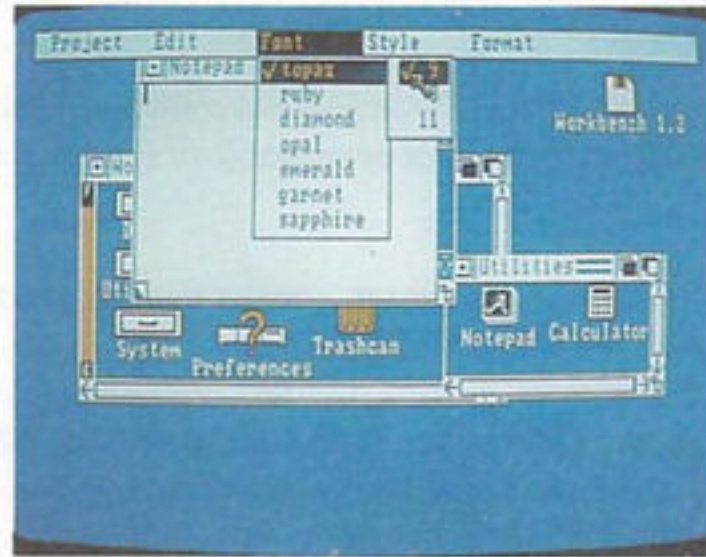




## Commands and Options

In menus, there are two kinds of items: *commands* and *options*. *Commands* are items that you choose to perform an action. One example of a command is the Open item in the Workbench menu. You chose Open to open a window.

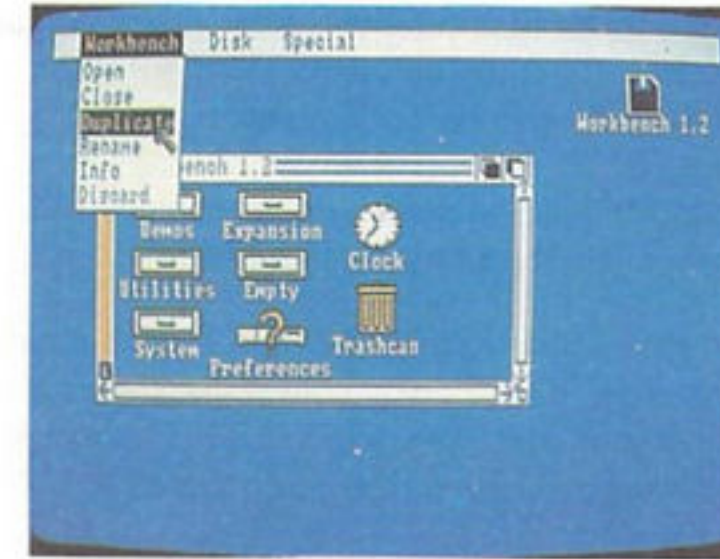
*Options* are choices that persist until you choose other, mutually exclusive options. Examples of options are the type styles available in the Amiga Notepad. (See Chapter 5 for a description of the Amiga Notepad.) Options you've chosen are indicated by check marks to the left of the menu items:



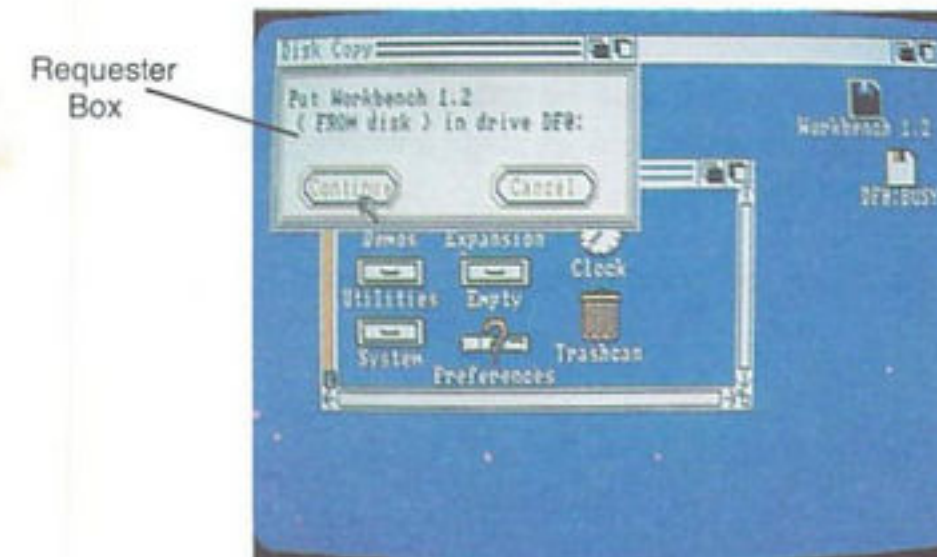
## Duplicating Your Disks Using a Menu

It's important to make duplicates of your original disks and keep the originals in a safe place. You can use these duplicates, called *working disks*, for everyday use. Before you do anything else with the Workbench, follow these directions for duplicating disks:

- Select the icon for the Workbench disk, then choose Duplicate from the Workbench menu:



- A requester asks you to put the disk you want to duplicate in drive df0. (Drive df0 is the floppy disk drive in the main unit; if there are two internal 3 1/2" drives, df0 is the rightmost drive.) Since the Workbench disk is already in drive df0, select Continue to go on.





- Next you'll see a requester that asks you to insert the disk to receive the copy. Take out the Workbench disk, insert one of the blank disks, then select Continue.
- Finally, there is a series of requesters asking you to exchange disks. (In these requesters, "volume" is another term for "disk.") Insert the disk each requester asks for, then select Continue.

When you've finished copying the disk, remove the copy and label it using one of the self-adhesive disk labels packaged with most new disks.

**Two warnings:** Copying a disk destroys any previous information stored on the disk that receives the copy. If, when you copy a disk, you insert the destination disk in place of the source disk, you will not get a message telling you that you've inserted the wrong disk. Be sure to insert the correct disk.

You can copy other disks in the same way: insert the disk you want to copy, select the icon for the disk, choose Duplicate from the Workbench menu, then follow the instructions in the requesters. Be sure to label the copies when you're finished.

If you have two or more disk drives (optional drives are available from your Amiga dealer), you eliminate the disk swapping involved in copying disks with a single drive.

When you've made a copy of a disk, put the original in a safe place and use only the working disk. That way, if you lose or damage a working disk, you'll be able to make another copy from the original.

To learn about proper care for your disks, see Chapter 8, "Caring for the Amiga."

## Resetting the Amiga

Before going on, you need to insert the newly copied Workbench disk, then *reset* the Workbench. To reset, **make sure the disk drive light is off**, hold down the CTRL key and both Amiga keys at the same time for at least half a second, then release the keys. When you reset the Workbench, you clear the Amiga's *memory* the electronic circuits the Amiga uses to store information then the Workbench reappears. You're back to where you were when you first inserted the Workbench disk.

Two warnings:

**NEVER reset the Workbench when a disk drive light on. Resetting when the light is on may damage the information on the disk.**

**When you reset the Workbench, any work that has not been saved to disk is lost.** When you begin using the tools on the Amiga, remember to save your work before you reset.

Now that you're acquainted with the mouse, menus, and disk operations, you're ready to use the Workbench tools. Chapter 4 starts you working on Workbench projects, and Chapter 5 covers the many other things you can do with the Workbench.



## Closing CLI

You finish with CLI and delete its window with the ENDCLI command.

Click the selection (left) button of the mouse in the window for the CLI you wish to close, and type:

ENDCLI

That's all there is to it.

## Changing the Startup Sequence

## Closing Comments

The series of command descriptions in this chapter is intended to give you a flavor of the kinds of things you can do with AmigaDOS and how to use the CLI. It is by no means a complete tutorial on either AmigaDOS or CLI. There are many CLI commands which haven't been covered here at all. Appendix B lists the available CLI commands as well as the ED commands and AmigaDOS error messages.

Most of the commands have other "templates" (alternate form in which to enter the commands) and options that haven't been demonstrated here. If you're interested in using CLI more extensively, we highly recommend purchasing *The AmigaDOS Manual* from Bantam Books, for complete tutorial and reference information on AmigaDOS and CLI.

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# Adding to the Amiga 2000

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Using the Internal Expansion Slots	8-4
Adding Internal Memory to the Amiga	8-4
Adding a Bridgeboard PC/XT Emulator	8-5
Adding Floppy Disk Drives	8-5
Adding a Hard Disk Drive	8-6
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*There are many ways you can add to your Amiga. You can make it more powerful by adding memory or additional disk drives, including hard disks. You can even add the ability to run IBM PC XT compatible programs. Tools for business and entertainment let you use your Amiga in new and exciting ways.*

*To print your projects, you can choose from many printers, including color printers. A modem can connect your Amiga to the outside world via normal phone lines. Other peripheral add-ons enhance the Amiga picture.*

*In this chapter, you'll get a quick look at some currently available peripherals. Complete instructions for installing and using these add-ons are included with the peripherals. For more information, and for many peripherals not described here, see your Amiga dealer.*

### **Precautions for Peripherals**

**When attaching any peripheral, use only the proper cables. Using a cable that is not properly wired may damage the peripheral and your Amiga.**

If you wish to adapt cables for use with the Amiga, see Appendix A, "Technical Reference," for information about the proper connections.

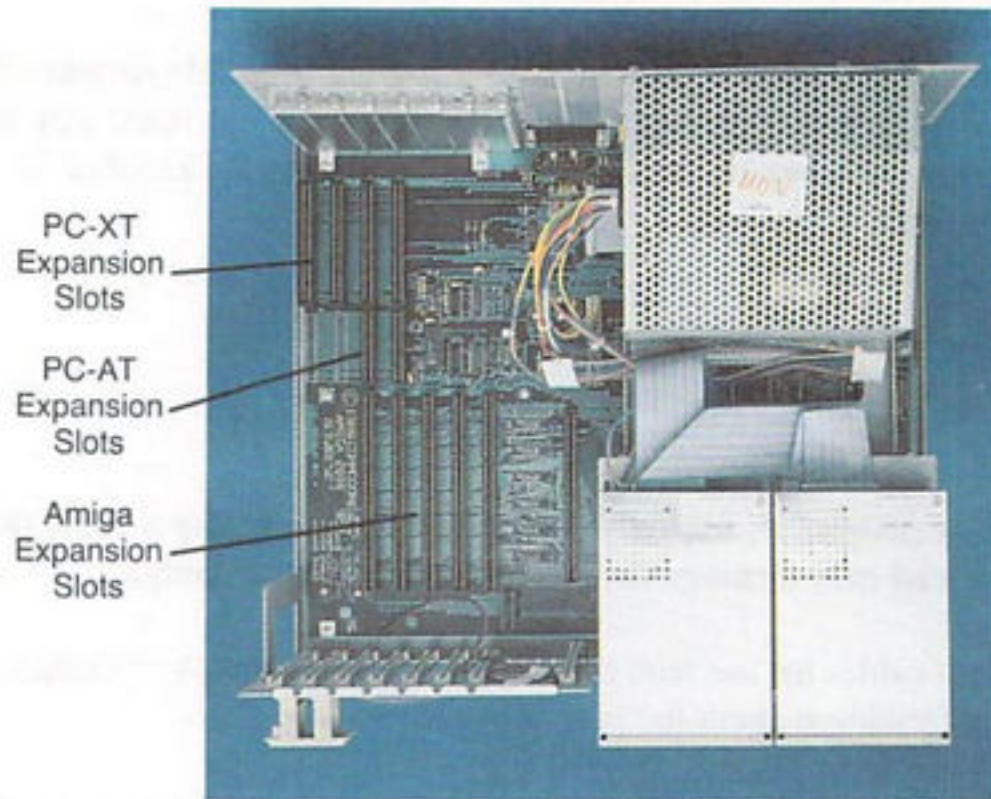
Before you attach a cable to any of the connectors on the back of the main unit, turn off the Amiga. Attaching a cable when the Amiga is turned on may reset the Amiga.

When using cables to attach any peripherals, including printers, be sure that the cables are shielded. Using unshielded cables can cause interference to radio and television reception. See the statement on the inside front cover for more information about how to prevent and correct interference.



## Using the Internal Expansion Slots

The Amiga 2000 has internal slots which are used to install additional peripherals. You can get an Amiga with peripherals already installed using these slots, or you can have these slots available for options you want to add later. The Amiga 2000 has internal slots for both Amiga and IBM-PC compatible peripheral cards.



## Adding Internal Memory to the Amiga

You can easily increase the random-access memory of your Amiga. With the additional memory, you can:

- work on several programs at a time
- work on extremely large files in a word processor, spreadsheet or database
- save your favorite commands to a RAM disk, which you can set up to run automatically when the system is booted

You can add a memory expansion card or cards to increase the 1 MB of memory the Amiga 2000 already has by as much as eight megabytes. RAM expansion memory cards can give you a half, one, two, four, six, or eight megabytes of additional RAM. The cards plug into any of the five 100-pin expansion slots.

## Adding a Bridgeboard PC-XT Emulator

One of the most useful cards available for the Amiga 2000 is the PC emulator card, also known as the Bridgeboard. In effect, this card adds another "side" to your computer, making it into an IBM-PC XT as well as an Amiga.

As its name suggests, the Bridgeboard plugs into two slots on the main computer board, forming a bridge between the Amiga and PC sides. The Amiga 2000 with the PC emulator option comes with a Bridgeboard already installed, and an internal 5.25" floppy disk drive. Also included is a special version of Workbench which contains programs to set up the PC display and assign the parallel port for use with a PC printer. You boot up your Amiga from Workbench as usual, and then click on an icon to load a PC display.

Software programs written for the IBM-PC can be run on the Amiga 2000 with the Bridgeboard option. With the Bridgeboard option, you can also use internal cards, and PC-compatible peripherals, such as printers, external drives, and monitors. Even with the PC option installed, you can still run all the Amiga software on the Amiga side.

## Adding Floppy Disk Drives

You can add both 3-1/2" microdisk drives and 5-1/4" floppy disk drives to your Amiga 2000.

The *Amiga 3.5 Disk Drive* (Model 1010, external; Model 2010, internal) is identical in storage capacity and performance to the disk drive built into the Amiga. To attach the external model of this drive, you simply plug it into the external disk connector on the back of the Amiga. To attach the internal model, follow the instructions packed with the drive or have your dealer install it. Added disk drives make performing many disk operations, such as copying disks, much easier and faster.

The *Amiga External 5-1/4" Disk Drive* (Model 1020, external; Model 2020, internal) can also be used as an external storage device. This device can work in both AmigaDOS and MS-DOS formats. Utilities that allow you to use this drive are included on the Amiga Extras disk. It can also be used with the Amiga Bridgecard peripheral, described previously. Instructions for installing these drives are included with the unit.



When using 5-1/4" disks on an Amiga, a system requester may appear that asks you to insert a disk. Unlike the 3.5" disks, the Amiga cannot detect when you insert a 5-1/4" disk. Once you have inserted the disk, you must enter the AmigaDOS Diskchange command, followed by the name of the disk drive, for the Amiga to recognize the disk. (For more details, see the *AmigaDOS Manual* published by Bantam Books.)

## Adding a Hard Disk Drive

Also available for the Amiga is the *SCSI Interface*, a high-speed parallel connector that is compatible with both ST 506 and SCSI type hard disk drives. Many companies today are making SCSI compatible hard disk drives. This is the quickest and easiest way to add up to 120MB of hard disk storage. There are other SCSI peripherals available, such as up to 80 tape streamers for hard disk backup and laser printers.

(Instructions for installing a hard disk drive should be packed with the unit. Appendix G gives the general installation procedure and tells how to initialize and partition a hard disk drive.)

## Printers for the Amiga

Examples of printers you can use with an Amiga are:

- **Dot Matrix:** Epson® FX-80™ and RX-80™, Apple® ImageWriter™, Commodore® MPS 1000™ and MPS 1250™ printers.

These dot matrix printers can produce both text and monochrome graphics.

- **Daisy Wheel:** Alphacom® Alphapro 101™, Brotherr® HR15-XL™, Diablo® Advantage D25™, Diablo 630™, and Qume LetterPro 20™ letter-quality printers.

These print text of comparable quality to that produced by high-quality typewriters. However, they are slower than most dot matrix printers and cannot print graphics.

- **Color Dot Matrix:** Okimate® 20™, Epson JX-80™ and Juki® 5510™ color printers. To use the Okimate 20 with the Amiga, you also need an Okidata "Plug 'n Print" cartridge that connects the printer to the parallel port of the Amiga.

These printers can produce color images from the Amiga, including pictures created with software graphics packages.

- **Color Ink Jet:** Xerox® 4020™ color printer.

This type of printer uses advanced ink-jet technology to produce high-quality color images.

- **Okidata® Microline™** series printers.

The models 92 and 192 are available in two versions: a standard version and a version compatible with IBM dot matrix printers.

To use the standard version, select Okidata 92 from the list of printer choices in Preferences. To use the IBM compatible version, select CBM MPS 1000 from the list. The Microline 292 can be used with two different personality cards: one that makes it compatible with IBM printers and another that, when used with a different ribbon, lets you print in color. To use the Microline 292 as an IBM compatible printer, select CBM MPS 1000 from the list of printers in Preferences.

To use the Microline 292 as a color printer, select Epson JX-80 from the list.

- **Laser Printers:** Hewlett-Packard® LaserJet™ and LaserJet PLUS™ laser printers.

These printers can produce high-quality, professional quality print.

You use the Preferences tool (described in Chapter 6) to tell the Amiga which printer you're using and to change a number of settings that affect printers.



## Adding a Modem

The Amiga 1680 Modem 1200/RS™ lets you telecommunicate with your Amiga over regular phone lines. The 1680 Modem utilizes the popular Hayes protocol to perform data transfers and access information networks.

A modem also gives your Amiga access to public domain software on electronic bulletin boards (BB's) and information services.

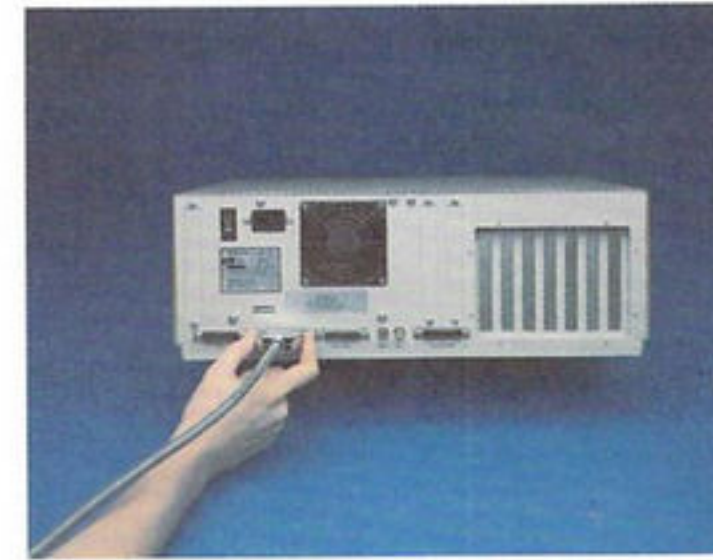
The Amiga 1680 Modem 1200/RS supports a standard RS232 interface, which means it can also be used with most other computers which use an RS232 serial port, such as the IBM PC and compatibles.

## Other Peripherals

There are many other hardware add-ons that can greatly enhance the function of your Amiga. A *MIDI Interface* gives the computer the ability to control musical instruments, such as synthesizers, and to digitize sound. A MIDI interface enables your Amiga to control several instruments at one time, to produce studio-like effects. Some MIDI interface connectors can connect to parallel ports. MIDI interface connectors are available from many sources.

The Amiga can display on RGB monitors, composite monitors, monochrome monitors and even television sets. The monitor you use depends on your needs for picture display. You can get a modulator/composite video interface that plugs into the Amiga's RGB video port which allows you to connect a Commodore 1702 or comparable composite color monitor or a television.

Still other available Amiga peripherals allow you to digitize the Amiga picture, connect to different networks, or add a graphics tablet. And the list is still growing! When you're ready to expand your Amiga system, visit your Amiga dealer for the latest in peripherals.



Connecting a parallel printer



Connecting a 3 1/2-inch disk drive



Connecting an Amiga 1680 modem  
(A 1680 modem may not be approved by local authorities in all countries.)  
This port is also used to connect a serial printer.



# Caring for the Amiga 2000

Amiga Precautions	9-3
Cleaning the Mouse	9-4
Taking Care of Disks	9-6
Radio and Television Interference	9-7



*Your Amiga 2000 needs very little care to keep it working at its best. Observe the precautions in this chapter to keep your Amiga in top shape.*

## **Amiga Precautions**

**Opening the case.** Open the case **only** to insert/remove peripheral expansion hardware. If your Amiga needs service, bring it to an approved Amiga Service Center. Attempting to service the Amiga on your own will void the warranty on your Amiga.

**Keep the Amiga dry.** Keep liquids away from the Amiga as you work. An accidental spill can seriously damage the Amiga.

**Keep the Amiga out of direct sunlight.** If the case gets too hot, the Amiga won't work reliably. Moreover, temperatures above 140 degrees Fahrenheit (60 degrees Celsius) can damage the Amiga's internal components. Keep it cool.

**Keep connectors and the ends of cables clean.** Food, especially sticky food, is the worst offender. Any substance that adheres to connectors or the ends of cables can prevent a good electrical connection or, worse, damage the connector.

**Keep magnets away from the monitor, all components of the computer setup.** Note that magnets can damage information on disks. Be sure to read "Taking Care of Disks" at the end of this chapter. Although magnets won't damage the monitor, they can distort the video display. In addition to more obvious magnets, beware of magnets in telephones, loudspeakers, and electric motors.

**Use the mouse on a clean surface.** The ball on the bottom of the mouse must be clean to work properly. If the mouse behaves erratically, it may need cleaning. The next section tells how to clean your mouse.



## Cleaning the Mouse

To keep the mouse working properly, give it an occasional cleaning.

To clean the mouse, you'll need:

- a soft, dry, lint-free cloth
- alcohol or head cleaning fluid for tape recorders
- cotton swabs

Cleaning the mouse takes just a couple of minutes. Here's how you do it:

Turn the mouse upside down with its cable toward you. Hold the mouse in both hands and remove the cover surrounding the mouse ball.

Put your hand over the opening, turn the mouse upside down, and catch the ball:



In the opening, you'll see three small metal rollers. Moisten a cotton swab with alcohol or head cleaning fluid and gently swab the surface of each roller. Turn each roller as you swab to clean it all the way around.

With the cloth, wipe off the mouse ball. (Don't use any liquid when cleaning the mouse ball.) When you're done, blow gently into the opening to remove any dust, replace the ball, and slide the cover for the ball back into place.



## Taking Care of Disks

To protect the information on your disks, observe these precautions: **Never remove a disk from a disk drive when the disk drive light is on.** The disk drive light tells you that the Amiga is using a disk. Taking a disk out too soon may ruin the information on the disk.

**Keep disks away from magnets.** Microdisks, like audio tapes, store information magnetically. Magnets can ruin the information on a disk. In addition to more obvious magnets, beware of magnets in telephones, loudspeakers, and electric motors.

**Keep disks dry and away from extreme heat or cold.** Microdisks are comfortable at about the same temperatures you are. Don't leave disks in direct sunlight, near heat sources, or in cars parked in the sun.

**Don't touch the surface of the disk.** A microdisk's metal cover closes automatically whenever you remove the disk from a disk drive. Don't touch the surface of the disk underneath the cover.

**Make copies of important disks.** The best insurance for the information on a disk is to make a copy of the disk and keep the copy in a safe place. Make a habit of copying an important disk each time you finish working with it.

## Radio and Television Interference

Your Amiga generates and uses radio frequency energy. If it not installed and used properly, that is, in strict accordance with the instructions in this manual, it may cause interference to radio and television reception. The Amiga has been certified to comply with the limits for a Class B computing device, pursuant to subpart J of Part 15 of the Federal Communication Commission's rules, which are designed to provide reasonable protection against radio and television interference in a residential installation. If you suspect interference, you can test the Amiga by turning it off and on. If the Amiga does cause interference, try the following:

- Reorient the antenna or AC plug on the radio or television.
- Change the relative positions of the Amiga and the radio or television.
- Move the Amiga farther away from the radio or television.
- Plug either the Amiga or the radio or television into a different outlet so that the Amiga and the radio or television are on different circuits.

Use only shield-grounded cables when connecting peripherals (computer input-output devices, terminals, printers, etc.) to the Amiga.

All peripherals must be certified to comply with Class B limits.

Operation with non-certified peripherals is likely to result in interference to radio and television reception.

Your house AC wall receptacle must be a three-pronged type (AC ground). If not, contact an electrician to install the proper receptacle.

If a multi-connector box is used to connect the computer and peripherals to AC, the ground must be common to all units.

If necessary, consult your Amiga dealer or an experienced radio-television technician for additional suggestions. You may find the following FCC booklet helpful: "How to Identify and Resolve Radio-TV Interference Problems." The booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, stock no. 004-000-00345-4.



# Technical Reference

Amiga 2000 Technical Specifications

Input/Output Connectors

Mouse/Game Controller Connectors

Custom Chips



*This appendix includes the technical specifications for the Amiga 2000, the electrical characteristics of the input/output connectors and the mouse/game controller connectors, and custom chip diagrams and features.*

## **Amiga 2000 Technical Specifications**

<b>CPU:</b>	Motorola 68000, 16/32 Bit
<b>Clock Speed:</b>	7.14 MHz
<b>Co-Processors:</b>	3 chip co-processor system for DMA, video, graphics and sound
<b>Memory:</b>	1 M RAM standard; externally expandable up to an additional 8 MB (with AutoConfig feature), total maximum 9 MB
<b>ROM:</b>	256 KB
<b>Interfaces:</b>	Keyboard Mouse/Joystick (2); one also for Lightpen Serial (RS 232, IBM-PC compatible) Parallel (Centronics, IBM-PC compatible) Video (RGB analog) Stereo Audio External Disk Drives
<b>System Slots:</b>	AMIGA CPU bus: 1 slot (86 pin) for CPU extensions AMIGA system bus: 5 slots (100 pin) with AutoConfig feature Secondary Bus System: 2 slots IBM PC/AT compatible (full size) 2 slots IBM PC compatible (full size) Total number of slots: 7 (2 slots are combined AMIGA-IBM PC/AT positions)
<b>Video Slot:</b>	1 video slot for internal NTSC/PAL coder for composite video, internal genlock, etc.
<b>Power Supply:</b>	200 watts
<b>Keyboard:</b>	Detachable U.S. version: 94 keys International version: 96 keys Includes: 10 function keys, separate numeric keypad, separate cursor keys (reverse 'T' layout), help key



**Mouse:**  
**Disk Drives:**

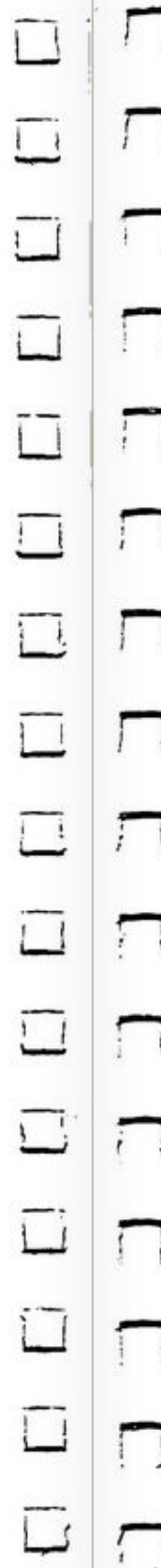
Optomechanical, two button system  
Mounting locations for:  
2 drives 3½"  
1 drive 5¼" (half height)  
Standard: built-in 3½" floppy disk drive  
(capacity: 880 KB formatted)  
Optional:  
Second floppy disk drive 3½"  
Floppy disk drive 5¼" (half height, for use with  
Bridgeboard)  
Hard disk drive 3½" (with controller board)  
Hard disk drive 5¼" (half height, with controller  
board)

**External Disk Drives:**

Capacity of HDD up to 120 MB  
2 AMIGA floppy disk drives  
(A 1010: 3½", A 1020: 5¼")  
3 floppy disk drives (MS-DOS formatted, if  
Bridgeboard is installed)

**Video Display:**

U.S.:  
525 lines/vertical frequency 60 Hz  
International version:  
625 lines/vertical frequency 50 Hz  
Graphic co-processor with draw, fill and  
move modes  
Maximum 512 KB video memory (chip  
memory)  
Palette of 4096 colors, max. 6 bitplanes,  
8 sprites per scanline, bit blitter  
Text Modes:  
Standard modes: 80 Characters/25 lines  
60 characters/25 lines  
International: 80 characters/32 lines  
60 characters/32 lines  
Different font sizes and font types select-  
able, screen colors user definable.  
Graphic Modes:  
—320 × 200 pixels, palette of 32 colors  
out of 4096, palette switchable on the  
scanline, no interlace (International: 320  
× 256 pixels)  
—640 × 200 pixels, palette of 32 colors  
out of 4096, palette switchable on the  
scanline, no interlace (International: 640  
× 256 pixels)



**Sound:**

—320 × 400 pixels, palette of 32 colors  
out of 4096, palette switchable on the  
scanline, interlace (International: 320 ×  
512 pixels)  
—640 × 400 pixels, palette of 16 colors  
out of 4096, palette switchable on the  
scanline, interlace (International: 640 ×  
512 pixels)

4 independent sound channels configured  
as two stereo channels  
Reproduces complex waveforms  
Sound buffer up to 400 KB nominal, 512  
KB maximum  
8 bit D/A conversion

**Clock/Calendar-Function:**

Low pass filter (7.5 kHz, 12 dB/Octave)

**Speech:**

Built-in, with battery back-up  
Built-in English text-to-speech device  
Controls for rate, pitch, volume, inflec-  
tion and sex of voice

**System Software:**

Provides multitasking. Includes Amiga-  
DOS; WORKBENCH, window oriented  
user interface; CLI command line inter-  
preter; AmigaBASIC from Microsoft  
(supports graphic, sound and window fea-  
tures of the machine)

**MS-DOS Compatibility:**

With Bridgeboard (XT level compatibil-  
ity)

**Power:**

U.S.: 110 Volts/60 Hz  
International: 220-240 Volts/50 Hz

**Included Items:**

Keyboard, mouse, power cable, Introduc-  
tion manual, AmigaBasic manual, system  
software WORKBENCH, AmigaBASIC  
and utilities on two 3½" floppy disks.

**Accessories from  
Commodore:**

Color Monitor A 2002 (RGB and com-  
posite video selectable)  
Color Monitor A 2080 (long persistence)  
External Floppy Disk Drive 3½" A 1010  
External Floppy Disk Drive 5¼" A 1020  
Modem (Hayes compatible) A 1680  
Bridgeboard A 2088 (XT compatible)  
2 MB RAM Expansion Board A 2052  
Hard Disk/SCSI Controller Board A 2090  
(for AMIGA bus)



## Input/Output Connectors

This section lists pin assignments for several input/output connectors on the Amiga. The information in this section is highly technical and is intended only for those expert in connecting external devices to computers. You do not need this information if you use a cable specifically designed for use with the Amiga and the add-on you want to connect.

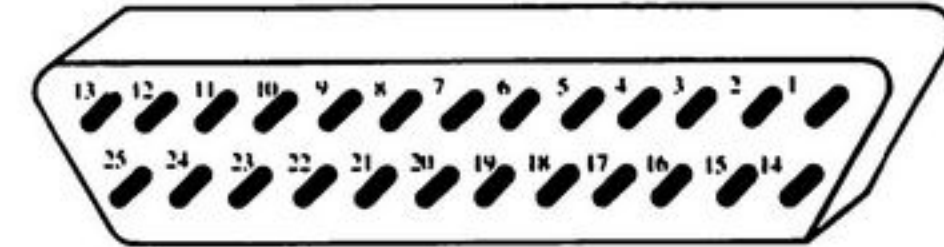
For information about connectors not described in this section, see the *Amiga Hardware Manual*.

If you attach peripherals with cables other than those designed for use with the Amiga, note: some pins on Amiga connectors provide power outputs and non-standard signals. Attempting to use cables not wired specifically for the Amiga may cause damage to the Amiga or to the equipment you connect. The descriptions below include specific warnings for each connector. For more information about connecting add-ons, consult your Amiga dealer.

In the descriptions that follow, an asterisk (\*) at the end of a signal name indicates a signal that is active low.

## Serial Connector

In the following table, the second column from the left gives the Amiga pin assignments. The third and fourth columns from the left give pin assignments for other commonly used connections; the information in these two columns is given for comparison only.

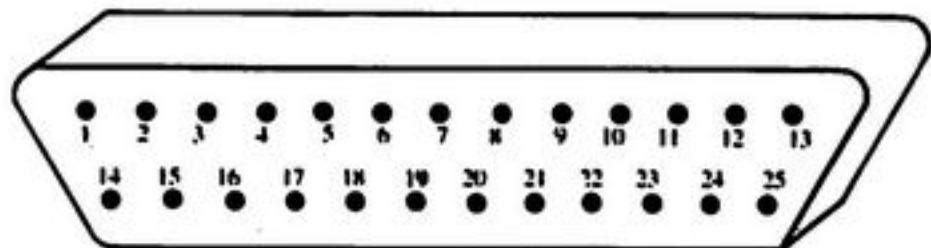


**WARNING:** Pins 9 and 10 on the Amiga serial connector are used for external power. Connect these pins **ONLY** if power from them is required by the external device. The table lists the power provided by each of these pins.

Pin	Amiga 2000	RS232	HAYES®	Description
1	SHIELD	GND	GND	SHIELD
2	TXD	TXD	TXD	TRANSMIT DATA
3	RXD	RXD	RXD	RECEIVE DATA
4	RTS	RTS		REQUEST TO SEND
5	CTS	CTS	CTS	CLEAR TO SEND
6	DSR	DSR	DSR	DATA SET READY
7	GND	GND	GND	SYSTEM GROUND
8	DCD	DCD	DCD	CARRIER DETECT
9	+12V			+12 VOLT CARRIER
10	-12V			-12 VOLT CARRIER
11	AUDO			AUDIO OUT OF AMIGA
12		S.SD	SI	SPEED INDICATE
13		S.CTS		
14		S.TXD		
15		TXC		
16		S.RXD		
17		RXC		
18	AUDI			AUDIO INTO AMIGA
19		S.RTS		
20	DTR	DTR	DTR	DATA TERMINAL READY
21		SQD		
22	RI	RI	RI	RING INDICATOR
23		SS		
24		TXCI		
25				



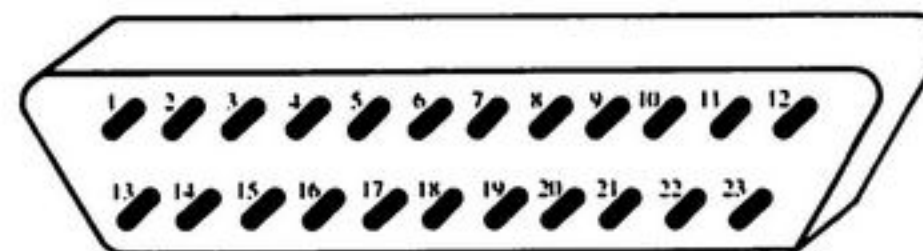
## Parallel Connector



**WARNING:** 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 ground.

Pin	Name	Description
1	STROBE*	STROBE
2	D0	DATA BIT 0 (Least sign. bit)
3	D1	DATA BIT 1
4	D2	DATA BIT 2
5	D3	DATA BIT 3
6	D4	DATA BIT 4
7	D5	DATA BIT 5
8	D6	DATA BIT 6
9	D7	DATA BIT 7
10	ACK*	ACKNOWLEDGE
11	BUSY	BUSY
12	POUT	PAPER OUT
13	SEL	SELECT
14	+5V PULLUP	+5 VOLTS POWER (10 mA)
15	NC	NO CONNECTION
16	RESET*	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

## RGB Monitor Connector



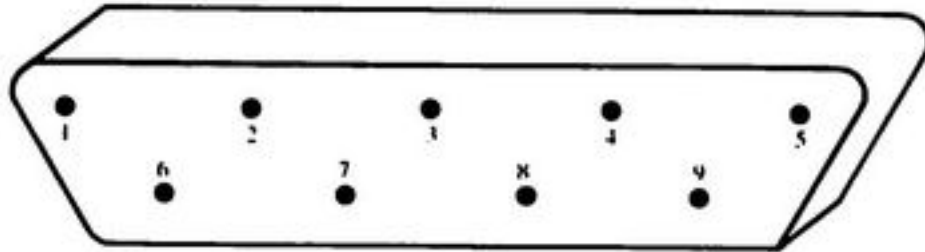
**WARNING:** Pins 21, 22, and 23 on the RGB monitor connector are used for external power. Connect these pins **ONLY** if power from them is required by the external device. The table lists the power provided by each of these pins.

Pin	Name	Description
1	XCLK*	EXTERNAL CLOCK
2	XCLKEN*	EXTERNAL CLOCK ENABLE
3	RED	ANALOG RED
4	GREEN	ANALOG GREEN
5	BLUE	ANALOG BLUE
6	DI	DIGITAL INTENSITY
7	DB	DIGITAL BLUE
8	DG	DIGITAL GREEN
9	DR	DIGITAL RED
10	CSYNC*	COMPOSITE SYNC
11	HSYNC*	HORIZONTAL SYNC
12	VSYNC*	VERTICAL SYNC
13	GNDRTN	RETURN FOR XCLKEN*
14	ZD*	ZERO DETECT
15	CI*	CLOCK OUT
16	GND	GROUND
17	GND	GROUND
18	GND	GROUND
19	GND	GROUND
20	GND	GROUND
21	-12V	-12 VOLTS POWER (50 mA)
22	+12V	+12 VOLTS POWER (100 mA)
23	+5V	+5 VOLTS POWER (100 mA)



## Mouse/Game Controller Connectors

The connectors for the mouse, joysticks and light pens are on the front of the Amiga 2000. If you use a mouse to control the Workbench, you must attach it to connector 1 (the left connector as you face 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.



**WARNING:** 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 2	MOUSE BUTTON 2
6	MOUSE BUTTON 1	MOUSE BUTTON 1
7	+5V	+5 VOLTS POWER (100 mA)
8	GND	GROUND
9	MOUSE BUTTON 3	MOUSE BUTTON 3

### Connectors 1 and 2: Game Controller

Pin	Name	Description
1	FORWARD*	CONTROLLER FORWARD
2	BACK*	CONTROLLER BACK
3	LEFT*	CONTROLLER LEFT
4	RIGHT*	CONTROLLER RIGHT
5	POT X	HORIZONTAL POTENTIOMETER
6	FIRE*	CONTROLLER FIRE
7	+5V	+5 VOLTS POWER (125 mA)
8	GND	GROUND
9	POT Y	VERTICAL POTENTIOMETER

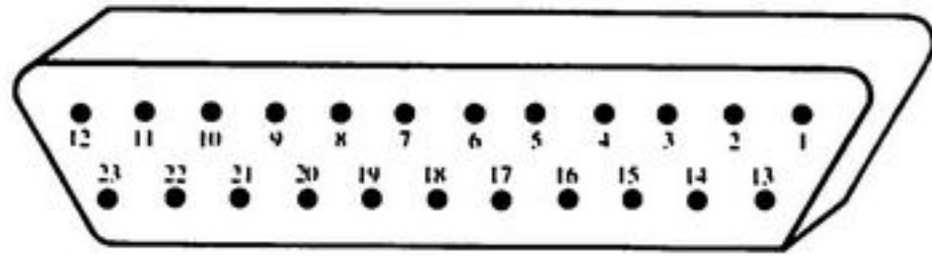
### Connectors 1 and 2: Light Pen

Pin	Name	Description
1		
2		
3		
4		
5	LIGHT PEN PRESS	LIGHT PEN TOUCHED TO SCREEN
6	LIGHT PEN*	CAPTURE BEAM POSITION
7	+5V	+5 VOLTS POWER (100 mA)
8	GND	GROUND
9		

*See jumper J200 description at the end of this Appendix to select whether connector 1 or 2 is enabled for light pen use.*



## External Disk Connector



Pin	Name	Description
1	/RDY	Disk Ready—Active Low
2	/DKRD	Disk Ready Data—Active Low
3-7	GND	Ground
8	/MTRXD	Disk Motor Control—Active Low
9	/SEL2B	Select Drive 2—Active Low
10	/DRESB	Disk RESET—Active Low
11	/CHNG	Disk has been Removed from Drive—Latched Low
12	+5	5 VDC Supply
13	/SIDE B	Select Disk Side—0 = Upper 1 = Lower
14	/WPRO	Disk is Write Protected—Active Low
15	/TKO	Drive Head Position over Track O—Active Low
16	/DKWE	Disk Write Enable—Active Low
17	/DKWD	Disk Write Data—Active Low
18	/STEPB	Step the Head—Pulse, First Low then High
19	DIRB	Select Head Direction—0 = Inner 1 = Outer
20	/SEL3B	Select Drive 3—Active Low
21	/SEL1B	Select Drive 1—Active Low
22	/INDEX	Disk Index Pulse—Active Low
23	+12	12 VDC Supply



## 86-Pin Connector

Pin	Name	Pin	Name
1	gnd	44	IPL2*
2	gnd	45	A16
3	gnd	46	BERR*
4	gnd	47	A17
5	+5	48	VPA*
6	+5	49	gnd
7	exp	50	E
8	-5	51	VMA*
9	28 MHz	52	A18
10	+12	53	RES*
11	COPFG*	54	A19
12	CONFIG*	55	HLT*
13	gnd	56	A20
14	C3*	57	A22
15	CDAC	58	A21
16	C1*	59	A23
17	OVR*	60	CBR*
18	XRDY	61	gnd
19	INT2*	62	BGACK*
20	BOSS*	63	PD15
21	A5	64	CBG*
22	INT6*	65	PD14
23	A6	66	DTACK*
24	A4	67	PD13
25	gnd	68	PRW*
26	A3	69	PD12
27	A2	70	LDS*
28	A7	71	PD11
29	A1	72	UDS*
30	A8	73	gnd
31	FC0	74	AS*
32	A9	75	PD0
33	FC1	76	PD10
34	A10	77	PD1
35	FC2	78	PD9
36	A11	79	PD2
37	gnd	80	PD8
38	A12	81	PD3
39	A13	82	PD7
40	IPL0*	83	PD4
41	A14	84	PD6
42	IPL1*	85	gnd
43	A15	86	PD5



## Video Connector

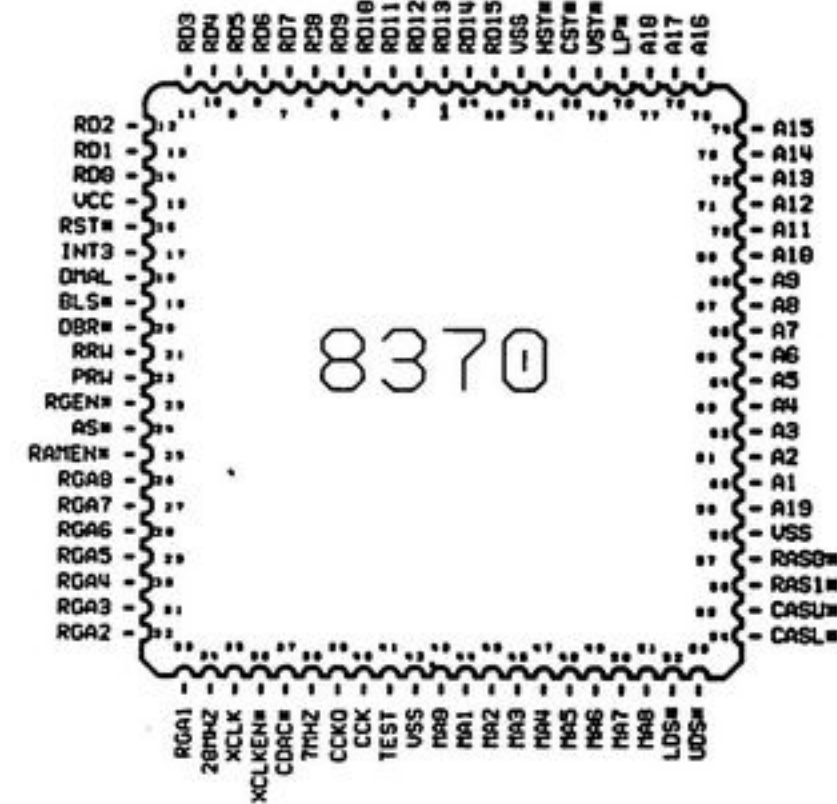
Pin	Signal	Pin	Signal
1	Reserved for Expansion	2	Reserved for Expansion
3	Left Audio Out	4	Right Audio Out
5	Reserved for Expansion	6	+5Vdc
7	Analog Red	8	+5Vdc
9	Video Ground	10	+12Vdc
11	Analog Green	12	Video Ground
13	Video Ground	14	/CSYNC
15	Analog Blue	16	/XCLKEN
17	Video Ground	18	BURST
19	/C4 Clock	20	Video Ground
21	Video Ground	22	/HSYNC (47 Ohm)
23	B0 = DI (47 Ohm)	24	Video Ground
25	B3 = DB (47 Ohm)	26	/VSYNC (47 Ohm)
27	G3 = DG (47 Ohm)	28	COMP SYNC (Analog)
29	R3 = DR (47 Ohm)	30	/PIXELSW (47 Ohm)
31	-5Vdc	32	Video Ground
33	XCLK	34	/C1 Clock
35	Reserved for Expansion	36	Reserved for Expansion

## Extended Video Connector

Pin	Signal	Pin	Signal
1	Ground	2	R0
3	R1	4	R2
5	Ground	6	G0
7	G1	8	G2
9	Ground	10	B1
11	B2	12	Ground
13	Composite Video	14	TBASE
15	CDAC Clock	16	POUT
17	/C3 Clock	18	BUSY
19	/LPEN	20	/ACK
21	SEL	22	Ground
23	PD0	24	PD1
25	PD2	26	PD3
27	PD4	28	PD5
29	PD6	30	PD7
31	/LED	32	Ground
33	Raw Audio Left	34	Audio Ground
35	Raw Audio Right	36	Audio Ground

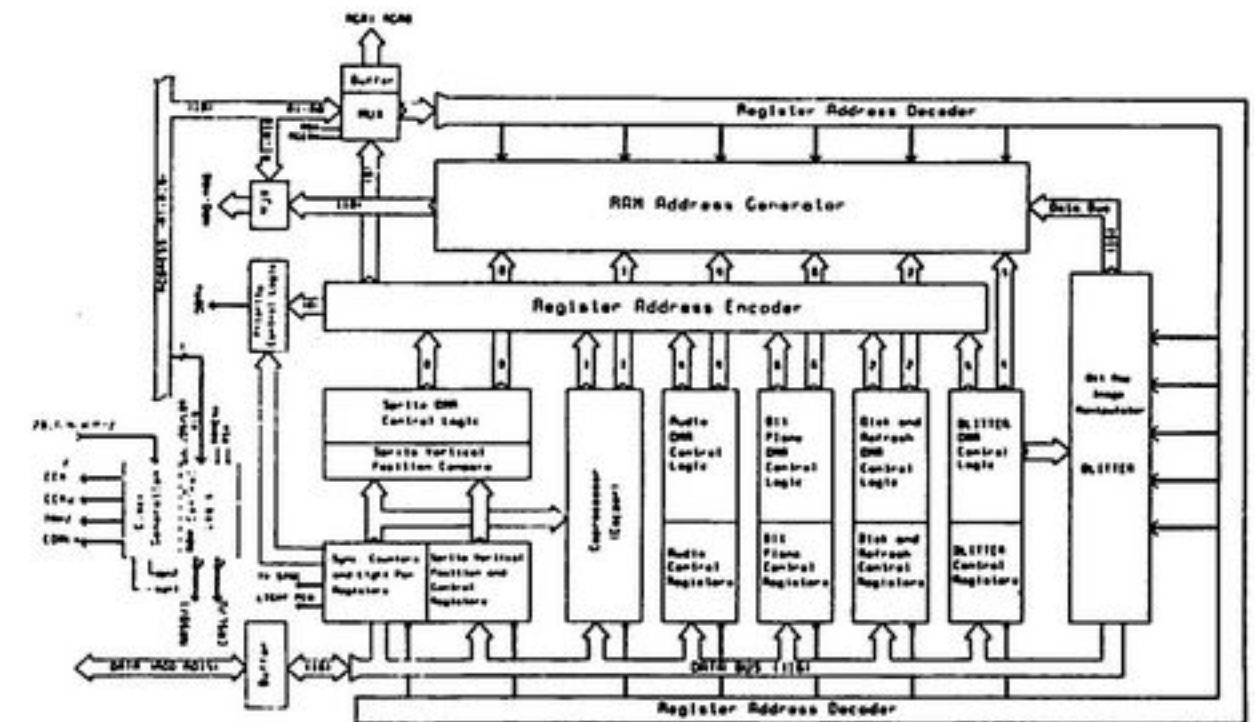


## Custom Animation Chip Fat Agnus



### Features:

- Bit Blitter—Uses hardware to move display data—Allows high speed animation—Frees the CPU for other concurrent tasks
- Display Synchronized Coprocessor
- Controls 25 DMA Channels—Allows the disk and sound to operate with minimal CPU intervention
- Generates all system clocks from the 28 Mhz oscillator
- Generates all control signals for the video RAM and expansion RAM card
- Provides the address to the video and expansion RAM multiplexing



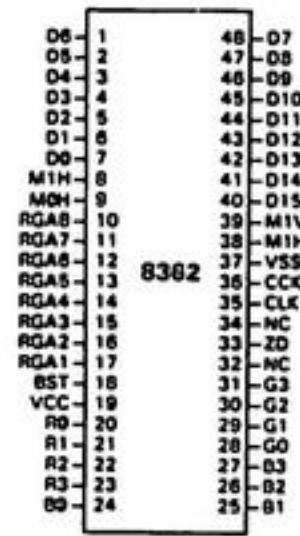
Fat Agnus Block Diagram



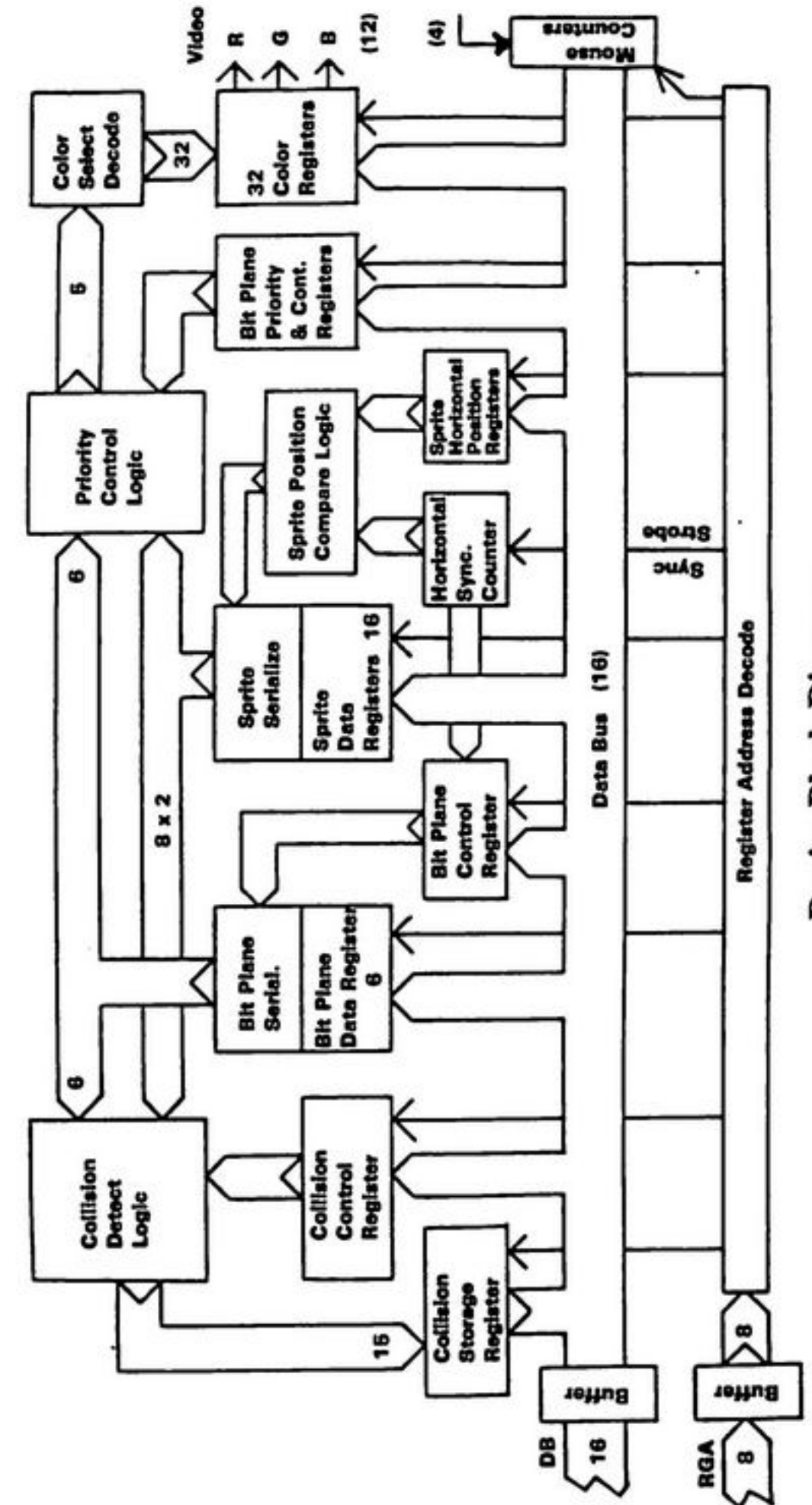
# Custom Graphics Chip Denise

## Features:

- Many different resolutions  
320 × 200 up to 640 × 400
- 4096 colors on a TV or RGB monitor
- Eight re-usable sprite controllers
- 60 or 80 column text
- Same software for all TVs and monitors



Pin	Name	Description	Type
1-7	D0-D6	Data Bus Lines 0-6	I/O
8	M1H	Mouse 1 Horizontal	I
9	M0H	Mouse 0 Horizontal	I
10-17	RGA1-8	Register Address 1-8	I
18	/BURST	Color Burst	O
19	Vcc	+5 VDC	I
20-23	R0-3	Video Red Bit 0-3	O
24-27	B0-3	Video Blue Bit 0-3	O
28-31	G0-3	Video Green Bit 0-3	O
32	N/C	No Connection	N/C
33	/ZD	Background Indicator	O
34	N/C	No Connection	N/C
35	7M	7.15909 MHz Clock	I
36	CCK	Color Clock	I
37	Vss	Ground	I
38	M0V	Mouse 0 Vertical	I
39	M1V	Mouse 1 Vertical	I
40-48	D7-D15	Data Bus Lines 7-15	I/O



Denise Block Diagram

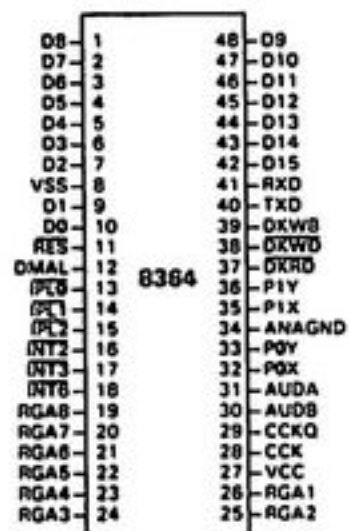


# Custom Sound/Peripherals Chip

## Paula

### Features:

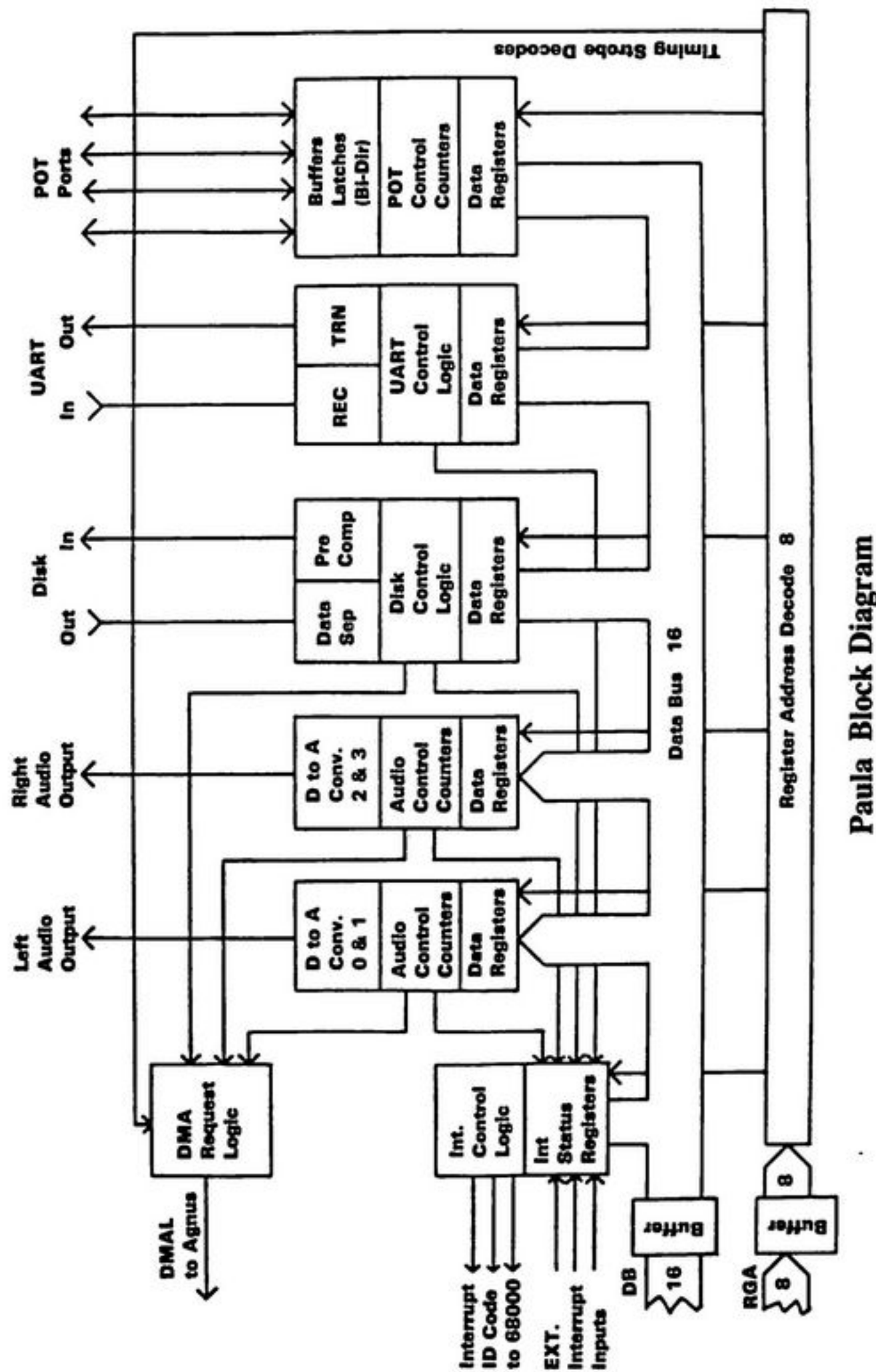
- Four voices of sound output configured as two stereo channels
- Nine octaves
- Complex waveforms
- Uses both amplitude and frequency modulation
- I/O controls for disk data and controller ports
- Microdisk controller
- Interrupt control system



Pin	Name	Description	Type
1-7	D2-D8	Data Bus Lines 2-8	I/O
8	Vss	Ground	I
9,10	D0,D1	Data Bus Lines 0,1	I/O
11	/RES	System Reset	I
12	DMAL	DMA Request Line	O
13-15	/IPL0-2	Interrupt Line 0-2	O
16-18	/INT2,3,6	Interrupt Level 2,3,6	I
19-26	RGA1-8	Register Address 1-8	I
27	Vcc	+5 VDC	I
28	CCK	Color Clock	I
29	CCKQ	Color Clock Delay	I

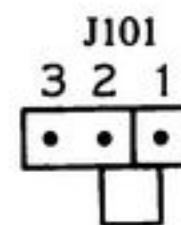
30	AUDB	Right Audio	O
31	AUDA	Left Audio	O
32	POT0X	Pot 0X	I/O
33	POT0Y	Pot 0Y	I/O
34	VSSANA	Analog Ground	I
35	POT1X	Pot 1X	I/O
36	POT1Y	Pot 1Y	I/O
37	/DKRD	Disk Read Data	I
38	/DKWD	Disk Write Data	O
39	DKWE	Disk Write Enable	O
40	TXD	Serial Transmit Data	O
41	RXD	Serial Receive Data	I
42-48	D9-15	Data Bus Lines 9-15	I/O



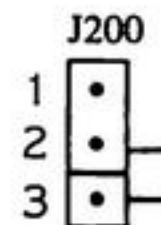


Paula Block Diagram

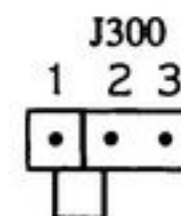
## List of 2000 Motherboard Jumpers



This jumper determines the high-order address bit for Fat Agnus. In its normal position, the high-order bit is A23; in its other position, this bit is A19. The current Fat Agnus chip requires the A23 signal for proper management of the memory at \$C00000. Future Fat Agnus chips may map things differently; this keeps the current board compatible with simple enhancements to the chip set.



This jumper is used to set the light-pen port number. In the position shown, the light pen input will be the FIRE input of mouse/joystick port 0. With the jumper in the other position, the light pen input will be the FIRE input of mouse/joystick port 1.



This jumper determines the time base used for the 50/60Hz CIA timer chip. In the normal position, the 50/60Hz TICK clock, based on AC line frequency, is used as a time base. In the alternate position, the vertical sync pulse from the video section is used. The system will not operate properly without one of these clocks.

J301  
X X

This jumper is closed to add a second internal floppy drive, open to leave the second floppy out of the main unit box. The Amiga expects an ID bit stream from each floppy drive; this lets it determine the drive type. External floppies have this ID circuitry on board, but as it's not an industry standard capability, it has to be implemented on the A2000 motherboard to save cost on internal drives. Leaving the jumper open prevents the Amiga from seeing the ID sequence.

J500  
X-X

This jumper is used to enable the 512K of RAM at \$C00000 and the real-time clock. It is normally closed; opening it will disable both this extra RAM and the real-time clock.





Commodore Business Machines, Inc.  
1200 Wilson Drive • West Chester, PA 19380  
Commodore Business Machines, Inc.  
3470 Pharmacy Avenue • Agincourt, Ontario M1W 3G3