

TEKMAGIC

A2060-040/060

User's Manual

MC68040- or MC68060-based Accelerator for the Amiga 2000

(Digitally reconstructed in May of 2019 by Greg Donner for clarity.)

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This product requires version 2.04 (or later) of Kickstart. The user is responsible for securing and having this installed. Installation of this product requires some degree of mechanical ability and precautions against electrostatic discharge. The user assumes all risks when this installation is performed by anyone other than a certified dealer.

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FCC Statement

Warning: This equipment has been designated to comply with the limits for a Class B computing device, pursuant to Part 15 of the Federal Communications Commissions rules. These rules and regulations are designed to provide reasonable protection against radio and television interference in a residential installation. If not installed properly, in strict accordance with the manufacturers instructions, it may cause interference. If you suspect interference, you can test this equipment by turning it on and off. If you still experience interference with the equipment switched off, then the cause lies elsewhere. If this equipment does cause interference when switched on, any or all of the following suggestions may correct the problem:

- Reorient the antenna or plug on the radio or television receiver.
- Change the relative positions of the computer equipment and the radio or television receiver.
- Plug the equipment into a different outlet so that the peripheral and radio or television receiver are on different circuits.

Caution: Only equipment with shield-grounded cables (computer input-output devices, terminals, printers, etc.) certified to comply with Class B limits, can be attached to this device. Operation with non-certified equipment may result in communications interference.

Your house AC wall receptacle must be a three-pronged type (AC grounded). If not, contact an electrician to install the proper receptacle. If a multi-receptacle switch box or "power strip" is used to connect the computer and peripherals to AC, then all receptacles must share a common ground.

If necessary, contact your dealer or an experienced radio/TV technician for additional suggestions. You may find the following FCC booklet helpful:

How to Identify and Resolve Radio/TV Interference Problems

The booklet, stock no. 004-000-00345-4, is available from:

The U.S. Government Printing Office
Washington, DC 20402

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Chapter 1: Introduction

Congratulations on your purchase of the TekMagic A2000-060/040 accelerator. This product represents the most powerful performance upgrade available for any Amiga, anywhere. The accelerator board plugs into the processor direct slot of any Amiga model 2000 equipped with version 2.04, or later, Kickstart in ROM. Amiga 2000 owners with older versions of the operating system will need to obtain the 2.04 ROM from their Amiga dealer.

TekMagic has engineered the accelerator to provide 100% backward compatibility with the original Amiga 2000. An accompanying utility program provides the means to select the Amiga 2000's original 68000 processor as the main CPU. This feature ensures that any software that will not run on a 68060 or 68040-processor can still be used.

Product Specification

The A2060-040/060 employs the most advanced state-of-the-art technologies of any product in the Amiga market.

Among its features are:

- Onboard 32-bit DMA SCSI-II controller supporting SCSI data transfer rates of up to 10 MB/sec.
- CPU access to local memory running at 50 MHz is up to 66 MB/sec.
- DMA access to local memory running at 50 MHz is up to 33 MB/sec.
- Motorola MC68040 CPU includes:
 - Integrated FPU (Floating Point arithmetic Unit)
 - 4-kilobyte instruction cache
 - 4-kilobyte data cache
- Motorola MC68060 CPU includes:
 - Integrated FPU (Floating Point arithmetic Unit)
 - 8-kilobyte instruction cache
 - 8-kilobyte data cache
- MC68040 running at 40 MHz provides more than 50 million instructions per second (MIPS) and more than eight million floating point operations per second (MFLOPS).
- MC68060 running at 50 MHz provides more than 80 million instructions per second (MIPS) and more than 12 million floating point operations per second (MFLOPS).
- Supports up to four (4) SIMMs of these types in various combinations:
 - Industry-standard 72-pin SIMMs (4 MB, 8 MB, 16 MB and 32 MB in 60 ns or 70 ns speeds) offering up to 128 MB of user-installable memory.
 - GVP custom 64-pin SIMMs offering up to 64 MB of user-installable memory.
- Full support of 68040/060 Burst Mode.
- TekMagic's high-performance autobooting DMA SCSI controller and SCSI-II software technology.
- An external 50-pin SCSI high-density connector for connecting high-performance SCSI-II devices.
- Special hardware allows the system ROM to be copied into high-speed onboard RAM for maximum performance.
- Surface-Mount Technology (SMT) for more reliable assembly and reduced cost to the user.
- Eight-layer printed circuit board for maximum system integration.

Chapter 2: Getting Started

This chapter provides an overview of the remainder of this document. Although we have attempted to present all relevant information in a complete and systematic fashion, each individual user may need to reference particular discussions out of sequence. This manual is organized as follows:

- Chapter 1: Introduction
- Chapter 2: Getting Started
- Chapter 3: Configuration
- Chapter 4: Hardware Installation
- Chapter 5: Software Installation
- Chapter 6: Hard Drive Installation
- Chapter 7: The 68060 Processor Upgrade
- Chapter 8: Warranty

The A2060-040/060 accelerator is a very easy product to use. In most cases, your accelerator is ready to use right out of the box. The first few pages of this manual describes configuring the jumpers and installing 32-bit SIMMs. In subsequent chapters, hardware and software installation is described. Finally, in Chapter 7, we discuss how to upgrade your 68040 processor to Motorola's superscalar MC68060 50 MHz processor.

An accompanying FaaastPrep 2.0 manual is included that explains with the use of the FastPrep software how to add additional hard disks to your system, re-partition, format, or prepare existing drives for use.

Chapter 3: Configuration Options

The A2060-040/060 accelerator is normally shipped with 0 MB of 32-bit memory installed. It is expandable to 128 MB, using various combination of SIMMs. The procedure for adding memory is detailed below.

Even if you are not making configuration changes to the A2060-040/060 board, we recommend that you check the board's jumper positions, as received, against the factory default configuration settings presented in Figures 3.1 to 3.3. These jumpers may have become dislodged during shipping.

Caution: The A2060-040/060 accelerator boards use CMOS technology electronic components. They are extremely sensitive to static discharge or physical shock. Always be sure to ground yourself by touching a grounded metal surface prior to handling the board or its components. Do not drop or physically jar the board or its components. Failure to observe these precautions may result in irreparable damage to the accelerator board.

"What you need"

Often, no tools are required to configure the accelerator board. It is always a good idea, when handling electronic components, to note the precaution above and, if possible, to use a suitably-grounded anti-static wrist strap. If you do not use an anti-static strap, make sure to touch some grounded metal surface before handling RAM SIMMs or other components.

Jumpers

All user-configurable settings on the accelerator board are accomplished by using jumper pins and shorting blocks. Located around the board are most upright metal pins. These are connection points for various open circuits on the board. To configure certain options, you can install a shorting block onto a pair of pins, completing the circuit.

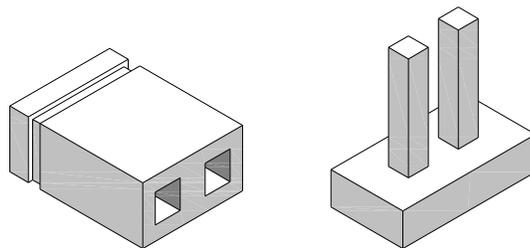


Figure 3.1: Jumper block and pins

Note: All jumpers have polarity indicated either by a pointed end on the jumper pin mount itself or in white ink on the surface of the circuit board (although polarity is irrelevant on a two-pin jumper). On both two and three-pin jumpers, pin one is the pin closest to the pointed end.

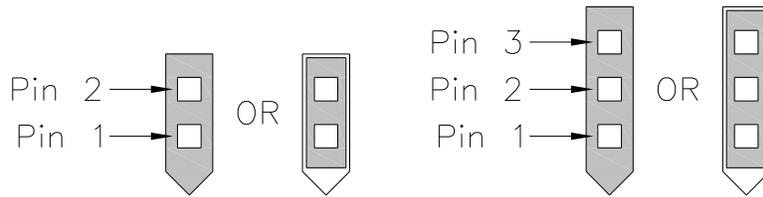


Figure 3.2: Jumper-pin numbering for 2- and 3-pin jumpers

Jumper	OPEN (OFF) Position	CLOSED (ON) Position	Default
J3	Clock Enabled	Clock Disabled	OFF
J4	CPU: 68000	CPU: 68060 or 68060	ON
J5	No DTACK Pull-up Resistor	DTACK Pull-up Resistor Enabled	OFF
J6	Active SCSI Termination Enabled	Active SCSI Termination Disabled	OFF
J7	DMA ignores interrupt	DMA Back Off for Interrupt	OFF
JR1	Non-Burst Mode (Any No. of SIMMs)	Burst Mode (Increments of 2 SIMMs)	ON
JR2	DRAM vs. CPU speed	[See chart below]	OFF
JR3	Burst Write Disabled	Burst Write Enabled	ON
JR4	Burst Read Disabled	Burst Read Enabled	ON
JR5	4 MB GVP SIMMs installed	16 MB GVP SIMMs installed	OFF
JR6	Single-sided 72-pin SIMMs used	Double-sided 72-pin SIMMs used	OFF
JR7	RESERVED	RESERVED	ON
JR8	2K OR 4K Refresh	4K Refresh only	
Jumper	Pins 1 and 2	Pins 2 and 3	Default
J1	CPU Power: 5V (68040 Only)	CPU Power: 3.3V (68060 only)*	see note
J2	CPU Clock Selection for the 68040	CPU Clock Selection for the 68060	*
J9	ROM Type 27C256 (VCC)	ROM Type 27C512 (A16)	1 and 2
Jumper	USE		
J10	12V Fan (Caution: Do not change!)		
J11	5V Fan (Caution: Do not change!)		

* Items marked with an asterisk are settings dependent upon the configuration that you purchased.

Note: Italicized listings will be marked as "RESERVED"

CPU vs. DRAM	68060/50 MHz	68040/40 MHz	68040/33 MHz	J2 Setting
Speed:	60 ns	60 ns / 70 ns	60 ns / 70 ns / 80 ns	OFF
	70 ns	80 ns		ON

Memory

The A2060-040/060 accelerator has eight SIMM sockets that cover much of the left half of the component side (toward the rear of the Amiga when installed). Please note that up to four of these SIMM sockets can be occupied at once; however, no more than four can be occupied. Memory configurations are discussed below.

This accelerator can accommodate either industry-standard 72-pin SIMMs (parity is not needed) or GVP 64-pin 4 MB and 16 MB SIMMs, or a combination of the two. As noted above, no more than four SIMMs can be installed (and be functional) at any one time. This is due to the manner in which SIMMs are accessed by the RAM controller. Note that the 72-pin sockets are labeled CN1 through CN4; corresponding to up to four occupied SIMM sockets. Connectors CN1 and CN5 are treated as the first single bank; CN2 and CN6 comprise the second bank; CN3 and CN7 correspond as do CN4 and CN8 comprise the final bank. For each bank, if a SIMM is installed in one of that bank's sockets, then the other socket cannot be used. For example, if you install a 4 MB 72-pin SIMM into socket CN1, you cannot insert a GVP SIMM into socket CN5. You could, however, insert a GVP SIMM into socket CN6 (and, consequently, you would be prevented from inserting a 72-pin SIMM into CN2). This may sound confusing, but it can be easier to understand if you remember the following two provisions:

1. You cannot install more than four SIMMs total.
2. Remember the four banks, and that using a SIMM in one socket of a bank prevents the use of the other socket:

Bank 1:	CN1 and CN5
Bank 2:	CN2 and CN6
Bank 3:	CN3 and CN7
Bank 4:	CN4 and CN8

Now that you think that you understand this concept, it gets more complicated. This is because there are a multitude of 72-pin SIMMs that can be used—be thankful that there are only two types of GVP SIMMs: 4 MB and 16 MB! Here are the various types of industry-standard 72-pin SIMMs that can be used:

- Single or double-sided SIMMs (this adds more possibilities)
- 1 megabyte (but why bother?)
- 2 megabyte (256 k x32 or x36)
- 4 megabyte (1 MB x32 or x36)
- 8 megabyte (2 MB x32 or x36)
- 16 megabyte (4 MB x32 or x36)*
- 32 megabyte (8 MB x32 or x36)

*** Note: 16 MB SIMMs or higher requires that jumper JR4 be set for 16 MB mode. With any amount of memory less than 16 MB, R5 should be set for 4 MB mode.**

When installing SIMMs of different memory capacities, you must install the SIMMs of higher capacity first. In other words, the largest SIMM should be installed into the lower-numbered banks. For example, if you had a 16 MB SIMM and a 4 MB SIMM, the 16 MB SIMM would be installed in socket CN1 and 4 MB SIMM in socket CN2. It should also be noted that when mixing SIMMs, jumper

J5 should be set to match the largest SIMM size. In our example above, this would require JR5 to be set for 16 MB SIMMs.

Because of the way that double-sided industry-standard SIMMs are designed, it is accessed as two separate SIMMs. This adds another twist: If you install a double-sided 72-pin SIMM, two of the GVP 64-pin sockets are disqualified. Consequently, if you install two double-sided SIMMs, you cannot install any GVP SIMMs. This caveat does not restrict the 72-pin SIMMs in any way, however.

The 68040/68060 processor's Burst Mode is also supported in specific configurations:

- You must have an even number of SIMMs installed (i.e. in pairs!)
- The SIMM pairs must be of the same capacity (i.e. a pair of 4 MB, 8 MB, etc. SIMMs).

All memory mounted on an A2060-040/060 board is configured as "Extended" RAM. This provides for maximum system expansion while maintaining complete compatibility with other existing AutoConfig™ memory peripherals.

32-Bit Memory

Whatever amount of memory is installed in your system, and no matter how it is configured, the A2060-040/060 board will always attempt to use 32-bit Fast RAM before any other kind. Only after its store of 32-bit memory has been consumed will the system use 16-bit memory. In this way, the accelerator board makes most efficient use of its resources for the maximum attainable performance.

Users should be aware, however, of the possibility that some applications may not work with Extended RAM on the A2060-040/060 board. These applications will generally not work on an Amiga 3000 or Amiga 4000 either. Such programs are not "32-bit pure"; their authors made some assumptions about the addressing range of the target computer and used the high-order address bits in unauthorized ways. The most surprising "32-bit impure" program is Amiga BASIC by Microsoft.

Some programs, while they cannot access use of memory beyond the AutoConfig™ range, will operate happily by ignoring Extended memory. Such programs will work on a 68060-equipped system.

Still other programs cannot cope with Extended RAM, but may not run correctly on the 68040 processor. The solution for such software requires rebooting your system under 68000 control. Refer to chapter 5 "Software Installation" for details on the use of support software.

As Workbench 2.x, 3.x and the current crop of programmers tools become more widespread, we expect to find fewer compatibility problems with Amiga software. Meanwhile, however, you should verify the program requirements or ask your dealer whether a particular program is 68060-compatible before deciding to purchase it. While there is no way to fix "broken" software, a general rule of thumb applies when selecting software for use on your system:

If a program runs correctly on an Amiga 4000, it will also work with the A2060-040/060 board.

Adding RAM

As stated previously, there are eight RAM SIMM sockets on the A2060-040/060 accelerator; comprising the left half of the component side (see Figure 3.3).

The accelerator board will automatically sense whether a SIMM is installed in each socket and will configure itself accordingly.

The SIMM package is a convenient, cost-effective, relatively rugged component with a high degree of reliability. They are much easier to install than single-chip arrangements. A SIMM consists of eight or more memory chips mounted on a single small printed circuit board. All of the connection points for the memory chips are arrayed along one edge of the SIMM and mate with the contacts of a matching SIMM socket on the accelerator board. These SIMM sockets can be populated one at a time, as finances permit, or all at once.

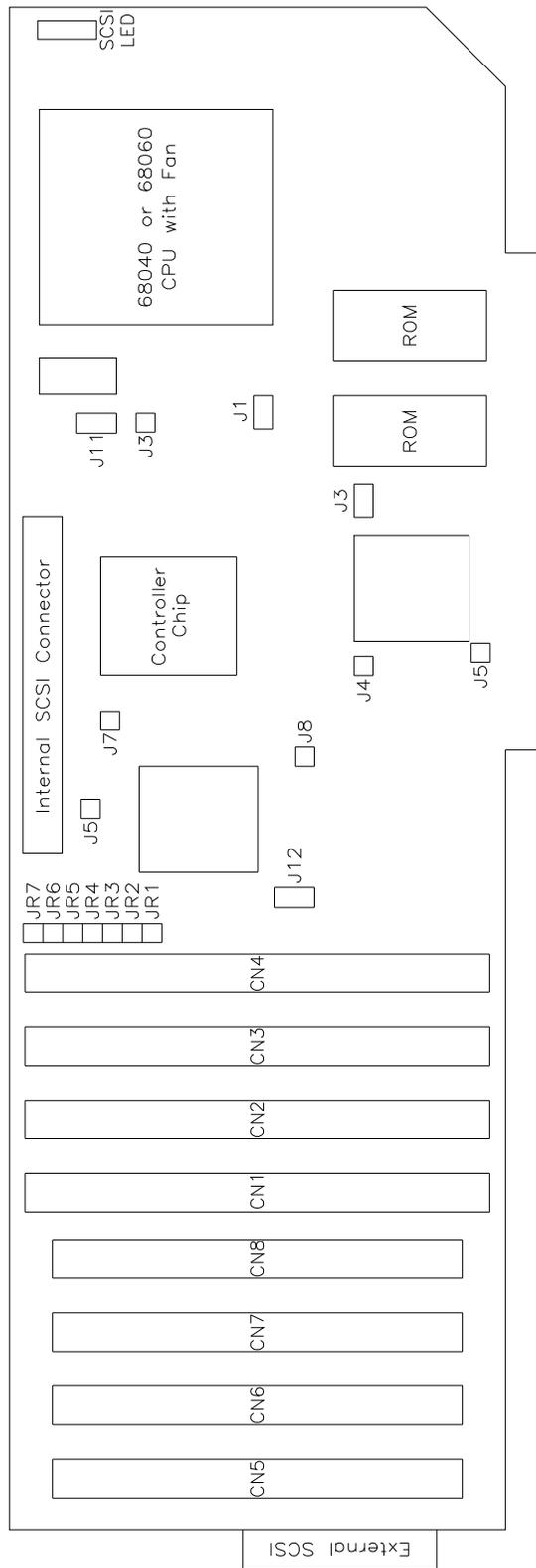


Figure 3.6: TekMagic A2000-040/060 Board RAM and Jumper Settings

Installation Procedure

1. If you are not using an anti-static wrist strap, be sure to ground yourself before touching the accelerator board or any of its components.
2. Lay the accelerator board on the anti-static envelope in which it was packaged.
3. Note the location of the SIMM sockets on the left half of the accelerator board. The sockets are numbered from left to right in ascending order.
4. The SIMMs are designed to fit into the sockets in only one way. They slide in easily and rotate into place. The plastic latches snap into place when the SIMM is properly positioned. Note that the GVP SIMMs rotate down toward the plane of the accelerator card; the 72-pin SIMMs rotate upward into a position perpendicular to the accelerator card.

Inserting a GVP SIMM

Orient the first SIMM such that the memory chips are facing you and the edge with the silver contacts is pointing down. These contacts will mate with the corresponding connectors inside the socket.

Inserting a 72-pin Industry-standard SIMM

Orient the first SIMM such that the memory chips are facing you and the edge with the silver contacts is pointing down. These contacts will mate with the corresponding connectors inside the socket.

Power-up Test

With the accelerator card configured to your preference, insert the card and attach SCSI hard drives if necessary. Insert all other cards, attach the mouse and keyboard, and connect your monitor and power cables. Turn on the Amiga. If it boots properly, you can proceed with the software installation. However, if the Amiga does not boot (or boot properly), follow the steps below to detect the cause of the problem:

1. Remove the accelerator and turn on the Amiga, to verify that the computer works properly. If it does not boot, remove all cards and try again. If it still fails to boot, have your dealer or service center examine your Amiga computer.
2. Remove all cards except the accelerator, and boot the Amiga. If it boots, then add cards one at a time until the entire combination functions or until you have found a card that causes the problem. There may be an incompatibility between some boards in the system, or the motherboard may have expansion bus troubles if it is not the latest revision. This could be in effect if your Amiga motherboard revision is below version 4.5, or 6.0 to 6.1.
3. Disconnect the hard drive and remove RAM from the accelerators (and set appropriate jumpers) and boot the Amiga with no other cards except the accelerator.
4. Verify all jumpers on the accelerator are properly set.
5. If possible, test the accelerator in a different Amiga (preferably with the latest revision motherboard).

Chapter 4: Hardware Installation

"What you need" You will need a medium cross-point to install the accelerator.

Amiga 2000 procedure:

This chapter will present the necessary steps to follow when installing a TekMagic accelerator into an Amiga 2000 computer. It is not meant to supersede any assembly instructions provided by Commodore.

1. Remove the screws from the computer's cover. There are five: one at the top center on the rear panel, two along the bottom edge of each side.
2. Remove the cover by pulling forward and away from the base.

Installing Drives

Those who intend to install SCSI hard drives at this time should follow Step 3. If you are not installing any SCSI drives at this time, proceed to Step 4.

3. Install your hard drive into the 3.5-inch or 5.25-inch drive bay. Remember to remove the face plate in the Amiga case if necessary. Also remember to configure SCSI termination properly.

Final Installation

Now we are about to actually install the accelerator into the Amiga 2000. Observe all previous cautions concerning electrostatic discharge and damage to the board.

4. Remove the two screws and cover plate from the rear panel of the A2000 that correspond to the processor slot position.
5. Fit the front edge of the board into the plastic guide on the front panel of the Amiga.
6. Insert the accelerator board into the processor slot (closest to the drive assembly).

Note: Take care to guide the DB50 external SCSI-II connector through the hole in the rear panel. The fit may be tight and may require careful manipulation of the board.

7. Verify that the accelerator board's edge connector and the processor slot are properly aligned. Press the accelerator board firmly into the processor slot. Do not over-stress the motherboard.
8. Secure the board to the rear panel with the cover plate screws.
9. If you are connecting SCSI drives to the accelerator, attach the SCSI hard drive ribbon cable to the bus connector at the top center of the board. If your cable is not keyed, pay close attention to the pin one markings. Pin 1 of the board's connector is the end closer to the front of the board (toward the CPU). Pin 1 of the SCSI ribbon cable should be marked with a red stripe.
10. Connect the leads from the Amiga's hard drive indicator light (LED) to the three-pin jumper labeled CN13, found on the upper-right corner of the board (by the CPU). Note that the center pin is ground. Match the black wire from the Amiga's indicator light lead with the center pin. The red wire may connect with either the top or bottom pin of CN13.
11. Replace any other boards you may have removed and replace the Amiga's cover.

Chapter 5: Software Installation

The A2060-040/060 accelerator includes several programs to maximize your system performance. Most of the programs may be used either from Workbench or AmigaDOS Shell interfaces.

All of these programs can be installed automatically on your system by booting from your standard system disk and then inserting the TekMagic install disk in any floppy.

After Workbench is loaded, installation of software is accomplished by double-clicking on the TekMagic.Install icon and then on the Install 040 icon. After the Install040 icon is open, simply follow the instructions and options given to install the software and optimize your system's performance.



It should be noted that there are four programs needed by the 68040 processor to insure maximum performance. These are: **CPU**, **Setpatch**, **68040.library**, and **KSRemap**. The latest of all four programs are included on the Install disk and these can be automatically installed if selected by the user. Only one of these programs, "KSRemap" is supplied by TekMagic; the rest are standard Amiga programs.

The programs included with the Installed disk are noted below:

KSRemap

This program will copy an image of the Kickstart ROM to Fast RAM on the accelerator board for increased performance of the entire system. It can be installed and loaded automatically every time the system boots as noted above or it can be used by selecting its icon or as a CLI command.

Arguments:

REMOVE – Reset the system ROM vector to the Amiga's ROM chips and frees any Fast RAM previously reserved for remapping the ROM.

FastPrep and ExpertPrep 2.5

These are the same programs provided with later SCSI controllers from Great Valley Products (GVP), and are used to format and prep hard disk drives. These programs have been licensed for use with this accelerator. Please refer to the accompanying manual for instructions on using these programs. Note that the only change is that the program works with the new SCSI device driver, tekscsi2.device, found in the autoboot ROMs on the A2000 accelerator board. The program icons reflect this change, but if either program is used from a CLI, the argument "tekscsi2.device" must follow the command FastPrep or ExpertPrep. These programs can be automatically installed as noted above.

Reboot040

This program is used to reboot the A2000 with its original 68000 CPU in control instead of the CPU on the A2060-040/060 accelerator. By booting with the 68000 processor, this utility provides 100% backward compatibility and ensures that any software that will not run on a 68040/060 processor can

still be used with the 68000 CPU. To return to the 68040/060, simply reboot the system with the key sequence of "Control-LAmiga-RAmiga." This program can be executed from an icon or as a CLI command.

Note: With the 68040/060 CPU running at speeds of 40 MHz or more, there is a tendency for the system to generate a "Software Failure" when the Reboot040 program is executed. This failure is due to the speed and very short length of the reset pulse generated by the 68040/060 CPU. If this failure occurs, simply press the left mouse button and the system will then properly boot into the 68000 mode.

For additional information on software and performance optimization, please consult the README file on the installation diskette. This file will always contain the latest information that may not be found in the manual.

Chapter 6: Hard Drive Installation

Several caveats must be followed when installing SCSI hard drives, and this list provides a general guide to work in nearly all situations: Because of the vast number of SCSI peripheral makers today, and the chance that some devices may not stick to the ANSI SCSI specifications, you may encounter a situation that is not covered in this list. In such a situation, a good test is to try various combinations until a working solution is found.

1. The last physical device in a SCSI chain (whether it is internal or external) **MUST** be terminated.
2. If you are connecting hard drives to both the internal and external SCSI connectors of the accelerator, you must disable the accelerator board's termination by setting jumper J6 to ON (see jumper table on page 8). Be sure that the drives on the physical end of both SCSI cables are terminated (see item 1 above).
3. There should be at least one foot between each device on the cable, and SCSI cabling should not exceed a total length (internal and external) of eight feet. The only exception to this is if special, high-priced and thick cable is used; this is not normally found at your local computer store or superstore. These cables have all 25 wires wrapped by a separate ground wire.
4. For external drives, it is recommended that SCSI termination be installed on the hard drive itself, and not by using an external termination plug. This is because SCSI termination may not be provided over the SCSI bus.
5. When using the internal SCSI connector on the accelerator, the accelerator must always remain at one end of the SCSI cable.

Chapter 7: 68060 Processor Upgrades

You will be happy to know that your A2000 accelerator was designed to work with the Motorola 68060 50MHz processor and can be upgraded by your dealer. By upgrading your accelerator to a 68060, you can expect a significant performance increase.

To upgrade your accelerator, three changes must be made to the board:

1. The socketed 68040 must be replaced with a 68060 processor.
2. The system clock (33 MHz or 40 MHz) should be replaced with a 50 MHz system clock.
3. The boot ROM must be upgraded to support the 68060.

The 68060 processor requires several modifications to the Kickstart ROM for compatibility and performance enhancements, and it is the job of the boot ROM to patch the operating system to support the 68060 properly. Please refer to your dealer for availability of the 68060 upgrade kit.