HARD DISK/
SCSI CONTROLLER
A 2091-40
A 2091

User's Guide
Manuel de l'utilisateur
Manuale per l'utente
Benutzerhandbuch
Manuel del Usario

C= Commodore

Contents

Preface

A hard disk drive is a large capacity data storage unit that can be installed inside your Amiga 2000. A hard disk can store more data than a floppy disk, and files stored on hard disk can be accessed more quickly.

To use a hard disk, you must install the A2091 SCSI Controller in your A2000. The Controller acts as a link between the hard disk and the Amiga 2000's system.

In addition, the A2091 can function as a SCSI "host adapter," allowing you to connect one or more SCSI storage subsystems, such as hard disks, tape streamers, or combined disk/tape systems. Hard disks and SCSI subsystems are available from your Commodore-Amiga dealer.

Chapter 1: Introducing the A2091-40/A2091

The A2091 Hard Disk Controller is an internal SCSI controller card and expansion memory unit for the Amiga 2000. The A2091-40 consists of an A2091 and a Quantum 40-megabyte SCSI hard disk. Installing a A2091-40 in your Amiga 2000 converts it into an Amiga 2000HD. If you have an Amiga 2000HD or an Amiga 2500, you already have an A2091-40 installed.

The A2091 connects to an expansion slot inside the Amiga and comes with a floppy disk containing all the software required for operation.

The A2091 includes the following features:

- Sockets for 512KB, 1MB, or 2MB of fast random access memory (RAM) chips
- Direct Memory Access (DMA) for fastest possible operation
- Internal and external connectors for the use of Small Computer Standard Interface (SCSI) expansion devices
- Autoboot ROMS to allow you to boot your system from the hard drive, if you are using Kickstart 1.3

The A2091-40 package includes a Quantum ProDrive 40S (40-megabyte SCSI hard disk), a 50-pin ribbon cable, and all the parts required to mount the hard disk and controller card.

With the addition of the A2091-40/A2091, your system will still operate normally using the floppy disk drive.

NOTE: *To obtain the full potential of the A2091, you will want to have the Kickstart 1.3 ROM installed in your Amiga 2000. With the Kickstart 1.3 ROM you will be able to automatically boot your system from the hard disk, rather than from a floppy disk.*

You can determine whether your Amiga has Kickstart 1.2 or 1.3 by starting your system without a disk in the floppy drive. The screen will show a hand holding a Workbench disk, with the version number below it. If the version number is 1.2, your Amiga is using Kickstart 1.2. Please see your Amiga dealer concerning the ROM upgrade. If the version number is 1.3, your Amiga already has Kickstart 1.3.

Chapter 2: How to use this guide

This guide assumes the user has a basic understanding of AmigaDOS and the SHELL/CLI (Command Line Interface). If you are not familiar with using the SHELL/CLI, refer to the *Introduction to the Commodore-Amiga 2000* that came with your computer.

This guide is supplied with two different products, the A2091-40 and the A2091. This guide tells you how to install and use the:

- A2091-40
- A2091 and your SCSI hard disk

If you are installing an A2091-40 or A2091 you will need to refer to **Installing the A2091-40/A2091** on page 3-1.

If you are installing any other hard disk, refer to **Preparing a New Hard Disk** on page 3-20.

If you wish to reinstall or modify a hard disk, refer to **The A2091 Installation Software Disk** on page 5-1.

This user's guide explains how to:

- install a hard disk in the Amiga
- connect a hard disk to the A2091-40/A2091 card
- set up and install the A2091-40/A2091 card
- connect additional SCSI devices
- install RAM chips on the A2091 board
- use the HDToolbox software to set up and configure your hard disk
- use the reinstallation software to rebuild your hard disk in the event of a catastrophic loss of data
- use the hard disk utilities and RAM Test software included on the A2091 Installation Software Disk

Chapter 3: Installing the A2091-40/A2091

WARNING: Commodore will not be responsible for any injury or damage resulting from improper installation. Such improper installation will also void the warranties on the A2091-40/A2091 and the Amiga 2000. Read this manual before attempting to install the A2091. Turn the computer off and unplug the power cord before proceeding. Installing the A2091 with the power on could cause personal injury to yourself and damage to the equipment. Make sure that nothing is attached to the computer. Disconnect all peripherals and power cords, and put them aside.

Most hard disk failures occur because of improper handling: never subject a hard disk to electrical or physical shock.

Although you can install multiple A2091 controller cards in your Amiga, you may only have one card-mounted 3.5" hard disk. A second card-mounted hard disk, connected to the card's power connector, will damage the Amiga and void the warranties on the Amiga and the A2091-40/A2091.

Unpack the A2091 and make sure you have all the required parts:

- A2091 Hard Disk Controller card
- short 50-pin SCSI ribbon cable
- 4-pin power cable
- A2091 Installation Software disk
- warranty card

The A2091-40 comes with the following additional parts:

- Quantum 40-megabyte hard disk
- long 50-pin ribbon cable
- 4 threaded shock mounts with nuts and washers
- reinforcement bar with nut and washer
- adhesive backed foam pad
- Amiga 2000HD label

In addition, when installing an A2091 you will need the following items:

- hard disk
- mounting screws
- long ribbon cable (if you are going to install a hard disk in a drive bay)

3.1 Hardware Installation Procedure

The following steps, required to install the A2091-40 or the A2091, are explained in detail, beginning on the next page.

A2091-40

1. Turn off and disconnect the Amiga.
2. Remove the Amiga's cover.
3. Install the hard disk.
4. Set the jumper pins on the A2091.
5. Connect the hard disk to the A2091.
6. Install the A2091.
7. Connect the LED cable to the A2091.
8. Install the reinforcement bar.
9. Install the foam pad.
10. Replace the Amiga's cover.

A2091

1. Turn off and disconnect the Amiga.
2. Remove the Amiga's cover.
3. Install the hard disk.
4. Set the jumper pins on the A2091.
5. Connect the hard disk to the A2091.
6. Install the A2091.
7. Connect the LED cable to the A2091.
8. *Not required.*
9. *Not required.*
10. Replace the Amiga's cover.

NOTE: *If you wish to connect an external SCSI drive or install RAM chips please refer to the appropriate section before installing the A2091 in the A2000.*

1. Turn off and disconnect the Amiga

Turn off the Amiga, and unplug the power cable. Disconnect all peripherals and cables from the Amiga.

2. Remove the Amiga's cover

Remove the two screws on the lower left side of the Amiga. Remove the two screws on the lower right side of the Amiga. Put them aside.
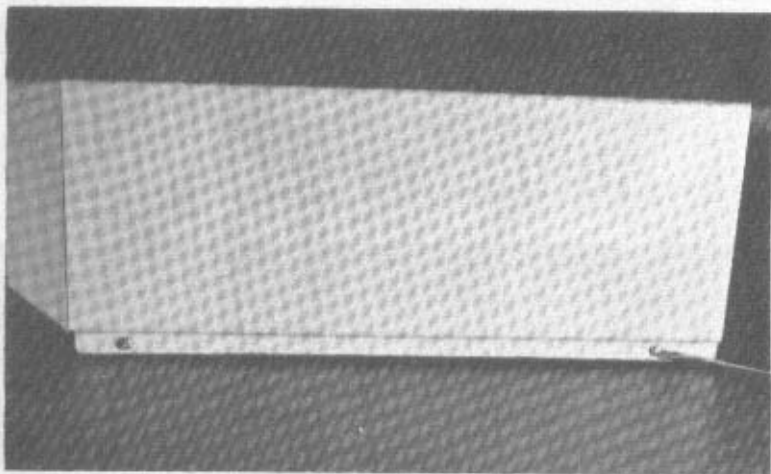
Remove the center screw from the rear of the Amiga. Be careful to remove the correct screw, as shown.
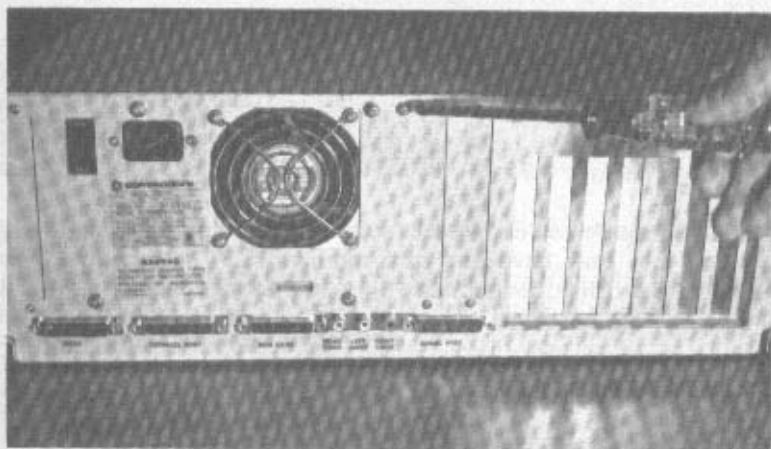
Turn the Amiga so that you are facing the front of the machine. Grasp the cover on both sides and slide it towards you while lifting upwards.
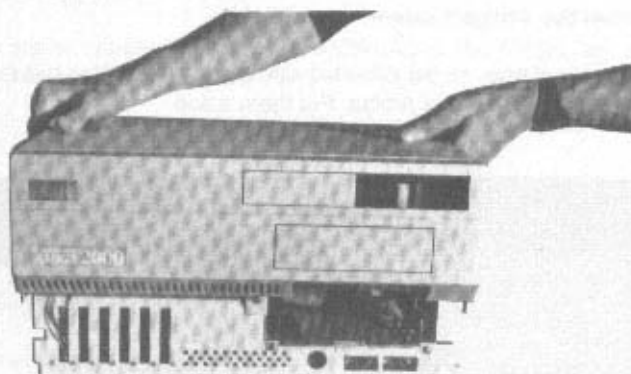
If the cover seems stuck, do not force it. Look under the cover to see if any wires or cables are caught on the cover. If anything is caught, gently untangle it, and continue to slide the cover off.

3. Install the hard disk

You can install a 3.5" hard disk on the A2091 card, a 3.5" hard disk in a 3.5" drive bay, or a 5.25" hard disk in the 5.25" bay.

If you are installing the hard disk in either of the drive bays, remove all internal expansion cards so that you can have full access to the hard disk mounting screws.

The hard disk supplied with the A2091-40 should be mounted in the 3.5" drive bay to the left of the floppy disk drive. These instructions begin on page 3-6. If you have an internal floppy disk drive in this bay, you can mount the hard disk on the A2091 controller card. These instructions begin below. The instructions for installing a 5.25" hard disk begin on page 3-9.

WARNING: Although you can install multiple A2091 controller cards in your Amiga, you may only have one card mounted 3.5" hard disk. A second card-mounted hard disk, connected to the card's power connector will damage the Amiga, voiding the warranties on the Amiga, and the A2091-40/A2091.

3.1.1 Installing a 3.5" hard disk on the A2091

NOTE: *Do not use the threaded shock mounts when installing a hard disk on the A2091 card. If your hard disk has a faceplate that prevents it from fitting on the A2091, you will need to remove the faceplate.*

Remove the four hard disk mounting screws and nuts on the A2091 controller card. Place the hard disk on the component side of the A2091, the side that faces the power supply when installed.

Connect the ribbon cable to the hard disk. Make sure that the cable is aligned properly and that pin 1 on the ribbon cable is aligned with pin 1 on the hard disk connector.
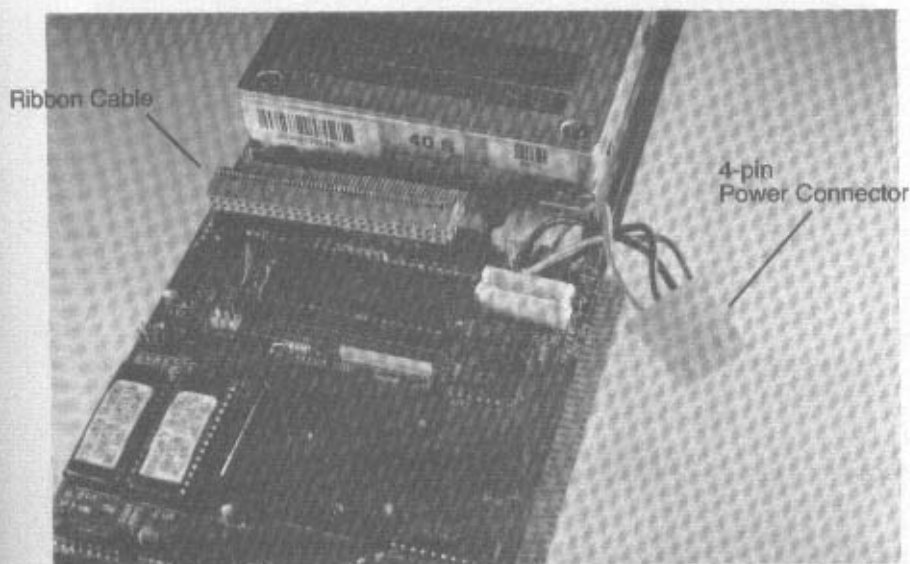
Attach 4-pin power cable to the hard disk power connector. The power connector is shaped that it can only fit one way. Make sure that the connectors on the power cable and the hard disk are aligned correctly.

Install the four screws to hold the disk in place. If the screws that come with the A2091 do not fit the hard disk, you will have to replace the screws with the appropriate type.
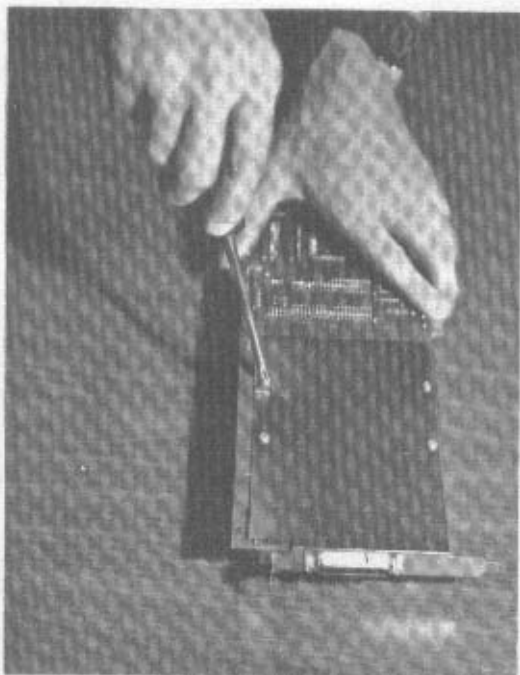
Proceed to **Install the A2091** on page 3-12.

3.1.2 Installing a 3.5" hard disk in a 3.5" drive bay

The internal floppy disk drive is attached to a metal plate. Your 3.5" hard disk will be mounted on that plate to the left of the floppy drive. To secure the threaded shock mounts or screws that will hold the hard disk in place, you will need to lift up the plate.

After noting how the floppy drive's power cable and ribbon cable are oriented, disconnect them from the floppy drive. Four screws hold the metal plate in place; two on each side. Remove the four screws, and lift up the plate.
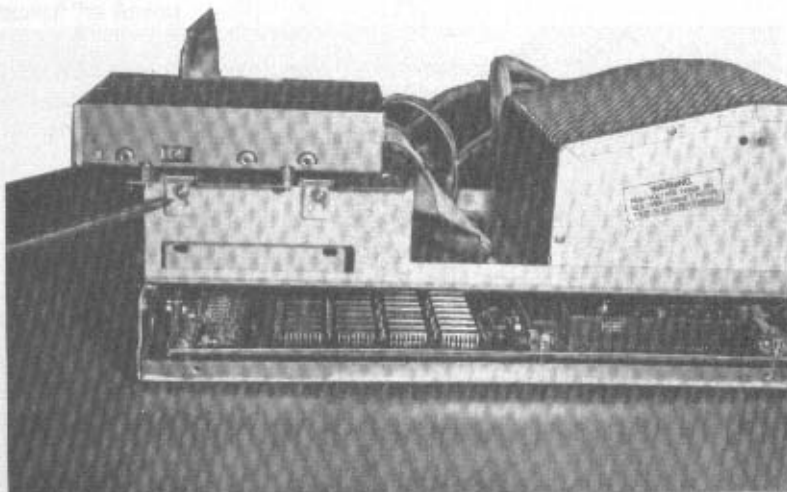
Note the slots in the plate. The threaded shock mounts or screws that hold the
hard disk in place will go into these slots.
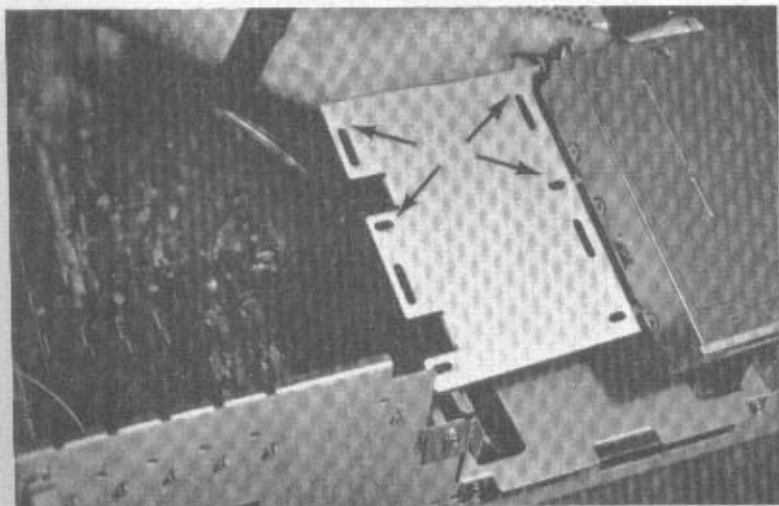
If you are installing a A2091-40, locate the four holes on the bottom of the hard disk. Install the four threaded shock mounts in these holes.
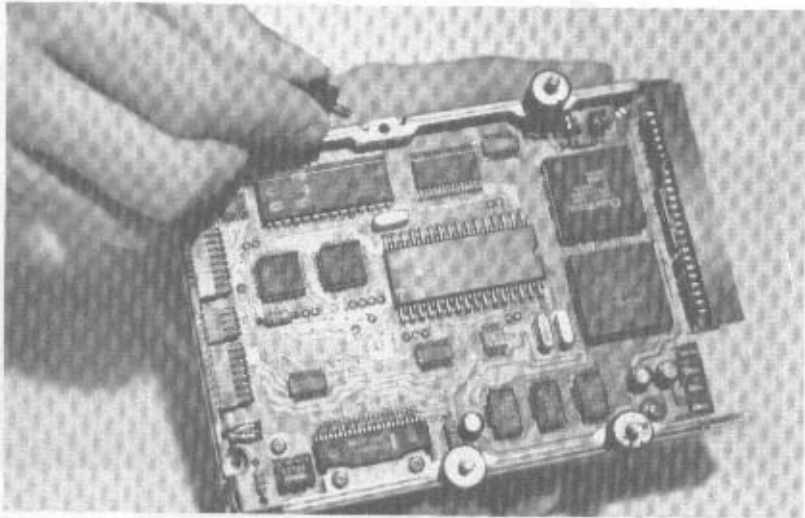
Position the hard disk on the plate. If you are installing an A2091-40, the shock mounts go through the holes in the plate. Working from the underside of the plate, secure the hard disk. If you are installing an A2091-40 hard disk install the washers and nuts on each of the threaded shock mounts. If you are installing another type of hard disk, secure the hard disk with four screws.
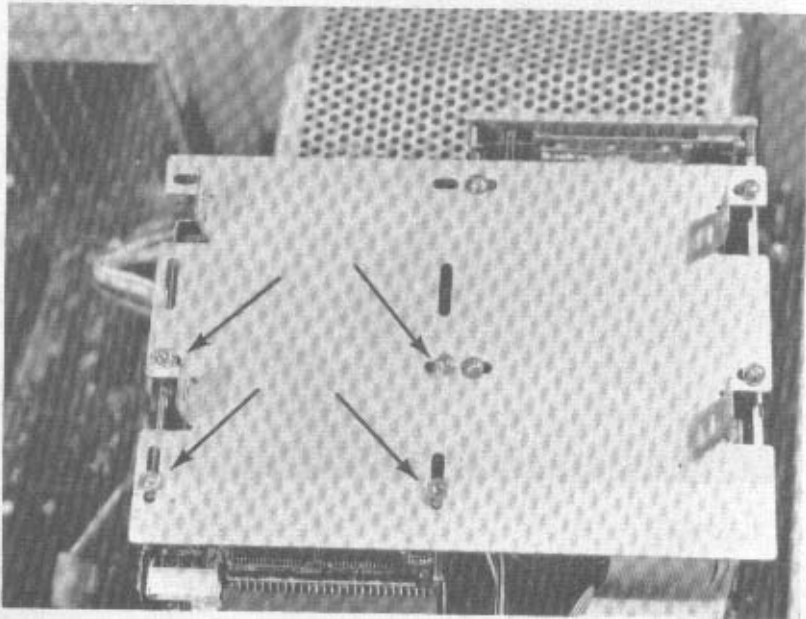
Replace the plate. You should have some leeway to slide the plate back and forth, since you will need to make sure that the face of the floppy disk drive is flush with the face of the Amiga.

Push the plate forward, and replace the Amiga's cover. If the disk drive is not flush with the face of the Amiga, slide the plate into place. Remove the Amiga's cover and tighten the screws holding the metal plate in place.

Connect the ribbon cable to the hard disk. Make sure that the cable is aligned properly and that pin 1 on the ribbon cable is aligned with pin 1 on the hard disk connector.

4-pin
Power Connector

Ribbon Cable

Connect the hard disk to the Amiga's power supply. Locate the wires running from the power supply. It splits into two sets of wires, each terminating with a plastic 4-pin connector. Attach one of the connectors to the hard disk power connector. The power connector is shaped so that it can fit only one way. Make sure that the connectors on the power cable and the hard disk are aligned correctly. Reconnect the floppy drive's power cable and ribbon cable.

3.1.3 Installing a 5.25" hard disk

Your 5.25" hard disk fits in the drive bay beneath the internal floppy disk drive.

Before installing the hard disk you must connect the ribbon cable to the hard disk. Make sure that the cable is aligned properly and that pin 1 on the ribbon cable is aligned with pin 1 on the hard disk connector.

Slide the ribbon cable through the front of the drive bay and out the back. Slide the hard disk most of the way into the slot.
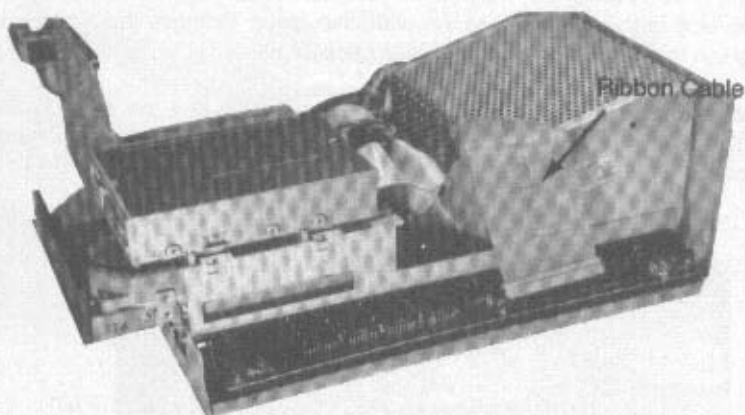
Connect the hard disk to the Amiga's power supply. Locate the wires running from the power supply. It splits into two sets of wires, each terminating with a plastic 4-pin connector. Attach one of the connectors to the hard disk power connector. The power connector is shaped so that it can fit only one way. Make sure that the connectors on the power cable and the hard disk are aligned correctly.

Align the holes on the side of the hard disk with the holes in the drive bay. Working through the rectangular openings on the sides of the drive bay, insert the screws loosely. Do not tighten them all the way.
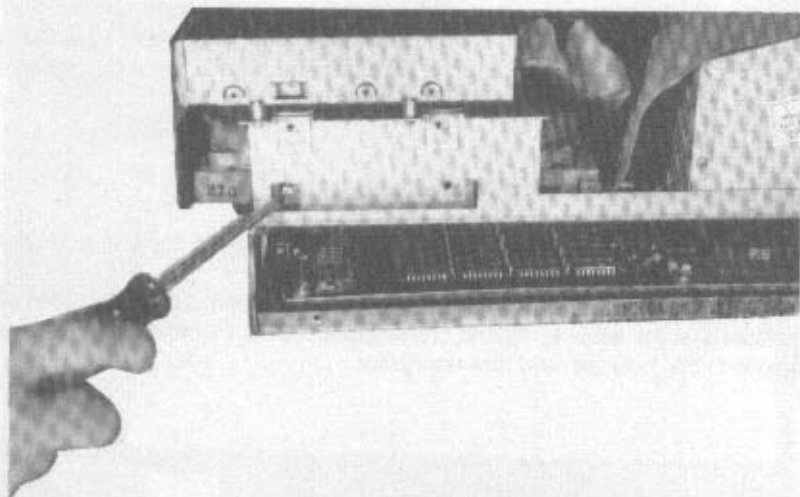
If your hard disk does not have a front cover with a drive light (LED), slide the drive to the back of the drive bay and tighten the screws.

If your hard disk does have a front cover with an LED, you will need to remove the plastic faceplate on the Amiga's cover that covers the 5.25" drive bay. Remove the two screws that hold the faceplate in place, and then remove the faceplate. You should be able to slide the hard disk back and forth to make sure that the hard disk is flush with the front cover of the Amiga.

Push the hard disk forward, and replace the Amiga's cover. If the disk drive is not flush with the face of the Amiga, slide it into place. Remove the Amiga's cover and tighten the screws holding the hard disk in place.

4. Set the jumper pins on the A2091

If you are running Kickstart 1.2 on your Amiga, you will have to set Jumper 2 to **Autoboot disabled**.

If you are installing a Seagate hard disk, refer to **Appendix C** to determine the correct settings for Jumper 5.

5. Connect the hard disk to the A2091

Connect the ribbon cable to the A2091. Make sure that the cable is aligned properly and that pin 1 on the cable is aligned with pin 1 on the hard disk and the A2091. The location of pin 1 on the A2091 is shown in the illustration on page 3-25.
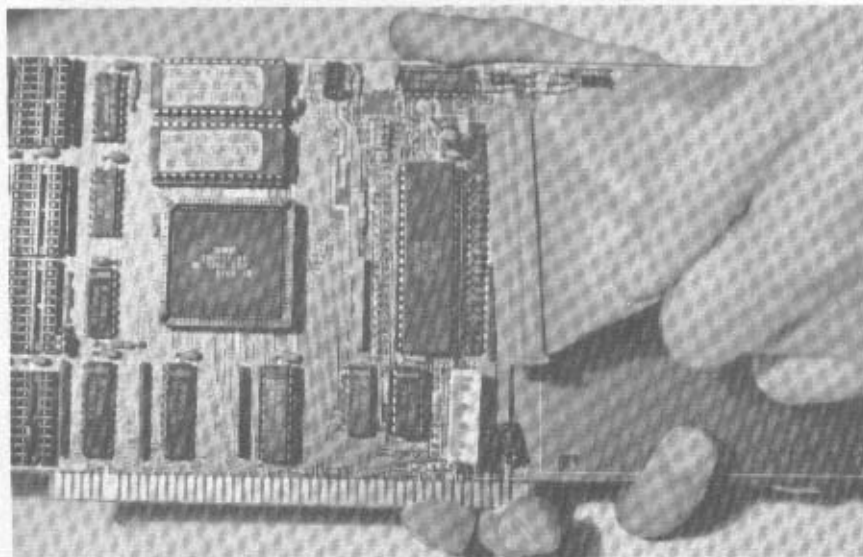
6. Install the A2091

The A2091 card can be installed in any one of the five 100-pin expansion slots shown. If you are mounting a hard disk on the card, use the right most slot in order to take up a single slot. Installing a card with a hard disk in any other slot will cover a second expansion slot.
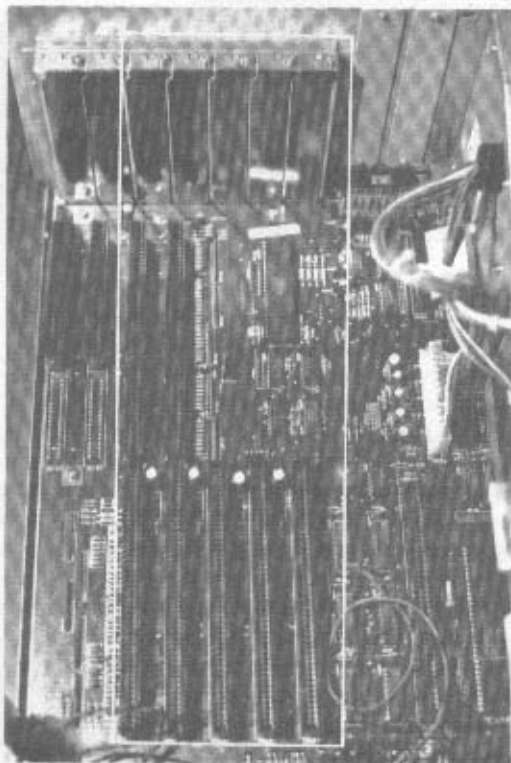
After you select a slot for the A2091, locate the metal slot cover at the back of that slot. Remove the screw and set it aside. Remove the slot cover and save it, in case you ever remove the A2091.
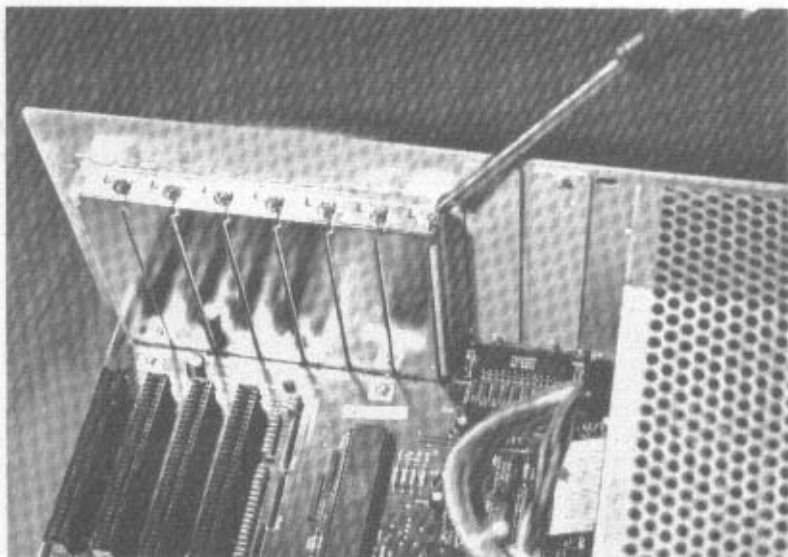
Align the A2091 card with the selected slot. Align the back edge of the card, the edge with the metal slot cover, with the slot at the back of the Amiga. Align the front edge of the card with the plastic groove inside the front of the Amiga.
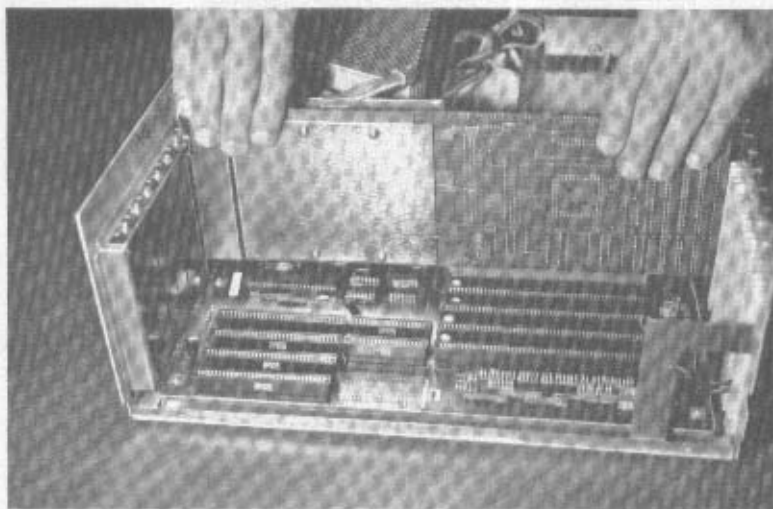
Make sure that the card is free of all cables. Apply even pressure to insert the board into the slot. Secure the A2091 to the back of the Amiga using the screw that held the slot cover.

7. Connect the LED cable to the A2091

Locate the hard disk LED on the front left side of the Amiga, under the power LED. Locate the three pins on the A2091 marked **SCSI LED**. The LED connector plugs onto these three pins.
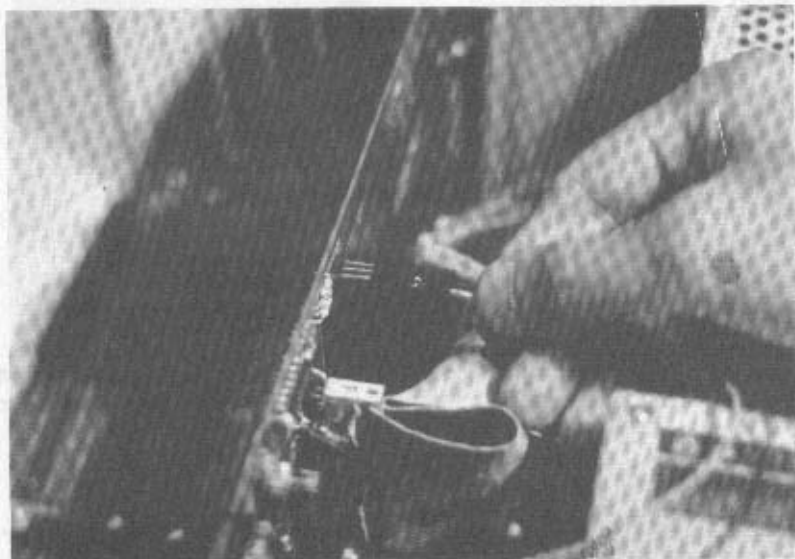
8. Install the reinforcement bar *A2091-40 only*

Locate the second expansion card slot from the right. Remove the screw that holds the metal slot cover in place.

Locate the small round hole in the front of the Amiga that is in line with the second slot from the right, as shown.
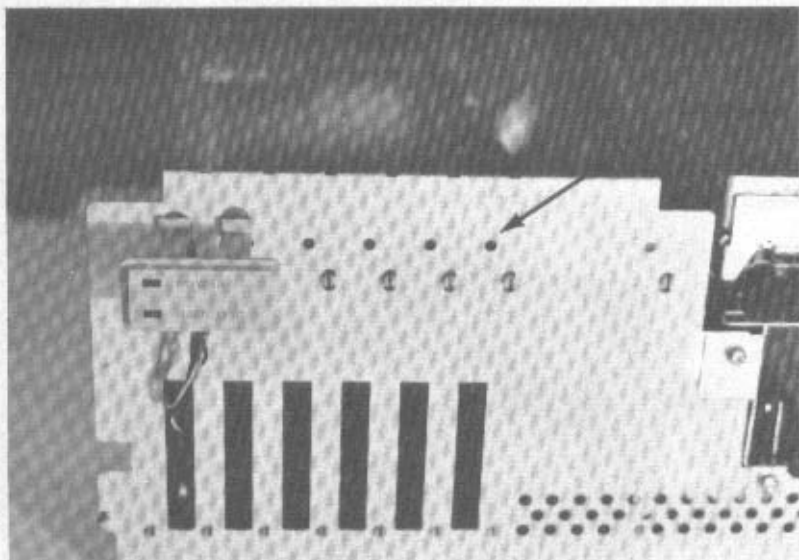
Insert the threaded end of the reinforcement bar through the hole, from the inside of the Amiga. Align the hole at the other end of the reinforcement bar with the hole in the metal slot cover at the back of the slot.
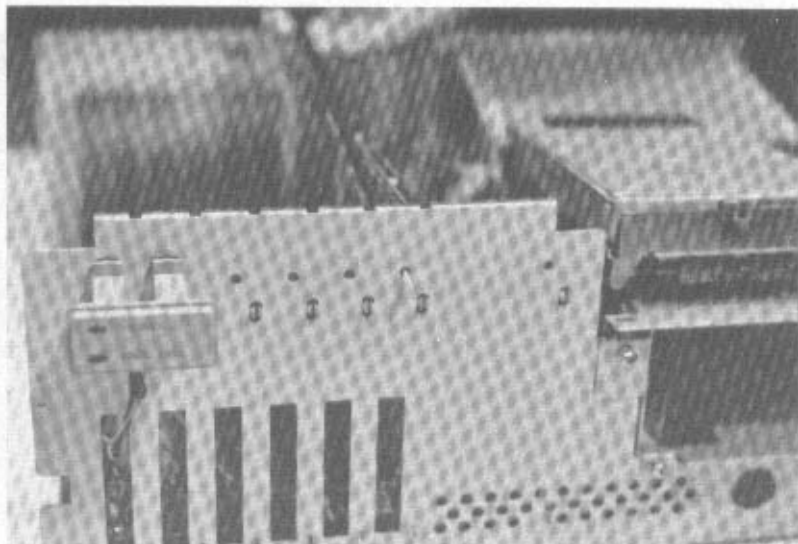
Replace the screw to hold the reinforcement bar in position. Install the washer and nut on the threaded end of the reinforcement bar.
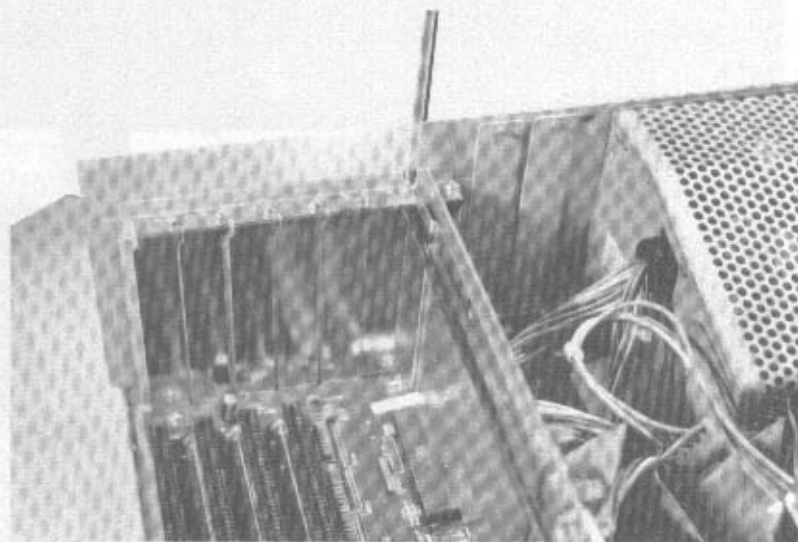
9. Install the foam pad *A2091-40 only*

The adhesive backed foam pad will be affixed to the inside of the Amiga's cover. This pad will help secure any expansion cards.

Place the Amiga's cover upside down on a flat surface and position the foam pad in the cover as shown below, 4.5 inches or 11 centimeters from the front of the cover.
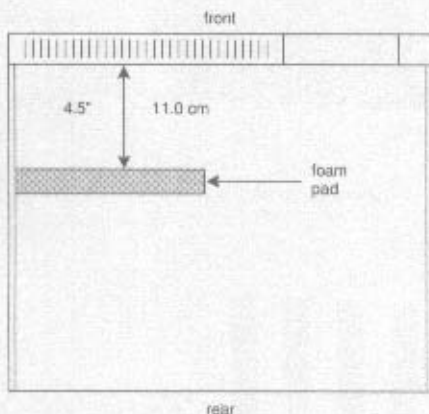
Remove the backing from the foam pad and affix the pad to the correct position on the Amiga's cover.

10. Replace the Amiga's Cover

Replace the Amiga's cover. Reconnect all cables and peripherals to the computer. Turn the power on to the Amiga 2000.

A2091-40 users can affix the **Amiga 2000HD** label to the front of your Amiga. Peel off the **Amiga 2000** label. Remove the adhesive backing from the **Amiga 2000HD** label and affix it to the cover.

The hard disk supplied with the A2091-40 is already formatted, and has Workbench and Extras installed on it. If you have Kickstart 1.3 installed in your Amiga, and the autoboot ROMs are enabled, you can boot directly from the hard disk.

If you are running Kickstart 1.2 you will need to create a boot floppy disk as described on page 3-18, **Kickstart 1.2 Users.**

If you have installed an A2091-40 you will need to verify the contents of the hard disk by following the procedure on page 3-18, **Verifying the A2091-40**.

If you are installing any other hard disk, refer to **Preparing a New Hard Disk** on page 3-20.

If you wish to install your language specific Workbench, follow the procedure on page 3-19, **Installing Your Language Specific Workbench**.

3.2 Software Installation Procedure

3.2.1 Kickstart 1.3 Users

If you have Kickstart 1.3 installed in your machine, and have enabled the ROMs on the A2091, you can boot your system directly from the hard disk. When you start your system, the hard disk will automatically boot. If you wish you may still boot from the floppy drive, rather than from the hard disk, by placing a bootable disk in the floppy drive at start-up. Verify the contents of the hard disk as described in **Verifying the A2091-40** on the next page.

3.2.2 Kickstart 1.2 Users

If your Amiga is running Kickstart 1.2, you will need to make a boot disk from the A2091 Installation Software disk for use with Kickstart 1.2. This disk will transfer control of most operations to the hard disk. To do this you will want to make a backup copy of the A2091 Installation Software disk, and then run the **MakeBootDisk program** on the copy. Never run **MakeBootDisk** on the original disk.

To make a 1.2 boot disk from the A2091 Installation Software disk:

1. Boot your system with the A2091 Installation Software disk.

2. If you have a second floppy disk drive connected to your system, insert a blank disk in this drive. If you have only one drive, remove the A2091 Installation Software disk and replace it with a blank disk. The blank disk will appear as a blank icon labeled **BAD**.

3. Position the mouse pointer over the A2091 Installation Software disk icon, hold down the left mouse button, drag the icon over the blank disk, and release the mouse button. Follow the requester instructions to make the copy.

4. Insert the copy of the A2091 Installation Software disk in df0:. Reboot the system. Double-click on the A2091 Installation Software disk icon. Double-click on the **MakeBootDisk** icon. Follow the directions displayed on the screen. You can now use this disk to boot your system. Verify the contents of the hard disk as described in **Verifying the A2091-40** below.

NOTE: *This copy is named **BOOT**, although the icon displayed will still have the old name until you remove the disk and reinsert it.*

3.2.3 Verifying the A2091-40

If you have installed an A2091-40, and are running Kickstart 1.3, you can boot your system directly from the hard disk. Before using the A2091-40 for the first time you should run **Verify Data on Drive** from **HDToolbox** on the A2091 Installation Software disk, as described below. This will check to see if any information on the disk has been lost during shipment.

NOTE: *Keep the original disk write-protected by leaving the write-protect tab in the open position. Make a copy of the A2091 Installation Software disk and put the original in a safe place. Always use the copy instead of the original.*

1. Boot your system with the **A2091 Installation Software** disk in the floppy drive.

2. Double-click on the **A2091 Installation Software** icon.

3. Double-click on the **HDToolbox** icon.

4. When the **Hard Drive Preparation, Partitioning and Formatting** screen appears, click on **Verify Data on Drive**. When prompted by the requestor, click on **Continue**. If the verification finds no errors, you can click on **Exit** and continue normally. If any new errors are found you should **Exit** and then run **PrepHD** and **FormatHD** as described under **Using the Installation Software** on page 5-2.

3.2.4 Installing Your Language Specific Workbench

If you wish, you can install your language specific Workbench by running **InstallHD** and inserting Workbench and Extras at the request. This will automatically change the keymap.

If your system failed to boot from the hard disk, and the A2091-40 is connected properly, run the following Quick Installation Procedure:

3.2.5 Quick Installation

If your system cannot find the hard disk supplied with the A2091-40, and you have connected it correctly, the disk may have lost some data during shipment. You may need to prepare it following the steps below. Note that this procedure will only work with a Quantum ProDrive 40S SCSI hard disk. Do not run **PrepHD** or **FormatHD** on any other type of hard disk. Please refer to the section **Running the Installation Software** for more information.

1. Boot your system with the **A2091 Installation Software** disk. Do not boot from the hard disk.

2. Double-click on the **A2091 Installation Software** icon.

3. Double-click on the **PrepHD** icon, and follow the instructions on the screen.

4. When **PrepHD** has finished, reboot the system.

5. Double-click on **FormatHD** and follow the instructions on the screen.

6. Insert Workbench and Extras when requested by the system.

7. Your hard disk is ready for use.

3.2.6 Preparing a New Hard Disk

After installing a hard disk other than the one included with the A2091-40, you will
need to prepare it following the steps below. Please refer to the section **Using the
Installation Software** if you need more information. Please note that if your hard
disk is less than 40 MB, it will default to one bootable partition. If your hard disk is
40 MB or larger, it will default to two partitions, with the first partition being bootable.

1. Boot your system with the **A2091 Installation Software** disk. Do not boot from
    the hard disk.

2. Double-click on the **A2091 Installation Software** icon.

3. Double-click on the **HDToolbox** icon.

4. Click on **Change Drive Type** on the Hard Drive Preparation, Partitioning and
    Formatting screen.

5. Click on **SCSI,** and then click on the correct drive type if listed on the screen.
    If the appropriate drive type is not listed, click on **Define new drive type**.

    You can type in the drive's specifications or you can have the system try to
    read the drive's specifications by clicking on **Read Configuration from Drive**.
    When the correct specifications are selected, click on **OK**.

6. Click on **OK** and return to the Hard Drive Preparation, Partitioning and Formatting
    screen.

7. Click on **Low-level Format Drive**. At the requester click on **Low-level Format**.

8. Click on **Verify Data on Drive**. This will check the hard disk for bad blocks.
    Note that some hard disks, such as some Seagates, do not support this feature
    and may cause your system to lock up. If you select **Verify Data on Drive,** and
    ten minutes pass without the screen message changing, your hard disk does
    not support this feature. If this occurs, reboot your system and prepare your
    hard disk, omitting this step.

9. Click on **OK**.

10. Click on **Save Changes to Drive**.

11. Reboot your system.

12. A new icon will appear for each partition on the hard disk. The icon name will appear in the form: devicename:xxxx. The devicename ends in a number that may include a decimal point. Perform the following procedure on the icon with the lowest number in the name:

    a. Click on that icon and select **Initialize** from the Workbench menu.

    b. When the Initialize is complete, select **Rename** from the Workbench menu and change the name of the partition.

    c. Copy **Workbench** and **Extras** to the partition by clicking on **InstallHD**, then hold down the ⎡**SHIFT**⎤ key and double-click on the partition's icon.

13. Perform steps 12a and 12b on the other new partition icons.

14. Your hard disk is now ready for use.

3.2.7 Transferring a Hard Disk From an A2090

In order to transfer a SCSI hard disk from an A2090 to an A2091, after making a backup of the contents and physically installing the hard disk, follow the steps below:

1. Reboot your system with the **A2091 Installation Software** disk.

2. Double-click on the **A2091 Installation Software** disk icon.

3. Double click on the **HDToolbox** icon.

4. Click on **Partition Drive**.

5. Click on **Advanced Options**.

6. Set each partition's starting and ending cylinders so that they match the information recorded in your mountlist.

7. Set each partition name to match the partition names from the A2090.

8. Click on **OK**.

9. Click on **Save Changes to Drive**.

10. Click on **Exit**.

11. Reboot your system. Your hard disk is now ready for use.

3.3 Connecting Additional SCSI Devices

You can connect up to seven SCSI devices to the A2091, using the internal connector and the external connector at the back of the A2091. To connect the first external SCSI device, gently insert the device's connector into the A2091's external connector and secure the screws. The SCSI device will need to have its own power supply. Additional SCSI devices can be connected in a daisy-chain. (The first peripheral device connects to the A2091, the second device connects to the first device, and so on.)

When connecting internal SCSI devices you will need to use a 50-pin ribbon cable with as many connectors as SCSI devices to be connected internally, in addition to the connector for the board. Each internal SCSI device must be connected to the internal power supply. Do not connect more than one device to the A2091 power connector.

Each SCSI device must be jumpered to a different SCSI address. Please note that the A2091 is set to SCSI address 7.

If multiple SCSI hard disks are connected to the A2091, you will need to remove the terminator packs on all but the last external SCSI device in the chain, and all but the last internal SCSI device in the chain. Refer to the manufacturer's documentation for the location of the terminator packs on each device.
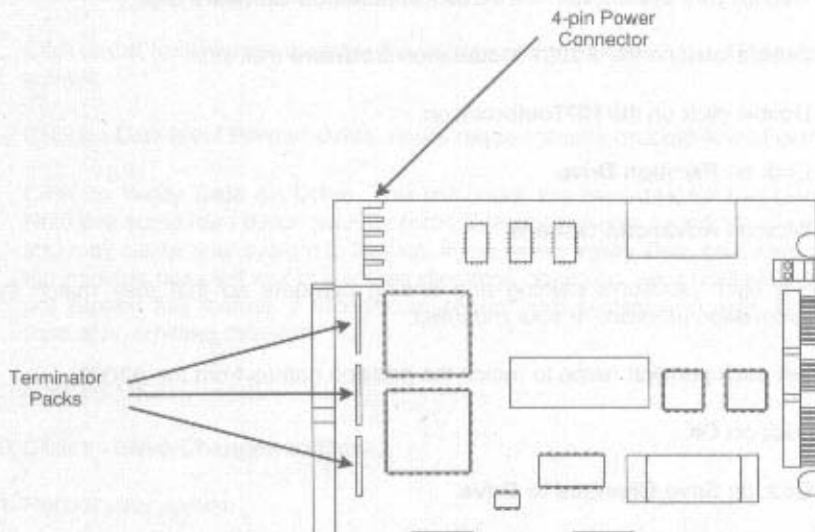
Bottom View of Quantum ProDrive 40S

After connecting an additional hard disk you will need to modify the tool type of the **Park** program as described on page 5-6.

For information on jumper settings for SCSI drives refer to **Appendix C**.

3.4   Installing Random Access Memory (RAM) Chips

You can install RAM chips in the A2091 to increase the memory available to your Amiga 2000. You can install 512KB, 1MB or 2MB of additional memory.

NOTE: *Use only CMOS 256k x 4 DRAMs, with an access speed of 120 ns or faster. Slower DRAMs will not work properly. Do not use NMOS DRAMs. The use of NMOS DRAMs will damage the A2091 and void your warranty.*

RAM chips are sensitive to static electricity. Contact with a chip when high levels of static electricity are present could ruin a chip. Touching a nearby grounded metal surface before touching the chip can help reduce static levels. Installation of RAM chips should be performed by an authorized Commodore Service Center, or by your Commodore dealer. Commodore will not be responsible or liable for any damages caused by improper installation of RAM chips.

WARNING: If your A2091 is connected to the computer, you must first turn off the power, disconnect all cables and peripherals, and detach the A2091 from the computer.

The following steps, required to install RAM chips, are explained in detail below.

1. Disconnect the A2091 from the Amiga.

2. Insert the RAM chips.

3. Set the RAM size jumper.

1. Disconnect the A2091 from the Amiga

With power off and all cables disconnected, remove the screw holding the A2091 in the slot. Remove the A2091 by pulling the card straight up.

If the hard disk is installed in a drive bay, disconnect the ribbon cable from the card.

2. Insert the RAM chips

NOTE: *Be careful to properly align the chips before inserting them. Do not force them or bend the pins.*

Place the A2091 on a flat surface. Turn the A2091 so that it matches the illustration on page 3-25. It is important that the chips be inserted properly. Each chip has a notch or dot on one end to show the location of pin 1. When the end with the notch or dot is held to the left, pin 1 will be in the lower left corner. The chip should then be inserted so that the notched end is towards the left of the board, as shown below. The location for pin 1 is circled in the illustration below. Align the chip with the socket and insert it with slight pressure. If you are installing 512 kilobytes of memory (4 chips), insert them in the four sockets labeled **512K**. If you are installing 1 megabyte of memory (8 chips), insert them in the eight sockets labeled **512K** and **1 MEG**. If you are installing 2 megabytes of memory (16 chips), insert them in all 16 sockets.

3. Set the jumper

You must set a jumper on the board to match the amount of RAM installed. As shipped, the jumper is set to **0/K**, or no RAM installed. Lift the jumper straight off and replace it on the set of pins labeled the same as the amount of RAM installed.

Reconnect the A2091 following the previously described installation procedure.

After the A2091 is reinstalled, run the **RAM Test**, included on the **A2091 Installation Software disk**, as described on page 5-7.

If your system fails to boot once the RAM chips are installed, there is most likely a problem in the first 512K of memory. Make sure that all the RAM chips are installed in the right direction and that all the pins are straight. Check to see if any pins are curled under or not fully inserted. If you find a bent pin, remove the chip, carefully straighten the pin, and then reinsert the chip. Run the **RAM Test** again to see if the problem has been corrected. If you cannot resolve a failure, contact an authorized Commodore service center.

External SCSI
Connector

A2091

SCSI LED
Connector

4-pin Power
Connector

Internal SCSI Connector 50-pin

Jumper 5
Options

Jumper 1
Memory

Jumper 2
Autoboot Enable

512 k	512 k	512 k	512 k
1 MEG	1 MEG	1 MEG	1 MEG
2 MEG	2 MEG	2 MEG	2 MEG
2 MEG	2 MEG	2 MEG	2 MEG
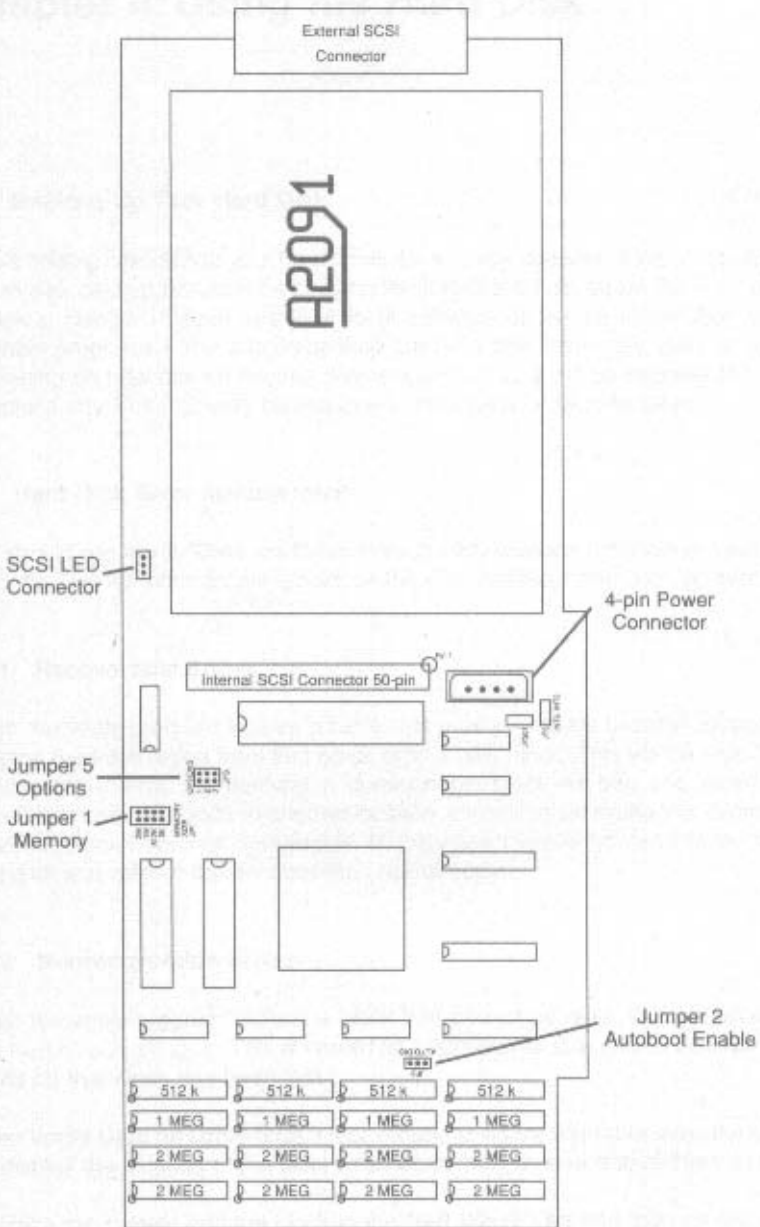
A2091 Card

Chapter 4: Using the Hard Disk

4.1 Backing Up Your Hard Disk

Before adding new data to your hard drive, it is strongly suggested that you purchase
a hard disk backup program for copying the information stored on the hard disk to
a backup device. (Please see your local software dealer for information on the
available programs.) You should backup the hard disk frequently, daily or weekly
depending on how often it is used. Without a backup, it will be impossible for you
to replace any files that may be lost due to user error or system failure.

4.2 Hard Disk Error Management

You should run **Verify Data on Drive** from the **HDToolbox** program at least once
a month. This will often locate blocks on the disk that may later develop problems.

4.2.1 Recoverable Errors

When the verify program locates a block that may eventually become unreadable,
it copies the information from that block onto a new block. This will be reported as
a recoverable error. By marking a questionable block as bad and moving the
information from that block to another location, you will avoid losing that information
when the block becomes unreadable. In this case there is no need to format the
hard disk and restore the file from the backup copy.

4.2.2 Nonrecoverable Errors

When the verify program locates a block that cannot be read, the system reports
it as `Bad block found`. This is known as a nonrecoverable error. The information
stored on that block has been lost.

When **Verify Data on Drive** finds a recoverable or nonrecoverable error, the system
will display the location of the block. You must then choose one of three options:

1. Have the system add the block to the **Bad Block List** and then continue.

2. Ignore the block and continue verifying the data on the disk.

3. Stop the verification.

You should add the block to the **Bad Block List**. After the verify is finished click on **Save Changes to Drive** and then **Exit**. You will then reboot the system.

If the system reported a single nonrecoverable error, you should follow the procedure explained below. If the system reports more than one nonrecoverable error you should format the affected partition using **Initialize** from the Workbench menu, and restore your files from your backup disks.

The lost block will be one of three types:

- a directory block
- a file data block
- an unused block

To determine if the block was a directory block:

1. Open the CLI/Shell.

2. Type: `Dir` partitionname: `all`

3. If a requester appears stating that there is a read/write error, or if any file names appear corrupted, the damaged block was a directory block.

If the damaged block was a directory block you must format the hard disk and restore your files from your backup.

If the damaged block was not a directory block but was in a file, you can restore that file from your backup by copying that file to the hard disk. If you cannot determine which file the damaged block was in, you may wish to continue to use your system normally. If you later find a file that does not function normally, restore that file from your backup.

WARNING: *To protect your hard disk, always park the drive heads before turning your system off. To park the drive heads, locate the **Park** icon on the A2091 Installation Software disk, and double click on it.*

4.3 Copying Programs to Your Hard Disk

In addition to working with the utilities on Workbench and Extras, you will want to transfer other software programs to your hard disk. Note that many commercial software packages have instructions for installing the software on the hard disk.

This section demonstrates how to copy a generic software program to your hard drive. Since this procedure involves the CLI/SHELL and some basic AmigaDOS commands, you should refer to Chapter 7 of the Introduction manual if you are not familiar with using the CLI.

1. The hard disk is large enough to store dozens of floppy disks worth of information. To do this efficiently you should organize the partition into drawers. The easiest way to create a new drawer, and at the same time a new directory, is to make a copy of the **Empty** drawer by using **Duplicate** from the Workbench menu.

   Open the hard disk's window by double-clicking on its icon. Click once on the **Empty** drawer, then select **Duplicate** from the Workbench menu. A new drawer called **Copy of Empty** will appear in the window.

2. Rename **Copy of Empty** using the Workbench menu's **Rename** item. For this example, we are going to call the drawer **Drawer.** Select the drawer, choose **Rename** from the menu, and a string gadget appears. Delete the old name with the **Del** key, and type in the new name.

   You can name it anything you'd like, but you should use a name that reminds you of the contents. Also, if there are spaces in the name (i.e., if it is more than one word), you must put quotation marks around the entire name when using it in CLI/Shell commands.

3. Now that you have a new directory, you can copy your software disks to the hard drive. To do this you must open the CLI or Shell. We'll assume that the software is on a disk called **DISK1** and that you are inserting it into the Amiga's internal floppy drive, DFØ:.

   Here are some general guidelines for copying programs to a hard disk partition, called DHØ: in this example:

   A. Copy any files and directories that are on **DISK1** but are not already in DHØ: to your new directory. Usually your software will contain many of the files that are already on DHØ:, such as the **Trashcan**, the **System** directory, etc. Do not copy these files into your new directory.

To look at the files on **DISK1** and on DHØ:, use the AmigaDOS **DIR** command. Simply type, **DIR DISK1:** and **DIR DHØ:**, and compare the files and directories that appear in the output window. (You can also refer to Appendices B and C of the Enhancer manual for a list of the files on Workbench and Extras.) Any files that are on **DISK1** but are not in the DHØ: should be copied to the new directory.

B. Examine the following directories of **DISK1** to see if there are any files or subdirectories included on the disk that do not appear in DHØ:. (Again, use the **DIR** command to do this.) If you find any, copy them into the corresponding directories of DHØ:. The directories to examine include:

Floppy disk	Hard disk
DISK1:FONTS	FONTS:
DISK1:L	L:
DISK1:LIBS	LIBS:
DISK1:S	S:
DISK1:DEVS	DEVS:
DISK1:DEVS/KEYMAPS	DEVS:KEYMAPS
DISK1:DEVS/PRINTERS	DEVS:PRINTERS
DISK1:C	C:
DISK1:SYSTEM	SYSTEM:
DISK1:UTILITIES	UTILITIES:
DISK1:EXPANSION	EXPANSION:

Most programs will not have any non-standard files in these directories. The directory most likely to contain non-standard files is FONTS:. If you have difficulties running a program you may wish to examine FONTS: and the other directories for special files.

C. To copy a file or directory, you must use the AmigaDOS **COPY** command. For instance, to copy a file from **DISK1** to the **Drawer** directory of DHØ:, you would type:

```
COPY DISK1:filename DHØ:Drawer
```

To copy all the files from a directory on **DISK1** to an equivalent directory within the **Drawer** directory, you would type:

```
COPY DISK1:directory DHØ:Drawer ALL
```

The **ALL** keyword tells the system to copy all the files and subdirectories in the directory. Please refer to the Enhancer manual for more information on using the **COPY** command. Before copying any software to your hard drive, check the documentation packaged with the program. It may include instructions for installing and using the software on a hard drive.

4. You may have to set up some special **ASSIGN** statements in order for your software to work correctly from the hard drive. The **ASSIGN** command allows you to assign a logical device name to a directory. In this case the device is **DISK1**, and the directory is **DHØ:Drawer**. Be sure to remove **DISK1** from the floppy drive before attempting to run the software from the hard drive.

   For example, suppose you copy a program into the directory **DHØ:Drawer**, and when you attempt to run the software a requester appears saying:

   ```
   Please insert Volume DISK1 into any drive
   ```

   This indicates that the software is looking for files on the original disk (volume) on which it was distributed. By assigning the volume name to your new directory, the software will be routed to the correct location. To do this, open a CLI/Shell window, and type:

   ```
   ASSIGN DISK1: DHØ:Drawer
   ```

   If the requester is still on the screen, click on **RETRY**. If the requester does not reappear, the **ASSIGN** worked. You may want to add this command to DHØ:'s StartupII file (DHØ:s/StartupII) so that the assignment is made when you boot the Amiga.

5. Double-click on the new drawer. All the icons that normally appear on the software disk will now appear in the drawer. However, if you copied more than one disk to the drawer, it may be quite cluttered. To straighten up the display, select **Clean Up** from the Workbench menu.

6. After **Clean Up** organizes the drawers, save the display. To do this, use multiple selection to mark the position of each icon, then select **Snapshot** to save the positions. Hold down the ⟦Shift⟧ key and click once on each of the icons. Release the ⟦Shift⟧ key and select **Snapshot** from the Workbench menu.

Chapter 5: The A2091 Installation Software Disk

This section will explain all the features of the **A2091 Installation Software** disk.

NOTE: *Keep the original disk write-protected by leaving the write-protect tab in the open position. Make a copy of the disk and put the original in a safe place. Always use the copy instead of the original.*

5.1   Using the A2091 Installation Software Disk

The **A2091 Installation Software** disk includes all the software required to install and manage your hard disk.

The disk contains:

- The **A2091HD driver** (in the Expansion Drawer)
- The current **Fast Filing System** (FFS) which supercedes the FFS from Workbench 1.3, version 34.20.
- **PrepHD**
- **FormatHD**
- **InstallHD**
- **Park**
- **Drive Definitions file for HDToolbox**
- **RAM Test**
- **MakeBootDisk**
- The **HDToolbox** hard disk preparation program

5.2   Using the Installation Software

WARNING: PrepHD, FormatHD, and InstallHD can only replace the files from the standard Workbench and Extras disks. It cannot recover programs and data that were later stored on the hard drive. For this reason it is EXTREMELY IMPORTANT to perform regular backups of the hard drive's contents.

To use the A2091 Installation Software disk, boot the Amiga with the A2091 Installation Software disk in the internal floppy drive (DFØ:). Do not boot from the hard disk. When the system boots, you will see a **A2091 Installation Software** icon on the screen. Double-click on the icon, and the following window appears:

The programs included on the **A2091 Installation Software** disk are listed below.

PrepHD

Under severe conditions, your hard drive may be so damaged that a complete reconstruction is necessary. **PrepHD** sets up the disk information required to manage the disk as a whole prior to a complete reformatting. This program should be run only as a final resort as it will destroy all information stored on the hard disk. This program only works with Quantum ProDrive 40S hard disks.

WARNING: *This program will not work if there are other hard disks in your system. If there are other hard disks in your system, follow the procedure explained under Preparing a New Hard Disk on page 3-20.*

FormatHD

This procedure reformats the hard disk and should be used only when a complete reconstruction is required. **FormatHD** is used after **PrepHD**. It does a high-level format of the default partitions. Again, this program should only be used as a last resort, as it will destroy all information stored on the hard disk. This program only works with Quantum ProDrive 40S hard disks.

InstallHD

This program installs Workbench and Extras on the selected partition.

Park

This program parks the drive heads on the hard disk. To prevent possible damage to the hard disk you should always park the drive heads before turning off your system.

RAM Test

This program tests any RAM chips installed on the A2091 card, to determine if any are damaged or improperly installed.

MakeBootDisk This program creates a boot disk for users with Kickstart 1.2.

HDToolbox

This initiates the program which allows you to add additional drives to your system, and to modify each hard disk. Please see the section describing **HDToolbox** on page 5-9 for more information.

NOTE: *This program is designed for use with both the A2091-40/A2091 and the A590. The references to XT type hard disks are for use with the A590 only.*

Please keep in mind that you should only use **PrepHD, FormatHD,** or **InstallHD**, as a last resort. If only a few files or directories on your disk have been corrupted, you should restore the corrupted files from your regular backups. You should always try to recover your disk by using the least severe procedures first.

If you decide to proceed, please follow the instructions below.

PrepHD
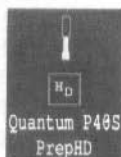
To prep the entire hard disk, double-click on the **PrepHD** icon, and a new window will appear. The system will prompt:

```
This will low-level format your Quantum 40S hard disk
(SCSI unit 6).
The drive will be re-partitioned to the standard
configuration.
This operation can take up to half an hour.
Any information on the hard disk will be lost!
Are you sure you want to continue?
```

Type a **Y** for yes or an **N** for no, and then press ⎡**Return ⏎**⎤. If you type Y, the Amiga automatically begins the **PrepHD** process. Note that the hard disk LED on the Amiga's front panel will not be lit during **PrepHD**. When **PrepHD** is complete, the system will display the message:

```
Hard disk prep completed.
Reboot the machine and run the FormatHD utility.
```

Reboot the machine. Be sure to leave the A2091 Installation Software disk in the disk drive when you reboot. When the Workbench screen reappears, open the A2091 Installation Software window and proceed with the formatting process as described below.

FormatHD

To reformat the entire hard disk, double-click on the **FormatHD** icon, and a new window appears. The system will prompt:

```
Hard Disk Format
WARNING: This will reformat your hard disk drive DH0.
All information on this hard disk will be lost!
Are you sure you want to continue?
```

Again, type either a **Y** for yes or an **N** for no and press ⎡**Return ⏎**⎤. The system must format the partition cylinder by cylinder, so do not be alarmed if it seems to be taking a long time. You will be able to follow the progress on the screen. The system displays which cylinder is being formatted/verified and how many cylinders are left to be formatted.

When formatting is complete, the following message appears:

```
Hard disk format complete.
Would you like the system software to be installed on
your hard  disk?
```

The FormatHD program automatically executes **InstallHD** (described below). You do not need to double-click on the **InstallHD** icon.
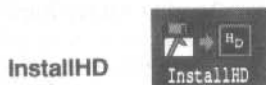
InstallHD

To reinstall the Workbench and Extras files on the hard disk, click on the **InstallHD** icon, press ⎡Shift⎤ and double-click on the partition's icon. This program copies the files from the Workbench and Extras disks onto the hard disk. You will have to insert the diskettes into the disk drive at the proper time. Be sure to keep unaltered copies of the Workbench disk and the Extras disk for this purpose.

After double-clicking on the **InstallHD** icon, you will be prompted:

```
This will reinstall the system software on hard disk drive
(name).
Files on the hard disk will be overwritten.
Are you sure you want to continue?
```

Type **Y** for yes or **N** for no and press ⎡Return ⏎⎤. If you type Y, watch the screen for requesters that ask you to insert a disk into the floppy drive so that the appropriate files can be copied to the hard drive. Be sure to use Workbench 1.3 and Extras 1.3.

The first requester that appears asks you to insert your Workbench 1.3 disk into any drive. When the disk is inserted, the program will continue. After several minutes, you will be prompted to insert your Extras 1.3 disk into any drive.

When the system has been properly configured, you will see:

```
Software installation is now complete.
```

Remove all floppy disks from the Amiga and reboot the machine. When the Workbench screen appears, the **Workbench** and **RAM DISK** icons should appear.

Park

Double-click on this icon to park the drive heads on the partition named DHØ:. In order to protect the hard disk, you should park the drive heads before turning your system off.

If you have additional drives connected to the A2091 you will need to modify **Park** in order to park the additional drives.

The partition on the **Park** command defaults to DHØ:. For each additional partition you will need to add that partition to the list of partitions to be parked. You can do this through Workbench or through the CLI or Shell.

From Workbench:
You must add a tool type by clicking once on the **Park** icon and then selecting Info from the Workbench menu. Click on **ADD** and then type:

```
PARTITION=partitionname1:|partitionname2:
```

Click on **SAVE.**

Note that **PARTITION** must be upper case, and there should not be a space between partition names.

If you wish to shut down the partition so that it cannot be accessed, add a tool type:

```
INHIBIT
```

Note that **INHIBIT** must be upper case. **INHIBIT** is a global command that prevents a hard disk from being accessed once any of its partitions have been parked. As an example, if you have two hard disks in your system, each with three partitions, and you list one partition from each disk under **Park** with **INHIBIT**, both hard disks will be inaccessible once the **Park** program is run.

From CLI or Shell type:

```
park partition1: partition2:
```

If you wish **Park** to shut the partitions down so that they cannot be accessed, type:

```
park partition1: partition2: INHIBIT
```

Park defaults to DHØ: unless otherwise specified.

RAM Test   `RAMTest`

This program tests any RAM chips installed on the A2091 card to make sure that the chips are installed properly and are functioning correctly. Your A2091 was tested with two megabytes of RAM at the factory before it was shipped.

Double-click on the **RAM Test** icon. The system will display the memory expansion sockets of the A2091, fully populated with two megabytes of RAM chips. The system will also display the Status window and the Result window.

The **Status** window displays the section of RAM being tested.

The **Result** window diplays the A2091 card being tested and the size of available memory on the card. This window will display any failure messages.

RAM Chip Map

Bank 3	U26	U27	U28	U29	2 MEG
Bank 2	U22	U23	U24	U25	2 MEG
Bank 1	U18	U19	U20	U21	1 MEG
Bank 0	U14	U15	U16	U17	512 K

Chip Pin Numbers

10 9 8 7 6 5 4 3 2 1

11 12 13 14 15 16 17 18 19 20
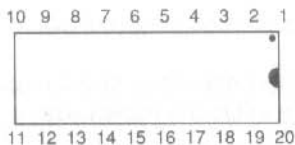
The **RAM Test** program runs three tests on the RAM chips:

1. Data test

A data test failure will display one of three error messages:

● bad bit—The bits will be listed, and the affected chip will be listed and marked with an **X** on the display.

   Replace the chip with a new one.

- problem found on pin—The chip will be listed, and an arrow will appear on the display, marking each affected pin.

  Turn off the power to the Amiga. Check the marked pins to see if any are curled under or not completely installed. If you find a bent pin, remove the chip, carefully straighten the pin and replace the chip.

- total failure on chip—The chip will be listed and marked with an **X** on the display.

  Turn off the power to the Amiga. Make sure that the chip is not inserted backwards. Check pins 3, 4, 10, 16, 17, and 20 to see if they are bent or not fully inserted. If this does not resolve the problem, replace the chip.

2. Unique address test

   A unique address test failure will display one of two errors:

- bad address pin—The chip will be listed, and an arrow will appear on the display, marking each affected pin.

  Turn off the power to the Amiga. Check the marked pins to see if any are curled under or not completely installed. If you find a bent pin, remove the chip, carefully straighten the pin and replace the chip.

- RAM fails—The system will list the failing bank of RAM chips.

  Contact an authorized Commodore Service center.

3. Interbank addressing test

   If an interbank failure occurs, contact an authorized Commodore service center.

If the test reports that no A2091 memory is found, make sure that the memory size jumper on the A2091 card is set to the correct size.

Run the **RAM Test** again to see if the problem has been corrected. If you cannot resolve a problem, contact an authorized Commodore service center.

MakeBootDisk

For a full description of **MakeBootDisk** please refer to Kickstart 1.2 Users on page 3-18.

HDToolbox

Double-click on this icon to run the **HDToolbox** program. Note that the **HDToolbox** program is used with both the A590 and the A2091-40/A2091. The references to XT type hard disks apply to the A590 only. A2091-40/A2091 owners should ignore all references to XT.

5.3 Using the HDToolbox Program

There are seven screens which you can use to modify the drives in the system.

- **Hard Drive Preparation, Partitioning and Formatting**
- **Change Drive Type**
- **Define/Edit Drive Type**
- **Bad Blocks**
- **Partitioning**
- **File System Characteristics**
- **File System Maintenance**

To use the **HDToolbox** software:

1. Boot your system.

2. Insert the **A2091 Installation Software** disk in DFØ:.

3. Double-click on the **A2091 Installation Software** disk icon.

4. Double-click on the **HDToolbox** icon.

There is a menu in the upper left corner of each screen that allows you to shrink any screen from the **HDToolbox** in order to use your Workbench. Move the pointer to the upper left corner of the screen, and hold down the right mouse button. Dragging the pointer to the first option reduces the screen, while dragging the pointer to the second option restores the screen to full size.

5.3.1 Hard Drive Preparation, Partitioning and Formatting

Hard Drive Preparation, Partitioning and Formatting - Version 1.1

```
                        Hard Drives in System
   Interface Address  LUN     Status      Drive Type
   SCSI        0      0      Changed     QUANTUM  P485 948-48-94XX 6.3


         Change Drive Type                    Partition Drive

       Modify Bad Block List       Help      Verify Data on Drive

       Low-Level Format Drive                Save Changes to Drive



                            Exit
```
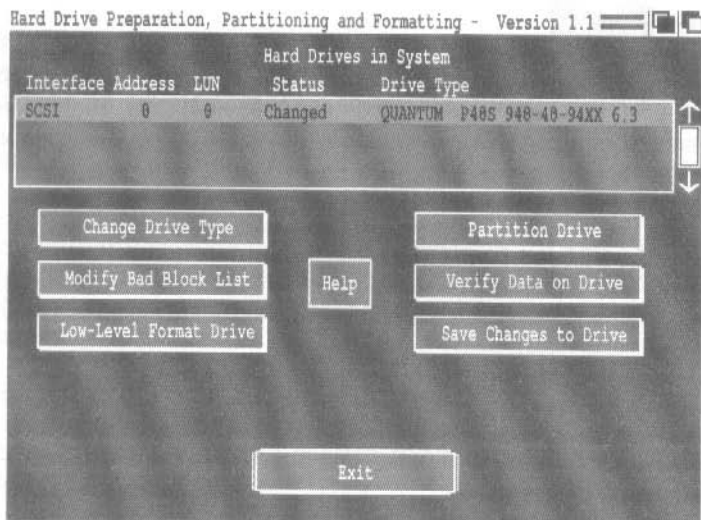
The **Hard Drive Preparation, Partitioning and Formatting** screen is the first screen
you will see when you run the **HDToolbox** software. You can use this screen to
add or change drive types, to keep a list of bad sections on the drive, to partition
the drive (divide the space on the disk into smaller sections), to check the drive for
errors, to low-level format the drive, and to save any changes made to the hard
disk configuration.

Help

Click on this box to receive brief instructions
explaining how to set up a new, blank drive.

Hard Drives in System

The list at the top of the screen is titled: **Hard Drives
in System:.** It lists the hard drives connected to the
system, with the selected drive highlighted. To select
a drive from this list, click on the desired drive in this
window. This window can display up to four drives
at a time. If there are more than four drives connected
to the system you will need to scroll the contents of
this window by clicking on the up and down arrows
at the right side of the window, or by dragging the
bar between the arrows. To drag a scroll bar just
point to the bar, press the left mouse button and hold
it while moving the mouse up or down, and then
release it.

You can use this window to select the drive you wish to partition or modify. To select a drive, just point to the desired drive and click the left mouse button.

`Interface`

Shows the type of drive, either SCSI or XT. A2091-40/A2091 owners will always use SCSI.

Shows the bus location of the drive. SCSI drives can be jumpered to a value between 0 and 7.

NOTE: *The A2091 SCSI controller is set as device 7. Each SCSI device connected to the system must have a different device number. Most hard drives come configured as device 0, so the first SCSI drive can be connected as is. Additional drives will need to be reset to different device numbers. If two or more devices are jumpered to the same identification number, the system will lock up.*

`LUN`

Shows the **Logical Unit Number** of the drive. The **LUN** of a SCSI drive will usually be 0, but you can attach controller cards capable of controlling multiple drives. In this case the **LUN** value can range from 0 to 7. See the controller card's documentation for more information.

NOTE: *Each SCSI device attached to the SCSI port must have a different address. Each device attached to a specific SCSI controller will have a different LUN.*

`Status`

Shows whether or not you have made any changes to a drive that have not been saved by clicking on **Save Changes to Drive**.

`Drive Type`

Shows the drive's manufacturer, name, and revision.

NOTE: *This may not correspond exactly to the name and number listed in the drive's documentation, as it is the name reported by the drive to the A2091.*

If the drive is listed in this window as **Unknown**, it is unformatted, and will have to be installed through the Change Drive Type screen, as explained below.

Change Drive Type

Click on this box to open the **Change Drive Type** screen. You can use this screen to select the drive type you are using. You can also record the specifications of new drive types, or change the specifications of previously recorded drive types.

Modify Bad Block List

Click on this box to open the **Bad Blocks** screen. You can use this screen to keep a list of areas on the hard disk that have developed errors. For complete instructions please see the explanation of the **Bad Blocks** screen.

Click on this box to perform a low-level format of the selected drive. This procedure will erase all information on the drive.

Low-Level Format Drive

When preparing a new drive for the first time you will select **Low-level Format**. A low-level format will erase all the information on the disk. A low-level format will take up to ten minutes. Note that with most SCSI hard disks, the hard disk LED on the front of the Amiga will not be on during a low-level format.

Partition Drive

Clicking on the box labeled **Partition Drive** opens the Partitioning screen. This screen allows you to divide the space on the hard disk into smaller sections with individual device names, to set partitions as bootable with individual boot priorities, and to change each partition's file system. For complete instructions please see the explanation of the **Partitioning** screen.

Verify Data on Drive

Clicking on the box labeled **Verify Data on Drive** performs a scan of the selected drive in order to locate any bad sectors. This procedure will mark as unusable any such blocks found, and will add these blocks to the **Bad Block List**. Refer to page 4-1 for hard disk error management.

Save Changes to Drive

Note that some hard disks, such as some Seagates, do not support this feature, and may cause your system to lock up. If you select **Verify Data on Drive**, and ten minutes pass without the screen message changing, your hard disk does not support this feature. If this occurs, reboot your system and omit this procedure.

Save Changes to Drive

Clicking on the box labeled **Save Changes to Drive** will save all changes made to the hard disk configuration. These changes will overwrite the previous configuration. When you click on **Save Changes to Drive,** you will receive a warning. If you wish to save your changes, click on **Continue**. If you wish to discard your changes, click on **Cancel**. **Warning: After saving a change or writing to the disk, wait at least ten seconds before turning off the power to the computer, or rebooting.**

Exit

Clicking on the box labeled **Exit** will return you to the Workbench screen. If you have not saved changes made to the software configuration you will receive the following warning:

```
Some disks have changes that have not
been saved. Do you really want to exit
the program?
```

If you wish to exit without saving the changes, click on **Continue**. If you wish to save your changes, click on **Cancel**, and then click on **Save Changes to Disk**. After saving your changes you can click on **Exit**. You will receive a prompt if you need to reboot the system.

NOTE: *If you have restructured the partitions on the hard disk, you will need to format all affected partitions. You can format each partition using the AmigaDOS* **Format** *command, or use the* **Initialize** *command from the Workbench screen, just as if it were a floppy disk. Each partition is treated as a separate storage device, using the same procedure used to format a blank disk. For further information please refer to the Workbench documentation.*

To format the partition from the CLI or the Shell type:

```
format drive (device name): name (volume name) quick
```

The (device name) is the name you entered under **Partition Device Name** on the **Partitioning** screen, and (volume name) is the name you wish to give to the partition. Further information on the **format** command is available in the **Enhancer 1.3** manual.

5.3.2 Change Drive Type

```
Set Drive Type ══════════════════════════════════════════════ ▣▢

                      Select a drive type

             Drive Types:  SCSI    XT

            ┌────────────────────────────────────┐ ↑
            │ QUANTUM P40S 940-40-94xx  6.3       │ █
            │ MINSCRIB    M8428 - SCSI  302B      │ █
            │                                     │ █
            │                                     │ █
            │                                     │ █
            │                                     │ █
            └────────────────────────────────────┘ ↓


        ┌─────────┐ ┌─────────┐ ┌──────────┐
        │Define new│ │Edit old │ │Delete old│
        │drive type│ │drive type│ │drive type│        ┌────────┐
        └─────────┘ └─────────┘ └──────────┘        │   Ok   │
                                                     └────────┘
                                                     ┌────────┐
                                                     │ Cancel │
                                                     └────────┘
```
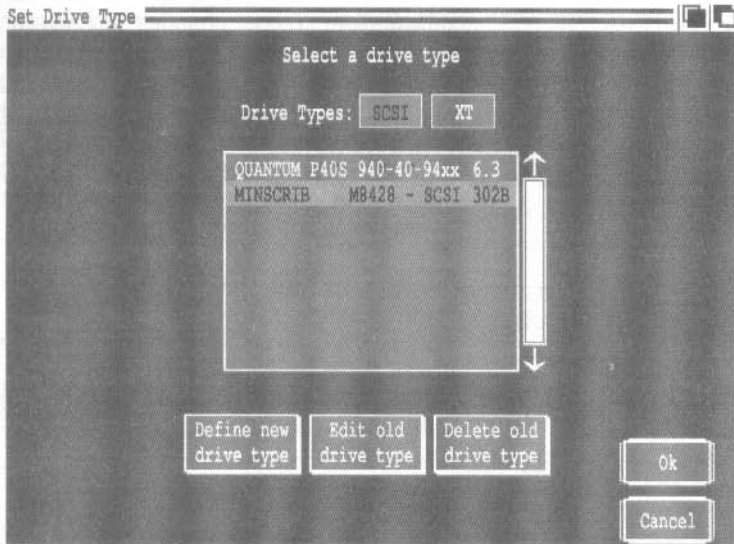
This screen lists the types of drives whose specifications are stored on the disk. You can use this screen to define, edit, or delete types of drives.

NOTE: *When creating a new drive type with the same name as an existing drive type, the computer will use the version with the most recent date. In order to save the correct change, make sure that your system clock shows the current date and time.*

Select a Drive Type

The list titled **Select a drive type** lists the names of the hard drives whose specifications are stored on the disk. After clicking on the drive to be identified or modified from the **Hard Drives in System** list, you must click on SCSI to select the list that corresponds to the type of drive being defined. If you are adding a drive which is listed, you need only click on the name of the drive to prepare it for use. If you are changing drive types from one to another, you will receive the following warning after you click on **OK**:

```
Are you sure that you want to change
the drive type for the current drive?
(All partition information for the
drive will be lost!)
```

If you wish to change to that drive type, click on **Continue**. If you do not wish to change to that drive type, click on **Cancel**.

If there are more drives types listed than can be displayed in the list at one time, you will need to scroll the list up or down. To scroll the contents you can either click on the arrows at the right of the window, or drag the scroll bar located between the arrows.

Define new drive type

Click on this box if you are adding a drive which is not listed. This will open the **Define/Edit Drive Type** screen, so you can input the drive's specifications as supplied by the drive's manufacturer. For complete instructions please see the explanation of the **Define/Edit Drive Type** screen.

Edit old drive type

If you wish to change the specifications of a drive that is already listed, click on that drive type, and then click on Edit old drive type. This will open the **Define/Edit Drive Type** screen, so you can change the listed specifications. For complete instructions please see the explanation of the **Define/Edit Drive Type** screen.

Delete old drive type

If you wish to delete a drive from the **Drive Types** list, click on the drive type to be deleted, and then click on **Delete old drive type**.

Ok

Click on this box to save the changes to this screen and to return to the **Hard Drive Preparation, Partitioning and Formatting** screen.

Cancel

Click on this box to return to the **Hard Drive Preparation, Partitioning and Formatting** screen without saving your changes.

5.3.3 Define/Edit Drive Type

Define/Edit Drive Type

```
                    Define a New Drive Type
              Filename:  drive definitions
     Manufacturers name:                          Read Configuration
            Drive Name:                               From Drive
        Drive Revision:

    Cylinders:    620
        Heads:      4    Size: 21046K (20 Meg)
 Blocks per Track:  17
Blocks per Cylinder: 68    Supports reselection?         Yes

Reduced Write Current      Park Head where (cylinder):   621
        Cylinder:   620
  Write Precomp
        Cylinder:   620                                   Ok

                                                        Cancel
```

This screen allows you to define a new type of hard drive by storing the name and specifications in the drive definitions file. These specifications should be provided with the manufacturer's information. Please read the manufacturer's information before attempting to define a new drive type.

Read Configuration From Drive

You can click on this box to have the computer attempt to read the drive's specifications and input them to this screen.

If you are installing the specifications of a new drive type you will need to click on the appropriate box, delete the existing information, type the correct information, and press **Return ↵**. Always press **Return ↵** after typing in new information.

Filename:

This is the name of the file containing the drive specifications. Since you can save multiple drive types and their specifications in this file, you do not need to change the filename.

Manufacturers name:

Type the name of the drive manufacturer, using up to eight characters.

Drive Name:

Type the name of the drive, using up to sixteen characters.

`Drive Revision:`	Type the number of the drive revision, using up to four characters.
`Cylinders:`	Type the number of drive cylinders.
`Heads:`	Type the number of drive heads.
`Blocks per Track:`	Type the number of blocks (512 bytes per block) on each track. Some manufacturers may list this as sectors.
`Blocks per Cylinder:`	Type the number of blocks in each cylinder. This will normally be the number of heads multiplied by the number of blocks per track.
`Size:`	This displays the amount of memory space on the drive in kilobytes (**K**) and megabytes (**Meg**). After you type information into the **Cylinders, Heads**, and **Blocks per Track** boxes, and press Return , the value listed after **Size** will change. When you are finished, compare the listed size to the drive specification, to insure that it is close to the value given by the drive manufacturer.
`Reduced Write Current Cylinder:`	This is not used with the A2091.
`Write Precomp Cylinder:`	This is not used with the A2091.
`Supports Reselection?`	Refer to the manufacturer's documentation to determine whether or not a SCSI device supports reselection. Click on the box to change it.
`Park head where (cylinder):`	Type in the number of the cylinder recommended by the manufacturer. This function is not needed with drives that automatically park the drive head. Please refer to the manufacturer's documentation. If no value is given by the manufacturer, use the number of the last cylinder.
`Ok`	Click on this box to save the changes to this screen and to return to the **Change Drive Type** screen.
`Cancel`	Click on this box to return to the **Change Drive Type** screen without saving your changes.

5.3.4   Bad Blocks

```
Bad Blocks ═══════════════════════════════════════════════════════════
                              Bad Block Entry
                               (approximate)
        Cylinder   Head   Bytes from Index   Sector
           2        0           0               1                    ↑
                                                              ┌──────────────────┐
                                                              │   Add Bad Block   │
                                                              └──────────────────┘
                                                              ┌──────────────────┐
                                                              │ Delete Bad Block │
                                                              └──────────────────┘



                                                                    ┌──────────┐
                                                                    │    Ok    │
                                                              ↓     └──────────┘
        Bad Blocks mapped out by drive:  0                          ┌──────────┐
                                                                    │  Cancel  │
                                                                    └──────────┘
```
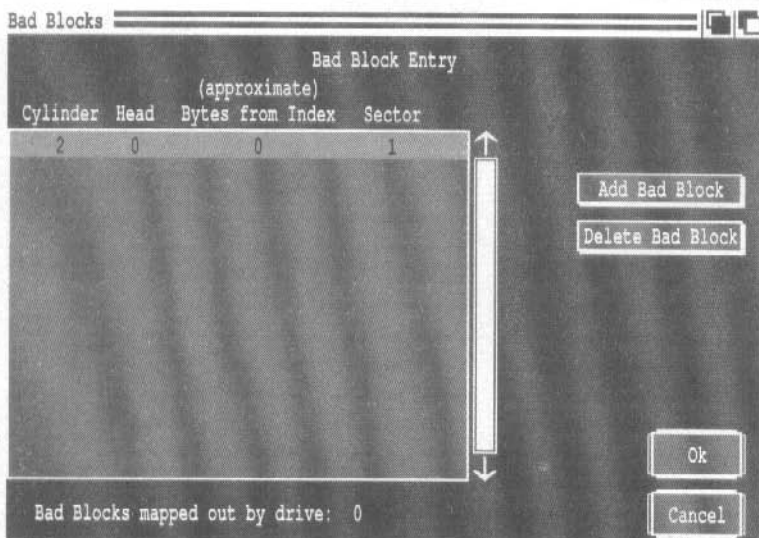
The **Bad Blocks** screen allows you to keep a list of any blocks on the hard disk that might develop read/write errors. The computer will use this list during initialization to avoid using these areas. Most SCSI hard disks handle bad block errors internally. The bad blocks listed on this screen are errors that are not handled by the hard disk. Bad blocks are handled most efficiently when the errors reported by **Verify Data on Drive** are recorded internally by the hard disk. The hard disk will record the location of the bad block, and will not use that block.

The list shows the location of the bad blocks by cylinder, head, bytes from index, and sector. Note that the system will list a range for the approximate number of **Bytes from Index**, and you will only be able to list one error per sector. Once a sector has an error, the entire sector will be marked as bad. If you scroll a selected block off the screen, it will become unselected.

Bad Blocks mapped out by drive:
This displays the number of bad blocks recorded and mapped out by the hard disk. These bad blocks will not be displayed on the **Bad Block Entry** list.

Add Bad Block
To add a new block to the list, click on this box. A smaller screen will open, requesting the location of the bad block. Click on each area and type in the **Cylinder, Head,** and **Bytes from Index** or **Sector** of the block. Click on **OK** to add this block to the list, or **Cancel** to delete it.

| Delete Bad Block | To delete a block from this list, click on the block to be deleted. That block will be highlighted to show that it is selected. Click on **Delete Bad Block**. |

| Ok | Click on **OK** to retain your changes and return to the **Hard Drive Preparation, Partitioning and Formatting** screen. Click on **Save Changes to Drive**. |

| Cancel | Click on **Cancel** to return to the **Hard Drive Preparation, Partitioning and Formatting** screen without retaining your changes. |

5.3.5 Partitioning

```
Partitioning ════════════════════════════════════════════════════════  ■■□
   Cyl                    Partitioning Drive                       Cyl
   0                     SCSI Address 6, LUN 0                      1170

           = Unused         = A partition         = Current partition



                            Size:
                           19 Meg
           Delete Partition  New Partition  Default Setup  Help

   Advanced Options    Partition Device Name    File System: Fast File System
                            QHD0

                  Bootable?  Yes                          Ok

                                                          Cancel
```

The **Partitioning** screen allows you to partition (divide) the hard disk into smaller sections. In addition, by using the **Advanced Options** you can modify drive access time by changing the number of sector cache buffers, change the file systems on the partitions, and set partitions as bootable with separate boot priorities.

The space on the drive is displayed as a horizontal bar with the number of the first and last cylinder listed above. With the default Workbench colors, the current partition is displayed in white, with the size of the partition listed below it. Other partitions are shaded, with dark lines as divisions. Unused areas are displayed in blue.

The partitions can be modified by using the mouse to adjust the partition bar and clicking on the options. When using the **Advanced Options** you can type the desired partition sizes into the cylinder boxes in the lower left of the screen. The **Advanced Options** will only be visible after you click on the box.

Partitioning with the mouse

| Help | To receive a brief explanation of how to partition the hard disk, click on **Help**.

To adjust the size of a partition click and hold the left mouse button on the orange triangle under the right edge of the bar. Slide the triangle to the new position and release the button. The new size will be displayed.

To move a partition, either click on the partition, hold the button down, and drag the partition to the new location, or click on the unused area on either side of the current partition.

If you create more than one partition with the same **Partition Device Name**, the system will generate a unique name for each duplicate partition. For example, if you have two partitions named **DHØ:**, they will be renamed **DHØ:** and **DH0.1:**.

| Delete Partition | To delete a partition, click on the partition to select it, and then click on **Delete Partition**. The leftmost partition will become the selected partition.

| New Partition | To create a new partition, click on **New Partition** and then click on a unused area of the bar.

| Default Setup | Selecting **Default Setup** creates a single partition on 20 MB or smaller drives, and two partitions on larger drives. The first partition will be named **xDHØ:**, and the second partition will be named **xDH1:**, where **x** is the first letter of the name of the drive manufacturer. When a new drive is added to the system, the default name will be **xDHØ:**

If a partition is too small to conveniently click on, you can also move left and right through the partitions by using the left and right cursor keys respectively.

| Partition Device Name | This displays the name of the selected partition. If you wish to change the name of the partition, click in the box, delete the existing name, type the new name, press | Return ⏎ |.

`File System:`   This displays the file system of the selected partition.

`Bootable?`   This displays whether or not the selected partition can be used to boot the system. The **Bootable?** selector defaults to **Yes** for the first partition and **No** for all other partitions.
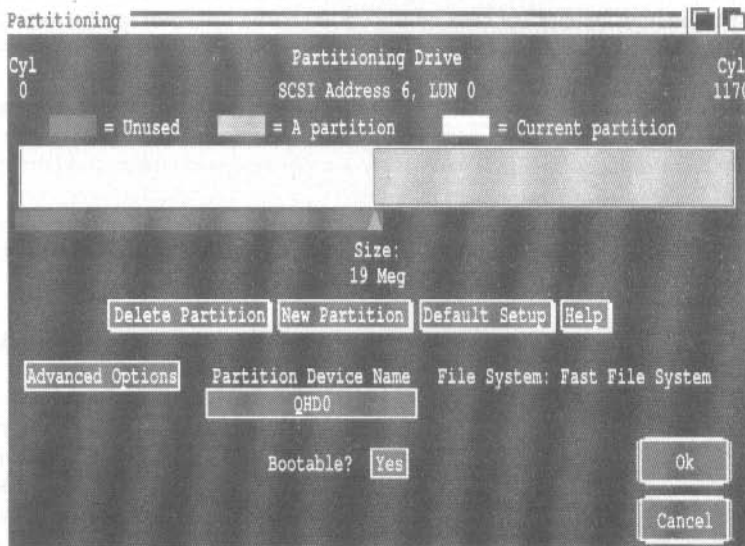
`Ok`   Click on this box to retain your changes and return to the **Hard Drive Preparation, Partitioning and Formatting** screen. To write these changes to the disk click on **Save Changes to Drive**.

`Cancel`   Click on this box to return to the **Hard Drive Preparation, Partitioning and Formatting** screen without retaining your changes.

`Advanced Options`   Experienced users may wish to modify their systems by using the **Advanced Options**. Most users will not need to use these options.

```
Partitioning ══════════════════════════════════════════════════ ▣▢

Cyl                        Partitioning Drive                      Cyl
 0                        SCSI Address 6, LUN 0                    1170

       ▨ = Unused        ▨ = A partition        ☐ = Current partition


                              Size:
                             19 Meg

        [Delete Partition] [New Partition] [Default Setup] [Help]

   [Advanced Options]   Partition Device Name    File System: Fast File System
   Start Cyl:   2             QHD0            [Change File System
   End Cyl:   586                              for Partition]
   Total Cyl: 585      Bootable? [Yes]                             [Ok]
   Buffers:   30      Boot Priority: [0]      [Add/Update
                                               File Systems]      [Cancel]
```

Partitioning with the keyboard

For more precise control of the partitions, you can also modify partitions using the mouse and the keyboard with the **Advanced Options**. Once you have selected a partition you can change the size of the partition by changing the number of the first and last cylinder of that partition.

Start Cyl:

To change the number of the first cylinder of the partition, click on the **Start Cyl:** box, delete the existing number, and type in the number of the desired cylinder. This number can be any cylinder in the current partition except for the last cylinder, or any cylinder in the unused area before the partition.

End Cyl:

To change the number of the last cylinder of the partition, click on the **End Cyl:** box, delete the existing number, and type in the number of the desired cylinder. This number can be any cylinder in the partition except for the first cylinder, or any cylinder in the unused area after the partition.

Total Cyl:

You can also change the size of the selected partition by clicking on the **Total Cyl:** box, deleting the existing number, and typing in the number of cylinders desired.

Buffers:

This displays the number of sector cache buffers being used. **Buffers** improve disk access time but use 512 bytes of memory per buffer. You can use as many buffers as you wish provided you have enough free memory. As a general rule you can use 30-50 buffers for every megabyte of RAM in your system.

Boot Priority:

This allows you to determine which drive or partition will boot your system. This will only apply to bootable partitions. If you use a hard drive partition to boot, you should copy your Workbench into that partition.

The value of the **Boot Priority** can range from 127 to -128. A larger value has a higher priority than a lower value. The Amiga's floppy disk drive (DF∅:) has a **Boot Priority** of 5.

Never set a partition's boot priority above 4. It is suggested that you set your boot partition's priority to 1, and any other bootable partitions to a priority of 0.

Change File System for Partition

Click on this box to go to the **File System Characteristics** screen. This screen will allow you to change the filing system on the selected partition. The default setting is the **Fast File System**.

Add/Update File Systems

Click on this box to go to the **File System Maintenance** screen. This screen will allow you to add, delete, and modify File Systems.

5.3.6   File System Characteristics

File System Characteristics

Partition DH0

Fast File System   Old File System

Custom File System   Reserved Partition

Automount? Yes

Identifier = 0x52455356   Reserved blocks at
Mask = 0xffffffe   beginning: 2
MaxTransfer = 0xffffff   end: 0

Ok

Cancel

This screen is provided because some experienced users may wish to modify a partition's filing system under special circumstances. Most users can safely ignore this screen.

Partition

This shows the name of the selected partition, and allows you to choose the filing system for that partition. You can choose a filing system, and then set the values for **Identifier, Mask,** and **MaxTransfer.**

Fast File System

This is the default filing system.

Old File System

This filing system trades speed for recoverability. If part of the disk were to become unreadable, it might be easier to recover information stored with this filing system.

Custom File System

This allows you to install your own filing system.

Reserved Partition

This will allow you to reserve an area on the disk without a partition. This area can be set aside for some special use, such as for a UNIX operating system.

Automount?

To have the selected partition accessible after booting up, this must be set to **Yes**. If set to **No** the selected partition will exist, but will not be accessible.

NOTE: *If you are using Kickstart 1.3 ROMs, the partitions will be automatically mounted at power up, unless Automount is set to No.*

If you are using Kickstart 1.2, The partitions will be mounted during **BindDrivers** in the startup-sequence.

NOTE: *To change any of the following values, click on the box, delete the existing information, type the new number, and press* Return ↵ .

Identifier

This hex number is a code that tells AmigaDOS what filing system is being used. The Identifier can only be modified when using a **Custom Filing System**. Hex numbers must begin with Øx.

Mask

This hex number defines which areas of memory can be used with Direct Memory Access (DMA). **Mask** is available when using **Fast Filing System** and **Custom Filing System**. For further information please see the **Commodore Amiga Enhancer Software 1.3** manual.

MaxTransfer

This hex number determines the maximum number of bytes to be moved during each DMA transfer. **MaxTransfer** is only available when using **Fast Filing System** and **Custom Filing System.**

Reserved blocks at beginning:

This is the number of blocks reserved at the beginning of the selected partition for DOS usage. This value defaults to 2, and should not normally be set to less than 2.

Reserved blocks at end: This is the number of blocks reserved at the end of the selected partition, for DOS usage. This value defaults to 0.
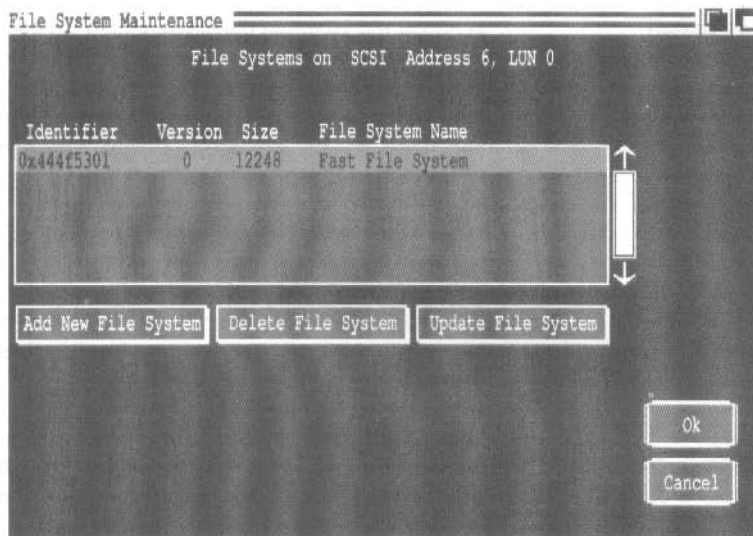
Ok   Click on this box to save your changes and return to the Partitioning screen. Click on **OK** to return to the **Hard Drive Preparation, Partitioning and Formatting** screen.

Cancel   Click on this box to return the **Partitioning** screen without saving your changes.

5.3.7   File System Maintenance

This screen allows you to modify the list of available filing systems by adding new file systems, deleting file systems, and modifying existing file systems.

The selected drive is displayed by address and LUN at the top of the screen. Each file system stored on that drive is displayed, showing its Identifier hex number, Version number, Size in bytes, and File System Name.

The selected file system is highlighted. To select a different file system, click on the desired file system, click on the up and down arrows at the right of the screen, or click and drag the bar located between the arrows.

Add New File System

To add a new file system, click on this box, and a smaller window will appear. Type in the pathname of the new file system.

Click on the second box, delete the existing hex number and type the hex number of the DOSType of the new file system. The system defaults to Fast Filing System with DOSType Øx44f530/1.

Click on the third box and type in the version number of the new file system.

Click on **OK** to retain your changes, or **Cancel** to erase your changes, and return to the **File System Maintenance Screen**.

Delete File System

To delete the selected file system, click on this box.

Update File System

To update an existing file system, click on this box, and a small window will appear. Click on the boxes that need to be changed, delete the existing information, and type the new information.

To update the Fast File System, after clicking on **Update File System**, click on **Update**.

Click on **OK** to record your changes, or **Cancel** to erase your changes, and return to the **File System Maintenance** screen.

Ok

Click on **OK** to record your changes and return to the **Partitioning** screen. Click on **OK**, and then **Save Changes to Drive** on the **Hard Drive Preparation, Partitioning and Formatting** screen.

Cancel

Click on **Cancel** to return to the **Partitioning** screen without saving your changes.

Appendix A: Approved Hard Disks

Any SCSI hard disk that implements the common command set standards and conforms to ANSI X3T9.2/82-2 or later should be compatible.

Note that removable media drives are not fully supported. Automatic sensing of disk change does not occur. These drives do work properly if a **diskchange** command is executed whenever the media is changed, and if each disk is partitioned identically. If a disk is partitioned in another way, you must reboot the system when changing disks.

Appendix B: Troubleshooting

With the power off, make sure that all cables are connected correctly, and that pin one on the ribbon cable is aligned with pin one on the hard disk and the A2091. Make sure that the A2091 is properly connected to the Amiga.

Symptom	Possible Cause	Solution
A2000 power light blinks, or system fails with the A2091 in the system.	A2000 is running with Kickstart 1.2, and Jumper 2 is set to autoboot enabled.	Set Jumper 2 to Autoboot Disabled.
When booting from the A2091-40, the system does not recognize the hard disk.	Some disk information has been lost during shipment.	Perform the Quick Installation procedure given on page 3-19.
When you boot your system from the hard disk, you see a screen requesting a Workbench disk (shown on page 3-6 of the **Introduction to the Amiga** manual).	No partition set as bootable.	Make sure that the partition is set as bootable and that the ROMs are enabled. Try to reboot your system by pressing **Ctrl**, left **Amiga**, right **Amiga** simultaneously. If this does not work, you may need to prepare your hard disk as described under **Preparing a New Hard Disk**.
	A2000 is running Kickstart 1.3, and Jumper 2 is set to autoboot disabled.	Set Jumper 2 to Autoboot Enabled.
	If you can reboot the system and it functions normally after reboot, the timeout is too short.	Set Jumper 5, Option 2 to the on position.
When you boot your system from floppy disk a Workbench screen appears without an icon for the hard disk.	System cannot find the A2091 hard disk. A2000 is running Kickstart 1.2 and the device driver was not copied to expansion drawer.	Boot with disk created with **MakeBootDisk**.

Continued from page 1

Symptom	Possible Cause	Solution
You receive a read/write error on your hard disk.	The hard disk has developed a bad block.	Click on **Retry** and attempt to finish your current task. Attempt to **Retry** at least twice. Whether or not the system successfully recovers, you should run **Verify Data on Drive** from **HDToolbox**. Refer to the section **Backing Up Your Hard Disk** for more information.
When booting you receive a requestor indication problems with the hard disk (error validating, disk corrupted, etc.). This may occur with or without read/write errors.	The boot partition has been corrupted.	Perform a High level format of the partition using **format** from the CLI/Shell, or **Initialize** from the workbench menu.
During startup you receive a requester stating **"Not a DOS disk in Unit 1".**	Partition not formatted.	Initialize the hard disk from the Workbench menu and then run **InstallHD**.
Unit appears as **NDOS** on Workbench screen. Requestor states "Not a DOS disk in Unit 1."	Hard drive prepared but not formatted.	Format the hard disk from CLI/Shell or Initialize hard disk from Workbench.
When you boot from the hard disk, you receive a CLI screen.	Workbench is not available on the boot partition.	Run **InstallHD**.
During format system reports **Can't find handler**.	System not using most recent Fast File System from the **A2091 Installation Software** disk.	Copy **Fast File System** from the **L** directory on the **A2091 Installation Software** disk to the **L:** directory on your boot disk. Update the file system using **HDToolbox** as described on page 5-27.
A hard disk appears multiple times on the screen.	The hard disk responds to all logical addresses.	Set Jumper 5, Option 1 to the off position.

Symptom	Possible Cause	Solution
When you attempt to access the hard disk, the hard disk light turns on and stays on. The system locks up and permits no further actions.	Drive does not generate a standard parity signal Ribbon cable not connected correctly.	Set Jumper 5, Option 2 to the on position. Check ribbon cable connector on card and hard disk. Make sure that the specifications listed under Drive Definitions from HD-Toolbox are correct.
System locks up during high-level format.	Incorrect configuration.	Check hard disk documentation for correct number of heads, cylinders, sectors. Make sure that the specifications listed under **Drive Definitions** from **HDToolbox** are correct.
After running **Verify Data on Drive**, verify message appears, but does not change within 10 minutes.	Drive does not support **Verify Data on Drive**.	Do not use **Verify Data on Drive** with this hard disk.
Unexpected partition names appear, such as **DHØ.1:** and **CHANGE_ ME.1:**.	Multiple partitions have identical names.	Use **HD Toolbox** to change the partition names as described on page 5-9.
The storage space available on the hard disk is smaller than the disk's specifications.	Incorrect configuration.	Check hard disk documentation for correct number of heads, cylinders, sectors. Make sure that the specifications listed under **Drive Definitions** from **HDToolbox** are correct.
The hard disk LED on the Amiga's front panel goes out during a SCSI hard disk low-level format.	This is normal for SCSI hard disks; there is no problem.	

Appendix C: Jumper Pin Settings

Jumper 1:   Memory Size
             2 Megabytes
             1 Megabyte
             512 Kilobytes
             0 Kilobytes

Factory set to **0 Kilobytes**.

Jumper 2:   Autoboot Enable/Disable

If you are using Kickstart 1.3 or higher, you can set Jumper 2 to the Autoboot position. This will allow you to boot your system from the A2091. Factory set to **Autoboot Enabled**.

Jumper 5, Option 1: LUN Enable

This only affects SCSI drives. If you have more than one device at a physical address, set this jumper to on. When this jumper is enabled, the system looks for eight Logical Unit Numbers (LUN), or eight devices, at each physical SCSI address, and will attempt to open Logical Units 0 through 7 at each physical SCSI address. When this jumper is disabled, the system will look for one device. Factory set to **off**.

NOTE: *Some SCSI drives, such as certain Seagate and Epson drives, respond to more than one logical address. Such drives will appear on the Workbench screen and the **Hard Drive Preparation, Partitioning and Formatting** screen in **HDToolbox** multiple times, at the same Address but at LUN 0 through 7. If this occurs, set this jumper to the off position.*

Jumper 5, Option 2: Time-out Length

If you are using a SCSI drive that takes longer than thirty seconds to start up when you turn the system on, such as some Seagate drives, you may wish to set this jumper to the on position. When this jumper is in the off position the time-out period, (the time between the start-up and when the system checks the drive), is short. When this jumper is in the on position the system will wait a longer time before checking the drive.

When this jumper is enabled it disables parity checking during the message in phase. Certain hard disks, such as Seagate disks, do not generate parity during the message in phase. With these hard disks, set this jumper to **on**. Factory set to **off**.

Jumper 5, Option 3: Reserved

Factory set to **off**.

Appendix D: Technical Specifications

A2091 Hard Disk Controller Card

- sockets for 2 MB of fast RAM
  CMOS 256K x 4 DRAMs 120 ns or faster
  RAM can be installed as 512K, 1MB or 2MB.
- Autoboot ROMs 16 kilobytes
- SCSI Interface
  ANSI X3T9.2 compatible
  DB-25 SCSI connector
  50-pin internal SCSI connector
- Host Interface connects to 100 pin connector on the Amiga
- Power requirements
  +5V @ 1A, +12V @ 0A, No hard drive on card
  +5V @ 2A, +12V @ 1A, Hard drive on card max
- Maximum power consumption of card-mounted hard drive
  +5V @ 1A, +12V @ 1A continuous, 2A maximum startup

A2091-40 SCSI Hard Disk (Quantum ProDrive 40S)

- Formatted storage capacity of 42 megabytes
- 19 msec average seek time
- Autopark
- 2.0 megabytes/second asynchronous data transfer rate
- Full disconnect/arbitrate/reconnect ability
- 64K-byte look ahead DisCache
- 48 bit cyclic Error Correction Code (ECC) with 11-bit burst correction capability
- Automatic retry for disk read errors
- Read/Write with 1:1 interleave
- Power requirements
  +5V at 0.5A idle, 0.6A seeking, 0.65A max
  +12V at 0.5A idle, 0.8A seeking, 1.6A max
  8 watts average power consumption, 10.5 watts max
- Industry-standard (ANSI) SCSI host interface, CCS Rev 4B

Hard Disk Geometry

- 3 Read/Write heads
- 834 data cylinders
- 2 data zones:
  outer zone: 590 cylinders, 35 sectors/track
  inner zone: 244 cylinders, 28 Sectors/track

Jumper Settings

Jumper 1:   Memory Size
            2 Meg
            1 Meg
            512 K
            0 K

Jumper 2:   Auto: Enables Autoboot ROMs   Kickstart 1.3 or higher
            Dis: Disables Autoboot ROMs Kickstart 1.2

Jumper 3:   Factory use only

Jumper 5:

            Option 1: OFF   LUN disabled One drive at each address
                      ON   LUN enabled Multiple drives at each address.

            Option 2: OFF   Time-out disabled Short wait period for drive
                            Parity checking enabled
                      ON   Time-out enabled Long wait period for drive
                            Parity checking disabled on message-in phase

            Option 4:   Reserved for future enhancements

Jumper 201:Factory use only

A2091 Card Power Connector

1.0 A Maximum Continuous Current at 12V
2.0 A Maximum Startup Current at 12V
1.0 A Maximum Continuous Current at 5V

Note that this connector is designed to operate one low power 3.5" hard disk mounted on the card. Never connect a 5.25" hard disk, or more than one 3.5" hard disk to the card as damage will result. Do not install multiple A2091 cards with card mounted hard disks.
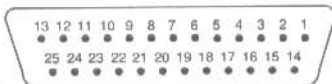
1. +12 VDC

2. ground

3. ground

4. +5 VDC

```
┌──────────────┐
│ •  •  •  •   │
└──────────────┘
  4  3  2  1
```

Internal SCSI Connector

Pin	Name
50	I/O
48	REQ
46	C/D
44	SEL
42	MSG
40	RST
38	ACK
36	BSY
34	N.C.
32	ATN
30	Ground
28	Ground
26	Termination Power
24	Ground
22	Ground
20	Ground
18	Parity
16	Data 7
14	Data 6
12	Data 5
10	Data 4
8	Data 3
6	Data 2
4	Data 1
2	Data 0

All odd pins, except pin 25, are ground. Pin 25 is open.

External SCSI Connector (DB-25)

```
   13 12 11 10 9  8  7  6  5  4  3  2  1
    •  •  •  •  •  •  •  •  •  •  •  •  •
      25 24 23 22 21 20 19 18 17 16 15 14
       •  •  •  •  •  •  •  •  •  •  •  •
```

(Female Connector)

Pin	Name	Pin	Name
1	REQ	14	Ground
2	MSG	15	C/D
3	I/O	16	Ground
4	RST	17	ATN
5	ACK	18	Ground
6	BSY	19	SEL
7	Ground	20	Parity
8	Data 0	21	Data 1
9	Ground	22	Data 2
10	Data 3	23	Data 4
11	Data 5	24	Ground
12	Data 6	25	Terminator Power
13	Data 7		

Approved RAM Chips

Manufacturer	Manufacturer Part Number
NEC	UPD424256C-10
	UPD424256C-12
OKI	MSM514256-12RS
Texas Instruments	44C256-10N
	44C256-12N
Toshiba	TC514256AP-10
	TC514256AP-12

Appendix E: Some Useful Terms

block	The smallest unit of storage used with a file system. 512 bytes under Fast File System.
boot	To start or initialize the system from a reset condition, loading part of the operating system into memory.
buffer	A temporary data storage space used to increase device access speed.
cylinder	Used with a hard drive with multiple heads. The same numbered track on each disk surface.
daisy-chained	A method of connecting multiple peripherals from a single connector, where each peripheral is connected to the previous one.
file system	Software that controls how data is organized on a disk.
format	To prepare a disk for storing data. A low-level format creates sectors of the proper size and writes the control information needed to later access each sector, rewriting the entire hard disk surface. A high level format writes the information within each sector to indicate a volume without files contained in it, and tests each sector of the partition for errors.
head	The device that reads, writes and erases data on a magnetic surface.
partition	An area of storage space created on a hard disk.
SCSI	Small Computer Standard Interface—as defined by the American National Standards Institute (ANSI) X3T9.2. A high level interface where the drive communicates via high level commands such as format drive, read data sector, etc.

sector   A specific section of a track on the surface of the
                                  hard disk.

track   A circular path on the surface of a hard disk, where
                                  data is stored.

validate   What the Filing System does when it determines
                                  that the bitmap of the allocated blocks is invalid. The
                                  system reads the file headers and reconstructs the
                                  bitmap.