

**Kingston Technology  
TurboChip 133  
Installation Guide**

**Model: TC5x86/133**



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**Kingston Technology's**

**TurboChip™ 133**

**133MHz 5x86  
Processor Upgrade**

**For 486-Based Computers**

**Installation Guide**

**Part No. 4460036-001.B00**

**Kingston Technology Corporation  
17600 Newhope  
Fountain Valley, CA 92708  
(714) 435-2600**



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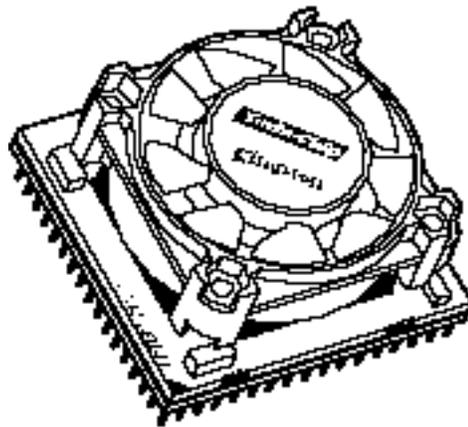
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## Introduction

Congratulations on the purchase of your Kingston **TurboChip 133** 5x86 processor upgrade for 80486 SX, DX and DX2 computers. The TurboChip model TC5x86/133 adds clock-quadrupling technology to run four times faster than your native 486 processor speed. At 133MHz, TurboChip 133 is rated at Pentium-75 plus performance. TurboChip 133 features 16KB internal cache, a built-in math coprocessor, and 32-bit internal and external processing running internally at 133MHz and externally at 33MHz. TurboChip is a convenient, high-performance solution to increase your computer's CPU speed up to 250% over its current 486 processor to give you the power and performance for today's most demanding software applications.

TurboChip is a chip-for-chip processor upgrade which installs directly into your existing processor socket, or an Intel® OverDrive™ socket if the original processor cannot be removed. Many 486 computers use ZIF (zero-insertion-force) sockets with a lever or retaining screw to make removing the CPU chip quick and easy. TurboChip also uses a cooling fan to control the TurboChip's operating temperature for years of reliable performance.



**TurboChip 133**  
**133MHz 5x86 Processor Upgrade**

## Special Features

Your Kingston TurboChip 133 includes these important features:

- Powerful Am5x86P-75 microprocessor running at Pentium-75 plus performance.
- 16KB internal cache.
- Clock-quadrupled to 133MHz processing speed.
- “Plug and Play” installation. No software drivers to install.

Kingston features the Landmark System Speed Test<sup>®</sup> Version 2.00 for testing the performance of your new TurboChip upgrade. The Speed Test program is located on a 3.5” Utility Diskette included in your TurboChip package. Kingston suggests running the speed test before and after installation to compare the performance increase. Refer to Appendix A on page 12 for instructions on running Landmark System Speed.

## Package Contents

The TurboChip package should contain the following items:

- TurboChip processor upgrade with cooling fan
- Chip Extractor Tool
- Utility Diskette
- This Installation Guide

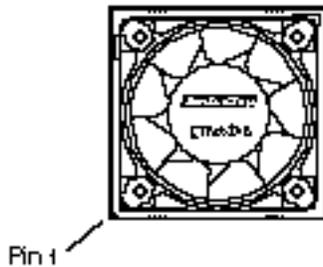
If any of the items are missing or damaged, please contact your Kingston dealer for a replacement. Remove the Processor Upgrade from its special anti-static foam pad only when you are at the point of installing it into your computer. Remember to ground yourself first to avoid static electricity discharge. Do this by applying both hands to a neutral metal surface like the rear of the computer or the power supply metal housing. Remove the protective foam pad from the TurboChip connector pins very carefully, and take care not to damage the pins when installing the upgrade. Retain all the protective packaging for future use.

## Before You Begin

The TurboChip installation should take less than 15 minutes to complete. Before you begin, however, there are two things to be aware of. First, notice the location of Pin 1 on the TurboChip upgrade denoted by a white triangle on one corner. This corner of the upgrade must match Pin 1 on the processor socket (See figures below). Secondly, determine your type of CPU configuration. The 486 processor may be *socketed* (easily removed), or *surface-mounted* (soldered directly to the system board). If the CPU is surface-mounted, it cannot be removed. In this case, install TurboChip into the adjacent OverDrive socket. For socketed configurations, the TurboChip is installed directly into the CPU socket. Take a few moments to read the sections below before beginning the installation process.

### Pin 1 Orientation

The location of Pin 1 on the TurboChip must be oriented to match Pin 1 on the processor socket. Pin 1 on the TurboChip is denoted by a white corner edge on the CPU chip. When installing TurboChip, it must be oriented so that Pin 1 is aligned with Pin 1 on the CPU socket. The socket should also have a beveled edge or silk-screened arrow denoting Pin 1. Before installing TurboChip, refer to your original 486 processor to verify the location of Pin 1. Figure 1-1 shows the location of Pin 1 on the TurboChip. Figure 1-2 shows Pin 1 on the original 486 processor, please make a note of it before removing.



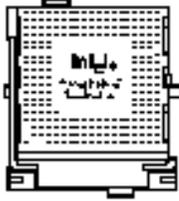
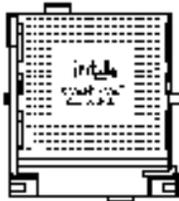
*Fig. 1-1 TurboChip Top View*



*Fig. 1-2 Original 486 CPU*

## Types of CPU Configurations

Your 486DX or 486SX computer will most likely resemble one of the following types of processor (CPU) configurations. If the CPU is surface-mounted (Option 3), it cannot be removed. In this case, install TurboChip into the adjacent OverDrive socket. For all other installations, install TurboChip directly into the CPU socket.

|   |  |  |
|---|--|--|
| <p style="text-align: center;"><b>Socketed CPU without OverDrive Socket</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p><b>Standard Socket</b></p> </div> <div style="text-align: center;">  <p><b>ZIF Socket</b></p> </div> </div> |  | <p><b>Option 1</b></p> <p><b>Socketed CPU<br/>(Standard or ZIF Socket)</b><br/>Remove CPU and install TurboChip into socket.</p>   |
| <p style="text-align: center;"><b>Socketed CPU with OverDrive Socket</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>  |  | <p><b>Option 2</b></p> <p><b>Socketed CPU with OverDrive socket</b><br/>Remove CPU and install TurboChip into CPU socket. (OverDrive socket is not used).</p>                              |
| <p style="text-align: center;"><b>Surface-Mounted CPU with OverDrive Socket</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div>  |  | <p><b>Option 3</b></p> <p><b>Surface-Mounted CPU with OverDrive socket</b><br/>CPU cannot be removed. Install TurboChip into OverDrive socket. Refer to Owner's Manual to set jumpers.</p> |

Now you are ready to begin the TurboChip installation. Remember, the TurboChip replaces the existing CPU so there is no need to change any system jumpers. If the CPU cannot be removed, then use the OverDrive socket, but your system will require setting jumpers when using this socket.

## Installing TurboChip

The TurboChip processor upgrade is designed to work in a wide variety of 486 computers. The installation procedure will differ slightly according to the location of your 486 processor socket. Also, the orientation when installing TurboChip will depend on the location of Pin 1 on the processor socket. Follow the steps below to install TurboChip into your computer.

### Step 1. Opening the Computer

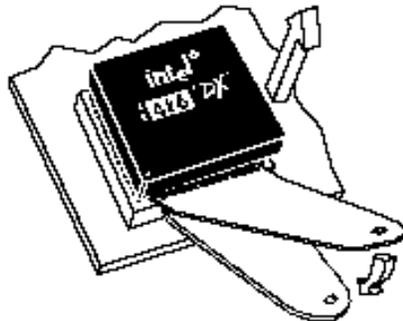
1. Set the power switch on the system unit to OFF.
2. Set all external power switches OFF (i.e. display, printer, etc.).
3. Disconnect all power cords and cables from the rear of the computer.
4. Remove the cover from your computer as described in your owner's manual. Make sure you have room to work. If necessary, place the computer on a desktop surface that is easily accessible with plenty of area to work.

### Step 2. Locating the CPU

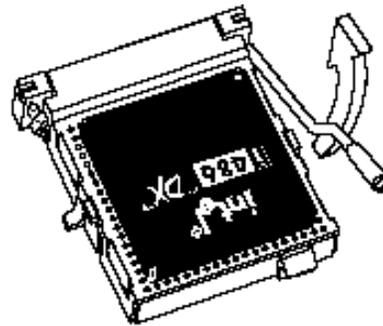
1. Locate the 486 CPU processor on your system board or CPU expansion card. The CPU chip is generally labeled by the manufacturer, such as "INTEL." The CPU chip will also have descriptive markings, such as "80486DX-33" denoting the CPU type (486DX) and the CPU speed (33MHz).
2. Make sure the 486 CPU is accessible. If the CPU socket is located under an expansion card, move any full-length adapter cards to other expansion slots. If no slots are available, place a half-length card in the slot nearest the CPU socket so that the CPU socket is unobstructed. If the CPU socket is located under the floppy drive (e.g., IBM ValuePoint™), loosen the retaining screws and remove the drive bay for easier installation.

### Step 3. Removing the CPU Chip

1. Before removing the CPU chip from its socket, note the position and orientation of Pin 1 (identified by either a notch, beveled edge, dot, or half-circle). The position of this corner (Pin 1) determines how the TurboChip will be installed. **Pin 1 on the CPU socket must match Pin 1 on TurboChip.** Refer to Figure 1-1 on page 3 for the location of Pin 1 on the TurboChip upgrade.
2. If the CPU is socketed in a standard or ZIF socket, remove it following the steps below. If the CPU is surface-mounted (soldered to the board), look for a ZIF type OverDrive socket. **Do not attempt to remove a surface-mounted CPU.**
  - ❑ **For Standard Sockets:** use the Chip Extractor Tool provided to remove the 486 CPU chip from its socket. Gently insert the edge of the tool **between** the CPU chip and the socket. (**Do not pry up the socket**). Start on one side of the 486 chip, levering it up slightly. Refer to Figure 2-1. Repeat this action for each of the four sides of the 486 chip, working around the sides several times until the pins on the underside of the chip are sufficiently exposed so it may be carefully lifted out with your fingers. Be careful not to bend or break the pins. Afterwards, if pins are slightly bent, lay the Chip Extractor Tool lengthwise between the rows of pins to straighten the pins back to their original state. Use the TurboChip's packaging material to store the 486 chip in a safe place.
  - ❑ **For ZIF Sockets:** unlatch the side lever, overhead bar, or retaining screw to unlock the socket and remove the CPU with your fingers. See Step 4 for details.



**Standard Socket Removal**



**ZIF Socket Removal**

*Fig. 2-1 Removing the CPU Chip*

## Step 4. Types of ZIF (Zero-Insertion-Force) Sockets

ZIF sockets are commonly used for either processor sockets or OverDrive sockets. The TurboChip can be installed into either socket, but only use the OverDrive socket if the CPU is surface-mounted and cannot be removed. Using the OverDrive socket will require setting system jumpers, thereby adding another step to the installation process. Refer to your owner's manual for any special settings that must be performed when using the OverDrive socket.

There are three types of ZIF sockets depending on the mechanism used to open and close the socket. ZIF sockets use either: 1) a side bar lever, 2) retaining screw, or 3) overhead bar to remove the CPU from the socket. When installing the TurboChip 133 into a ZIF socket, no force is required. The locking mechanism (i.e., sidebar, retaining screw, or overhead bar) is used to open and close the socket.

For ZIF sockets with a sidebar lever, lift the sidebar up and away from the socket to open. For ZIF sockets with a retaining screw, use a screwdriver to rotate the screw to the open position. For ZIF sockets with an overhead bar, lift the bar up and over the CPU chip to open. Once the socket is open, the CPU is easily removed and the TurboChip is easily inserted. Then the locking mechanism closes the socket to finish the installation.

Figure 2-2 below illustrates the various types of ZIF sockets.



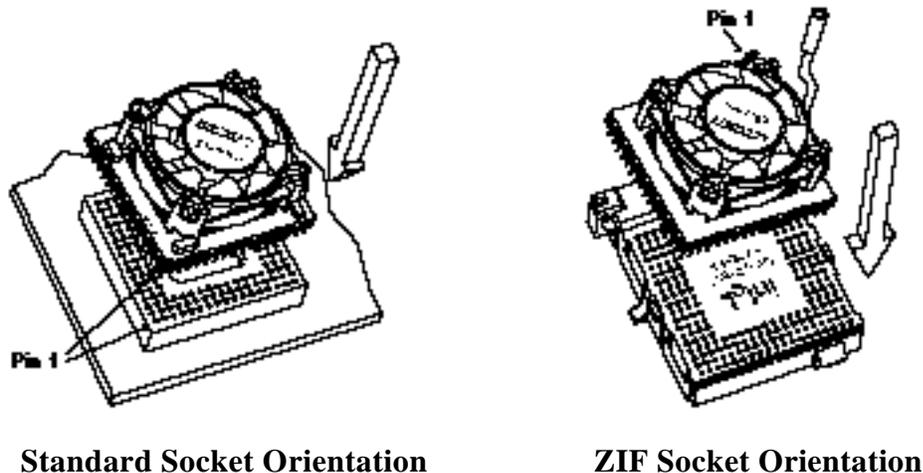
*Fig. 2-2 Types of ZIF sockets*

## Step 5. Orienting the TurboChip

When installing the TurboChip, the orientation of Pin 1 (marked with a white dot on the upper-left corner of the unit) must match the original Pin 1 orientation of the 486 processor chip (See Figure 1-1 on page 3). Pin 1 is usually denoted by a beveled or cut edge. The orientation of the processor socket will vary depending on the make and model of your particular computer. Follow the steps below to determine the correct orientation of TurboChip in your computer.

1. Look at the TurboChip carefully. There is a beveled corner marked with a white dot on one corner of the TurboChip CPU. Refer to the illustrations on page 3 for help in locating Pin 1 on the TurboChip.
2. With the TurboChip positioned so that the beveled corner on the upgrade matches the beveled corner on the processor socket, you are ready to insert TurboChip into the empty CPU socket.

**Warning:** If the processor upgrade is not installed correctly (Pin 1 to Pin 1), it may result in damage to the computer, the processor upgrade, or both. Please orient Pin 1 on the TurboChip upgrade to match Pin 1 on your CPU socket. Refer to Figure 2-4 below.



*Figure 2-4 Orienting the TurboChip*

## Step 6. Inserting the TurboChip

To insert the processor upgrade correctly, you need to have the pins on the TurboChip adapter exactly lined up with the corresponding holes on the CPU socket.

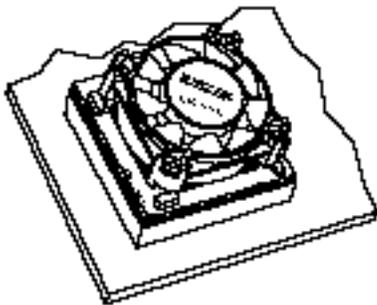
### ❑ For Standard Sockets

When you are sure the alignment is correct, grasp the sides of the TurboChip with your thumb and forefinger and gently push the adapter into the socket applying an even pressure. Finally, to make sure a good connection is made, use both thumbs to push down firmly on opposite corners of the fan unit, again using even pressure. **Do not push down from the center of the fan.** Refer to Figure 2-5.

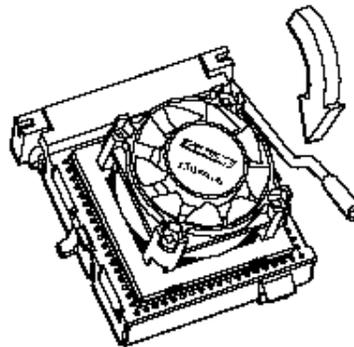
**Note:** You will meet some resistance so firmness is required. If it proves difficult to insert the processor upgrade, stop and check the alignment. If the alignment is incorrect, remove the processor upgrade and begin the insertion again.

### ❑ For ZIF Sockets

While the socket is unlocked or in the open position, align the pins on the TurboChip into the holes on the ZIF socket. **Place the TurboChip into the socket without using any force.** Apply gentle pressure, only if needed, to make sure the processor is completely inserted. Lower the overhead or sidebar lever or rotate the retaining screw to close the socket back to a locked position. Refer to Figure 2-6.



*Fig. 2-5 TurboChip Installed*



*Fig. 2-6 Securing the ZIF Socket*

## Step 7. Completing the Installation

1. Replace any adapters removed earlier.
2. If you installed TurboChip into the OverDrive socket because the CPU was surface-mounted and could not be removed, refer to your owner's manual for details on setting any system jumpers or other special instructions that must be performed before continuing.
3. Replace the cover of your computer, and reconnect any cables that were removed.
4. Check that your computer starts correctly. It should begin a memory count and run its POST (Power-On-Self-Test). If it does not boot, turn to "*Appendix B Troubleshooting*" in the back of this manual for help.

**Congratulations!** The installation is now complete. Because TurboChip requires no device drivers, there is no software installation to perform. If you experience any problems, refer to "*Appendix B Troubleshooting*". If your problem is beyond the scope of this manual or you have questions regarding this product, call Kingston Technical Support at (714) 435-2639 to speak to a trained technician.

# Appendices

## Appendix A Running the Landmark Speed Test

Included on the Kingston Utility diskette is the Landmark System Speed Test Version 2.0. To verify the clock speed and ensure proper operation of your new TurboChip, run SPEED200.EXE from a DOS prompt.

**Note:** Due to the multitasking nature of both Windows and OS/2, running Landmark Speed Test in these environments yields inconsistent results. In order to obtain accurate results, you must start SPEED200 directly from DOS. Do not open a DOS window from within OS/2 or Windows.

To run SPEED200.EXE from DOS, follow the steps below:

- Step 1. Insert the Kingston Utility diskette into Drive A.
- Step 2. At the DOS prompt, enter the following commands:  
C> **A:** [Enter]  
A> **SPEED200** [Enter]

Speed Test can also be run with the following switches, as desired:

- /b** bypass initial menu screen.
- /nv** do not run video test.
- /q** run in quiet mode (no sound). Note: Pressing [F10] while the test is running turns sound off.
- /xx** perform test for *xx* seconds, then exit.

To use one or more switches, type the following command in bold:

A> **SPEED200 /b /nv /q** [Enter]

## Benchmark Test Results

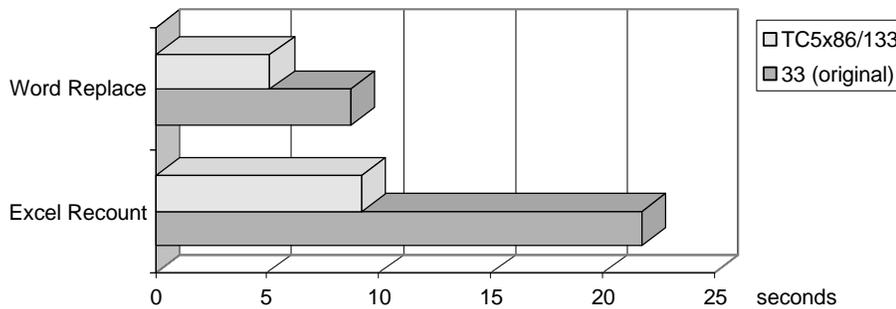
**Please Note:** Test results will vary depending on your configuration, make, and model.

The following Benchmark Tests were performed on an IBM ValuePoint™ 6384 N50, 486DX 33MHz microprocessor with 8MB RAM installed. Notice that by adding 256KB of cache memory or simply changing the video display, varying results were found. The Diagnostic Programs below indicate the relative speed in Megahertz (MHz) of the processor, or a value indicating the overall performance index.

| IBM ValuePoint<br>6384 N50   | with 256KB L2 Cache     |                     | with 0KB Cache Memory   |                     |
|--|-------------------------|---------------------|-------------------------|---------------------|
|  | Original<br>486DX 33MHz | TurboChip<br>133MHz | Original<br>486DX 33MHz | TurboChip<br>133MHz |
| <b>Landmark Speed 2.0</b><br>MHz in relation to IBM AT   | 112 MHz                 | 443 MHz             | 111 MHz                 | 426 MHz             |
| <b>Wintach 2.1</b><br>Overall Wintach RPM:<br>VGA 640x480 16 color<br>VESA 800x600 16.8M color | 3.73<br>64.50           | 9.17<br>133.62      | 3.21<br>54.28           | 6.41<br>98.94       |

*Fig. A-1 Benchmark Tests*

The following test results were based on a Compaq Prolinea™ 4/33 with and without the TurboChip 133 installed. The first test uses Microsoft Word® to calculate the amount of time to replace the word “the” with “Kingston” 2,209 times. The second test uses Microsoft Excel® to calculate the amount of time to execute a change in the formula to a spreadsheet 16,384 rows by 20 columns in size.



*Fig. A-2 Real Time Tests*

## Appendix B Troubleshooting

This section describes problems you may encounter when installing the TurboChip processor upgrade. If you experience any problems, do the following:

1. Read this section carefully, and see if your problem is described. Try the suggested actions.
2. If necessary, call the place of purchase. However, before you call, write down the following information:
  - Your computer make and model.
  - The exact wording of any error messages associated with your problem.
  - The contents of your CONFIG.SYS and AUTOEXEC.BAT files.
  - The version numbers of your software applications and operating system.

### Computer Does Not Start

If there is no display on the screen when you turn the power on:

1. Check that the power cord and all necessary cables are correctly plugged in and power is ON. There should be a light on your system unit and on your monitor indicating that they have power.
2. Turn off your computer and disconnect the power cable. Remove the cover from the system unit and check the seating and orientation of the processor upgrade. The best method for checking the seating of the TurboChip is to remove the processor upgrade and carefully reinstall it. But first, see if the connector pins are showing between the upgrade and the socket. If so, the TurboChip may not be seated properly to the processor socket. Use both thumbs on opposite corners of the fan unit, applying even pressure to seat the processor upgrade completely into the processor socket. **Do not push down on the center of the fan unit.**

3. Check that all other adapters are firmly seated in their sockets. Replace the cover and try the power again.
4. If it still does not boot, remove the TurboChip from your computer and replace it with the original 486 processor. Try the power again. If the computer now starts, the Processor Upgrade may be incompatible with your computer. Contact Kingston Technical Support at (714) 435-2639 for help in diagnosing any problems.

## **Cannot Access Diskette or Hard Disk Drive**

You may have dislodged the connection between the diskette or the hard disk drive and its controller card when you installed the processor upgrade. Check this connection now.

## **Older System BIOS**

Some early model 486 systems do not support clock-quadrupling. In some cases, the computers have older system BIOS which does not support clock-quadrupling. This type of BIOS uses CPU-dependent timing loops which are based on the time it takes the CPU to execute a series of instructions. By quadrupling the speed of the CPU, the timing loop is greatly reduced and does not allow enough time to complete the instructions, resulting in system lockups.

This problem can sometimes be resolved by upgrading the BIOS in your computer. BIOS chipsets are relatively inexpensive and can be purchased at your local computer store. Kingston's Chip Extractor tool can also be used to remove BIOS chips if a tool is not provided.

## **SL Enhanced Jumper**

Some computers have a system board jumper to use "SL Enhanced" logic designed for Intel-specific microprocessors only. The TurboChip's microprocessor, designed by Advanced Micro Devices (AMD), uses the same low power management, but with microcode developed by AMD. If your computer has this type of jumper, set it to "Non-SL", or set "SL" to OFF.

## How to Reach Kingston

If you have any problems, questions, or comments associated with installing or using your TurboChip processor upgrade, please call Kingston Technology Technical Support to speak to a technician. For the latest file updates and information, access the Kingston BBS, CompuServe, or Kingston's Internet Web site using your modem. To receive immediate product information sent to you by fax, call Kingston's RAMfax™ service and use the voice menu system to make your selections. The RAMfax server will call back to your office fax machine and send you the requested information immediately from anywhere in the U.S. or Canada.

**Technical Support:** 6:00 am to 6:00 pm Pacific Time  
Monday through Friday  
(800) 435-0640 or (714) 435-2639  
(714) 437-3310 FAX

**Kingston Germany:** (089) 62 71 56-21

**Internet:** Visit Kingston's Web site at <http://www.kingston.com>

For Product Information: [sales@kingston.com](mailto:sales@kingston.com)

For Technical Support: [tech\\_support@kingston.com](mailto:tech_support@kingston.com)

**BBS:** Kingston's Bulletin Board Service  
(714) 435-2636, up to 14.4Kbps, 8-N-1

**CompuServe:** 71333,3714 or type: **GO KINGSTON**  
from any CIS prompt.

**RAMfax:** Automatic Faxback System (U.S. and Canada)  
(800) 435-0056 or (714) 435-2677

## Appendix C Product Warranties and Notices

### Limited Warranty

KINGSTON TECHNOLOGY CORPORATION ("Kingston") warrants that this product is free from defects in material and workmanship. Subject to the conditions and limitations set forth below, Kingston will, at its option, either repair or replace any part of this product which proves defective by reason of improper workmanship or materials. Repair parts or replacement products will be furnished by Kingston on an exchange basis, and will be either new or refurbished to be functionally equivalent to new.

This warranty applies only to the original end user purchaser, and does not cover any damage to this product which results from accident, abuse, misuse, natural or personal disaster, or any unauthorized disassembly, repair or modification.

### Duration Of Warranty

**Lifetime Warranty:** The following Kingston products are covered by this warranty for life: solid state memory (e.g., Single Inline Memory Modules, or "SIMMs"), network interface cards and adapters, solid state PCMCIA interface adapters, and x86-based microprocessor upgrade products.

**Five Year Warranty:** The following Kingston products are covered by this warranty for a period of five years from the date of original retail purchase: storage enclosures, power supply units and subassemblies, Winchester hard disk drives with a capacity of one gigabyte or more, and all other Kingston products (other than those products covered by a two-year or one-year warranty, as provided below).

**Two Year Warranty:** The following Kingston products are covered by this warranty for a period of two years from the date of original retail purchase: Winchester hard disk drives in a 2.5 inch, 3.5 inch or 5.25 inch form factor and with a capacity of less than one gigabyte.

**One Year Warranty:** The following Kingston products are covered by this warranty for a period of one year from the date of original retail purchase: Winchester hard disk drives in a 1.8 inch form factor, optical storage products, and magnetic tape storage products.

## Warranty Claim Requirements

To obtain warranty service, return the defective product, freight prepaid and insured, to your local authorized Kingston dealer or distributor, or to the Kingston factory service center located at 17600 Newhope Street, Fountain Valley, California 92708, U.S.A. You must include the product serial number (if applicable) and a detailed description of the problem you are experiencing. For products covered by the five-year, two-year or one-year warranty, you must also include proof of the date of original retail purchase as evidence that the product is within the applicable warranty period. If you return the product directly to the Kingston factory, you must first obtain a Return Material Authorization ("RMA") number by calling Kingston Customer Service at (714) 438-1810, and include the RMA number prominently displayed on the outside of your package. Products must be properly packaged to prevent damage in transit.

## Free Technical Support

Kingston provides free technical support. If you experience any difficulty during the installation or subsequent use of a Kingston product, please contact Kingston's Technical Support Department at (714) 435-2639 prior to servicing your system. This warranty covers only repair or replacement of defective Kingston products, as provided above. Kingston is not liable for, and does not cover under warranty, any costs associated with servicing and/or installation of Kingston products.

## Disclaimers

The foregoing is the complete warranty for Kingston products and supersedes all other warranties and representations, whether oral or written. Except as expressly set forth above, no other warranties are made with respect to Kingston products and Kingston expressly disclaims all warranties not stated herein, including, to the extent permitted by applicable law, any implied warranty of merchantability or fitness for a particular purpose.

In no event will Kingston be liable to the purchaser, or to any user of the Kingston product, for any damages, expenses, lost revenues, lost savings, lost profits, or any other incidental or consequential damages arising from the purchase, use or inability to use the Kingston product, even if Kingston has been advised of the possibility of such damages.

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## Revision History

| <b>Revision Level</b> | <b>Comment</b>   |
|-----------------------|--|
| A00                   | First Release  |
| B00                   | New illustrations showing PQFP low-profile design. Updated Benchmark Test Results to include range of ValuePoint configurations (i.e. cache / no cache). Removed Socket Extender. Removed Jumper JP1. Added SL Enhanced Jumper to Troubleshooting. |