KINGSTON TECHNOLOGY
TURBOCHIP® 400
PROCESSOR UPGRADE
USER'S GUIDE

MODEL: TC400

Kingston Technology's

TurboChip® 400

400MHz AMD-K6® -2 Processor Upgrade with 3DNow!™ Technology For AMD-K5®, AMD-K6® and Pentium® Desktop Computers

User's Guide

Part No. 4460147-001.A00

Kingston Technology Company
17600 Newhope Street
Fountain Valley, CA 92708
(714) 435-2600

http://www.kingston.com

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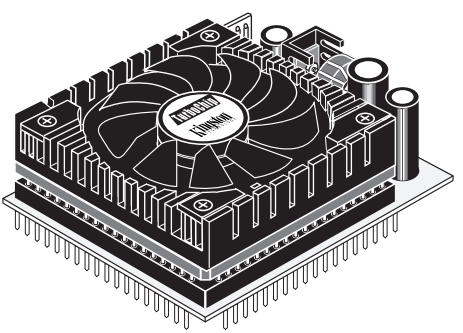
Introduction

Congratulations on the purchase of your Kingston ***TurboChip® 400*** processor upgrade designed for Pentium® 75MHz or higher computers. The TurboChip® model TC400 incorporates the AMD-K6® -2 processor to combine the power of 400MHz processing with graphics-enhancing 3DNow! Technology to equip your system with the necessary tools for today's exciting media-intensive graphics, sound, and video software applications.

TurboChip® 400 features 64KB of internal Level 1 cache, integrated cooling unit, and onboard voltage regulator to interface the processor with the voltage requirements of your system motherboard automatically. TurboChip® 400 is a convenient, high-performance solution to increase your computer's CPU speed over its current processor providing a perfect fit for 16-bit or 32-bit operating systems such as Microsoft Windows® 95, Windows® 98, and Windows NT®.

TurboChip® 400 is a chip-for-chip processor upgrade that installs directly into your existing Socket 5 or Socket 7 ZIF (zero-insertion-force) socket. Most desktop computers use ZIF sockets with a swing lever to make removing the CPU chip quick and easy. There are no software drivers to install or hardware jumpers to set. The TurboChip® package also includes an integrated heat sink and fan cooling unit to control the operating temperature of the TurboChip® for years of reliable service.



TurboChip® TC400

400MHz Processor Upgrade

Special Features

Your Kingston TurboChip® 400 includes these important features:

- Powerful 400 MHz AMD-K6-2 processor with 3DNow! Technology.
- Ideal processor upgrade for AMD-K5®, AMD-K6® and Pentium® based systems.
- 64KB Level One (L1) Cache.
- Designed with independent voltage management. No voltage settings are required.
- System clock-multiplier equipped for 400 MHz of processing power.
- Compatible with existing system hardware and software configurations.
- Integrated heat sink and fan cooling unit.
- Convenient male/female pass-through DC power cable.
- Supports Socket 5 or Socket 7 ZIF socket.
- Supports 3D and MMX™ technology enhancements.
- "Plug and Play" installation. No software drivers to install.

Package Contents

The TurboChip® package should contain the following items:

- TC400 processor upgrade
- User's Guide
- WinBench® 99 CD ROM
- Service Pack for Windows 95 OSR 2.x floppy disk

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 is one very important point to be aware of. First, notice the location of Pin 1 on the TurboChip® upgrade denoted by a white triangle on the bottom of the unit. This corner of the upgrade must match Pin 1 on the processor socket (See figures below). Your computer should be using either a Socket 5 or Socket 7 type processor socket. Pin 1 orientation is standard for both socket types. Take a few moments to read the section 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. The TurboChip® upgrade is keyed to fit only one way into the CPU socket. If the pins are aligned, the TurboChip® should easily slide into the socket. Refer to the figures below for proper orientation:

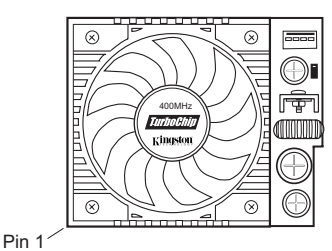


Figure 1: TurboChip Top View

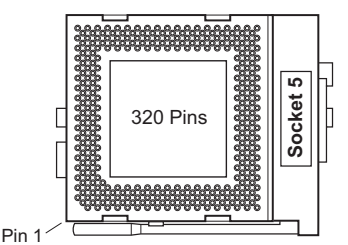


Figure 2: Empty Socket 5 Top View

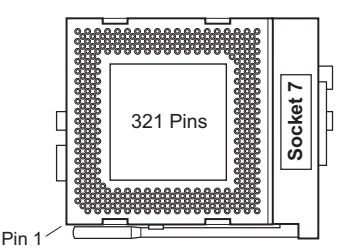


Figure 3: Empty Socket 7 Top View

Installing the TurboChip

The TurboChip® 400 processor upgrade is designed to work with AMD-K5®, AMD-K6® and Pentium® based systems that support Socket 5 or Socket 7 ZIF sockets. The installation procedure will differ slightly according to the location of your 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 CPU chip on your system board or CPU expansion card. The CPU chip will most likely have a large metal heatsink attached on top (See Figure 4 on the next page to view a standard heatsink). **Note:** some system manufacturers also include a cooling fan on top of the heatsink.
2. Make sure the CPU chip 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. **Remove the Heatsink Retaining Clip:** If your CPU has a heatsink similar to the illustration below, it is most likely secured with a retaining clip. Before removing the CPU chip from its socket, you must first unlatch the retaining clip by pressing down on the retaining clip **tab** (See Figure 4) and releasing the **latch**. Try not to touch the motherboard or any other components near the socket. With the retaining clip completely removed from the heatsink, you are ready to remove the CPU chip.

Note: The retaining clip is not needed for the TurboChip® upgrade.

2. **Unlock the Socket:** Socket 7 and Socket 5 ZIF (zero insertion force) sockets use a side bar lever to lock and unlock the socket. Unlatch the side lever and lift upward to unlock the processor chip.

3. Once the socket is in the unlocked position, remove the CPU by grasping the sides of the chip with your fingers.

   Note: you may use the TurboChip's protective foam packaging to store your original CPU chip.

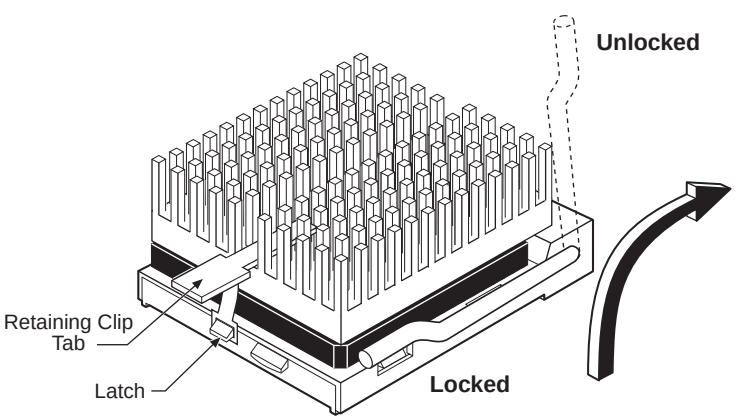


Figure 4: Removing the CPU Chip

Step 4. Orienting the TurboChip®

When installing the TurboChip®, the orientation of Pin 1 (See Figure 1 on page 3) must match Pin 1 on the processor socket (See Figures 2 and 3 on page 3). 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 to verify which corner is Pin 1. Refer to Figure 1 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: The processor pins are keyed to fit into the socket one way only. 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 5 below.

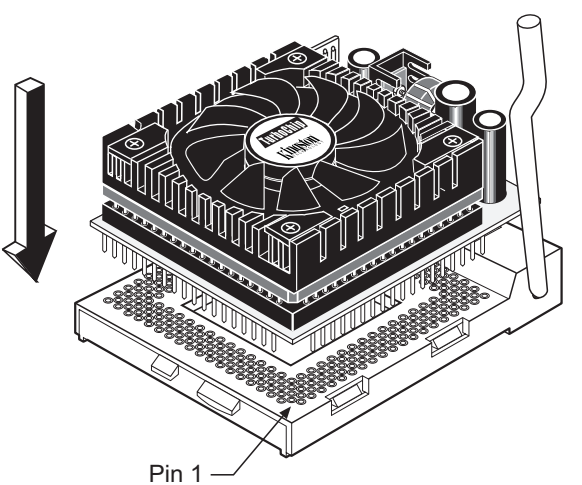


Figure 5: Orienting the TurboChip

Step 5. 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.

1. 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, but be careful not to press down on the fan unit. Instead, grasp the sides of the unit for handling.
2. Lower the sidebar to close the socket back to a locked position. Refer to Figure 6 below.

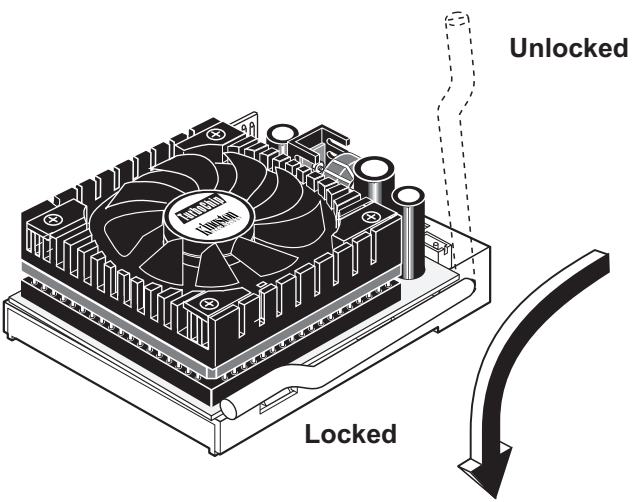


Figure 6: Securing the ZIF Socket

Step 6. Plugging in the DC Power Cable

The TurboChip® uses a standard 4-Pin power connector, which attaches to any available power connector coming from the computer's power supply. The power supply in your computer should have several power connectors available for adding hard drives, CD-ROMs, and other devices.

Find any available power connector that is not currently in use and attach it to the 4-Pin male connector from the TurboChip® (See Figure 7 below). If no power connectors are available, the TurboChip® also has an in-line female connector, which allows the upgrade to connect into an existing power line. Simply disconnect any non-primary power cable (e.g., floppy disk). Attach the male connector to the power source. Then reattach the other end of the cable to the in-line female connector on the TurboChip® cable.

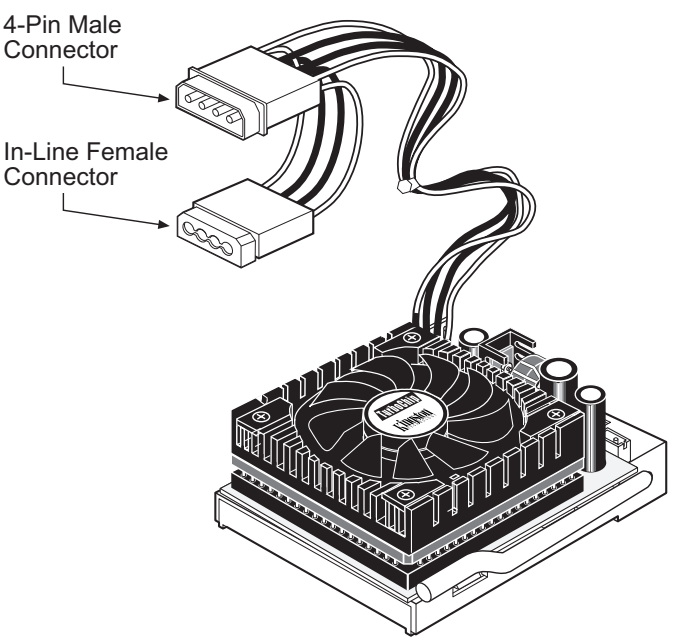


Figure 7: Attaching the Power Cable

Step 7. Completing the Installation

1. Replace any adapters removed earlier.

2. The TurboChip® 400 is designed with independent voltage management. Therefore, there are no special voltage settings required on the motherboard or the TurboChip 400®.

3. The TurboChip® 400 is equipped with a 6.0x internal clock multiplier to run at 400MHz of processing power with 66MHz external bus speed. The TurboChip® 400 is a simple plug-and-play upgrade. Depending on the clock frequency of your original processor, the external bus frequency may have a variety of settings. It would be recommended to use the 66MHz external bus speed for full performance. (Note: some systems may require a lower bus frequency (e.g. 60MHz) to operate correctly.

External Bus Speed	Clock Multiplier	Processing Speed
50MHz	6.0x	300MHz
60MHz	6.0x	366MHz
66MHz	**6.0x**	**400MHz**

4. Reconnect any cables, power cord, keyboard, mouse, etc…

5. 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.

6. If the computer starts correctly then replace the cover.

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 (refer to *"Appendix E Warranties and Notices"* for information on how to reach us).

Appendices

Appendix A Specifications

TurboChip® 400 Processor Upgrade	
Processor:	400 MHz AMD-K6®-2 with 3DNow! Technology
Internal Cache:	64KB Level one (L1) cache - 32KB data cache and 32KB instruction cache
Systems Supported:	AMD-K5®, AMD-K6® and Pentium® based systems
ZIF Socket Supported:	Socket 5 or Socket 7
Ext. Bus Supported	50 MHz, 60 MHz, and 66 MHz
Internal Clock Multiplier:	6.0x
DC Power Cable:	4-pin Molex connectors (male and female)
Environmental:	
Operating Temperature:	0°C to 70°C (32°F to 158°F)
Storage Temperature:	-10°C to 70°C (14°F to 158°F)
Relative Humidity:	10% to 90% non-condensing
Electrical:	
Power Consumption:	23.7 watts maximum
Physical:	
Dimension (HxWxD):	0.88" x 1.98" x 3.03" (22.4mm x 50.3mm x 22.4mm)
Weight:	0.33 lbs. (0.15 kg)
Certification:	
EMI Standards:	FCC Class B, CE CISPR B, C-Tick
EMC Standards:	EN55022, IEC801-2, IEC801-3, IEC801-4

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 Appendix C if using Windows® 95, to see if your problem is described. Try the suggested actions.

2. If still encountering problems, call Kingston Technical Support (refer to *"Appendix E Warranties and Notices"* for information on how to reach us). However, before you call, please 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 the fan on the TurboChip® unit. It should be spinning. Also check the 4-pin power cable which leads from the TurboChip® unit. Verify the power cable is plugged into the system power supply. Ensure that all the external 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. Then verify that the sidebar lever is down in the locked position after reinserting the unit.

3. Check that all other adapters are firmly seated in their sockets. Reconnect the power cable and turn the power on again.

4. If it still does not boot, remove the TurboChip® from your computer and replace it with the original Pentium processor. Try the power again. If the computer now starts, the processor upgrade may be incompatible with your computer. Contact Kingston Technical Support 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. Please check this connection again.

Older System BIOS

Some earlier systems do not support the faster CPU technology. In some cases, the computers have an older system BIOS that may be upgraded to support the TurboChip® 400 processor. The older incompatible BIOS may cause the system to lockup or not boot up at all.

This problem can sometimes be resolved by upgrading the BIOS version of your computer, either with a software update or by replacing the chips. First check with your computer manufacturer or visit their website for a software utility to update your existing BIOS. If your system does not support flash ROM software updates, the next option is to replace the BIOS chips.

BIOS chipsets are relatively inexpensive and can be purchased at your local computer store, or contact **Unicore Software, Inc.** at 1-800-800-BIOS (2467) to order a BIOS upgrade. Unicore supports all the major brands of BIOS chipsets, including AMI, Award, Phoenix, MR BIOS, and others. Unicore Software, Inc. can be contacted at:

Unicore Software, Inc.
1538 Turnpike Street
North Andover, MA 01845
(800) 800-BIOS
(800) 800-2467
(978) 686-6468
(978) 683-1630 Fax

Appendix C Windows® 95 Issue

Problem: When running Windows® 95 on a computer with an AMD-K6®-2 processor running at speeds of 350 MHz or above, you may receive one of the following errors:

- Device IOS failed to initialize.
- Windows Protection Error. You must reboot your computer.

Cause: The first error is a result of a divide exception in IOS.VXD, the second is due to a similar error within ESDI_506.PDR or SCSIPORT.PDR.

Certain Windows® 95 files need to be updated because they contain initialization timing loops that do not execute properly on the AMD-K6®-2 processor at speeds of 350 MHz or higher. This problem is due to limitations of the software algorithms and is not a problem with the processor itself.

Microsoft has confirmed this to be a problem in Microsoft Windows® 95 and OEM Service Release versions 2, 2.1 and 2.5.

This issue does not occur in Microsoft Windows® 98 or Microsoft Windows NT®.

Resolution: The Service Pack for Windows 95 OSR 2.x floppy disk contains the patch necessary to correct the problem. This patch only works with Windows® 95 OEM Service Release versions 2 or higher. To find out what version of Windows® 95 is installed on your system, right click on the 'My Computer' icon and select 'Properties'. An OEM Service Release 2 system will show a designator, such as "4.00.9500B" as the version. The number may vary slightly, but the designator will be a 'B' for the OSR2 version. Versions without a 'B', such as an 'A' or those with nothing after the number, cannot utilize this patch to fix the software timing loop issue.

To install the patch, insert the Service Pack for Windows 95 OSR 2.x floppy disk and double-click on **amdk6upd.exe** in Windows® Explorer.

For further information, please go to the following URL:

http://support.microsoft.com/support/kb/articles/q192/8/41.asp?FR=0

Appendix D WinBench® 99 CD-ROM

The TurboChip® 400 package includes the Ziff-Davis WinBench® 99 CD-ROM. WinBench® 99 is a benchmark utility that measures performance in a Windows based PC environment. The WinBench® 99 utility can only be run on a Windows® 95, Windows® 98 or Windows NT® system.

Installing WinBench® 99

To install WinBench® 99, insert the WinBench® 99 CD-ROM and the installation screen will come up automatically with AutoPlay enabled (For systems without AutoPlay enabled, run install from your CD-ROM). Choose WinBench® 99 from the installation screen. Setup will guide you through the installation.

Note: Users without CD-ROM access can download WinBench® 99 at: http://www.zdbop.com/zdbop/winbench/winbench.html

WinBench® 99 Processor Tests

WinBench® 99 contains CPUmark 99™ and the FPU WinMark 99 benchmarks that can be used to compare the performance of your original processor to that of your TurboChip® 400 processor upgrade. All applications must be closed before running either test. To start a test, scroll down to the chosen test and select it, then click on run. These tests may take several minutes. The results of the tests are not measured in a standard unit. Higher numbers indicate better performance.

For additional information on WinBench® 99 performance tests or to download the latest version of the software, please visit: http://www.zdbop.com

Appendix E Warranties and Notices

Limited Warranty Statement

KINGSTON TECHNOLOGY COMPANY ("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 provided by Kingston on an exchange basis, and will either be new or refurbished to be functionally equivalent to new.

This warranty does not cover any damage to this product that 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: memory modules and expansion boards, networking adapters, networking hubs without cooling fans (excluding the power supply), and microprocessor upgrade products.

***Seven Year Warranty*:** The following Kingston products are covered by this warranty for a period of seven years from the date of original retail purchase: all core storage enclosures (including the power supply), cables, terminators, and related accessories. Under certain agreements where core products are slightly modified (e.g. paint, handle, etc.) by Kingston at the customer's request, the product will be covered for a period of seven years for repair only. Storage products that are custom designed and /or incorporate component-level modification by Kingston in order to meet specific customer requests, will be negotiated with the applicable customer on a per case basis.

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: the power supply in networking hubs without cooling fans; Flash memory cards (e.g. CompactFlash, ATA Flash, and Linear Flash); solid state PC Card (PCMCIA) adapters, PC Card Readers and all other Kingston products (other than those products covered by a three-year, two-year, or one-year warranty, as provided below).

Three Year Warranty: The following Kingston products are covered by this warranty for a period of three years from the date of original retail purchase: networking hubs with cooling fans (including the power supply).

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: Solid State Floppy Disk Cards (SSFDC), and Winchester hard disk drives in a 2.5 inch, 3.5 inch or 5.25 inch form factor.

***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.

Rev. 3/99

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. 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 prior to servicing your system.

Kingston Technical Support can be reached in the U.S. at (714) 435-2639 or toll-free at (800) 435-0640 (U.S. and Canada only). Kingston European Technical Support can be reached from within the U.K. at 01932 738858. Kingston provides other service numbers when calling from Germany 0130 115 639 or fax 0130 860 599, from Austria 0660 5569 or fax 06 607 434, from Switzerland 0800 557 748 or fax 0800 552 182, from France 0800 905 701 or fax 0800 900 910, or from Belgium (in English) 0800 72763.

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 the 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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TurboChip® is a registered trademark of Kingston Technology Company. Pentium® is a registered trademark of Intel Corporation. AMD-K6® -2 is a registered trademark and 3DNow! is a trademark of Advanced Micro Devices, Inc. All other trademarks and registered trademarks are the property of their respective owners.

F.C.C. Certification

This device has been tested and found to comply with limits for Class B digital device, pursuant to Part 15 of the FCC Rules. Operation is subject to the following conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received; including interference that may cause undesired operation.

CE Notice

The official CE symbol indicates compliance of this Kingston Technology product to the EMC directive of the European Community. The CE symbol found here or elsewhere indicates that this product meets or exceeds the following standards:

- **EN50081-1** "Electromagnetic Compatibility-generic emissions standard"

  EN55022: "Limits and methods of measurement of radio interference characteristics."

- **EN50082-1** "Electromagnetic Compatibility-generic immunity standard"

  IEC 801-2: "Electrostatic discharge requirements"
  IEC 801-3: "Radiated immunity requirements"
  IEC 801-4: "Electrical fast transient requirements"

- **Declaration of CE Conformity** in accordance with the above standards has been made and is on file at Kingston Technology.

CE

C-Tick Certification

- **AS/NZS 3548** "Information Technology Equipment"

- **Declaration of C-Tick Conformity** in accordance with the above standards has been made and is on file at Kingston Technology.

N1298