

IBM Ultra320 SCSI Controller 2 User's Guide



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Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1000000 bytes, and GB stands for 1000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

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IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.

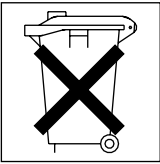
IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of programs and services to assist equipment owners in recycling their IT products. Information on product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.

Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

In the Netherlands, the following applies.



For Taiwan: Please recycle batteries.



Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two 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.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwanese Class A warning statement

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Chinese Class A warning statement

聲 明
此為 A 級產品。在生活環境中，該產品可能會造成無線電干擾。在這種情況下，可能需要用戶對其干擾採取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD or in the IntelliStation *Hardware Maintenance Manual* at the IBM Support Web site.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, go to <http://www.ibm.com/services/>, or go to <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Statement of Limited Warranty Z125-4753-08 04/2004

Part 1 - General Terms

General Terms

*This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.***

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

What this Warranty Does not Cover

This warranty does not cover the following:

- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and

- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

IBM does not warrant uninterrupted or error-free operation of a Machine.

Any technical or other support provided for a Machine under warranty, such as assistance with “how-to” questions and those regarding Machine set-up and installation, is provided **WITHOUT WARRANTIES OF ANY KIND**.

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you contact IBM for service, you must follow the problem determination and resolution procedures that IBM specifies. An initial diagnosis of your problem can be made either by a technician over the telephone or electronically by access to an IBM website.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called “BIOS”), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit (“CRU”) (e.g., keyboard, mouse, speaker, memory, hard disk drive), IBM will ship the CRU to you for you to install.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone or electronically, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

When the warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

Your Additional Responsibilities

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to:

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
3. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
4. where applicable, before service is provided:
 - a. follow the service request procedures that IBM or your reseller provides;
 - b. backup or secure all programs, data, and funds contained in the Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
 - d. inform IBM or your reseller of changes in the Machine's location.
5. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

IBM is responsible for loss of, or damage to, your Machine only while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller are responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM for any reason. You should remove all such information from the Machine prior to its return.

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Governing Law

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BOLIVIA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of La Paz.

BRAZIL

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

CHILE

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Civil Courts of Justice of Santiago.

COLOMBIA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of the Republic of Colombia.

EQUADOR

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of Quito.

MEXICO

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Federal Courts of Mexico City, Federal District.

PARAGUAY

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of Asuncion.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

URUGUAY

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the City of Montevideo Court's Jurisdiction.

VENEZUELA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Courts of the Metropolitan Area Of the City of Caracas.

NORTH AMERICA

How to Obtain Warranty Service: *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Limitation of Liability: *The following replaces item 1 of this section:*

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

What this Warranty Covers: *The following paragraph is added to this section:*

The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this section:*

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State or Territory.

CAMBODIA AND LAOS

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America.

CAMBODIA, INDONESIA, AND LAOS

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the SIAC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA

Governing Law: *The following replaces “laws of the country in which you acquired the Machine” in the first sentence:*

laws of Hong Kong Special Administrative Region of China.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence; and
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term “Machine” includes Machine Code and Licensed Internal Code (“LIC”).

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

Governing Law: *The following sentence is added to this section:*

Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

Limitation of Liability: *The word “SPECIAL” in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

What this Warranty Covers: *The following paragraph is added to this section:*

The warranties specified in this section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words "SPECIAL" and "ECONOMIC" in item 3 in the fifth paragraph are deleted.*

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

How to Obtain Warranty Service:

*Add the following paragraph in **Western Europe** (Andorra, Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Vatican State, and any country subsequently added to the European Union, as from the date of accession):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

If you purchase a Machine in one of the Western European countries, as defined above, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service.

If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase a Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

Governing Law:

The phrase “the laws of the country in which you acquired the Machine” is replaced by:

1) “the laws of Austria” in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia**; 2) “the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna**; 3) “the laws of Finland” in **Estonia, Latvia, and Lithuania**; 4) “the laws of England” in **Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe**; and 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland**.

Jurisdiction: The following exceptions are added to this section:

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) in **Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) in **Belgium and Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) in **France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) in **Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) in **South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) in **Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) in

the United Kingdom, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: *The following is added under this heading:*

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

The warranty for Machines acquired in EU countries is valid and applicable in all EU countries provided the Machines have been announced and made available in such countries.

How to Obtain Warranty Service: *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:

IBM Warranty & Service Quality Dept.
PO Box 30
Spango Valley
Greenock
Scotland PA16 0AH

CONSUMERS

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC"). The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.
2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

FRANCE AND BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC"). The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

The provisions of this Statement of Limited Warranty replace any applicable statutory warranties.

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this section:

The limitation period for consumers in action for breach of warranty is the statutory period as a minimum. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, IBM will reimburse you for the transportation charges for the delivery of the failing Machine to IBM.

Limitation of Liability: *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

GERMANY

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this section:

The minimum warranty period for Machines is twelve months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *The following is added to this section:*

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.
3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a “Default” means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for:
 - a. death or personal injury caused by the negligence of IBM; and
 - b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the table below.

Note:“Region” means either Hong Kong or Macau Special Administrative Region of China.

A warranty period of 3 years on parts and 1 year on labor means that IBM provides warranty service without charge for:

1. parts and labor during the first year of the warranty period; and
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor provided in performance of the repair or replacement(s) in the second and third year of the warranty period.

IBM Ultra320 SCSI Controller 2

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	1 year	1
* See “ Types of Warranty Service ” for the legend and explanations of warranty-service types.		

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM’s normal service area, contact your local IBM representative or your reseller for country and location specific information.

Customer Replaceable Unit (“CRU”) Service

IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your Machine and are available from IBM at any time on your request. Installation of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service designated for your Machine. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of the replacement.

3. On-site Service

IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. For some Machines, certain repairs may require sending the Machine to an IBM service center.

4. Courier or Depot Service*

You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

5. Customer Carry-In or Mail-In Service

You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM’s expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

6. CRU and On-site Service

This type of Warranty Service is a combination of Type 1 and Type 2 (see above).

7. CRU and Courier or Depot Service

This type of Warranty Service is a combination of Type 1 and Type 3 (see above).

8. CRU and Customer Carry-In or Mail-In Service

This type of Warranty Service is a combination of Type 1 and Type 4 (see above).

When a 5, 6 or 7 type of warranty service is listed, IBM will determine which type of warranty service is appropriate for the repair.

* This type of service is called ThinkPad EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM’s Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List

Phone numbers are subject to change without notice. For the warranty service contact telephone number in a country subsequently added to the EU and not yet reflected in the list below, contact IBM in that country or visit the website above for a current telephone listing.

Austria -- +43-1-24592-5901	Latvia -- +386-61-1796-699
Belgium -- +32-70-23-3392	Lithuania -- +386-61-1796-699
Cyprus -- +357-22-841100	Luxembourg -- +352-298-977-5063
Czech Republic -- +420-2-7213-1316	Malta -- +356-23-4175
Denmark -- +45-4520-8200	Netherlands -- +31-20-514-5770
Estonia -- +386-61-1796-699	Poland -- +48-22-878-6999
Finland -- +358-8001-4260	Portugal -- +351-21-892-7147
France -- +33-238-557-450	Slovakia -- +421-2-4954-1217
Germany -- +49-1805-253553	Slovenia -- +386-1-4796-699
Greece -- +30-210-680-1700	Spain -- +34-91-714-7983
Hungary -- +36-1-382-5720	Sweden -- +46-8-477-4420
Ireland -- +353-1-815-4000	United Kingdom -- +44-1475-555-055
Italy -- +39-800-820-094	

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Introduction

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Ultra320 SCSI on the Adaptec SCSI Card 29320ALP

The Adaptec SCSI Card 29320ALP enables you to connect up to 15 Low Voltage Differential (LVD) and/or 15 Single-Ended (SE) SCSI devices—such as very large arrays of high-performance hard disk drives, external storage subsystems, Ultra320/160 hard disk drives, scanners, and CD-ROM drives—to any Intel-based computer with 64- or 32-bit PCI/PCI-X expansion slots. Ultra320 is an enhanced SCSI technology that transfers data at up to 320 MB/sec. Ultra320 SCSI allows cable length of up to 12 meters for optimal connectivity and flexibility.¹

The low profile Adaptec SCSI Card 29320ALP is a single channel SCSI card with a maximum throughput of of 320 MB/sec. You can

connect Ultra320/160 and Ultra2 SCSI devices to the internal 68-pin Low Voltage Differential/Single-Ended (LVD/SE) connector and the external very high-density cable interconnect (VHDCI) connector.

For the best data I/O performance, Adaptec recommends that you keep your Low Voltage Differential (LVD) and non-LVD devices separate. (*LVD devices* means Ultra 320, Ultra160, and Ultra2 SCSI devices and non-LVD are Fast SCSI or Ultra SCSI devices.)

Although an Adaptec SCSI Card 29320ALP is a 64-bit PCI/PCI-X card, it also works in a 32-bit PCI slot. When installed in a 32-bit PCI slot, the card automatically runs in the slower 32-bit mode.

This *User's Guide* provides information about using the Adaptec SCSI Card 29320ALP and SCSI devices, troubleshooting, SCSI termination, and other important topics. It explains how to use the built-in SCSISelect[®] utility if you need to change Adaptec SCSI Card 29320ALP settings. It also explains how to install the software device drivers for your operating system.



Note: Read the *Installation Guide* for your Adaptec SCSI Card 29320ALP if you need instructions on installing the Adaptec SCSI Card 29320ALP and connecting SCSI devices to it.

¹ When only one Ultra2 or Ultra320/Ultra160 SCSI device is connected, the cable length can be up to 25 meters (82 feet).

Device Drivers

An Adaptec SCSI Card 29320ALP comes with a set of software device drivers and other files that enable it to communicate with your computer. The following table lists the correct driver for your operating system.

Operating System	Ultra320 Driver
Windows NT 4.0	adpu320.sys
Windows 2000	adpu320.sys
Windows XP	adpu320.sys
NetWare	adpu320.ham
SCO UnixWare	adpu320
Caldera Open Unix	adpu320

For information on how to install the driver for an Adaptec SCSI Card 29320ALP, refer to the section of this *User's Guide* that describes your specific operating system.

Operating Systems

The Adaptec SCSI Card 29320ALP supports these operating systems:

- Windows NT[®] 4.0
- Windows[®] 2000
- Windows[®] XP
- Novell NetWare 4.2, 5.0, 5.1, 6.0
- Caldera Open Unix 8
- SCO UnixWare 7.11
- Linux
 - Red Hat 7.2/Red Hat Advanced Server 2.1/Red Hat 7.3
 - SuSE 7.0 Enterprise/SuSE 7.3/8.0



Note: For Linux operating system drivers, go to the Adaptec Web site at: <http://opensource.adaptec.com>.

System Requirements

The minimum system requirements needed to install Adaptec SCSI Card device drivers are:

- A PCI computer, with an installed and configured Adaptec Ultra320 host adapter(s).
- The driver floppy disks included with your Adaptec SCSI Card 29320ALP.
- An installed and configured CD-ROM drive.
- The distribution software and documentation included with your operating system.

Understanding SCSI

SCSI (pronounced “scuzzy”) stands for Small Computer Systems Interface. SCSI is an industry standard computer interface for connecting SCSI devices (such as a hard disk drive, CD-ROM drive, or scanner) to a common SCSI bus.

A SCSI bus is an electrical pathway that consists of a SCSI adapter card (such as the Adaptec SCSI Card 29320ALP) installed in a computer and one or more SCSI devices. SCSI cables are used to connect the devices to the SCSI adapter card.

For the SCSI bus to function properly, a unique SCSI ID must be assigned to the SCSI card and each SCSI device connected to it, and the SCSI bus must be properly terminated.

SCSI IDs

Each device attached to an Adaptec SCSI Card 29320ALP, as well as the Adaptec SCSI Card 29320ALP itself, must be assigned a unique SCSI ID number from 0 to 15 for each of the two SCSI buses. A SCSI ID uniquely identifies each SCSI device on the SCSI bus and determines priority when two or more devices are trying to use the SCSI bus at the same time.

Refer to the device’s documentation to set the SCSI ID. Here are some general guidelines for SCSI IDs:

- For internal SCSI devices, the SCSI ID usually is set by configuring a jumper on the device.
- For external SCSI devices, the SCSI ID usually is set with a switch on the back of the device.
- SCSI ID numbers do not need to be sequential, as long as the Adaptec SCSI Card 29320ALP and each device has a different number. For example, on each of the two SCSI buses you can have an internal SCSI device with ID 0, and an external SCSI device with ID 6.
- SCSI ID 7 has the highest priority on the SCSI bus. The priority of the remaining IDs, in descending order, is 6 to 0, then 15 to 8.
- Most internal SCSI hard disk drives come from the factory preset to SCSI ID 0.

- If you have 8-bit (or Narrow) SCSI devices, they must use SCSI IDs 0, 1, 2, 3, 4, 5, or 6. SCSI ID 0 is recommended for the first SCSI hard disk drive.
- If you are booting your computer from a SCSI hard disk drive connected to the Adaptec SCSI Card 29320ALP, the Boot SCSI ID setting in the *SCSISelect* utility must correspond to the SCSI ID of the device from which you are booting. By default, the Boot SCSI ID is set to 0. We recommend that you do not change this setting.
- With the *SCSISelect* disk utility feature, you can confirm/view which SCSI ID is assigned to each device. See [Chapter 3, Configuring the Adaptec SCSI Card 29320ALP with SCSISelect](#) for more information.

Terminating the SCSI Bus

To ensure reliable communication on the SCSI bus, the ends of the SCSI bus must be properly terminated. This is accomplished when the device at the end of each cable, or the end of the cable itself, has a terminator installed (or enabled). Terminators must be removed, or termination must be disabled, on devices between the ends of each cable.

Since the method for terminating a SCSI device can vary widely, refer to the device's documentation for instructions on how to enable or disable termination. Here are some general guidelines for termination:

- Internal Ultra320/160 and Ultra2 SCSI LVD devices come from the factory with termination disabled and cannot be changed. Proper termination for these internal devices is provided by the built-in terminator at the end of the 68-pin internal LVD SCSI cable.

- Termination on SE internal SCSI devices is usually controlled by manually setting a jumper or a switch on the device, or by physically removing or installing one or more resistor modules on the device.
- Termination on most external SCSI devices is controlled by installing or removing a SCSI terminator. However, termination on some external SCSI devices is enabled or disabled by setting a switch on the back of the SCSI device.
- By default, termination on an Adaptec SCSI Card 29320ALP itself is set to *Automatic* (the preferred method). We recommend that you do not change this default setting. This automatic setting is just for the Adaptec SCSI Card 29320ALP itself; the card cannot change the termination setting on a device.
- Internal and External Ultra320/160 and Ultra2 SCSI LVD SCSI buses *must* be terminated with an LVD terminator. This is sometimes referred to as an LVD terminator or a Multi-Mode terminator.

Using the Adaptec SCSI Card and SCSI Devices

In this Chapter

<i>Using SCSI Devices</i>	2-2
<i>Combining SCSI and Non-SCSI Devices</i>	2-4
<i>Installing Multiple SCSI Cards</i>	2-5
<i>Overriding SCSI Termination Settings</i>	2-7
<i>Connecting SCSI Devices</i>	2-8

This section provides useful information on using the Adaptec SCSI Card 29320ALP and your SCSI devices. For more information about a specific SCSI device, refer to the documentation for that device.

Using SCSI Devices

Using SCSI Hard Disk Drives

- If you connect a SCSI hard disk drive to an Adaptec SCSI Card 29320ALP that was previously connected to a different SCSI card, it is recommended that you low-level format the drive before you can use it. Back up the data on the drive before moving the drive to the new SCSI card and before you format the drive. (See [Using SCSI Disk Utilities on page 3-15](#) for information on using the *SCSISelect* format utility.)

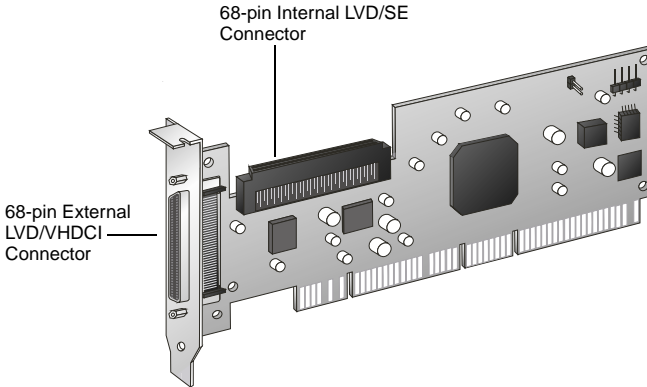


Caution: A low-level format destroys all data on the drive. Be sure to back up the data before performing a low-level format.

- Every SCSI hard disk drive must be physically low-level formatted, partitioned, and logically formatted before it can be used to store data. Most SCSI drives are preformatted at the factory. If your SCSI hard disk drive has *not* been preformatted at the factory, and if your computer is running under DOS, you can prepare the disk with the DOS *Fdisk* and *Format* commands. (See the DOS and Windows documentation for more information.) To format SCSI hard disk drives running under other operating systems, see the operating system documentation.

Using Ultra320/160 Hard Disk Drives

- We recommend keeping your LVD (Ultra 320, Ultra160 and Ultra2) SCSI devices separate from your non-LVD SCSI devices. If you combine LVD and non-LVD SCSI devices on the same SCSI channel, the data transfer rate of the LVD SCSI devices will drop down to non-LVD SCSI performance levels of up to 40 MB/sec.



- Internal LVD SCSI devices come from the factory with termination disabled and cannot be changed. Proper termination is provided by the terminator at the end of the internal LVD SCSI cable.

Using SCSI Devices

If you connect SCSI devices (such as scanners, tape drives, zip drives, etc.) to your Adaptec SCSI Card 29320ALP, you must install the device manufacturer's proprietary software drivers. See your device's documentation for details.

Combining SCSI and Non-SCSI Devices

You can install an Adaptec SCSI Card 29320ALP in a computer that already has a non-SCSI controller, such as an ATA controller. However, you cannot cross-connect the disk drives and other devices: SCSI devices must be connected to an Adaptec SCSI Card 29320ALP, ATA devices must be connected to the ATA controller, and so on.

When you install an Adaptec SCSI Card 29320ALP and SCSI disk drives in a computer that boots from a non-SCSI disk drive, the computer will continue to boot from the non-SCSI disk drive unless you change the computer's CMOS configuration. You do not need to change the configuration if you just want to use the SCSI drives for additional file storage space.

If your computer's motherboard BIOS supports the BIOS Boot Specification (BBS) feature, you can select a different boot device without much difficulty. (To determine if the motherboard BIOS supports BBS, read the computer documentation or contact your motherboard manufacturer.)

The following table shows what to do, after you physically install the SCSI card and SCSI devices, to use different kinds of disk drives in the same computer:

Does computer BIOS support BBS?	Want computer to boot from SCSI drive?	Then do this:
No	No	No action required. SCSI drives and non-SCSI drives can be used together.
No	Yes	Run CMOS Setup program. Change primary Hard Disk setting to None or No Drives Installed (see computer documentation). <i>You will not be able to use the non-SCSI drive(s) at all</i> when you boot from the SCSI drive.
Yes	No	No action required. SCSI drives and non-SCSI drives can be used together.
Yes	Yes	Run CMOS Setup program and select SCSI drive as boot device. SCSI drives and non-SCSI drives can be used together.

Installing Multiple SCSI Cards

- You can install multiple SCSI cards in your computer; you are limited only by the available system resources (for example, IRQ settings, I/O port addresses, BIOS addresses, and so forth).
- Each SCSI card you install forms a separate SCSI bus with a different set of SCSI devices. SCSI IDs can be reused as long as the ID is assigned to a device on a different SCSI card (for example, each SCSI card can have a device with SCSI ID 2).
- If you have two or more SCSI cards and your computer boots from a SCSI disk drive, leave the host adapter BIOS enabled on the SCSI card to which the boot disk drive is connected. Use *SCSISelect* to disable the host adapter BIOS on the other SCSI cards.

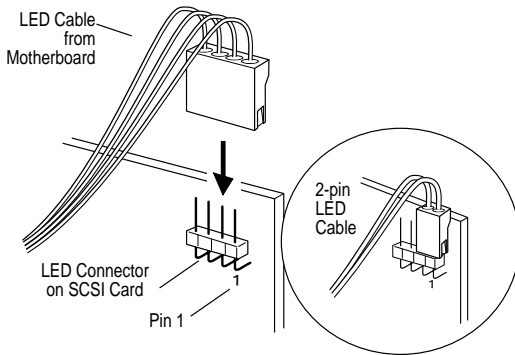
- If you have two or more SCSI cards, you can choose which SCSI card is found first by your system by physically changing the order of the SCSI cards in the PCI slots. Your system scans the PCI slots in a set order.

Connecting the LED Connector

(*Optional feature*) Most computers have an LED disk activity light on the front panel of the system case. If you choose to disconnect the cable from the LED connector on the motherboard and connect it to the LED connector on the SCSI card as shown in the figure below, the LED on the front panel of the computer will light whenever there is activity on the SCSI bus.



Note: If you connect the LED cable to the SCSI card, the LED disk activity light will no longer indicate disk activity on the non-SCSI disk drives.



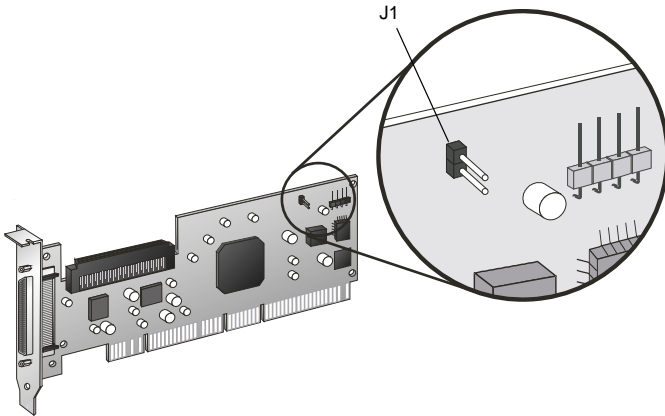
Overriding SCSI Termination Settings

You use *SCSISelect* to control the termination of the SCSI channel on an Adaptec SCSI Card 29320ALP. The default termination setting for the channel is *Automatic*. This setting allows the SCSI card to adjust SCSI termination automatically, depending on which connectors have SCSI devices attached to them.

Regardless of the *SCSISelect* termination setting, the SCSI card termination is always disabled when the power is turned off. If you want SCSI card termination to be enabled when the power is turned off, you must terminate the SCSI channels manually.

Manual Termination

To manually terminate the channel on the Adaptec SCSI Card 29320ALP, place a shunt on jumper J1. The following figure shows where the jumper is located on Adaptec SCSI card 29320ALP.



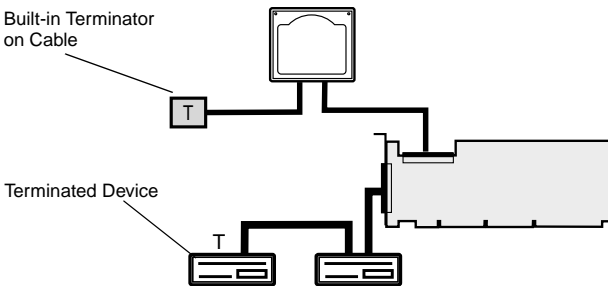
Note: If you manually terminate the SCSI card with jumpers, you will override the *SCSISelect* setting. Making changes in *SCSISelect* will have not effect on termination when these jumpers are installed.

You might want to manually terminate the SCSI card if an Adaptec SCSI Card 29320ALP is connected to one or more external SCSI devices that are also connected to a SCSI card in another computer. The devices can be shared between the two computers if one SCSI card is terminated when it is powered off, while the computer with the other SCSI card is using the SCSI devices.

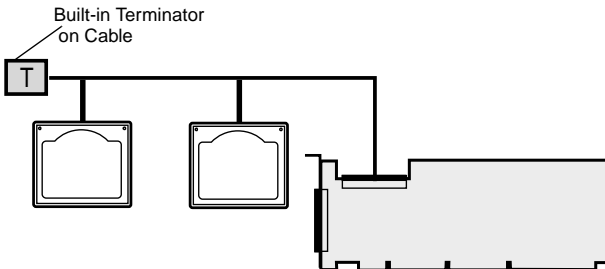
Connecting SCSI Devices

Here are some examples of how you can connect internal and external SCSI devices to an Adaptec SCSI Card 29320ALP.

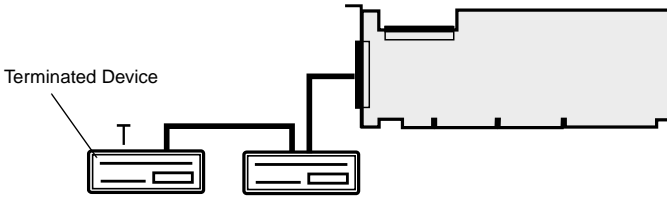
To achieve maximum performance, attach the first device to the end connector of the cable (furthest from the SCSI card); attach other devices to the connectors that are closer to the SCSI card. The following example shows how you can connect internal and external SCSI devices to the Adaptec SCSI Card 29320ALP.



The following example shows SCSI devices connected to the internal connector.



The following example shows SCSI devices connected to the external connector.



Maximum Cable Lengths

The total length of cabling (internal and external) on the SCSI bus cannot exceed the maximum lengths listed in the following table. The third column lists the maximum number of SCSI devices you can connect to the SCSI card.

Maximum Cable Length	Data Transfer Rate	Maximum Devices Supported
25 m (82.0 ft)	Ultra320 SCSI (320 MB/sec) Ultra160 SCSI (160 MB/sec) Ultra2 SCSI (80 MB/sec)	1
12 m (39.4 ft)	Ultra320 SCSI (320 MB/sec) ¹ Ultra160 SCSI (160 MB/sec) Ultra2 SCSI (80 MB/sec)	15
3 m (9.8 ft)	Fast Wide SCSI (20 MB/sec)	15
3 m (9.8 ft)	Fast SCSI (10 MB/sec)	7
3 m (9.8 ft)	Ultra SCSI (40 MB/sec for 16-bit, 20 MB/sec for 8-bit)	4
1.5 m (4.9 ft)	Ultra SCSI (40 MB/sec for 16-bit, 20 MB/sec for 8-bit)	5-7 ²

¹ Mixing Fast/Ultra devices with Ultra320/Ultra160 and Ultra2 SCSI devices causes the entire SCSI bus to default to Ultra SCSI speeds and cable length requirements.

² Ultra SCSI data transfer rates do not currently support more than seven devices connected to the SCSI card due to cable lengths.

Configuring the Adaptec SCSI Card 29320ALP with *SCSISelect*

In this Chapter

<i>Starting SCSISelect</i>	3-3
<i>Using SCSISelect Settings</i>	3-4
<i>Changing Configuration Settings</i>	3-10
<i>Using SCSI Disk Utilities</i>	3-15

SCSISelect, which is included with the Adaptec SCSI Card 29320ALP, enables you to change SCSI settings without opening the computer or handling the card. *SCSISelect* also enables you to low-level format or verify the disk media of your SCSI hard disk drives. The following table lists the available and default settings for each *SCSISelect* option.

The default settings are appropriate for most systems and should not be changed. Run *SCSISelect* if you need to change or view current settings, or if you need to use the SCSI disk utilities. See the descriptions of each option, starting on [page 3-4](#).

SCSISelect Options	Available Settings	Default Setting
SCSI Bus Interface Definitions:		
SCSI Controller ID	0-15	7
SCSI Controller Parity	Enabled Disabled	Enabled
SCSI Controller Termination:		
Ch. A	Automatic, Enabled, Disabled	Automatic
Ch. B	Automatic, Enabled, Disabled	Automatic
Boot Device Configuration Options—BBS Systems Only:		
Select Master SCSI Controller	A, B	A
Boot Device Configuration—Non-BBS Ssystems Only:		
Select Master SCSI Controller	A, B	A
Boot SCSI ID [<i>Auto-sync</i>]	0-15	0
Boot LUN Number ¹ [<i>Auto-sync</i>]	0-7	0
SCSI Device Configuration Options:		
Sync Transfer Rate (MB/sec)	320, 160, 80.0, 66.6, 320 40.0, 33.3, 20.0, 10.0, ASYN	
Packetized	Yes, No	Yes (Enabled)
QAS	Yes, No	Yes (Enabled)
Initiate Wide Negotiation	Yes, No	Yes (Enabled)
Enable Disconnection	Yes, No	Yes (Enabled)
Send Start Unit Command	Yes, No	Yes (Enabled)
BIOS Multiple LUN Support ¹	Yes, No	No (Disabled)
Include in BIOS Scan ²	Yes, No	Yes (Enabled)
Advanced Configuration:		
Reset SCSI Bus at IC Initialization	Enabled, Disabled	Enabled
Display <Ctrl> <A> Messages during BIOS Initialization [<i>Auto-sync</i>]	Enabled, Disabled	Enabled
Extended INT 13 Translation for DOS Drives > 1 GB	Enabled, Disabled	Enabled

SCSISelect Options	Available Settings	Default Setting
Post Display Mode	Verbose, Silent, Diagnostic	Verbose
SCSI Controller INT 13 Support	Enabled Disabled: Scan Bus Disabled: Not Scan	Enabled
Domain Validation	Enabled, Disabled	Enabled
Support Removable Disks Under INT 13 as Fixed Disks ²	Disabled, Boot Only, All Disks	Disabled
BIOS Support for Bootable CD-ROM ²	Enabled, Disabled	Enabled

¹ Setting is valid only if Multiple LUN Support is enabled.

² Settings are valid only if host adapter BIOS is enabled.

Starting SCSISelect

To start SCSISelect:

- 1 Turn on or restart your computer.

During the startup process, pay careful attention to the messages that appear on your screen.

- 2 When the following message appears on your screen, press the **Ctrl-A** keys simultaneously (this message appears for only a few seconds):

Press <Ctrl><A> for SCSISelect (TM) Utility!

- 3 From the menu that appears, use the arrow keys to move the cursor to the option you want to select, then press **Enter**.

Exiting SCSISelect

To exit SCSISelect:

- 1 Press **Esc** until a message prompts you to exit (if you changed any settings, you are prompted to save the changes before you exit).
- 2 At the prompt, select **Yes** to exit, then press any key to restart the computer. Any changes you made in SCSISelect take effect after the computer restarts.

Using SCSISelect Settings

To select an option, use the arrow keys to move the cursor to the option, then press **Enter**. In some cases, selecting an option displays another menu. You can return to the previous menu at any time by pressing **Esc**.

To restore the original SCSISelect default values, press **F6** from the main SCSISelect screen.

SCSI Bus Interface Options

- **SCSI Controller ID**—(Default: 7) Sets the SCSI ID for the SCSI card. The Adaptec SCSI Card 29320ALP is set at 7, which gives it the highest priority on the SCSI bus. We recommend that you do not change this setting.
- **SCSI Controller Parity**—(Default: *Enabled*) SCSI cards perform parity checking to verify the accuracy of data transfer on the SCSI bus. Most currently available SCSI devices support parity checking. However, if a device on the SCSI bus does not support parity checking, disable this option. This setting changes parity for the entire SCSI controller and the way it looks at each ID on that controller. You cannot mix devices that do and do not support parity checking on the same SCSI bus.
- **SCSI Controller Termination**—(Default: *Automatic*) Determines the termination setting for the SCSI card. The default setting is *Automatic*, which allows the SCSI card to adjust the termination as needed. We recommend that you do not change this setting.

Boot Device Configuration Options – *BBS Systems Only*

Select Master SCSI Controller—Enables the user to select the boot SCSI card. The master SCSI card does not necessarily have to be the same as the boot SCSI card.

Boot Device Configuration – Non-BBS Systems Only

- **Select Master SCSI Controller**—(Default: *A First*) Specifies which of the two SCSI channels the boot device is connected to (if the computer boots from a SCSI device). If you change this setting, the change automatically applies to both SCSI channels.
- **Boot SCSI ID**—(Default: *0*) Specifies the SCSI ID of your boot device. We recommend that you do not change the default setting. If you change this setting, the change automatically applies to both SCSI channels.
- **Boot LUN Number**—(Default: *0*) Specifies which LUN (Logical Unit Number) to boot from on your boot device. This setting is not valid unless Multiple LUN Support is enabled (see [Advanced Configuration Options on page 3-7](#)). If you change this setting, the change automatically applies to both SCSI channels.

SCSI Device Configuration Options

SCSI Device Configuration options can be set individually for each connected SCSI device.



Note: To configure settings for a SCSI device, you must know its SCSI ID (see [Using SCSI Disk Utilities on page 3-15](#)).

- **Sync Transfer Rate**—(Default: *320*) Determines the maximum synchronous data transfer rate that the SCSI card supports. We recommend that you leave the maximum (default) value of 320 MB/sec.
- **Packetized**—(Default: *Yes*) Packetized protocol is required to operate at 320 MB/sec. When enabled, this option is available if it is implemented in the device drivers. However, this option is not supported by the BIOS.
- **QAS**—(Default: *Yes*) Quick Arbitration and Selection reduces the overhead of control release on the SCSI bus from one device to another. This improvement reduces command overhead and maximizes bus utilization. When enabled, this option is available if it is implemented in the device drivers. However, this option is not supported by the BIOS.

- **Initiate Wide Negotiation**—(Default: *Yes*) Enables the SCSI controller to initiate Wide Negotiation with the SCSI target. When set to **Yes**, the SCSI card attempts 16-bit data transfer (wide negotiation). When set to **No**, the SCSI card uses 8-bit data transfer unless the SCSI device requests wide negotiation.



Note: Set Initiate Wide Negotiation to **No** if you are using an 8-bit SCSI device that hangs or exhibits other performance problems with 16-bit data transfer rate enabled.

- **Enable Disconnection**—(Default: *Yes*) When set to **Yes**, Enable Disconnection allows the SCSI device to disconnect from the SCSI bus. When set to **No**, the SCSI device cannot disconnect from the SCSI bus. Leave the setting at **Yes** if two or more SCSI devices are connected to the SCSI card. When Enable Disconnection is set to **No**, the SCSI device cannot disconnect from the SCSI bus, packetized transfers cannot occur, and transfer rates are set at Ultra 160 levels.
- **Send Start Unit Command**—(Default: *Yes*) When set to **Yes**, sends the Start Unit Command to the SCSI device at bootup. This reduces the load on a computer's power supply by allowing the SCSI card to turn on SCSI devices one-by-one when the computer boots; otherwise, all SCSI devices turn on at the same time.



Note: Check the device documentation to make sure the device supports the command. On most devices, you must also change a switch or jumper setting on the device to enable the device to respond to the command.

The following options have no effect if the SCSI card BIOS is disabled. (The SCSI card BIOS is normally enabled by default.)

- **BIOS Multiple LUN Support**—(Default: *No*) Leave this setting at **No** if the device does not have multiple LUNs. When set to **Yes**, the SCSI card BIOS provides boot support for a SCSI device with multiple LUNs (for example, a CD *juke box* device in which multiple CDs can be accessed simultaneously).

- **Include in BIOS Scan**—(Default: *Yes*) When set to **Yes**, the SCSI card BIOS controls the SCSI device if it is an INT 13 device (such as a SCSI disk drive) without device driver software. When set to **No**, the SCSI card BIOS does not control the SCSI device and device driver software is required. The BIOS can support up to eight INT 13 devices without an additional device driver.

Advanced Configuration Options



Caution: Do not change the Advanced Configuration Options unless absolutely necessary and you thoroughly understand the consequences of the change.

- **Reset SCSI Bus at IC Initialization**—(Default: *Enabled*) When set to **Enabled**, the BIOS resets the SCSI bus at POST time and then waits two seconds before scanning the bus for SCSI devices. If this option is disabled, the SCSI card BIOS does not issue a SCSI reset and there is no two-second delay.
- **Display <Ctrl> <A> Messages during BIOS Initialization**—(Default: *Enabled*) When set to **Enabled**, the SCSI card BIOS displays the **Press <Ctrl> <A> for SCSISelect (TM) Utility!** message on your screen during system bootup. If this setting is disabled, you can still invoke the SCSISelect Utility by pressing **<Ctrl> <A>** after the SCSI card BIOS banner appears. If you change this setting, the change automatically applies to both SCSI channels.
- **Extended INT 13 Translation for DOS Drives > 1 GByte**—(Default: *Enabled*) When set to **Enabled**, provides an extended translation scheme for SCSI hard disks with capacities greater than 1 GB. This setting is necessary only for current versions of MS-DOS; it is not required for other operating systems, such as NetWare or UNIX.



Caution: Changing the translation scheme destroys all data on the drive. Be sure to back up your disk drives before changing the translation scheme.

- **Post Display Mode**—(Default: *Verbose*) During POST, the amount of information displayed depends on the mode. If you change this setting, the change automatically applies to both SCSI channels. The following modes are available:
 - **Verbose**—The results of the SCSI bus scan are displayed, but the results of the PCI bus scan are not displayed.
 - **Silent**—Nothing is displayed about POST, not even the Adaptec banner. However, error messages are displayed if there is a problem on the SCSI bus or SCSI devices.



Caution: Setting this feature to Silent completely disables the messages displayed by the Adaptec Ultra320 SCSI card during the restart of the system. You will have to remember where in the POST cycle of the BIOS the Press Ctrl-A to enter SCSI *Select* message was displayed, and press **Ctrl-A** at that time to get into SCSI *Select*. If you press **Ctrl-A** too early or too late, you will not be able to enter into the the cards setup.

- **Diagnostic**—The PCI and SCSI bus scan results are displayed separately. There is a pause between PCI and SCSI scans.
- **SCSI Controller INT 13 Support**—(Default: *Enabled*) This option controls the state of the BIOS at POST time. The following settings are available:
 - **Enabled**—Supports INT 13 for booting from a SCSI hard disk drive connected to the SCSI card. If you use this option, the following options are available:
 - Extended INT 13 Translation for DOS Drives > 1 GB
 - Support Removable Disks Under INT 13 as Fixed Disks
 - BIOS Support for Bootable CD-ROM
 - **Disabled:NOT Scan**—Set to this option if all the devices on the SCSI bus (for example, CD-ROM drives) are controlled by software drivers and do not need the BIOS, and you do not want the BIOS to scan the SCSI bus. SCSI*Select* remains available if needed.

- **Disabled:Scan Bus**—Set to this option if all the devices on the SCSI bus (for example, CD-ROM drives) are controlled by software drivers and you need the BIOS to scan the SCSI bus. Allows devices to spin up according to the setting of the Send Start Unit Command. SCSISelect remains available if needed.

The following options have no effect if the SCSI card BIOS is disabled. (The SCSI card BIOS is normally enabled by default.)

- **Domain Validation**—(Default: *Enabled*) Determines the optimal transfer rate for each device on the SCSI bus and sets transfer rates accordingly. When enabled, this option is available if it is implemented in the device drivers. However, this option is not supported by the BIOS. If you change this setting, the change automatically applies to both SCSI channels.
- **Support Removable Disks Under INT 13 as Fixed Disks**—(Default: *Disabled*) Determines which removable-media drives are supported by the SCSI card BIOS. The options are as follows:
 - **Disabled**— No removable-media drives running under DOS are treated as hard disk drives. Software drivers are required because the drives are not controlled by the BIOS.



Caution: *You may lose data* if you remove a removable-media cartridge from a SCSI drive controlled by the SCSI card BIOS while the drive is on. If you want to be able to remove the media while the drive is on, install the removable-media software driver and set Support Removable Disks Under BIOS as Fixed Disks to **Disabled**.

- **Boot Only**—Only the removable-media drive designated as the boot device is treated as a hard disk drive.

- **All Disks**—All removable-media drives supported by the BIOS are treated as hard disk drives. This setting has no effect on drives under NetWare because NetWare automatically supports removable-media drives as hard disk drives.



Note: The Boot Only and All Disks options are available only if the SCSI Controller BIOS option is enabled.

- **BIOS Support for Bootable CD-ROM**—(Default: *Enabled*)
When set to **Enabled**, the SCSI card BIOS allows the computer to boot from a CD-ROM drive. If booting from a hard disk or other device, make sure no bootable CD is inserted, or disable this option.

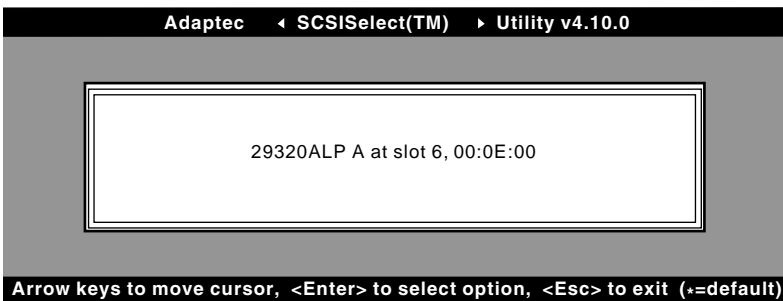
Changing Configuration Settings

The factory default settings for Adaptec SCSI cards are correct for most computers. However, if you need to change the settings for the SCSI card or a SCSI device:

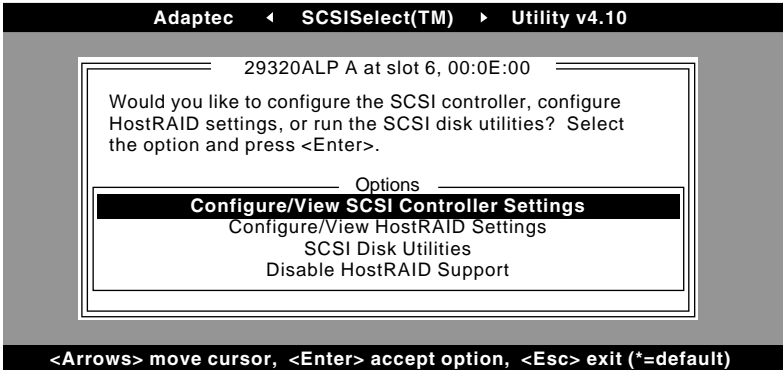
- 1 If you have not yet installed the SCSI card and the SCSI devices, do so now. Refer to your SCSI card *Installation Guide* for details.
- 2 Start *SCSISelect*. See [Starting SCSISelect on page 3-3](#).

SCSISelect detects all Adaptec SCSI cards and displays the model number, channel letter, slot number, and PCI address for each card and channel. Channels are listed separately.

- 3 Select a channel and press **Enter**.



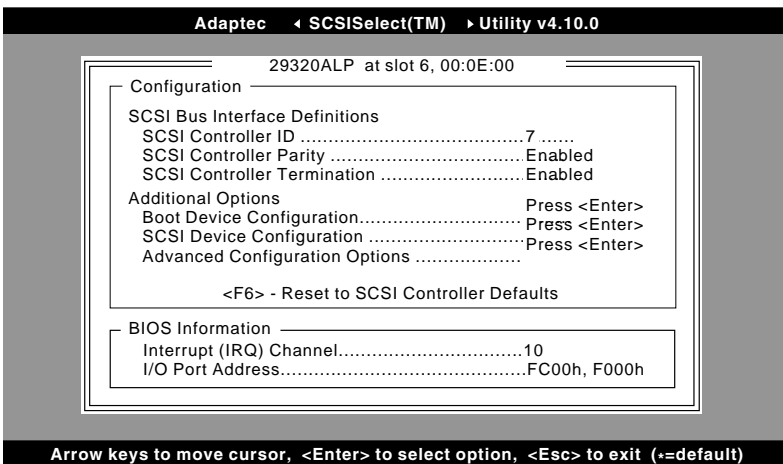
- 4 The Options menu appears. Select **Configure/View SCSI Controller Settings**. (For details on *Using SCSI Disk Utilities*, see page 3-15.)



The Configuration menu appears. The Configuration menu displays the current settings for the SCSI bus interface. The BIOS Information section at the bottom of the menu displays the Interrupt (IRQ) channel and I/O Port Address of the selected device. This section cannot be modified.



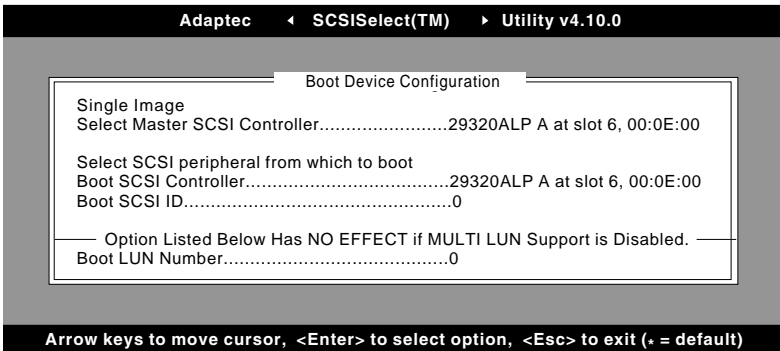
Note: Text displayed in yellow is for information only and cannot be selected.



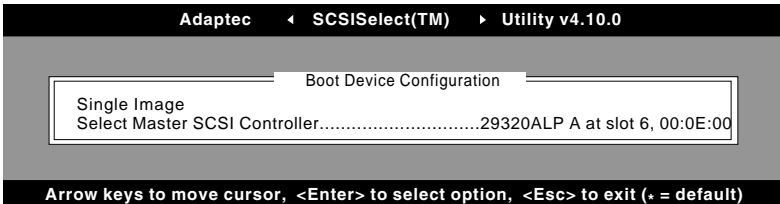
From the Configuration menu, you can access the following settings:

- Boot Device Configuration
- SCSI Device Configuration
- Advanced Configuration Options

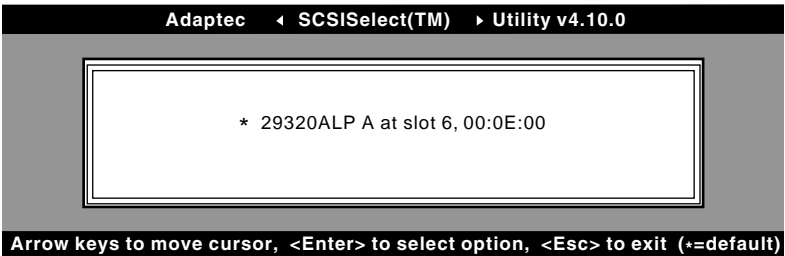
If you select **Boot Device Configuration**, the Boot Device Configuration menu appears. The non-BBS version is shown as follows. This menu displays and provides menu options for setting Master SCSI Controller, Boot SCSI Controller, Boot SCSI ID, and Boot LUN Number.



The BBS version of the Boot Device Configuration menu is shown as follows. This menu displays the Select Master SCSI Controller option only.

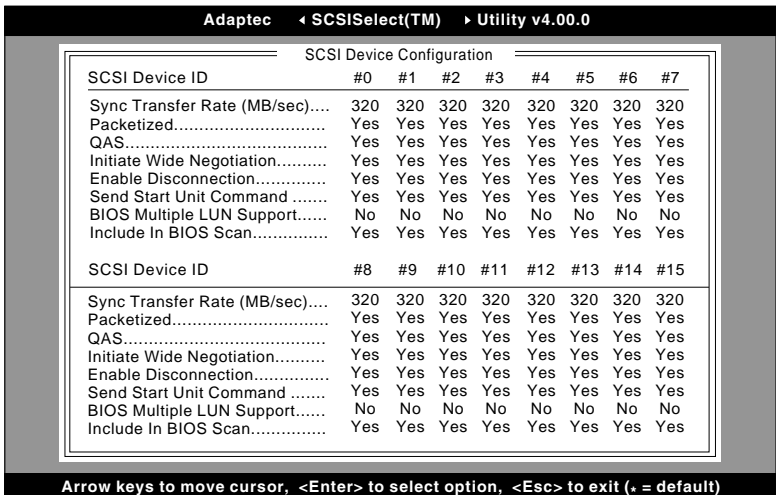


If you select **Select Master SCSI Controller** or **Boot SCSI Controller** (non-BBS systems only), the Master/Boot SCSI Controller Selection menu appears. The asterisk indicates the default master or boot SCSI controller and channel.



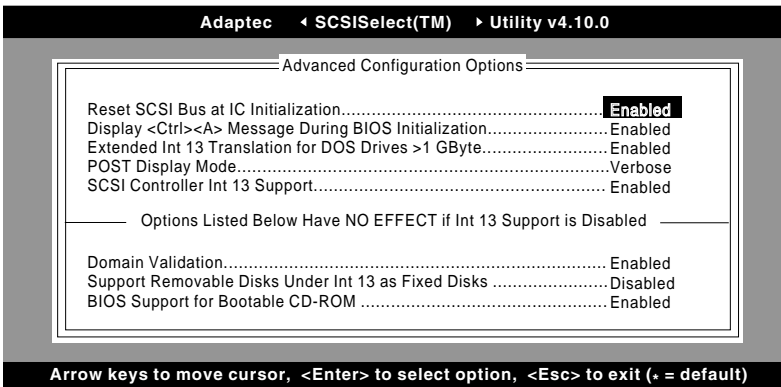
Note: Default settings are always marked with an asterisk. You can press **F6** to return all settings to the defaults.

If you select **SCSI Device Configuration**, the SCSI Device Configuration menu appears. This menu lists the current device settings for each SCSI ID, including IDs not assigned to a device.



If you do not know the SCSI ID of a device you want to configure, press **Esc** to get back to the Options menu. Then, select **SCSI Disk Utilities**. A list of SCSI devices and SCSI ID appears. Note the ID of the device you want to configure. Press **Esc** to redisplay the Options menu, select **Configure/View SCSI Controller Settings**, and then select **SCSI Device Configuration**.

If you select **Advanced Configuration Options**, the Advanced Configuration Options menu appears. To change a setting in the Advanced Configuration Options menu, select the setting. From the pop-up menu that appears, select a new setting.



5 When you are finished changing settings, press **Esc** until a message prompts you to save the changes. To save the changes, select **Yes**. To abandon the changes, select **No**.

6 Press **Esc** until prompted to exit the utility. Then, select **Yes**.

The computer prompts you if a restart is needed for your new settings to take effect. (Changing the Boot SCSI Controller setting or running the standalone SCSI utility forces an automatic restart.) Otherwise, your new settings take effect immediately.

Using SCSI Disk Utilities

The disk utilities provide options for:

- Listing SCSI IDs and LUNs
- Verifying or Formatting a disk

Listing SCSI IDs and LUNs

With *SCSISelect*, you can list the SCSI IDs of devices attached to the SCSI card. This enables you to quickly verify that no devices on the SCSI bus have duplicate IDs.

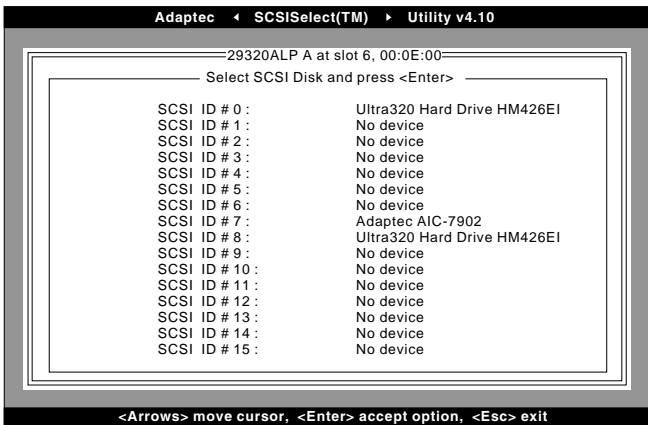
To view the SCSI IDs:

- 1 Start *SCSISelect*. See [Starting SCSISelect on page 3-3](#).

SCSISelect detects all Adaptec SCSI cards and displays the model number, channel letter, slot number, and PCI address for each SCSI card and channel.

- 2 Select the SCSI card and channel that has the devices you want to list. The Options menu appears.
- 3 Select **SCSI Disk Utilities**.

SCSISelect scans the SCSI bus (to determine the devices installed) and displays a list of all SCSI IDs and the devices assigned to each ID.



If a device does not show up in *SCSISelect*, check these items first:

- Is the device attached to the SCSI cable?
- Is there power to the device?
- Does the device have a unique SCSI ID?

If two devices are on the same ID and are on the same bus, only one device or neither of the devices may show up. To correct this, make sure that each device has a unique SCSI ID.

- 4 Use the ↑ and ↓ keys to move the cursor to a specific ID and device, then press **Enter**.

Verifying or Formatting a Disk

SCSISelect includes a utility that enables you to format and verify disks:

- **Verify Disk Media**—Allows you to scan the media of a hard disk drive for defects. If the utility finds bad blocks on the media, it prompts you to reassign them so they are no longer used.
- **Format Disk**—Allows you to perform a low-level format on a hard disk drive. A disk must be low-level formatted before you can use the operating system's partitioning and high-level formatting utilities. *Most SCSI disk devices are preformatted at the factory and do not need to be formatted again.* If a drive is not preformatted, you can use *SCSISelect* to perform a low-level format on the drive. This operation is compatible with most SCSI disk drives.



Caution: A low-level format destroys all data on the drive. Be sure to back up your data before performing this operation. You *cannot* abort a low-level format once it is started.



Caution: When a low-level format command is sent to the hard disk drive, the drive will start its format. The SCSI card will not be in use and may appear to be hung. You must not interfere or try to stop the low-level format as this can destroy the disk drive and render it unusable. When the drive has completed its low-level format, it will send a command to the SCSI card and allow the user to exit the utility.

To use SCSISelect to format or verify a disk:

- 1 Start SCSISelect. See [Starting SCSISelect on page 3-3](#).

SCSISelect detects all Adaptec SCSI cards and displays the model number, channel letter, slot number, and PCI address for each card and channel.

- 2 Select the SCSI card and channel that has the devices you want to format or verify. The Options menu appears.
- 3 Select **SCSI Disk Utilities**. SCSISelect scans the SCSI bus and lists the SCSI IDs and associated devices on the SCSI bus.
- 4 From the list of SCSI devices, select the device you want to format or verify.
- 5 If the device has multiple logical units, a menu of LUNs appears. Select the LUN of the unit you want to format or verify. A small menu appears.
- 6 Select **Verify Disk Media** or **Format Disk**.
 - If you select **Verify Disk Media**, SCSISelect notifies you of bad blocks and prompts you to reassign them. Select **Yes** to reassign the bad blocks or **No** to leave them as is. You can press **Esc** at any time to abort verification.
 - If you select **Format Disk**, a prompt appears, asking you to confirm that you want to format the disk. Select **Yes** to start formatting the disk, or **No** to cancel formatting.

Installing Windows 2000

In this Chapter

<i>Installing the Driver When Installing Windows 2000</i>	4-2
<i>Updating the Driver When Windows 2000 is Already Installed</i>	4-3
<i>Upgrading a Windows NT 4.0 Installation to Windows 2000</i>	4-4
<i>Using Advanced Configuration Parameters</i>	4-4
<i>Installing a New Host Adapter after Windows 2000 Is Already Installed</i>	4-5
<i>Removing a Host Adapter</i>	4-5
<i>Swapping a Host Adapter</i>	4-6
<i>Troubleshooting</i>	4-7

This chapter explains how to install the Adaptec Ultra320 driver for Windows 2000.

If you are performing a first-time Windows 2000 installation, see *Installing the Driver When Installing Windows 2000* on page 4-2. If Windows 2000 is already installed in your system, see *Updating the Driver When Windows 2000 is Already Installed* on page 4-3.

Installing the Driver When Installing Windows 2000

The adpu320.sys driver is not embedded on the Windows 2000 installation CD and must be added during Windows 2000 installation.

- 1 Start your system with the Windows 2000 CD in the CD-ROM drive.



Note: When using a CD-ROM drive to install Windows 2000 from the bootable CD, make sure Bootable CD support is enabled in either the system or SCSI BIOS Setup Utility. If these options are not available, boot from the Windows 2000 floppy disks.

- 2 You may see a message:
Press any key to boot from CD.
You have five seconds to press a key to boot off the CD.
- 3 Press **F6** when this message is displayed:
Press F6 if you need to install a third-party SCSI or RAID driver...
- 4 After a brief delay, a message prompts you to install your driver. Press **S** to specify a driver.
- 5 Insert the Ultra320 FMS driver floppy disk for Windows 2000 into drive A, and press **Enter**.
- 6 You are presented with a selection of driver choices. Select the Windows 2000 driver and press **Enter**.
- 7 If you have no other controllers to add, press **Enter** to continue with the Windows 2000 installation.

Updating the Driver When Windows 2000 is Already Installed

To update or install the driver if Windows 2000 is already installed:

- 1 Start Windows 2000.
- 2 Right Click **My Computer**.
- 3 Select **Manage**.
- 4 From Computer Management, select **Device Manager**.
- 5 Click + next to the SCSI and RAID controller banner.
- 6 Right click the banner for the Ultra320 host adapter.
- 7 Select **Properties**.
- 8 Select the Driver tab.
- 9 Select **Update Driver**.
- 10 Click **Next**.
- 11 On the Install Hardware Device Drivers screen, select **Display a list of the known drivers for this device**, and click **Next**.
- 12 Select the **Have Disk** button. When prompted, insert the Windows 2000 floppy disk into the floppy disk drive, enter the following path, then click **OK**:

```
a:\win2000
```
- 13 Select the Adaptec Ultra320 driver from the list, then click **Next**.
- 14 Click **Next** again to confirm the installation of the driver. You may get a warning that a Digital Signature was not found. Check Adaptec's Web site periodically for updated drivers with the Digital Signature. Click **Yes**.
- 15 When the driver is copied to your hard drive, click **Finish**. You may be required to restart your computer.
- 16 If you have a multi-channel Ultra320 host adapter or additional Ultra320 cards, repeat step 6 through 15 for each additional Ultra320 channel.

Upgrading a Windows NT 4.0 Installation to Windows 2000

- 1 With your operating system started, insert your Windows 2000 CD and choose to upgrade your system. Your system restarts.
- 2 The Windows 2000 Setup program starts. Press **F6** when this message is displayed:
Press F6 if you need to install a third-party SCSI or RAID driver...
- 3 Follow the directions from [Installing the Driver When Installing Windows 2000](#) on page 4-2.

Using Advanced Configuration Parameters

Advanced users may use software parameters to alter the configuration of the Windows 2000 device drivers supplied by Adaptec. For more information on using advanced configuration parameters, see [Appendix C, Using Windows Advanced Configuration Parameters](#).

Installing a New Host Adapter after Windows 2000 Is Already Installed

To install a new host adapter after Windows 2000 is already installed:

- 1 Make sure your system is shut down and the power is off.
- 2 Install the new host adapter.
- 3 Start Windows 2000. When the hardware wizard detects the card, click **Yes** to continue the installation.
- 4 Select the **Have Disk** button. When prompted, insert the Ultra320 FMS driver floppy disk for Windows 2000 into the floppy disk drive, enter the following path, then click **OK**.
`a:\win2000`
- 5 The driver is now installed.

Removing a Host Adapter

Removing a host adapter can be as simple as physically removing it from the slot when your computer is shut down. See the documentation for your host adapter for more information. Windows 2000 starts and functions properly in this configuration.



Note: Windows 2000 Setup does not delete the device driver from your system disk; it only updates Windows 2000 software configuration information so that the device driver is no longer loaded during system startup.

Swapping a Host Adapter

Swapping a SCSI host adapter for another SCSI host adapter is similar to the procedure for adding a host adapter. The important distinction is that you add the new SCSI adapter into the system first, before removing the old adapter.



Note: If you do not install the new host adapter first, it may result in a Windows 2000 boot failure. If the operating system fails to start, remove the new host adapter and replace the original.

To swap adapters:

- 1 Turn off your computer.



Warning: Turn power to the computer to the OFF position, and disconnect the power cord.

- 2 Discharge any static electricity build-up before handling the SCSI adapter by touching a grounded metal object.
- 3 Insert the new SCSI adapter into an available PCI slot, leaving the existing SCSI card intact.
- 4 Turn on your computer. Windows 2000 should load up as normal and detect the new SCSI card. Install the Windows 2000 driver if prompted to.
- 5 Restart your computer if prompted to.
- 6 Once the new SCSI adapter is functioning properly, turn off your computer.
- 7 Remove the old SCSI adapter and move all desired devices to the new adapter. See [Removing a Host Adapter on page 4-5](#), for more information.
- 8 Restart the computer and all attached devices should be recognized.

Troubleshooting

Most problems can be resolved by following the recommendations in *Problems and Solutions*. If you still experience problems after following the recommendations, continue with the rest of this section.

Problems and Solutions

I made changes to the host adapter configuration and Windows 2000 no longer boots!

The boot manager for Windows 2000 contains recovery logic to allow you to return to the last known good configuration. If you have changed your host adapter configuration and Windows 2000 no longer boots:

- 1 Undo any hardware changes you have made to the computer since it was last operational.
- 2 Restart the computer. Watch the display carefully during startup. When you see the following message at the bottom of the screen, press **F8**:

Starting Windows...

This opens the Windows 2000 Advanced Options menu. Select **Last Known Good Configuration**; then select a boot profile.

- 3 Once your computer is operational again, check all of the hardware and software configuration changes you want to make. Look specifically for conflicts with parts of the existing system configuration that are not being changed.

Error Messages

Error messages generated by the adpu320.sys driver can be viewed by opening the Windows 2000 Event Viewer error logs. For more information on these Error Messages, see [Appendix B, Windows Error Messages](#).

Installing Windows NT 4.0

In this Chapter

<i>Installing the Driver When Installing Windows NT</i>	5-2
<i>Installing the Driver When Windows NT 4.0 is Already Installed</i>	5-4
<i>Using Advanced Configuration Parameters</i>	5-5
<i>Using Windows NT 4.0 and the Host Adapter</i>	5-6
<i>Troubleshooting</i>	5-9

This chapter explains how to install the Adaptec Ultra320 driver `adpu320.sys` for Windows NT 4.0.

If you are performing a first time Windows NT 4.0 installation, see *Installing the Driver When Installing Windows NT* on page 5-2. If Windows NT 4.0 is already installed in your system, see *Installing the Driver When Windows NT 4.0 is Already Installed* on page 5-4.

Installing the Driver When Installing Windows NT

The adpu320.sys driver is not embedded on the Windows NT 4.0 installation disk and must be added during Windows NT 4.0 installation.



Note: Adaptec recommends that you install Windows NT 4.0 onto a hard disk with a primary active FAT 16 partition, 2 GB or smaller. Once Windows NT 4.0 is installed and configured properly, you can use the Convert command to convert the drive to NTFS. This minimizes the number of variables involved during the installation process and therefore reduces the possibility of problems.



Note: In order to add or remove SCSI controllers from Windows NT you must be logged on as Administrator.

Completing a Fresh Windows NT 4.0 Installation From Floppy Disk

- 1 Start your system with the Windows NT 4.0 Boot Disk in the floppy disk drive.
- 2 When prompted, insert disk #2 in your floppy disk drive. After a few moments you will see a blue screen. To setup Windows NT 4.0 now, press **Enter**.
- 3 Press **S** to skip auto-detection of your SCSI host adapter.
- 4 Press **S** again to specify an additional device.
- 5 Press **Enter** to select **Others**; insert the Ultra320 FMS driver floppy disk for Windows NT 4.0 into your floppy disk drive.
- 6 Using the arrow keys, select the following driver and press **Enter**:

Adaptec Ultra320 Family PCI SCSI Controller (WinNT4.0)

- 7 To add other host adapters, press **S** and repeat from Step 5 for each additional adapter and insert the appropriate driver disk.
- 8 Press **Enter** to continue with the Windows NT 4.0 operating system setup. Follow the instructions on-screen and in the Windows NT 4.0 documentation to complete the installation.

Completing a Fresh Windows NT 4.0 Installation From CD

- 1 Insert the Windows NT 4.0 CD into the CD-ROM drive.
- 2 Start your system. Press the **F6** key when you see the following message:

Setup is inspecting your computer's hardware configuration...

If you do not see this message, your system may not be setup to boot from a CD. You will need to install from floppy disks. See [Completing a Fresh Windows NT 4.0 Installation From Floppy Disk](#) on page 5-2.

- 3 When prompted, press **S** to specify an additional device.
- 4 Press **Enter** to select **Others**; insert the Ultra320 FMS driver floppy disk for Windows NT 4.0 into your floppy disk drive.
- 5 Using the arrow keys, select the following driver and press **Enter**:

Adaptec Ultra320 Family PCI SCSI Controller (NT4.0)

- 6 To add other host adapters, press **S** and repeat from Step 4 for each additional adapter and insert the appropriate driver disk.
- 7 Press **Enter** to continue with the Windows NT 4.0 operating system setup. Follow the instructions on-screen and in the Windows NT 4.0 documentation to complete the installation.

Installing the Driver When Windows NT 4.0 is Already Installed

To update or install the adpu320m.sys driver if Windows NT 4.0 is already installed, follow the instructions below for the version of Windows NT 4.0 you are installing.

Updating Windows NT 4.0

- 1 Start Windows NT 4.0.
- 2 Click the **Start** button on the Windows NT 4.0 task bar, and then point to **Settings**.
- 3 Click the **Control Panel**.
- 4 Double-click the **SCSI Adapters** icon.
- 5 Click the **Drivers** tab, and then click the **Add** button.
- 6 In the Install Driver window, click the **Have Disk** button.
- 7 Insert the Ultra320 FMS driver floppy disk for Windows NT 4.0 into your floppy disk drive and press **Enter**. Enter the following path to the installation files and click **OK**:
a:\winnt40
- 8 In the Install Driver window, select the Adaptec Ultra320 driver from the list and click **OK**.
- 9 You must restart your computer for the changes to take affect. Click **Yes** to restart your computer. Click **No** to return to the SCSI Adapters window.

Using Advanced Configuration Parameters

Advanced users may use software parameters to alter the configuration of the Windows NT 4.0 device drivers supplied by Adaptec. For more information on using advanced configuration parameters, see [Appendix C, Using Windows Advanced Configuration Parameters](#)

Hot-Plug PCI Support

Hot-Plug PCI is supported by the Windows NT 4.0 driver `adpu320.sys`.



Warning: You will need a system that supports Hot-Plug PCI as well as associated Hot-Plug PCI application software provided by the system vendor, in order for Hot-Plug PCI to work. *Do not* enable the Hot-Plug PCI feature unless your system is Hot-Plug PCI capable and you wish to use the Hot-Plug PCI feature. For more information on Hot Plug PCI, refer to your motherboard or system documentation.

To enable Hot-Plug PCI support in the driver:

- 1 With Windows NT 4.0 running, insert the Windows NT driver floppy disk.
- 2 Run `hotp320.reg` from the `a:\Winnt40` directory.
- 3 Restart your computer.



Note: The file hotp320.reg adds Hot-Plug related entries into the NT Registry, including the driver-specific registry value /HOTPLUG. Running hotp320m.reg will overwrite your current driver-specific registry values located at:

```
\HKEY_LOCAL_MACHINE\System\CurrentControlSet\  
Services\adpu320\Parameters\Device\DriverParameters
```

If you have previously added other driver specific registry values, you should note them before running the hotp320m.reg file. After running hotp320m.reg, you may verify and restore those previously added driver-specific registry values, if needed.

Using Windows NT 4.0 and the Host Adapter

This section contains useful information on using Windows NT 4.0 and your host adapter.

Removing a Host Adapter



Note: In order to add or remove SCSI controllers from Windows NT you must be logged on as Administrator.

Removing a host adapter can be as simple as physically removing it from the slot when your computer is shut down. Windows NT 4.0 starts and functions properly in this configuration, but a Warning message is generated every time you start Windows NT 4.0.



Caution: If you have removed a host adapter but still have other host adapters of the same type installed in your computer, *do not* use Windows NT 4.0 Setup to remove the device driver.

To eliminate the Warning message, you must update the Windows NT 4.0 software configuration, as described below:

Removing a Host Adapter in Windows NT 4.0

- 1 From the Control Panel, double-click the **SCSI Adapters** icon.
- 2 Click the **Drivers** tab.
- 3 Using the arrow keys select the following driver:
Adaptec Ultra320 Family PCI SCSI Controller (NT 4.0)
- 4 Click the **Remove** button.
- 5 If you are sure you are removing the correct host adapter type, click **Yes**.
- 6 Click **Yes** to restart the computer and initialize changes. Click **No** to return to the SCSI Adapters window.



Note: Windows NT 4.0 Setup does not delete the device driver from your system disk; it only updates Windows NT 4.0 software configuration information so that the device driver is no longer loaded during system startup.

Swapping a Host Adapter

Swapping an Ultra320 Family host adapter for a non-Ultra320 host adapter is similar to the procedure for adding a host adapter. The important distinction is that you make all software configuration changes while Windows NT 4.0 is running and before you make the hardware changes.



Note: If you do not install the driver that comes with the new host adapter, it may result in a Windows NT 4.0 boot failure.

To swap adapters:

- 1 Install the driver for the Ultra320 Family host adapter by following the steps in [Installing the Driver When Windows NT 4.0 is Already Installed on page 5-4](#).

It is not essential to remove the device driver for the host adapter you are replacing. Windows NT 4.0 dynamically detects the absence or presence of host adapter hardware, and no problems should arise if you leave the existing device driver installed. You may remove the device driver later, after you have successfully restarted Windows NT 4.0. However, if you leave the driver installed, the system alerts you with an error message of the extra device driver every time you start your computer. See [Removing a Host Adapter on page 5-6](#).

- 2 Once the new device driver is installed, shut down Windows NT 4.0 and replace the existing host adapter with the Ultra320 Family host adapter.
- 3 Restart your computer and Windows NT 4.0. It is possible that some drive letter assignments may change from the previous configuration.

Troubleshooting

Problems and Solutions

I made changes to the host adapter configuration and Windows NT 4.0 no longer boots!

The boot manager for Windows NT 4.0 contains recovery logic to allow you to return to the last known good configuration. If you have changed your host adapter configuration and Windows NT 4.0 no longer boots:

- 1 Undo any hardware changes you have made to the computer since it was last operational.
- 2 Restart the computer. Watch the display carefully during startup. If the following message appears, press the **Spacebar** and follow the instructions on-screen to continue with the last known good configuration:

Press spacebar NOW to invoke the Last Known Good menu

- 3 Once your computer is operational again, check all of the hardware and software configuration changes you want to make. Look specifically for conflicts with parts of the existing system configuration that are not being changed.

The PCI SCSI controller is not detected during Windows NT 4.0 installation, or I am getting an Inaccessible Boot Device error message.

Try these workaround options:

Option 1

- If you encounter the Inaccessible Boot Device error message
 - a Restart your computer system to a DOS prompt after you receive this error and copy the current version of adpu320.sys into the C:\$win_nt\$.~bt directory.
 - b Once you've completed this process, remove the floppy disk from drive A and restart your system.

- If the error message persists
 - a Restart your computer system to a DOS prompt again and copy the current versions of `adpu320.sys` into the `%systemroot%\system32\drivers` directory.
 - b Once you've completed this process, remove the floppy disk from drive A and restart your system.

Option 2

- 1 Make a backup copy of disk 3 of the Windows NT 4.0 floppy disk installer set.
- 2 Copy these files from the Current Driver Set:
 - DISK1
 - TXTSETUP.OEM
 - ADPU320.SYS
 - OEMSETUP.INF
- 3 Use the floppy installer set to begin the express setup and then specify **other** when asked for type of mass storage controller. The new OEMSETUP.INF should detect your controller and allow you to complete the installation.

Option 3

This option assumes you are doing a fresh installation of Windows NT 4.0.

- 1 Make a Bootable DOS partition on your hard disk drive using Microsoft `fdisk.exe` 2 GB or less in size and then format the partition with Microsoft `format.com`.
- 2 Restart your computer system to a DOS prompt and make a directory in the C drive called `I386`.
- 3 Copy all of the contents of the `I386` subdirectory on the Windows NT 4.0 CD into the `I386` you created on the C drive.
- 4 Copy the files, `TXTSETUP.OEM`, `ADPU320.SYS` and `OEMSETUP.INF`, from the Ultra320 Family Manager Set (FMS) into the `I386` directory on your C drive.
- 5 Restart the computer (make sure there are no floppy disks or CDs in the computer).

- 6 At the DOS prompt do a change directory to I386.
- 7 Once you are in the I386 directory, type `WinNT /B`.

This should begin a floppy-less installation of Windows NT 4.0. The installation process should be able to find the SCSI controller since the OEMSETUP.INF and drivers are current for your SCSI card.

The system is hanging and I can't copy files.

All of Intel's Pentium Processors require adequate heat sinks and ventilation. If the processor is running excessively hot, this can cause problems when installing Windows NT 4.0 (such as hanging or not being able to copy files). Make sure you have an adequately sized heat sink and good ventilation. If you're overclocking your processor, then set it back to the manufacturers default clock speed.

I can't install from the CD.

If Windows NT 4.0 is being installed from a CD, then you need to make sure the CD is functioning properly. If you suspect a problem with the CD, then try following the steps in Option 3.

Error Messages

Error messages generated by the `adpu320m.sys` driver can be viewed by opening the Windows NT 4.0 Event Viewer error logs. For more information on these Error Messages, see [Appendix B, Windows Error Messages](#).

Installing Windows XP

In this Chapter

<i>Installing the Driver When Installing Windows XP</i>	6-2
<i>Installing a New Host Adapter after Windows XP is Already Installed</i>	6-4
<i>Using Advanced Configuration Parameters</i>	6-5
<i>Removing a Host Adapter</i>	6-5
<i>Swapping a Host Adapter</i>	6-6
<i>Troubleshooting</i>	6-7

This chapter explains how to install the Adaptec Ultra320 driver for Windows XP.

If you are performing a first-time Windows XP installation, see *Installing the Driver When Installing Windows XP* on page 6-2. If Windows XP is already installed in your system, see *Installing a New Host Adapter after Windows XP is Already Installed* on page 6-4.

Installing the Driver When Installing Windows XP

The adpu320.sys driver is not embedded on the Windows XP installation CD and must be added during Windows XP installation.

Installing Windows XP (32-bit)

- 1 Start your system with the Windows XP CD in the CD-ROM drive.



Note: When using a CD-ROM drive to install Windows XP from the bootable CD, make sure Bootable CD support is enabled in either the system or SCSI BIOS Setup Utility. If these options are not available, boot from the Windows XP floppy disks.

- 2 You may see a message:
Press any key to boot from CD.
You have five seconds to press a key to boot off the CD.
- 3 Press **F6** when this message is displayed:
Press F6 if you need to install a third-party SCSI or RAID driver...
- 4 After a brief delay, a message prompts you to install your driver. Press **S** to specify a driver.
- 5 When prompted, insert the Ultra320 FMS driver floppy disk for Windows XP into drive A, and continue.
- 6 You are presented with a selection of driver choices. Select **Adaptec Ultra320 SCSI Cards (WinXP IA32)**, and press **Enter**.
- 7 If you have no other controllers to add, press **Enter** to continue with the Windows XP installation.
- 8 You will need to restart your computer to finish setting up the operating system.

Installing Windows XP (64-bit)



Note: You will need to modify the Adaptec Ultra320 driver disk for Windows XP in order to properly install Windows XP 64-bit Edition

- 1 On the disk, rename the TXTSETUP.OEM on the root directory to something like TXTSETUP.I32, and copy the TXTSETUP.OEM file from the \WINXP64\ directory to the root directory.



Note: If you want to use this disk for installation of Windows NT4, Windows 2000 or Window XP (32-bit) in the future, the previous TXTSETUP.OEM file will need to be restored.

- 2 Start your system with the Windows XP CD in the CD-ROM drive. Be sure to choose the CD-ROM boot option if working with an EFI BIOS.
- 3 Press **F6** when this message is displayed:
Press F6 if you need to install a third-party SCSI or RAID driver...
- 4 When prompted, insert the Ultra320 FMS driver floppy disk for Windows XP into drive A, and continue.
- 5 You are presented with a selection of driver choices. Select **Adaptec Ultra320 SCSI Cards (WinXP IA64)**, and press **Enter**.
- 6 If you have no other controllers to add, press **Enter** to continue with the Windows XP installation.
- 7 You will need to restart your computer to finish setting up the operating system.



Note: When booting on an IA-64 system with an EFI BIOS, be sure to select the **Microsoft Windows XP 64-bit Edition** option to continue installing the operating system.

Installing a New Host Adapter after Windows XP is Already Installed

To install a new host adapter if Windows XP is already installed:

- 1 Start Windows XP.

Windows XP will automatically discover the new hardware and load the built-in driver. Let Windows XP complete the hardware detection and manually update the Adaptec Ultra320 driver afterward.

- 2 Select the option, **Install from a list or specific location (Advanced)**, then select **Next**.
- 3 When prompted, insert the Ultra320 FMS driver floppy disk for Windows XP into your floppy disk drive. Select the **Include this location in the search** option.
- 4 Type the following and click **Next**:

```
a:\winxp
```

If you are installing on an IA-64 class system, type the following and click **Next**:

```
a:\winxp64
```

- 5 You may get a warning that a Digital Signature was not found. Check Adaptec's Web site periodically for updated drivers with the Digital Signature. Click **Continue Anyway**.
- 6 After completing the installation, select **Finish**.
- 7 You may be prompted to restart the computer. Select **Yes**.
- 8 If you are installing a dual channel adapter, the Found New Hardware Wizard will restart. Select the **Install the software automatically** option and follow the instructions.
- 9 You may be prompted to restart the computer. Select **Yes**.

Using Advanced Configuration Parameters

Advanced users may use software parameters to alter the configuration of the Windows XP device drivers supplied by Adaptec. For more information on using advanced configuration parameters, see [Appendix C, Using Windows Advanced Configuration Parameters](#).

Removing a Host Adapter

Removing a host adapter can be as simple as physically removing it from the slot when your computer is shut down. See the documentation for your host adapter for more information. Windows XP starts and functions properly in this configuration.



Note: Windows XP Setup does not delete the device driver from your system disk; it only updates Windows XP software configuration information so that the device driver is no longer loaded during system startup.

Swapping a Host Adapter

Swapping a SCSI host adapter for another SCSI host adapter is similar to the procedure for adding a host adapter. The important distinction is that you add the new SCSI host adapter into the system first, before removing the old adapter.



Note: If you do not install the new host adapter first, it may result in a Windows XP boot failure. If the operating system fails to start, remove the new host adapter and replace the original.

To swap adapters:

- 1 Turn off your computer.



Warning: Turn power to the computer to the OFF position, and disconnect the power cord.

- 2 Discharge any static electricity build-up before handling the SCSI adapter by touching a grounded metal object.
- 3 Insert the new SCSI adapter into an available PCI slot, leaving the existing SCSI card intact.
- 4 Turn on your computer. Windows XP should load up as normal and detect the new SCSI card. Install the Windows XP driver if prompted to.
- 5 Restart your computer if prompted to.
- 6 Once the new SCSI adapter is functioning properly, turn off your computer.
- 7 Remove the old SCSI adapter and move all desired devices to the new adapter. See [Removing a Host Adapter on page 6-5](#), for more information.
- 8 All attached devices should be recognized.

Troubleshooting

Most problems can be resolved by following the recommendations in *Problems and Solutions*. If you still experience problems after following the recommendations, continue with the rest of this section.

Problems and Solutions

I made changes to the host adapter configuration and Windows XP no longer boots!

The boot manager for Windows XP contains recovery logic to allow you to return to the last known good configuration. If you have changed your host adapter configuration and Windows XP no longer starts:

- 1 Undo any hardware changes you have made to the computer since it was last operational.
- 2 Restart the computer. Watch the display carefully during startup. When you see the following message at the bottom of the screen, press **F8**:

Starting Windows...

This opens the Windows XP Advanced Options menu. Select **Last Known Good Configuration**; then select a boot profile.

- 3 Once your computer is operational again, check all of the hardware and software configuration changes you want to make. Look specifically for conflicts with parts of the existing system configuration that are not being changed.

Error Messages

Error messages generated by the adpu320.sys driver can be viewed by opening the Windows XP Event Viewer error logs. For more information on these Error Messages, see [Appendix B, *Windows Error Messages*](#).

Installing Novell NetWare

In this Chapter

<i>Installing the Driver When Installing NetWare</i>	7-2
<i>Installing the Driver When NetWare is Already Installed</i>	7-4
<i>Loading the Driver at Server Bootup</i>	7-5
<i>Using the Load Command Line Options</i>	7-6
<i>Using NetWare and the Host Adapter</i>	7-8
<i>Troubleshooting</i>	7-12

This chapter explains how to install the Adaptec Ultra320 driver `adpu320.ham` for Novell NetWare— NetWare 4.2, 5.0, 5.1, and 6.0.

If you are performing a first time NetWare installation, see *Installing the Driver When Installing NetWare on page 7-2*. If NetWare is already installed in your system, see *Installing the Driver When NetWare is Already Installed on page 7-4*.

Installing the Driver When Installing NetWare

To install the adpu320.ham driver when you install NetWare, follow the instructions below for the version of NetWare you are installing.

NetWare 4.2

Follow these instructions only if you are installing NetWare 4.2 for the first time:

- 1 Begin installation of NetWare 4.2 on your server as instructed in your NetWare documentation.
- 2 When a screen appears that asks you to select a disk driver, press **Insert**.
- 3 Insert the Ultra320 FMS driver floppy disk for NetWare into your floppy disk drive.
- 4 Press **F3** and type a `:netware\v42_v50` as the path to the adpu320.ham driver for NetWare.
- 5 Select **adpu320.ham** and press **Enter**.
- 6 Select **No** not to save existing file, **Yes** to save existing file cdrom.nlm.
- 7 Select **No** not to save existing file, **Yes** to save existing file nbi.nlm.
- 8 Select **No** not to save existing file, **Yes** to save existing file nwpa.nlm.
- 9 Select **No** not to save existing file, **Yes** to save existing file nwpaload.nlm.
- 10 Select **Save parameter and continue** and press **Enter**.
- 11 To install additional adapters, follow the procedures from Step 5.
- 12 When complete, select **Continue the installation** to complete the installation.

NetWare 5.0

Follow these instructions only if you are installing NetWare 5.0 for the first time:

- 1 Begin installation of NetWare 5.0 on your server as instructed in your NetWare documentation.
- 2 When a screen appears that asks you to add device drivers, select **Modify** and press **Enter**.
- 3 Select **Storage adapters** and press **Enter**.
- 4 Press **Insert** to add storage drivers.
- 5 Press **Insert** to add an unlisted driver.
- 6 Insert the Ultra320 FMS driver floppy disk for NetWare into your floppy disk drive.
- 7 Press F3 and type a `:netware\v42_v50` as the path to the `adpu320.ham` driver for NetWare.
- 8 Select **adpu320.ham** and press **Enter**.
- 9 Select **Return to driver list** and press **Enter**.
- 10 To install additional adapters, follow the procedures from Step 4.
- 11 When complete, select **Continue** to complete the installation.

NetWare 5.1 and 6.0

Follow these instructions only if you are installing NetWare 5.1 and 6.0 for the first time:

- 1 Begin installation of NetWare 5.0/6.0 on your server as instructed in your NetWare documentation.
- 2 When a screen appears that asks you to add device drivers, select **Modify** and press **Enter**.
- 3 Select **Storage adapters** and press **Enter**.
- 4 Press **Insert** to add storage drivers.
- 5 Press **Insert** to add an unlisted driver.

- 6 Insert the Ultra320 FMS driver floppy disk for NetWare into your floppy disk drive.
- 7 Press **F3** and type a : \fmsimage\fms41\netware\v51_v60 as the path to the adpu320.ham driver for NetWare.
- 8 Select **adpu320.ham** and press **Enter**.
- 9 Select **Return to driver list** and press **Enter**.
- 10 To install additional adapters, follow the procedures from Step 4.
- 11 When complete, select **Continue** to complete the installation.

Installing the Driver When NetWare is Already Installed

To update or install the adpu320.ham driver when NetWare is already installed, follow the instructions in this section. The procedures are similar for all versions of NetWare. Procedures that are specific to a NetWare version are noted when necessary.

- 1 Make a backup copy of the old driver (if it exists) before installing the new driver.
- 2 Copy the adpu320.ham driver from the Ultra320 FMS driver floppy disk for NetWare into the server's startup directory (for example, c:\nwserver, c:\server.40) on your hard disk. This overwrites any existing version of the driver in the directory.



Note: For NetWare 4.2 and 5.0, the file is in \netware\v42_50. For NetWare 5.1 and 6.0, the file is in \netware\v51_60

- 3 If necessary, modify the load command line in the startup.ncf file so that the proper path to the driver and all appropriate command line options are specified. See [Loading the Driver at Server Bootup on page 7-5](#).

The correct syntax to load the Ultra320 driver is:

```
load [pathname]adpu320 [options]
```

Command line options are *not* case sensitive. Placing commas between command line options is optional. See [Loading the Driver at Server Bootup on page 7-5](#) for possible values.

Loading the Driver at Server Bootup

To automatically load the adpu320.ham at server bootup, the startup.ncf file (usually located in your server's startup directory) must contain a load command line that specifies the location of the driver and any appropriate command line options (see [Using the Load Command Line Options on page 7-6](#)). For additional information on the startup.ncf file, refer to your NetWare documentation.

The correct syntax to load the driver is:

```
load [pathname]adpu320.ham [options]
```

For example, the command line to load the driver from the c:\nwserver directory, with the verbose= option *on* is:

```
load c:\nwserver\adpu320 verbose=y
```

Command line options are *not* case sensitive. Placing commas between command line options is optional. See [Using the Load Command Line Options on page 7-6](#) for possible values.

To modify the startup.ncf file:



Note: You can also use your DOS text editor to modify the startup.ncf file.

- If you are using NetWare 4.2, type `load install` at the NetWare prompt and press **Enter**.
- If you are using NetWare 5.x or 6.0, type `load nwconfig` and press **Enter**.

Using the Load Command Line Options

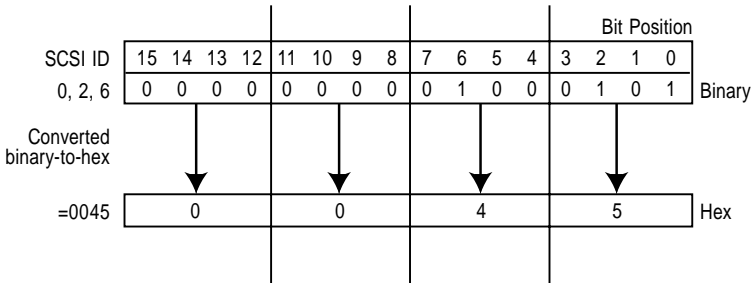
You can specify several command line options when the driver is loaded. The available options are described in the table below. This table describes command line options for the `adpu320.ham` driver for Ultra320 products.

adpu320.ham Command Line Options

Option Name	Default Value	Acceptable Values	Definition
SLOT	If none specified, NeWare prompts you to choose.		Dependent on system configuration. Obtains a physical slot number for the host adapter.
/LUN	N/A	N/A	Scans all possible LUNs.
MAX_TAGS	16	1-128	Maximum number of tagged I/Os which will be active per device.
VERBOSE	off	on,y,1,off, n	Displays host adapter information.
INSTRUMENTATION	Off	on,y,1,off, n	Enables/disables recording of I/O statistics and errors.
MULTLUN_TARGETS	FFFF	0-FFFF	A bit mask to enable LUNs on selected targets.
LUN_ENABLE	1 (Scan LUN 0 only)	0-FF	LUN scan enables mask on all targets.
IO_MAPPED	off	on,y,1,off, n	Disables the auto detection of PCI-X and forces the use of I/O Mapped. The default is off in which it will automatically detect the PCI-X slot and use I/O Mapped, or use memory mapped otherwise.
READ_STREAMING	off	on,y,1,off, n	Enables read streaming to be negotiated for all drives.

Bit Mask Options

Use the example below as an aid for calculating Bit Mask option hex values. Each SCSI device is enabled by a 1 in its corresponding bit position. The table that follows the figure, lists the binary-to-hex conversions. Use this example, if you want to enable scanning for LUNs 0, 2, and 6 on all targets, then use the command line option of `lun_enable=0045`.



Binary	Hex	Binary	Hex
0000	0	1000	8
0001	1	1001	9
0010	2	1010	A
0011	3	1011	B
0100	4	1100	C
0101	5	1101	D
0110	6	1110	E
0111	7	1111	F

Sample Load Commands

Here is a simple load command with no option switches (if loaded from drive A):

```
load a:\netware\adpu320.ham
```

If an error message appears when attempting to load the driver, refer to [Troubleshooting on page 7-12](#).

Here is an example of the `adpu320.ham` driver being loaded with command line options (if loaded from drive A):

```
load a:\netware\adpu320.ham verbose=y slot=2
```

Using NetWare and the Host Adapter

This section contains useful information on using NetWare and your host adapter.

Using Removable Media

The adpu320.ham driver module fully supports removable-media disk drives, including magneto-optical drives. Removable media is treated as a standard SCSI hard disk, with some exceptions:

- The driver recognizes and registers only media with 512 bytes/sector.
- NetWare allows you to mount/dismount the media and to lock/unlock the media.

NetWare's monitor.nlm program supports several removable-media options. To view and configure these options:

- 1 Load monitor.nlm to display the various options.
- 2 Select **Disk Information**. All system disk drives appear.
- 3 Select the removable-media device. The following drive status items appear:

Menu Choice	Default Value
1. Volume Segments On Drive ¹	(select for list)
2. Read After Write Verify ¹	Hardware Level
3. Drive Light Status ¹	Not Supported
4. Driver Operating Status ¹	Active
5. Removable Drive Mount Status ²	Mounted
6. Removable Drive Lock Status ²	Not Locked

¹ Valid for both removable and nonremovable types of SCSI disk drives.

² Valid for removable media only.

Mount Status

Mounting causes a drive to come online as a NetWare storage device. Dismounted drives are inactive and cannot be accessed.

Before you eject your current media, you should first *Dismount* it (menu choice 5). When the media status is *Dismounted*, you can eject the media. However, NetWare does not allow you to dismount it if the media is locked.

To insert your new media, wait for the drive to spin-up, and then select the **Drive Mount** option.

Lock Status

If your removable-media device supports the Lock/Unlock feature, you can lock the media (menu choice 6). The media must be in the *Not Locked* state before you can eject it. If the media is *Locked*, it cannot be ejected when you press the **Eject** button.

Using the NetWare Tape Backup

Included with Novell NetWare is a server-based tape backup utility called `sbackup.nlm`. This utility allows you to backup server disk drives to a server tape drive. The utility supports Adaptec host adapters.

Novell NetWare documentation contains instructions for loading the server backup software. Refer to the *NetWare Server Backup Manual* to load the `tapedai`, `tsa`, and `sbackup` modules.

- 1 Once you have loaded `adpu320.ham`, load `tsaxxx.nlm` (`tsa312.nlm`, `tsa400.nlm`, `tsa410.nlm`) and `sbackup` with these options:

```
:load scsi2tp.cdm
:load tsaxxx
:load sbackup
```

The appropriate driver that interfaces `sbackup` to ASPI is loaded automatically.

- 2 When `sbackup` is loaded, it asks for a login name. Enter the appropriate name.

- 3 If sbackup asks you to select the device driver, select the **HP DIBI-2 Tape Driver**, regardless of the type of SCSI tape drive being attached (for example, even if the tape drive is manufactured by Wangtek, *do not* select the Wangtek driver).



Note: Novell also includes a driver called `adaptec.nlm`. This driver is not needed and should not be loaded. Adaptec's driver module takes advantage of ASPI interface features bypassed by `adaptec.nlm`.

Novell publishes a list of SCSI tape drives supported by `sbackup.nlm`.

Using a CD with NetWare

Netware 4.2

To use a CD with NetWare 4.2, follow these instructions:

- 1 Load `adpu320.ham` by entering the following line:

```
:load [pathname]adpu320
```
- 2 The `scsicc.cdm` driver will auto-load if the device(s) are detected.



Note: For multiple LUN CDs, enable multiple LUN scanning with the `lun_enable` switch (for example, `load adpu320 lun_enable=FF`). The `lun_enable` switch is needed for `adpu320.ham`. Type the following line at the prompt: `scan all luns`

- 3 Enter the following line at the prompt, then note the number and name of the CD:

```
:cd device list
```
- 4 Enter the number or volume name of the CD at the command line:

```
:cd mount [x] [name]
```

- 5 Edit the startup.ncf file to include the load commands in Step 1 and 2 above, if auto-mounting devices.
- 6 Edit the driver load command in the startup.ncf file to include the slot number (for example, load c:\server.312\adpu320 slot=2).

NetWare 5.x and 6.0

To use a CD with NetWare 5.x and 6.0, follow these instructions:

- 1 Load adpu320.ham by entering the following line:
:load [pathname]adpu320
- 2 The scsicc.cdm driver will auto-load if the device(s) are detected.



Note: For multiple LUN CDs, enable multiple LUN scanning with the `lun_enable` switch (for example, `load adpu320 lun_enable=FF`). The `lun_enable` switch is needed for `adpu320.ham`. Type the following line at the prompt: `scan all luns`

- 3 Type the following line at the prompt:

```
:load CDRROM.NLM
```

Optimizing Performance

The Adaptec Ultra320 SCSI Bus Master firmware increases the SCSI performance of the Adaptec Ultra320 host adapters under multitasking environments. The firmware uses a paging mechanism to handle up to 255 simultaneous SCSI commands. The sequencer can simultaneously manage up to 128 tagged, or 1 nontagged, SCSI commands for each SCSI device, up to a limit of 255 SCSI commands. The firmware can queue as many commands as the operating system is able to send to the host adapter. To set this feature, enter the following command:

```
max_tags=n
```

In general, a low number of `max_tags` gives better sequential performance, and a high number a better random performance.



Note: A large number of `max_tags` can also cause starvation problems leading to deactivation with some drives.

Troubleshooting

Error Messages

The error messages listed below are the messages associated with the `adpu320.ham` driver. Messages are listed sequentially according to the last three digits of the error code. For example, `[xxxxx080]`, `[xxxxx081]`, `[xxxxx082]`, and so on.



Note: When reporting problems to Customer Support, be sure to include the complete error code in your problem description.

[xxxxx080] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx081] Adapter software initialization failure

An error has occurred while the driver was setting up its internal data structures. Verify that your adapter is supported by this version of the driver.

[xxxxx082] Internal driver error

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx083] Adapter not supported by this version of the driver

Your adapter is not supported by the driver on your system. You may have installed a new adapter and have not updated the driver on your system.

[xxxxx084] Adapter software initialization failure

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx085] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx087] Internal driver error

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx088] Adapter software initialization failure

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx089] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx096] Adapter hardware initialization failure - possible resource conflict

The driver has attempted to initialize the adapter hardware but failed. This might suggest that the adapter resources (for example, IRQ) conflict with the resources of another board installed in your system.

[xxxxx099] Adapter software initialization failure

[xxxxx09a] Adapter software initialization failure

[xxxxx09b] Adapter software initialization failure

An error has occurred initializing one of the driver's internal data structures for a device connected to the adapter. This may result in problems accessing the device. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx0ab] Driver already loaded for this host bus adapter

The driver is already loaded for this adapter. Verify that the correct adapter is specified in your command line or startup file.

[xxxxx0ac] Driver already loaded for all host bus adapters

The driver is already loaded for all the supported adapters in this system.

[xxxxx0a4] SCSI bus reset by third-party hardware

Hardware such as an array enclosure may have reset the SCSI bus. This is a normal condition unless you receive additional errors.

[xxxxx0a7] Unable to allocate memory

[xxxxx0a8] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx0a9] Possible interrupt conflict

This indicates that the adapter IRQ conflicts with the IRQ of another board installed in your system. Check your hardware documentation for instructions on setting and changing IRQs.

[xxxxx0c9] Invalid command line parameter

A command line option for the driver is invalid. See [Using the Load Command Line Options on page 7-6](#) for valid command line options.

[xxxxx0ca] Invalid command line syntax
[xxxxx0cb] Invalid command line syntax
[xxxxx0cc] Invalid command line syntax

The command line syntax for the driver is incorrect. See [Using the Load Command Line Options on page 7-6](#) for entering the correct syntax.

[xxxxx07c] Unable to allocate memory
[xxxxx07d] Unable to allocate memory
[xxxxx07e] Unable to allocate memory
[xxxxx07f] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

Installing UnixWare and Open Unix

In this Chapter

<i>Installing the Driver When Installing UnixWare/Open Unix</i>	8-2
<i>Installing the Driver When UnixWare/Open Unix is Already Installed</i>	8-3
<i>Using UnixWare/Open Unix and the Host Adapter</i>	8-7
<i>Troubleshooting</i>	8-9

This chapter explains how to install the Adaptec Ultra320 driver adpu320 for UnixWare 7.1.1. and Caldera Open Unix 8.0.

The adpu320 driver (or package) is used with UnixWare/Open Unix.

If you are performing a first time UnixWare/Open Unix installation, see [Installing the Driver When Installing UnixWare/Open Unix on page 8-2](#). If UnixWare/Open Unix is already installed in your system, see [Installing the Driver When UnixWare/Open Unix is Already Installed on page 8-3](#).

Installing the Driver When Installing UnixWare/Open Unix

To install the adpu320 driver at the same time you install UnixWare/Open Unix:

- 1** Insert the Install CD of the UnixWare/Open Unix package into the boot CD-ROM drive. Start your computer.

Wait for the first UnixWare/Open Unix installation screen and prompt to appear, then follow the on-screen instructions.

- 2** When prompted to either **Install Host Bus Adapter Drivers** or **Continue Installation**, select **Install Host Bus Adapter Driver** and press **Enter**.
- 3** Insert the Ultra320 FMS driver disk for UnixWare/Open Unix into the primary floppy disk drive and press **Enter** (you cannot load drivers from a secondary floppy disk drive).

As the driver loads, a message identifying the installed host adapter briefly appears on screen. The installation process determines which device drivers on the disks are needed.

- 4** If you have additional HBA disks, insert the next HBA disk, select **Install Another HBA Disk**, and press **Enter**.

If all of your HBA disks have been installed, remove the last HBA disk, select **Continue Installation**, and press **Enter**.

- 5** If necessary, enter the DCU (Device Configuration Utility) to view/change the UnixWare/Open Unix device driver configuration data.

- 6 Follow the on-screen instructions to continue with installation. Refer to the UnixWare/Open Unix documentation and on-screen help files for help in selecting options.



Note: If your installation fails, *do not* attempt to use the update installation `pkgadd` procedure to fix the installation. Follow the instructions in the UnixWare/Open Unix documentation and in this user's guide to retry the installation.

Installing the Driver When UnixWare/Open Unix is Already Installed

To update or install the `adpu320` driver on a system where UnixWare/Open Unix is already installed, follow the instructions in this section.



Caution: Improper or corrupt driver updates might *destroy* your existing UnixWare/Open Unix file system. Back up all important files before proceeding. Consult your UnixWare/Open Unix documentation for proper backup procedures.

Installing or updating the driver involves the following tasks, which must be completed in the following order:

- 1 **Back up the Kernel**—Backs up the old UnixWare/Open Unix kernel and any other important files.
- 2 **Load the Package**—Uses `pkgadd` to load the Ultra320 driver package by typing `pkgadd -d /dev/rdisk/f03ht`
- 3 **Rebuild the UnixWare/Open Unix Kernel**—Rebuilds the kernel with the new driver by typing `/etc/conf/bin/idbuild -B`

- 4 **Boot the New Kernel**—Restarts the computer with the new kernel.



Note: Remember that UnixWare/Open Unix commands are *case sensitive*. Enter the commands exactly as shown.

Back Up the Kernel

If you have not already done so, back up all important files on the computer. See your UnixWare/Open Unix documentation for proper UnixWare/Open Unix file system backup procedures.

- 1 Log in as **root** at the UnixWare/Open Unix # system prompt.
- 2 To back up the old UnixWare/Open Unix kernel, type the following and press **Enter**:

```
cp /stand/unix /stand/unix.work
```

Load the Package

To load the driver:

- 1 At the system prompt, type the following and press **Enter**:

```
pkgadd -d diskette1
```

Follow the instructions on-screen to insert the IHV HBA disk (or Ultra320 FMS driver disk for UnixWare/Open Unix) into the boot floppy disk drive.

- 2 Select the **adpu320** package from the on-screen menu and press **Enter**. The package is loaded into your UnixWare/Open Unix operating system.
- 3 When the package has loaded, you may be prompted to install the disk again.

Do not reinsert the IHV HBA disk (or Adaptec Ultra320 FMS driver disk for UnixWare/Open Unix). Instead, type **q** (quit) and press **Enter**.

- 4 Type `mail` and press **Enter**. The mail messages tell you if the installation was successful.

If a mail message informs you that the installation has failed, turn to [Troubleshooting on page 8-9](#).

- 5 Type `pkginfo -l adpu320` and press **Enter**.
- 6 Verify that the `adpu320` driver is now listed.

If the `adpu320` driver does not appear in the `pkginfo` listing, turn to [Troubleshooting on page 8-9](#).

The listing should be similar to

```
PKGINST: adpu320  
NAME: Ultra320 Driver for UnixWare 7.1.1
```

Modify the New System File

- 1 Display the contents of the UnixWare/Open Unix file by typing the following and pressing **Enter**:

```
cat /etc/conf/sdevice.d/adpu320
```

- 2 If your computer *is to boot* from a device connected to a Ultra320 host adapter, verify that the line `$static` is present immediately below the line `$version 2`.
- 3 If your computer *is not to boot* from the host adapter SCSI bus, and you wish to leave the driver as a loadable module, edit and verify that the line `$static` is not present directly below the line `$version 2`.

Rebuild the UnixWare/Open Unix Kernel

To rebuild the UnixWare/Open Unix kernel with the new changes:

- 1 Type the following at the # prompt and press **Enter** after each line:

```
cd /etc/conf/bin
./idbuild -B
```

Status messages appear.

- 2 When the kernel has been built, type the following and press **Enter** after each line (0 in -g0 is zero, *not* the letter O):

```
cd /etc/conf/cf.d
cp unix /stand/unix
cd /
shutdown -g0
```

- 3 Type *y* and press **Enter** when the computer asks if you really want to shut down. System Is Down should appear on the screen.

The UnixWare/Open Unix kernel is now ready for host adapter operation.

Boot the New Kernel

To reboot the computer with the new kernel:

- 1 Follow the on-screen instructions (usually by pressing **Enter**) to reboot your computer.
- 2 Check the bootup messages to verify that all your installed SCSI devices are listed.

If some or all of your installed SCSI devices do not appear at this time, your SCSI cables may be loose, or the SCSI device setup may not be complete. If so, go back and correct any problems before proceeding.

- 3 Wait for UnixWare/Open Unix to complete bootup with the new kernel.

Refer to [Troubleshooting on page 8-9](#) if the computer crashes or if panic (UnixWare/Open Unix) messages appear during bootup.

The updated driver for UnixWare/Open Unix should now be ready to use.

Using UnixWare/Open Unix and the Host Adapter

This section contains useful information on using UnixWare/Open Unix and your host adapter.

Using Tunable Parameters

For UnixWare/Open Unix, some parameters are defined in the following file:

```
/etc/conf/pack.d/adpu320/space.c
```

These parameters can be tuned for either the adst21 driver or the adpu320 driver. Please refer to the comments in the appropriate space.c file for a description of these parameters. After modifying the space.c file, you must rebuild the kernel then reboot the system for the new parameters to take effect. To rebuild the kernel, type the following, and press **Enter** after each line:

```
/etc/conf/bin/idbuild -B  
cp /etc/conf/cf.d/unix /stand/unix
```



Note: The drivers support Tagged Queuing and Reinitialization.

Using Multiple Host Adapters

When using multiple host adapters, consider the following:

- The host adapter and computer must be configured for multiple host adapters as explained in the host adapter's user's guide.
- To boot from the Ultra320 host adapter, make sure the host adapter is installed in the lowest PCI slot number. See your host adapter's user's guide.
- UnixWare/Open Unix supports auto-configuration. When adding multiple host adapters to an existing UnixWare/Open Unix system, simply install the board and reboot; the system automatically reconfigures and rebuilds the kernel. If you want to select a host adapter to boot from, simply disable the BIOS on all other host adapters.

Removing the Driver

If you no longer need the adst21 or adst70 driver, you can use the following procedure to remove it completely:

- 1** Back up all important computer files.
- 2** At the UnixWare root prompt, type the following:

For UnixWare/Open Unix:

```
/etc/conf/bin/idinstall -d adpu320
```

The following files will be deleted:

```
/etc/conf/mdevice.d/adpu320  
/etc/conf/pack.d/adpu320/Driver.o  
/etc/conf/pack.d/adpu320/space.c  
/etc/conf/pack.d/adpu320/disk.cfg  
/etc/conf/sdevice.d/adpu320
```

- 3** Then, rebuild the kernel (0 in -g0 is zero, *not* the letter O):

```
/etc/conf/bin/idbuild -B -K  
cp /etc/conf/cf.d/unix /unix  
cd /  
shutdown -g0
```

- 4** Reconfigure your computer for your alternate or replacement drive controller, and reboot the computer.

Troubleshooting

Problems and Solutions

My computer crashes or displays panic messages during the bootup procedure!

You may have to boot from the backup kernel created earlier, and then perform the driver update procedure again.

To boot from the old kernel:

- 1 Reboot the computer.
- 2 At the Booting UNIX System... prompt or loading UnixWare/Open Unix graphics, press the **Spacebar**.
- 3 From the [boot]# prompt, first type `BOOTPROG=old kernel` (for example, `BOOTPROG=unix.work`) and press **Enter**. Then, type `go` and press **Enter**. Your computer should now boot from the backup kernel created earlier in *Installing the Driver When UnixWare/Open Unix is Already Installed* on page 8-3.

To repeat the driver update procedure:

- 1 Follow the instructions in *Removing the Driver* on page 8-8 to delete the driver from your computer.
- 2 Perform the driver update procedure again. See *Installing the Driver When UnixWare/Open Unix is Already Installed* on page 8-3.

Error Messages

The error messages listed below are the messages associated with the drivers. Messages are listed sequentially according to the last three digits of the error code. For example, [xxxxx020], [xxxxx021], [xxxxx022], and so forth.



Note: When reporting problems to Customer Support, be sure to include the complete error code in your problem description.

[xxxxx003] Command completed with error

[xxxxx004] Command completed with error

[xxxxx005] Command completed with error

[xxxxx006] Command completed with error

[xxxxx007] Command completed with error

[xxxxx008] Command completed with error

[xxxxx009] Command completed with error

A request issued to a target device completed with an indication that there is an error. In most cases, the error is recovered and normal operation continues.

[xxxxx010] Error issuing command

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx011] Error issuing command

The requested command is not supported by this driver.

[xxxxx012] Error issuing command

The driver does not recognize the target device.

[xxxxx013] Error issuing command

[xxxxx014] Error issuing command

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx015] Error issuing command

An error has occurred with the driver. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx020] Adapter or target device not responding or not connected

The target device did not respond to the adapter. If the device is present, refer to your host adapter's user's guide for troubleshooting information. If the device is no longer connected to the system, ignore this error.

[xxxxx021] Target device protocol error

An unexpected event occurred during data transfer between the adapter and target device. Normally, this indicates a faulty or noncompliant target device.

[xxxxx022] Adapter or target device protocol error

The adapter or target device has broken the communication protocol. A badly behaving device could cause this message to appear. Normally this is not a serious problem. If you get this message frequently over a short period of time, it could indicate that the device or system is malfunctioning. Unplug or turn off unused devices to see if the problem persists.

[xxxxx023] Target device parity error

The driver has detected a parity error by the target device. Try decreasing the transfer rate or disable the Ultra SCSI speed in *SCSISelect*. Also, make sure you are using good quality SCSI cables.

[xxxxx024] Data overrun or underrun

The adapter was given more or less data than was expected.

[xxxxx030] Target device busy

The target device reports a Busy status. Another program might already be using this device.

[xxxxx031] Target device queue full

The target device internal buffer is full.

[xxxxx032] Target device busy

The target device reports a Busy status. Another program may already be using this device.

[xxxxx041] Command aborted

[xxxxx042] Command aborted

[xxxxx043] Command aborted

[xxxxx044] Command aborted

[xxxxx045] Command aborted

An internal condition caused the driver to abort the command. In most cases, the command is retried and is recovered, and normal operation continues.

[xxxxx046] Target device did not respond to abort sequence

The target device did not abort the command requested by the driver. Some devices do not support the abort command properly. Normally, this indicates a faulty or noncompliant target device.

[xxxxx047] Command aborted

An internal condition caused the driver to abort the command. In most cases, the command is retried and is recovered, and normal operation continues.

[xxxxx048] Unable to abort command

An error occurred while aborting a command. Possibly, the command has already completed and there is nothing to abort.

[xxxxx049] Command abort in progress

This indicates an abort command has been issued. This is a normal operating condition.

[xxxxx051] Target device did not respond to reset sequence

The target device did not reset correctly as requested by the driver. Normally, this indicates a faulty or noncompliant target device.

[xxxxx081] Adapter initialization failure

An error has occurred while the driver was setting up its internal data structures. Verify that your adapter is supported by this version of the driver.

[xxxxx083] Adapter not supported by this version of the driver

Your adapter is not supported by the driver on your system. You may have installed a new adapter and have not updated the driver on your system.

[xxxxx096] Adapter hardware initialization failure - possible resource conflict

The driver has attempted to initialize the adapter hardware but failed. This might suggest that the adapter resources (for example, IRQ) conflict with another board installed in your system.

[xxxxx097] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx098] Exceeded maximum number of host bus adapters

The driver has detected more host bus adapters than is supported by this version of the driver or operating system.

[xxxxx0a4] SCSI bus reset by third party

Hardware such as an array enclosure may have reset the SCSI bus. This is a normal condition unless you receive additional errors.

[xxxxx0a5] SCSI bus reset by host adapter

The host adapter may have reset the SCSI bus. This is a normal condition unless you receive additional errors.

[xxxxx0cf] System configuration error

The driver encountered an error with your hardware. Refer to your host adapter's user's guide for troubleshooting information.

[xxxxx0d0] Command timeout

The target device is either busy, not ready, malfunctioning, or is not present. Refer to your host adapter's user's guide for troubleshooting information.

[xxxxx0d7] Target device scan failed

The driver encountered an error scanning the target device. Refer to your host adapter's user's guide for troubleshooting information.

Installing Linux

In this Chapter

<i>Installing the Device Drivers for Red Hat Linux</i>	9-2
<i>Installing the Device Drivers for SuSE Linux</i>	9-3

This chapter explains how to install the Adaptec Ultra320 driver for Red Hat Linux 7.2, Red Hat Advanced Server 2.1, Red Hat 7.3, SuSE Enterprise 7, SuSE 7.3, and 8.0.



Note: To download Linux drivers and for the most up to date documentation, see the Adaptec Web site at:
<http://opensource.adaptec.com>.

Installing the Device Drivers for Red Hat Linux

To install the device drivers for Red Hat Linux 7.x and Red Hat Advanced Server 2.1:

- 1 Boot off of the Red Hat Linux 7.x CD. Refer to the instructions for your operating system. Follow the standard installation steps with the exceptions noted below.
- 2 At the boot prompt, type: `linux dd`
You will have about 10 seconds to type the command; otherwise, you will go directly to the standard installation screen and you will not be able to use the driver diskette.
- 3 When the Do You Have a Driver Diskette screen appears, select **Yes** and follow the on-screen instructions. Use the diskette created in x-ref.



Note: If you are installing Red Hat 7.3 or Red Hat Advanced Server 2.1, continue with normal installation. If you are installing Red Hat 7.2, continue with Step 4.

- 4 When the Boot Loader Configuration menu appears, select **Use GRUB as the Boot Loader**.
- 5 When the Boot Disk Creation menu appears, select **Skip Boot Disk Creation**.



Note: If you do not select this option, you will copy over the driver disk and you will not be able to complete the final steps.



Note: If you are installing Red Hat 7.2, continue with normal installation. If you are installing Red Hat 7.3 or Red Hat Advanced Server 2.1, go to Step 11.

- 6 At the Congratulations screen, press **Ctrl+Alt+F2**.
- 7 At the prompt, type: `chroot /mnt/sysimage`
- 8 Type: `mount /dev/fd0 /mnt`

9 Type: `/mnt/fixup.sh`

10 Press **Alt+F7**.

The program returns you to the installation window.

11 Click **Exit** to complete the installation.

Installing the Device Drivers for SuSE Linux

To install the device drivers for SuSE 7.0 Enterprise/SuSE 7.3/8.0:

1 Boot off of the SuSE Linux CD. Refer to the instructions for your operating system. Follow the standard installation steps with the exceptions noted below.

2 At the first installation window, while the progress bar is moving to the left (decreasing), press **Alt** before the timer expires.

The message, Please get your Driver Update Floppy Ready appears at the bottom of the window. If you do not press the Alt key before the timer expires, you will not be able to use the driver disk.

3 Select **Installation**.

4 Insert the disk created in x-ref and follow the on-screen instructions.



Troubleshooting in Windows

In this Appendix

<i>Troubleshooting Checklist</i>	A-1
<i>General Troubleshooting</i>	A-2
<i>Troubleshooting in Windows NT 4.0</i>	A-5
<i>Common Error Messages</i>	A-5

Most problems for Windows can be resolved by following the recommendations in the Troubleshooting Checklist below. If you still experience problems after following the recommendations, continue with the rest of this section.

Troubleshooting Checklist

Most problems with using the Adaptec SCSI Card result from errors in preparing and connecting devices on the SCSI bus. If you have problems, check these items first:

- Are all SCSI cables and power cables properly connected?
- Are all SCSI devices turned on?
- Have you connected SCSI devices to *more than two* of the three SCSI Channel A connectors? If you connected devices to all three connectors, *disconnect* devices from one connector!

- Is the Adaptec SCSI Card firmly seated and secured in the PCI expansion slot?
- Is the PCI expansion slot compliant with PCI Rev. 2.1 or higher, and does it support Bus Mastering?
- Are all SCSI devices on each SCSI bus assigned unique SCSI IDs?
- Is termination set correctly on all the devices?



Note: If you have problems with a specific SCSI device when other connected SCSI devices are working correctly, please contact the manufacturer of the problem device for troubleshooting information.

General Troubleshooting

The following procedures can be used for troubleshooting in all the Windows operating systems. For troubleshooting specifically in Windows NT 4.0, see [Troubleshooting in Windows NT 4.0 on page A-5](#).

What if I can't load the driver and suspect that it is an IRQ conflict?

The PCI specification allows the motherboard manufacturer to determine the IRQ assignment for each PCI device. Check with the motherboard/computer manufacturer for the specific PCI configuration details of your system.

These are some basic steps that can assist the motherboard in correctly allocating resources to your PCI devices and/or resolve existing IRQ conflicts:

- 1 Move the PCI SCSI card to a PCI slot that is not forced to share an IRQ with any other PCI, AGP, or ISA slot. These are usually the PCI slots in the middle of the PCI expansion. You will need to check with the motherboard/computer manufacturer for the specific PCI configuration details of your system.

- 2 Check with your video card/display adapter manufacturer to see if your specific video card requires an IRQ allocation. Most motherboard CMOS/BIOS setup utilities have an option to disable the allocation of an IRQ to the AGP slot. Disable this option only if you have verified that your video card does not require an IRQ.
- 3 Verify that all IRQs not specifically required for ISA devices are set to **Available** or **PNP ISA/PCI** in the motherboard CMOS/BIOS setup utility.
- 4 Verify that all devices not being used are disabled so that the resources they are being allocated can be freed up for allocation to another device. This is accomplished through the motherboard CMOS/BIOS setup utility. For example, if you are not using the onboard COM/Serial port on your motherboard, you can usually disable this chipset and free up the IRQ it is currently being assigned.

What if I have devices that are showing up at the wrong speed (usually slower) when the BIOS scans the SCSI bus during boot?

- Make sure you are using the terminated cable supplied with your Adaptec kit.
- Do not mix Ultra320/160 devices and any other speed devices on the same SCSI cable. All Ultra320/160 devices need to be on a single cable. Adding a slower device will slow down all the devices on the same cable.
- Be sure you have the connection firmly seated. A bad connection on a disk drive or other devices can cause problems talking to that device as the maximum speed.
- Try to route the cable inside the system as smoothly as possible. Avoid bending, flexing, or stretching the cable inside your system.
- If you are not booting from the SCSI card (your boot hard disk drive is not attached to the card) then the BIOS on the card should be disabled.

- If the card driver will not load and you do not have your boot hard disk drive attached to the card, try removing all the cables and devices from the card then starting up.

If this is successful and the driver loads, then you may have a problem with a device setting (conflicting SCSI ID numbers or Termination setting) or you have a bad cable or cable connection. Reattach devices one at a time until the problem is isolated, remembering to follow the correct termination procedure for the SCSI bus. For more information on termination, see [Terminating the SCSI Bus on page 1-6](#).

What do I do if I am having a resources conflict?

Physically move the Adaptec SCSI card to another PCI slot. It may be necessary to swap its position with a PCI card that is already in the system. By doing this, the order that the system finds the SCSI cards will be changed and the system can assign different resources to the SCSI cards.

What do I do when during boot, the Adaptec SCSI Card banner comes up but the system hangs?

Go into *SCSISelect* and choose the settings for the device that are more appropriate for the device time.

All narrow devices should have the option for Initiate Wide set to **No** and the Maximum transfer rate should be set to the fastest that the device supports, usually 20 MB/sec. (check your device documentation for this information). Setting the speed any faster for these devices will not improve performance of the device and can make the SCSI bus unstable. This can also be caused by incorrect termination, a resource conflict, or a bad device or cable.

Troubleshooting in Windows NT 4.0

Windows NT by default is not set up to detect cards automatically when they are added to a system. Because of this it will be necessary to add the driver manually. In order to add or remove a SCSI driver controller in Windows NT, you must be logged on as the Administrator.

What if I can't load the driver?

If the driver is failing to load, then be sure you are using the latest version available from the Adaptec Web site at www.adaptec.com.

If you are using the latest version of the driver and are still having difficulties, then see [General Troubleshooting on page A-2](#).

Common Error Messages

Here is what you should do if the following messages appear on the screen at bootup:

“Device connected, but not ready”

The host computer received no answer when it requested data from an installed SCSI device.

- 1 Run *SCSISelect* and set the Send Start Unit Command to **Yes** for the particular SCSI device ID. See [Starting SCSISelect on page 3-3](#).
- 2 Ensure that the device is set to spin up when the power is switched on. The spin up option is typically set by a jumper. (See the documentation for the device.)

“Start unit request failed”

This message can appear if the option to send Start Unit Command is set to **Yes** and device is *not* a disk drive. If this is the case, then change the setting to **No** in *SCSISelect* for the device.

The SCSI card BIOS was unable to send a Start Unit Command to one of the installed SCSI devices. Run *SCSISelect* and disable the Send Start Unit Command for the device.

“Time-out failure during...”

An unexpected time-out occurred:

- 1 Verify that the SCSI bus is properly terminated.
- 2 Verify that all cables are properly connected.

Try disconnecting the SCSI device cables from the SCSI card and then starting the computer. If the computer successfully restarts, one of the SCSI devices may be defective.

B

Windows Error Messages

In this Appendix

Error Messages

B-1

Error Messages

Error messages generated by the Windows drivers can be viewed by opening the Windows Event Viewer error logs.

To view events generated by the driver:

- 1 Double-click the **Event Viewer** icon in the Administrative Tools program group.

Error messages generated by the driver show up as Event ID 11. Error messages generated by the SCSI port show up as Event ID 9.

- 2 To view event details, select **System Log** from the Event Viewer tree. Double-click the appropriate Windows driver event that has an Event ID of 11. (There may be none or multiple driver events.)

The top portion of the Event Detail dialog box displays information such as the time that the event was generated, the computer on which the event occurred (in case of remote monitoring), and the description of the event. The Data section of the Event Details dialog box displays the error messages generated.

3 Click the **Words** option.

In the Data section of the dialog box, the entry in the second row and second column (to the right of the 0010: entry) lists the error message generated by the driver. The common error messages for the driver are described in [Driver Error Messages on page B-2](#):



Note: The entry in the third row of the last column identifies the SCSI ID of the device originating the error.

Driver Error Messages

The following error messages are listed sequentially according to the last three digits of the error message. For example, [xxxxx010], [xxxxx011], [xxxxx012], and so on.



Note: When reporting problems to Customer Support, be sure to include the complete error message in your problem description.

[xxxxx004] **Command completed with error**

[xxxxx005] **Command completed with error**

[xxxxx006] **Command completed with error**

A request issued to a target device completed with indication that there is an error. In most cases, the error is recovered and normal operations continues.

[xxxxx010] **Error issuing command**

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

[xxxxx011] **Error issuing command**

The requested command is not supported by this driver.

[xxxxx012] **Error issuing command**

[xxxxxx99] **Error issuing command**

The driver does not recognize the target device.

[xxxxx021] Target device protocol error

An unexpected event occurred during data transfer between the adapter and target device. Normally, this indicates a faulty or noncompliant target device.

[xxxxx022] Adapter or target device protocol error

The adapter or target device has broken the communication protocol. A badly behaving device could cause this message to appear. Normally this is not a serious problem. If you get this message frequently over a short period of time, it could indicate that the device or system is malfunctioning. Unplug or turn off unused devices to see if the problem persists.

[xxxxx023] Target device parity error

The driver has detected a parity error by the target device.

[xxxxx024] Data overrun or underrun

The adapter was given more or less data than the expected amount of data.

[xxxxx031] Target device queue full

The target device internal buffer is full.

[xxxxx032] Target device busy

The target device reports a Busy status. Another program may already be using this device.

[xxxxx050] Host adapter failure

[xxxxxx9A] Host adapter failure

Your host adapter may not be properly installed or is defective. Try resetting the adapter in the PCI slot, or try installing it a different PCI slot.

[xxxxx081] Adapter initialization failure

[xxxxxx8A] Adapter initialization failure

[xxxxxx83] Adapter initialization failure

An error has occurred while the driver was setting up its internal data structures. Verify that your adapter is supported by this version of the driver.

[xxxxx089] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx096] Adapter hardware initialization failure—possible resource conflict

The driver has attempted to initialize the adapter hardware but failed. This might suggest that an adapter resource (for example, an IRQ) conflicts with another board installed in your system.

[xxxxx097] Unable to allocate memory

This indicates that there may be a problem with the amount of memory installed in your system. Verify that your system has at least the minimum amount of memory required by your operating system.

[xxxxx0af] Unable to de-allocate memory that was allocated for a target device

Normally, this is not a serious problem, unless you get this message frequently over a short period of time. The memory can be reclaimed by rebooting the system.

[xxxxx0ce] Scatter/Gather limit exceeded

An I/O request packet from the system contained a Scatter/Gather element list that contained more elements than are supported by the miniport. Scatter/Gather is a list of data segments that define the entire data transfer. Scatter/Gather is a means to improve total data throughput. This error might be caused by a component external to the miniport driver, such as the operating system or an ASPI application.

[xxxxxd4] Adapter hardware failure - adapter reset

The host adapter hardware failed and the miniport driver has to reset the hardware.

[xxxxx0d6] Internal driver error

An error has occurred while the driver was setting up its internal data structures. Try installing the most up-to-date version of the driver available from the Adaptec Web site.

Using Windows Advanced Configuration Parameters

In this Appendix

<i>Using Windows SCSI Parameters</i>	C-2
<i>Using Driver-specific Parameters</i>	C-4

Advanced users may use software parameters to alter the configuration of the Windows device drivers supplied by Adaptec. All Windows configuration information is stored in a data structure supplied by Windows called the Registry. You can edit this information through a tool called the Registry Editor.



Caution: *Do not* edit your Registry unless it is absolutely necessary. If there is an error in your Registry, your computer may become nonfunctional.

The following is a table of supported Windows Registry Settings.

Option Name	Default Value	Valid Values	Definition
/MAXTAGS= <i>nnn</i>	32	1-255	Specifies tagged command queue depth per target.
/INSTR_ERRLOG_Z= <i>nnn</i>	32	0-127	Specifies the length of the instrumentation error log.
MaximumSGList	65	2-255	Sets the maximum transfer size for an individual command.
MaximumLogicalUnit	32	0-31	Limits the scan for connected devices on the SCSI bus.
NumberOfRequests	255	16-255	Specifies the maximum number of commands that can be delivered to an adapter.

Using Windows SCSI Parameters

Follow the instructions below to enter the registry values that affect how the Windows SCSI manager interprets the generic configuration information of SCSI device drivers. Each driver has its own key reference in the Registry. In this example, the Ultra320 key is used (adpu320). All SCSI host adapters supported by the modified key are affected by the values you enter here. A list of valid values follows:



Note: The following value keys are case-sensitive and must be entered exactly as shown.

- **MaximumLogicalUnit**—This can limit the scan for connected devices on the SCSI bus. Valid values are 0 to 32. If 1 is specified, the Windows SCSI manager assumes that no SCSI targets support LUNs other than LUN 0. Otherwise, LUNs from 0 to 31 are scanned during system initialization. The data type for this value is REG_DWORD.
- **MaximumSGList**—Specifies the maximum number of Scatter/Gather elements. Valid values are 2-255. The data type for this value is REG_DWORD.

- **NumberOfRequests**—specifies the maximum number of commands that can be delivered to an adapter. Valid values are 16-255. The data type for this value is REG_DWORD.

To enter Windows parameters:

- 1 Select **Run** from the Start button.
- 2 Type `regedt32` and press **Enter**.
- 3 Open the registry list to the following location:

`\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\adpu320\Parameters\Device`

If the `Parameters\Device` keys already exist, skip to Step 8 below to begin entering values. If the keys do not yet exist, you need to create them by continuing with Step 4.

- 4 Click on the **adpu320** key.
- 5 Select **Add Key** from the Edit menu; type `Parameters` in the Key Name edit box. Leave the Class edit box blank.
- 6 Click on the **Parameters** key.
- 7 Select **Add Key** from the Edit menu; type `Device` in the Key Name edit box. Leave the Class edit box blank.

To specify a certain host adapter, append `Device` with the number of the host adapter. For example, type `Device0` for the first host adapter, `Device1` for the second, and so on. If you omit the host adapter number, the configuration information applies to all Ultra320 host adapters.

- 8 Click on the **Device** key.
- 9 Select **Add Value** from the Edit menu. In the Value Name edit box, enter one of the valid parameter values. Make sure to enter the appropriate data type for the value. To enter additional values, repeat Steps 8 and 9.



Note: Changes made with the Registry Editor do not take effect until you shut down and then restart your computer.

Using Driver-specific Parameters

To use the Registry Editor to enter `adpu320m.sys` driver-specific parameters that affect the configuration information for Adaptec SCSI PCI device drivers, follow the instructions below. A list of valid parameters follows:



Note: The following parameters are case-sensitive and must be entered exactly as shown. When entering multiple parameters, each parameter must be separated by a space.

- `/MAXTAGS=nnn`—specifies the tagged command queue depth per target. If a number is not specified, the tagged queue depth defaults to 32. Valid values are 1-255. The data type for this value is `REG_SZ`.
- `/INSTR_ERRLOG_Z=nnn`—sets the maximum number of error log entries, if `/INSTRUMENTATION` is enabled. If a number is not specified, the maximum number of error log entries defaults to 32. Valid values are 0-127. The data type for this value is `REG_SZ`.
- `/HOTPLUG` —enables Hot-Plug PCI feature. If this option is not specified, Hot-Plug PCI feature defaults to disabled.



Note: The `/HOTPLUG` parameter is only supported with Windows NT 4.0.

To enter driver-specific parameters:

- 1 Select **Run** from the Start button.
- 2 Type `regedt32` and press **Enter**.
- 3 Open the registry list to the following location:
`\HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\adpu320\Parameters\Device`

If the `Parameters\Device` keys already exist, skip to Step 10 below to begin entering parameters. If the keys do not yet exist, you need to create them by continuing with Step 4.

- 4 Click on the **adpu320** key.

- 5 Select **Add Key** from the Edit menu; type `Parameters` in the Key Name edit box. Leave the Class edit box blank.
- 6 Click on the **Parameters** key.
- 7 Select **Add Key** from the Edit menu; type `Device` in the Key Name edit box. Leave the Class edit box blank.

To specify a certain host adapter, append `Device` with the number of the host adapter. For example, type `Device0` for the first host adapter, `Device1` for the second, etc. If you omit the host adapter number, the configuration information applies to all Ultra320 host adapters.

- 8 Click on the **Device** key.
- 9 Select **Add Value** from the Edit menu, and type `DriverParameters` in the Value Name edit box. Enter `REG_SZ` as the data type and press **Enter**.
- 10 A String Editor text box appears. Enter valid parameters in the text box. When entering multiple parameters, each parameter must be separated by a space.



Note: Changes made with the Registry Editor do not take effect until you restart your computer.

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Part Number: CDP-00034-01-A, Rev. A
JG 11/04