INSTALLATION GUIDE

ADAPTEC SCSI RAID 2010S/2015S

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Installation Guide

adaptec®
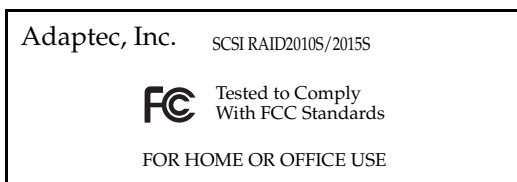
Regulatory Compliance Statements

Federal Communications Commission Radio Frequency Interference Statement

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between equipment and receiver.

• Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/television technician for help.

• Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

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.

Adaptec, Inc.   SCSI RAID2010S/2015S

FC Tested to Comply
With FCC Standards

FOR HOME OR OFFICE USE

CE   European Union Compliance Statement

This Information Technology Equipment has been tested and found to comply with the following European directives:

EMC Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC

EN 50081-1 (1992)
EN55022 (1994) Class B
EN 50082-1 (1992)
EN61000-4-2 (1998)
EN61000-4-3 (1998)
EN61000-4-4 (1995)
EN61000-4-5 (1995) Surges
EN61000-4-6 (1996) Conducted immunity
EN61000-4-11 (1994) Supply dips of variation

Australian/New Zealand Compliance Statement

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to the Australian/New Zealand standard AS/NZS 3548 set out by the Spectrum Management Agency.

Canadian Compliance Statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Japanese Compliance (Voluntary Control Council Initiative)

This equipment complies to class B Information Technology equipment based on VCCI (Voluntary Control Council for Interface). This equipment is designed for home use but it may causes radio frequency interference problem if used too near to a television or radio. Please handle it correctly per this documentation.

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1

Introduction

In this Chapter

Read this First

Before you begin installing your new Adaptec SCSI RAID 2010S/
2015S Zero Channel RAID (ZCR) controller, read this chapter. This
chapter is an important guide to the rest of the documentation and
provides a summary of the installation process.

Register your controller

Before you go any further, please register your ZCR controller at
register.adaptec.com.

System Requirements

The following system requirements are discussed:

■ Storage requirements for drivers and software.

■ Motherboard compatibility.

■ SCSI requirements.

Storage Requirements for Drivers and Software

Adaptec Storage Management software and device drivers require approximately 5 MB of disk space. The host system should have 64 MB of memory, and a Pentium processor that is at least as fast as 200 MHz. A mouse and SVGA color monitor are also required.

These requirements are met for the 2010S and 2015S. Motherboards designed to work with these controllers are server motherboards having Pentium III or later processors or equivalents with ample memory and faster than 200 MHz operating speeds.

Motherboard Compatibility

The Adaptec controller requires a motherboard BIOS that:

■ Complies with the *PCI Local Bus Specification* - revision 2.2.

■ Supports multifunction devices where one of the devices is a PCI bridge.

■ Provides large memory-mapped address ranges.

■ provides SCSI device connectivity along with at least one motherboard based SCSI channel.

The Adaptec ZCR controllers provide advanced RAID functionality to server motherboards incorporating on-board Adaptec Ultra320 SCSI and Embedded RAID Logic (EMRL) or RAIDIOS™ logic. The ASR-2010S is designed to work in one of the supported EMRL- or RAIDIOS-enabled PCI slots. The ASR-2015S plugs into a specially-designed SO-DIMM PCI connector, present only on specific motherboards.

SCSI Requirements

The ASR-2010S/2015S ZCRs are designed to be used with Ultra 320 hard disk drives, they will operate, at a reduced level of

performance, with all SCSI devices of Ultra 2 or higher. Use of SCSI devices older than Ultra 2 is not suggested.

Kit Contents

Your Adaptec controller kit includes:

■ ASR-2010S or ASR-2015S (does not include cables).

■ Warranty cards.

■ *Adaptec SCSI RAID 2010S/2015S* (this book).

Adaptec ZCR Controller Features

Adaptec ZCR controllers support:

■ RAID levels 0, 1, 5, multilevel 10 and 50, JBOD (Just a Bunch Of Drives).

■ Fixed cache memory with Error Correction Code (ECC).

■ Predictive caching capability.

■ *PCI Local Bus Specification,* Revision 2.2 with PCI clock speeds up to 66 MHz.

■ Microsoft Windows® 2000, Windows® NT, Windows® XP, and Red Hat Linux.

■ Operating system independent configuration and RAID creation using Storage Manager On ROM (SMOR).

■ Local and remote configuration, array status, and I/O monitoring using Adaptec Storage Management software.

■ Intelligent hot spares that automatically replace failed drives. When multiple hot spares are available on a controller, the intelligent hot spare algorithm picks the best spare based on capacity and bus location. RAIDs are rebuilt automatically using the spare drive.

■ ASPI protocol support for third-party applications and utilities.

■ Flash ROM for easy upgrades of controller firmware, controller BIOS, and SMOR.

■ Event logging and broadcasting, including messaging for alphanumeric pagers.

■ *Windows XP, Windows 2000, and Windows NT only*—Array expansion and extension during normal operation on RAID 0 or RAID 5 arrays with the NTFS file system. Refer to the *Adaptec Storage Management Software User's Guide* for more information.

■ Legacy SCSI devices (including hard disk, tape, CD-ROM, CD-RW, and Magneto-Optical drives) and jukeboxes.

■ SCSI Accessed Fault-Tolerant Enclosure (SAF-TE) and SCSI Enclosure Services (SES) for high-availability Local Area Network (LAN) servers and storage subsystems.

■ Adaptec RAID software supports up to 64 hard disk drives per array and up to 2 Terabytes of storage capacity per array.

RAID features are summarized in the following table:

	2010S	2015S
PCI bus type (bits/MHz)	64/66	64/66
Cache, standard (MB)	48	48
# of Channels[1]	0	0
# Devices per channel[2]	15	15
Total # devices	30	30
# Connectors, internal[1]	0	0
# Connectors, external[1]	0	0
RAID 0, 1, 5, 10, 50, JBOD	Yes	Yes
Hot spare	Yes	Yes
Hot swap	Yes	Yes
Connector type	PCI[3]	SO-DIMM[4]

[1] Usable channels and whether they are internal, external, or both depends on motherboard design. No channels on controller.

[2] ZCR controllers support Ultra320 and legacy hard disk drives and non-hard-disk-drive devices, such as CD and tape drives.

[3] Requires a special PCI slot designed to support the motherboard's RAIDIOS or EMRL logic connections.

[4] Requires a special attachment slot (a PCI connected SO-DIMM) to connect to the motherboard's EMRL logic.

Specific Characteristics of ZCR Controllers

ZCR controllers perform the same functions as add-in RAID controller cards, but Adaptec's ZCR controllers can only be used in motherboards that support EMRL or RAIDIOS logic and on-board Adaptec Ultra320 SCSI Protocol Chips (SPC). When a ZCR is not installed, EMRL logic is not active, letting the SPC function as a SCSI adapter only.

> **Note:** Neither the ASR-2010S or the ASR-2015S will function when used with motherboards having embedded Adaptec 7899W or 7892 U160 SCSI chips. Use ASR-2000S or ASR-2005S controllers for those motherboards using U160 SCSI chips.

Data stored on any individual SCSI hard disk drive must be backed-up prior to installing a ZCR. Once installed, the ZCR hides the normal SCSI BIOS and replaces it with an I_2O RAID BIOS and SMOR.

To meet the space constraints of the high-density servers and the flexibility required for the pedestal servers, EMRL is designed to support two form factors. One is a PCI add-in card and the other is a daughter card designed to attach to a motherboard connector. Functionally the PCI add-in card and the SO-DIMM card are identical. The primary difference is the form factor of the two cards.

Pedestal Server Form Factor Implementation

The Adaptec PCI-based ZCR controller (2010S) is packaged in a low profile PCI form factor, targeting the 1U and 2U server market using a discrete I/O controller on the motherboard. This implementation is intended to be used in the more generic pedestal server designs.

The 2010S requires EMRL or RAIDIOS on the motherboard to allow the Input/Output Controller (IOC) to function normally when the ZCR controller is not installed, but be hidden and controlled only by the ZCR controller Input/Output Processor (IOP) when the Adaptec PCI-based ZCR controller is installed.

The following figure shows the relationship of the Adaptec ZCR 2010S to the IOC, PCI bus, and EMRL.
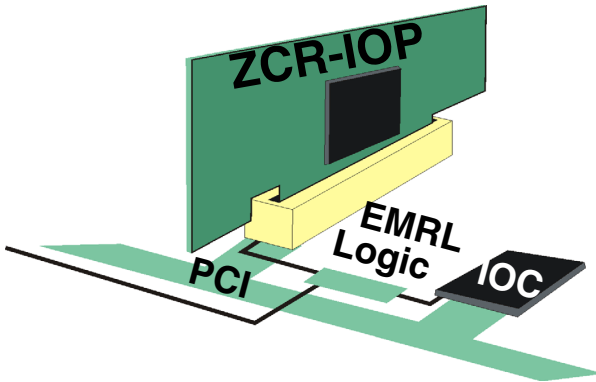
High Density Server Form Factor Implementation

This implementation uses a low-profile connector and card to provide the ZCR functionality. All the normal PCI signals found in a PCI slot route to the motherboard ZCR connector -- allowing the ZCR card to be plugged in without using a PCI slot, critical for high-density applications. The following figure shows the relationship of the Adaptec ZCR 2015S to the IOC, PCI bus, and EMRL logic.
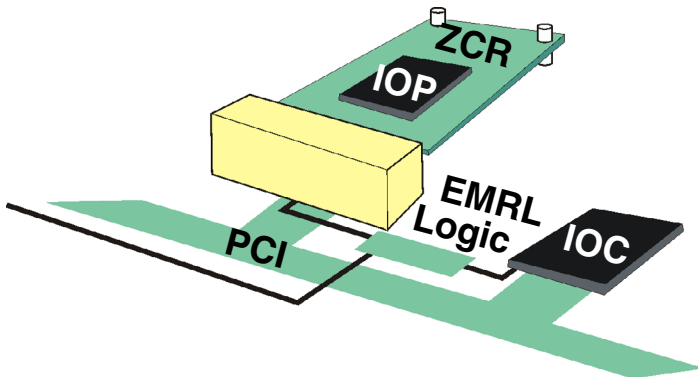
About the Documentation

The complete documentation set for Adaptec ZCR controllers consists of the following:

■ *Adaptec SCSI RAID 2010S/2015S Installation Guide* (this book)—Contains information that helps you to configure and install your Adaptec ZCR controller and attached devices.

■ *Adaptec Storage Management Software User's Guide*—Describes how to use SMOR, Adaptec Storage Manager software, and the RAIDUTIL command line utility.

Storage Manager provides online help for creating and managing RAIDs, including topical and pop-up help displays.

Overview of the Installation Process

The following steps provide an overview of the process of installing and setting up the controller and configuring the ZCR:

1 Read this entire chapter.

2 Verify that your motherboard is compatible with the controller. For details, refer to *Motherboard Compatibility* on page -2.

3 Install and configure your Adaptec ZCR controller and hard disk drives according to the instructions in Chapter .

4 Use SMOR to set up your boot array. Refer to Chapter .

5 Install the controller driver according to the instructions in Chapter . If you are building a new system, installing the driver involves installing the operating system, too.

   Chapter presents numerous scenarios for installing the driver. Identify the scenario that applies to your system before proceeding. When installing the driver, you may need to use SMOR to configure the controller or create the array.

6 Install the Adaptec Storage Management software application, software installation procedures are described in Chapter .

Storage Management Software Overview

Adaptec supplies a number of software applications for setting up and managing RAID arrays with the Adaptec ZCR. One is a Graphical User Interface (GUI), one is a Command-Line Interface (CLI) that is loaded along with the GUI application, and the third is provided as a utility that may be used before the operating system is available.

■ **Adaptec Storage Management software**—The GUI through which you interact with the storage subsystem. Storage Manager supports the following operating systems:

> ■ Windows NT 4.0, 2000, XP
>
> ■ Red Hat Linux 7.3

Note: Up-to-date information, including the latest versions of drivers and RAID management software for Adaptec RAID products, may be found by perusing Adaptec's web site at www.adaptec.com. Similar information for LINUX may be found at linux.adaptec.com

Furthermore, Adaptec Storage Management provides additional features, such as Simple Network Mail Protocol (SNMP) and Desktop Management Interface (DMI) agents.

■ **RAIDUTIL CLI**—Provides the same functions as Storage Manager in environments where a GUI is not available. It is also scriptable, making it an invaluable companion RAID configuration utility in environments where many similarly-configured RAID subsystems must be replicated quickly. For details, refer to the *Adaptec Storage Management Software User's Guide*.

■ **SMOR**—A built-in utility that is part of the controller's BIOS code. Start SMOR by pressing **Ctrl+A** during BIOS startup. For details, refer to .

Safety Information

Any device that uses electricity must be treated with caution. To ensure general safety:

■ Keep your work area and the computer clean and clear of debris. Eliminate hazards such as spills or bad wiring.

■ Before opening the system cabinet, unplug the power cord.

Notes, Cautions, and Warnings

This *Installation Guide* uses notes, cautions, and warnings that emphasize important information, as described below:

Note: Emphasizes important information that, if ignored, would not result in injury, property damage, or data loss.

Caution: Emphasizes important information that, if ignored, could cause equipment failure or loss of data.

Warning: Indicates a hazard that could cause injury or property damage.

Electrostatic Discharge

Electrostatic discharge (ESD) is a natural by-product of human activity. ESD is transmitted by materials that retain and accumulate electrical charges.

Caution: ESD can damage electronic components when they are improperly handled and can result in complete or intermittent failures. Always follow ESD-prevention procedures when removing and replacing components.

To prevent ESD damage:

■ Always use an ESD wrist or ankle strap and ensure that it makes skin contact.

■ Connect the equipment end of the strap to an unpainted metal surface on the chassis.

■ If no wrist strap is available, ground yourself by touching the metal chassis.

■ When installing or removing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or card slot. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.

■ Handle adapter cards by available handles or edges only. Avoid touching the printed circuit boards or connectors.

■ Avoid contact between printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.

■ Place a removed component board-side-up on an antistatic surface or in an approved antistatic container.

■ If you plan to return the component to Adaptec, immediately place it in a static-shielding container.

2

Installing Your Controller

In this Chapter

Configuring SCSI Devices

When configuring devices for Adaptec ZCR controllers, you may need to:

■ Decide how to position drives on the SCSI bus.

■ Select cables.

■ Enable or disable SCSI termination.

■ Set the SCSI IDs.

> **Note:** SCSI drives should, in general, not be reformatted. However, if your SCSI drive was formatted to a sector size other than 512 bytes, you must reformat the drive before you can use it in a RAID. Refer to the *Adaptec Storage Management Software User's Guide* for details.

Narrow and Wide SCSI Devices

You can attach either narrow (8-bit) or wide (16-bit) SCSI devices to your Adaptec ZCR controller. If you use narrow and wide devices on the same wide cable, put one of the wide devices at the end of the cable. This ensures that the 16-bit signals are correctly terminated.

Wide devices allow data to be transferred at twice the rate of narrow devices. The wide bus is backward compatible with narrow devices, allowing both types of SCSI devices to be used with the same controller. The narrow interface is still used with some SCSI devices, such as tape and CD drives.

LVD and SE Devices

Attaching a single-ended (SE) SCSI device to a Low Voltage Differential (LVD) bus causes the bus to slow down to Ultra SCSI speed (20 MHz) for all devices.

Note: Adaptec ZCR controllers cannot be used with older SCSI 5-V differential (DE) devices.

SCSI Cables

Adaptec recommends using Ultra320 SCSI devices and good quality LVD SCSI cables.

SCSI Device IDs

A narrow SCSI bus can support up to 7 SCSI devices and a controller connected to a single 8-bit SCSI bus. A wide SCSI bus can support up to 15 devices and the controller connected to its 16-bit bus.

All SCSI devices, including the controller, must be assigned a unique SCSI ID. SCSI IDs, which are typically set using jumpers or switches on peripheral devices, can be assigned any number from 0 to 7 for 8-bit SCSI devices or 0 to 15 for wide SCSI devices. Some computer systems and hard disk drive towers offer intelligent backplanes (SAF-TE / SES) that automatically assign a fixed SCSI ID to each slot in the backplane. When using these types of backplanes it is not necessay to assign an ID to each SCSI device.

Set the SCSI ID of each SCSI device attached to the controller to a unique ID number between 0 and 6. The Adaptec RAID controller is set to ID 7 by default (most SCSI controllers use ID 7). Wide SCSI devices can also use SCSI IDs 8 through 15. SCSI IDs can only be duplicated on the same controller if the devices using the same ID are not attached to the same bus.

If necessary, the Adaptec ZCR controller ID can be changed to any ID from 0 through 7. Use SMOR or the Configure Host Bus Adapter window in Adaptec Storage Management to change the controller SCSI ID.

Note: Changing the controller ID is not recommended. You should leave the Adaptec ZCR controller set at SCSI ID 7.

SCSI Termination

The basics of termination are:

■ Enable termination on the devices on each physical end of a SCSI cable. Depending upon how you configure your system, you would either:

   ■ Enable termination on two SCSI peripheral devices, or

   ■ Enable termination on the SCSI controller and one peripheral SCSI device.

■ If using both SCSI channels, terminate each channel separately.

Note: In some cases, the termination settings may need to be set using your motherboard's SCSI BIOS. This would be accomplished by removing the ZCR controller, setting the termination as desired, and replacing the controller. Any termination settings made or recommended in this guide may be superseded by settings or controls designed into the motherboard. Please review this chapter along with the contents of your motherboard guide for a better understanding of the settings necessary for your combination.

SCSI termination is configured through the SMOR utility or from the Configure Host Bus Adapter window in Adaptec Storage Management. The controller has only these termination settings:

Setting	Function
On	**Default**—Enables the controller termination built.
Off	Disables the built-in controller termination. Use only if the controller will not be situated at one end of the cable.

The following figure shows various SCSI cabling examples for a single bus. Terminate your SCSI devices as shown in the examples, ensuring that the devices at the ends of the cables are terminated, and the devices in the middle are not terminated. If only one cable is attached, then one end is the controller, and must have its termination enabled, as indicated in the figure where the circled T is in the controller.

> **Note:** Each channel being used on a multichannel ZCR adapter must be terminated properly for its configuration. The figure shows use with a motherboard channel having both an internal and external connection. Your motherboard may differ.
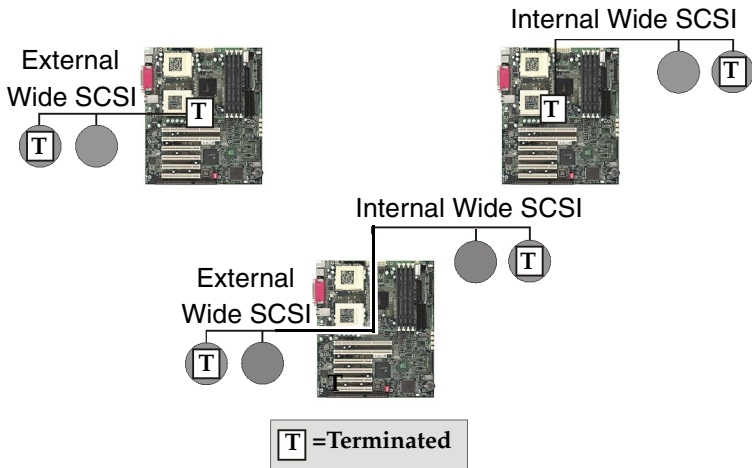
Installing the Controller

The Adaptec 2010S controller has a standard 64-bit, 3.3V PCI interface but will only function properly when inserted into a PCI slot supporting EMRL or Intel RAIDIOS logic.

The ASR-2015S controller also has a unique design but plugs into a special EMRL enabled SO-DIMM socket provided on specific motherboards.

To install your ZCR controller, insert the device into the supported ZCR enabled slot on the motherboard (consult your system's documentation for the supported slot(s)). Load the driver associated with the operating system as described in this guide. To ensure proper installation, examine the screen during system boot. Instead of showing an Adaptec SCSI BIOS message, the system will display an Adaptec I$_2$O BIOS message indicating the results of its SCSI scans and RAID device creation.

1 Locate the SCSI connectors on the motherboard and connect any internal drive cables now, if not already connected.

2 Install the ASR-2010S controller in the appropriate ZCR slot allocated for it and secure the controller bracket to the motherboard case with the screw provided in the system. There will be only one ZCR enabled slot on the motherboard. It will often be a different color than the rest.

ASR-2015S controllers may be secured using either locking stand-offs into the holes in the board, or via other means available from the system manufacturer. Care should be taken to ensure that the controller board is not pressing against any cables or internal hardware.

Considerations to Adding a ZCR Controller to an Existing Compatible System

The Adaptec ZCR controllers have unique installation requirements. These controllers are ZCR cards and work with the motherboard's embedded Adaptec SCSI chip to provide advanced RAID functionality. SCSI devices may be connected to the system prior to installation of the ZCR. Under these conditions, the user should back-up any data on the disk drives prior to implementing a ZCR solution.

> ⚠ **Caution:** If data exists on drives before implementing RAID, backup data prior to installing RAID controller as data will be lost during RAID creation.

Creating an Array Using SMOR

1 If you wish to set up an array using SMOR, the controller's on-board BIOS system, do the following:

> ✓ **Note:** In using the following sequence to create an array, the following conditions will be assumed. Three drives are attached to channel 1 and will be used to set up a bootable RAID 5. For details on setting up other arrays, or for information about using SMOR, consult the *Adaptec SCSI RAID Software User's Guide* on the enclosed CD.

2 Restart the system. While the system is restarting, press **Ctrl-A** when the controller BIOS displays on the screen.

3 When the blue-background SMOR screen displays, press **Alt-R** to pull down the RAID menu.

4 Highlight **Create** and press **Enter**.

5 Select (●)**RAID-5** and press **Enter**.

6 In the window that appears, click **OK**.

7   In the next window, select the three drives that will comprise your RAID 5. Press the **Insert** key or Space Bar to select the highlighted drive, and the **up** and **down** arrow keys to highlight other drives. When finished, **Tab** to highlight Done, and press **Enter**.

8   Press **Alt-F** to pull down the File menu.

9   Highlight **Set System Configuration** and press **Return**.

10 In the Configuration Changes window, press **Return** to select OK. The SMOR window will indicate in the Information tab that the array is building.

11 When through, press **Alt-F** again, highlight **Exit**, press **Enter**, then **OK** on the window that appears. The system will restart.

Determining the Booting Controller

Adaptec ZCR controllers are shipped with a controller BIOS ROM enabled for PCI assignment. This BIOS intercepts and processes Int13h BIOS calls with an embedded DOS driver.

Controlling which device the system will start from may involve two separate steps, one in the system's Setup screen area, and the second in the controller card's settings.

System Setup

Consult the documentation that came with your system for particulars on changing the Setup options. Look for an entry in the system's Setup area called **Boot Sequence** or something similar. In it, you can set the device order that will be used for starting your system.

Placing the CD-ROM drive first; then the hard disk drive will make installing the operating system easier. Placing the floppy disk drive, which might be called a floppy diskette drive, before the hard drives might be handy, but Windows and Linux do not use floppy disks for installation much anymore.

The Setup may also have another entry for controlling the hard drive sequence to be used. This entry, which may be on the same screen, or in a subsequent screen, will order the system's on-board drive, usually the IDE drive, and that of the controller that is being added. Make the controller the first hard disk drive to be used if you wish to start the system from the controller's array.

Save and Exit the system's BIOS area. Restart the system. See the next section for details on setting up the controller.

Configuring the Controller to Boot from Channel 1

The controller defaults to enable booting from either channel when the ZCR motherboard is fitted with an Adaptec 7902W SCSI controller. In this case the controller will attempt to boot from the first array found. If arrays exist on both channels; the first array found, and therefore the boot device, will be the one with the lowest SCSI ID on channel 0.

If you wish to boot from an array on channel 1, you will need to disable booting for channel 0. To do this:

1 Restart the system, press **Ctrl-A** when the controller BIOS displays.

2 When the blue screen of the SMOR display appears, highlight **Channel 0** on the card on the left side, and **tab** to switch to the right side.

3 Highlight the **[√] Bus Boot Enable** and press the **Spacebar** to toggle the switch off, the √ will disappear. The system will now bypass Channel 0 as a bootable channel.

4 Press the **Esc** key.

5 When asked to save changes, tab to **yes** and press **Return**.

6 Exit SMOR and allow the system to restart.

Controller IRQ and Address

Both the IRQ and address space used are not set by the user. During the host system start process, the system BIOS should automatically configure the controller BIOS Interrupt Request (IRQ) level and memory location for all Adaptec PCI controllers in the system.

After Setting Up your System

After your system is set up, you can use all of the advanced features of Adaptec Storage Management to modify and improve the RAID.

The array build/rebuild process occurs in the background and therefore the array can be used while the array is building/rebuilding. Once the operating system and Adaptec Storage Management are installed, Adaptec Storage Management can be used to monitor the array's build/rebuild progress. For additional information, refer to Chapter 4 or the *Adaptec Storage Management Software User's Guide*.

3

Installing the Driver

In this Chapter

This chapter presents several scenarios for installing the controller driver. Identify the appropriate scenario and read the entire procedure and related explanations before proceeding.

Instructions are provided for installing a new system, and for upgrading an existing system by adding the ZCR.

Driver Disks

A system with an Adaptec SCSI RAID controller installed will need to have an appropriate driver for the controller to operate properly.

Installation is easier when the drivers are available on a floppy disk. Create the driver disk from the included CD.

> **Note:** If doing an upgrade to an existing system, the drivers may be installed directly from the CD, eliminating the need to create individual driver disks. New installations of Windows usually will require a driver disk. Installing the drivers from the CD requires navigating into the CD's hierarchy of folders. This may be confusing.

Creating a driver disk for Red Hat Linux 7.3 is not necessary. Drivers for this version of Linux are included in the distribution.

Creating the Driver Disk from the Bootable CD

These instructions cover creation of disks for Windows and Linux. To start creating a driver disk:

1 Ensure your system BIOS is ready to boot from the CD-ROM drive. See your system documentation if you need help. Insert the CD that came with your controller, and start your system from the CD. Follow instructions and respond to prompts as necessary to get to the Adaptec Main Menu.

2 From the Main Menu, click the **Create Driver Disk(s). . .** line.

3 Review the type of installation you are doing elsewhere in this chapter to know what type of driver disk to create. Click on the type of driver disk desired, then click **OK.**

4 When the screen prompts you to insert a disk and click **OK**, do so. The system will format the disk, insert a file system, if needed, and write the appropriate information onto it. When finished, the screen will display another **OK** button.

5 Remove the floppy disk and click **OK**. Label the disk to represent the driver disk created.

New Installations

For new installations of any of the operating systems supported, it is possible, if not desireable, to install the operating system on an array. This provides a more robust system, since failure of a drive won't cause the system to stop running.

Any such installation requires that the redundant array be created prior to installing the operating system. Adaptec SCSI RAID controllers provide two ways to do this, by starting (also called booting) the system using the Adaptec CD, or by using the tools built into the on-board firmware on the controller.

While it is beyond the scope of this guide as to which RAID type to use for this application; you may want some guidance. The following condensed table may offer help. For more details, consult external resources detailing relative performance vs. desireable characteristics for the various RAID types.

RAID Type	Minimum Number of Drives	Properties
0	2	Not redundant - do not use RAID 0 for this application if you want the protection afforded by redundancy.
1	2 only	Fast writes and reads, equivalent to the transfer rate of the constituent drives.
5	3	Comparable read speed but rather slow write speed compared to constituent drives.
10	4	Requires multiples of 2, starting with 4. Provides the speed of a RAID 0 with the redundant protection of a RAID 1.
50	6	Requires a minimum of 6 drives. Provides greater efficiency in drive usage than the RAID 10.

Windows 2000 and XP

The following sections describe procedures for installing the Adaptec ZCR controller with Windows 2000 or Windows XP.

■ *Installing the Driver in a New System* on page 3-4

■ *Adding the Controller to an Existing System* on page 3-5

> **Caution:** When adding a ZCR controller to an existing system, backup all data from system drives prior to the installation. If the boot device is connected to one of the on-board SCSI channels, or you plan to use a RAID array as a boot device, the operating system will need to be reinstalled after installing the ZCR controller.

> **Note:** The Adaptec driver for Windows 2000 and Windows XP do not include a digital signature. Your system may display warning messages about this condition. Bypass the warnings and continue with the installation. The driver will function normally when the upgrade or installation is complete.

Installing the Driver in a New System

In this scenario, you are installing the Adaptec RAID controller in a new system that has no operating system. To install the driver:

1 Install and configure your Adaptec RAID controller and hard disk drives according to the instructions in Chapter 2.

2 Create the driver disk as shown at the beginning of this chapter. Remove the floppy disk after it is created.

3 Restart the system, during the start, press **Ctrl-A** when the Adaptec BIOS message displays. Use SMOR to create an array as shown in *Creating an Array Using SMOR* on page 2-6 or in the Software User's Guide on the CD that came with the Adaptec SCSI RAID controller.

4 Insert the Windows 2000/XP CD and restart the system to begin the Windows installation.

5 When the Windows 2000/XP installation starts, a blue screen appears after the hardware detection message. When prompted to install a third-party driver, press **F6**.

> ✓ **Note:** You only have 5 seconds to press the F6 key during the installation startup. A prompt appears at the bottom of the screen when F6 is active. Press **F6** at this time; otherwise, you must restart the Windows 2000/XP installation process to complete this procedure correctly.

6 When prompted by the Windows text-based install routine that appears, insert the driver disk you created, and continue with the standard Windows installation.

7 When Windows 2000/XP starts for the first time, it launches the Found New Hardware Wizard. Click **Next**. Then, select **Search for suitable driver for my device** and click **Next** again.

8 Insert the Adaptec driver disk you created at the beginning of this chapter, select it, and click **Next**. The wizard should find the *Adaptec RAID Adapter*.

9 Click **Next** and follow the instructions. Eventually, the installation will require that the system shut down and restart. After the restart, respond to any further instructions as needed to complete the installation.

Adding the Controller to an Existing System

In this scenario, you are adding an Adaptec ZCR controller to a system that already has a Windows 2000/XP operating system. If this system will have the operating system installed to an array attached to the motherboard's SCSI ports, use the preceeding section, treating the installation as a new install, but first back up any data you wish to save. To install the driver:

1 Backup any data that may already be on drives attached to the motherboard's SCSI ports.

2 Create the driver disk as shown at the beginning of this chapter. Remove the floppy disk after it is created.

3 If necessary, install and configure your controller and any other hard disk drives according to the instructions in Chapter 2.

4 Start Windows 2000/XP. Windows launches the Found New Hardware Wizard, which searches for the controller.

5 Insert the driver disk you created at the beginning of this chapter, select it, and click **Next**.

6 Click **Next** in the succeeding two windows that appear. Follow the on-screen instructions to complete the installation.

7 Reinstall any applications or data that had been backup up.

Windows NT 4.0

The following sections describe procedures for installing the Adaptec ZCR controller with Windows NT:

■ *Installing the Driver in a New System* on page 3-6

■ *Installing the Controller in an Existing System* on page 3-7

⚠ **Caution:** When adding a ZCR controller to an existing system, backup all data from system drives prior to the installation. If the boot device is connected to one of the on-board SCSI channels, or you plan to use a RAID array as a boot device, the operating system will need to be reinstalled after installing the ZCR controller.

✓ **Note:** The Microsoft I_2O Operating System Module (OSM) does not support the Adaptec ZCR controllers.

Installing the Driver in a New System

In this scenario, you are installing an Adaptec ZCR controller and Windows NT 4.0 in a new system.

✓ **Note:** If Windows NT is to coexist with another operating system, the other operating system must be installed before you install Windows NT.

To install the driver:

1 Create the driver disk as shown at the beginning of this chapter. Remove the floppy disk after it is created.

2 Install and configure your Adaptec ZCR controller and hard disk drives according to the instructions in Chapter 2.

3 Start up the system. During startup, press **Ctrl+A** to start SMOR. Use SMOR to create the RAID. For details, refer to *Creating an Array Using SMOR* on page 2-6 or in the Software User's Guide on the CD that came with the Adaptec SCSI RAID controller.

4 Insert the Windows NT setup media (floppy disk or CD) and restart the system.

5 Press **F6** when Inspecting Your Computer Hardware appears.

6 Insert the driver disk you created.

7 Press **S** to Specify Additional Devices.

8 Select **Other**, then insert the driver disk.

9 Select **Adaptec I$_2$O RAID Host Adapter Driver for NT 4.0**.

10 Press **Enter** and continue with the installation as described in the Windows NT documentation when the installation pauses.

Installing the Controller in an Existing System

In this scenario, you are adding an Adaptec ZCR controller to a working Windows NT 4.0 system having an appropriate slot for the ASR-2010S or ASR-2015S.

To install the driver:

1 Create the driver disk as indicated at the beginning of this chapter. Remove the floppy disk after it is created.

2 Back up all data on hard disk drives attached to the motherboard's SCSI channels.

3 Power down the system and install the ASR-2010S or ASR-2015S controller. Start the system again.

4 Open the **Control Panel**, double click on the **SCSI Adapters** icon.

5 Select the **Drivers** tab and click the **Add** button.

6 When prompted, click **Have Disk**.

7 Select **Adaptec I₂O RAID Host Adapter Driver for NT 4.0**.

8 After the driver is loaded, shut down the system and remove the disk.

9 Restart the system.

Red Hat Linux

The following sections describe procedures for installing the Adaptec ZCR controller with Red Hat Linux.

■ *Installing the Driver in a New Linux System* on page 3-9

■ *Installing the Controller in an Existing Linux System* on page 3-10

■ *Installing a Newer Driver* on page 3-12

The Adaptec ZCR controllers supports Red Hat 7.3.

Note: For the most up-to-date information on Adaptec's support of Linux, or to download driver sources, visit linux.adaptec.com.

Caution: When adding a ZCR controller to an existing system, backup all data from system drives prior to the installation. If the boot device is connected to one of the on-board SCSI channels, or you plan to use a RAID array as a boot device, the operating system will need to be reinstalled after installing the ZCR controller.

Installing the Driver in a New Linux System

The drivers for the ASR-2010S and ASR-2015S are embedded in version 7.3 of Red Hat. Installing the controller in a new Red Hat Linux system doesn't require any driver installation. This scenario is for installing the controller into a new system, where the operating system will be loaded to a RAID.

To install the Adaptec ZCR controller:

1 Install and configure your Adaptec ZCR controller and hard drives according to the instructions in Chapter 2.

2 Start up the server. During startup, press **Ctrl+A** to start SMOR. Use SMOR to create the RAID. For details, refer to *Configuring the Controller to Boot from Channel 1* on page 2-8 or in the Software User's Guide on the CD that came with the ASR-2010S or ASR-2015S.

> **Note:** Any partitions created on disks that are not part of an array will be unavailable if you subsequently use the disk in a RAID configuration. If your hard disk drives do not have partition tables or do not contain a recognizable partition, you will be prompted to initialize these disks. The operating system can automatically remove the data or you can manually partition the drives. For more information, refer to the Red Hat documentation.

3 Insert the Red Hat CD Disk 1 in the CD-ROM drive.

4 Start up the system.

5 When the Red Hat welcome screen appears, type linux or simply press **Enter**.

6 Follow the prompts to set up your preferred environment; for example, your preferred language and keyboard type.

7 Continue with the Linux installation according to the Red Hat documentation.

Installing the Controller in an Existing Linux System

Adding the controller to an existing system is essentially the same as if the system were new. Data on any hard disk drive attached to the SCSI channels that will be controlled by the ASR-2010S or ASR-2015S will not be accessible after the Adaptec ZCR controller is inserted. The following assumes you have Linux installed to a hard disk drive that will not be affected by the installation of the ZCR, such as an IDE drive:

1 Back up all data from the hard disk drives attached to the motherboard SCSI channels.

2 Install and configure your Adaptec ZCR controller according to the instructions in Chapter 2. Make any desired changes to the SCSI connections or configurations now.

3 Start up the server. If you desire to change your system to boot from a RAID, see the previous section, treating the installation as a new installation. Be sure to back up your data.

> **Note:** Any partitions created on disks that are not part of an array will be unavailable if you subsequently use the disk in a RAID configuration. If your hard drives do not have partition tables or do not contain a recognizable partition, you will be prompted to initialize these disks. The operating system can automatically remove the data or you can manually partition the drives. For more information, refer to the Red Hat documentation.

4 Reboot the system after you have made all of your configuration changes.

5 When Red Hat starts to come up, it will detect the new hardware. Press the appropriate key to enter into Kudzu when prompted.

6 When asked about the newly detected RAID controller, allow Kudzu to configure the device.

> **Note:** The ASR-2010S/2015S will be detected as a Distributed Tech: SmartRAID V controller.

7 Once the system has started, verify that an entry has been made for the new controller in the modules configuration file by typing:

```
cat\etc\modules.conf
```

Look for an entry similar to:

```
alias scsi_hostadapter dpt_i20
```

If the appropriate entry is not present, use an editor such as VI to make the change.

8 For the new module to start when the system boots, a new ramdisk will be required. An alternative to creating a new ramdisk is to allow the Adaptec RAID module to be started each time the system is booted by using the following command:

```
modprobe dpt_i20
```

9 To create a new ramdisk, change to the \boot directory. Rename the existing ramdisk to something similar to:

mv initrd-2.4.18-3.img initrd-2.4.18-3.img.old

> **Note:** This assumes you are using kernel 2.4.18-3. If your kernel version is different, please use the appropriate kernel number. Consult your system documentation for help on creating the initrd if needed.

10 To create a new ramdisk, type the following from the \boot directory:

mkinitrd initrd-2.4.18-3.img

11 Restart the server to verify that the module will now load on booting the system. When the system has booted, type lsmod and look for the entry for the dpt_i20 module.

12 Finally; partition, format, and create mount points for the attached RAID arraysor hard drives that will be used with the system.

Installing a Newer Driver

While the drivers for the ASR-201S and ASR-2015S are in the Red Hat Linux 7.3 kernel, newer drivers may be released occasionally. For current information about newer drivers, visit linux.adaptec.com.

Installation instructions for any newer kernel versions will be posted with the drivers.

4

Installing Storage Management Software

In this Chapter

As described in *Storage Management Software Overview* on page 1-8, you can use Storage Manager as your primary RAID management utility.

System Requirements

To run the controller and RAID management software, you need a system that meets the following minimum hardware requirements:

- Pentium or equivalent CPU that is at least as fast as 200 MHz

- 64 MB of RAM

- 5 MB of disk space for Storage Manager

- Mouse or other pointing device

- Graphics card and monitor capable of a minimum of 800 × 600 resolution and 256 colors

These requirements are met for the 2010S and 2015S. Motherboards designed to work with these controllers are server motherboards having Pentium III or later processors or equivalents with ample memory and faster than 200 MHz operating speeds.

Linux Considerations

Storage Manager for Linux requires X-Window support. Storage Manager includes LessTif components and supports the following environments:

- K Desktop Environment (KDE)

- GNU Network Object Environment (GNOME) GUI

Note: Use of more than 256 colors in your GUI can result in Storage Manager displaying incorrect colors. If this occurs, reset your color setting to use only 256 colors.

Installing Storage Manager

Operating System Compatibility

Storage Manager runs on the following operating systems:

■ Microsoft Windows 2000, Windows XP, and Windows NT 4.0

■ Red Hat Linux

Storage Manager's remote management capabilities are only available on your system if it contains a network card configured to use the TCP/IP protocol.

Install the configuration application supplied on the CD by following these steps:

1   With the system running, insert the CD. For the following installation examples, the CD drive will be represented as F: for Windows and as <mount point> for Linux. Linux tyically uses /mnt/cdrom as the <mount point>.

2   Select the following for a Windows installation:

   a   The CD should start automatically. If it doesn't, run F:\autorun.exe

   b   On the Autorun window that appears, click the icon on the Install Adaptec Storage Manager line.

   c   Storage Manager will begin installing. Follow the prompts to finish the installation

   d   Restart the system when finished.

   e   Storage Manager will be available in the Start → Programs display.

3   Do the following for a RedHat Linux installation:

   a   Type the following, or use the RPM installation utility to install the file at the location shown in capital letters:

```
rpm -Uvh /<mount point>/packages/Linux/
apps/sm/dptapps-3.32-1.i386.rpm
```

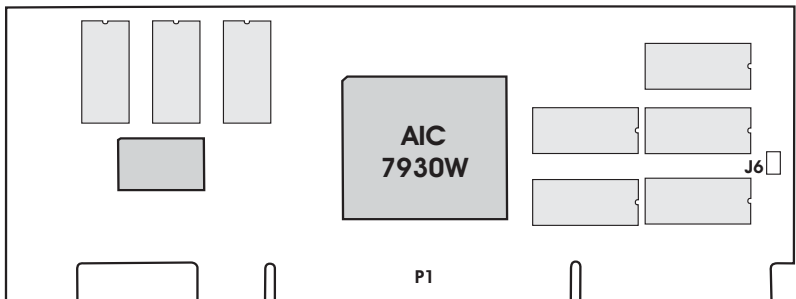   where <mount point> is the mount point from step #1.

b When finished, restart the system, removing the CD during the restart.

c An icon representing Storage Manager should be on your desktop, if you use one. Otherwise, the file to launch the application will be in the root/desktop directory.

A

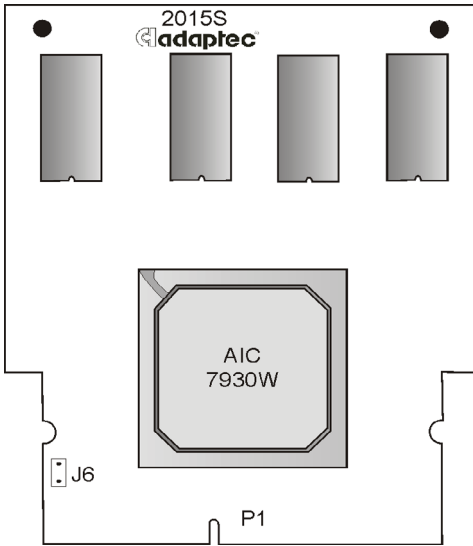# Card and Module Diagrams

In this Appendix

Adaptec SCSI RAID 2010S

Part	Description
J6	Flash Mode 0
P1	PCI connector

Adaptec SCSI RAID 2015S

Part	Description
J6	Flash Mode 0
P1	SO-DIMM connector

B

Troubleshooting

This *Appendix* provides answers to many frequently asked questions. If a situation occurs that is not covered in this appendix, or if these recommendations do not correct the problem, contact Adaptec Technical Support.

When the controller BIOS displays the hard disk drives during startup, a device fails to appear.
The power cable or the interface cable may be loose or disconnected. There might also be a SCSI ID conflict.

Windows NT displays a blue screen error message that references the system video controller.
The video controller fails to properly implement Extended BIOS Data Area (EBDA) usage rules. Use SMOR to enable the EBDA Relocation option.

In addition to the Adaptec controller, the system contains another manufacturer's controller. During startup, the system hangs or one controller cannot communicate with its attached drives.
Perhaps the other controller does not correctly implement EBDA usage rules. Use SMOR to try a different setting for the EBDA relocation parameter or rearrange the controller slot assignments. Alternatively, if your system BIOS supports configuring the boot order, you can also try changing those settings.

Pressing Ctrl+A to access SMOR does not work or the information displayed is garbled.
Reset the NVRAM to the default settings and reconfigure the ZCR. To reset the NVRAM, refer to Appendix C.

After updating the Adaptec controller firmware or BIOS and restarting, the controller does not respond.

The update may have been unsuccessful. Reset the NVRAM to the default settings and reconfigure the ZCR. To reset the NVRAM, refer to Appendix C.

You want the system to boot from a drive that is not attached to an Adaptec ZCR controller. However, during startup, the controller BIOS message appears first, indicating that a drive attached to an Adaptec ZCR controller will be the boot drive.

Use SMOR to disable Boot Enable for that controller. This prevents the Adaptec ZCR controller from being used as the boot controller for the system.

The Adaptec controller BIOS reports a drive as a disk instead of a drive.

This condition can occur if SMOR is used to disable Boot Enable. If you require access to disk drives connected to the Adaptec ZCR controller during the boot process, set Bootable Devices to **Normal**.

A firmware upgrade is unsuccessful, causing the Adaptec ZCR controller to hang the system.

You can temporarily disable the firmware, BIOS, and SMOR and then replace them using the Flash Mode 0 procedure. For details, refer to Appendix C.

After an upgrade of the controller BIOS only, pressing Ctrl+A at the system prompt displays the message

> Card not configurable.

Upgrade SMOR using the Flash Mode 0 procedure. For details, refer to Appendix C.

The floppy disk drive cannot be accessed after installing an Adaptec ZCR controller.

Use SMOR to enable the EBDA Relocation option. For details, refer to *Configuring the Controller to Boot from Channel 1* on page 2-8.

C

Controller Reset Procedures

In this Appendix

This *Appendix* describes procedures that you can use to reset your controller in the event it becomes inoperable.

■ **NVRAM Reset**—The controller was improperly configured.

■ **Flash Mode 0**—An upgrade to the controller was attempted, but failed.

NVRAM Reset

Adaptec ZCR controllers retain their setup parameters even when powered off. These parameters are stored on the controller in an area of nonvolatile memory called NVRAM. There is a possibility that, through improper configuration, the controller can be put into a state where it hangs the system. If this happens, the parameters stored in the NVRAM can be restored to their default settings by using SMOR's Default command or RAIDUTIL's -X command.

Flash Mode 0

The Adaptec controller firmware, BIOS, and SMOR are all upgradable. There is a possibility that an unsuccessful upgrade could render the controller inoperable. If this happens, you need to reset the controller firmware, BIOS, and SMOR.

1 If your system hangs with the Adaptec ZCR controller installed, shut down the system and remove the controller from your system.

2 Using the system's motherboard and SCSI BIOS, examine the SCSI channels to see if they are operating.

3 Reinstall the Adaptec ZCR controller in your system.

Now, to reset the controller firmware, BIOS, and SMOR,

1 Install a jumper onFlash Mode 0 jumper connector. For the location of the jumper connector, refer to Appendix A.

2 There are two options available for resetting, using SMOR.exe or RAIDUTIL under DOS. A SMOR start floppy disk may be created using instructions shown in the Software User's Guide:

SMOR

a Insert the SMOR start floppy disk and start the system. SMOR starts.

b Use SMOR to flash the controller firmware. The utility will indicate when the flash has completed.

c Power down the system. Go toStep 3.

RAIDUTIL

    a Start the system in DOS mode.

    b Go to the folder having the RAIDUTIL program

    c Enter the following command: RAIDUTIL -F

3 Remove the jumper you installed in Step 1.

4 Restart the system from the SMOR start floppy disk. If the system restarts normally, the controller can now be configured using SMOR or Storage Manager.

5 Use SMOR.exe to flash the controller BIOS and SMOR images.

If the system fails to restart, call Adaptec Technical Support.

D

Specifications

DC Power Requirements

Voltage (all DC)	
ASR-2010S/2015S	3.3 V ± .3 V
Ripple and noise	50 mV peak-to-peak maximum

Current Requirements

Adaptec ZCR Controllers (ASR-2010S/2015S)	1.2 A

Environmental Specifications

Ambient temperature without battery backup module	0 °C to 50 °C
Relative humidity	10% to 90%, noncondensing
Altitude	up to 3,000 meters

Note: Forced airflow is recommended, but not required.

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