



Media Vault™ 4105 Series

User Manual



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This version of the MediaVault MV 4105 User Manual supersedes all previous versions.

Recommendations

This User Manual contains information about host adaptors and formatting software that are approved by the companies of manufacture and/or origin. These specially approved host adaptors and formatting software are the only ones approved and recommended for use with the MV 4105.

Contact Information

Ciprico Inc. has several support options for users of its products, in order to access information and updates.

When you contact Ciprico Inc., please have the following information available:

- Product model and serial number
- A description of the problem/situation
- System configuration information, including: system type, operating system, host adapter, and host adapter driver.

Technical and Sales Support

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Document Change History

Revision Level	Date	Changes
A	January 2008	Initial release of this manual.

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Safety

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This section includes general safety precautions, specific Ciprico Inc. precautions, and first aid information. Read this material carefully before working on any components of the MediaVault 4105 (hereafter referred to as the MV 4105).

Read and keep this User Manual for future reference.

Safety Definitions

The following types of safety precautions appear in this manual:



WARNING: Denotes the possibility of serious damage to equipment and/or serious injury to self.



CAUTION: Denotes the possibility of minor to severe damage to equipment and/or possible injury to self.

Safety Precautions



WARNING: Before installing and using the MV 4105 User Manual read all instructions and caution markings on the equipment.



WARNING: To reduce the risk of electrical shock, disconnect AC power from the MV 4105 before attempting any maintenance or cleaning.



WARNING: Do not expose the MV 4105 to any liquids.



WARNING: To reduce risk of fire hazard, do not cover or obstruct the ventilation openings



WARNING: To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that the wire is not undersized. Do not operate the MV 4105 with damaged or substandard wiring.



WARNING: Do not operate the MV 4105 if it has received a sharp blow, been dropped, or has been damaged in any way.



WARNING: Use only attachments recommended or sold by Ciprico. Doing otherwise might result in a risk, improper operation or injury, or voiding the warranty.



CAUTION: Do not upgrade your system if there are any tasks (such as a rebuild) running on any of the arrays.



CAUTION: Deleting a stripe set from the host operating system permanently destroys all data. This action cannot be undone; all data will be lost.



CAUTION: When a task is cancelled, data that is in the part of the task that did not finish could be lost on the destination array.

Important Safety Considerations

TABLE 1-1. Safety Considerations.

Consideration	Risk/Description
Servicing the Unit	Do not attempt to service this unit yourself other than the removal of the front panel, and the disk drive modules. See Figure 1-1 .
Risk of Shock	The power supplies are removable, hazardous voltage levels maintained on removable module. After disengaging, do not completely remove the power supply module for 30 seconds to permit power dissipation.
Risk of Damage	The power supplies are removable. After disengagement of power supply, wait 30 seconds before re-engagement.
Use Near Liquids	Do not use the MV 4105 unit near any liquids.
Unstable surfaces	Do not place this unit on an unstable cart, stand, bracket or table. The unit might fall, causing serious injury and damage to the unit.
Ventilation	Do not block the front or rear ventilation. Proper airflow is required to ensure reliable operation and to protect the product from over heating.
Grounding power plug	Do not defeat the safety purpose of the grounding power plug. Use a grounding type power outlet and the power connector intended for the unit. The power cord should be routed so that they are not likely to be walked on or pinched by items placed upon or against them.
Power cord	The power cord provided is for North America use only. Outside of North America the proper power cord must be procured and used.

Invisible Laser Radiation Warning

Lasers emit visible and invisible radiation from the aperture opening when no fiber-optic cable is connected. When removing cables do not stare into the open apertures. See Figure 1-1.

In addition, install protective aperture covers to fibre ports with no cable connected.

Safety Warning Label

The following safety label is located on the rear of the MV 4105.



FIGURE 1-1. Hazardous Laser Product - Invisible Laser Radiation Warning

Important Safety Considerations: French and German Languages

Les Considérations importantes de Sûreté

Pas la tentative pour entretenir cette unité. L'ouverture ou enlever la couverture vous exposera aux tensions dangereuses ou aux autres dangers.

Ne pas utiliser cette unité près de l'eau - tel que; la baignoire, le lavabo, l'évier de cuisine ou le baquet de lessive, dans un sous-sol mouillé de proche une piscine.

Ne pas placer cette unité sur une charrette instable, une position, un crochet ou une table. L'unité peut tomber, causant la blessure et les dommages sérieuse à l'unité.

Ne pas bloquer le devant et la ventilation postérieure. Le flux d'air correct est exigé assurer l'opération fiable et protéger le produit de par-dessus le chauffage.

Ne pas battre le but de sûreté de la prise de courant mettree à terre. Utiliser une sortie de pouvoir qui met à la terre et l'arrivée secteur a projeté pour l'unité. Le cordon d'alimentation devrait être mis en dérouté pour qu'ils ne sont pas probables être marché sur ou pincé par les articles placés sur ou contre eux.

Le cordon d'alimentation fourni est pour l'usage d'Amérique du nord seulement. Hors de l'Amérique du nord que le cordon d'alimentation correct doit être procuré et doit être utilisé.

Wichtige Sicherheitsberücksichtigungen

Versuchen Sie nicht, diese Einheit zu warten. Öffnen oder Herausnehmen der Decke werden Sie zu gefährlichen Spannungen oder anderen Gefahren entblößen.

Benutzen Sie dieses Einheit nahes Wasser nicht - wie zum Beispiel; Badewanne, washbowl, Küche Ausguß oder Wäscherei Wanne, in einem nassen Kellergeschoß von nahe einem schwimmenden Teich.

Stellen Sie diese Einheit auf einen unsicheren Wagen, Gestell, Bügel oder Tisch nicht. Die Einheit kann fallen, verursachend ernste Verletzung und Schaden an der Einheit.

Hemmen Sie die Front und die hintere Belüftung nicht. Passender Luftstrom ist erfordert, zuverlässigen Betrieb zu sichern, und, das Produkt von über Heizung zu schützen.

Besiegen Sie den Sicherheitszweck Stöpsel der Erdungskraft nicht. Benutzen Sie einen Erdungstyp Netzanschluß und den Kraft Verbinder haben vorgehabt für die Einheit. Das Netzkabel sollte umgeleitet werden, damit sie nicht wahrscheinlich sind, auf gelaufen zu werden, oder zusammengedrückt durch Punkte, die auf oder gegen sie gestellt werden.

Netzkabel hat für Nördlich Amerika Gebrauch nur versorgt ist. Außerhalb Nördlich Amerikas des passenden Netzkabels muß verschafft werden und muß benutzt werden.

Protecting Equipment and Data

Backing Up Data

Creating or deleting disk arrays destroys existing data on the drives. Always back up the data on the drives and save it to a server or hard-drive before attaching the drives to the controller.

Electrostatic Discharge (ESD)

Static electricity can destroy sensitive electronic components inside a computer. Follow these procedures to prevent damage due to ESD:

- When unpacking a static-sensitive component from the shipping carton, do not remove the component from the anti-static bag until you are ready to install the component. Before you unwrap the anti-static packaging, touch an unpainted metal surface to discharge static electricity from your body.
- When transporting a static-sensitive component, place it in an anti-static container or packaging
- Before touching any computer part, discharge any static charge you might have accumulated. Wear an ESD strap, stand on an ESD mat, or periodically touch an unpainted metal surface, such as the card-slot openings of the computer chassis.

IMPORTANT: The top and side surfaces of the MV 4105 are painted, not metallic. It is safe to touch them.

- Do not remove the MV 4105 from its protective bag until you are properly grounded.
- Handle the MV 4105 by its edges.
- Do not touch any pin or connector on the MV 4105.

First Aid: Electrical Shock

IMMEDIATE action must be initiated after a person has received an electrical shock. Obtain immediate medical assistance if available.

The source of the shock must be immediately removed by either shutting down the power or removing the victim from the source.

If it is not possible to shut off the power, the wire should be cut with either an insulated instrument or by a rescuer wearing electrically insulated gloves and safety glasses. Whichever method is used do not look at the wire while it is being cut. The ensuing flash can cause burns and blindness.

If the victim has to be removed from a live circuit, pull the victim off with a non-conductive material.

DO NOT TOUCH the victim! You can receive a shock from current flowing through the victim's body.

Use the victim's coat, a rope, wood, or loop your belt around the victim's leg or arm and pull the victim off.

After separating the victim from power source, check immediately for the presence of a pulse and respiration.

If a pulse is not present, start CPR (Cardio-Pulmonary Resuscitation) and call for emergency medical assistance. If a pulse is present, respiration may be restored by using mouth-to-mouth resuscitation, but call for emergency medical assistance.

Introduction

In this chapter...

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About the MV 4105

Congratulations on purchasing the MV 4105 from Ciprico Inc., a leader in performance, quality, and storage for video editing and storage.

The main features of the units are indicated in Table 2-1.

MV 4105 Features

TABLE 2-1. Features of the MV 4105.

Feature	Number or Value
Number of RAID controllers	1
Number of removable disk modules	5
Number of 4Gb Fibre Channel ports	2
Internal data rate	306 MBytes/sec
Burst rate (maximum)	400 MBytes/sec
Sustained data rate	250 MBytes/sec
HDT (High Definition Turbo)	250 Mbytes per second per channel (with reduction of capacity)
Mode Select Switch	Allows switching between RAID 0, RAID 3 @512 or RAID 3 @2K modes
Data protection (built-in)	RAID 3 mode
Real Time RAID	RTR reconstructs data "on the fly" if a drive "glitches"
Fans	Multiple cooling fans
Serial port	Serial port for detail level maintenance and support.
Alarm	Audible Alarm and LED indicators.
Functionality	Easy user selection of functionality via Mode Selection and Mode Set switches. No complicated software setup or maintenance

Who Should Use This Manual

Only trained, experienced, and authorized personnel should install and operate the MV 4105.

The intended user audience are system administrators and experienced users who understand and have used of one or more of the following operating systems:

- Microsoft Windows®
- Macintosh®
- Linux®
- Unix®
- SGI Irix®
- Sun Solaris®

For specific supported versions of each operating system, see the list given on the Ciprico Inc. website:

<http://www.ciprico.com>

Getting Started

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Unpacking

Remove all components from the shipping container.

Retain all boxes and packing materials in case you might need to reuse them later. Be sure to ship the unit in the original Ciprico Inc. packaging.

If the unit is improperly packaged, and the unit is damaged during shipping, there could be a delay in repairing the unit, and you will be liable for the damage.

Examine the components for shipping damage. See the “Inspection” section on [page 3-4](#). Contact the freight carrier immediately if damage exists.

Checking the Package Contents

The MV 4105 comes pre-assembled and ready to be connected to the Fibre Channel of your video edit computer equipment.

The MV 4105 is shipped with the components and cables indicated in Table 3-1. Make sure that all components are included in the shipping carton. Notify your supervisor if components are missing.

TABLE 3-1. Components Shipped with the MV 4105

Description	Quantity
MV 4105 4Gb Fibre Channel External Disk Storage Array.	1
Pre-installed disk drive modules.	5
SFP (Small Form-factor Pluggable) optical LC Duplex transceiver module	1
LC to LC Duplex optical cable.	1
AC power cord (for North America use only).	1
Diagnostic cable.	1
This MV 4105 User Manual (available only on CD-ROM).	1

Inspection

Examine the MV 4105 for:

- Correct part number on the barcode sticker at the rear of the unit (i.e., that the MVxxxxxxxxx and SNxxxxxxxxx numbers on the barcode stickers match the information on the MV 4105 invoice).
- A front bezel that is not marked for 4Gb and 2Gb Fibre Channel connections.
- Scratches, gouges, dents, or cracks in the enclosure.
- Cracked or loose handles and/or feet.
- Missing switches.
- Bent, scratched, or missing pins on the connectors.
- Rust, discoloration, or signs of corrosion or water, moisture, or chemical damage.
- Loose or missing screws.
- Ripped, illegible, or missing safety labels or stenciled lettering.
- Parts that rattle or slide around the inside of the unit, when the unit is lifted.

Installation

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Hardware Installation and Configuration

The MV 4105 is shipped with integral carrying handles. The unit is available only in a tower configuration.

Carrying handles



FIGURE 4-1. MV 4105, Showing Its Carrying Handles.

Compatible Fibre Channel Host Adaptors

TABLE 4-3. Recommended 4Gb Fibre Channel Host Adaptors.

ATTO	Celerity series
Apple	Fibre Channel
Qlogic	QLE series

TABLE 4-4. Compatible 2 Gb Fibre Channel Host Adaptors

ATTO	Celerity series
Apple	Fibre Channel
Qlogic	QLA series

The MV 4105 communicates with the host computer by using an industry standard 4Gb Fibre Channel LC Duplex optical interface. There must be a compatible host adapter installed in the host computer.

To maximize the 4Gb Fibre Channel interface, the host adapter in the host computer should also be rated for 4Gb Fibre Channel. However, 2Gb Fibre Channel host adapters will work but at a lower transfer rate.

Make sure the host adapter is installed correctly, and that the appropriate host adapter drivers are installed and functioning properly, before connecting the MV 4105 to your computer system.

Fibre Channel Connections

The MV 4105 is shipped with a 4Gb Fibre Channel SFP (Small Form-factor Pluggable) optical transceiver, with an LC Duplex hookup on Side A or Side B. The SFP mates to two LC Duplex optical cables for data transfer to and from the host computer, server, etc.

To Install the SFP and Connect the LC Duplex Optical Cable

1. Remove the protective cover from the SFP.
2. With the gold contacts facing up, insert the SFP into FC Port 1. Gently push the SFP in until it clicks. See Figure 4-2.



FIGURE 4-2. The SFP Positioned at FC Port 1.

3. The tips of the LC Duplex cable are packaged with a protective covering. (The protector might be a cap over the white tips of the white tips of the LC cable or a clipped-on shell). Remove the cover before use. See Figure 4-3.

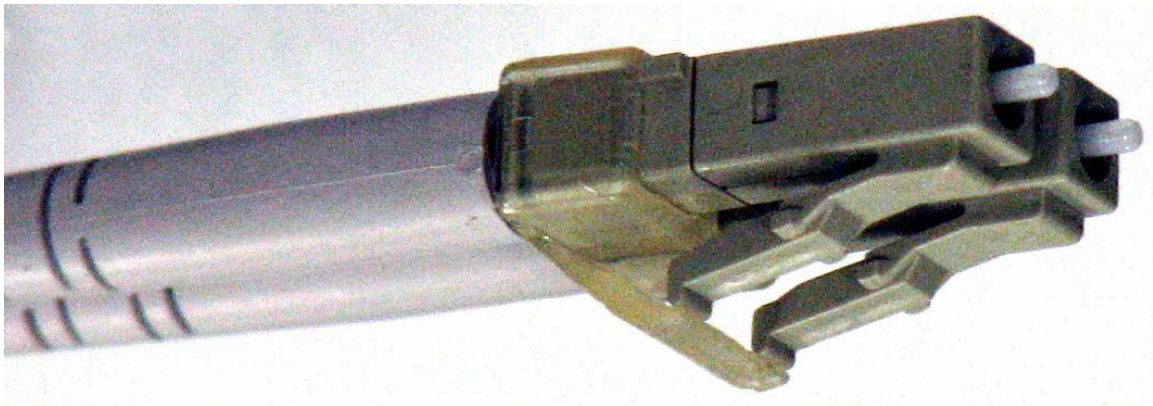


FIGURE 4-3. The Tips of the LC Duplex Cable.

4. Insert one end of the LC Duplex cable into the SFP at FC Port 1. See Figure 4-4.
5. Insert the other end of the LC Duplex cable into the Fibre Channel switch or Fibre Channel host base adaptor of the host computer, server, etc.



FIGURE 4-4. LC Duplex Cable Being Inserted into the SFP (at FC Port 1).

NOTE: To remove the LC Duplex optical cable from the SFP, hold the release tab and pull out.

Daisy Chaining

MV 4105 units include a hub feature, which allows up to 4 units to be daisy chained (if each of the units is equipped with a hub). The unit at the end of the chain does not require a hub.

The built-in hub can be identified by looking at the back of the unit and at the Fibre Channel connections. The LEDs are located between the two Fibre Channel ports, as shown in Figure 4-5.



FIGURE 4-5. Built-In Hub, Showing the LEDs Located Between the Fibre Channels.

Hub Description

Table 4-5 describes the function of each hub LED. See Figure 4-5 for the location of the Fibre Channel ports and LEDs.

TABLE 4-5. Built-In Hub LEDs.

LINK LED	Indicates that communications are established between the Fibre Channel microprocessor inside the MV 4105 and the built-in hub of the MV 4105.
SYNC LED	FC speed is established between the built-in hub portion of the MV 4105 and the device to which this port is connected.
ACTIVE LED	Data is being transmitted.

Hub Configurations

The hub can be configured for no daisy chain (see Figure 4-6) or with a daisy chain (see Figure 4-7), for multiple MV 4105 units connected to a computer with a Fibre Channel host adapter.

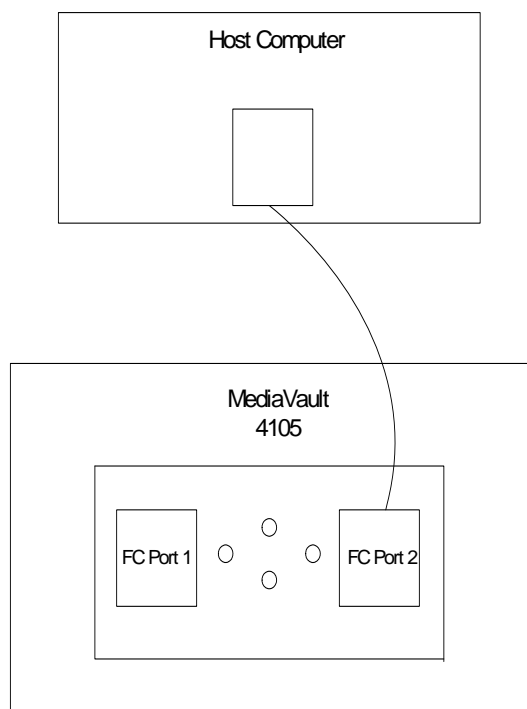


FIGURE 4-6. Hub Configuration - No Daisy Chain.

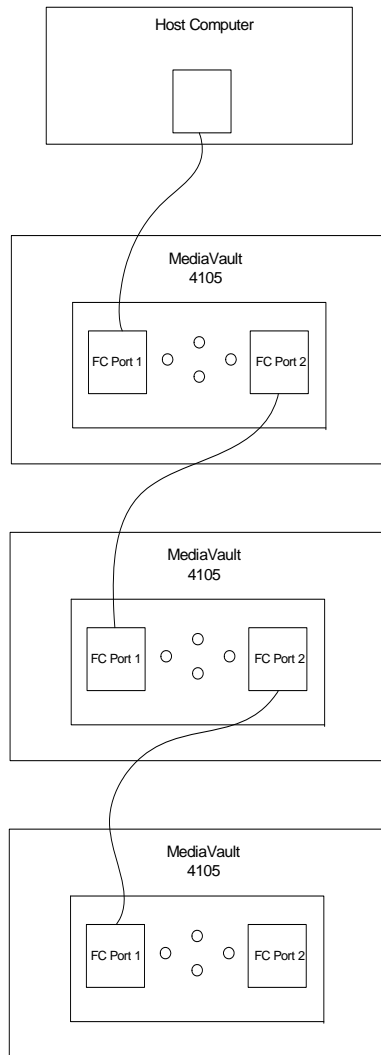


FIGURE 4-7. Hub Configuration That Daisy Chains Multiple MV 4105 Units to a Computer (with a Fibre Channel host adapter).

DIAG - Diagnostic Port

A serial diagnostic cable is supplied with the unit and allows unit diagnostics, as well as firmware updates.

For information about MV 4105 diagnostics or firmware updates access the Ciprico Inc. knowledge base at <http://kb.ciprico.com/lore/>

Editing System Requirements

For video editing, the following video editing equipment, operating system, and video cards must be installed on your computer, or connected to the computer or to the MV 4105.

- 4Gb Fibre Channel Host Adapter with optical LC Duplex transceiver.
- Windows 2000/2003/XP, Mac OS9.2/X, Linux.
- Video Capture card.
- Video Editing software.
- Video player or other source of video input.

Operations

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Operational Functions

The operational functions for the MV 4105 are indicated on Table 5-1.

TABLE 5-1. Operational Functions for the MV 4105.

To Review this Function...	See This Page...
The front panel components used for MV 4105 operations.	5-3
The rear panel components used for MV 4105 operations.	5-5
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The types of mode selection (RAID types) that can be selected for the MV 4105.	5-8
Changing the mode (RAID type)	5-11
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Components

Front Panel Components

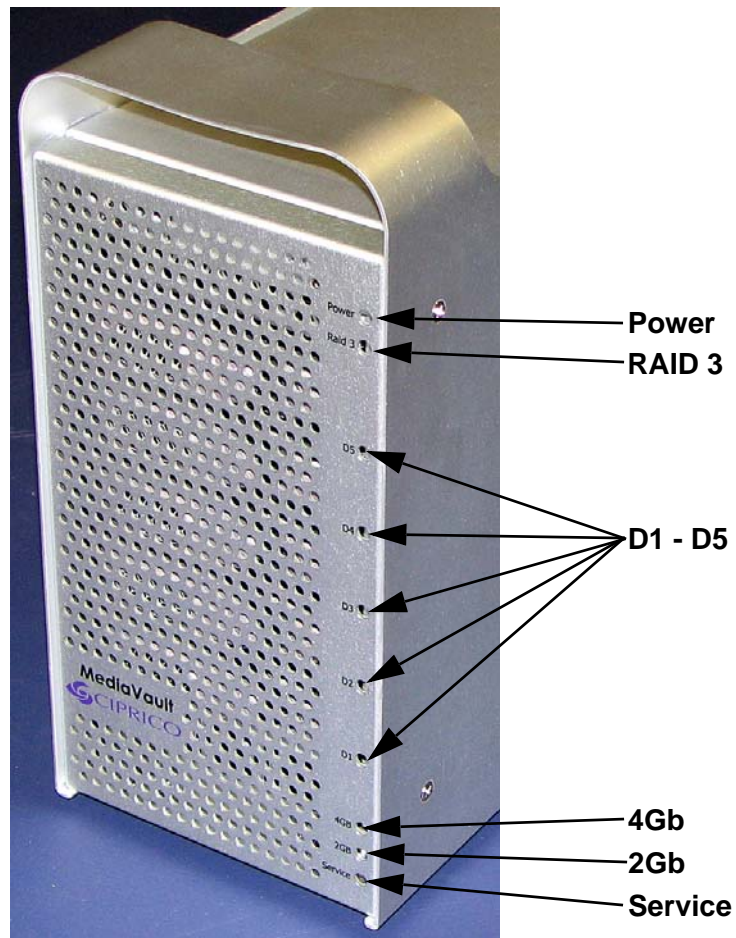


FIGURE 5-1. Front Panel Components.

TABLE 5-2. Description of the Front Panel Components.

Component	Description
Power	<p>“On” indicates that the unit is powered up and ready for operation.</p> <p>This indicator will flash rapidly for 20 seconds during the initial power-on self-test.</p>
RAID 3	<p>“On” indicates that the MV 4105 is operating in a RAID 3 protected mode. See the “Mode (RAID Type) Functions” section in this chapter for additional RAID type information.</p> <p>When this indicator is off, the MV 4105 is operating in RAID 0 (performance) mode.</p>
D1 to D5 (Drive 1 to Drive 5)	<p>These LEDs indicate drive activity or drive fault.</p> <p>The LEDs will illuminate as the disk drives are being accessed. The LEDs are off when there is no drive activity.</p> <p>In a fault condition, associated with the Service LED and an audible alarm, the faulty drive is identified by a slow blinking drive LED.</p>
4Gb	<p>“On” indicates that the Fibre Channel interface is operating at its optimum 4Gbit speed.</p> <p>When this indicator and the 2Gbit indicator are off, the MV 4105 is operating at less than 2Gbit speed.</p>
2Gb	<p>“On” indicates that the Fibre Channel interface is operating in 2Gbit speed.</p> <p>When this indicator and the 4Gbit speed indicator are off, the MV 4105 is operating at less than 2Gbit speed.</p>
Service	<p>“On” indicates that the MV 4105 needs to be serviced. Normally this LED is associated with an audible alarm. One of the drives LED will flash slowly. A drive replacement might be necessary. See the “Audible Alarm” section on page 5-14.</p>

Rear Panel Components

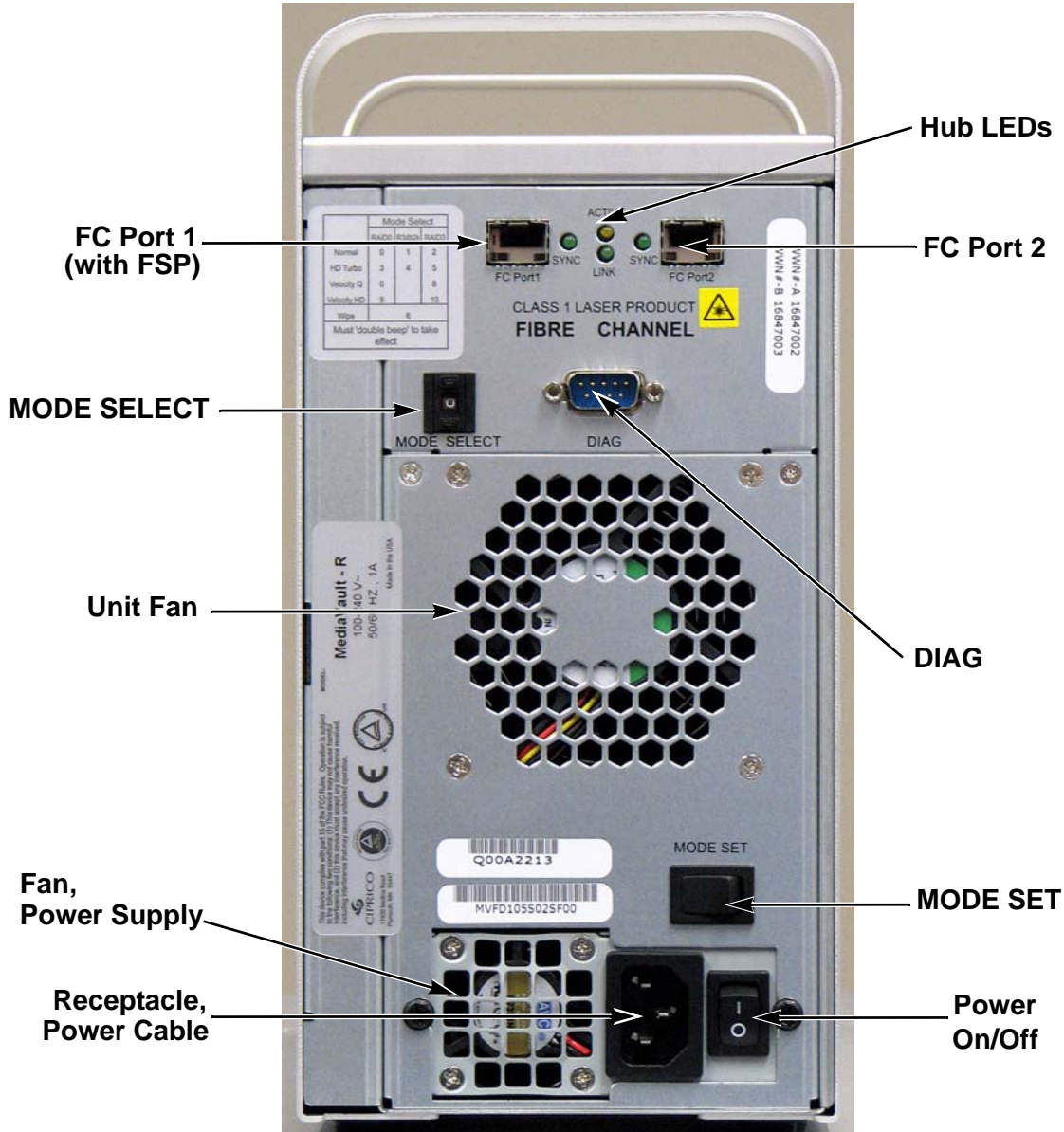


FIGURE 5-2. Rear Panel Components - MV 4105.

TABLE 5-3. Rear Panel Components.

Component	Description
FC Port 1, FC Port 2	FC Port 1 and FC Port 2 (on Side A or Side B) can accept a Fibre Channel SFP with an LC Duplex optical cable. See "Fibre Channel Connections" in Chapter 4, <i>Installation</i> .
MODE SELECT	Used to change the mode (RAID type) number. See "Mode (RAID Type) Change Procedure" on page 5-12.
Unit Fan	Vents heat from the interior of the MV 4105.
DIAG	The Diagnostic port is used to enable firmware downloads or perform special diagnostics. See "DIAG - Diagnostic Port" in Chapter 4, <i>Installation</i> .
Power On/Off	In the "On" (1) position, the power switch provides power to the MV 4105. In the "Off" (0) position, the MV 4105 is powered-off. To completely remove power from the MV 4105, disconnect the power cable from the power cable receptacle.
MODE SET	A multi-function button. See the description in the "Mode Set Button" section on page 5-13.
Receptacle, Power Cable	Power receptacle for 100-240 Vac power cable to the auto-ranging power module (power supply).
Fan, Power Supply	Vents heat from the power supply.
Hub LEDs	LINK LED: Indicates that communications are established between the Fibre Channel microprocessor inside the MV 4105 and the built-in hub of the MV 4105. SYNC LED: Indicates that the FC speed is established between the built-in hub portion of the MV 4105 and the device to which this port is connected. ACTIVE LED: Indicates that data is being transmitted.

Unit Power-Up Sequence

1. Always power-up the MV 4105 before powering-up the host computer.

IMPORTANT: Wait for the MV 4105 to completely boot-up before powering-up the host computer.

2. If the MV 4105 needs to be re-booted:

- Shut down the host computer.
- Power-cycle the MV 4105.
- Re-boot the host computer.

The unit power-up sequence allows the disk drive modules, and the data access/data transmission functions of the MV 4105, to be fully operational before the host computer is booted-up and “sees” the MV 4105 activities.

LED Power-On Sequence

The front panel LEDs of the MV 4105 power-up in the following sequence. Depending on the size and type of the drive, some LEDs might blink on momentarily, go off, then illuminate fully after a minute or so.

TABLE 5-4. LED Power-Up Sequence.

1. Power LED.
2. RAID 3 LED (momentarily, if unit is in RAID 3 when powered-up).
3. D1 through D5 LEDs (blink momentarily before illuminating fully, depending on the size and type of drive).
4. 4 Gb LED (illuminates after host computer is powered-up).

Mode (RAID Type) Functions

The MV 4105 allows you to choose the RAID type at which the unit will operate.

In general, if you do not backup your data on a daily basis Ciprico Inc. recommends using the RAID 3 function.

TABLE 5-5. Mode (RAID Type) Functions

Type	Mode*	Sector Size	Usable Capacity	Description and Advantages	If a Drive Fails...
RAID 0	0	512 bytes	Full	Used with all operating systems. There is full capacity for the array, but without any redundancy to protect your data. This mode stripes data across all 5 drives for the total capacity of the array	Data is lost.
RAID 3 @ 2K	1	2048 bytes	80%	Used with any system except: Avid (Macintosh or PC), Media 100 (Macintosh or PC), Video Toaster, SGI, Linux, or Windows (when striping only). There is access to 80% of the total capacity with redundancy to protect your data. This mode stripes data across 4 drives with 1 drive as a parity drive for redundancy. This mode uses a 2048 sector size.	Data is preserved
RAID 3 @ 512	2	512 bytes	80%	There is access to 80% of the total capacity with redundancy to protect your data. This mode stripes data across 4 drives with 1 drive as a parity drive for redundancy. This mode uses a 512 sector size.	Data is preserved
RAID 0 HD Turbo**	3	512 bytes	80%	There is access to 80% of the total capacity without any redundancy to protect your data. This Turbo mode uses the highest data rate portions of the disk drives.	Data is lost

TABLE 5-5. Mode (RAID Type) Functions

Type	Mode*	Sector Size	Usable Capacity	Description and Advantages	If a Drive Fails...
RAID 3 @ 2K HD Turbo**	4	2048 bytes	40%	Uses the highest data rate portions of the disk drives.*** There is access to 40% of the total capacity with redundancy to protect your data. This mode stripes data across 4 drives, with 1 drive as a parity drive for redundancy. This mode uses a 2048 sector size and uses the higher data portion of the disk drives.	Data is preserved
RAID 3 @ 512 HD Turbo**	5	512 bytes	40%	Uses the highest data rate portions of the disk drives.*** There is access to 40% of the total capacity with redundancy to protect your data. This mode stripes data across 4 drives with 1 drive as a parity drive for redundancy. This mode uses a 512 sector size and uses the higher data portion of the disk drives.	Data is preserved
Wipe	6	This mode will start a write operation for all disk drives in the array. This function wipes out the first and last 256 sectors of an array. When the function is finished a series of 3 beeps is repeatedly sounded			
Diagnostic tests	7	The diagnostic tests are, in sequence: RAID 0 read test, RAID 0 write test, and read/write tests on individual drives. The cycle is repeated until stopped by the user.			
RAID 3 @ 512 Velocity Q	8	512 bytes	80%	For use with Leitch Velocity, Velocity Q, Reality, and Velocity HD in SD resolutions. Same functions as Mode 2.	Data is preserved
RAID 0 Velocity HD	9	512 bytes	100%	For use with Leitch Velocity HD. Same function as Mode 0.	Data is lost
RAID 3 @ 512 Velocity HD	10	512 bytes	80%	For use with Leitch Velocity HD. Same function as Mode 2 (RAID 3 @512)	Data is preserved

TABLE 5-5. Mode (RAID Type) Functions

Type	Mode*	Sector Size	Usable Capacity	Description and Advantages	If a Drive Fails...
Reserved	15	Reserved for future use.			

* Make sure to “double beep” to set the mode. See the “double beep” discussion on page 5-12.

** For a single controller configuration, the HD Turbo mode ensures the highest disk drive data rates are used to provide sufficient performance required for HD video resolution operation. The trade off is a reduction in storage capacity. If full capacity and HD

performance is required, the solution is to stripe two MV 4105s, using the Operating System stripping utility

*** Data striped across four drives, plus one drive for redundant information. Usable storage is the sum of four drives.

Changing the Mode

Mode selection allows the MV 4105 operator to choose the desired operating mode for the unit. See the mode selection choices at [Table 5-5](#).



CAUTION: *Changing the mode can cause any existing data to become unreadable or corrupted. Make sure that any data you want to keep is stored elsewhere before you change the mode.*



CAUTION: *Remove or delete any known partitions before changing the mode. This keeps the operating system from malfunctioning due to left-over file system information.*

IMPORTANT: *Consult the “[RAID Compatibility](#)” section in Appendix A, Specifications, to ensure proper operations.*

Mode Change Procedure

To change the mode, perform the following.

1. Turn off the computer.
2. Select a mode.
3. Set the mode number at the Mode Select buttons, located at the rear of the MV 4105. See Figure 5-3. Use a pointed object (such as a pen tip) to press the desired Mode Select button.
 - Press the upper button to decrease the mode number.
 - Press the lower button to increase the mode number.

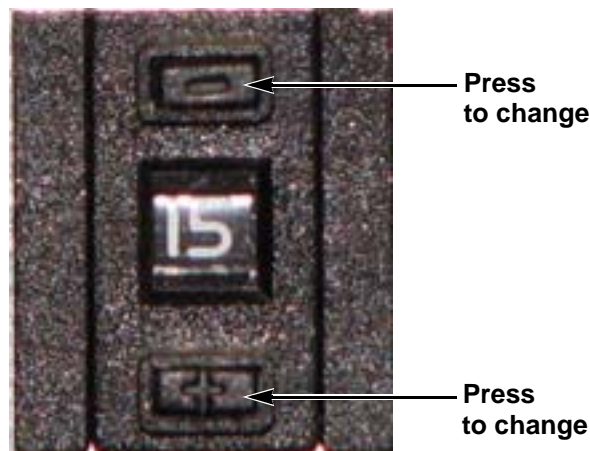


FIGURE 5-3. Mode Select Buttons.

4. Turn off power to the MV 4105.
5. Press and hold the **MODE SET** button (see a description of the button on page [5-13](#))
6. Apply power to the MV 4105.
7. Keep holding down the button until two beeps are heard to confirm the mode change.
8. Release the **MODE SET** button.

Mode Set Button

This switch performs several functions:

- During power up, it acts as a Mode Set switch.
- During normal operation it is used to Silence Alarms and to start the rebuild process for a replaced drive.

During the first 20 seconds of power up, the switch acts as a Mode Set switch and is used in conjunction with the Mode Selection option. See the [“Mode Change Procedure”](#) on page 5-12.

During normal operation, and only when the MV 4105 is in the RAID 3 modes, this switch is used to silence alarms and to start a drive rebuild process. When a defective drive has been replaced, this rebuild process brings the MV 4105 back up to its fully protected mode. See the [“Audible Alarm”](#) section on page 5-14, and the [“Drive Replacement”](#) section in Chapter 8, *Maintenance*, for additional information.

TABLE 5-6. Mode Set Button Functions

Indicator	Description
Mode Set Button (for Mode changes)	Used during the RAID “Mode Change” procedure (see page 5-12). Press and hold this switch and apply power to the MV 4105. A double beep confirms the mode change. Release the switch after the double beep. The new Mode selection is now set.
Mode Set Button	Mutes the audible alarm when the MV 4105 requires service. Do a quick press & release to mute the alarm.
Mode Set Button (for drive rebuilds)	In RAID 3 mode, and when a drive is marked as “down,” this switch is used to start the drive rebuild process. After the alarm has been muted, press and hold the Mode Set button until you hear two beeps. The rebuild process has now started. See the “Audible Alarm” section on page 5-14 and the “Drive Replacement” section (in Chapter 8, <i>Maintenance</i>) for additional information.

Audible Alarm

The MV 4105 sounds an alarm when there is a problem with a drive. Corrective actions should be applied to fix the problem.

TABLE 5-7. Audible Alarm Beeps and Tone.

3 Short and 3 Long Beeps	<p>These beeps is normally associated with a Fibre Channel interface problem.</p> <p>Always turn on the MV 4105 first, then turn on the computer. You might need to physically reseal the Fibre Channel connections or the SFP module, or replace these components.</p>
Slow Beeps	<p>One or more slower beeps indicate a bad drive or an intermittent drive; the number of beeps indicates which drive is having problems.</p> <p>When operating in RAID 3 mode the MV 4105 is still available for normal operation without performance degradation, but the beeps indicate that a drive is down and the MV 4105 is running in a degraded RAID 3 state. If another drive fails data might be lost.</p> <p>To service the unit, any data that needs to be kept must be off loaded to another fully functional unit. Send the entire defective unit to the service center. The defective component will be replaced or repaired and returned to the sender. Data will not be preserved by the service center. Upon receiving the repaired unit, reformat and partition the MV 4105. Restore any needed data.</p>
Constant, Solid Tone	<p>This indicates that a drive is down. The Service indicator should also be on.</p> <p>One of the drive indicators should exhibit a slow blink (one second on, one second off). The drive needs to be serviced. See the “Drive Replacement” section in Chapter 8, <i>Maintenance</i>, for more information.</p> <p>Mute the alarm by pressing the Mode Set button once. Holding the Mode Set button until two beeps are heard starts the rebuild process. (This is typically done only after a replacement drive module had been installed to replace a defective drive module).</p>

Configuration

In this chapter...

Formatting and Partitioning	6-2
Macintosh with OS 10.4.x Partitioning/Formatting	6-3
Windows 2000/2003/XP Partitioning/Formatting.....	6-16

Formatting and Partitioning

Formatting and partitioning the MV 4105 is required, in order to prepare the unit for usage.

After the unit is physically connected to your computer, use the following sections as a guide to locate and execute the appropriate utility to format and partition the MV 4105.

The MV 4105 is treated, by the host adapter in your computer, as one large disk drive. Install the appropriate driver for your host adapter. No additional software or drivers are necessary to use the MV 4105.

Treat the MV 4105 as a normal hard disk drive when partitioning and formatting.

Macintosh with OS 10.4.x Partitioning/Formatting

Use the following configuration to get maximum speed from the MV 4105 with OS 10.4.x for video capturing/playback and editing.

Check and ensure you are using the latest recommended configuration for your SCSI controller card, video capture card and editing software. Update any software or drivers, as necessary.

Launching the Apple Disk Utility Program

1. Launch the Apple Disk Utility program. (The Disk Utility is located at Macintosh HD > Applications > Utilities.)
2. If the MV 4105 is unformatted, a warning appears before the Apple Disk Utility program is launched. Click **INITIALIZE....** See Figure 6-1.

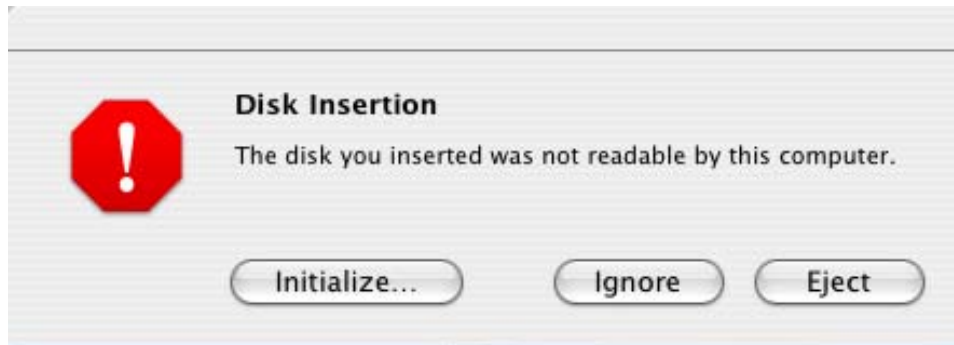


FIGURE 6-1. Disk Insertion Warning for Unformatted MV 4105 Units.

3. The *Apple Disk Utility* screen appears. In the example below, an icon of the “3.4 TB CIPRICO FC-RAID...” drive is shown in the left side. See Figure 6-2.

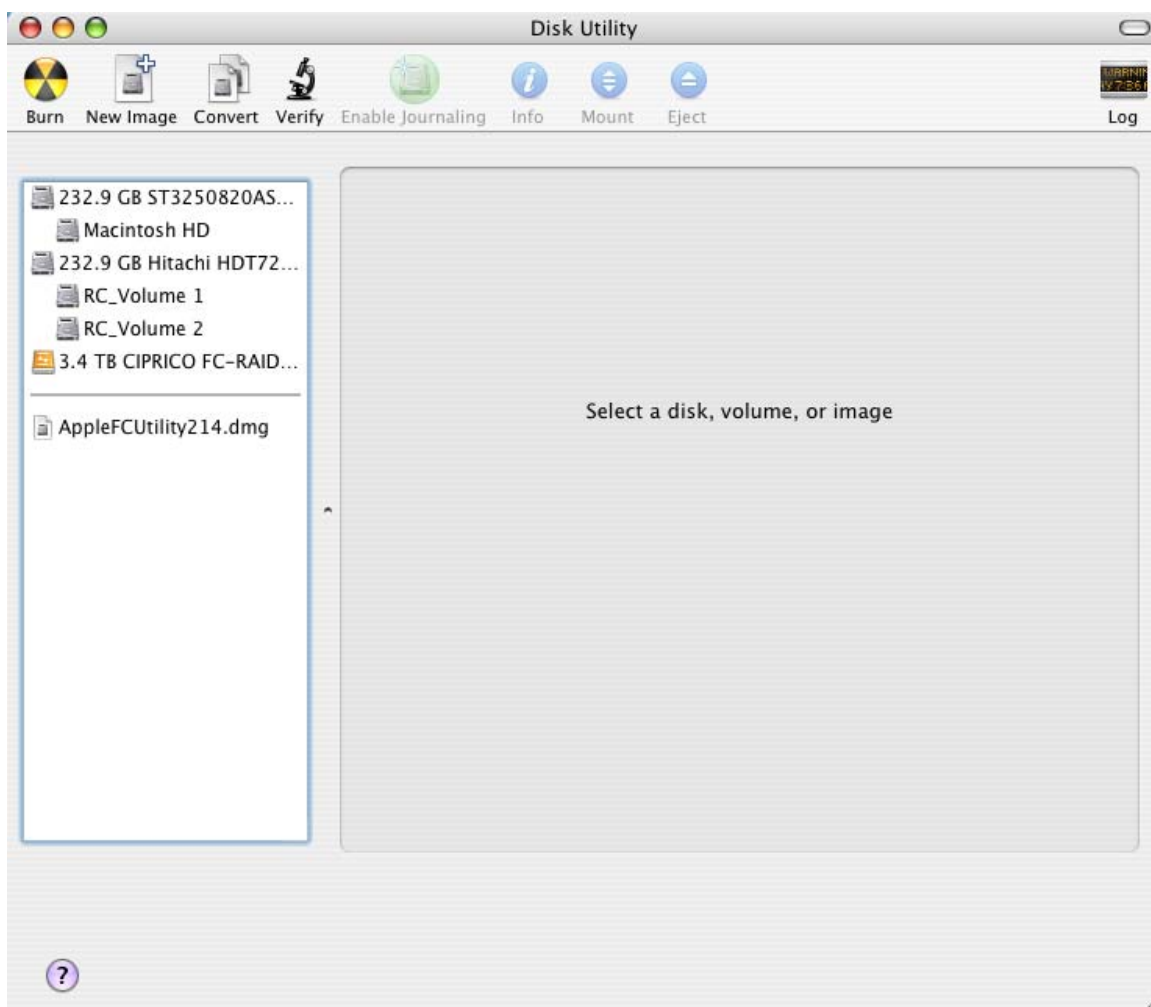


FIGURE 6-2. Apple Disk Utility Screen, Showing the 3.4 TB Ciprico FC-RAID Drive.

4. Click on the CIPRICO FC-RAID icon. The screen changes, with the text of the “First Aid” tab displayed. See Figure 6-3.

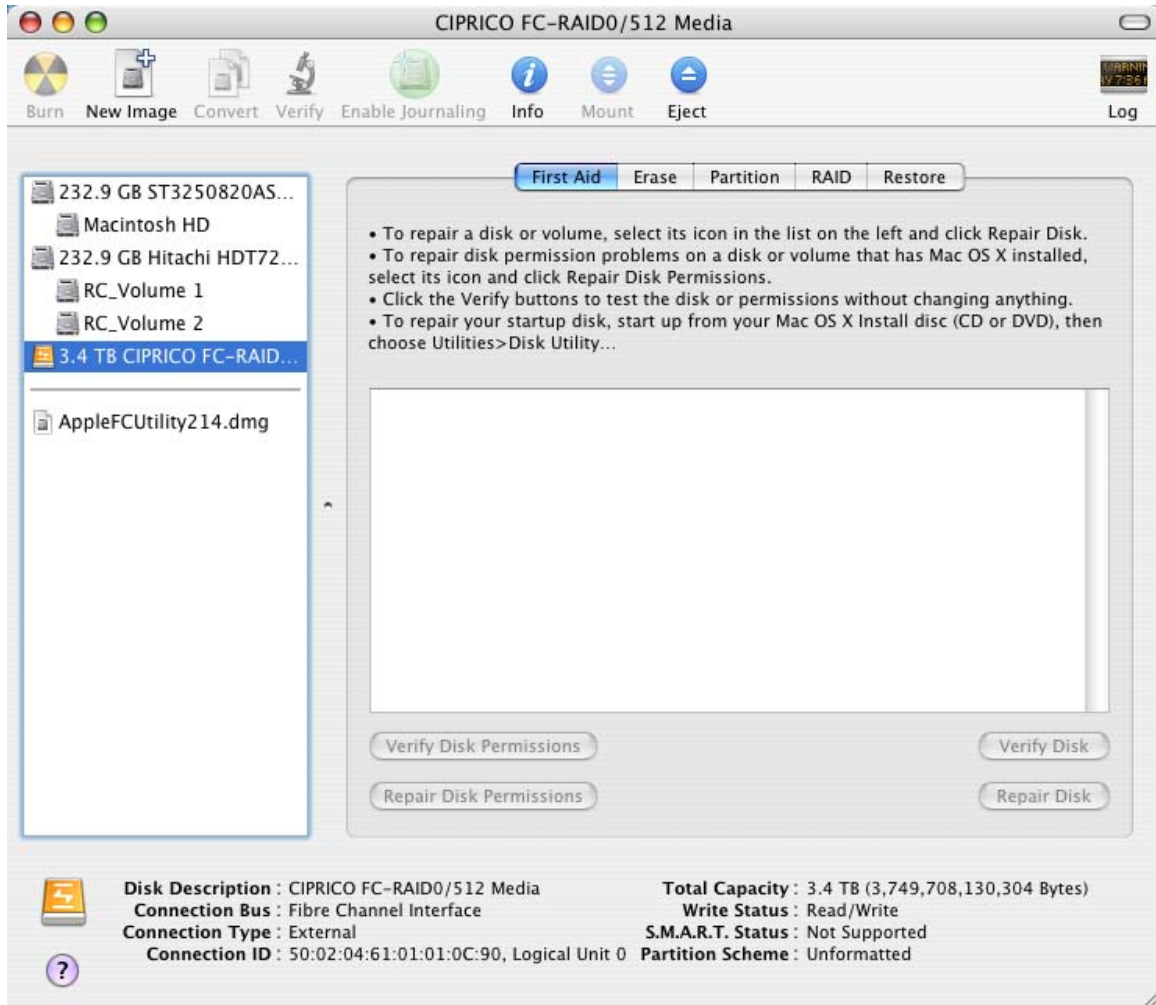


FIGURE 6-3. The Apple Disk Utility Screen, Showing the Disk Icon and “First Aid” tab.

Preparing a Single MV 4105 (non-striping)

1. Click the “Partition” tab at the upper right of the *Apple Disk Utility* screen. See Figure 6-4.

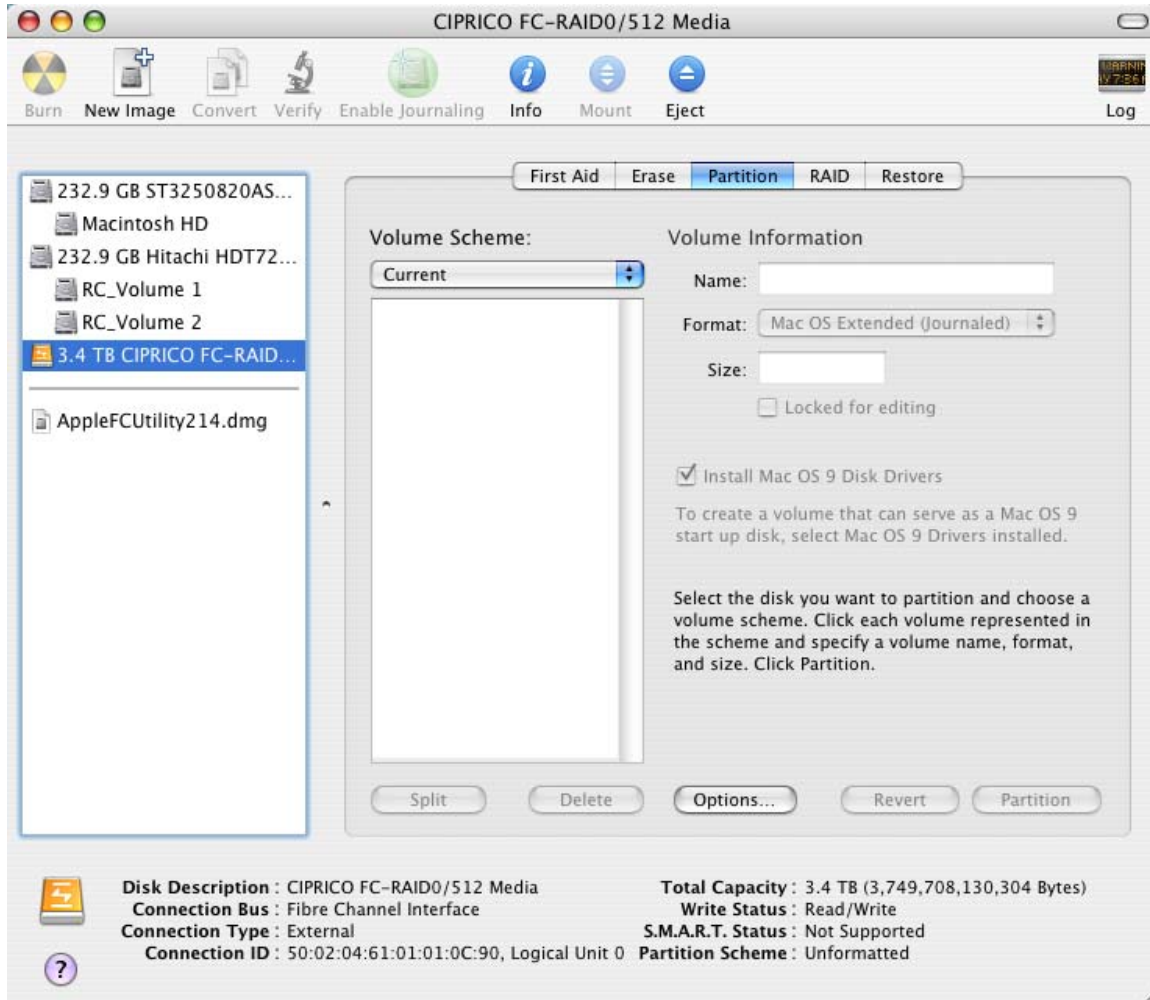


FIGURE 6-4. The Apple Disk Utility Screen, After the Partition Tab is Clicked.

2. At the “Volume Scheme:” field choose “1 partition”. See Figure 6-5.
IMPORTANT: Do not choose “Use Current”.
3. At the “Name:” field, under “Volume Information,” choose a name for the volume. See Figure 6-5.
4. In the “Format:” field, select “Mac OS Extended (Journaled)”. See Figure 6-5.

NOTE: For some versions of Mac OS/X, the screen contains a checkbox: “Install Mac OS 9 Disk Drivers”. Make sure to check this checkbox.

5. Click the **PARTITION** button at the lower right of the screen. See Figure 6-5.

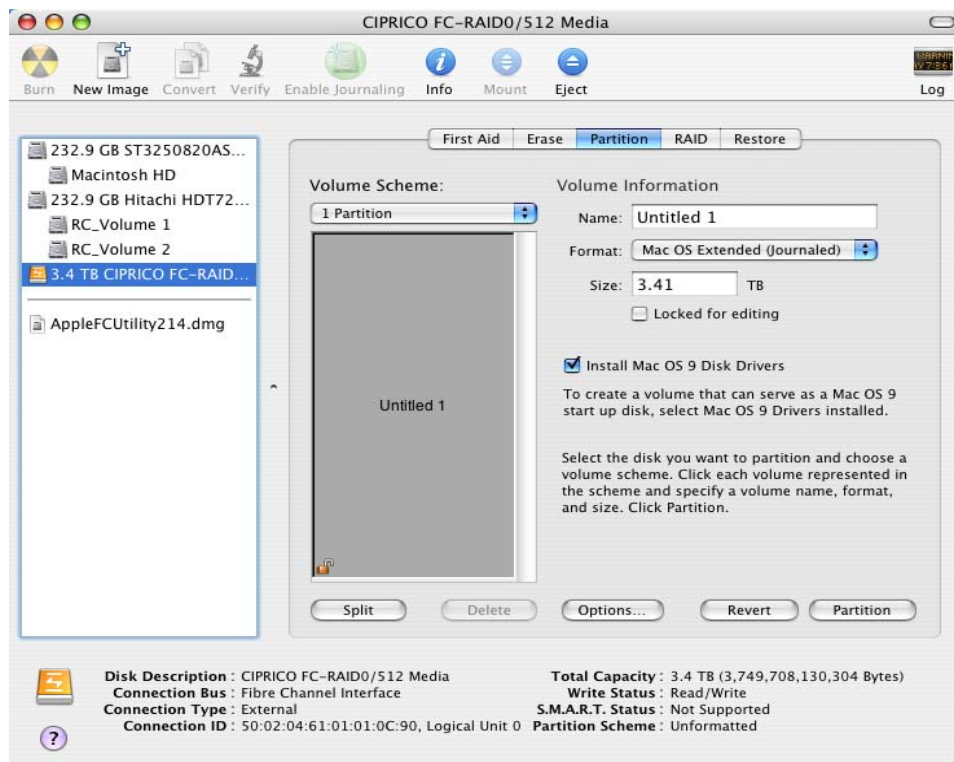


FIGURE 6-5. The Apple Disk Utility Screen, After Selections Are Made.

6. A *Partition Disk* screen appears. It warns about destroying data when partitioning a disk. To continue with the partition process, click the **PARTITION** button on this screen. See Figure 6-6.

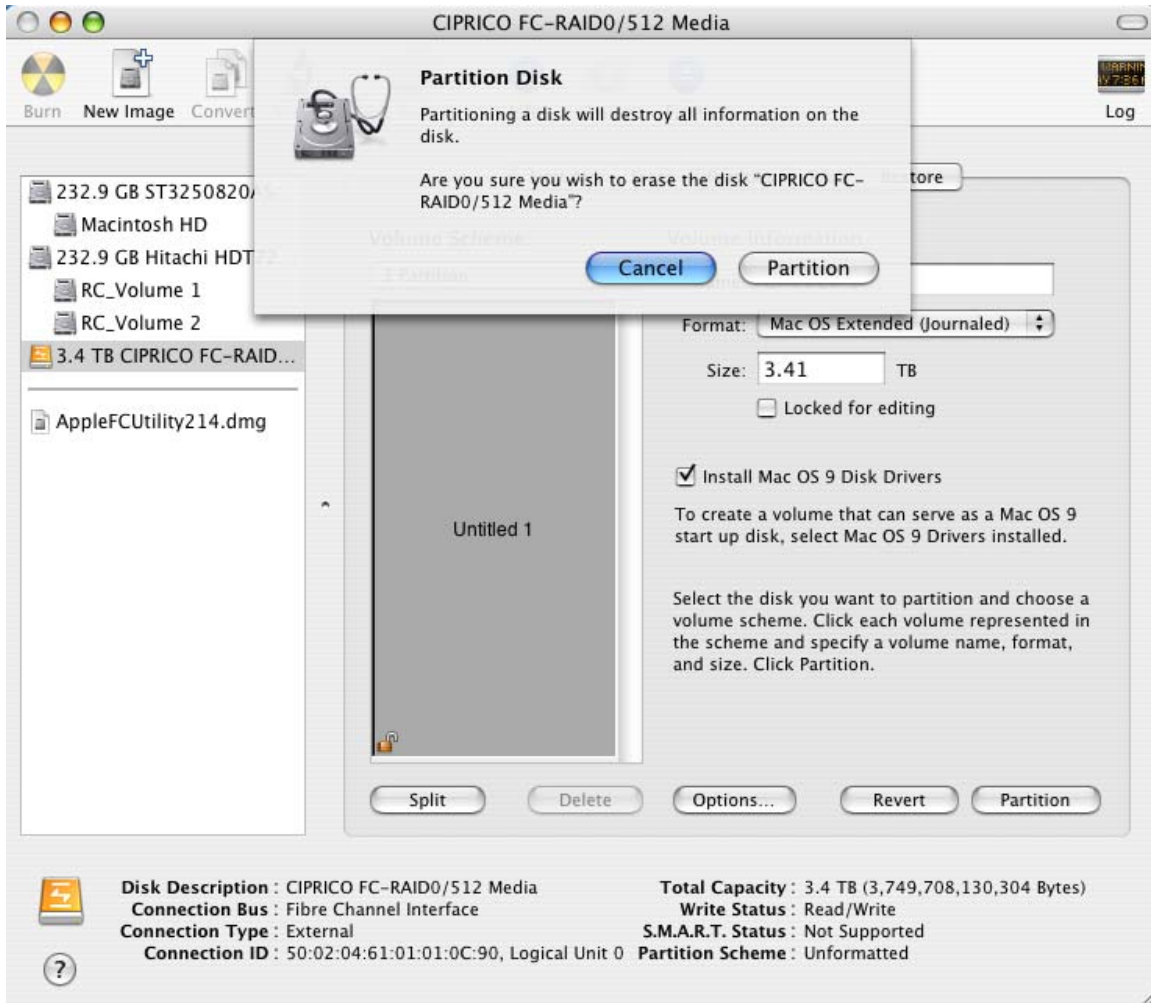


FIGURE 6-6. Partition Disk Screen, Displayed Before the First Drive is Partitioned.

NOTE: Depending on system security, a dialog box might appear and require a system password.

7. When the partition process is finished, the named disk appears at the left side of the *Apple Disk Utility* screen. See Figure 6-7.

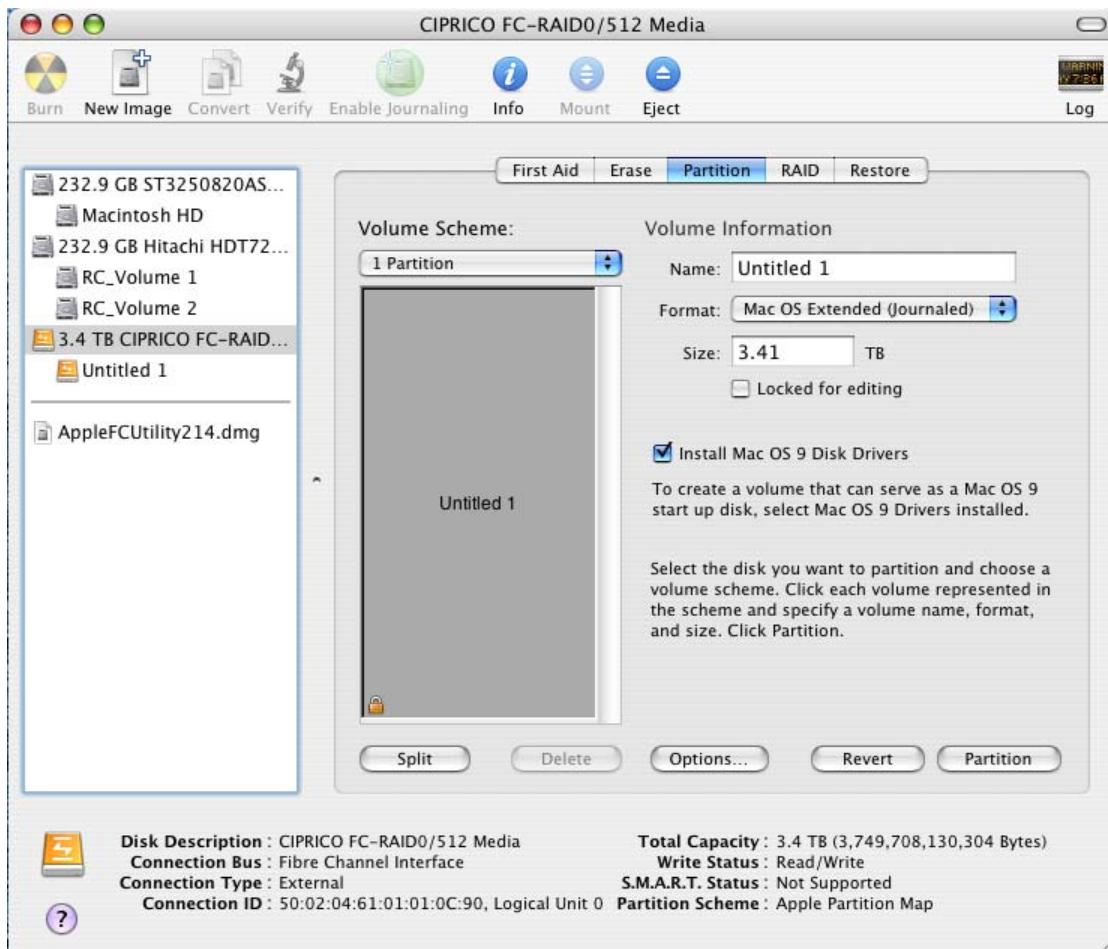


FIGURE 6-7. The Name of the Newly Partitioned Disk at the Apple Disk Utility Screen.

8. Close the *Apple Disk Utility* screen. The MV 4105 is ready for operations.

Preparing a Pair of MV 4105 Units (Striping)

1. Launch the Apple Disk Utility program. (The Disk Utility is located at Macintosh HD > Applications > Utilities.)
2. If the MV 4105 has not previously been formatted, a warning appears before the Apple Disk Utility program is launched. Click **INITIALIZE....** See Figure 6-8.



FIGURE 6-8. Disk Insertion Warning for Unformatted MV 4105 Units.

3. The *Apple Disk Utility* screen appears. In the example below, icons of the two CIPRICO FC-RAID drives of the two MV 4105 units are shown in the left side. See Figure 6-9.
4. Click on the upper CIPRICO FC-RAID icon.

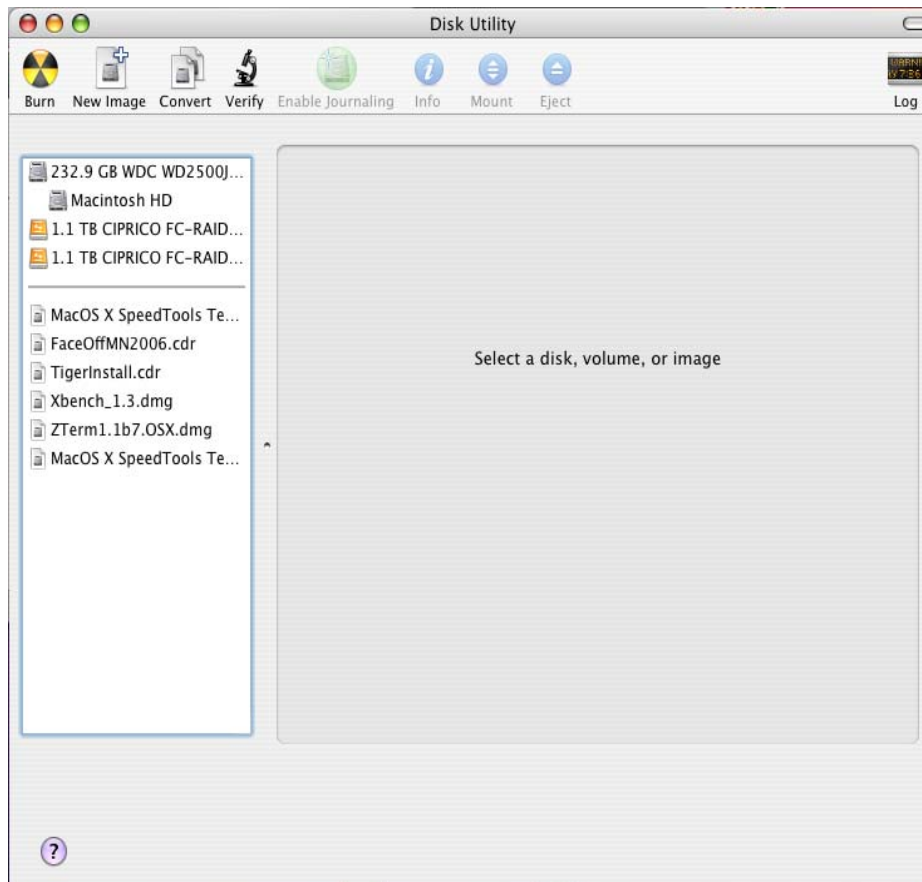


FIGURE 6-9. The Apple Disk Utility Screen, Prior to Clicking on the Upper Disk Icon.

5. Click on the “RAID” tab at the upper section of the screen. See Figure 6-10.

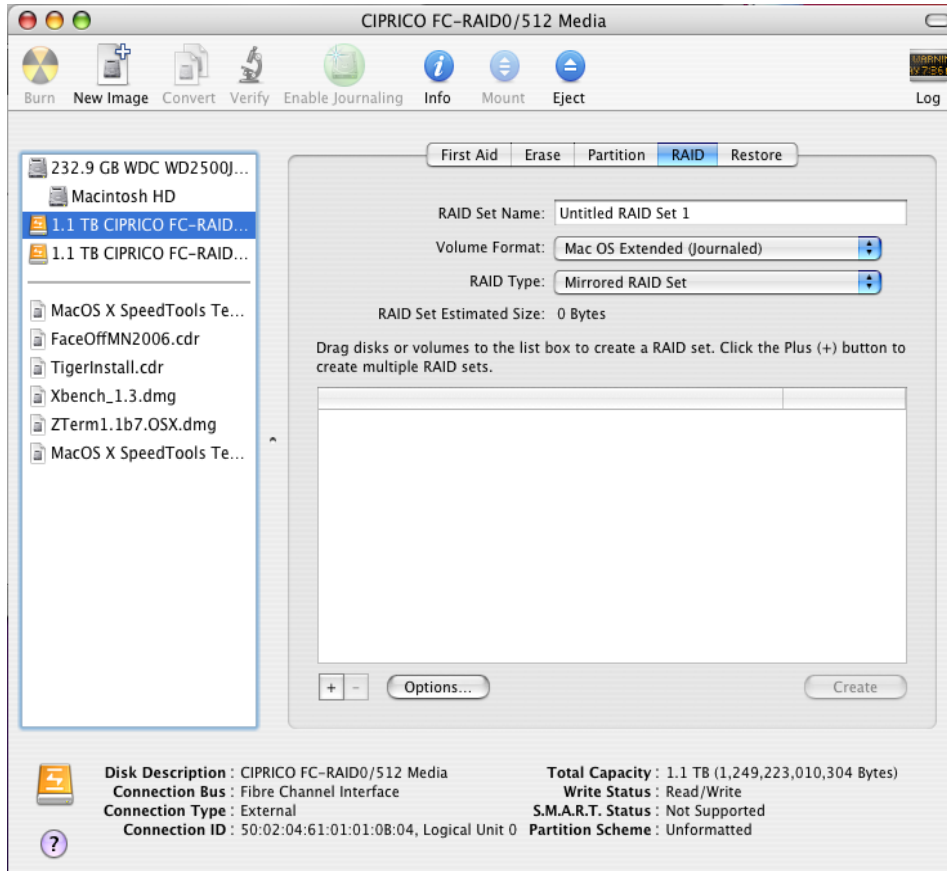


FIGURE 6-10. The “RAID” Tab of the Apple Disk Utility Screen, Showing the Disk Icon.

6. Drag the upper CIPRICO FC-RAID icon to the middle section of the screen. See Figure 6-11.
7. Drag the lower CIPRICO FC-RAID icon to the middle section of the screen. See Figure 6-11.

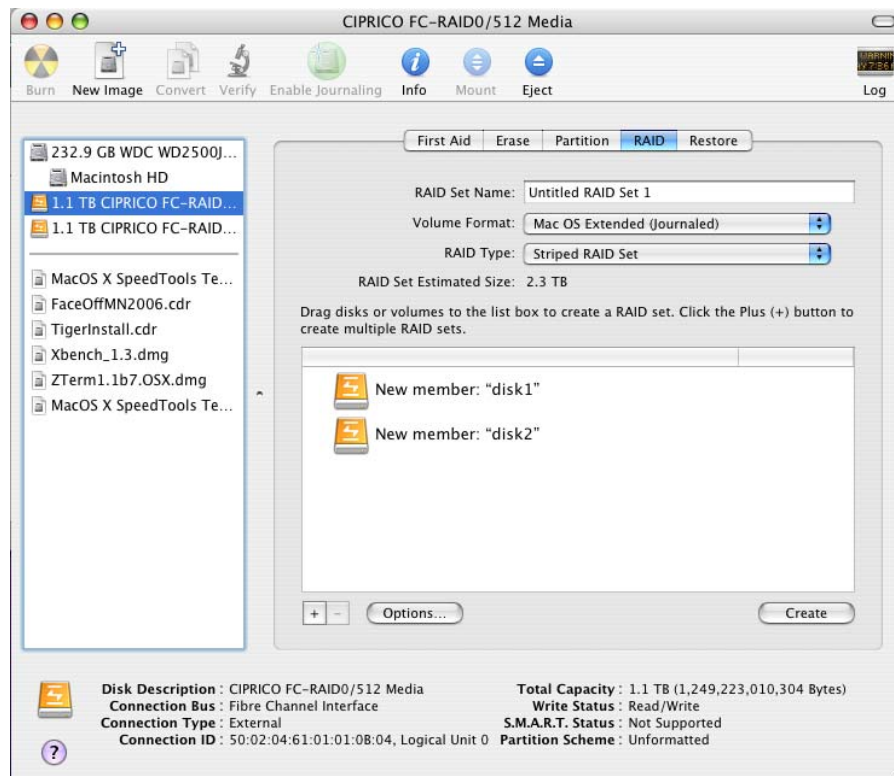


FIGURE 6-11. The Apple Disk Utility Screen, With Both RAID Icons in the Middle Section.

8. At the “RAID Set Name:” field, name the volume.
9. At the “Volume Format:” field, choose “Mac OS Extended (Journaled)”.
10. At the “RAID Type:” field, choose “Striped RAID Set”.
11. Click the **CREATE** button.

12. A *Partition Disk* screen appears. It warns about destroying data when a RAID set is created. To continue with creating the RAID, click the **PARTITION** button on this screen. See Figure 6-12.

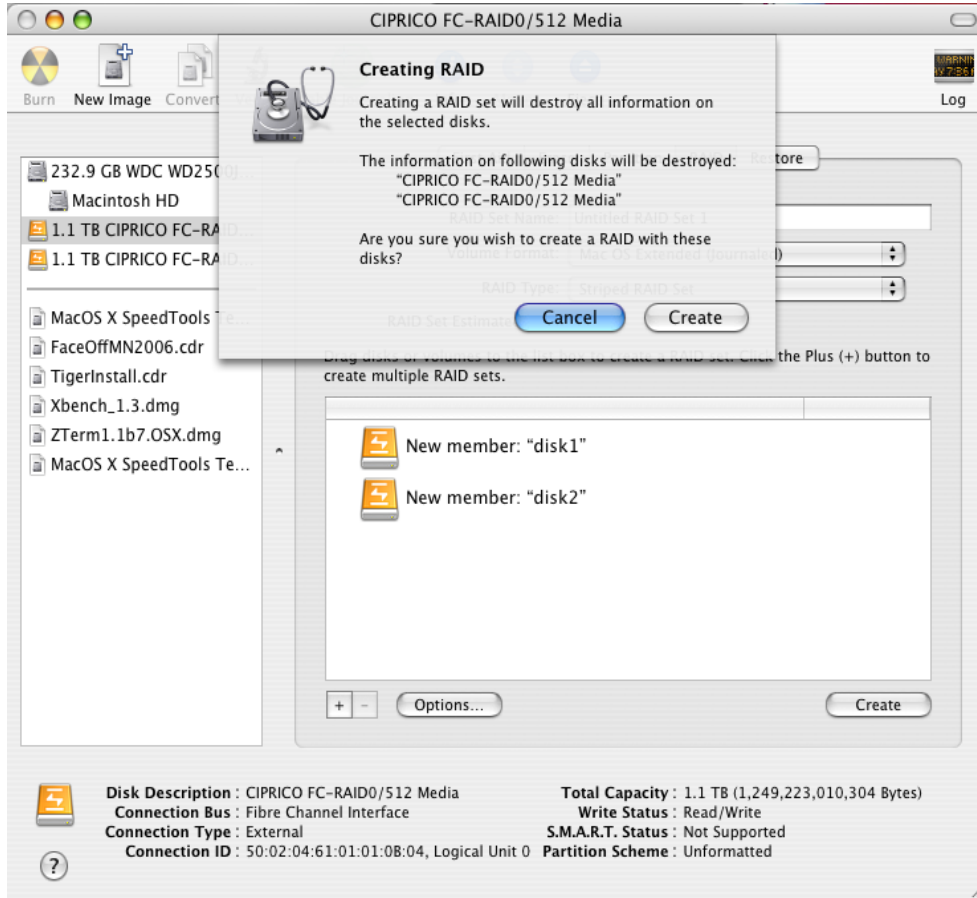


FIGURE 6-12. Partition Disk Warning Screen, Displayed Before a RAID Set is Created.

13. When the creation process is finished, the *Apple Disk Utility* screen displays icons similar to the ones shown in this example. See Figure 6-13.
 - The “1.1 TB CIPRICO FC-RAID...” icons represent the physical occurrences of the MV 4105.
 - The “1.1 TB disk1s3” and “1.1 TB disk2s3” icons represent placeholders for the RAID set.
 - The RAID set is represented by “Untitled RAID Set 1” and is shown below its “2.3 TB Untitled RAID Set 1” physical occurrence.
 - At the center of the screen the “2.3 TB - “Untitled RAI...1” icon represents the volume on the RAID set.

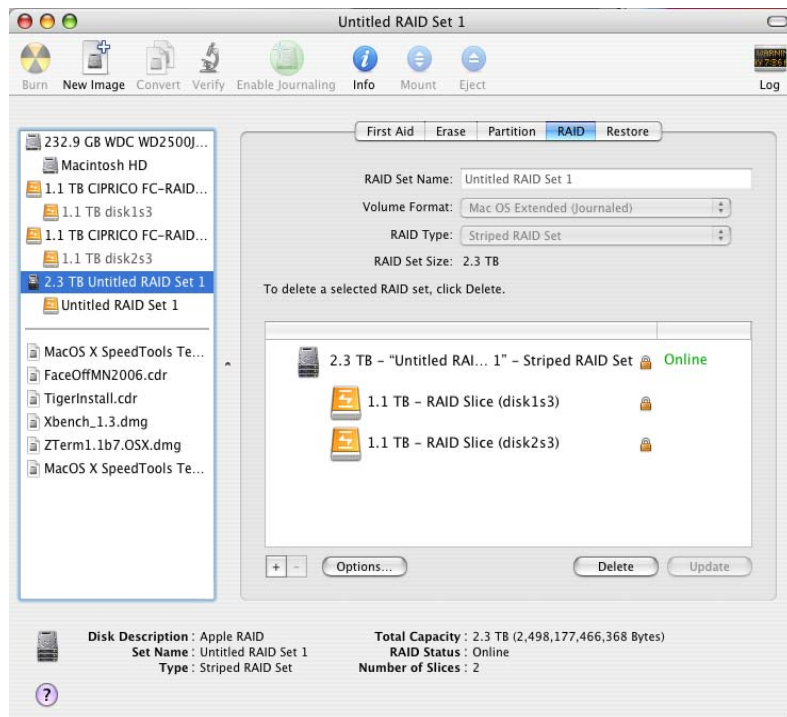


FIGURE 6-13. The Apple Disk Utility Screen, Showing the Striped RAID Set.

14. Close the *Apple Disk Utility* screen. The MV 4105 is ready for operations.

Windows 2000/2003/XP Partitioning/Formatting

Setup Procedure for Unstriped or Striped Volumes

NOTE: Steps 1 through 9 of this section describe a process that is common to unstriped and striped volumes. The process diverges after step 9. At that point, see [“Procedure for Unstriped Volumes Only” on page 6-22](#) or [“Procedure for Striped Volumes Only” on page 6-27](#).

1. After the computer boots-up, right-click on the “My Computer” icon on the desktop and select “Manage”. Or, right-click on Start > Explore, then right-click on My Computer > Manage. (For Windows XP, click on **START**).
2. The *Computer Management* screen appears. Click “Disk Management” at the left side. See Figure 6-14.

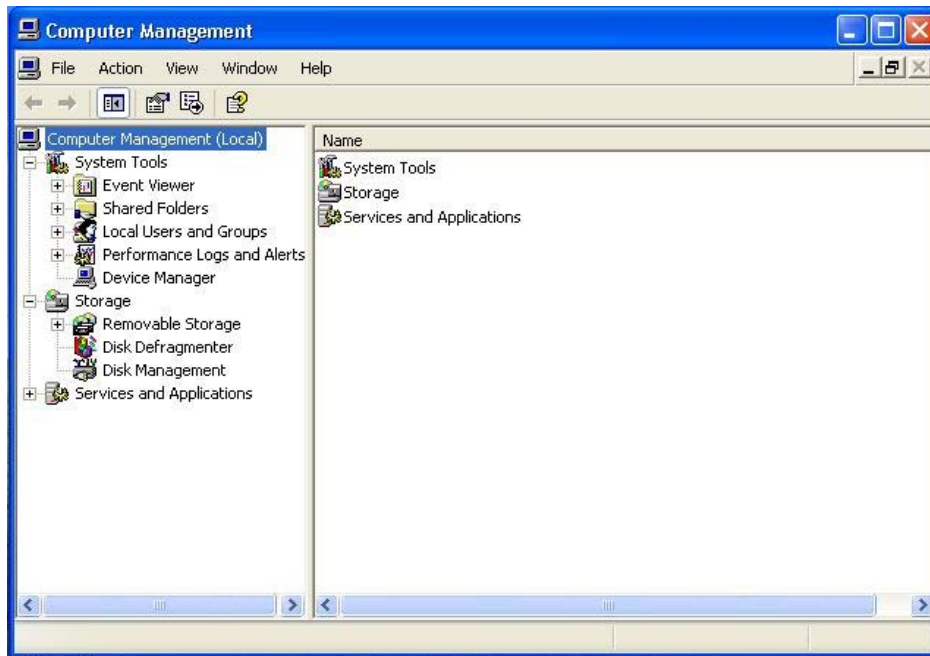


FIGURE 6-14. Computer Management Screen.

3. If this is the first time that the array has been used on the PC, the *Initialize and Convert Disk Wizard* screen appears. Click **NEXT >**. See Figure 6-15.



FIGURE 6-15. Initialize and Convert Disk Wizard Screen.

4. At the *Initialize and Convert Disk Wizard - Select Disks to Initialize* screen, make sure the Disk 1 and Disk 2 checkboxes are checked. Click **NEXT >**. See Figure 6-16.

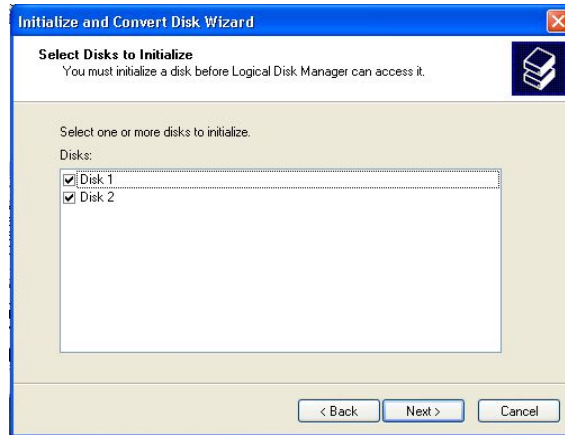


FIGURE 6-16. Initialize and Convert Disk Wizard - Select Disks to Initialize Screen.

5. At the *Initialize and Convert Disk Wizard - Select Disks to Convert* screen, check the Disk 1 and Disk 2 checkboxes. Click **NEXT >**. See Figure 6-17.

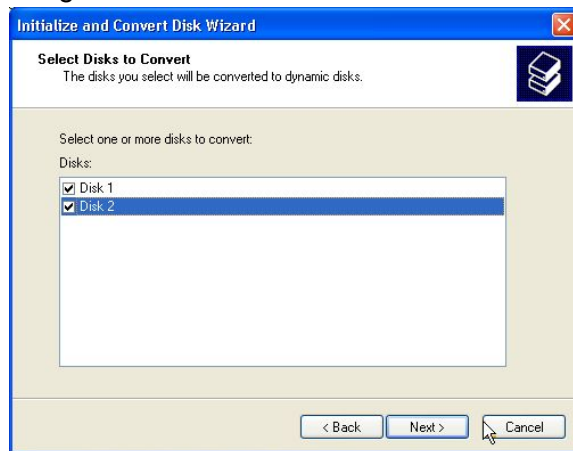


FIGURE 6-17. Initialize and Convert Disk Wizard - Select Disks to Convert Screen.

6. When the *Initialize and Convert Disk Wizard - Completing the Initialize and Convert Disk Wizard* screen appears, review the information. If it is OK, click **FINISH**. See Figure 6-18.

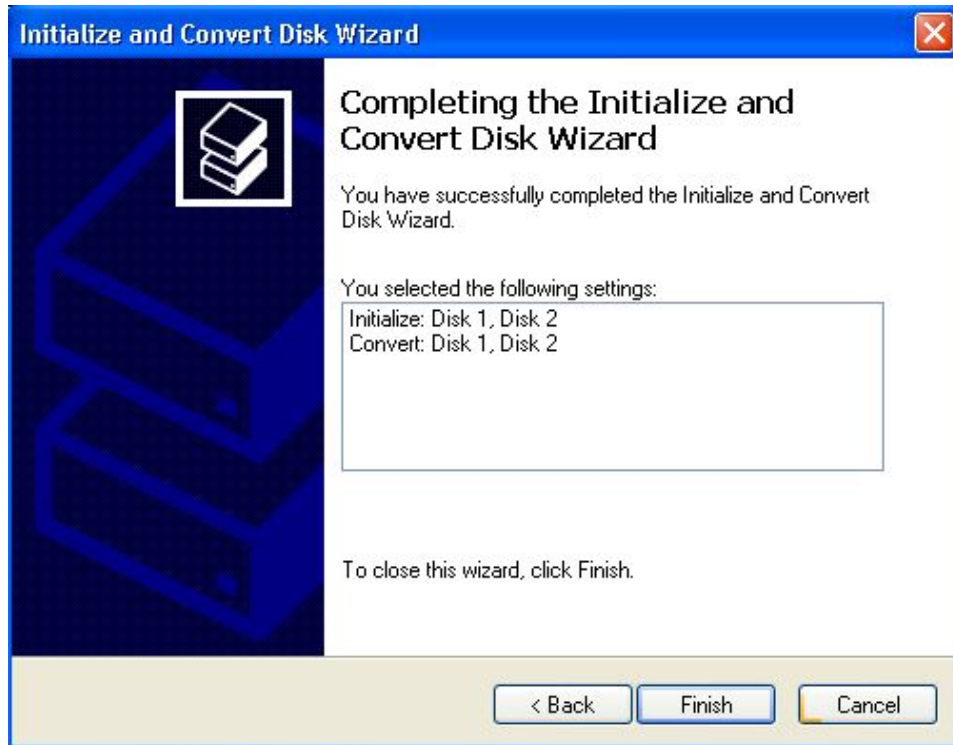


FIGURE 6-18. Initialize and Convert Disk Wizard - Completing the Initialize and Convert Disk Wizard Screen.

- The *Computer Management - Disk Management* screen appears. It shows Disk 1 and Disk 2 as unallocated and each with 1862 GB (1.862 TB) of capacity. See Figure 6-19.

NOTE: Windows 2000 and Windows XP have limits of 2 TB per disk. If the data exceeds this limit, the disks will not appear in Disk Management.

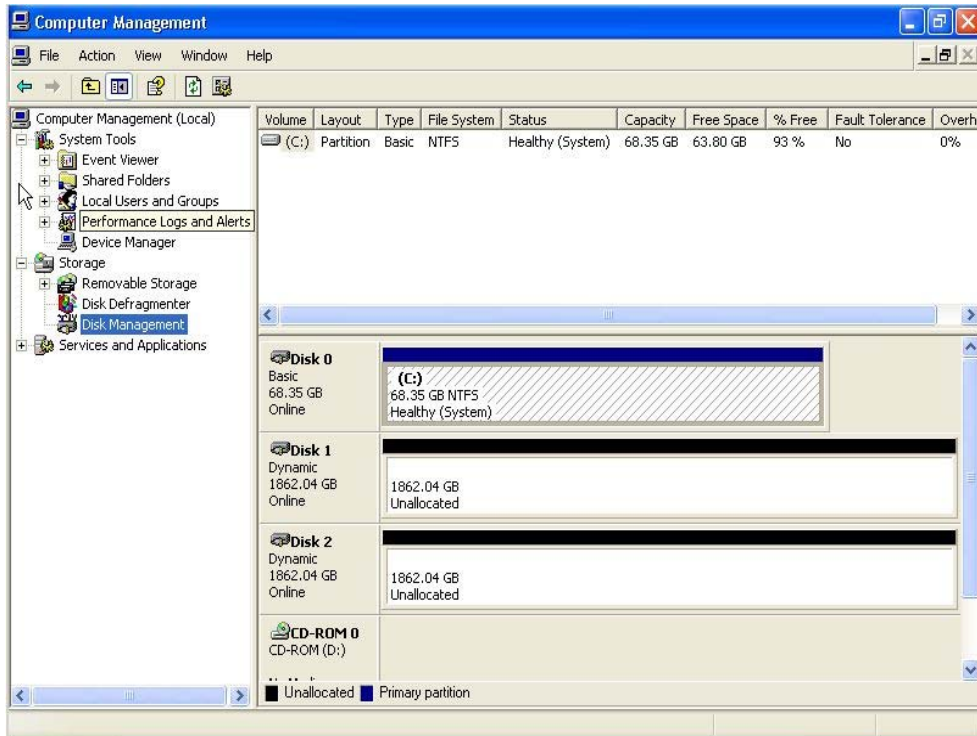


FIGURE 6-19. Computer Management - Disk Management Screen.

8. Right-click anywhere within the Disk 1 area, below the black bar, and select “New Volume...” in the pop-up menu. See Figure 6-20.

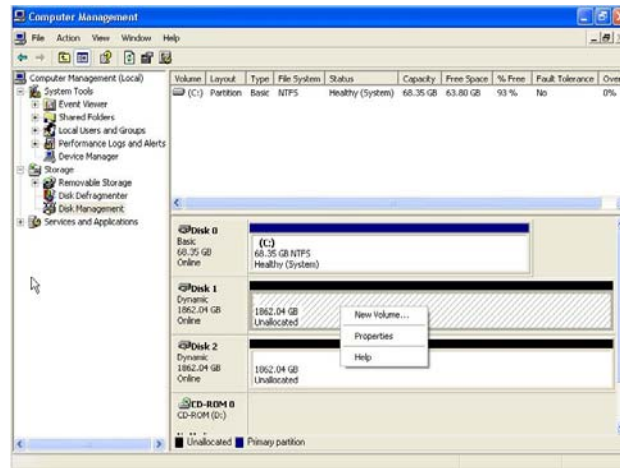


FIGURE 6-20. Computer Management Screen, Showing “New Volume...” Selected.

9. The *New Volume Wizard* screen appears. Click **NEXT**. See Figure 6-21.



FIGURE 6-21. New Volume Wizard Screen.

Procedure for Unstriped Volumes Only

NOTE: As applicable, see the section entitled **“Procedure for Striped Volumes Only”** on page 6-27, to set-up striped volumes for the Windows operating system.

1. When the *New Volume Wizard - Select Volume Type* screen appears, set the “Volume Type” to “Simple”. Click **NEXT >**. See Figure 6-22.

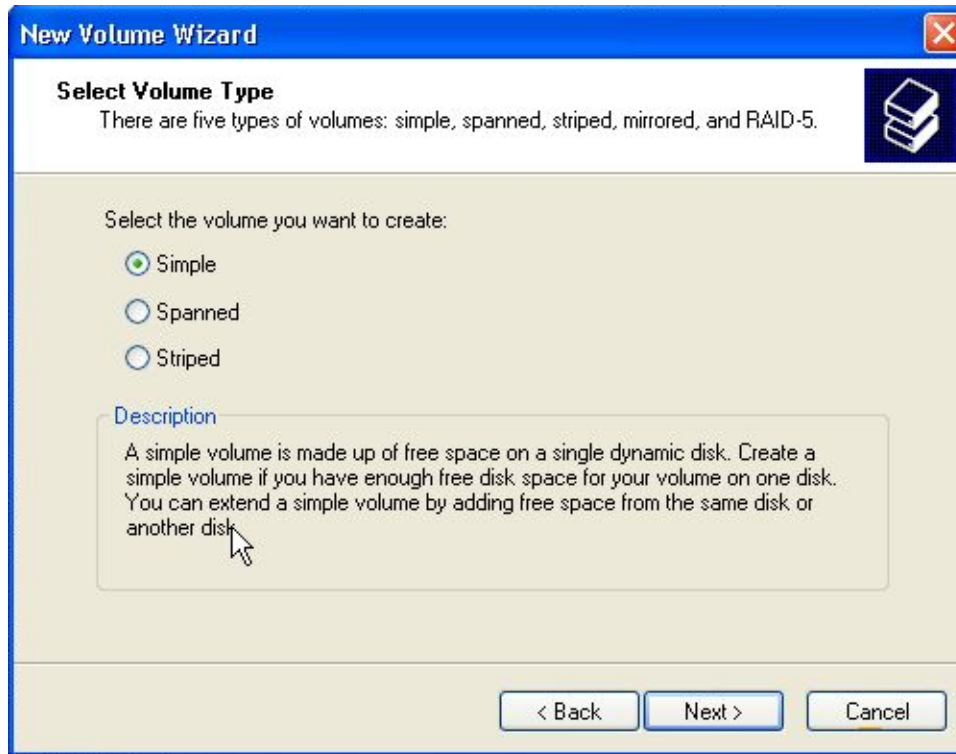


FIGURE 6-22. New Volume Wizard - Select Volume Type Screen.

2. The *New Volume Wizard - Select Disks* screen appears. Make sure that “Disk 1” is selected. Click **NEXT >**. See Figure 6-23.

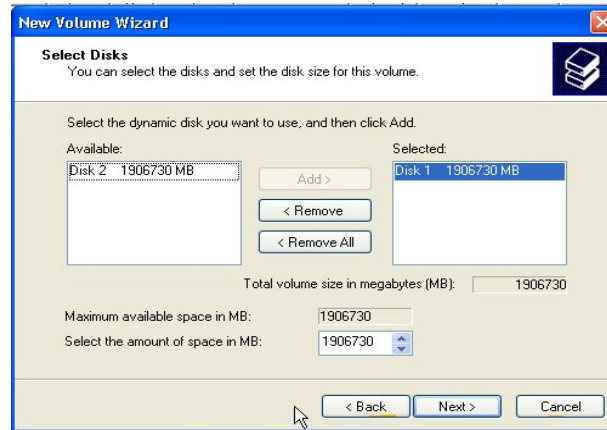


FIGURE 6-23. New Volume Wizard - Select Disks Screen.

3. The *New Volume Wizard - Assign Drive Letter or Path* screen appears. Change the drive (array) letter, as desired. Click **NEXT >**. See Figure 6-24.

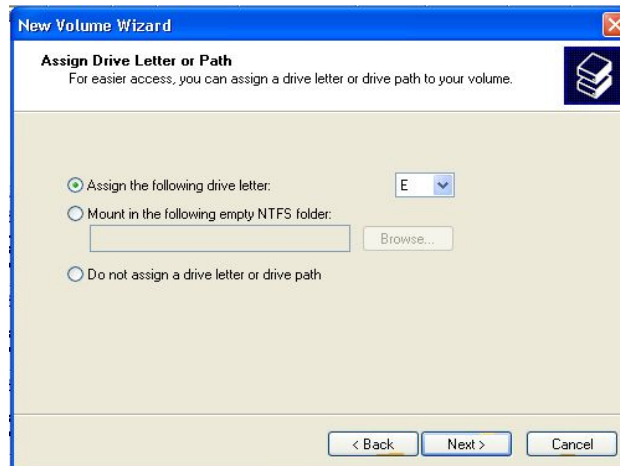


FIGURE 6-24. New Volume Wizard - Assign Drive Letters or Path Screen.

4. The *New Volume Wizard - Volume Format* screen appears. As desired, change the “Volume label”. Make sure the “Perform a quick format” checkbox is checked. Click **NEXT >**. See Figure 6-25.

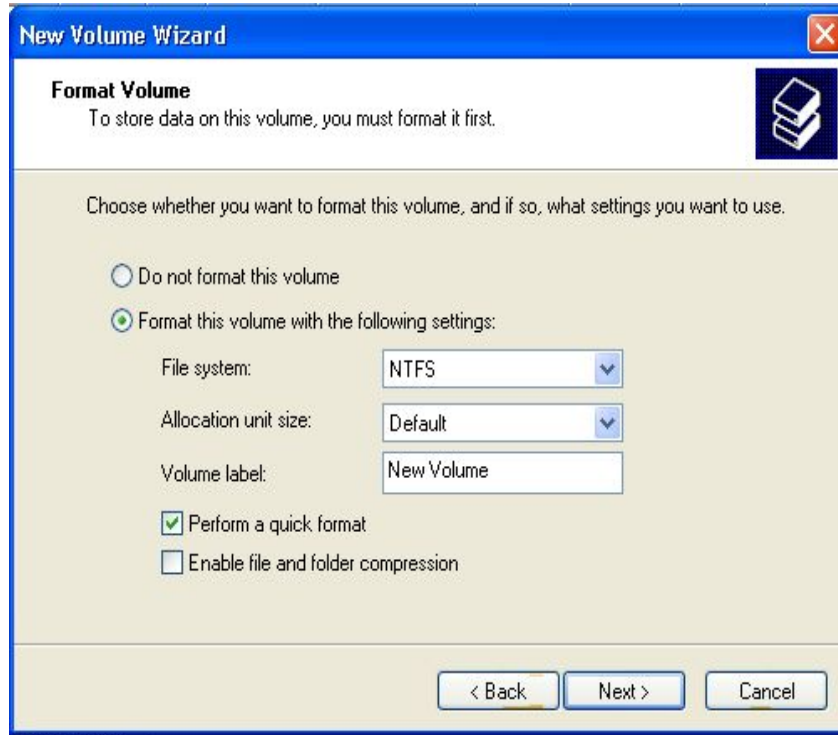


FIGURE 6-25. New Volume Wizard - Format Volume Screen.

5. The *New Volume Wizard - Completing the New Volume Wizard* screen appears. Review the settings that have been made. If incorrect, click **< BACK** to make a correction at a previous screen. If OK, click **FINISH**. See Figure 6-26.



FIGURE 6-26. New Volume Wizard - Completing the New Volume Wizard Screen.

- The *Computer Management* screen appears. It shows the settings of “New Volume (E:)” for Disk 1. See Figure 6-27.

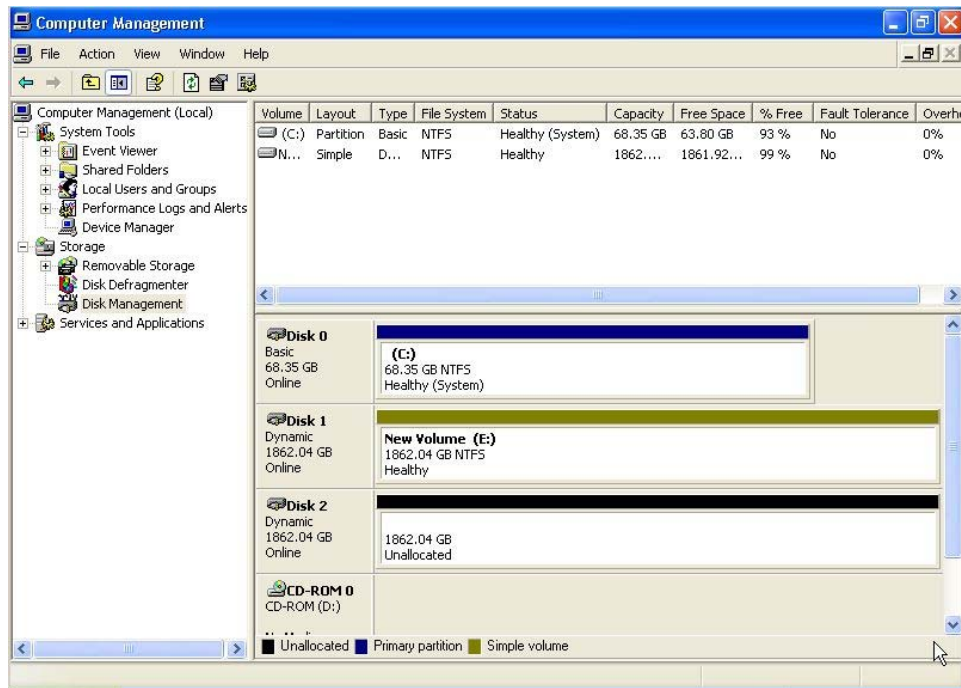


FIGURE 6-27. Computer Management Screen, Showing the New Volume for Disk 1.

- Right-click in the area below the black bar of Disk 2 and select “New Volume”. Repeat steps 1 through 6 of this section.
- Close the *Computer Management* screen after reviewing the settings of “New Volume (E:)” for Disk 2. The MV 4105 is ready for operations.

Procedure for Striped Volumes Only

NOTE: As applicable, see the section entitled **“Procedure for Unstriped Volumes Only”** on page 6-22, to set-up unstriped volumes for the Windows operating system.

1. When the *New Volume Wizard - Select Volume Type* screen appears, set the “Volume Type” to “Striped”. Click **NEXT >**. See Figure 6-28.

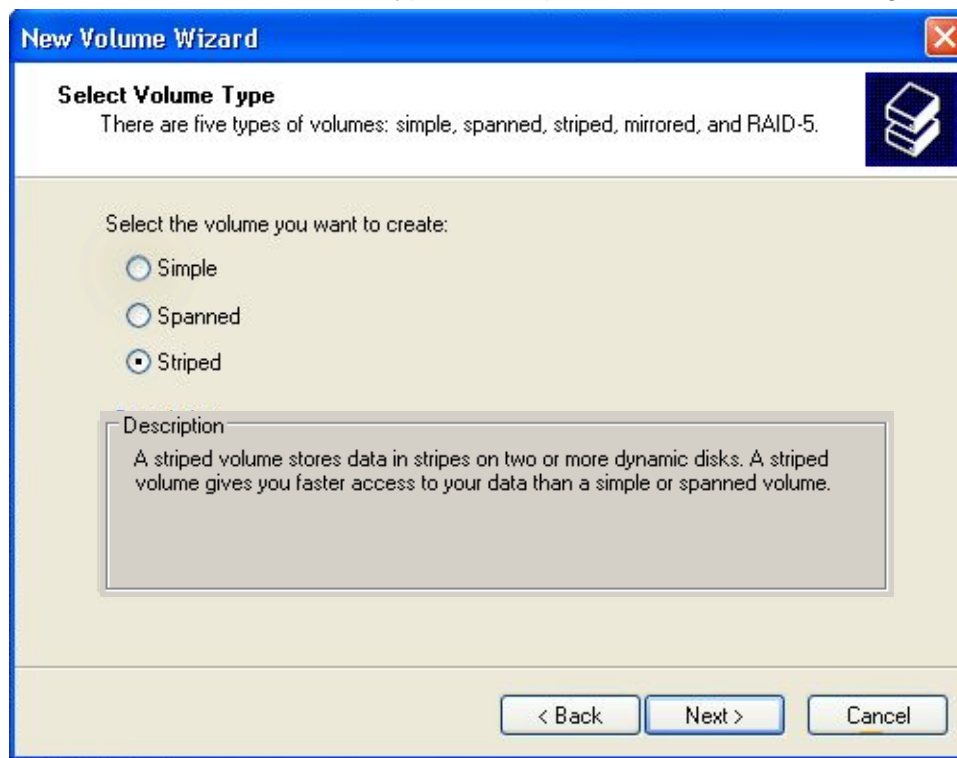


FIGURE 6-28. New Volume Wizard - Select Volume Type Screen, Showing “Striped” Selected.

2. The *New Volume Wizard - Select Disks* screen appears. Highlight “Disk 2” in the “Available:” field. Click **ADD >** to move “Disk 2” to the “Selected:” field. See Figure 6-29.
3. At the bottom of the screen, at “Select the amount of space in MB:” select a number that is at least 10MB less than the maximum available space of the disk. Click **NEXT >**. See Figure 6-29.

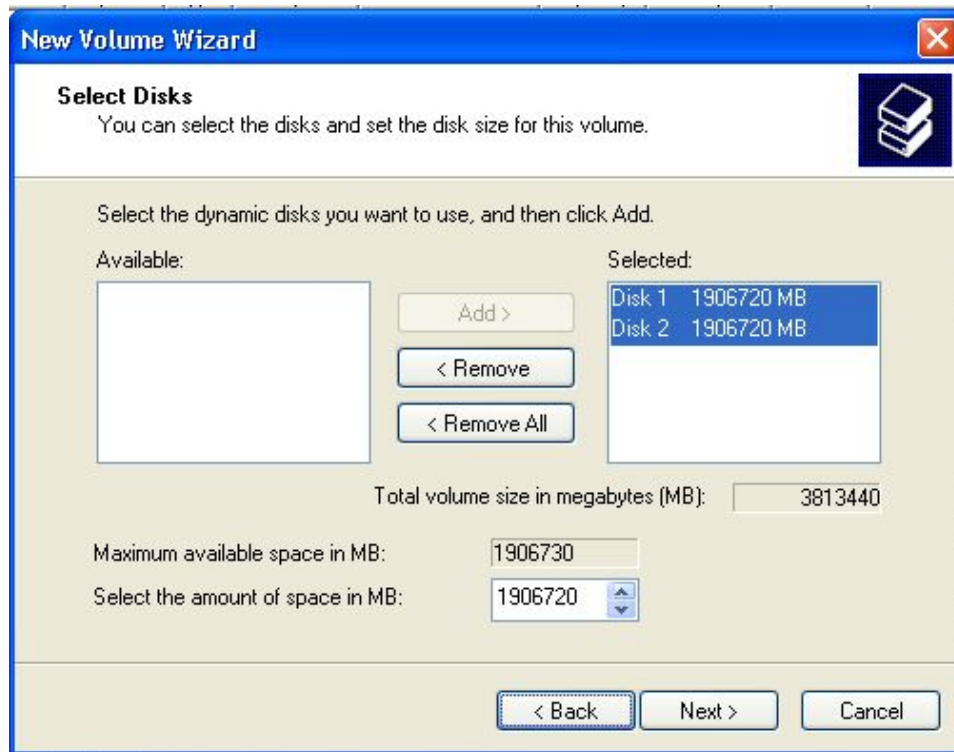


FIGURE 6-29. New Volume Wizard - Select Disks Screen, With “Disk 2” Moved to “Selected:”.

4. The *New Volume Wizard - Assign Drive Letter or Path* screen appears. Change the drive (array) letter, as desired. Click **NEXT >**. See Figure 6-30.

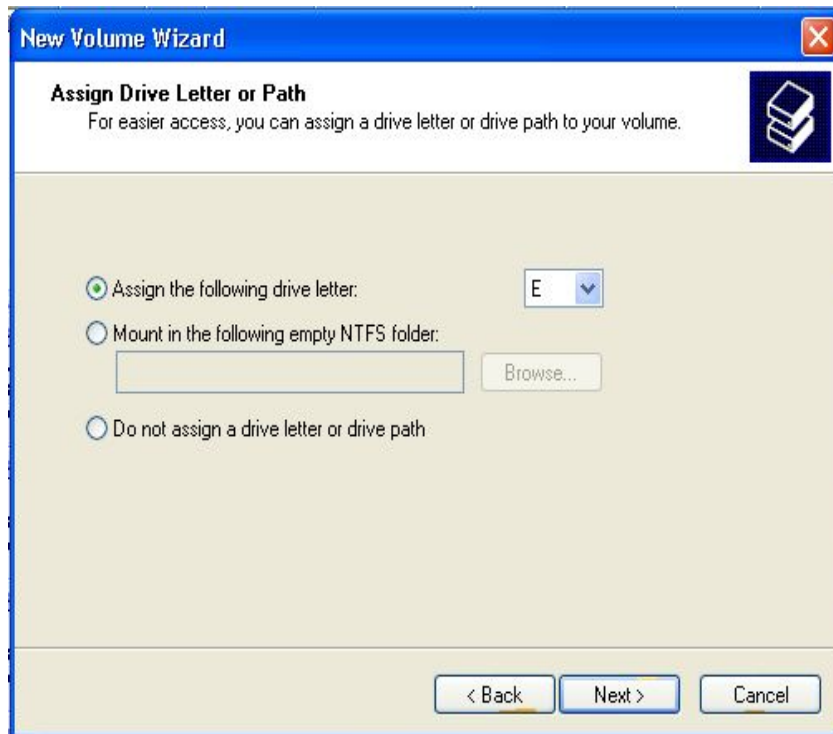


FIGURE 6-30. New Volume Wizard - Assign Drive Letters or Path Screen.

5. The *New Volume Wizard - Format Volume* screen appears. Select “Do not format this volume”. Click **NEXT >**. See Figure 6-31.

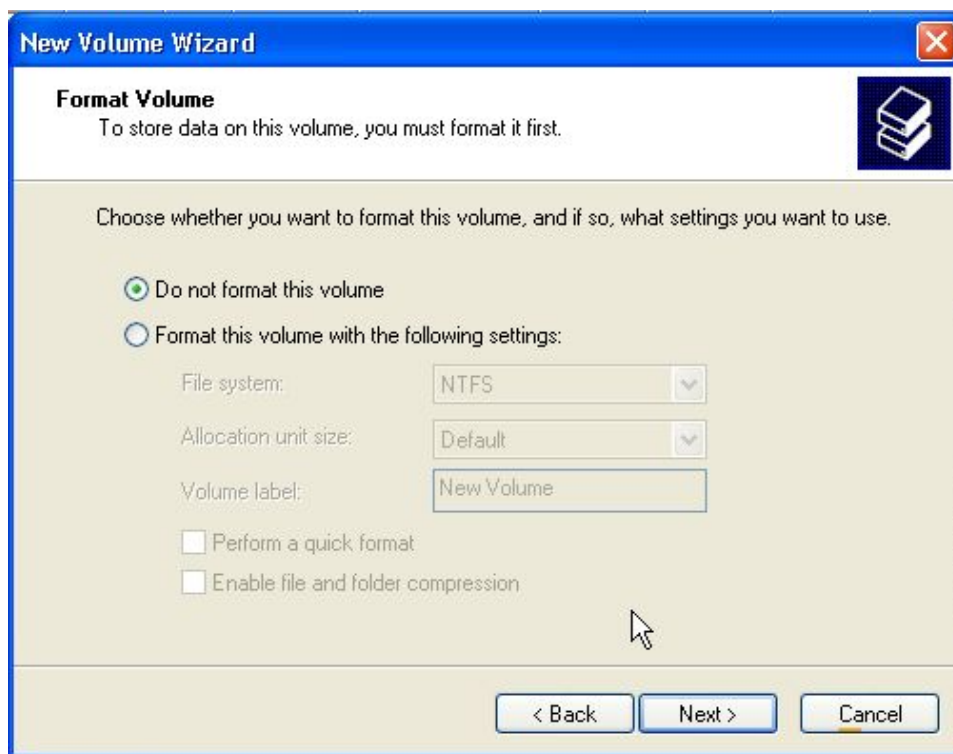


FIGURE 6-31. New Volume Wizard - Format Volume Screen.

6. The *New Volume Wizard - Completing the New Volume Wizard* screen appears. Review the settings that have been made. If incorrect, click **< BACK** to make a correction at a previous screen. If OK, click **FINISH**. See Figure 6-32.



FIGURE 6-32. New Volume Wizard - Completing the New Volume Wizard Screen.

- The *Computer Management* screen appears. It shows the settings of “New Volume (E:)” for Disk 1 and “New Volume (E:)” for Disk 2. Close the screen. See Figure 6-33.

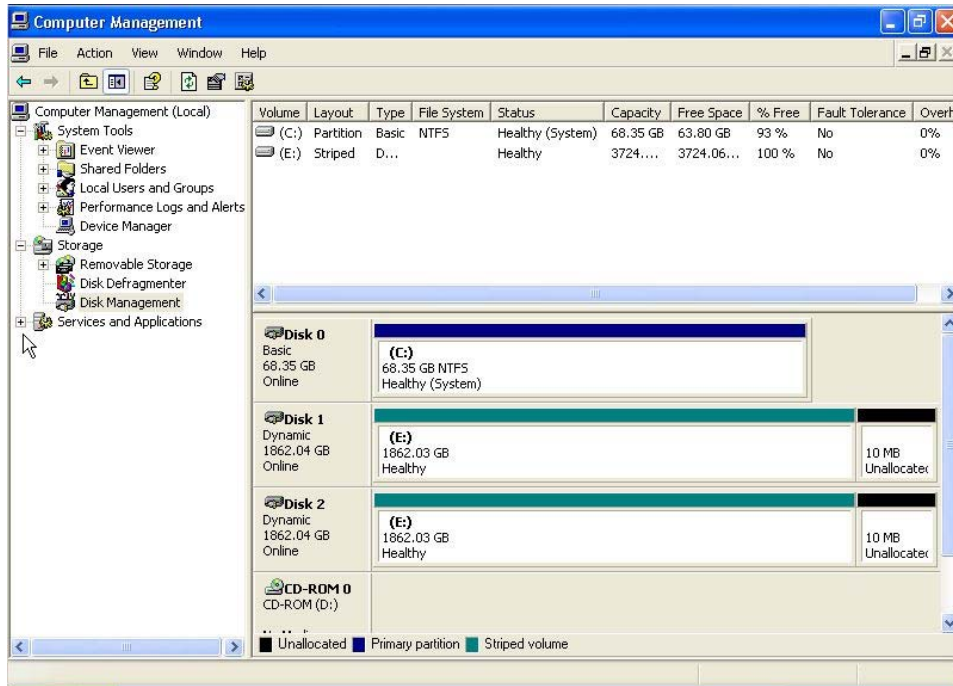
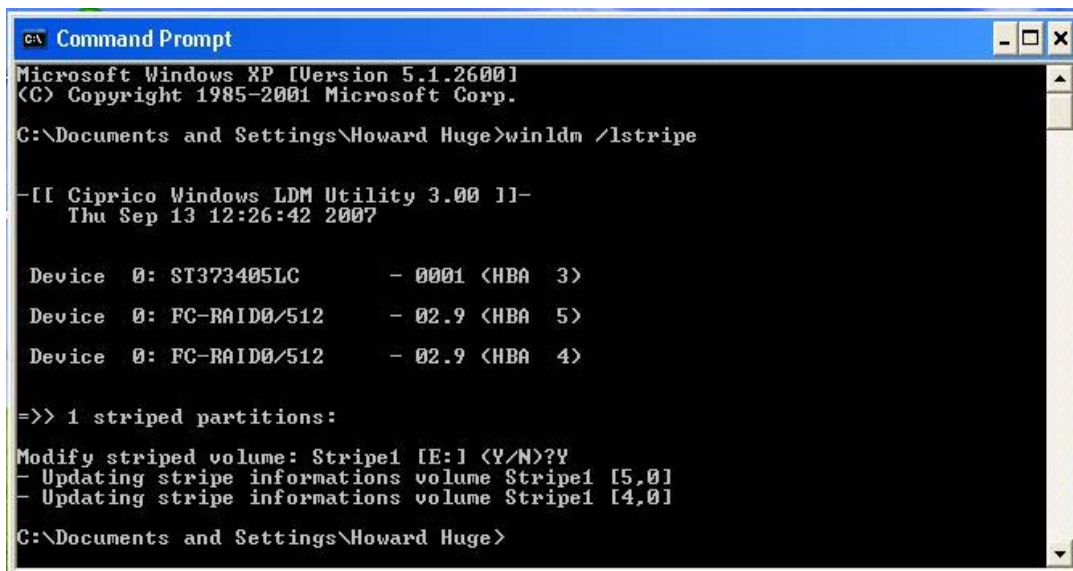


FIGURE 6-33. Computer Management Screen, Showing Formatted Disk 1 and Disk 2.

NOTE: Prior to performing step 8, obtain the WinLDM utility from the following Ciprico Inc. URL: <ftp://ftp.ciprico.com/pub/MediaVault/winldm.zip>. Uncompress the .zip file and save the .exe file to the C:\windows folder.

8. Access Start > All Programs [Programs] > Accessories > Command Prompt.
9. At the *Command Prompt* screen, type "winldm /lstripe". Press **ENTER**.
10. The *Command Prompt* screen lists all of the drives (devices) on the system. It inquires if you want to modify the striped partition. Type "Y" (make sure the "Y" is uppercase). Press **ENTER**. See Figure 6-34.



```
CAV Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\Howard Huge>winldm /lstripe

-[ Ciprico Windows LDM Utility 3.00 ]-
  Thu Sep 13 12:26:42 2007

Device 0: ST373405LC      - 0001 <HBA 3>
Device 0: FC-RAID0/512   - 02.9 <HBA 5>
Device 0: FC-RAID0/512   - 02.9 <HBA 4>

=>> 1 striped partitions:
Modify striped volume: Stripe1 [E:] (Y/N)?Y
- Updating stripe informations volume Stripe1 [5,0]
- Updating stripe informations volume Stripe1 [4,0]
C:\Documents and Settings\Howard Huge>
```

FIGURE 6-34. Command Prompt Screen, Showing the Listed Drives [Devices] and a "Y" Response to the "Modify striped volume..." Inquiry.

11. Type "Exit". Press **ENTER** to close the *Command Prompt* screen.

12. Reboot the computer.
13. After the computer boots-up, right-click on the “My Computer” icon on the desktop and select “Manage”. Or, right-click on Start > Explore >, then right-click on My Computer > Manage. (For Windows XP, click on **START**).
14. The *Computer Management* screen appears. Click “Disk Management” at the left side.
15. At the center of the screen, right-click on the “(E:)” drive at Disk 1 or Disk 2. From the pop-up menu select “Format...”. See Figure 6-35.

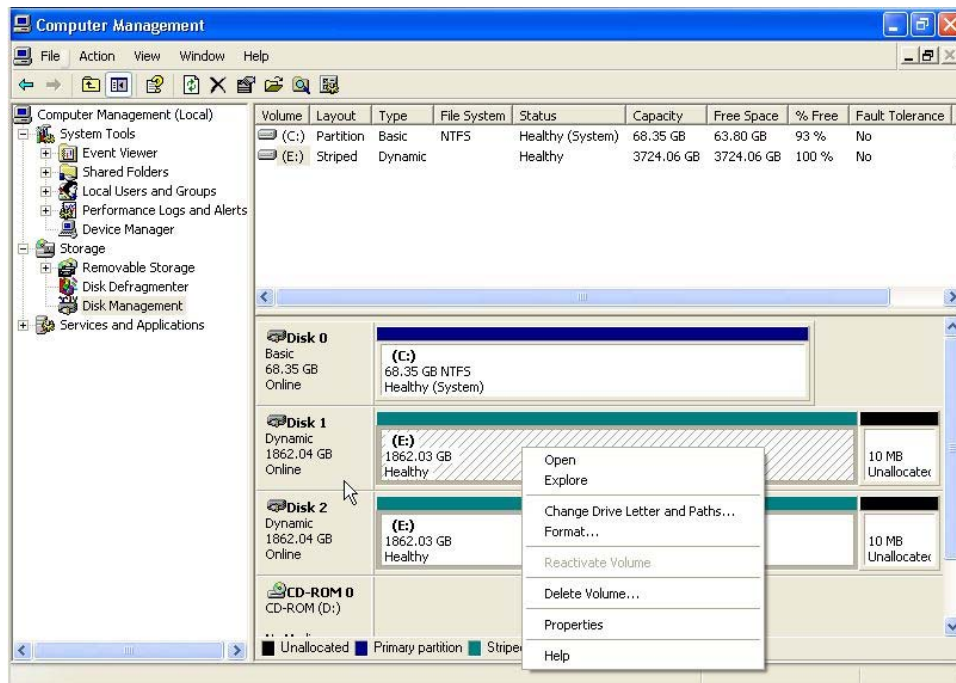


FIGURE 6-35. Computer Management Screen, Showing the Pop-Up Menu and “Format...”.

16. The *Format E:* screen appears. At “Volume label:” give the volume a name. Make sure that the “Perform a quick format” checkbox is checked. See Figure 6-36.

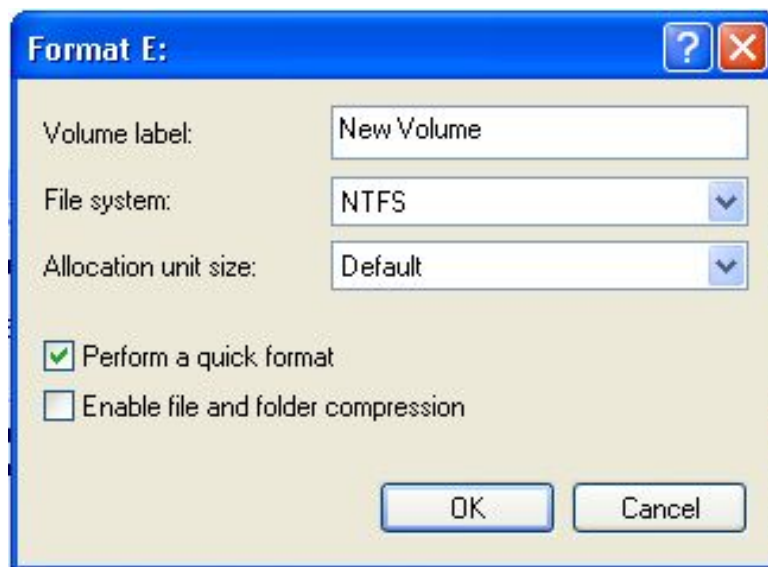


FIGURE 6-36. Format E: Screen.

17. The *Format E:* warning dialog box appears. Click **OK**. See Figure 6-37.

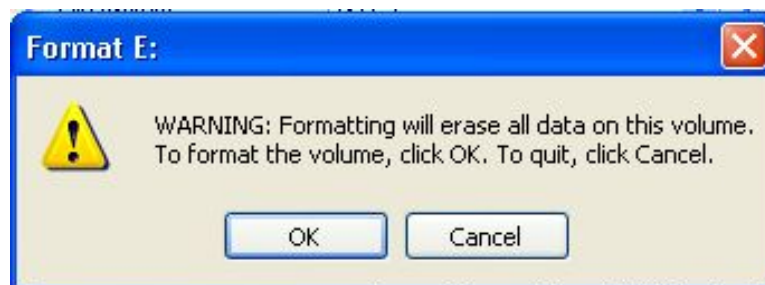


FIGURE 6-37. Format E: Warning Dialog Box.

- The *Computer Management* screen appears. Click **DISK MANAGEMENT** at the left side. The volume name, file system, and allocation unit size appear. See Figure 6-38.

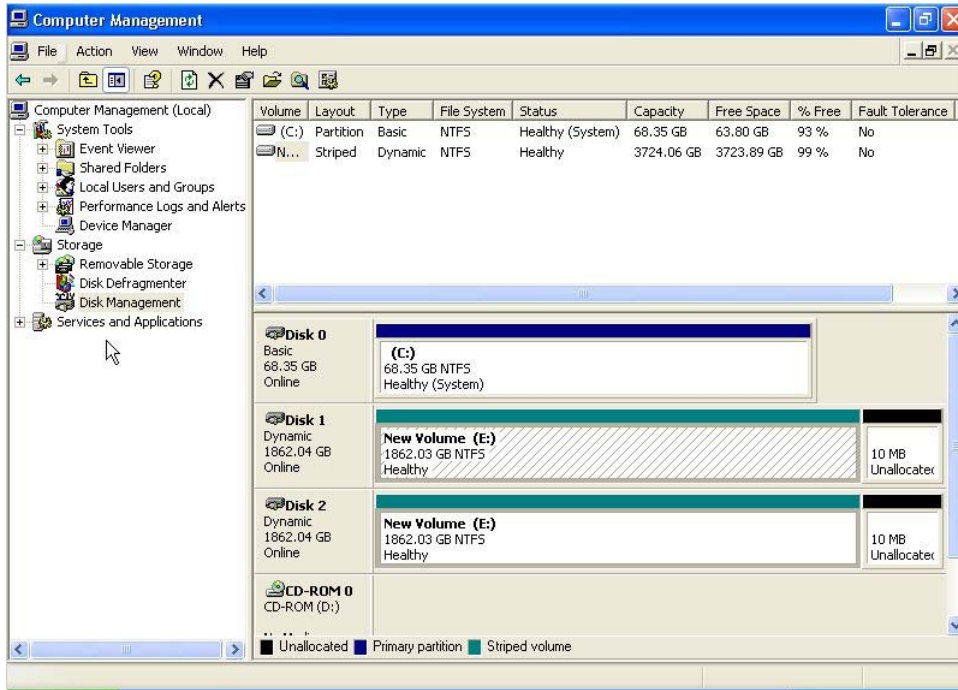


FIGURE 6-38. Computer Management Screen, Showing the Volume Name.

- Close the *Computer Management* screen. The MV 4105 is ready for operations.

Problem Solving

In this chapter...

Problem Solving Issues & Answers 7-2
Frequently Asked Questions (FAQs) 7-5

Problem Solving Issues & Answers

Review the following sections and tables for typical questions/problems, likely causes, and Ciprico Inc. recommendations.

For additional troubleshooting issues and answers, see the Ciprico Inc. Knowledge Base at <http://kb.ciprico.com/lore/index.php>

TABLE 7-1. Problems, Likely Causes, and Recommended Solutions.

Issue/Problem	Likely Causes	Recommended Solutions
<p>5 or less slow beeps (repeating over and over).</p> <p>Indicates that a drive with that number has a problem. Also indicates the unit is in a (unprotected) RAID 0 mode.</p>	<ul style="list-style-type: none"> - A drive has failed - The interposer board has failed - The IDE cable to the interposer board has failed - The port on the controller has failed. - Can also be caused by a severed LED board cable. 	<ol style="list-style-type: none"> 1. Swap the drive with another drive and power-cycle it. Determine if the problem follows the drive. 2. If it does, replace the drive. Otherwise contact Ciprico Inc. technical support for further instructions.
<p>3 short/3 long beeps (Also known as 6 beeps)</p> <p>Indicates a communication time-out. This is broken into two categories: either a) The problem is outside of the array; or b) A drive is taking too long to respond.</p>	<p>Outdated/incorrect driver for host adapter installed; OS corrupt; faulty host adapter; faulty cable; faulty SFP.</p> <p>Can be caused by bad RAM on the controller, bad drive, bad IDE cable, or bad interposer.</p>	<ol style="list-style-type: none"> 1. Determine whether the problem is on the host or the array. 2. If the problem occurs on both channels of the array, it is most likely the host. 3. If cable ends on the array end are swapped, and the problem switches sides, then the problem is on the host. 4. Reinstall the host adapter drivers. 5. If this fails, contact Ciprico Inc. technical support for further instructions.
<p>Constant, Solid Tone</p>	<p>This indicates that a drive is down. The Service indicator should also be on.</p>	<ol style="list-style-type: none"> 1. Reconstruct the drive. 2. If that fails, replace the drive, perform a reconstruct. 3. If that fails, contact Ciprico Inc. technical support for further instructions.

TABLE 7-1. Problems, Likely Causes, and Recommended Solutions.

Issue/Problem	Likely Causes	Recommended Solutions
<p>LED(s) stuck on immediately on power up Indicates that a controller is not getting power.</p>	<p>Can be caused by loose power connector to controller, defective controller, or defective power supply.</p>	<p>Contact Ciprico Inc. technical support for further instructions.</p>
<p>Immediate continuous tone (high-pitched) on power-up Indicates that the controller either isn't getting proper power or that the controller failed., or that there is a possible power supply failure.</p>	<p>Can be caused by any of the above problems, or that the power supply is not functioning properly.</p>	<p>Contact Ciprico Inc. technical support for further instructions.</p>
<p>Other Hardware Failure</p>	<p>Includes:</p> <ul style="list-style-type: none"> - LED failure - Beeper failure - Switch failure - A problem inside the chassis. 	<p>Contact Ciprico Inc. technical support for further instructions.</p>

TABLE 7-1. Problems, Likely Causes, and Recommended Solutions.

Issue/Problem	Likely Causes	Recommended Solutions
Lost Volume	Includes: <ul style="list-style-type: none"> - Drive or multiple drives down - Faulty controller - Incorrect driver installed when array was formatted/striped - Incorrect/corrupt driver installed now - Failed host adapter - Computer virus - SAN software not controlling the volume - Array powered off while writing - Incorrect/faulty cable - Failed SFP - Application failed to write properly - Host computer locked up - OS is corrupt - Boot drive security is corrupt. 	<ol style="list-style-type: none"> 1. Depends on the cause, as listed the problems above. 2. If all hardware, OS, drivers, and array are verified good, then data recovery software might be needed to get the data back. 3. Contact Ciprico Inc. technical support for further instructions.

Frequently Asked Questions (FAQs)

TABLE 7-2. Frequently Asked Questions.

What is the proper placement of my MediaVault?	<p>The MV 4105 can be operated in a tower configuration only.</p> <p>Whenever possible, do not place the unit near the floor, as it will pick up more dust.</p>
What are typical data-rate speeds?	<p>The internal data rate ranges is 500MB/sec.</p> <p>Externally, you should see between 250-320MB/sec in RAID 0 under ideal conditions. In RAID 3, this rate drops by about 20-40 MB/sec.</p>
What is striping?	<p>Striping is a technique where different parts, called sectors, of different disk drives are used alternately in sequence.</p> <p>This is done for several possible reasons: a) Gaining performance; b) Increasing reliability; or c) Increasing capacity.</p>
What is spanning/concatenation?	<p>This is a technique where hard disk drives are used end-to-end, i.e. where one fills up the data continues on to the next. This is strictly done for capacity, and has no gains in either speed or reliability.</p>
What is mirroring?	<p>Mirroring is where data, when written, is written to two different disks or sets of disks -- i.e. the same copy in both places. This offers reliability, at the cost of capacity and speed.</p>
What is RAID 0?	<p>In RAID 0, the disk drives are striped with corresponding sectors of other drives, called strips, sequentially.</p> <p>Data written goes to sector 1 of drive 1, then sector 1 of drive 2, and so on. RAID 0 sacrifices data protection to gain capacity and performance.</p> <p>To do RAID 0 requires a minimum of 2 disk drives. The MV 4105 uses 5 disk drive modules.</p>

TABLE 7-2. Frequently Asked Questions.

<p>What is RAID 3?</p>	<p>In RAID 3, all of the drives except one (this one called a parity drive) are striped in RAID 0, as above.</p> <p>However this one drive has a special purpose: Through a simple mathematical calculation, it is able to operate if one of the RAID 0 drives goes down.</p> <p>If, for example, you set a rule that all of the bits (like switches - on/off) on all of the drive have to add up to an odd number, such as 0111 (with 1 being on, 0 being off), the extra drive stores the extra piece of data necessary to keep this number odd. In the case of 0111, the 5th bit would be 0, so that $0+1+1+1+0 = 3$ (which is odd).</p> <p>If one of any of the bits is lost, suppose the 2nd one: 0?110, by using the same rule (all numbers must add up to an odd number), it is possible to calculate the missing number: $0+?+1+1+0=2$ (which is even), so the missing number must be 1 in order to make that formula add up to an odd.</p> <p>To do RAID 3 requires a minimum of 3 disks - the MV 4105 uses one set of 5 (The reason you couldn't use two disks is that you would be mirroring, with the 2nd drive in the mirror being the inverted version of the first).</p>
<p>What is RAID 5?</p>	<p>RAID 5 is the same as RAID 3, except instead of having a dedicated parity drive, the parity is distributed across all of the disks, alternating disks in order.</p> <p>In the first strip of sectors (i.e. sector 0 of all of the drives), the 5th drive would have the parity, then on the 2nd strip (sector 1 of all drives), drive 1 would have parity, then drive 2, etc.</p> <p>RAID 5 requires a minimum of 3 drives - the MV 4105 does not support RAID 5 - only RAID 3</p> <p>(The drawbacks with RAID 5 is that additional calculation for the location of the parity within a strip -- in most cases, arrays have to be pre-formatted, and when a drive is down, RAID 5 performance goes down as well).</p>

TABLE 7-2. Frequently Asked Questions.

What is the self-healing feature I've heard about?	<p>This is a new name given to a slightly new technique for relocating bad sectors on the disks. Rather than relocate the actual sector, a pointer for the sector number is used.</p> <p>When a bad sector is found, the pointer updates to skip that area - this is done while the drive is reading/writing. If you were to watch the performance of this bad sector, as the performance appears to increase, it could be said the sector was "cured."</p>
Can I increase the capacity of the MV U320-R or MV U320-RX by installing larger drives?	<p>a) For the most part, if the firmware supports them and your host OS supports it, then yes.</p> <p>b) The drives must be Ciprico-tested/approved in order to maintain the warranty on the unit.</p> <p>c) The drives must be Ciprico-tested/approved in order to work on the unit.</p>
Do I need to do any software-based preventative maintenance on the array	No. Programs, such as Disk First Aid, Scan Disk, etc. are not recommended
How do I defragment the array?	Defragmenting software is not recommended. The best way to defragment the array is to back it up, reformat/restripe it, then restore the backup.
What is journaling and should I use it?	<p>Journaling is where the computer (in the background), logs all disk transactions, such as file open, file write, file read, file close.</p> <p>In the event of volume corruption, this journal is easy for recovery programs to find on the disk and make repairs, based on this file. We recommend journaling (if your OS supports it), in case of such corruption.</p>
I've heard journaling makes the array run slower - should I still use it?	Journaling only slows down the array by about 2KB/sec. For the most part, when a journal entry is written, it is usually only a few bytes of data, and doesn't update non-stop. The benefits greatly outweigh the small decrease in data rate
Do I need to do anything to keep my MV 4105 clean?	Although the outside of the unit might appear to be metal, on older models it is paint. Clean the unit with a soft cloth. If further cleaning is necessary, use a mild liquid soap.
Can I attach a 2nd computer to the "B" channels?	No. You must use a switch and SAN software if you want to attach multiple computers.

Maintenance

In this chapter...

Disk Drive Module Replacement	8-2
Power-Off the Host Computer and MediaVault Unit	8-2
Remove the Front Panel	8-3
Remove the Disk Drive Module	8-4
Install and Rebuild a Disk Drive Module.....	8-5

Disk Drive Module Replacement

Removing, replacing, and rebuilding a disk drive module consists of four inter-related procedures. Perform these four procedures in sequence:

1. "Power-Off the Host Computer and MediaVault Unit" (see below)
2. "Remove the Front Panel" (see [page 8-3](#)).
3. "Remove the Disk Drive Module" (see [page 8-4](#)).
4. "Install and Rebuild a Disk Drive Module". Rebuild the disk drive module, depending on whether the disk drive failed in RAID 0 mode (see [page 8-5](#)) or RAID 3 mode (see [page 8-6](#)).

Power-Off the Host Computer and MediaVault Unit

Before removing and replacing any components from the MV 4105, perform the following:

1. Power-off the host computer (PC or Macintosh).
2. Power-off the MV 4105.

Remove the Front Panel

The front panel is attached to the chassis by four snap pins. To remove the front panel:

3. Place your index and middle finger at the bottom of the front panel to pull the front panel forward and un-snap it from the pins.
4. Continue to pull forward to remove the front panel from the MV 4105.



FIGURE 8-1. Front Panel Partially Removed.

Remove the Disk Drive Module

1. Identify the disk drive module to be replaced, by locating the slow blinking light next to it.
2. Shutdown the host computer and turn off the MV 4105.
3. Push down on the button of the disk drive to be removed. The handle pops-up automatically.
4. Lift the handle while pulling forward on the disk drive. See Figure 8-2. Gently pull it forward. Set the defective disk drive module aside.

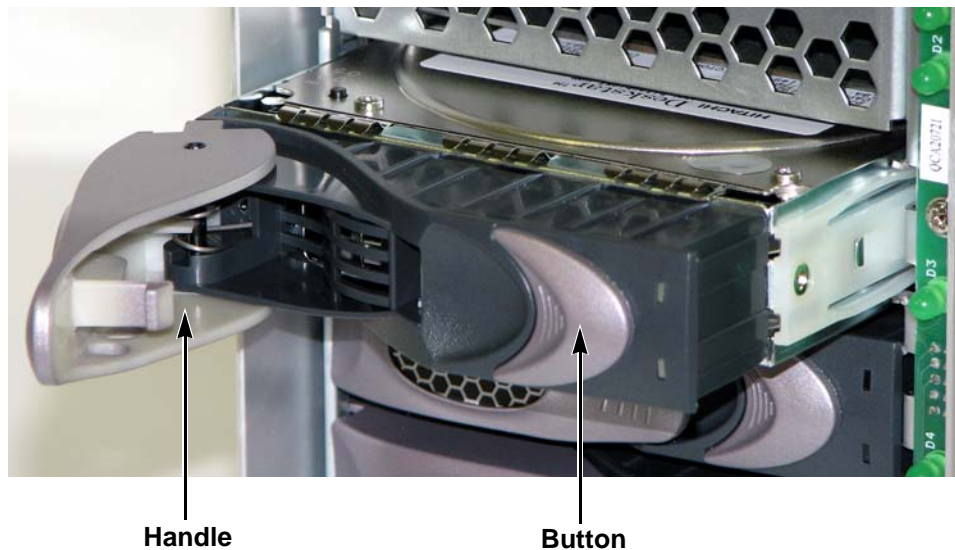


FIGURE 8-2. Handle and Button at the Disk Drive Modules.

5. Perform the install and rebuild process. See [page 8-5](#).

Install and Rebuild a Disk Drive Module

For Disk Drive Modules in RAID 0 Mode

A failed disk drive module in RAID 0 mode is indicated by a series of beeps. The beep indicate the number of the drive that failed. As the beeps occur, the LED nearest the defective disk drive module is illuminated.

1. Gently insert the new disk drive module into the bay.
2. Push down on the handle while pushing the disk drive module inwards, until a “click” is heard.
3. Reinstall the front panel of the MV 4105.
4. Apply power to the MV 4105 (the beeps should no longer be heard).
5. Apply power to the host computer.



CAUTION: The previous volume might appear on the monitor. Do not attempt to use this volume! The data on this volume is corrupt.

Format/partition/stripe the array using the procedures described in Chapter 6, *Configuration*. Restore data to the array if a backup is available.

For Disk Drive Modules in RAID 3 Mode

This procedure assumes that the MV MV 4105 is formatted in a RAID 3 mode, and is running at least 2.7 firmware version.

A failed disk in RAID 3 mode is indicated by three sets of beeps (each set of beeps will be the number of the disk drive module) when the MV 4105 is powered-up. The sets of beeps are followed by a continuous tone.

In addition, the LED located next to the failed disk drive module will flash, and the service LED for that channel will be illuminated.

1. Power-up the MV 4105 only. (The series of 3 sets of beeps are heard).
2. When a continuous tone is heard, quickly press the **MODE SET** button at the back of the MV 4105 once. The continuous tone is silenced.
3. Remove the replacement disk drive module from its protective anti-static bag. (Save the bag, for returning the defective disk drive module).
4. Gently insert the replacement disk drive module in the bay.
5. Push down the handle while gently inserting the disk drive module, until a "click" is heard.
6. Install the front panel onto the MV 4105.
7. Press and hold the **MODE SET** button until two beeps are heard. Release the button.
8. All of the drive LEDs for that channel will illuminate. This indicates that the rebuild (reconstruction) process has begun.

NOTE: Rebuild (reconstruction) times vary, depending on the system's work load. When the system is idle the rebuild time is approximately 16.5 Gbytes/minute (that is, it takes approximately 60 minutes to rebuild 1TByte).

NOTE: The service LED stays illuminated and the RAID 3 LED blinks. After the rebuild process is finished, the drive LEDs and service LED go off.

9. As a precaution, after the rebuild (reconstruction) process is finished, power-down the array.
10. Power-up the array.
11. Power-up the host computer.

Product Information

In this chapter...

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Specifications

TABLE A-1. Specifications for the MV 4105.

Specification	Value or Range
Physical dimensions	6.5-in. wide x 11-in. high x 12.5-in. deep (165 mm wide x 279 mm high x 317.5 mm deep)
Power	Auto switching 100-240 Vac, 50-60 Hz
Operating temperature	41 to 104 degrees Fahrenheit (5 to 40 degrees Celsius)
Weight (shipping)	20 lbs. (9 kg.)
Current draw, 117 VAC	Start-up 1.0A / 117W Seek 0.6A / 75W Idle 0.4A / 47W
Current draw, 220 VAC	Start-up 0.53A / 117W Seek 0.34A / 75W Idle 0.21A / 47W

Model Numbering

The MediaVault model number follows this pattern:

MV4FaRXbbbbcDef

MV = MediaVault family

4F = 4GBit Fibre Channel

a = "C" if the array does not have a hub or "H" if the array has a hub

R = Denotes that the unit has removable drives.

X = Denotes that the unit is convertible from Rack Mount to Desktop.

bbbb = The capacity of the array in GB. For 10TB models, 10TB is indicated.

c = The type of drives installed, P is for PATA, S is for SATA

D = Indicates the array is dual-channel.

e (when used) = a code which indicates the type of accessory kit included. If not used, indicates that the array is being referred to without the kit.

f = a code for the version of the unit.

Example: MV4FHRX2500PDA (indicates an MV 4105 with a hub, 2.5TB with PATA drives, version A).

Video Resolution Data

TABLE A-2. Video Resolution Data Rates

Video Resolution	Data Rate, Megabytes/Sec
DV/DV25	3.7
DV 50	7.4
SD, 8 bit	20
SD, 10 bit, 4:2:2	27
HD 1080i, 8 bit	120
HD 1080i, 10 bit, 4:2:2	155
HD 720p, 8 bit	110
HD 720p, 10 bit, 4:2:2	138

TABLE A-3. Video Resolution vs. Hours per Terabyte

Video Resolution	Hours per Terabyte (1000 gigabytes)
DV/DV25	75.1
DV 50	37.5
SD, 8 bit	13.9
SD, 10 bit, 4:2:2	10.3
HD 1080i, 8 bit	2.3
HD 1080i, 10 bit, 4:2:2	1.8
HD 720p, 8 bit	2.5
HD 720p, 10 bit, 4:2:2	2.7

RAID Compatibility

For Macintosh Operating Systems

TABLE A-4. Compatibility by Mode and Partition.

Media Vault Mode Selection	Apple Non-Striped Partition (standard) G4/G5 PowerMac	Apple Striped Partition (RAID 0) G4/G5 PowerMac	Mac Pro (Intel-based) Apple Non-Striped Partition (standard)	Mac Pro (Intel-based) Apple Striped Partition (RAID 0)
RAID 0 (mode 0)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 3/2K (mode 1)				
OS X Apple Disk Utility	OK	not-compatible	OK	not-compatible
RAID 3 (mode 2)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 0 (mode 3)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 3/2K (mode 4)				
OS X Apple Disk Utility	OK	not-compatible	OK	not-compatible
RAID 3 (mode 5)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 3 (mode 8)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 0 (mode 9)				
OS X Apple Disk Utility	OK	OK	OK	OK
RAID 3 (mode 10)				
OS X Apple Disk Utility	OK	OK	OK	OK

For Windows 2000/2003/XP Operating Systems

TABLE A-5. Compatibility by Mode and Partition.

Media Vault Mode Select	Non-Striped Partition (standard)	Striped Partition (RAID 0)
RAID 0 (mode 0)		
Windows 2000 /2003/ XP	OK	OK
RAID 3/2K (mode 1)		
Windows 2000 /2003/ XP	Basic Disk only, no Dynamic	Not compatible
RAID 3 (mode 2)		
Windows 2000 /2003/ XP	OK	OK
RAID 0 (mode 3)		
Windows 2000 /2003/ XP	OK	OK
RAID 3/2K (mode 4)		
Windows 2000 /2003/ XP	Basic Disk only, no Dynamic	Not compatible
RAID 3 (mode 5)		
Windows 2000 /2003/ XP	OK	OK
RAID 3 (mode 8)		
Windows 2000 /2003/ XP	OK	OK
RAID 0 (mode 9)		
Windows 2000 /2003/ XP	OK	OK
RAID 3 (mode 10)		
Windows 2000 /2003/ XP	OK	OK

Compliance Statements

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FCC Compliance Statement

The MediaVault family of products complies with FCC Rules Part 15. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

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 instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television 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 the equipment and receiver.
- Connect the equipment into 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.

Industry Canada Compliance Statement

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

Cet appareil numérique de la classe `B' est conforme à la norme NMB-003 de Canada.

For further compliance information, contact Ciprico Inc., using the information given on page iv of this manual.

CE Compliance Information

The MediaVault product family conforms to:

EN55022:1998/CISPR 22:1997, Class B - Limits and Methods of measurement of Radio Disturbance Characteristics of Information Technology Equipment.

L'INFORMATION DE CONFORMITE DE LA CE

La famille de produit de RAIDCore se conforme a:

EN 55022:1998/CISPR 22:1997, Classe B - Limites et methodes de mesure des caracteristiques d'interferences radiophoniques, Materiel des technologies de l'information.

CE-BEFOLGUNGINFORMATIONEN

EN 55022:1998/CISPR 22:1997, - Klasse B - Grenzwerte und Messverfahren für Funkstörungen von Einrichtungen der Informationstechnik.

European Union Compliance Statement

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

- European Standard EN55022 (1998) Class B
- European Standard EN50081-1 (1992)

Updates

In this chapter...

[Firmware Updates](#) C-2

Firmware Updates

From time to time firmware updates are made available to maintain compatibility with latest software releases, correct problems, or add new features.

If you are experiencing problems with the MediaVault you might want to go online and visit the Ciprico Inc. Web site, at <http://www.ciprico.com>, to check for any available firmware download for the MediaVault series products.

Limited Warranty and Return Parts Policy

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Repaired Parts and Return Shipment	D-7

Limited Warranty

Ciprico Inc. warrants that from a period of three (3) years from the date of shipment to customer, each product will be free from defects in materials and workmanship. The liability of Ciprico Inc. under this warranty is limited to replacing, repairing, or issuing credit (at the discretion of Ciprico Inc.) for any devices which are returned by the purchaser during such period, proved that (a) Ciprico Inc. is promptly notified in writing upon discovery of such defects by purchaser, and (b) the defective product is returned to Ciprico Inc. transportation charges prepaid by purchaser, and (c) examination of such unit by Ciprico Inc. discloses to its satisfaction that such defects have not been caused by normal wear, misuse, neglect, improper installation, repair, alteration or accident. Equipment, accessories, disk drives, and similar items not manufactured by Ciprico Inc. are subject only to adjustments as can be obtained from the original supplier by Ciprico Inc. In no event shall Ciprico Inc. be liable to purchaser for indirect or consequential damages of any kind.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES,
EXPRESSED OR IMPLIED, EXCEPT AS TO TITLE.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusions may not apply to you.

Disclaimers of Warranty and Limitations of Remedy

EXCEPT AS PROVIDED IN THIS WARRANTY POLICY, CIPRICO INC. (ON ITS OWN BEHALF AND ON BEHALF OF ANY OF ITS AGENTS) DISCLAIMS ALL WARRANTIES, WHETHER EXPRESSED OR IMPLIED, AND SPECIFICALLY DISCLAIMS THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CIPRICO INC. WILL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR FOR ANY OTHER LOSSES, EXPENSES OR DAMAGES RELATING TO PRODUCT DEFECTS OR FAILURES. YOUR SOLE REMEDY, AND CIPRICO INC.'S SOLE OBLIGATION, WITH RESPECT TO ANY PRODUCT DEFECTS OR FAILURES (REGARDLESS OF WHETHER YOUR CLAIM IS ASSERTED IN CONTRACT, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE (AT CIPRICO INC.'S OPTION) REPAIR, REPLACEMENT OR REFUND OF THE PRICE PAID.

Inspection and Acceptance

Customer shall inspect all shipments within forty-eight (48) hours after arrival and notify Ciprico Inc. in writing within two (2) days of any shortages or other failures to conform to the Agreement which are reasonably recoverable upon arrival, including, without limitation, any claim that product fail to conform to the applicable specification. Customer shall allow Ciprico Inc. a reasonable opportunity to inspect the product to enable Ciprico Inc. to verify the alleged nonconformity. Customer's failure to timely notify Ciprico Inc. in writing of any alleged nonconformity of product or sale or any processing of the product shall constitute an immediate and irrevocable acceptance of product and an acknowledgment by customer that product delivered was accepted.

Advanced Replacement Option

For a period of thirty (30) days, forty-five (45) days for International, from the date of shipment to the customer, Ciprico Inc. will provide the customer with an advanced replacement of the defective product or component. Under this option, the customer shall return the defective product or component to Ciprico Inc. upon receipt of the replacement item. The customer will be invoiced for any advanced replacement items not returned to Ciprico Inc. within thirty (30) days of the advanced replacement shipment. To obtain an advanced replacement and a Return Materials Authorization (RMA) number, contact Ciprico Inc. Inside Sales at 1-800-727-4669.

Customer Responsibilities for MV 4105 Usage and Damage

The customer is responsible for using the MV 4105 as it was designed, manufactured, and intended to be used. The customer is responsible for:

- Determining whether the MV 4105 is appropriate for the customer's applications and systems.
- Determining whether the MV 4105 will integrate with the customer's equipment and systems with malfunction or damage.

The customer is also responsible for backing up data before installing the MV 4105 on their equipment and systems, and for regularly backing-up data after the MV 4105 is installed and in operation.

Return Parts Policy

Any warranty or service returns must be accompanied by an approved Return Materials Authorization (RMA) number to ensure prompt handling and processing.

Spare parts manufactured by Ciprico Inc. and purchased from Ciprico Inc. after the original disk array order carry a three (3) year warranty. Host Bus Adapters and spare parts (including drives) not manufactured by Ciprico Inc. will carry whatever warranty is supported by manufacturer, and customer will be advised to seek remedy through the appropriate manufacturer. Ciprico Inc. will make effort to assist customer, however any assistance outside of nominal facilitation will be billed at current hourly rate.

If the MV 4105 is suspected of malfunctioning or not performing as expected, conduct Ciprico Inc. Technical Support at 1-877-484-3797, extension 7, or through the Ciprico Inc. Web site at <http://www.ciprico.com>.

Provide the service support personnel with the following information:

- MV 4105 model and serial number
- Return shipping address
- Daytime telephone number
- Description of the problem
- Copy of the original purchase invoice

The service support personnel will assist you in determining whether the MV 4105 requires repair. If the products needs repair, the Service Support department will issue an RMA (Return Materials Authorization) number.

IMPORTANT: Obtain an RMA number from Service Support before you return the MV 4105. Include the RMA number on the shipping label. The RMA number is crucial for tracking the returned MV 4105 and providing proper service.

What Items to Return

Return the following items to Service Support at Ciprico Inc.:

- The MV 4105 covered by the Ciprico Inc. warranty. Do not return cables, manuals, etc.
- A copy of the original invoice as a proof-of-purchase.

Mail the damaged MV 4105 and a copy of the invoice to:

Destination	Address
USA and Canada	Ciprico Inc. 7003 W. Lake Street, Suite 400, St. Louis Park, MN 55426 USA
Other countries	Return the MV 4105 to your dealer or retailer. Contact them for instructions, before shipping the product.

How to Return the Product

Follow these guidelines for returning the MV 4105 to Ciprico Inc.

- Use the original shipping carton and packaging.
- Package the MV 4105 as carefully as possible. (The product might be damaged, but still repairable).
- Use a form or sheet of paper to describe the product's problem(s).
- On the shipping label, include an "Attention:" line, with the approved RMA number.
- Include a copy of the original invoice in the carton.

The customer is responsible for the cost of insuring and shipping the MV 4105 to Ciprico Inc. Damage that is incurred due to improper packaging and/or transportation is not covered under the Ciprico Inc. Limited Warranty.

Repaired Parts and Return Shipment

When repairing the returned MV 4105 Ciprico Inc. might replace defective or damaged parts with new or reconditioned parts. Ciprico Inc. might replace the entire product with a new or reconditioned product.

In the event of a replacement, the replacement unit will be under warranty for the remainder of the original warranty term from date of purchase, or 30 days, whichever is longer.

The customer is responsible for prepayment of shipping costs, when returning the defective or damaged product.

Fabric Switch Zoning

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Fabric Switch Zoning

Background Information

If an array or multiple arrays and multiple computers are attached to a fibre channel switch, by default the switch acts as a hub, relaying information from all ports to all other ports.

A number of problems are created, however. If a computer has two ports, both ports being connected to the switch, and a single channel array is connected to the switch, the computer sees the array twice. In most cases, if this occurs, the computer is confused and does not format the array properly. With a dual-channel array, the computer sees it four times. To prevent this, something must be done with the switch.

Fabric Switch Zoning Techniques

As Fibre channel switches advanced, they became managed. They used switch management software to control the settings on-the-fly. Also, different ports could be grouped into layers. The ability of a switch to have this capability is called a "Fabric Switch." The process of doing the settings is called "Zoning," because several zones are created that do not affect each other. Zoning also fixes another problem: unused ports.

There are three techniques for zoning:

- Plain and Simple (has a tendency to be "trafficky")
- Host Grouped
- 1:1 Relational

Example 1

Here is a basic example, with a dual-channel computer and dual-channel array: Channels 1 and 2 of the computer are attached to ports 1 and 2 of the switch. The two channels of the array are attached to ports 3 and 4 of the switch. The switch is ten-port.

By default, without zoning, the computer sees two copies of the array on each of the two channels. Each channel of the array sees two copies of the computer. The switch also constantly tests the remaining six ports to see if anything is attached. To fix this problem, the switch needs to be zoned, per the following 1:1 Relational set-up:

Create two zones:

- Zone 1 contains ports 1 and 2
- Zone 2 contains ports 3 and 4

This setup limits channel 1 of the computer to communicating only with one channel of the array, while limiting channel 2 of the computer to communicating only with the second channel of the array. All other ports on the switch are locked out.

Example 2

With another array and another computer, it would be possible to set up two more zones similar to the above, on the same switch. But zoning is most appropriate when the switch has multiple arrays or multiple host. In Example 2, a dual-channel computer is attached to ports 1 and 2 of the switch, with two dual-channel arrays: one attached to 3 and 4, and the other is attached to 5 and 6. In this case, host grouped does not apply. Review the following, using the Plain and Simple technique, then the 1:1 Relational technique:

Plain and Simple

Create two zones:

- Zone 1 contains ports 1, 3, and 5
- Zone 2 contains ports 2, 4, and 6

1:1 Relational

Create four zones:

- Zone 1 contains ports 1 and 3
- Zone 2 contains ports 2 and 4
- Zone 3 contains ports 1 and 5
- Zone 4 contains ports 2 and 6

In the Plain and Simple configuration, the setting works, though occasionally one channel of the array might test the corresponding channel of the other array, causing a very slight amount of extra traffic on the line. In the 1:1 Relational configuration, this problem is alleviated, but the drawback is that it is harder to set up on the switch. Whenever possible, set up 1:1 Relational zones if the Storage Area Network (SAN) software supports it.

SAN Software Examples

Example 1

Here is a simple SAN software example, using two single-channel computers and a single-channel array. The computers are attached to ports 1 and 2 of the switch, and the array attached to port 3. Although this setup can function unzoned, zoning is required to keep the computers from "chatting" with each other, rather than the array. Two zones are required:

- Zone 1 contains ports 1 and 3
- Zone 2 contains ports 2 and 3

At first, everything seems OK, until one computer formats the array. The other computer thinks the array is unformatted and tries to erase the array whenever possible. If one computer writes files to the array, the directory will be in that computers' cache and the other computer might not see it. If the other computer writes to the array, the first computer might destroy those files, thinking that part of the array is blank.

To avoid this, SAN software is required. In it's simplest form, SAN software sends information to both computers that it is updating the array. This information is usually passed through Ethernet, rather than Fibre Channel.

SAN software can perform more complex functions, such as giving users different access to different parts of the arrays, or limiting bandwidth. SAN software typically requires a client program/license be installed on each client. However, if the number of clients becomes too great, it is recommended that a dedicated server also be used to manage the flow of the data.

Example 2

The simple SAN setup above is easy, but as far as zoning goes, functions become more complex when the array and/or hosts have multiple channels. Here is a more complex example, using two hosts, with dual-channel host adapters, attached to ports 1 through 4, and with a dual-channel array attached to ports 5 and 6. The Plain and Simple technique and 1:1 Relational technique are used (The Host-Grouped technique does not apply, because there is only one array)

Plain and Simple

Create two zones

- Zone 1 contains ports 1, 3, and 5
- Zone 2 contains ports 2, 4, and 6

1:1 Relational

Create four zones:

- Zone 1 contains ports 1 and 5
- Zone 2 contains ports 2 and 6
- Zone 3 contains ports 3 and 5
- Zone 4 contains ports 4 and 6

Example 3

The configurations can be made more complex, using any of the three techniques. Example 3 uses three dual-channel host computers, with two dual-channel arrays. The computers are attached to ports 1 through 6, with the arrays on 7 through 10.

Plain and Simple

Create two zones:

- Zone 1 contains ports 1, 3, 5, 7, and 9
- Zone 2 contains ports 2, 4, 6, 8, and 10

Host-Grouped

Create four zones:

- Zone 1 contains ports 1, 3, 5, and 7
- Zone 2 contains ports 1, 3, 5, and 9
- Zone 3 contains ports 2, 4, 6, and 8
- Zone 4 contains ports 2, 4, 6, and 10

1:1 Relational

Create 12 zones:

- Zone 1 contains ports 1 and 7
- Zone 2 contains ports 1 and 9
- Zone 3 contains ports 2 and 8
- Zone 4 contains ports 2 and 10
- Zone 5 contains ports 3 and 7
- Zone 6 contains ports 3 and 9
- Zone 7 contains ports 4 and 8
- Zone 8 contains ports 4 and 10
- Zone 9 contains ports 5 and 7
- Zone 10 contains ports 5 and 9
- Zone 11 contains ports 6 and 8
- Zone 12 contains ports 6 and 10.

NOTE: Three licenses for SAN software are needed, one for each host.

Combinations of Hosts, Channels and Arrays

Review Table E-1 for combinations of common hosts, channels, and arrays. Contact Ciprico Inc technical support for other combinations (The table is based on this assumption: that the hosts are connected to the left-most ports, with the arrays connected to their immediate right).

TABLE E-1. Combinations of Fabric Switch Zoning Hosts, Arrays, and Channels

No. of Hosts	Host Description	No. of Arrays	Array Description	Recommended Zoning
1	1 channel	1	1 channel	1 zone - (1, 2)
1	2 channel	1	1 channel	1 zone - (1, 2) [2nd port of host is not used]
1	4 channel	1	1 channel	1 zone - (1, 2) [only one port from host is used]
1	1 channel/host	1	2 channel	2 zones - (1, 3), (2, 3)
1	2 channel/host	1	2 channel	2 zones - (1, 3), (2, 4)
1	4 channel/host	1	2 channel	2 zones - (1, 3), (2, 4) [two ports from host is not used]
2	1 channel/host	1	1 channel	2 zones - (1, 3), (2, 3)
2	1x1/1x2 channel	1	1 channel	2 zones - (1, 3), (2, 3) [2nd channel on 2-channel host is not used]
2	2 channels/host	1	1 channel	2 zones - (1, 3), (2, 3) [2nd channel on each host is not used]
2	1 channel/host	1	2 channel	4 zones - (1, 3), (1, 4), (2, 3), (2, 4)
2	1x1/1x2 channel	1	2 channel	4 zones - (1, 4), (1, 5), (2, 4), (3, 5)
2	2 channels/host	1	2 channel	4 zones - (1, 5), (2, 6), (3, 5), (4, 6)
2	4 channels/host	1	2 channel	4 zones - (1, 5), (2, 6), (3, 5), (4, 6) [2 channels on each host is not used]
1	1 channel	2	1 channel	2 zones - (1, 2), (1, 3)
1	2 channel	2	1 channel	2 zones - (1, 3), (2, 4)
1	4 channel	2	1 channel	2 zones - (1, 2), (1, 3) [only one port from host is used]
1	1 channel/host	2	2 channel	4 zones - (1, 3), (1, 4), (1, 5), (1, 6)
1	2 channel/host	2	2 channel	4 zones - (1, 3), (1, 5), (2, 4), (2, 6)
1	4 channel/host	2	2 channel	4 zones - (1, 5), (2, 6), (3, 7), (4, 8)

TABLE E-1. Combinations of Fabric Switch Zoning Hosts, Arrays, and Channels

2	1 channel/host	2	1 channel	4 zones - (1, 3), (1, 4), (2, 3), (2, 4)
2	1x1/1x2 channel	2	1 channel	4 zones - (1, 4), (1, 5), (2, 4), (3, 5)
2	2 channel/host	2	1 channel	4 zones - (1, 5), (2, 6), (3, 5), (4, 6)
2	1 channel/host	2	2 channel	4 zones - (1, 5), (1, 6), (2, 5), (2, 6)
2	1x1/1x2 channel	2	2 channel	8 zones - (1, 5), (1, 6), (1, 7), (1, 8), (2, 5), (2, 7), (3, 6), (3, 8)
2	2 channel/host	2	2 channel	8 zones - (1, 5), (1, 7), (2, 6), (2, 8), (3, 5), (3, 7), (4, 6), (4, 8)

Glossary

TABLE G-1. Acronyms or Terminology.

Acronym or Word	Acronym Description	Definition
ATA	Advanced Technology Attachment	A standard interface for connecting a computer's storage devices, such as CD-ROMs and hard-drives.
BIOS	Basic Input/Output System	Built-in software routines, stored in ROM, that contain the code for controlling the keyboard, monitor, disk drives, serial communications, etc.
channel		A link that transports data point-to-point.
concatenation		The process of connecting entities end-to-end on a single communications channel.
CPU	Central Processing Unit	The computational segment of a computer.
DMA	Direct Memory Access	A method of transferring data from a storage device to RAM without using CPU resources.
HBA	Host Bus Adaptor	An adaptor card that includes the I/O logic, software and processing to manage the transfer of that information between the host system and devices connected to it.
HDT	HD Turbo	A mode that uses the highest data rate portions of the disk drives for maximum throughput until the disk is full, but with a tradeoff in total data capacity of the disk from 40% to 80%, depending on the RAID level.
IDE	Integrated Drive Electronics	Most commonly used data bus for PC's.
LED	Light Emitting Diode	An electronic device that illuminates when powered.
Linux		Free, open-source UNIX-based operating system.

TABLE G-1. Acronyms or Terminology.

Acronym or Word	Acronym Description	Definition
logical drive		One or more disk drives grouped together and which appear as a single device to an operating system.
mirroring		The duplication of data for backup, or a method of distributing network data traffic among several computers with identical (redundant) data.
NTFS	New Technology File System	The file system used by the Microsoft Windows NT/2000/XP operating systems.
parity		A type of data protection that recreates the data of failed disk drive.
port		A connection point to the RAID controller, disk drive, enclosure, or another device.
RAID	Redundant Array of Independent Drives	A method for storing the same data in different places on multiple hard disks (except for RAID 0, which does not have redundancy).
RTR	Real Time RAID	Allows RAID data to be identified, and for disk failures to be corrected, on the fly and without interrupting real-time data flow.
SMART	Self-Monitoring Analysis and Reporting Technology	A set of advanced diagnostics that monitor the internal operations of disk drives and provide early warning of any potential problems
striping		The process of partitioning each drive's storage space into units ranging from a sector (512K) up to several megabytes. Striping interleaves bytes or groups of bytes across multiple drives, so more than one disk is reading and writing simultaneously.

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