Dolphin StorExpress
DSE4XM1
DSE4XM2

User Guide for Windows

Revision Information: **Revision 0.3**

March 2009

Contents

Introduction

Congratulations on your purchase of a Dolphin StorExpress product. This guide provides user instructions for the following StorExpress models:

- DSE4XM1
- DSE4XM2

These products are part of the DSE4XM family of StorExpress products.

Dolphin's StorExpress is a PCI Express based solid state storage system designed to deliver superior response times and storage capacity. Providing large capacity and fast direct storage, StorExpress connects directly to any PCI Express system. It is the ideal solution for deploying fast solid state cache solutions to improve the performance of database or web-based applications. StorExpress systems integrate with Dolphin's PCI Express cluster technology enabling businesses to easily build fast distributed storage solutions. Capable of being connected to multiple servers, StorExpress provides a flexible and scalable storage solution which can be distributed within the enterprise to improve access to latency sensitive data. In a multi-server configuration, StorExpress is also capable of functioning as a clustering switch and can obviate the need for a dedicated clustering fabric for inter-server communication

Offering both superior power utilization and outstanding performance, this fl ash based solution signifi cantly lowers annual power usage while delivering outstanding performance. StorExpress leverages the latest solid state SLC NAND technology to provide extremely faststorage solutions that outperform traditional disk based systems.

1.1 System Requirements

The DSE4XM requires an open x4 or x8 PCI Express slot for each DXH510 Host Adapter card.

Please refer to Chapter 3 for supported operating systems.

1.2 DSE4XM Components

Your DSE4XM product includes the following items:

- DSE4XM chassis

- DXH510 PCI Express host adapter card
- DXH510 half-height bracket
- 2 - 1m CX4 cables
- StorExpress USB Key, containing
  - DSE4XM User's Guide for Windows
  - DSE4XM User's Guide for Linux
  - ioManager User's Guide
- Quick Start Instructions
- Configuration Sheet

1.3 Features and Performance

The DSE4XM product has the following features:

- 480 Gbyte or 960 Gbyte NAND Flash SLC using Fusion-IO ioDrive® technology
- Performance for x4, x8 and dual x8 server connection(s), respectively:
  - 800 MB/s, 1500 MB/s, and 2700 MB/s (read)
  - 600 MB/s, 1250 MB/s, and 2500 MB/s (write)
  - 80,000, 150,000, and 270,000 I/O operations per second (IOPS)[1]
- < 50 microseconds read access latency[2]
- Server connection options
  - x4 PCI Express for up to four servers
  - x4 or x8 PCI Express for up to two servers
  - x4, x8, or dual x8 PCI Express for one server
  - Requires PCI Express slot in server (two slots for dual x8 connection)
  - Additional DXH510 host adapter required for each server connection or dual x8 connection
- Supports external 4-channel parallel fiber-optic transceivers
  - Extended distance up to 100 meters

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1. Based on 4KB packet sizes

2. Based on 4KB packet sizes

1.4 Specifications

1.4.1 Mechanical

The following specifications are for the DSE4XM chassis:

- Standard 4U rackmount chassis
- Dimensions
    - Height: 6.96" (4U /176.8mm)
    - Depth: 18.9 (480mm)
    - Width: 19" (483mm)
- Weight approximately 32lbs (14.5kg)

1.4.2 Environmental

- Operating Temperature: 0^0C to 50^0C ambient
- Storage Temperature: -20^0C to 70^0C
- Relative Humidity: 15-85% non-condensing

1.4.3 Electrical

- Operating Voltage:100-240 VAC at 50-60Hz
- Power Supply: 300 watt dual PSU

1.4.4 Agency Approvals

- FCC Part 15, Class A
- EMC Directive CE Mark, EN55022, EN55024, 61000-3-2, 61000-3-3, EN6950-1
- VCCI, Class A

1.5 Customer Support

If you continue to have issues with your system or need service, please contact Dolphin customer support at http://www.dolphinics.com/support

Hardware Installation

This chapter describes how to install your DSE4XM hardware.

Your DSE4XM includes a DXH510 PCI Express host adapter card and two 1-meter CX4 cables. These components support a x8 connection between the DSE4XM chassis and one server, which is the standard shipping configuration for the DSE4XM.

The DSE4XM supports additional configurations accommodating connections to up to four servers, with a fixed amount of storage allocated to each server. Each additional server requires a DXH510 adapter card and cable to connect to the DSE4XM chassis. Allocation of memory to each server is specified at the time the product is ordered and pre-configured at the factory. Dual x8 connection to a single server also requires an additional DXH510 and factory pre-configuration. Please contact Dolphin customer support at http://www.dolphinics.com/support to request a multi-server or dual x8 DSE4XM configuration.

2.1 DSE4XM Chassis Overview

Figure 2–1 shows the rear of the DSE4XM chassis. Table 2–1 lists the features noted by the labels in Figure 2–1. This figure will be referenced by the hardware installation instructions.

Figure 2–1 DSE4XM Chassis Rear
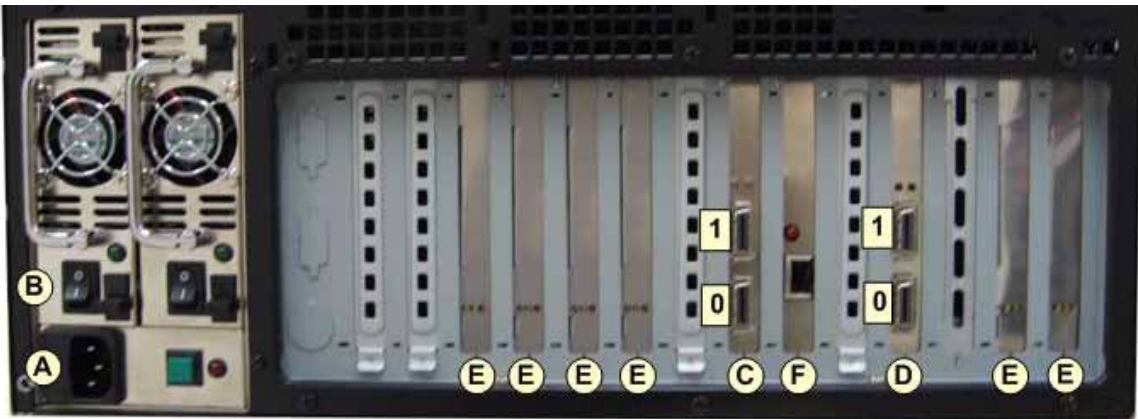
Table 2–1 DSE4XM Chassis Rear Features

Label	Name
A	AC Power Inlet
B	AC Power Switch
C	Uplink Slot 0
D	Uplink Slot 1
E	ioDrive SSD Slot
F	For Manufacturing Use Only
C/D - 0	Connector P0
C/D - 1	Connector P1

Figure 2–2 shows the front of the DSE4XM chassis with the front cover open.

Figure 2–2 DSE4XM Chassis Front

Caution: *For protection of the StorExpress devices, we recommend that you do not attempt to service or remove the cover of your DSE4XM chassis. However, if you do, power should be disconnected from the chassis prior to servicing the chassis or removing the cover for any reason. In order to disconnect power remove the power cord from its receptacle in the back of the chassis as shown in Figure 2–1. The front power switch is not a disconnect switch for system power.*

2.2 Installing DXH510 Card in Server

The DXH510 host adapter card is shown in Figure 2–3. The connector ports P0 and P1 are labeled in this figure.

Figure 2–3 DXH510 Adapter Card
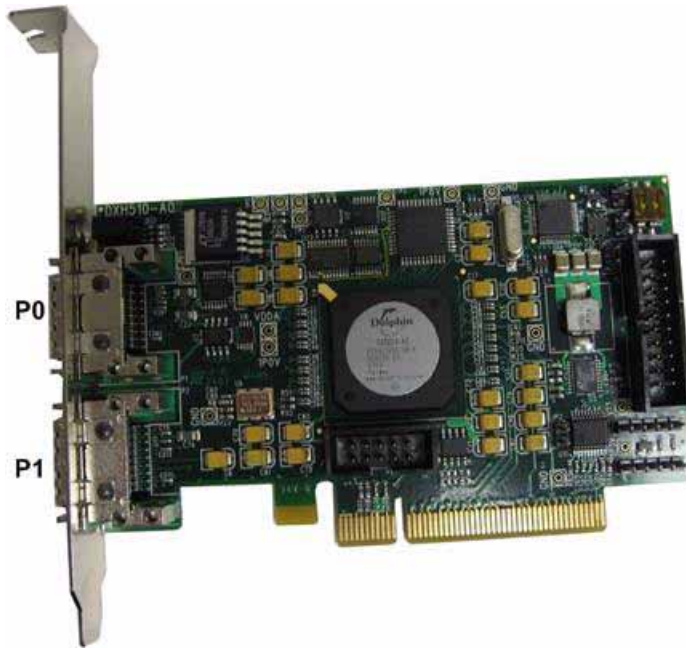
Caution: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded prior to any hardware installation procedure using an ESD protection device such as a wrist strap.

If you are installing the DXH510 in a low-profile system and need to use the half-height bracket, please refer to the Section 2.2.1.

1. Locate the serial number on the back of your DXH510 and record it for future reference.

2. Power off the server and disconnect the power cable.

3. Remove the server's access panel. Locate an available PCIe slot.

    – Consult your server's documentation for details on removing the panel and identifying PCIe slots.

Note: Your DXH510 is designed for use in a x8 PCIe slot. It will work in a x16 slot, but this does not improve performance. Your DXH510 can also work in a x2 or x4 slot but performance may be diminished in a x2 slot, or in a x4 slot if a x8 connection is intended.

4. Follow server manufacturer's instructions for installing PCIe add-in cards.

5. Replace the server's access panel

6. Plug in the server's power cable

You have completed the hardware installation of the DXH510 into the server. If you are connecting multiple servers to the DSE4XM chassis, repeat this process for each server. Each server requires a DXH510 host adapter to connect to the DSE4XM chassis. If you are making a dual x8 connection to a single server, locate a second PCI Express slot and install the second DXH510 adapter.

2.2.1 Half-height Bracket Installation

For installation in a low-profile server, the full-height bracket must be replaced with the half-height bracket.

Caution: *Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded prior to any hardware installation procedure using an ESD protection device such as a wrist strap.*

1. Locate the half-height bracket in the DSE4XM package

2. Remove the four screws, indicated in Figure 2–4, that hold the full-height bracket to the DXH510. Do not attempt to remove the bracket until the screws have been fully removed.

3. Remove the bracket carefully from the device.

4. Align the connectors on the DXH510 with the openings in the half-height bracket: Be sure the bracket tabs are on the backside of the device.

5. Adjust the bracket so that the notches on the bracket tabs fit around the guides on the back of the card. The bracket guides are illustrated in Figure 2–4.

6. Attach the half-height bracket using a screwdriver to tighten the four screws. Do not overtighten the screws as this can damage the device.

7. Return to Step 2 of Section 2.2.

Figure 2–4 DXH510 Adapter Card Rear View
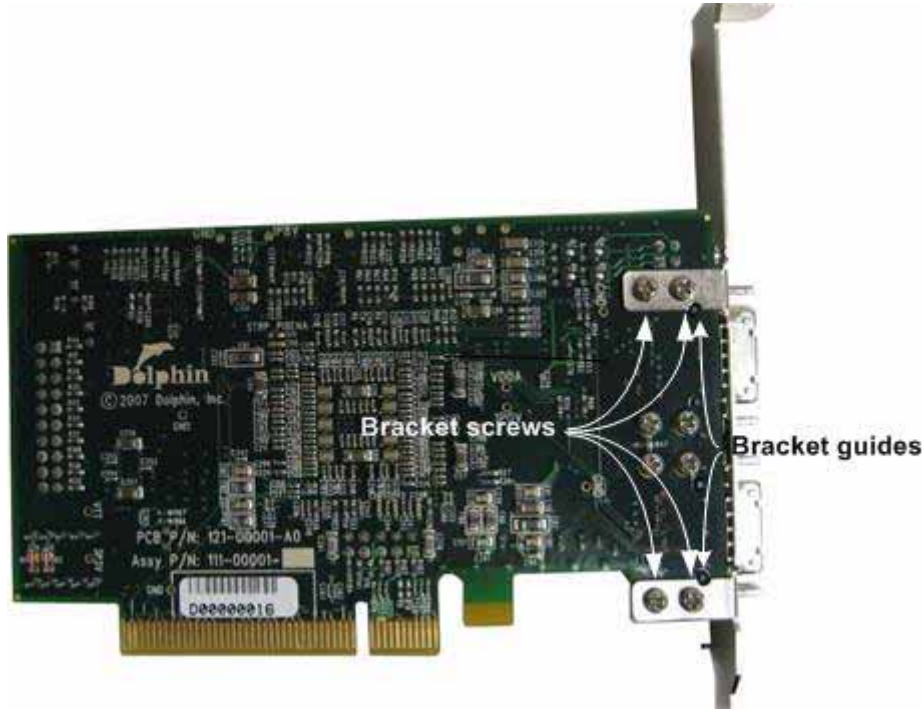
2.3 Connecting the DXH510 to Chassis

A server connects to the DSE4XM chassis using the DXH510 PCI Express host adapter card. One or two cables are used to connect the DXH510 to the DSE4XM chassis. One cable provides a x4 (8 Gbps) connection; two cables provide a x8 (16 Gbps) connection.

Two 1-meter cables (Model DXC1M-A) are provided as a part of the standard DSE4XM package. Additional compatible cables are available from Dolphin for connecting the DXH510 to the DSE4XM chassis, as listed in Table 2–2. See http://www.dolphinics.com/support for the most up to date compatible cable offerings.

Table 2–2 Dolphin DSE4XM Compatible Cables

Part Number	Description
DXC1M-A	1 Meter copper cable
DXC3M-A	3 Meter copper cable
FCDX10M-A	10 Meter fiber optic cable
FCDX50M-A	50 Meter fiber optic cable
FCDX100M-A	100 Meter fiber optic cable

The DSE4XM chassis has two pairs of connectors (four total), which are used to cable to the DXH510 host adapter. As shown in Figure 2–1 on Page 9, one set of connectors is located at Uplink Slot 0; the second set of connectors is located at Uplink Slot 1. The lower connector is P0 and the upper connector is P1.

One set of connectors can be used for a x8 connection when cabled to a single DXH510, or for two x4 connections when each connector in the set is cabled to a different DXH510 adapter card. Two sets of two connectors allow for connection to up to four DXH510 adapter cards in this manner.

Each DXH510 card has one pair of connectors, as shown in Figure 2–1 on Page 9. Both connectors are used for a x8 connection, or a single connector may be used for a x4 connection.

Table 2–3 shows how the DXH510 card(s) are cabled to the DSE4XM for configurations of one to four servers.

Table 2–3 DXH510 to DSE4XM Chassis Cable Connections

			One Server	Two Servers	Three Servers	Four Servers
DXH510: 1	P0	*cables to*	Uplink Slot 0: P0	Uplink Slot 0: P0	Uplink Slot 0: P0	Uplink Slot 0: P0
	P1	*cables to*	Uplink Slot 0: P1[‡]	Uplink Slot 0: P1[‡]	Uplink Slot 0: P1[‡]	–
DXH510: 2	P0	*cables to*	–	Uplink Slot 1: P0	Uplink Slot 1: P0	Uplink Slot 0: P1
	P1	*cables to*	–	Uplink Slot 1: P1[‡]	–	–
DXH510: 3	P0	*cables to*	–	–	Uplink Slot 1: P1	Uplink Slot 1: P0
	P1	*cables to*	–	–	–	–
DXH510: 4	P0	*cables to*	–	–	–	Uplink Slot 1: P1
	P1	*cables to*	–	–	–	–

[‡] Only required if a x8 connection is desired. May be left unconnected if a x4 connection only is needed.

The single server dual x8 configuration is similar to the two server configuration, however in this case both DXH510:1 and DXH510:2 adapters reside in the same server.

Attach the cable(s) to the required connectors for your configuration as specified by Table 2–3.

Figure 2–5 DSE4XM with One x8 Connection

Figure 2–6 DSE4XM with Four x4 Connections

Figure 2–7 DSE4XM with Two x8 Connections

Note: Cables should be strain relieved or strapped to a cabinet/rack to ensure additional reliability.

Note: Cables should be connected according to the configuration of your DSE4XM product. The configuration is documented on the configuration sheet included with your product. The standard StorExpress configuration is single server. Multiple server configurations require additional DXH510 adapter cards and cables, which may be purchased through http://www.dolphinics.com.

2.4 Powering up the DSE4XM

1. Connect main power (100-240VAC) to the DSE4XM chassis using the provided AC power cord or a regionally appropriate AC power cord to the DSE4XM chassis power connector, which is located on the back of the chassis, as shown in Figure 2–1. The AC power cord provided by Dolphin is a Northern American 3- prong plug. A different power cord, with the appropriate power prongs, is required for other geographies that don't support the North American standard. The chassis accepts any IEC 320 EN60320 C13 connector and the power supply provided with the DXE410 accepts any voltage from 100V to 240V at a frequency of 50-60Hz.

   Auxiliary power is supplied to the DSE4XM when AC power is connected.

2. An AC power switch for each power supply unit is located on the back of the chassis near the power connector, as shown in Figure 2–1. These switches must be placed in the on position to provide full AC power to the chassis.

3. A DC power switch is provided in the front of the chassis, as shown in Figure 2–2. This switch can be used to manually fully power up the chassis.

   The DSE4XM chassis provides automatic remote power-on capabilities. Toggling the front power button is not necessary to fully power to the chassis. As long as AC power is switch on, the DSE4XM will fully power up when the server (or first server) is powered on.

   – When fully powered, the DSE4XM will go through a self test. You will observe that for 0.5 seconds the P0 and P1 LEDs on the Uplink slots will turn green. Then for 0.5 seconds, the P0 and P1 LEDs turn yellow. If the servers connected to the DSE4XM are powered down, or if the connectors are not cabled, then the LEDs will turn off.

4. Power-on the server that contains the DXH510. If not already powered, after server power is turned on, the DSE4XM will come on automatically. This is indicated by the following:

   – Chassis fans will turn on

   – The Uplink Slot P0 and P1 LEDs will transition from yellow to off and then green for connected ports, as described in the previous step.

5. Check the P0 and P1 LEDs for both the DXH510 and the DSE4XM Uplink slot(s)

   – For a x8 or a single x4 connection, the P0 LED should be illuminated

   – For two x4 connections, both the P0 and P1 LEDs should be illuminated

6. Follow the procedure outlined in Chapter 3 for driver software installation. If you are prompted by the operating system for a driver, click Cancel.

7. Repeat the power-on procedure for any additional servers you may have connected to the DSE4XM.

Note: If you are running a Windows operating system, Dolphin provides drivers to support the DXH510. These drivers are available on the Dolphin website at www.dolphinics.com/ support

2.5 Troubleshooting

Table 2–4 Troubleshooting Tips

Symptom	Tip
No Power to board	1) Check AC power cord for power.
	2) Ensure rear power switch is turned on
Both Uplink slot LEDs are off when connected to server (both server and the DSE4XM must be powered)	1) Check cable connections
LED(s) are blinking when connected to server	Contact customer support
Memory cards do not appear in device manager or device list	Contact customer support
Host does not boot properly	Contact customer support
System hangs on boot	Contact customer support
Red Alarm LED is illuminated	TBD
Red Alarm LED is flashing	TBD

Software User Guide

3.1 Software Installation

This section describes how to install software for your DSE4XM product. The DSE4XM storage device is the Fusion-IO ioDrive. The software will reference ioDrive.

3.1.1 New ioDrive Installation

To install the ioDrive software on a new system:

1. Make sure you have completed the DSE4XM hardware installation steps in Chapter 2.

2. If you want to use SNMP with your ioDrive, review Section 3.6 for details on that part of the installation.

3. Login in as Administrator or have Administrator rights.

4. Download the ioDrive Windows Setup Program from http://www.dolphinics.com/support to your desktop or a convenient directory.

5. Run the Setup program.

6. Follow the onscreen prompts to complete the install. (If Setup requests you to verify the driver install, click **Yes** to continue.)

   The Setup program will:

   – Create a Program Files/Fusion-io folder for the ioDrive software components.

   – Create shortcuts to the utilities and documentation in this folder.

   – Install and load the ioDrive Windows driver.

   – Install the ioManager administrator console.

   – Create an ioManager desktop icon.

   It will also create shortcuts in the All Programs/Fusion-io folder for:

   – User documentation

   – ioManager and ioManager Remote

   – SNMP License Readme file

When Setup creates the Fusion-io folder on the drive, it also creates these sub-folders:

- – Docs—for the ioDrive User documentation
- – Driver—for the latest ioDrive Windows driver
- – Firmware—for the latest ioDrive firmware
- – ioManager—for the administrator console software and manual
- – SNMP—for components of SNMP
- – Utils—for the ioDrive command line utilities

7. Proceed to the appropriate section to continue:

- – Section 3.1.3 Outdated Firmware Check on Windows XP Pro or Windows 2003 Server
- – Section 3.1.4 Outdated Firmware Check on Windows Vista or Windows Server 2008

3.1.2 Existing ioDrive Installation

To install the latest ioDrive Windows software on an existing installation:

1. Review the Release Notes and the Errata file available for this version of the software for additional steps that may be needed to complete the install.

2. If you want to use SNMP with your ioDrive, review Section 3.6 for details on that part of the installation.

3. Login as Administrator (or have administrator rights).

4. Uninstall the existing Fusion-io driver using Device Manager.

5. Download the ioDrive Windows Setup Program from http://www.dolphinics.com/support to your desktop or a convenient directory.

6. Run the Setup program.

7. Follow the onscreen prompts to complete the install. (If Setup requests you to verify the driver install, click **Yes** to continue.)

8. Click **Restart** once the Setup program finishes.

9. Once the system reboots, proceed to the appropriate section to continue:

- – Section 3.1.3 Outdated Firmware Check on Windows XP Pro or Windows 2003 Server
- – Section 3.1.4 Outdated Firmware Check on Windows Vista or Windows Server 2008

3.1.3 Outdated Firmware Check on Windows XP Pro or Windows 2003 Server

After installing the ioDrive software, check the Windows *System Event Log* for fiodrive entries. These entries will show details of the ioDrive driver status.

To view the Windows System Event Log:

1. Choose Start > Control Panel

2. Click on **Administrative Tools**.

3. Click on **Event Viewer**.

4. Click on **System** in the console tree. The *System Event Log* appears in the dialog.

5. Click on the **Source** column to resort the list by source.

6. Scroll through the list to identify any fiodrive Error entries:.

7. Double-click on the error entry in the list to view its details.
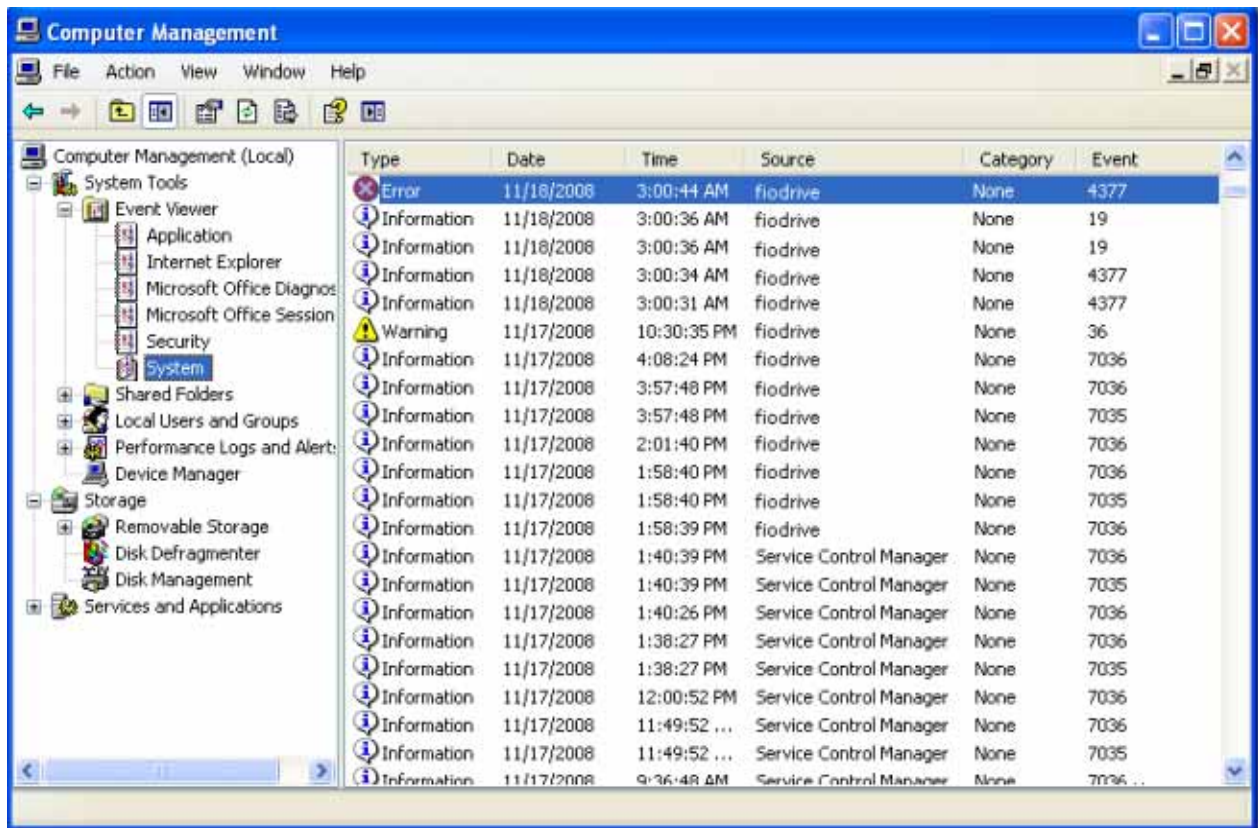
Check to see if the fiodrive Error entry says "ioDrive (*x*) firmware is too old". (The *x* is the PCI bus number of the ioDrive you just installed.)

If there is a fiodrive error entry warning of old firmware, follow the instructions in the Section 3.2.4.3 later in this guide to update the firmware.

If the System Event Log shows no fiodrive error entries (as in the example above), then your ioDrive is ready to receive a Windows file system.

If you choose to enable SNMP support, continue to Section 3.6.

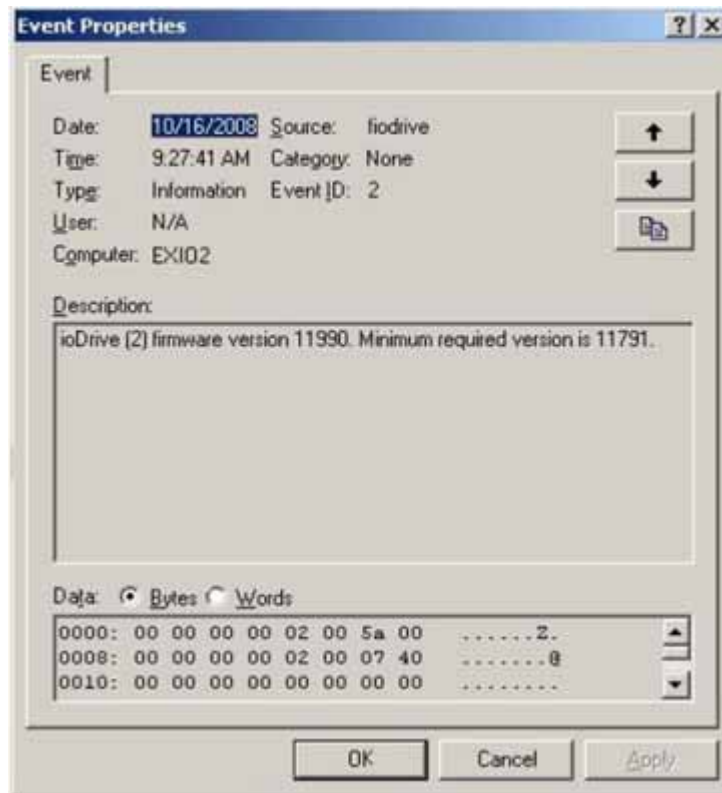### 3.1.4 Outdated Firmware Check on Windows Vista or Windows Server 2008

After installing the ioDrive software, check the Windows *System Event Log* for fiodrive entries. These entries will show details of the ioDrive driver status.

To view the Windows System Event Log:

1. Click **Start**.
2. Type **event viewer** in the Search box.
3. Press **Enter** to launch the Event Viewer.
4. Click **Windows Logs** in the console tree.

5. Select **System** in the console tree. The *System Event Log* appears in the dialog.
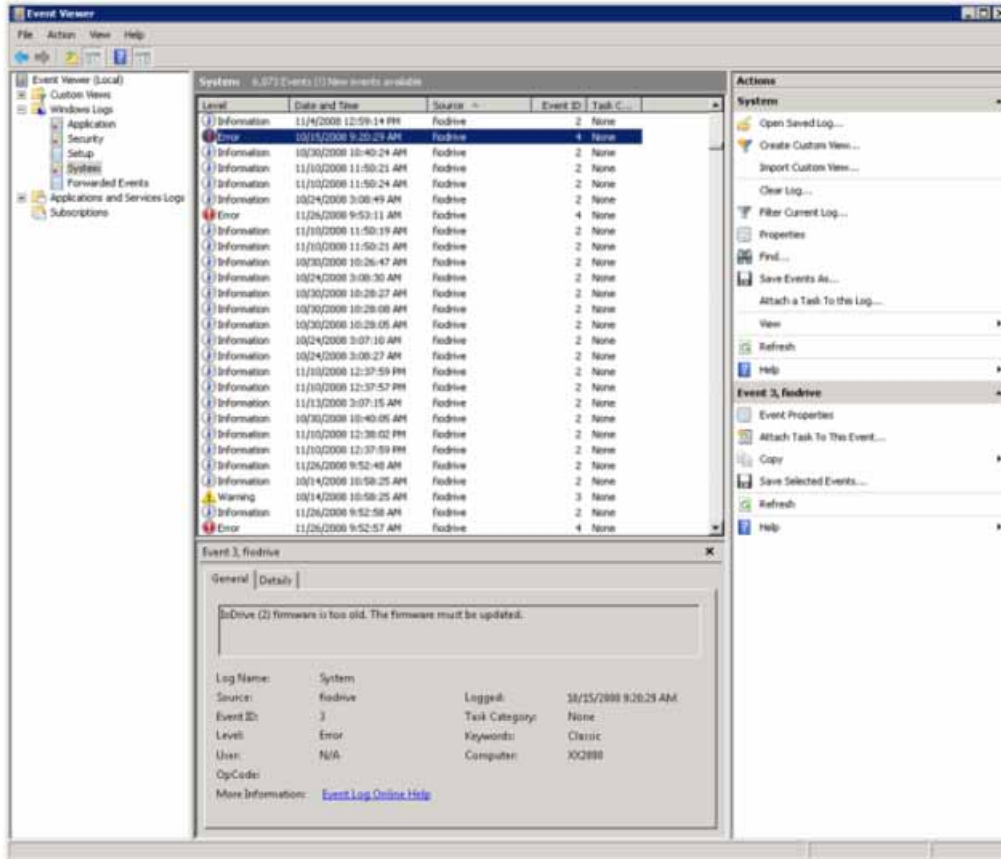
6. Click the **Source** column to re-sort the list by source.

7. Scroll through the list to identify any *fiodrive* error entries.

8. Highlight an entry in the list to view its details.

Check to see if there is a fiodrive Error entry that reads "ioDrive (*x*) firmware is too old". (The *x* is the number of the ioDrive you just installed.)

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If there is a fiodrive error entry warning of old firmware, as in the example above, follow the instructions in the Section 3.2.4.3 later in this guide to update the firmware.

If the System Event Log shows no fiodrive error entries, then your ioDrive is ready to receive a Windows file system.

If you choose to enable SNMP support, refer to Section 3.6.

3.1.5 ioDrive Naming
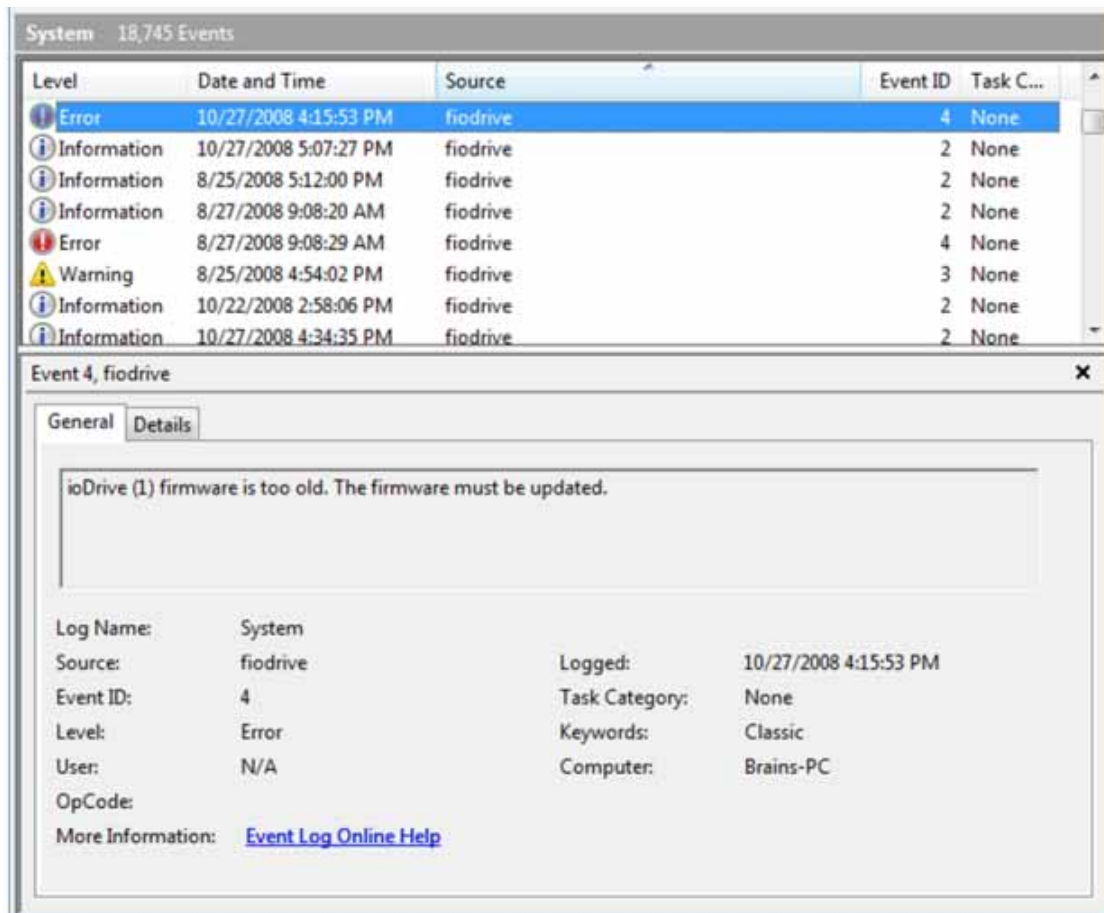
The ioDrive receives a name and number as part of the install process for identification. The syntax is fct*x* where *x* is the number of the PCIe bus where you installed the ioDrive. Use ioManager to view this bus number or you can:

1. Choose Start > Control Panel > System > Hardware > Device Manager.

2. Select **Fusion-io Devices**. (Select **System Devices** for pre-1.2.3 drivers.)

3. Click on your ioDrive in the list. The *Properties* dialog appears.

The Location field shows the PCIe bus number for your device (fct13 in this case):

Note: The system manufacturer assigns bus numbers, which can range from 0 on up. These numbers may or may not reflect the physical location of the bus. For example, the second slot from the edge of the motherboard may be Bus 2, but it could also be Bus 16 or another arbitrary number. Checking Device Manager is one way to confirm the specific bus number for your installation. You can also use ioManager to view this number.)

3.1.6 Adding a File System to the ioDrive

With the ioDrive and driver installed, you can now use the *Windows Disk Management* utility to make your device available to applications. Typically, Windows will detect the new device, initialize it and display it in Disk Management. You can then add partitions, format a volume, or create a RAID configuration on your ioDrive using the standard Windows procedures (see the *Windows Disk Management Utility* documentation for more details)

If Windows does not, you may need to initialize it manually. To initialize an ioDrive:

1. Select Start > Control Panel.

2. Click **Administrative Tools**.

3. Click **Computer Management**.

4. Click **Disk Management** in the *Storage* section of the console tree.

5. Locate and right-click the ioDrive in the list of storage devices on the right. (If the ioDrive does not appear in the list, choose **Rescan Disks f**rom the **Action** menu. You may also need to restart your computer to display the ioDrive in the list.)

6. Click **Initialize Disk**.

You can now use the Disk Management Utility to add a file system to your ioDrive.

3.1.7 Creating a RAID Configuration

You can use your ioDrive as part of a RAID configuration. To do so, you must format your ioDrive as a dynamic volume. In turn, you can then use this dynamic volume to create multi-disk RAID configurations (spanned, striped, mirrored, or RAID 5).

Note: Windows XP Professional does not support software RAID or mirroring. It does support spanning and striping.

For specific steps to perform a RAID configuration, see the *Windows Disk Management Utility* documentation for details.

Note: If you are using RAID1/Mirroring, and one device fails, be sure to run a fio-format on the replacement device (not the remaining good device) before rebuilding the RAID.

3.2 ioDrive Maintenance

The ioDrive includes both software utilities for maintaining the device as well as external LED indicators to display its status.

3.2.1 ioDrive LED Indicators

Each ioDrive slot includes three LEDs showing drive activity or error conditions. The LEDs for one slot is shown in Figure 3–1. The behavior of the LEDs are described in Table 3–1.

Figure 3–1 ioDrive Slot LEDs

Table 3–1 ioDrive Slot LED Indicators

Green	Yellow	Amber/ Red*	Indicates	Notes
OFF	OFF	OFF	Power off	
ON	OFF	ON	Power on (driver not loaded)	Load driver
ON	OFF	OFF	Power on (driver loaded)	
ON	FLASH	OFF	Writing (rate indicates volume of writes)	Can appear in combination with the Read LED
FLASH	OFF	OFF	Reading (rate indicates volume of reads)	Can appear in combination with the Write LED
ON	ON	ON	Location beacon	Also appears during a firmware update

* Later versions of the ioDrive use an amber-colored LED instead of a red LED.

3.2.2 The ioManager Console

Your ioDrive software includes the ioManager console application. This GUI performs the most common operations you need to do with the ioDrive. In addition, it provides a detailed information screen on each of your installed devices.

The ioManager can perform:

- Firmware upgrades
- Low-level formatting
- Attach and detach actions

The ioManager installs as part of your Windows Setup process. Details on how to use ioManager appear in the *ioManager User Guide* available in the All Programs/Fusion-io/ioManager menu.

3.2.3 ioDrive Command Line Utilities

The Windows Setup package also includes five command line utilities for managing your ioDrive. They include:

- fio-attach
- fio-detach
- fio-format
- fio-status
- fio-update-iodrive

Each of these utilities is described in detail in Section 3.5.

3.2.4 Common Maintenance Tasks

The most common tasks involve drivers and firmware.

3.2.4.1 Uninstalling the ioDrive Windows Driver

To uninstall the ioDrive Windows driver:

1. Go to Start > Control Panel.
2. Click **Administrative Tools**.
3. Click **Computer Management**.
4. Click **Device Manager** in the console tree at the left.
5. Expand the *Fusion-io Devices* item. (Select *System Devices* for pre-1.2.3 drivers.)
6. Right-click on the desired ioDrive.
7. Click **Uninstall**.

Windows will uninstall the driver.

3.2.4.2 Upgrading the ioDrive Windows Driver

To upgrade the ioDrive Windows driver:

1. Refer to the Release Notes and the Errata file for this new version of the driver for details on any additional steps to perform the upgrade.
2. Follow the steps above to uninstall the existing driver.
3. Download the latest driver from http://www.dolphinics.com/support.
4. Either unzip or run the Windows package to copy the files to a convenient directory.
5. Go to Start > Control Panel.
6. Click **Administrative Tools**.
7. Click **Computer Management**.
8. Click **Device Manager** in the console tree at the left.
9. Expand the *Fusion-io Devices* item. (Select *System Devices* with pre-1.2.3 drivers.)
10. Right-click on the desired ioDrive.
11. Click **Update Driver Software**. Refer to Section 3.4 for details on the remaining steps to install the updated driver.

The operating system will now detect your ioDrive.

Note: *Read both the release notes and the errata files that come with each new release as well as these installation instructions to ensure no loss of data when performing upgrades.*

3.2.4.3 Upgrading the ioDrive Firmware

> ***Caution:*** *You should upgrade the firmware only if the* System Event Log *reports out-of-date firmware or if instructed to do so by Dolphin Customer Support.*

3.2.4.3.1 Viewing the Firmware Version

You can view the ioDrive's firmware version using the Windows *System Event Log*. You can then use this information to evaluate upgrading to a newer firmware release.

To view the firmware version in the System Event Log:

1. Choose Start > Administrative Tools.

2. Click **Event Viewer**.

3. Click **System** in the console tree at the left. The *System Event Log* appears in the dialog.

4. Click the **Source** column to re-sort the list by source.

5. Scroll through the list to identify any fiodrive entries.

6. Highlight each entry for fiodrive that is of the "Information" type and view its details. Each installed ioDrive will have an entry listing its firmware version.
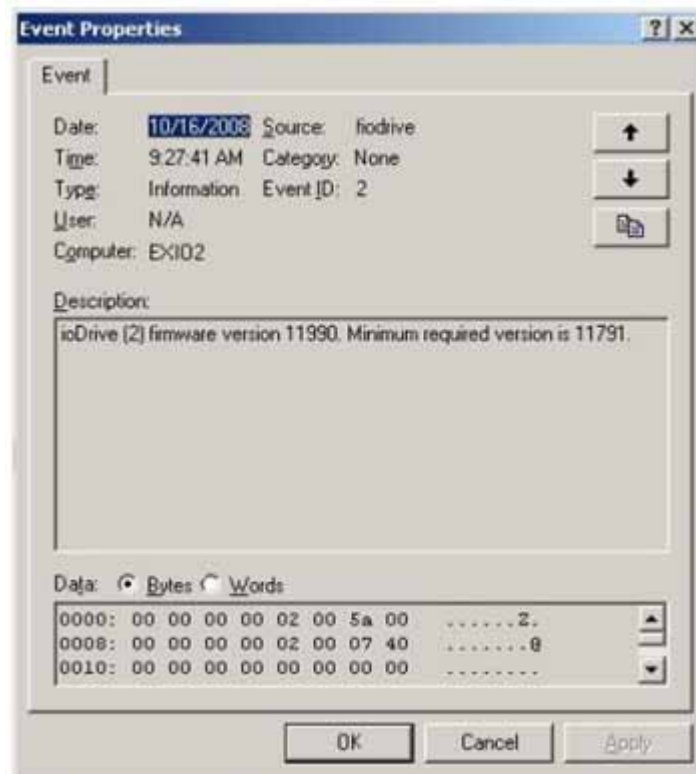
Record this firmware version information for future reference.

3.2.4.3.2 Performing the Upgrade

Warning: *It is extremely important that the power **not be turned off** to either the server or the DSE4XM chassis during a firmware upgrade, nor should the cable be disconnected. Power or connectivity loss during a firmware upgrade could cause device failure. Consider adding a UPS to the system prior to performing a firmware upgrade to prevent this from happening.*

Caution: *You should back up the data on the ioDrive prior to any upgrade as a precaution.*

Note: *You must upgrade the ioDrive driver if you upgrade the device firmware.*

Note: *To correctly perform the firmware upgrade, you must power the system, including* the DSE4XM *chassis, all the way down and bring it all the way back up. This shutdown and restart is required for the upgrade to complete on the ioDrive.*

Note: *A firmware upgrade may in some instances require a low-level format. Refer to the release notes for specific details.*

Note: *Upgrading the firmware may take several minutes. The update command displays a progress bar to indicate the pace of the upgrade.*

Typically, you use the ioManager console to perform firmware upgrades. You can also perform the upgrade using the *fio-update-iodrive* command line utility.

To upgrade the firmware on the ioDrive using *fio-update-iodrive*:

1. Open a Command Prompt. Navigate to the Program Files\Fusion-io\utils directory.

2. Run the *Detach* command for your device at the Command Prompt. For example:

   ```
   fio-detach /dev/fct0
   ```

   detaches the ioDrive labeled "fct0". You need to specify the name of your drive you want to detach. (Each ioDrive is labeled /dev/fct# where # is its PCIe bus number. Use *fio-status* at a Command Prompt to view this number.)

   The fio-detach command will show a progress bar and percentage as it completes the operation.

3. Type the following command at the Command Prompt:

   ```
   fio-update-iodrive <path>iodrive_version.fff
   ```

   where `<path>` is the location of the ioDrive firmware. The default path is Program Files\Fusion-io\firmware. The *version* is the numerical version of the drive.

   Note: *All three of the ioDrive slot LED indicators will light during the update process.*

4. Completely power down the server and the DSE4XM chassis. Turn off the AC power to the DSE4XM chassis, and turn it back on again. Restart the server, which

will completely power up the DSE4XM chassis, to complete the firmware upgrade. (It must be a power down and restart of both the server and the chassis to ensure a complete reset of the+ system and the ioDrive(s). If there are multiple servers connected to the DSE4XM chassis, these servers should be powered down as well, and powered back up after the DSE4XM is powered up.)

3.2.5 Unmanaged Shutdown Issues

Unmanaged shutdowns due to power loss or other circumstances will force the ioDrive to perform a consistency check during the reboot. This may take several minutes or more to complete and is shown by a progress percentage during Windows startup.

You can cancel this consistency check by pressing **Esc** during the first 15 seconds after the *Fusion-io Consistency Check* message appears at the prompt. If you choose to cancel the check, however, the ioDrive(s) will remain unavailable to users until the check is done. (You can perform this check later on using ioManager's *Attach* function).

Although data written to the ioDrive will not be lost due to unmanaged shutdowns, important data structures may not have been properly committed to the drive. This consistency check repairs these data structures.

3.2.6 Disabling Auto-Attach

The ioDrive Windows driver defaults to automatically attach (auto-attach) all installed ioDrives to the operating system. (If the ioDrive does not attach, it will not be available to applications or users.) You can disable auto-attach to assist in troubleshooting or diagnostics.

To disable auto-attach:

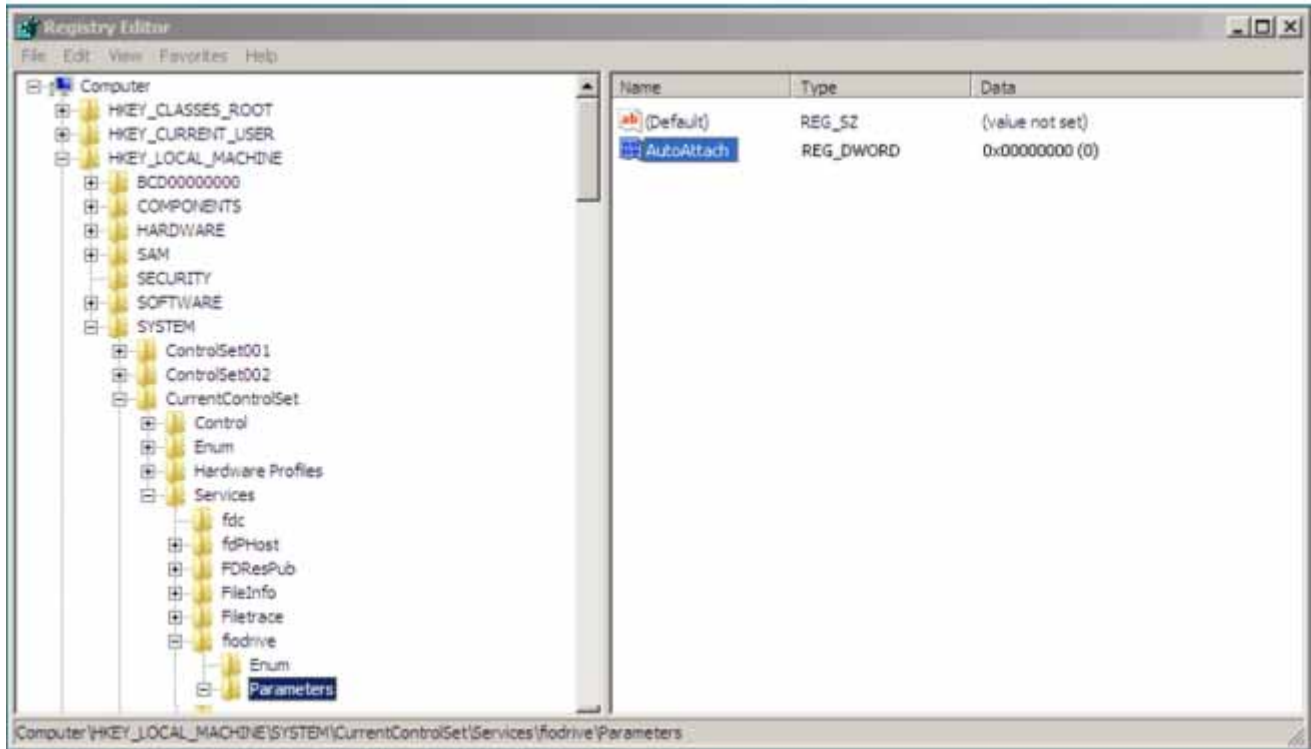1. Choose Start/Run.

2. Type in the command:

```
Regedit <path>autoattachdisable.reg<enter>
```

where `<path>` is the folder where the autoattachdisable.reg file is. The default is:

```
C:\Program Files\Fusion-io\Utils
```

This will create a new DWORD parameter registry key called *AutoAttach* with a hex value in:

`HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\fiodrive\Parameters`

Your ioDrive will now *not* automatically attach the next time you reboot the computer.

When you finish troubleshooting the driver issue, use ioManager to attach the ioDrive(s) and make them available to Windows.

3.2.6.1 Enabling Auto-Attach

To re-enable auto-attach after disabling it with the autoattachenable.reg file:

1. Choose Start/Run.

2. Type in the command:

   `Regedit <path>autoattachenable.reg<enter>`

   where `<path>` is the folder where the autoattachenable.reg file is. The default is:

   C:\Program Files\Fusion-io\Utils

This will reset the AutoAttach parameter in the Registry. The next time you reboot your Windows system, your ioDrive will automatically attach.

3.3 Troubleshooting Event Log Messages

The Windows System Event Log will display fiodrive messages concerning the ioDrive—both Informational and Warnings.

Note: Each ioDrive is numbered from 0 upwards. These numbers reflect the PCIe bus number where you installed the device. Use ioManager to view this number for your device.

The following are the most common Event Log error messages.

Message:

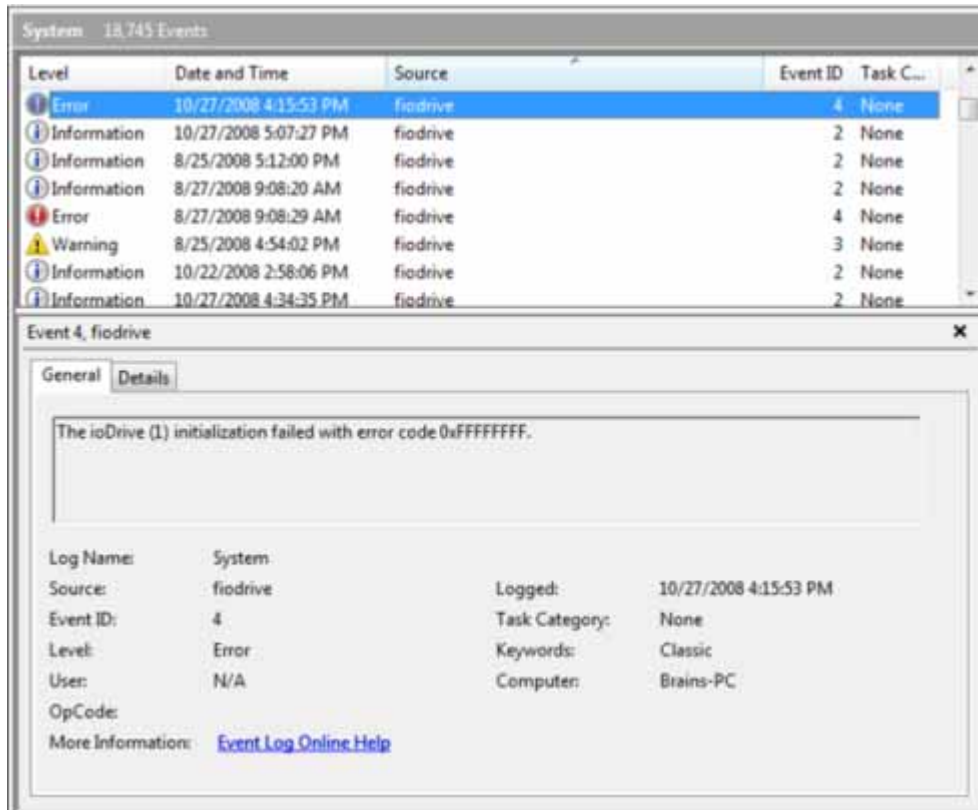Error: ioDrive*(x)* firmware is too old. The firmware must be updated.
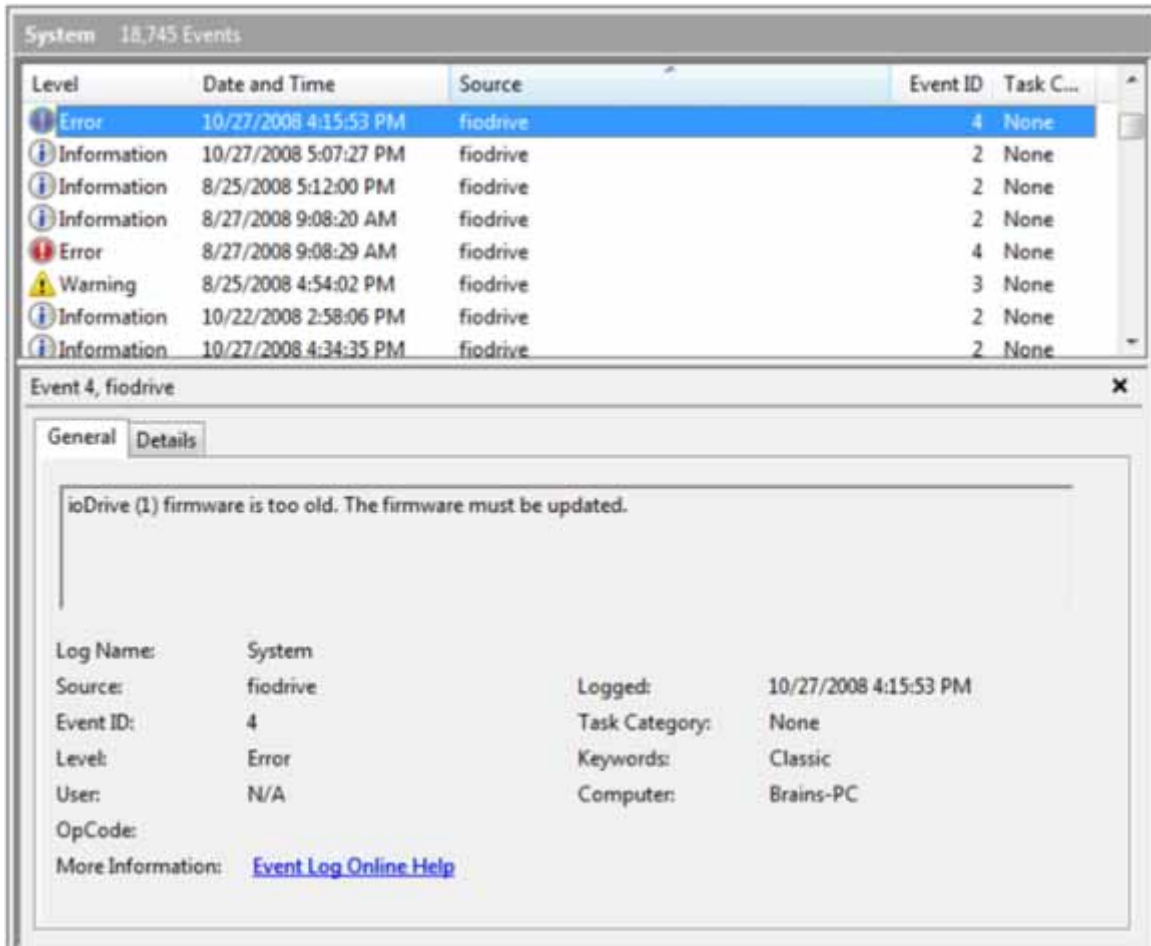
Suggested Solution:

Use the firmware upgrade instructions in this guide to update the firmware.

Message:

Error: The ioDrive(*x)* initialization failed with error code 0x*errorcode* (where *errorcode* is a number which may vary)
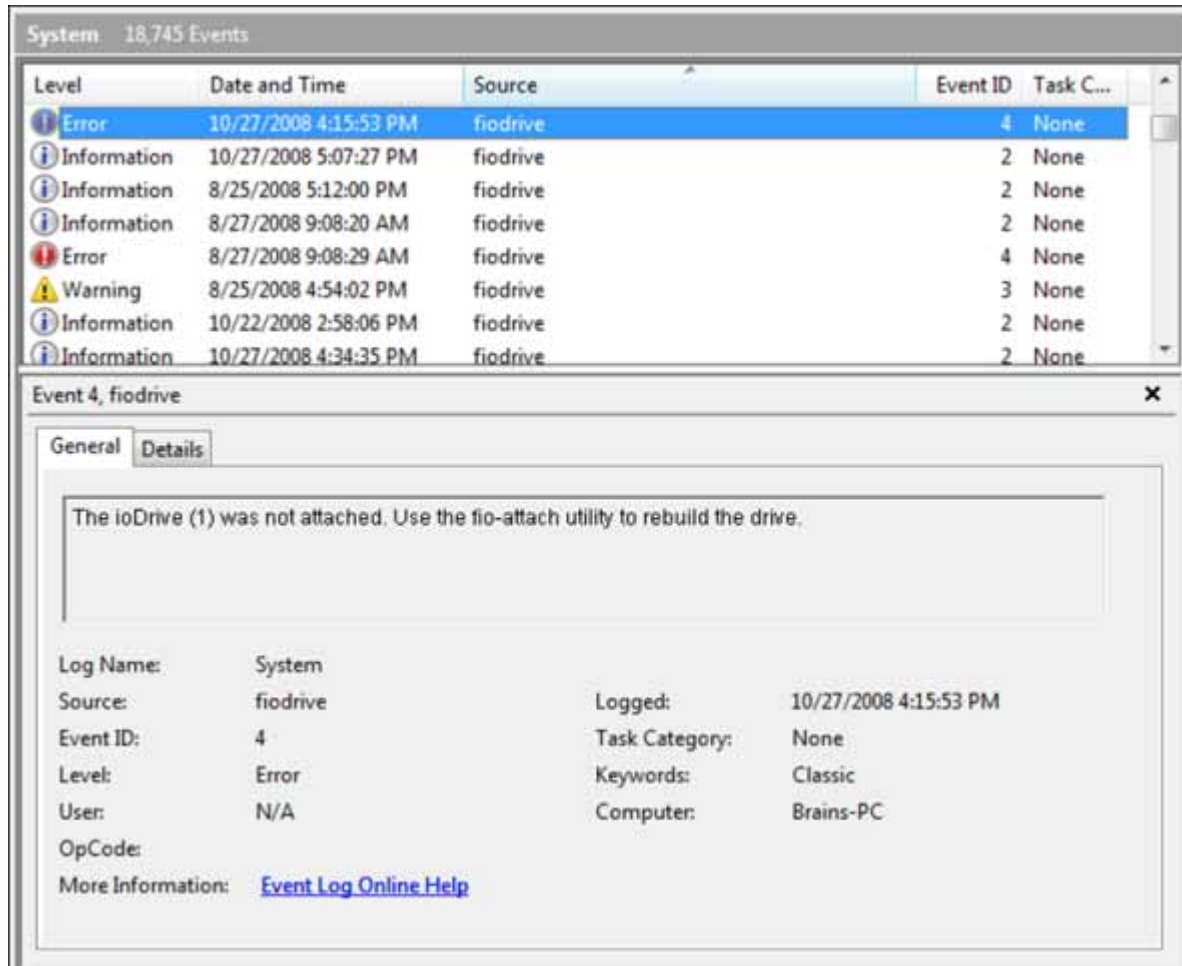

Suggested Solutions:

- Reinstall the Windows driver
- Remove and reseat the ioDrive device
- Remove and insert the ioDrive in a different PCIe slot

If these do not correct the error, please contact Dolphin Customer Support.

Message:

Error: The ioDrive(*x)* was not attached. Use the fio-attach utility to rebuild the drive.
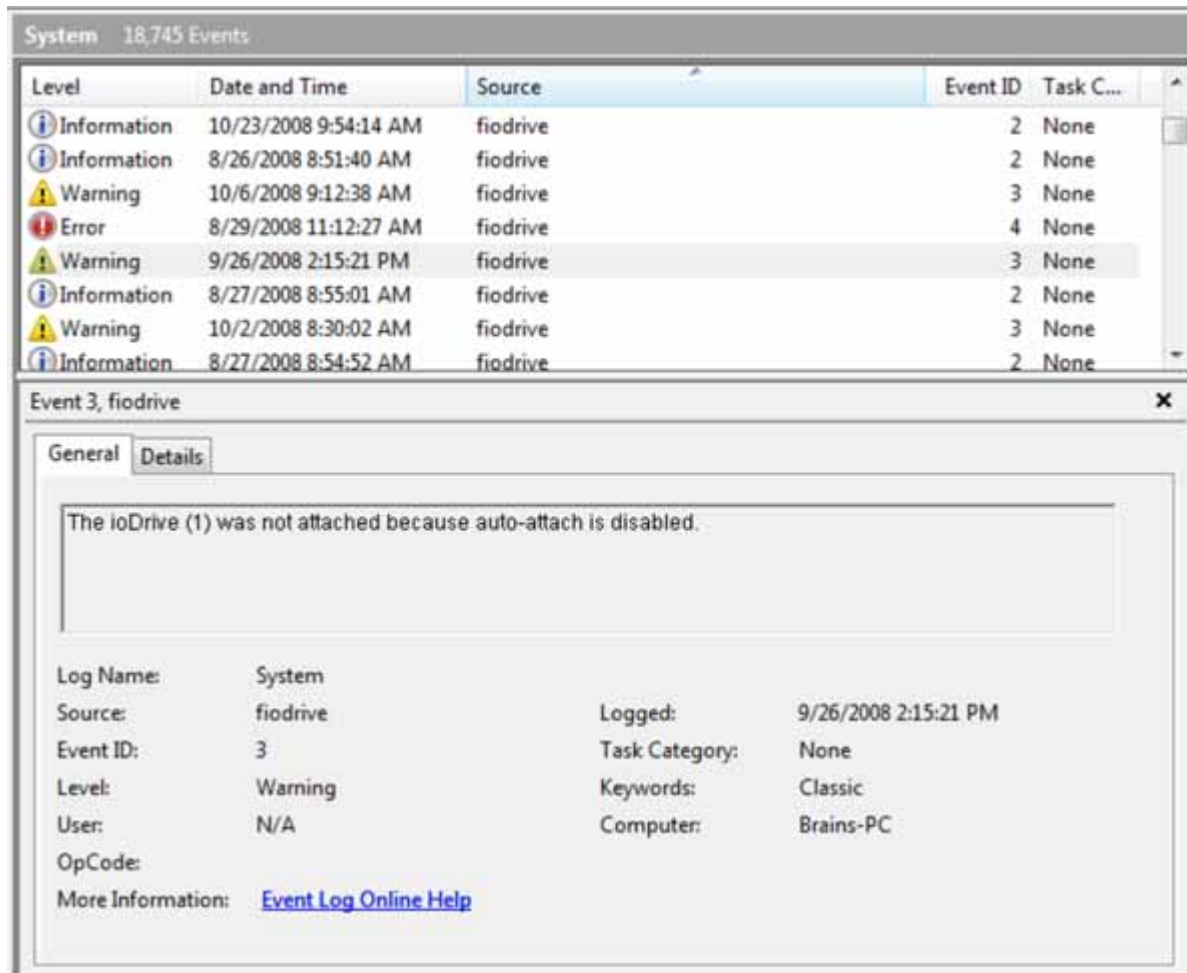
Suggested Solution:

This error may appear if the system shut down abruptly or hung. You can use either the fio-attach command line utility or ioManager to re-attach the ioDrive. This attach process may take up to ten minutes as the utility rebuilds the drive.

Message:

Warning: The ioDrive(x) was not attached because auto-attach is disabled.

Suggested Solution:

The ioDrive must attach to the Windows operating system to be available to users and applications. (This attach normally occurs at boot time.) As part of this attach process, the ioDrive driver checks to see if there is an AutoAttach parameter in the Windows registry. If you create this Registry parameter to disable auto-attach, the attach operation does not complete. The driver will then display this message.

To attach an unattached ioDrive:

1. Run ioManager.

2. Select your unattached ioDrive from the Device Tree.

3. Click the *Operations* tab.

4. Click **Attach**.

5. Confirm the Attach operation.

Your ioDrive now attaches to the Windows operating system.

To re-enable Auto Attach at boot time, refer to the section on *Enabling Auto Attach*.

3.4 Manual Installation Procedures

The Windows Setup program should install your needed driver and software. However, if the driver does not install, you can perform a manual install (or upgrade) using the steps below for either Windows XP Pro/Server 2003 or Windows Vista/Server 2008.

3.4.1 Manual Install on Windows XP Pro or Windows Server 2003

Windows Driver Wizard will automatically detect the new ioDrive and start to locate its driver after you restart the system. To complete the install:

1. Windows will ask you to locate the software driver.
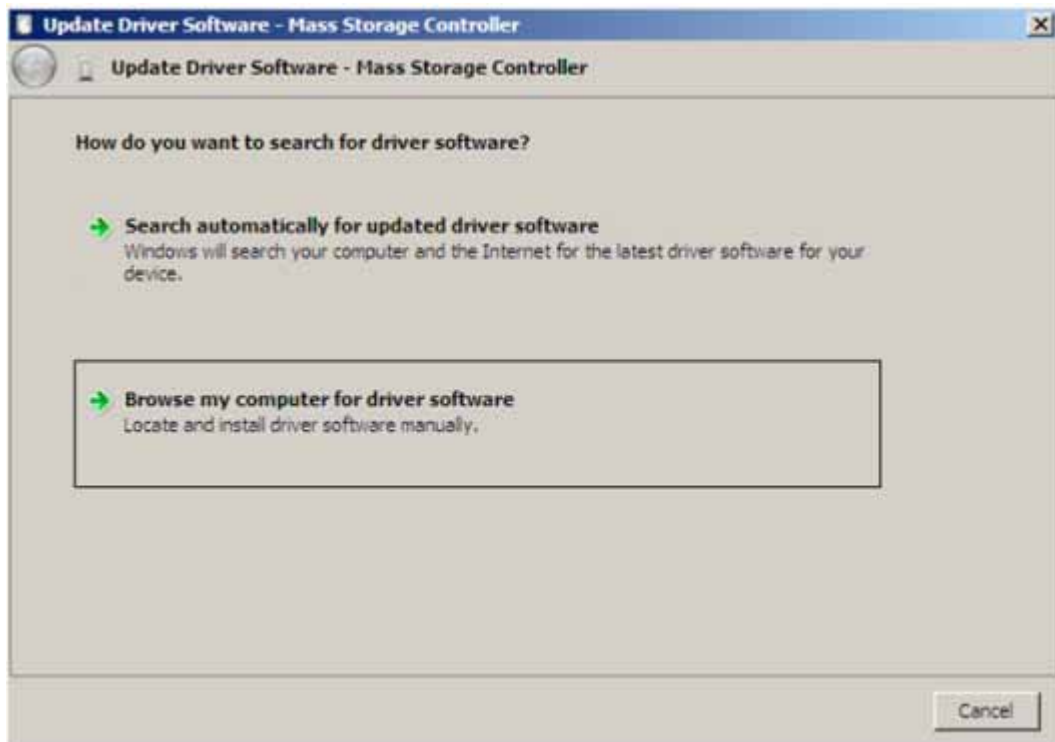
2. If you have not done so, download and run the ioDrive Windows Setup program from http://www.dolphinics.com/support.

3. Return to the *Update Driver* dialog.

4. Click **Browse my computer for driver software**. The Setup program will ask you for a path to search.

5. Click **Browse** next to the path field. Windows will display a file dialog.

6. Select the folder with the ioDrive driver (the default is Program Files\Fusion-io\driver).

7. Click **OK**.

Windows will find the correct driver and install the device software. When the driver install completes, Windows will display this message:

Proceed to the appropriate Windows section in this guide to perform an outdated firmware check.
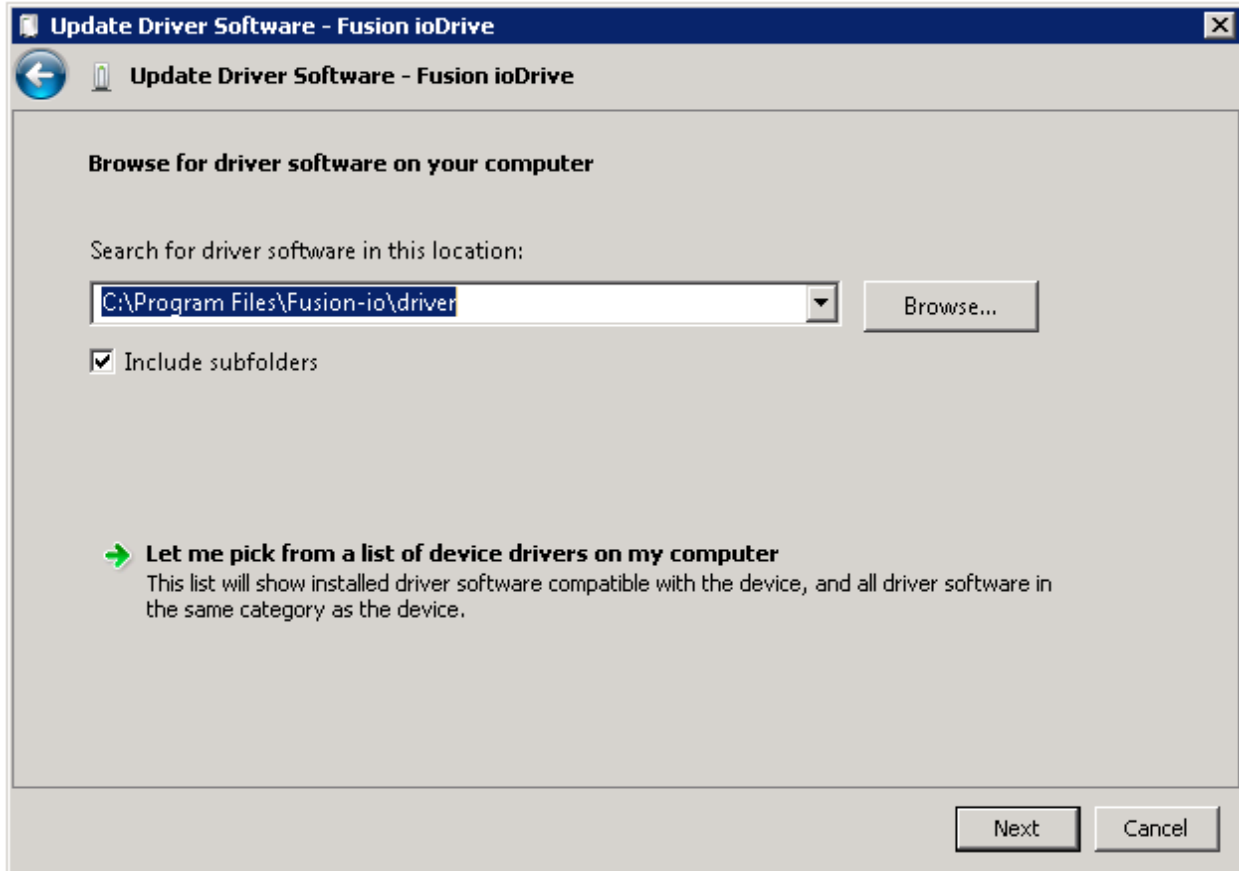
3.4.2 Manual Install on Windows Vista or Windows Server 2008

The Windows Driver Wizard will automatically detect the new ioDrive and start to locate its driver after you restart the system. To complete the install:

1. Windows will ask you to locate the software driver.

2. Click **Browse my computer for driver software**. The Setup program will ask you for a path to search.

3. Click **Browse** next to the path field. Windows will display a file dialog.

4. Select the folder with the ioDrive driver (the default is Program Files\Fusion-io\driver).

5. Click **OK**.

6. Click **Next**.

Windows will find the correct driver and install the device software.

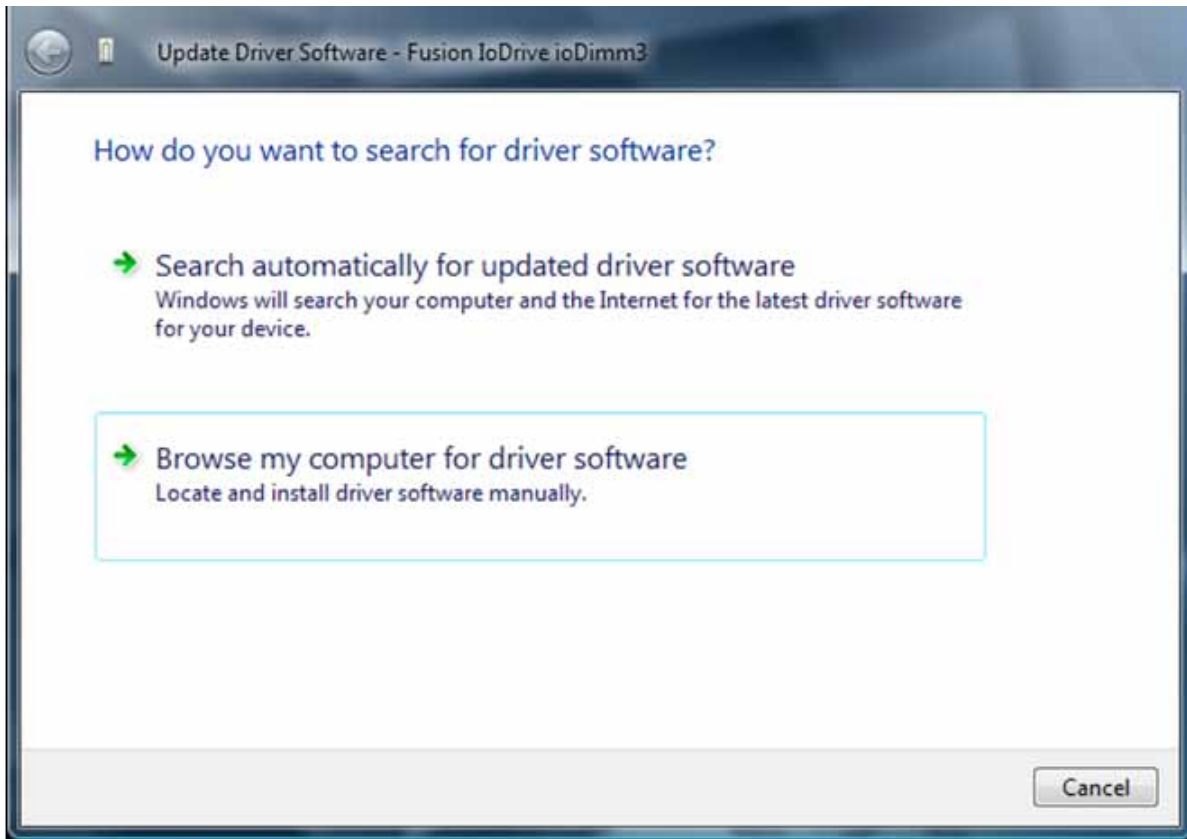When the driver install completes, Windows will display this message:
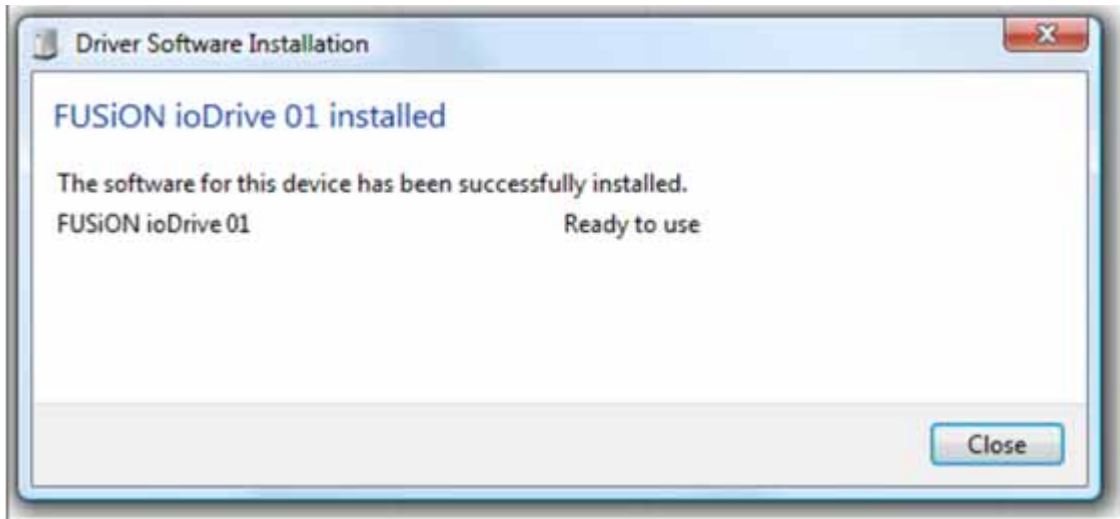
Proceed to the appropriate section for your Windows version to perform the outdated firmware check.
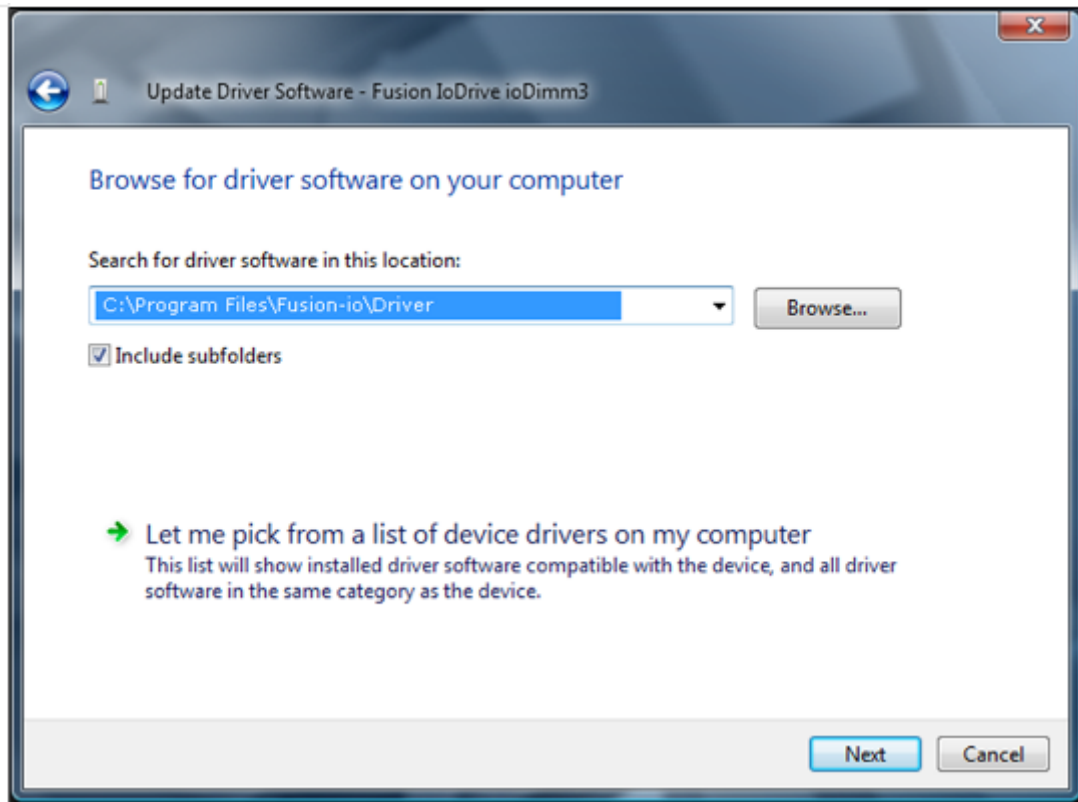
3.5 Command Line Utilities Reference

The Windows Setup package installs various utilities into the Program Files\Fusion-io\utils folder. These provide a number of useful ways to access, test, and manipulate the ioDrive via the command line (Command Prompt). They include:

Utility	Purpose
fio-attach	Makes an ioDrive available to Windows
fio-detach	Removes an ioDrive from Windows access
fio-format	Used to perform a low-level format on an ioDrive
fio-status	Displays information about the ioDrive
fio-update-iodrive	Updates the ioDrive's firmware

Note: Each utility has –h (for Help) and –v (for Version) options.

fio-attach

Description

Attaches the ioDrive and makes it available to Windows. You can then partition, format, or set up the ioDrive as part of a RAID array using the Windows Disk Management utility. This command displays a progress bar and percentage as it completes the attach process.

Note: In most cases, the ioDrive driver automatically attaches the device at boot time. You only need to run fio-attach if you ran fio-detach or if you create and set the ioDrive's AutoAttach parameter in the Windows Registry to 0. (See Disabling Auto-Attach for details.)

Syntax

```
fio-attach <device-node> [-q, -h, -v]
```

where `<device-node>` is the name given by the ioDrive driver to your device. This name is `/dev/fct`*x* where *x* indicates the PCIe bus number where you installed the ioDrive. (For example, the name `/dev/fct4` refers to the ioDrive installed in PCIe Bus 4 in your Windows system. Use ioManager or *fio-status* to view this bus number.)

Option

  -q   Quiet: Runs the Attach process without displaying the progress bar or percentage.

fio-detach

Description

Detaches the ioDrive and removes the corresponding "fct*x*" ioDrive block device from the OS. The fio-detach command will wait until the device completes all read/write activity before executing the detach operation. The command also displays a progress bar and percentage as it completes the detach.

Caution: Before using this utility, ensure that the device you want to detach is not currently mounted and in use.

Syntax

```
fio-detach <device-node> [-i, -q, -h, -v]
```

where `<device-node>` is the name given by the ioDrive driver to your device. This name is `/dev/fct`*x* where *x* indicates the device number. (The number reflects the PCIe bus for the ioDrive.) For example, the name `/dev/fct4` refers to the ioDrive installed in PCIe Bus 4 in your Windows system. (Use ioManager or *fio-status* to view this number.)

Options

  -i   Immediate: Causes a forced immediate detach
                  (does not save metadata)

  -q   Quiet: Runs the Detach process without displaying the progress bar or percentage.

fio-format

Description

Performs a low-level format of the ioDrive. (This format is distinct from a format performed by Windows.) The fio-format utility displays a progress bar and percentage as it completes the format.

Note: *The ioDrive ships pre-formatted and does not require the use of fio-format except to change the logical size of the device.*

Caution: *Use this utility with care, as it deletes all user information on the ioDrive.*

Syntax

```
fio-format <ioDrive-device> [-q, -s <device-size>, -f, -u, -h, -v]
```

where `<ioDrive-device>` is the name given by the ioDrive driver to your device. This name is `/dev/fct`*x* where *x* indicates the device number (this number is the ioDrive's PCIe bus). Use ioManager or *fio-status* to view this number.

Options

-q	Quit on erase error.
-s *<device-size>*	Sets the storage size by a number and one of the following units as a suffix:

- %   Percentage of drive for user data

- t/T   Number of terabytes to format

- g/G   Number of gigabytes to format

- m/M   Number of megabytes to format

For example, setting the size as either 90% or 72GB on an 80GB ioDrive both result in the same capacity for user data—72GB.

-f	Force size: Bypass sizing sanity checks to enable 64-bit address space. This option also bypasses interactive prompts in the formatting process.
-u	Quiet: Disables the display of the progress bar or percentage.

fio-status

Description

Provides detailed information about the specified or all installed ioDrive(s). The fio-status command requires that the Windows driver be loaded. If it finds no device, it displays an index number instead.

Syntax

```
fio-status </dev/fctx> [-c, -a, -h, -v]
```

where /dev/fctx refers to the name of this device and the *x* is its PCIe bus number. If you don't specify a name, fio-status displays information on all installed ioDrives.

Options

-c   Count: Report only the number of ioDrives installed.

-a   All: Print all available information for each device. The fio-status command displays the following information:

- Serial number
- Part number
- Manufacturer's name
- Manufacturing date
- Firmware version at manufacturing time
- Size of the device, out of total capacity
- NAND manufacturer
- NAND cell type (SLC, MLC, or unknown)
- Size of the device in blocks
- Size of a block in pages
- Size of a page in bytes (including ECC overhead)
- Number of pads, planes and banks
- Size of an ECC-protected unit (including check-bit overhead)
- FPGA ID

- Hardware UID
- Bus ID
- Vendor ID
- Subsystem vendor and device IDs
- Device ID
- PCI slot number
- Internal temperature (avg. and max., since driver load) in degrees Centigrade
- Ambient temperature, in degrees Centigrade
- Internal voltage: avg. and max.
- Auxiliary voltage: avg. and max.
- Health status: *Healthy*, *Marginal*, or *Degraded*, based on the percentage of good erase blocks on the device
- Percentage of good data
- Percentage of good blocks
- Percentage of good metadata

Sample Output

The fio-status command alone displays abbreviated information on all installed ioDrives:

```
fio-status
Found 2 ioDrives in this system.
Fusion-io driver version: 1.2.4.3

fct0    Attached
        ioDimm3 SN:0719 Firmware v11791
        92 GBytes unformatted capacity.

fct1    Not attached
        ioDimm3 SN:0299 Firmware v11791
        154 GBytes unformatted capacity.
```

The fio-status command with the –a parameter and no device name displays all the information available on every installed ioDrive.

```
fio-status -a

Found 2 ioDrives in this system.
Fusion-io driver version: 1.2.4.3

fct0    Attached
```

```
        ioDimm3 SN:0719 PN:001195011, Mfr:000 Date:20080709
        Firmware v11791
        92 GBytes, 8192 blocks, 256 pages, 47264 bytes/page (25 pads, 1 plane, 4
banks)
        Nand: Samsung (ec) SLC
        Error correction: 11 bits per 240 bytes, retire above 4 bits
        FPGA ID:000 UID:0000000002cf01326845000048f00c00
        PCI: 02:00.0, Slot Number:2 Vendor ID: 1aed Device ID: 1003
        Ambient temperature: 40 degC
        Internal temperature: avg 44.3 degC, max 50.7 degC
        Media status: healthy. 99.78% blocks good. data:99.77% good, md:100%

fct12   Not attached
        ioDimm3 SN:0299 PN:001160002, Mfr:AEMS Date:20080724
        Firmware v11791
        154 GBytes, 8192 blocks, 256 pages, 78848 bytes/page (20 pads, 1 plane, 4
banks)
        Nand: Samsung (ec) SLC
        Error correction: 11 bits per 240 bytes, retire above 4 bits
        FPGA ID:xc5vlx110t-ff1136-1 UID:00000000012b01326854000046cd0801
        PCI: 03:00.0, Slot Number:3 Vendor ID: 1aed Device ID: 1001
        Ambient temperature: 34 degC
        Internal temperature: avg 37.9 degC, max 42.8 degC
        Media status: healthy. 99.87% blocks good. data:99.82% good, md:100%
```

fio-update-iodrive

Description

Updates the ioDrive's firmware. This utility scans the PCIe bus for all attached ioDrives and updates up to 256 total devices. Each ioDrive displays a progress bar and percentage as the update completes. To update one or more specific devices, use the -d option along with the PCIe bus address to identify which device to update. This utility requires the device driver be loaded to operate. It also requires a complete power down of the computer after using fio-update-iodrive to ensure a complete reset and installation of the firmware.

Caution: The default action (without using the "–d" option) is to upgrade all ioDrive devices with the updated firmware contained in the `<ffffile>` *file. Confirm that all devices need the upgrade prior to running the update. If in doubt, use the –p Pretend option to view the possible results of the update.*

Syntax

```
fio-update-iodrive <iodrive_version> [-d, -f, -l, -p, -q, -h, -v]
```

where `<iodrive_version>` is the path and firmware archive file.

Options

-d	Updates the specified device. Use /dev/fct*x* where *x* is the device's PCIe bus number. (Use fio-status to view this.)
-f	Force Upgrade (Also used to perform a rollback to an earlier firmware version.)
-l	List firmware available in the archive.
-p	Pretend: Show what updates would be done (the firmware is not modified). This option requires the -d option.
-q	Runs the update process without displaying the progress bar or percent completed.

Caution: Use the -f option with care, as forcing an upgrade could damage your device.

Note: *All three external LED indicators will light during the update process.*

3.6 Enabling SNMP

The ioDrive also supports monitoring using SNMP or Windows Management Instrumentation (WMI). The Windows Setup package places the ioDrive SNMP extension agent DLL and MIB into Program Files\Fusion-io\SNMP. This ioDrive agent requires the Windows SNMP service active on the computer (see your Windows documentation for details). Currently, WMI requires SNMP in the background to function so you'll need to setup SNMP for either.

To install and enable the extension agent:

1. Copy fio-snmp-win.dll into Windows\System32.

2. Open Regedit and create the following registry key:

   ```
   HKEY_LOCAL_MACHINE\SOFTWARE\Fusion-io\
   fio-snmp-win\CurrentVersion\Pathname = %systemroot%\system32\
   fio-snmp-win.dll
   ```

3. In Regedit, locate the following registry key:

   ```
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Ser-
   vices\SNMP\Parameters\ExtensionAgents
   ```

4. Modify this key to include a String Value. Number it next in the list of agents.

5. Modify this value with the following:

```
SOFTWARE\Fusion-io\io-snmp-win\CurrentVersion
```

6. Save and exit Regedit.

7. Stop and restart the Windows SNMP service.

You can now monitor your ioDrive using SNMP. By default, the ioDrive agent uses the cpqIODrv.mib in the Program Files\Fusion-io\SNMP folder. (Refer to the Release Notes for further details on the MIB.)

3.6.1 Windows Management Instrumentation (WMI)

WMI is the Microsoft implementation of the Common Information Model (CIM) and Web-Base Enterprise Management (WBEM). WMI support is an optional component. To install it:

1. Click on **Start/Control Panel**.

2. Click on **Add/Remove Programs** (**Programs and Features** in Vista/Server 2008).

3. Click on the **Add/Remove Windows Components** button.

4. Select **Management & Monitoring Tools**.

5. Click on the **Details** button.

6. Check the box labeled **WMI Windows Installer Provider**.

7. Click **OK**.

8. Click **Next**.

Follow the on-screen instructions to complete the install.

3.6.1.1 Install WMITools

Next, install the WMITools package:

1. Enter "WMITools" in the Downloads search box at the top of the page at www.microsoft.com/downloads.

2. Download the package to a convenient folder.

3. Click on the package to launch the setup process.

4. Follow the onscreen instructions to complete the install.

3.6.1.2 Convert the MIB File

You must now create and register the WMI .MOF version of the SNMP MIB file.

1. Download a copy of the RFC1213-MIB file from an available online resource such as http://www.simpleweb.org. Place it in Program Files\Fusion-io\SNMP.

2. Open a Command Prompt and navigate to this directory.

3. To create the MOF version of the MIB file, type in the command:

```
C:\WINDOWS\system32\wbem\snmp\smi2smir /g RFC1213-MIB.txt
cpqHost.mib cpqIODrv.mib > cpqIODrv.mof
```

4. To register this MOF file with WMI, type in the command:

```
C:\WINDOWS\system32\wbem\mofcomp cpqIODrv.mof
```

Your management system is now ready for active monitoring.