Owner’s Manual

SATA II Aluminum Hot-Swap Systems

Macintosh, Windows, Linux

SATA (Serial ATA) Hot-Swap Drive System / Case Kit
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How SATA Works

SATA II (Serial ATA) is a High Performance Serial Bus designed to transfer data at up to 300MBytes per second. This ultra-fast data transfer rate is perfect for storage applications where speed is a critical issue. The low cost of the SATA drives also provide affordable backup and archiving solutions.

Granite offers a variety of host adapters that support the Hot-Swap capabilities of SATA. These PCI cards and PCMCIA adapters support multiple drives. Check the Granite website (www.granitedigital.com) for a complete listing all our host adapters.

SATA is simple to configure because each drive operates on a separate channel. The cable goes from the host adapter to the drive and ends there. Installation is only a matter of plugging in the host adapter, plugging in the cable, turning on the drive and booting up the computer.
How SATA Works

In order to get SATA to perform at its maximum speed, the following items should be considered:

1) Pick the controller card that best suits your needs. SATA Host Adapters come in a variety of models from 2 channel to 16 channel RAID cards. Also it is important to note that not all SATA Host Adapters support Hot-Swap and without that ability the drive can only be removed when the computer is turned off.

2) The drive mechanism must go fast. Currently SATA drives are rated at 300MB/s burst rate and most drives can sustain 55MB/s data transfer rates. In order to get SATA to go faster, a Stripped RAID (also known as RAID 0) must be created. RAID is supported by most operating systems so having a knowledge of the operating system is important. The other alternative is to purchase a RAID Host Adapter. The advantage here is that most RAID Host Adapters will perform at higher data transfer rates than their software alternatives.

3) The computer and the speed of its PCI bus will directly affect the performance of the SATA Bus and their drives. Earlier computer models run at a fraction of the speed of the newer models. In order for the drives to transfer at their highest performance levels use of a high performance computer is also a must. Again, the newer computer technologies offer the greatest performance levels.

There are two types of SATA cables (shielded for external use and unshielded for internal use) and two types of connectors. The original SATA connector is known as the “L” type because it’s opening looks like an “L”. The new eSATA connector, known as an “I” type because the connector is similar to the letter “I”. The eSATA “I” connector is almost identical to the SATA “L” with the exception that it is designed to be used as a Hot-Swap type of connection with many more insertions and removals than the original “L” type.
Connecting SATA Devices

Granite cases use the “L” type connector because we Hot-Swap the drive mechanism not the cable. Host adapters use both the “L” or “I” types with the eSATA becoming more popular as the external connection, “I” internal.

Since SATA uses one channel per drive, each SATA drive must be directly connected to a SATA host adapter channel. Cable length can be up to 72” using Granite shielded external cables.

Granite manufactures a variety of cables, brackets, and adapters that allow SATA to be used in a variety of applications. Our website (www.granitedigital.com) lists all of these products. Our cable selection includes internal and external shielded cables.

After installing the hardware some operating systems may require additional drivers. The host adapter may include a CD with these necessary drivers. Make sure the host adapter supports your operating system because different adapters support different systems.

Installing the SATA drive mechanism in our Hot-Swap System is easy. SATA drives do not have terminators or switch settings, so all that is usually necessary is to plug them into the power and data cables.

Temperature is always a consideration with drive mechanisms and our Aluminum Hot-Swap Systems are made so that the drive mechanisms stay cool enough to run without the necessity of fans. This makes for a safer temperature environment, less noise, less dust, and lower power consumption. Advanced cooling design using aluminum heat dissipating properties eliminates the complexity and possible failure associated with fans.
Removing the Hot-Swap Tray

We have designed the Hot-Swap System to be as simple as possible when installing a hard drive mechanism. The tray is easily removed from the frame by pulling on the handle. Removing the tray allows you to swap drives in and out, quickly and easily.

When removing the tray with a drive running, gently pull out the tray about 1” and then pause for about 10 seconds allowing the drive mechanism to stop spinning. Then continue to remove the drive.

The Aluminum Tray is easily removed with little pressure.

The tray is made of aluminum. Aluminum offers great heat dissipating properties, protects the drive circuitry, and isolates the drive from damaging static. The four elongated holes in the sides are used to attach the drive mechanism to the tray.

Four special flat headed screws are included with each tray. Use only these screws to attach the drive mechanism to the tray. SATA drives do not need to be jumpered so installation is very simple.

No jumper changes are necessary. When installing the drive make sure the connectors are facing the rear of the tray.
Gently slide the SATA Drive Mechanism in from the rear of the tray. Locate the 4 screw holes and line up the drive mechanism. The drive should be flush with the rear of the tray.

The drive connectors should face the rear of the tray.

Using a phillips head screw driver install the 4 mounting screws that hold the drive in place. Use only the flat headed phillips screws that are supplied. Make sure they are tight and that the rear of the drive is flush with the rear of the tray.

Once the drive mechanism has been securely attached to the tray it can be safely moved and stored. Drives can also be transported long distances with the use of our padded carrying cases. These cases protect the tray and surround the mechanism with shock absorbing foam. Packaging a drive to shipment should be done in a box with at least an additional 4” of foam surrounding the padded carrying case.
Installing the Drive

The tray slides back into the Hot-Swap System with very little effort. As the tray reaches the last 1/4 inch, push it in using the handle. The tray will now be flush with the front and has been seated properly. Never force the tray into place and always make sure there is nothing in the opening before inserting it.

When the tray is flush with the front it has been inserted correctly. As the drive slides into the connector in the rear of the case you will be able to feel it lock into place.

There is a power switch that must be turned on in the rear of the external systems. Turn it on before inserting the tray. This switch can be used to power the drive or simply remove the drive from the system to power it down.
There are two types of PCI Host Adapters on the market and many different variations of these two types. The first type is the PCI-X. As seen in the picture to the right, this PCI bus looks very different than the PCI-E type shown below. Before purchasing a host adapter make sure you know what type of PCI bus your computer has.

There are also a variety of cards ranging from 2 SATA Channels to 16 SATA Channels and soon, with the use of Port Multipliers, cards will be able to address even more channels.

Generally speaking most host adapters come with a driver CD that has the drivers on it required for your installation. Drivers are different for Linux, Windows, and Mac so be careful to use the proper driver.

The cards that we include in our packages should be up to date and their CD will have the necessary drivers for most Operation Systems. Check our website, www.granitedigital.com for possible updates or links to the chip manufacturer’s website for additional drivers.

Cards do not come with external cables. SATA “L” connectors are used on the host adapters in conjunction with our shielded cables. See page 4,5 for additional information.
Installing the Host Adapter

Using the proper cable guarantees good data transfers and optimum performance. For external use “shielded cables” are designed to protect the data from static and noise. These cables are much heavier than the internal types and should be used with all of our external systems.

When purchasing external shielded cables know which type of connector ends you need and what length you need. Granite manufacturers external cables in both 36 and 72 inch lengths. Connectors are either SATA “L” or eSATA “I” types. Different connectors are used on different host adapters and systems so know what type you need before purchasing the cable.

Since most 8 or 16 channels PCI Host Adapters have only internal connectors, Granite manufactures a PCI Bracket that allows up to 8 shielded cables to be routed through an adjacent PCI slot. This bracket also acts as a strain relief, holding the cables in place even if they are accidently pulled on.

We also offer a custom solution for G5 Macintosh computers which will not take up an additional PCI slot. If interested, call Granite Digital Sales Department for details on this product and instruction on how to modify the G5 case.
After the Host Adapter and drivers have been installed the next step is to format and partition your drive mechanism. This procedure is different in every operating system. The screen on the right is an example of what the Macintosh uses... it is called “Disk Utility”. On a PC running windows it is called “Disk Management”.

No matter which operating system you are running the basics are still the same. The drives will need to be formatted and partitioned before they can be used.

Many RAID controllers include their own set of utilities for formatting and controlling the PCI Host Adapter. If this is the case then the standard formatting process will not be used and the utilities supplied by the host adapter manufacturer will format, partition and manage the drives.

After you finish this initialization process the drives will then be ready to use. Again, every system is slightly different especially when it comes to RAID and RAID levels. Read the documentation carefully before putting important data on your system.
Troubleshooting

1- THE DRIVE DOESN'T MOUNT:

Macintosh OS 9: The Host Adapter manufacturer may have special drivers that will need to be installed with the PCI Host Adapter. Check the manufacturer’s installation instructions for details.

Macintosh OS X: When you install a new drive mechanism using OSX, the Application “Disk Utility” is what you use to Partition, Format, RAID, Test, or Erase the drive. Disk Utility is located in the Applications / Utility folder.

Windows:

New drive mechanisms that are plugged into the Windows operating systems will need to be partitioned and formatted before they will show up as a new drive letter. Check the Microsoft website for details on how to use Fdisk and Format (98SE or ME) and how to use Disk Management Utility (2000 and XP). Formatting and partitioning a SATA drive is exactly the same as any other Microsoft supported drive.

Also read the Host Adapter manufacturer’s instructions on driver installation. Every PCI Host is different and may need specific files to work.

2- COPIED FILES ARE MUCH BIGGER THAN ORIGINAL:

This problem is specific to the Macintosh. If you initialize a drive using Standard HFS partition, the files will appear very large. The solution is to reinitialize the drive using “Extended HFS+ Partitioning”.

3- THE DRIVE DOES NOT RUN AS FAST AS IT SHOULD:

SATA bus speed is determined by four things:

1- The drive performance level. Faster drives (10,000rpm) have higher data transfer rates and make a difference in speed. A larger buffer size also improves drive performance.

2- The Host Adapter technology. SATA Host Adapters come in a variety of speeds and support RAID for even faster performance. Check the specifications on your Host Adapter to make sure that it fits your needs.

3- The computer itself and its PCI Bus. The faster the computer the faster its PCI performance. The SATA host adapter will work faster with faster PCI speeds.

4- The Operating System. Older Mac OS’s and Windows OS’s do not perform as well as newer ones. Using the most advanced and recent OS will offer a dramatic improvement in speed.
2 - 4 Bay Hot-Swap Specifics

The 2 & 4 Bay Aluminum Hot-Swap Systems are virtually identical with the exception of 2 extra bays in the 4 bay model. Both models come with an internal Micro ATX power supply with switchable 115 / 230 volt operation. The truly unique feature of these systems is their ability to keep drives running cool without individual fans. The heavy duty aluminum construction absorbs the heat from the drives and keeps them running well within their design specifications.

Trays are interchangeable between all the different Aluminum Hot-Swap models. Drives can be moved from one location to another and used on other computers. RAID sets can also be moved from one location to another as long as the controller card supports it. Most hardware RAID controllers support this type of interchangability.
Drive & Host Adapter Install

4 - 8 Bay Hot-Swap Rack Specifics

The 4 & 4 Bay Aluminum Rack Hot-Swap Systems are virtually identical with the exception of 4 extra bays in the 8 bay model. Both models come with two internal Micro ATX power supplies with switchable 115 / 230 volt operation. The truly unique feature of these systems is their ability to keep drives running cool without individual fans. The heavy duty aluminum construction absorbs the heat from the drives and keeps them running well within their design specifications.

4 Bay Rack Hot-Swap

These models can be mounted into a Rack or used as a stand alone system. Blue LED's indicate that the power supply is working properly and ready for any drive insertion.

8 Bay Rack Hot-Swap
The rear panel of the 2-4 Bay SATA System is simple and easy to use. The IEC (standard computer type) power cord plugs into the built in 250 watt Micro ATX power supply. Next to that connector is the power on switch. This switch can be used to power the drive mechanisms on or off... or leave this switch in the on position and simply pull the drive mechanisms out about 1” and the drives will disconnect and power down.

SATA “L” type connectors from shielded cables plug in here.


Power ON Switch

Voltage Selector Switch

The SATA “L” type connectors are connected directly to the tray in front of them. Marking them 1 - 4 or 1 - 8 to match the controller cards channels will make it easier to find a drive that reports an error and can be done with a marking pen on label maker.

When inserting the SATA Data Cable make sure the orientation is correct. The “L” type SATA connector only plugs in one way.
Specifications

DIMENSIONS:
3.5”H x 8.5”W x 12.0”D - 2 - 4 Bay System
3.5”H x 19.0”W x 12.0”D - 4 - 8 Bay Rack

POWER SUPPLY:
250W TUV/CE/UL/CSA - 90-264 VAC In. 2-4 Bay System
2 x 250W TUV/CE/UL/CSA - 90-264 VAC In. 4-8 Bay Rack

DATA TRANSFER RATE:
300 MB/second (actual speed depends upon the drive and the computer, see page 4 for details)

DEVICE SUPPORT:
3.5” SATA Hard Drives

CONNECTORS:
2-4 SATA 7 Pin / 1 IDC Power In - 2-4 Bay System
4-8 SATA 7 Pin / 1 IDC Power In - 4-8 Bay Rack

OS COMPATIBILITY:
Works with all OS’s that support SATA Hot-Swap or that have a compliant card and software. This includes Mac OS OS X.xx, Windows 98SE, ME, 2000, XP and Linux.

CABLE LIMITATIONS:
72” using Granite Shielded External Cables.
Warranty and Service

Granite Digital warrants your SATA Hot-Swap System against any defects in material and workmanship, under normal use, for a period of one year following its date of purchase. In the event this product is found to be defective within the warranty period, Granite Digital will, at its option, repair or replace the defective unit.

This warranty is void: a) if the unit is operated or stored under abnormal use and maintenance conditions; b) if the unit is repaired, modified or altered, unless such repair, modification or alteration is expressly authorized in writing by Granite Digital; c) if the unit is subjected to abuse, neglect, lightning strike, electrical fault, improper packaging, or accident; d) if the unit is installed improperly; e) if the serial number of the unit is defaced or missing.

Granite Digital will not, under any circumstances, be liable for direct, special, or consequential damages such as, but not limited to, damage or loss of property or equipment, loss of profits or revenues, cost of replacement goods, or expense or inconvenience caused by service interruptions. Under no circumstances will any person be entitled to any sum greater than the purchase price paid for the unit.

To obtain warranty service, you must contact Granite Digital’s Technical Support Department by calling 510-471-6442. They will attempt to diagnose and correct your problem by phone. If the unit does not function properly, they will issue a Return Material Authorization (RMA) number. You may be asked to furnish proof of purchase to confirm that the unit is still under warranty. Also have the serial number available.

All enclosures returned to Granite Digital must be securely packaged and shipped postage prepaid. All the product returns must be authorized in advance by Granite Digital’s Technical Support Department. Authorization is confirmed by issuance of the RMA number, which must be written prominently on the outside of the box in which the defective unit is returned to Granite Digital.