

MOUNTAIN SECURE SYSTEMS

Fibre Channel to SATA Conversion

White Paper: Mountain Secure Systems offers the most cost-effective, ruggedized solution for converting a Fibre Channel or SCSI interface to SATA in a standard 3.5" Form Factor.

ANDES
SERIES

FIBRE
CHANNEL



MOUNTAIN SECURE SYSTEMS
RUGGED & WIRELESS SOLUTIONS

RUGGEDIZED ELECTRONICS TO OUTLAST HARSH ENVIRONMENTS

Mountain Secure Systems offers the most cost-effective, ruggedized solution for converting a Fibre Channel or SCSI interface to SATA in a standard 3.5" Form Factor



All MSS conversion sleds are designed and manufactured to meet AS9100 configuration control standards and are fully-functional tested to the customer's environmental requirements prior to delivery.

Mountain Secure Systems (MSS) offers the most cost-effective solution in the marketplace to extend the life of legacy systems that utilize Fibre Channel or SCSI interfaces with its drop-in replacement conversion sled. The conversion sled mimics a 3.5" Fibre Channel or SCSI (50, 68 and 80-pin) HD or SSD by integrating a standard, commercially-available 2.5" SATA HD or SSD into a 3.5" standard form factor package. Almost any drive can be selected to best meet program requirements, including considerations of HD vs. SSD, capacity, price point, environment, speed, endurance, and Single Level Cell (SLC) versus Multi-Level Cell (MLC). This convenient solution reduces the effort of locating replacement end-of-life (EOL) drives, which may or may not be available, and helps avoid the high cost of redesigning and re-qualifying the architecture of the system to utilize modern interfaces.

MSS works directly with the leading players in interface conversion and integrates their technology into our own rugged package. Our solutions are designed to mitigate low frequency resonant vibration input to the HD/SSD, as well as provide an optimized path to conduct heat away from the drive. MSS conversion sleds can also be matched to the weight and center of gravity (CG) of the HD/SSD being replaced, which is important for systems used in flight, where it is imperative that nothing changes that would affect the original design criteria.

In addition, MSS conversion sleds incorporate an electrical barrier that prevents anything from shorting against the PCBA or HD/SSD. PCBAs are conformal coated to withstand moisture, sand, dust, etc. And, most importantly, all MSS conversion sleds are designed and manufactured to meet AS9100 configuration control standards and are fully-functional tested to the customer's environmental requirements prior to delivery.

Fibre Channel to SATA Embedded Storage Bridge Solution

The MSS **Andes Fibre Channel to SATA Conversion Sled** provides a path to remove high-cost FC drives in favor of lower-cost SATA drives. This can leverage FC connectivity from a RAID controller, creating a target for the storage device(s). This configuration can provide a high performance solution for enterprise class tiered storage JBOD.

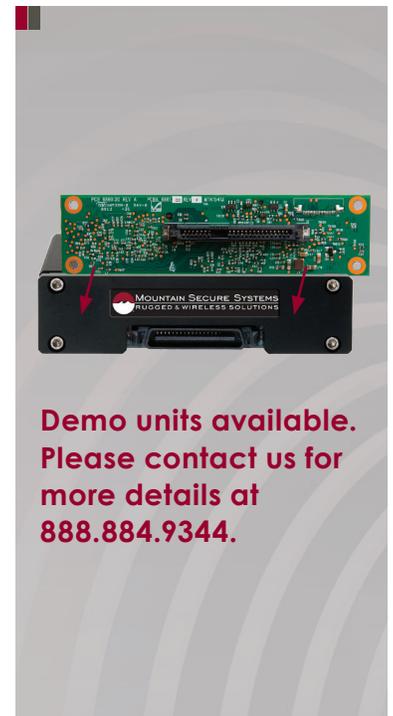
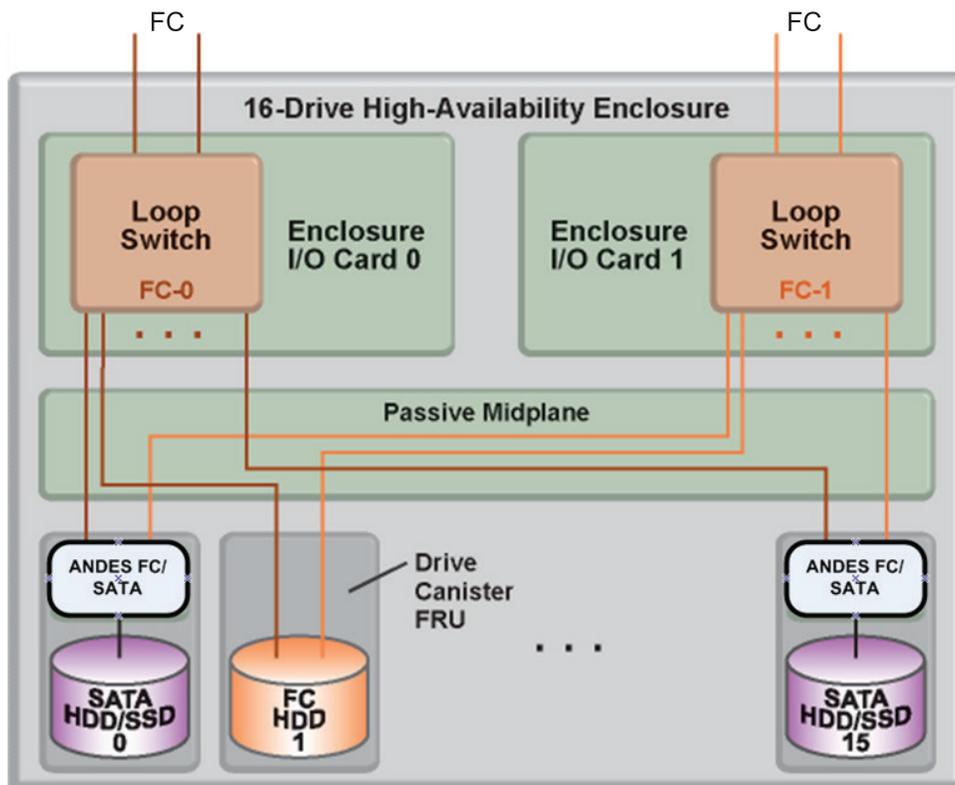
FC Ports and FCP Layer (Target Mode)

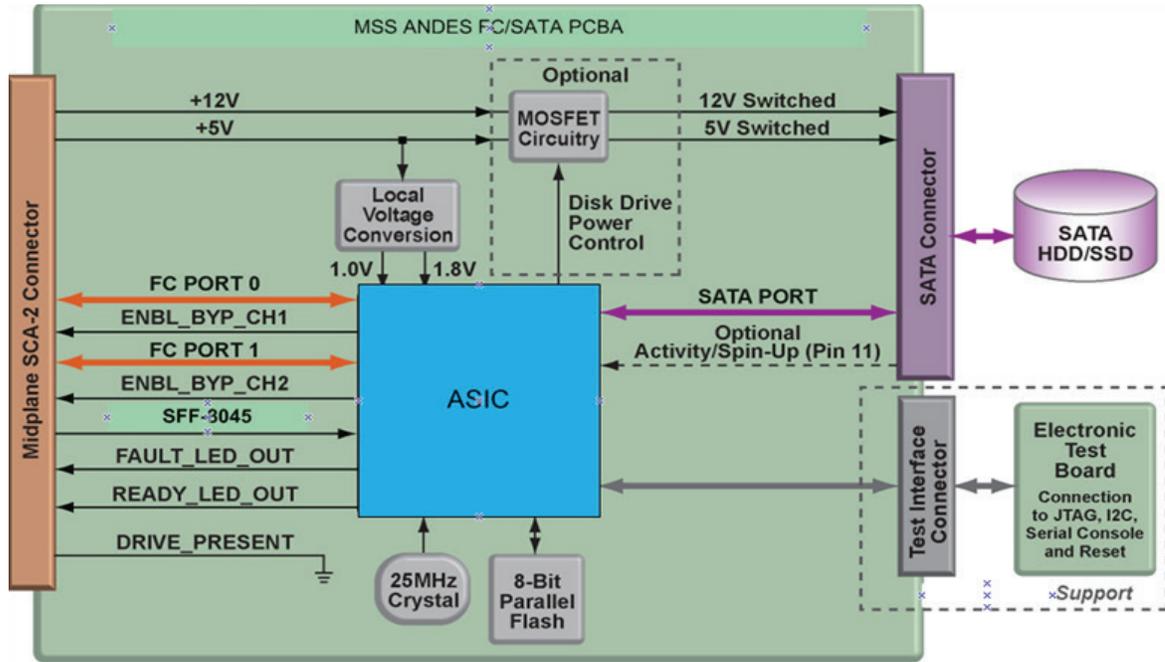
The MSS **Andes Fibre PCBA Hardware** provides two FC target ports for communicating with one or more initiators, such as RAID controllers and servers. The FC ports are independent and capable of full-duplex 1, 2 or 4 gigabit/sec operation. The FC ports are responsible for Physical Layer (FC-0) and Link Layer (FC-1) functionality, including data encode/decode, ordered sets handling, link control protocols, and basic frame validation and classification. The FC ports also handle Arbitrated Loop initialization, including participation in the master selection phase and loop map frame generation and reception. Both ports provide two Buffer-to-Buffer (BB) credits for managing data flow to the MSS Andes Fibre PCBA hardware.

The PCBA hardware FCP Layer is responsible for FC Layer 2 (FC-2) functionality, including exchange and sequence management, frame structure, flow control, and class of service. The FCP Layer supports the Class 3 (connectionless) class of service. The FCP Layer manages context data structures in

hardware to send and receive FCP frames with minimal CPU intervention. Essentially, the FCP Layer coordinates SCSI I/Os so that the CPU Complex is only involved for non-data frame processing, such as commands, XFER_RDY, Response and Link Service frames, and at burst boundaries for data frames. Disk emulation commands that are not I/O (performance path) related are processed by the CPU Complex.

The FCP Layer also implements an auto-FCP status generation under Native Command Queuing (NCQ). NCQ is a technology designed to improve performance and reliability as the transactional workload increases on SATA HDs. An auto-FCP status generation is only possible if status aggregation is not active and the device responds with a status prior to a timer expiration. This is accomplished by returning FCP status in the Arbitrated Loop tenancy (with minimal inter-frame gap) as the data sequence. The FCP Layer is also responsible for portions of the Layer 4 (FC-4) SCSI mapping.





SATA Port and SATA Layer (Target Mode)

The PCBA hardware supports a single SATA target port and it is capable of 1.5 and 3.0 gigabit/sec operation. The SATA port provides the host interface for communicating with a SATA disk drive. It implements the Transport, Link and Physical Layers as described by the SATA 1.0a and II specifications. The SATA port requires that the SATA drive supports 48-bit addressing mode only. It can accept any size Frame Information Structure (FIS), but it never transmits a FIS larger than 8 Kbytes, as the SATA specifications dictate. The Physical Layer of the SATA port also implements the required far-end, re-timed loopback mode using the Built-In Self-Test Frame Information Structure (BIST FIS). In addition, Spread Spectrum Clocking (SSC) is supported in the receive direction. The SATA port and SATA Layer support the SATA 1.0a and II specifications. This includes NCQ support. The SATA port and SATA Layer also comply with the ATA-5, 6, 7 and 8 specifications.

Features include:

- A solution to intermix dual port 4, 2 and 1 Gb/s FC and 3.0 and 1.5Gb/s SATA disk drives in a sled enclosure
- SATA II compliant with Auto-speed negotiation and Native Command Queuing to optimize the

order in which received read and write commands are executed

- Fault isolation
- Detailed diagnostic capabilities with various hardware bus attachments
- Node and Loop port support (private or public)
- Class 3 Soft and Hard device addressing
- Activity LED via FC interface
- Data Integrity: Data path is in hardware with variable size sectors supported
- Standard SFF-8045 support
- Hot plug
- SCSI CMD queue for up to 128
- GPIO ports can be provided
- Configurable Disk Scrubbing operations
- Industrial-rated components instantiated on 370HR PCB materials and conformal coating
- Embedded ASIC with single clock design
- 1149.6 AC JTAG support
- 20-pin test interface connector for testing and debugging
- 40-pin SCA-2 connector
- Modifiable Flash prom to facilitate the usage of a range of HBAs.

SCSI to SATA Embedded Storage Bridge solution

The MSS **Andes SCSI to SATA Conversion Sled** provides a path to SCSI to lower-cost and highly-available SATA drives. This is an Ultra320 SCSI-to SATA bridge solution with maximum data rate of 320MB/s on the SCSI interface and 1.5Gb/s on the SATA backend. It can be easily deployed to bridge between any SCSI host and SATA drive.

Features include:

- 50, 68 & 80pins SCA-2 for SCSI interface
- Built in SCSI to SATA conversion hardware
- SCSI Target mode
- Selectable SCSI synchronous offset
- Support LBA 48-bit addressing mode
- Synchronous transfer rate up to 320MB/s
- SATA 1.5Gb/s drive interface
- Cross-platform operation supports Windows and Linux

Physical Characteristics

The MSS Conversion Sleds are intended to replace 3.5" hard drives (HDs) and Solid State Drives (SSD). The physical characteristics of HDs are designed into the conversion sleds so they can mount directly into a 3.5" HH bay. The sleds have the same mounting-hole configurations and the same connector locations as a standard 3.5" HD. They are also configurable to match the weight and center of gravity (CG) of specific HDs. HDs are used in rugged environments, such as aircraft and military vehicles, which require isolating the drives in assemblies to protect them from high shock and vibration. In order to maintain the isolation characteristics of the assemblies, the conversion sleds must match the weight and CG of the hard drives being replaced. This can also eliminate the need to recalculate an equipment payload for aircraft.

The MSS Conversion Sleds are designed for rugged environments. All the PCBAs are conformal coated, and, in the FC models, the conversion chip has a conduction heat path to help cool it. The sleds have rugged frames that allow them to survive in high vibration environments, and are designed to mitigate resonances below 2 kHz. The frame construction is aluminum, with hard anodizing to withstand harsh handling. The sleds go through extreme temperature testing, as well as vibration tests, from DO-160. Since SSDs don't have delicate moving parts like a HD, they can be used in applications where it is impossible for a HD to survive. This is a significant advantage when considering SWaP.

Key benefits of MSS Conversion Solutions:

- The most cost-effective, ruggedized solution in the marketplace for converting Fibre Channel or SCSI to SATA in a standard 3.5" Form Factor
- Easy-to-use, drop-in replacement
- Enables low-cost SATA drives to be used transparently within existing FC or SCSI enclosures
- Enables vendor-independent SATA drive selection
- Firmware can be customized to a customer's specific application and system
- Avoid the high cost of redesigning and re-qualifying system architecture to a modern interface.

For more information call us at 888.884.9344.