

# RAM-SAN™

## 20-TB

### The World's Fastest Storage®

## RamSan-5000

- **10-20 TB Flash Storage**
- **20 GB per Second**
- **1,000,000 IOPS**
- **RAM Cache 160-640 GB**
- **20-80 FC Links (4Gb)**

### Capacity and Speed: Achieving the Ultimate Balance

The RamSan-5000 is a scalable enterprise data storage solution consisting of an array of ten individual award-winning RamSan-5000 Cached Flash Solid State Disk (SSD) units. The RamSan-5000 is available with 20TB of RAID-protected Flash, up to 640GB of RAM cache, and up to 80 4Gbit Fibre Channel ports (or 40 4x InfiniBand ports). It can deliver over 1,000,000 random read IOPS and up to 20GB/second of read or write bandwidth. Texas Memory Systems RamSan-5000 systems serve a range of enterprise requirements, including storage for large OLTP systems or data warehouses, video on demand, rendering, geospatial analysis, seismic processing, and data acquisition. The unique combination of cache to accelerate writes and Flash to accelerate reads results in a system truly balanced for enterprise applications.

### Turbo-charged Solid State Disk

In order to maximize the performance of the predominantly Flash-based RamSan-5000 units that make up the RamSan-5000, an optional Turbo feature has been integrated into this Solid State Disk system allowing its users to lock a logical unit of storage in the large RAM cache. The Turbo feature transitions the RamSan system into a self-contained tiered storage solution with frequently-accessed files placed in persistent RAM storage while the remaining files are stored in Flash. A single RamSan-5000 with the Turbo feature can provide over 3,000,000 random IOPS based on a mixture of accesses to the locked LUN and Flash memory.

### Highly Reliable Storage

The RamSan-5000 is designed to offer superior reliability compared to other SSD and RAID devices. Its standard features include: Chipkill™-protected RAM, RAID protected hot-swap Flash storage, hot-swap power supplies, redundant Fibre Channel ports, and SNMP compatibility. The RAID design ensures data integrity even with a complete failure of a single Flash module. In addition to the RAID protection, each Flash module incorporates its own error-correcting technology.

## Flash & RAM



**RamSan-5000**

## CACHING

- The Large DDR RAM cache in the RamSan-5000 enables the system's high performance
- The fusion of RAM and Flash allows the RamSan-5000 to leverage the strengths of both media:
  - Blazing read/write performance (RAM)
  - Fast read performance (Flash)
  - High density (Flash)
  - Low power (Flash)
- Cache can be tuned for Read-Ahead
- Write-through and write-back caching modes are supported
- In write-back mode dirty writes flush to Flash memory when shut down or if external power fails  
This operation is supported with redundant internal batteries

## SCALABILITY

- 160-640GB RAM cache
- 10 or 20TB Flash storage
- Multiple RamSan-5000s can be used to scale to higher capacities

## LUN SUPPORT

- 10 to 10,240 LUNS with variable capacity per LUN
- Flexible assignment of LUNs to ports
- Hardware LUN masking

## MANAGEMENT

- Browser-enabled system monitoring, management, and configuration
- SNMP support
- Telnet management capability
- Front panel displays system status and provides basic management functionality

## FLASH MODULES

- The RamSan-5000 leverages ninety proprietary Flash modules with up to 256 GB of capacity each. Within each module is a powerful Flash controller that handles wear leveling and parallel operations to reach high performance levels. The module's back-end connectors use a high density pin block connector and a specialized low latency protocol.
- The Fastest Write Performance of any Flash system is achieved with the RamSan-5000 since the writes are buffered by the battery-backed cache before they are mapped to the Flash.
- RAID-3 protection across the modules is provided by dual RAID controllers that are built specifically to leverage Flash. The controllers allow modules to be hot-swapped and can rebuild the RAID online.

## DATA RETENTION

- Completely nonvolatile solid state disk

## RELIABILITY AND AVAILABILITY

- RAM cache features
  - ECC and Chipkill prevent data corruption by protecting against single-bit errors as well as chip failures
  - Soft error correction improves system reliability by rewriting ECC corrected data
- Flash memory features
  - Layer 1: ECC (chip)
  - Layer 2: RAID 3 - hot swap modules provide the highest availability for the Flash
  - Wear leveling
  - SLC NAND Flash memory
- Hot swap redundant power supplies
- Redundant batteries
- Active:Active controllers

## Specifications

<b>Capacity</b>	(unit)	10-20TB Flash memory
	(cache)	160-640GB DDR RAM
<b>I/Os per second read</b>		1,000,000 (random)
<b>I/Os per second write</b>		250,000 (random)
<b>Bandwidth</b>		20-GB/second
<b>Latency: cache hit</b>		15 $\mu$ s
	cache miss	200 $\mu$ s
<b>Power Supplies</b>		Redundant Hot-Swap
<b>Batteries</b>		20 Redundant
<b>Size</b>		70" (40U) x 20"
<b>Power Consumption</b>		3,000 Watts
<b>Weight (maximum)</b>		700 lbs
<b>Interfaces</b>		20-80 FC Links (4Gb)

