



Top Ten Storage Guidelines for Compliance Readiness



Abstract

This report covers recommendations by the professional staff at GST, Inc. to assist in complying with new regulations mandating how recordkeeping must be performed across a broad range of industries. Compliance with the new records management regulations will become increasingly important as critical compliance deadlines draw near. sAIT and AIT tape technology, along with GST's unique intellectual property can play a role in achieving compliance.

A dedicated manufacturer of tape storage solutions, GST, Inc. produced this GST Research Report as part of its commitment to provide information leading to the better management of data and application protection within the IT industry.



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Forward

The situation that US-based organizations are faced with today regarding compliance with records-keeping regulations is covered in GST's Research Report, *Current Compliance Issues for Storage Professionals*. This paper is available at: <http://www.gstinc.com/white/compliance.pdf>. It shows that the newly-mandated rules are making a significant impact on storage strategies and backup processes as well as the retention and protection of stored data.

The number of estimated laws, rules and regulations on record-keeping that organization must comply with range between 10,000 and 15,000. Not all apply to a particular industry, but every organization is facing a mountain of regulations that are changing and becoming more stringent. This makes compliance with these regulations a continual challenge and one that makes increasing demands on the organization's IT resources, since most records today are stored in electronic form.

Just about every industry has been affected by the new regulations. Although more may be written about the medical, financial and FDA-related industries, no organization is immune to their reach. Your organization may not be one of the more highly regulated industries, but so long as you file a tax return (even if non-profit) and have a certain level of capitalization, you fall within their scope and reach....with violations resulting in significant fines and even imprisonment.

Failure to comply with these regulations can result in severe penalties that have ranged into the millions of dollars, result in prison sentences of up to 20 years and do permanent damage to an organization's reputation within its markets and the business community.

As mentioned in the above-referenced GST Research Report, "With deadlines approaching, and many already here, the compliance issues that storage managers and records management managers face must be thoroughly understood. This understanding of the compliance issues at hand is needed to begin to formulate the best way for each organization to become regulatory compliant in a way that adds rather than detracts from the organization's performance."

The guidelines for compliance readiness presented here are provided to assist you to develop successful practices for becoming regulatory compliant.

GST has gained experience with all the major tape technologies used to protect data files today. These are represented in the table near the end of this report. Of all of them, Super-AIT (sAIT) and AIT are the two tape technologies that offer the greatest promise for meeting the challenges made by the new record-keeping regulations. GST has built on the inherent capabilities of sAIT and AIT, adding its own innovative solutions, to provide answers for industry-wide compliance challenges.



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Note: In this report, we have used **boldface** to emphasize wording in excerpts to show what is most relevant to IT strategies. We have also included two **Tape Technology Comparison Charts** at the end of this report for your reference.

#1

Incorporate WORM technology – Write Once Read Many (WORM) identifies a storage drive technology that includes built-in protection against writing over any data stored on the media. If the media already contains some recorded data, additional data is appended just after the existing data. Specialized storage drives and media are available with WORM technology for tape, optical disk and magnetic disk. WORM tape drives with WORM cartridges provide the best mix of high performance and large capacity for most servers. WORM with optical disk has three drawbacks: capacity is limited, performance speeds are too low and cost per MB is high. The third alternative, magnetic disk with WORM technology, is not very satisfactory for long-term storage due to the lack of portability of hard disk drives. Also, using it for remote storage is impractical and cost per MB is high.

GST Solution: WORM technology is available for GST's tape backup solutions that utilize Super-AIT (sAIT) and AIT tape technology. No other tape technology has implemented WORM yet.

#2

Mirror your backups – The use of **Mirrored Backup Technology** enables the simultaneous creation of identical backup cartridge sets simultaneously. This technology has multiple benefits. First, immediate backup sets provide one on-site set for rapid restores and another set for safekeeping off-site to strengthen the Disaster Recovery (DR) function. Second, duplicate backup sets ensure that copies of backup data are available almost immediately for review by outside auditors. Third, the likelihood of a successful backup or restore procedure is increased greatly through the fail-safe characteristics of mirrored backup technology, where one drive continues the operation even when the other drive experiences a failure.

GST Solution: GST's Dual-Drive Tape Subsystems, and Tape Libraries use GST's own Mirrored Backup Technology to provide GST's **Server-Transparent Media Duplication™ (STMD)™** that delivers identical sets of backup tapes with no penalty to the server.



GST SafeDR™ sAIT-1 Tape Subsystem



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#3

Utilize tape drives with highest reliability ratings – The **Mean Time Between Failure** rating (MTBF) is a longstanding reliability measure that focuses on the expected time until the next failure of a device. MTBF ratings for all the popular high performance tape technologies are shown on the Tape Technology Comparison Chart below. Another key measure of drive reliability is head life hours; these ratings are also in the chart; note that sAIT drives are certified at 50,000 hours, others are less. A measure of cartridge and media reliability is the number of end-to-end reliable media passes; note that sAIT drives are certified up to 30,000 end-to-end passes, others have lower ratings.

GST Solution: GST carries all the latest tape super-drives available in the market. Note that sAIT and AIT have the highest MTBF reliability ratings among tape technologies.

#4

Employ media with highest shelf life – Media with shelf-life ratings of up to 30 years or higher help to meet compliance regulations pertaining to sustained media storage viability. The rated shelf life of all leading tape media is shown on the chart below. To attain the time periods shown, manufacturers usually require that the media be stored in strict accordance with their physical storage specifications.

GST Solution: All the drives supported by GST have rated media archival lives of 30 years.

#5

Use Backup Consolidation techniques – A variety of approaches to backup consolidation can all be beneficial. The three main ones are described below:

- **Media Consolidation:** Consistent use of one tape technology greatly simplifies the management of removable media. Particularly with tape, the different technologies have widely differing cartridge dimensions; use of a common physical format supports easy and error-free storing of cartridges.
- **Hardware Consolidation:** Using of tape libraries to back up multiple servers consolidates the tape hardware and the location and handling of media into one place, which facilitates both the management of backup media and its security.
- **Software Consolidation:** Using centralized tape management software product permits use of a single set of software for backing up multiple servers, thus tightening controls over the maintenance of backup software.

GST Solution: GST supports Hardware Consolidation through its tape libraries. GST libraries use the company's **Virtual Library Partitioning** technology to back up 2 - 16 servers or logical partitions with one tape library. Cartridges are allocated to the servers as needed.



GST Commander™ Controller



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#6

Utilize tape technologies with extended roadmaps – Longer retention periods for removable media are being mandated. This requires a robust technology roadmap with a longer technology life, so that conversions from end-of-life technologies to newer technologies are minimized. AIT, DAT72, LTO, sAIT, sDLT and SLR each has a road map that indicates current and future generations; the last generation date is associated with the end-of-life.

GST Solution: The current LTO roadmap ends in 2007, while the AIT roadmap extends to 2008 and the sAIT roadmap extends to 2010.

#7

Reduce the complexity of media management – Decreasing the workload of managing backup and archival media can greatly simplify the backup operation and strengthen controls and security over backup procedures. This is accomplished in part by selecting backup media with larger capacities – typically with a native capacity of 100GB or more. Larger capacity cartridges generally permit an entire backup to fit on a single cartridge. Having only one removable media per day simplifies the cataloging, managing and storing of backup media.

GST Solution: For larger organizations, tape super-drives using sAIT tape technology with a native capacity of 500GB and a maximum compressed capacity of 1.3TB offer single-cartridge backup capacities. For smaller organizations, AIT3 offers a native cartridge capacity of 100GB and a maximum compressed capacity of 260GB.

#8

Perform complete backups everyday – Most installations follow a practice of doing **full backups** on the weekend and daily **incremental backups** of what has changed each weekday. With this method, a full picture of the current state of server files backed up is obtained by starting with the last full backup set and then successively applying the incremental backups until all are applied to bring the server files current. Changing to a policy of making full backups every day increases the demands on backup capacity and speed, but has three important advantages:

- A full restore only requires using the last full backup tape.
- Files can be restored more quickly to a usable state.
- Managing backup media is simplified, since larger-capacity drives can backup a day on one cartridge.
- Providing easy-to-use backup data to auditors is simplified.

GST Solution: Larger cartridge capacities of GST's 100-500GB super-drives support this approach, as do the faster backup speeds.



GST EntryDR™ AIT Tape Subsystem



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#9

Incorporate your workstations into your backup procedures – Often the backup strategies of an organization focus on larger server-based data files. Organizations often pay less attention to protecting data on individual workstations tied into the server network. Saving workstation data will automatically archive required employee documents and correspondence including **emails**. Backing up **Instant Messaging** communications also must be reviewed; the more-regulated industries like investments and securities already are mandated to do so. Factors that have discouraged a centralized backup function for workstations are the massive increase in backup data volumes and longer backup processing times; both of these need to be carefully managed.

GST Solution: Larger cartridge capacities of GST's 100-500GB super-drives support full system backups, as do the faster backup speeds.

#10

Take advantage of concurrent backup streams and direct server attachments – The growing roster of compliance regulations will significantly raise the frequency and amount of data backed up. Also, greater backup volumes will put increased pressure on the window of time available for the backup operation. In addition to the use of newer, faster high-capacity drives, there are additional approaches to expanded backups that can improve the operation:

- **Concurrent backup:** The use of concurrent backup operations to produce multiple backups simultaneously can significantly shorten backup times.
- **Direct attach:** Instead of backing up servers through the network, which can create significant network bottlenecks, use direct SCSI or fibre attachments to each server for optimum backup speeds.

GST Solution: GST storage engineers are available to consult in data protection areas. Client work includes configuring both concurrent backup operations and planning direct attach connections for faster server backups.



GST SafeDR™ AIT Tape Subsystem



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- Super Drive - Technology Comparison Chart

Specification	sAIT-1	sDLT 600	LTO-2	sDLT 320	AIT-3	LTO-1
Capacity and Performance						
Native Capacity	500 GB	300 GB	200 GB	160 GB	100 GB	100 GB
Compressed Capacity	1.3 TB	600 GB	400 GB	320 GB	260 GB	200 GB
Native Transfer Rate	30 MB/s	36 MB/s	35 MB/s	16 MB/s	12 MB/s	15 MB/s
Compressed Transfer Rate	78 MB/s	72 MB/s	70 MB/s	32 MB/s	31 MB/s	30 MB/s
Average Compression Ratio	2.6:1	2:1	2:1	2:1	2.6:1	2:1
Average File Access Time	45 sec	79 sec	49 sec	70 sec	< 27 sec	73 sec
Average Media Load Time	15 sec	12 sec	15 sec	12 sec	< 10 sec	21 sec
Roadmap						
Remaining Generations	3	2	2	2	3	2
Estimated Final Release	2010	2007	2007	2007	2008	2007
Max Compressed Capacity	10.4 TB	2.4 TB	1.6 TB	2.4 TB	2 TB	1.6 TB
Max Transfer Rate	624 MB/s	200 MB/s	320 MB/s	200 MB/s	250 MB/s	320 MB/s
Technology						
WORM Enabled	Yes	No	No	No	Yes	No
Automatic Head Cleaner	Yes	No	No	No	Yes	No
Buffer Size	64MB	64MB	64MB	64MB	18MB	32MB
Auxiliary (Cartridge) Memory	Yes	No	Yes	No	Yes	Yes
Power Consumption	25 watts	35 watts	29 watts	27 watts	18 watts	41 watts
Reliability						
MTBF (Hours)	500,000	250,000	250,000	250,000	400,000	250,000
Duty Cycle	100%	100%	100%	100%	100%	100%
Head Life (Hours)	50,000	30,000	N/A	30,000	50,000	60,000
Media Uses (end-to-end passes)	30,000	17,850	5,000	17,850	30,000	5,000
Media Archival Life	30 years	30 years	30 years	30 years	30 years	30 years



GST GrowthDR™ sAIT Library



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- Compact Drive - Technology Comparison Chart

Specification	Mammoth2	sDLT 220	AIT-2	VXA-2	SLR100
Capacity and Performance					
Native Capacity	60 GB	110 GB	50 GB	80 GB	50 GB
Compressed Capacity	120 GB	220 GB	130 GB	160 GB	100 GB
Native Transfer Rate	12 MB/s	11 MB/s	6 MB/s	6 MB/s	5 MB/s
Compressed Transfer Rate	24 MB/s	22 MB/s	15 MB/s	12 MB/s	10 MB/s
Average Compression Ratio	2:1	2:1	2.6:1	2:1	2:1
Average File Access Time	52 sec	70 sec	< 27 sec	N/A	58 sec
Average Media Load Time	17 sec	40 sec	< 10 sec	30 sec	< 30 sec
Roadmap					
Remaining Generations	N/A	2	3	N/A	3
Estimated Final Release	N/A	2007	2008	N/A	2007
Max Compressed Capacity	N/A	2.4 TB	2 TB	N/A	400 GB
Max Transfer Rate	N/A	200 MB/s	250 MB/s	N/A	64 MB/s
Technology					
WORM Enabled	No	No	Yes	No	No
Automatic Head Cleaner	No	No	Yes	No	No
Buffer Size	32MB	32MB	10MB	2MB	8MB
Auxiliary (Cartridge) Memory	No	No	Yes	No	No
Power Consumption	16 watts	26 watts	12 watts	10 watts	23 watts
Reliability					
MTBF (Hours)	300,000	250,000	300,000	300,000	300,000
Duty Cycle	100%	100%	100%	12%	100%
Head Life (Hours)	50,000	30,000	50,000	N/A	10,000
Media Uses (end-to-end passes)	20,000	17,850	30,000	N/A	N/A
Media Archival Life	N/A	30 years	30 years	30 years	20 years



GST InternalDR™ AIT Tape Subsystem



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Conclusion

With the extended retention periods mandated for most organizations in the US, electronic records must be stored in ways that ensure their protection and original condition. Records management must include the assurance that records have been archived in a non-erasable, non-corruptible format and that data is safe to be stored for highly extended time periods. Multiple copies of that data need to be maintained, so that all original records are available to regulators on demand no matter where they are located.

WORM technology will be an essential pillar in the infrastructure needed to achieve compliance. Sony has implemented WORM technology on their sAIT and AIT tape drives which are in turn used to provide the inner technology for GST's tape subsystems and libraries. The option of having WORM technology on a tape drive assures the indelible nature of recorded and stored data. sAIT and AIT technology also provides a tested shelf life of over 30 years when stored under conditions that are consistent with those in Federal guidelines.

As a provider of backup solutions, GST has a great interest in all emerging storage issues. Our Mirrored Backup technology and WORM technology products can play a constructive part in assisting organizations to achieve the required levels of compliance that are mandated by the new laws and regulations.

With the Sarbanes-Oxley Act coming due in 2004, and other regulations coming due in a seemingly random and haphazard fashion, developing a compliance strategy should be a top priority on IT agendas in 2004.

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About the author

This GST Research Report was prepared under the leadership of David Breisacher, CEO/Chairman at GST. In addition to founding GST, David has founded several other successful companies including BCC Technologies, a manufacturer of eServer disk, tape and memory storage devices. A visionary for the storage industry since the early 90's, David's market insights and predictions for the storage marketplace are impetus for the research conducted at GST. His experience at structuring backup strategies for hundreds of organizations to meet their data protection needs uniquely qualifies David as the author of this paper. If you would like to contact David for further information, he can be reached at GST: 949-900-1090 Extension 200, email dbreisacher@gstinc.com.



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Feedback

We value your feedback on this GST Research Report. Please send your comments, suggestions and questions to: research@gstinc.com.

About GST, Inc.

GST Inc. engineers, manufactures, markets and sells a full line of innovative storage backup and restore products to meet today's need for high-performance, fail-safe reliability and cost-effective data storage. Solutions support a wide variety of servers. GST's advanced tape solutions focus on improved backup/restore processes and enhanced disaster recovery. Products range from single and dual tape subsystems and autoloaders to midrange tape libraries and modular enterprise-wide libraries. Unique modular design enables field upgrades, scalability, investment protection and lower life-cycle costs. Development is guided by expert advisory boards that closely track market needs and ensure use of the latest engineering technology in product design. Complete information about the company, its products and support can be found at: <http://www.gstinc.com>

GST maintains corporate offices in the Spectrum Centre Business Park, one of Southern California's premier high-tech business centers near the Santa Ana (I-5) and San Diego (I-405) Freeways, Amtrak and John Wayne Airport. Lake Forest is adjacent to Irvine in the Greater Los Angeles Area.

Trademarks

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