

Reasons for Using an LCD Operator Panel



Abstract

The increasing need to safeguard the enterprise's data is placing greater importance on the backup function. One critical link in the backup function is the backup device being used and the capabilities engineered into this device.

This paper explores the importance of an LCD operator panel on the backup device that provides data describing the functioning of the device for use by the operator responsible for performing backups and restore operations using tape backup media.

A dedicated manufacturer of tape storage solutions, GST, Inc. produced this GST Research Report as part of its commitment to provide information leading to improved safeguarding of mission-critical applications and data within the IT industry.



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Executive Summary

Backup has become today's major line of defense against catastrophic operational failure of the enterprise. Essential to the backup and restore operations is the information available to the operator of the backup tape unit. The most important source of this information is the device itself. Therefore, what the device can tell the operator about how the backup operation is performing is vital to the success of any backup or restore.

Display of the complete status of the backup drive and media can provide inexperienced operators of backup and restore functions with specific data on the critical performance and operational measures of the backup device and job during execution. This additional information can reduce the errors made by operators making decisions on incomplete information.

The more complete the status information is for the drive performing the backup, the more effective the operator will be in working with technical support personnel during the problem identification stage as well as in getting the problem rectified and the backup completed. In a remote location, the capability of the drive to communicate detailed status information directly to the local operator is even more critical.

The LCD module is uniquely suited to provide a wealth of information to the operator during the backup or restore operation, to better ensure the successful completion of this critical operation. For this reason, GST has engineered an LCD operator panel into many of its tape backup products.



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The material that follows is meant to provide information that can be useful to organizations assessing the value of an LCD Operator Panel as a part of their backup infrastructure.

Background

The need to safeguard data has become highly critical following the World Trade Center attack and since the debacle of major corporations like Enron and Anderson Consulting. Data is no longer viewed as the property of the safeguarding organization alone. Data protection methods are being mandated by federal and state legislation including the Sarbanes-Oxley Act, HIPAA and the Graham-Leach-Bliley Act among thousands in force today. This has placed intense focus on how data is backed up, stored, and safeguarded from unauthorized access or alteration

In recent years, the preservation of critical data at most organizations, including all publicly-traded ones, has taken center stage. Backup equipment and procedures are a central part of data protection processes as well as the actual survival strategy of most enterprises.

The failure of a backup operation can threaten the entire organization for days. It can even put the enterprise out of business. Organizations that fail to have access to their critical computer files for periods as little as a week can find themselves out of business within the next several years.

The Gartner Group industry analyst organization has listed the following findings in connection with disasters and loss of data/files/applications:

- Nearly 75% of all U.S. businesses have experienced an interruption.
- 20% of all small to medium businesses suffer a disaster every 5 years.
- 43% of all U.S. companies never re-open after an unexpected business interruption and 29% close within 3 years.
- 93% of companies with a significant data loss are out of business within 5 years.

Furthermore, a recent Contingency Planning Group study shows that the financial impact of one or more hours of main server downtime can be quite costly:

- Nearly half of all companies reported that each hour of downtime costs them at least \$50,000.



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- One in four companies reported their cost of downtime ranges from \$250,000 to a \$1million or more.

Clearly, backup processes have become one of today's major lines of defense against catastrophic operational failure of the enterprise.

An essential link in all backup and restore processes is the information available to the operator of the backup tape unit. The most important source of this information is the device itself. Historically, LED (light emitting diode) indicator lights provided minimal information about whether power is present in the unit and if the device is ready to operate. This is where the function of LED lights usually ends.

However, there are other types of information regarding the status of the drive, the backup operation and the media that can be communicated to the operator. To display this information requires an LCD (liquid crystal display) mounted in an operator panel easily visible by the operator.

This GST Research Report focuses on the function and benefits of the operator panel as part of a tape backup solution.

Reasons

1. What is an LCD?

In its early research into backup and data protection needs, GST's engineers found a strong interest in a product that would provide operators easy-to-read information about important measures like tape presence, readiness, when to clean, movement operations and remaining unused capacity, to name a few. The best way to display this information is with a specialized operator panel right on the tape backup device. Liquid Crystal Displays (LCDs) offered a technology that would be both easy to read and low in incremental cost to the drive. The LCD takes very little power, is easy to read and permits entering messages of several words to several sentences.

2. How does GST implement LCDs in their tape units?

GST provides real-time operator information with the GST LCD Operator Panel that continuously displays key tape conditions to help operations personnel monitor the status of the drive and backup operation on a continuous basis. The multi-function LCD Operator Panel, is an integral part of the drive.

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How does the GST Operator Panel work? GST developed and patented two types of intelligent LCD Module that contain the LCD Operator Panel. The two types differ in terms of the LCD size:

- **2x8 LCD Screen:** Displays two rows of eight characters each. This type is enabled for tape technologies using 3.5 inch drive form factors. GST developed a patented LCD Module to hold both the 3.5 inch drive and the LCD display and components within a standard 5.25 inch drive bay.



- **2x40 LCD Screen:** Another GST Operator Panel for tape technologies with 5.25 inch drive form factors has a an LCD screen with two rows of 40 characters each. This unit is also used in the GST Commander™ Tape Controller.



3. How do drives without LCDs operate?

Tape drives that do not use an LCD screen to communicate device status with the operator, generally use a combination of Light Emitting Diode (LED) indicators. Meaning is attached to the LED's by changing the color or presenting several (usually three) in various combinations of ON, OFF or BLINKING.



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A review of a cross-section of tape devices with LED lights shows the following type of code setup:

Message	Light A	Light B	Light C
Tape loaded	ON	DM	DM
Write or read	Slow blink	DM	DM
Other access	Fast blink	DM	DM
Needs cleaning	DM	ON	DM
Cleaning not done	DM	Slow blink	DM
Media error	DM	DM	ON
Hardware error	Fast blink	Fast blink	Fast blink

Note: DM means light configuration doesn't matter.

In this example, the operator must be able to discern that an LED that is ON from one that is blinking fast or blinking slow and the combinations include the fact that some lights are to be ignored (DM) in the inspection of lights to determine the cause of error. The use of LED light combinations generally restricts the number of messages that can be communicated to a reasonable set of combinations. Field updates cannot be made to the messages, other than changing the manuals that define the LED combinations.

4. What problems can occur without an LCD?

The failure of a backup operation can quickly reach serious or even catastrophic proportions. This occurs when in the same day that a backup fails there is a computer failure and the system goes down. The previously stored backup data must be accessed to initiate the restore process to recover the computer to the state it was in when the most recent backup data was collected. Each hour of server downtime can cost millions of dollars for organizations where critical applications are handled on-line in a real-time environment. For every organization, there is a point, beyond which it cannot survive if computer operations are not restored. Thus, successful backup and restore operations are essential to enterprise survival.

The use of an LCD operator panels on backup devices is of value under any circumstances. However, there are some situations where the additional information afforded by an operator panel is of greater importance. These include the following:

- **Personnel issues.** When the operator performing the backup or restore processes is new to that job, or has not received formal training and certification to perform the backup or restore operations, the risk of an operator error is always greater. Hence, the need to provide additional information about the status of the backup operation and device is doubly important.



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- **Remote locations.** Whenever the operator is physically separated from the central IT function, the ability to quickly access help in case of a problem is generally not available. Additional information about the status of the backup is important when technical support is remote and generally provided initially by telephone.
- **Strain on help desks.** Centralized help desk functions perform better, the more information they can be given about the problem at hand. Without the extra information provided via the LCD operator panel, the time it takes to diagnose the problem is extended and the advice given can take longer and be less accurate.
- **Busy Locations.** When the workload increases to the point that there is little margin for error, then there is little time for repair operations. The ability to run backup and restore operations with minimal or no operator error is critical under these conditions.
- **Equipment Turnover.** Changes in hardware, operating systems or backup software, can introduce confusion into the backup arena. The consistent information that the LCD operator panel displays maintains an air of familiarity within the backup or restore process that can help eliminate operator errors during times of equipment turnover.

5. What are the benefits of an LCD operator panel?

Continuous display of the most-critical operational factors can ensure that even an inexperienced operator of tape backup and restore functions has awareness of all key performance and operational measures of the tape unit. This more-complete information can eliminate errors made by operators, particularly where the operator is new or inexperienced, or is operating in an isolated environment and making decisions alone.

Units without an LCD operator panel generally have two or three colored lights to communicate the present state of the unit to the operator. Such a scheme is not conducive to communicating the status of the drive whenever intervention of any type is needed, since light combinations are easily subject to mis-reading.

6. Where does GST implement its LCD Operator Panel?

GST uses both a smaller 2-line 8-character-per-line LCD and a 2-line 40-character-per-line LCD. The smaller LCD goes in the AIT tape technology drives with a 3.5 inch form factor. The larger LCD is used for other tape technologies that have a larger form factor.



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GST incorporates its two sizes of LCD Operator Panel throughout most of GST's product line. See the chart below.

Family	2x8 LCD	2x40 LCD
InternalDR - Single Drives	x	
EntryDR - Single Drives, External	x	x
SafeDR - Dual Drives		x
AutoDR – Autoloaders		x
GrowthDR - Midrange Library		x
ScalableDR - Enterprise Library		x

7. LCD operator panel messages.

The types of information provided by the LCD operator panel on GST's drives includes:

Media Present: tells whether a tape cartridge is present or absent in the tape drive. This fact is not always visible by simply viewing the drive.

Ready: whether the tape drive is ready for operation or not.

Clean Me: the need for cleaning functions to be performed on the drive.

Read: shows when a read operation is taking place in the drive.

Write: shows when a write operation is taking place.

Load: shows when a tape cartridge is being loaded into the drive.

Unload: shows when a tape cartridge is being unloaded from the drive.

Rewind: shows when the tape cartridge is being rewound.

Position: shows when the tape cartridge is being positioned prior to reading.

Remaining MB: shows remaining megabytes of unused capacity on the tape; continuously updated as data is written to the tape. Display is in uncompressed bytes. It is used to determine when the capacity of the tape has reached its limit and approximately how much longer the backup will take.



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As examples of operator panels that provide a deeper level of information to the operator, links to two different photos of GST LCD Operator Panels are shown below:

- AIT tape drive with LCD - http://www.gstinc.com/images/int_ait_hires.jpg
- AIT tape drive with LCD up close - http://www.gstinc.com/images/int_aitcloseup_hires.jpg

-END-



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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.

Related GST Research Reports

Click here for a complete list of GST Research Reports on data protection.
<http://www.gstinc.com/white/index.html>

About the authorship of this paper

This GST Research Report was prepared by GST's Research & Engineering Group under the leadership of David Breisacher, CEO/Chairman at GST. David is the founder of several successful companies, including GST and BCC Technologies, a manufacturer of eServer disk, tape and memory storage devices. A visionary for the storage industry since the early 90's, David lends his market insight and predictions for the IBM midrange storage marketplace to the research conducted at GST. His experience in sensing shifts in technology and industry directions has made it possible for him to organize and structure successful companies to rapidly meet the evolving needs of storage users.

About GST, Inc.

GST, Inc. (www.gstinc.com) engineers, manufactures, markets and sells a line of innovative storage products to meet the need for high-performance, continuous reliability and cost-effective data storage. These products include tape solutions available today, and will include storage-related services, software and disk subsystems in the future. A comprehensive array of tape solutions range from single and dual tape subsystems, autoloaders, midrange tape libraries, to modular enterprise-wide tape libraries, with focus on improved backup and disaster recovery solutions. Modular design enables field upgrades, scalability, investment protection for existing GST tape solutions, and lower life-cycle costs. GST's product development is guided by several advisory boards to closely track market needs and fully utilize the latest engineering developments in product design. Complete information about products, support and company background can be found at the company's Website.

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