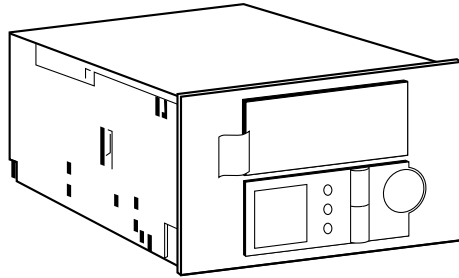


Intel StorageExpress™ System

Automating Enterprise Backup with the StorageExpress System

The Intel StorageExpress™ System is a self-contained data management server designed to back up and restore data from file servers, workstations, and UNIX systems in a NetWare* network. With its Autochanger option, the StorageExpress system introduces a new standard of automation and convenience for network administrators.



StorageExpress™ System Autochanger

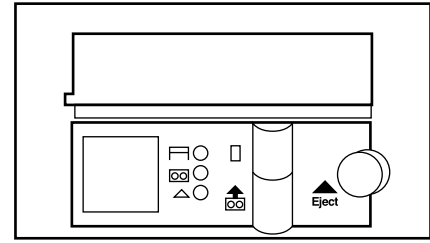
Introduction to the Autochanger

DDS-2 tape drive plus picker mechanism

The StorageExpress system Autochanger is a full-height SCSI device which occupies two half-height drive bays in a StorageExpress II System control unit or a peripheral box. The Autochanger is composed of two parts: a DDS-2 DAT tape drive and a tape loading mechanism which handles a six-tape DAT magazine. The tape loading mechanism automatically ejects or inserts tapes into the embedded tape drive and rotates the magazine in its internal turntable to access all six tapes. The Autochanger only consumes a single SCSI address, unlike some Autochangers in which the tape drive and picker mechanism are separate SCSI addresses.

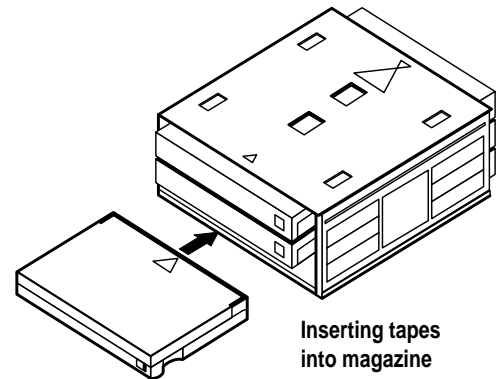
Front panel of Autochanger

The front panel of the Autochanger has three buttons and an LCD panel. The buttons are used to eject the magazine of tapes or to manually load a tape into the internal tape



Front Panel

drive. The LCD panel includes a 10 character display to communicate drive status messages, with additional indicators to display how many tape cartridges are in the current magazine, which tape is loaded in the internal drive, whether compression is on or off, and whether or not the loaded tape is write-protected. Finally, there is a tape odometer which indicates the current tape position relative to the full length of the tape.



Inserting tapes into magazine

Using the Autochanger

Inserting tapes into the magazine

The Autochanger uses a magazine to hold up to six DAT tapes in the Autochanger at a time. Inserting tapes into the magazine is simple: hold the spine of the tape in your hand and push the tape into an open slot of the Autochanger magazine, as shown in the illustration above.

Inserting the magazine into the Autochanger

Inserting the magazine into the Autochanger is just as easy. Simply insert the magazine

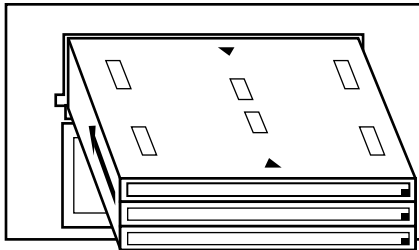


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into the faceplate opening in the Autochanger and push gently. The Autochanger will automatically grab the magazine and draw the magazine in toward the Autochanger's turntable. The StorageExpress™ system software will then take five to fifteen minutes to examine all the tapes in the magazine so that the software can quickly insert the proper tape in the tape drive when it is time for a backup, restore, or other tape operation to occur.



Inserting magazine into the Autochanger

Ejecting the magazine is accomplished by pushing the eject button on the faceplate of the Autochanger.

Using cleaning tapes

Like other tape drives, the StorageExpress system Autochanger requires periodic cleaning with a DAT cleaning cartridge. The StorageExpress system software will automatically remind the LAN administrator to clean the tape drives after every thirty hours of tape activity.

There are two mechanisms available to LAN administrators to clean the Autochanger. The first method is to have a magazine with just a cleaning cartridge in it. To clean a tape, the LAN administrator can simply insert the magazine with the cleaning cartridge in it and eject the magazine after two to three minutes.

The second method is to configure the StorageExpress system so that slot six is dedicated for cleaning cartridges. Then, when the cleaning alert comes up on the administrator's console, the administrator can select a simple function from the StorageExpress system software to remotely command the StorageExpress system to insert the cleaning cartridge in slot six.

Capacity vs. Automation

While the StorageExpress system Autochanger can hold six DDS-2 DAT tapes with a typical capacity of approximately 8GB per tape for a total capacity of 48GB, the real benefits of the Autochanger are in increased levels of automation rather than strictly in terms of increased capacity.

Depending on network and file server configurations, LAN Administrators will typically be able to back up somewhere between 500MBytes and 1.5GB per hour to a DDS-2 tape drive or Autochanger. LAN administrators with 10-hour backup windows would be able to back up 5 to 15GB on a typical night, which doesn't begin to approach the total capacity of 48GB per Autochanger.

The real power of the Autochanger is the fact that LAN administrators do not have to change tapes each day. Administrators can change tapes once or twice a week (depending on the size of their network) and let the StorageExpress system's Autochanger automatically swap tapes as needed.

Backup Schemes and the Autochanger

While it is possible to use the StorageExpress system Autochanger just like a standard DAT drive, the special features of the Autochanger open several new opportunities.

Streamlined backup

The StorageExpress system streamlined backup method puts each day's backup on a separate tape and automatically names the tapes used each day. With streamlined backup, the Autochanger can put the entire week of backup data on the tapes in a single magazine. For example, if all the devices backed up by one Streamlined backup have a total of 6GB of data, the magazine could be used as shown below.

Slot	Contents
1	Monday differential
2	Tuesday differential
3	Wednesday differential
4	Thursday differential
5	Friday full
6	Cleaning tape

If, however, the total amount of data is between 8 and 16GB, the LAN Administrator can forego the cleaning tape in the magazine and have data tapes in both slots 5 and 6 to cover the full backup of the system. Normally, differential backups take less than 15 percent of the full backup size, so there should be no problem having one tape doing each of the differentials.

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Slot	Contents
1	Monday differential
2	Tuesday differential
3	Wednesday differential
4	Thursday differential
5	Friday full part 1
6	Friday full part 2

Alternatively, the following configuration with two magazines could be used to back up as much as 24GB of data using two magazines:

Slot	Contents [Magazine 1]
1	Monday differential
2	Tuesday differential
3	Wednesday differential
4	Thursday differential
5	
6	Cleaning tape

Slot	Contents [Magazine 2]
1	Friday full (Tape 1)
2	Friday full (Tape 2)
3	Friday full (Tape 3)
4	
5	
6	Cleaning tape

This would require just one auto-changer, with magazines swapped Mondays and Fridays.

Custom backup

With Custom backup, the LAN administrator can use the Autochanger to enable more frequent backups or backups which ordinarily would have required an operator to spend too much time swapping tapes. For example,

a LAN administrator with less than 8GB of data on one or two servers could choose to do put all the incremental data on one tape (overwriting it each Monday) and potentially not have to change tapes in the Autochanger for a month!

Slot	Contents [Magazine 1]
1	Differentials (Append)
2	Full (Week 1)
3	Full (Week 2)
4	Full (Week 3)
5	Full (Week 4)
6	Cleaning tape

Custom backups can also be used with the Autochanger to enable mid-day backups. For example, an administrator could augment the two magazine streamlined backup example above with incremental backups of key files or directories once or twice a day by adding another tape into slot 5 of both magazines as shown below.

Slot	Contents [Magazine 1]
1	Monday differential
2	Tuesday differential
3	Wednesday differential
4	Thursday differential
5	Noon backups
6	Cleaning tape

Slot	Contents [Magazine 2]
1	Friday full (Tape 1)
2	Friday full (Tape 2)
3	Friday full (Tape 3)
4	
5	Noon backups
6	Cleaning tape

Very large volumes

Volume size on file servers has increased dramatically over the last few years as hard disks have increased in size. Some LANs now have volumes larger than 8GB in size which cannot be backed up by standard tape drives. The StorageExpress™ system's Autochanger option allows LAN administrators to easily protect very large LAN volumes with its ability to span tapes. When a tape fills up with data, the Autochanger can automatically insert another tape in the drive to continue the backup.

Event-driven backup

One unique feature of the Intel StorageExpress system is its comprehensive event-driven backup capabilities. StorageExpress systems can integrate with Intel's LANDesk® Management Suite or Novell's NetWare Management System* (NMS) or ManageWise* to monitor network activity and automatically back up server data in case of emergencies. For example, if LANDesk Management Suite's Server Monitor detects that a mirrored drive has failed, the StorageExpress system will be automatically notified of the failure on that server and will initiate an event-driven backup of the data on the server's surviving mirrored drive.

The Autochanger facilitates the adoption of event-driven backup by enabling the LAN administrator to dedicate a tape to be used by the system for event-driven backup purposes. Taking the streamlined example mentioned earlier and adding in event-driven backup support, an administrator could set up tape magazines as follows:

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Slot	Contents [Magazine 1]
1	Monday differential
2	Tuesday differential
3	Wednesday differential
4	Thursday differential
5	Event-driven backup
6	Cleaning tape

Slot	Contents [Magazine 2]
1	Friday full (Tape 1)
2	Friday full (Tape 2)
3	Friday full (Tape 3)
4	
5	Event-driven backup
6	Cleaning tape

Frequent restores

LAN administrators find that most requests for data restores are not because hardware, such as a hard disk, failed. More often it's because somebody deleted an important file or they edited a file and need the original version they had yesterday or the day before. With comprehensive backup schemes such as the StorageExpress™ system's streamlined backup and the StorageExpress system Autochanger, network administrators can often satisfy these restore requests without having to find backup tapes because the tapes are already loaded in the Autochanger magazine. This speeds up the restore process and is less work for the network administrator. In this type of scenario, it makes sense to always have the most recent full backup tape and the most recent differential backup tape loaded in the Autochanger.

Disparate archival requirements

Some organizations have stringent guidelines concerning archival periods for certain types of data. For example, final financial spreadsheets may need to be kept two years or more and interim versions of the data may have a 30-day archival requirement. Customer databases may need to be archived for a year or more. In the same company, there may be a mandate that e-mail only be archived for a maximum of two weeks. The StorageExpress system Autochanger enables the LAN administrator to satisfy varying archival requirements within their organization.

For example, a LAN administrator can set up the Autochanger's magazine as shown below and have each department's backup data be automatically placed on its own tape. This makes it easy to take the financial information off-site to a vault without having to archive the e-mail data with the finance data.

Slot	Contents
1	Sales
2	Finance
3	Manufacturing
4	E-mail
5	Event-driven backup
6	Cleaning tape

Flexibility and convenience

Many backup products treat Autochanger devices simply as monolithic tape drives with increased capacity, but the Intel StorageExpress system allows the network administrator to direct backup and restore operations to use specific

tapes within the Autochanger as shown above. What's more, the StorageExpress system treats the tapes by logical name rather than Autochanger magazine slot number, so backup and restore operations are simplified. For example, if data was backed up on tapes in slots 1 and 2, but the administrator put the tapes in slots 2 and 3 during the restore process, the StorageExpress system software would automatically select the proper tapes for the restore operation based upon their internal tape name, rather than their position in the Autochanger.

Multiple-drive systems

In many cases it makes sense to have multiple tape drives in a StorageExpress system. You can put up to two Autochangers and two additional drives for a maximum of four tape devices in a single StorageExpress system. It is often desirable to have two Autochangers, particularly in larger environments or in environments where automation is crucial. For example, some organizations want to back up large amounts of data over the weekend without having to pay somebody to come in and change tapes over the weekend. In these cases, companies can easily back up more than 50GB in a weekend using dual Autochanger systems to concurrently back up two servers or workstations.

Many customers find that systems with dual Autochangers or one Autochanger plus at least one stand-alone tape drive is also useful for making copies of backup tapes before taking the tapes

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to an off-site archival facility. This way, data can be archived in accordance with the most stringent corporate data security guideline and still be available for immediate restores of network data.

Intel recommends including a standard DDS-2 DAT tape drive along with each Autochanger-based system. The DDS-2 tape drives offer the same speed and media compatibility as the Autochanger units without the Autochanger's tape picker mechanism. Stand-alone tape drives are useful when data needs to be restored

from a tape which is not in the Autochangers current magazine; the additional drive allows the administrator to perform the restore operation without having to dismount the currently loaded tape magazine or wait for the Autochanger to inventory each of the tapes in the new magazine. Having the additional drive also allows the administrator to initiate backup or restore operations even while the Autochanger is busy doing a different task. Stand-alone tape drives can also be used in tape-to-tape copy operations and for maintenance/ utility purposes.

Configuration and Ordering Information

Available configurations

Customers can purchase Autochangers as the primary tape drive in their StorageExpress™ system, or they can purchase the StorageExpress system DAT Autochanger Upgrade Kit to work with their StorageExpress system. There are five basic rules which determine which configurations are valid:

- Autochangers work with XL-based models only (no EL-based systems)
- Maximum of two Autochangers per system
- Maximum of four tape groups per system
- Autochangers cannot be in a tape group with tape drives or other Autochangers
- Autochangers and 8mm drives cannot exist in the same control or peripheral unit

Technical Specifications

The Autochanger has the following specifications:

Capacity: 90 meter (DDS-1) tape 120 meter (DDS-2) tape	2GB native, 4GB compressed 4GB native, 8GB compressed
Sustained Transfer Rate	510 Kbytes/second native, 1MB/second compressed
DAT Drive Search Speed	200 times normal speed
DAT Drive Search Latency	40 seconds average time for 120 meter tape
Recording Format	ANSI/ECMA DDS-DC
Data Compression	DCLZ (Data Compression Lempel-Ziv)
Internal Buffer Size	1MB
Bit ErrorRate	1 in 1×10^{15} bits
MTBF	40,000 hours, >100,000 cartridge swaps
Media Supported	DDS Media Recognition System compatible Supports 60 meter, 90 meter, and 120 meter tapes (120m tapes required for maximum capacity)

Intel StorageExpress™ System

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Intel Services – Intel PC & LAN Products Customer Information and Support Phone Numbers

North American Service Center: Oregon, USA

Intel BBS [†]	1-503-264-7999
CompuServe* ^{††}	GO INTEL
FaxBack*	1-800-525-3019 or 503-264-6835
TalkBack	1-800-368-3160 or 503-264-7777
Sales	1-800-538-3373 or 503-264-7354

Technicians

CPU and Math Processors	1-800-321-4044
Fax, Modems, PCMCIA, Wireless	1-503-264-7000
Memory	1-503-264-7000
Video, Personal Conferencing	1-503-264-7000

Network Products 1-503-264-7000

Phone Hours: 7:00 – 5:00 M-W, F
7:00 – 3:00 Th (US Pacific Time)

European Service Centre: Swindon, UK

Intel BBS [†]	+44-1793-432955
CompuServe* ^{††}	GO INTEL
FaxBack*	+44-1793-432509
Sales	+44-1793-431155
Technicians	Hours (British Time)
English	+44-1793-431144 (08:00 – midnight)
French	+44-1793-421777 (08:00 – 17:30, Tu 08:00 – 15:45)
German	+44-1793-421333 (08:00 – 17:30, Tu 08:00 – 15:45)

Asia-Pacific Service Center: Sydney, Australia^{†††}

Intel BBS [†]	+61-2-975-3066
CompuServe* ^{††}	GO INTEL
FaxBack*	+61-2-975-3922
Sales	+61-2-975-3300
Technicians	+1-800-649-931 Hours: 08:00 – 18:00

† modem settings: 8-N-1, up to 14.4Kbps

†† modem settings: 7-E-1, up to 14.4Kbps

Asia-Pacific Service Center: Singapore^{†††}

Intel BBS [†]	+65-256-4776
CompuServe* ^{††}	GO INTEL
FaxBack*	+65-256-5350
Sales	+65-735-3811
Technicians	+65-831-1311 Hours: 08:00 – 18:00

Asia-Pacific Service Center: Hong Kong^{†††}

Intel BBS [†]	+852-2-530-4116
CompuServe* ^{††}	GO INTEL
FaxBack*	+852-2-844-4448
Technicians	+852-2-844-4456 Hours: 08:00 – 18:00

Asia-Pacific Service Center: Korea^{†††}

Intel BBS [†]	+822-784-3430
CompuServe* ^{††}	GO INTEL
FaxBack*	+822-767-2594
Technicians	+822-767-2595 Hours: 08:00 – 18:00

Asia-Pacific Service Center: Taiwan^{†††}

Intel BBS [†]	+886-2-718-6422
CompuServe* ^{††}	GO INTEL
FaxBack*	+886-2-514-0815
Technicians	+886-2-718-9915 Hours: 08:00 – 18:00

Japan Service Center: Tsukuba, Japan^{†††}

Sales and Technicians
+81-298-47-1841 or 0120-868686 (toll-free in Japan)
Hours: 09:00 – 12:00 & 13:00 – 17:00 M-F

††† Or contact your dealer or distributor. Call our FaxBack service and order document #9000 for a current list of names and phone numbers.

For all other International Sales and Technical Support questions:

Contact your local dealer or distributor or call the North American Service center at +1-503-264-7354

Support files on the Internet:

Support information for Intel Brand products is available on the Internet for downloading by Anonymous FTP and for viewing or downloading on the World Wide Web.

Intel FTP Server hostname: ftp.intel.com Intel FTP Server IP address: 143.185.65.2 File directory location: /pub/PCandNetworkSupport World Wide Web address (URL): http://www.intel.com

For FTP Server access instructions, order document #9051

Mailing address:

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European Service Centre:
Branded Products Support Centre
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