



# IBM Virtualization Engine TS7700 supports disk-based encryption

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## At a glance

IBM® Virtualization Engine TS7700 Release 3.0 introduces TS7720 Cache Controller Model CS9, TS7720 Cache Module Model XS9, TS7740 Cache Controller Model CC9, and TS7740 Cache Module Model CX9. TS7700 Release 3.0 also includes support for:

- Encryption capability of the disk cache
- Over 45% increased maximum storage capacity in the TS7720 encryption base frame compared to the non-encrypting TS7720 base frame, and over 40% increase in the maximum capacity of a two-frame TS7720 system
- Up to 4 million logical volumes in a grid domain
- Native LDAP support for the management interface
- Enhancements to the look and feel of the TS7700 management interface

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## Overview

IBM System Storage® TS7700 Virtualization Engine Release 3.0 offers new enhancements:

- Support for optional disk-based encryption with new disk models
- Increased maximum capacity for TS7720 systems
- Up to 4 million logical volumes in a grid domain
- Native LDAP support for the management interface
- Updated look and feel of the management interface to align with other Storage System products

New models supporting disk-based encryption are:

- IBM Virtualization Engine TS7740 Cache Controller Model CC9
- IBM Virtualization Engine TS7740 Cache Module Model CX9
- IBM Virtualization Engine TS7720 Cache Controller Model CS9
- IBM Virtualization Engine TS7720 Cache Module Model XS9

Encryption keys for disk-based encryption are managed internally within the TS7700 system. Interactions with external key management systems are not supported

for disk-based encryption in Release 3.0. Physical tape encryption continues to use external key management systems.

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## Key prerequisites

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Disk-based encryption requires Release 3.0 disk cache models to be installed as the exclusive disk cache models in the TS7700 system. Previous generation disk cache models do not support disk-based encryption.

A TS7700 Virtualization Engine Server attaches to FICON® channels on selected IBM System z® servers with the appropriate levels of System z software. Additional features may be required on the TS7700 Virtualization Engine components or automation frames. Refer to the [Technical information](#) section for details.

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## Planned availability date

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December 7, 2012

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## Description

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IBM System Storage TS7700 Virtualization Engine Release 3.0 machine code is designed to deliver support for:

- TS7720 encryption capable systems with R3.0 disk models
- TS7740 encryption capable systems with R3.0 disk models
- Optional disk-based encryption on the encryption capable configurations
- Up to 4 million logical volumes in a grid domain
- Native LDAP support for the management interface
- Updated look and feel of the management interface to align with other Storage System products

IBM DB2® technology, which is designed to manage data more effectively and efficiently, is used for TS7700 internal database operations. Greater availability is supported through DB2 enhancements such as online, automated database reorganization.

TS7700 Release 3.0 machine code is not supported on TS7740 systems using the TS7740 Cache Controller Model CC6.

### Encryption capable systems

TS7700 R3.0 introduces the TS7740 Encryption Capable Base Frame. This encryption capable frame requires the installation of one TS7740 Cache Controller Model CC9 and one TS7740 Server Model V07. The TS7740 Encryption Capable Base Frame, identified by 3952 Model F05 feature #7330, may also include up to Two TS7740 Cache Module Model CX9.

Each Model CC9 provides approximately 9.4 TB of usable capacity, and each Model CX9 provides approximately 9.6 TB of usable capacity. The maximum supported usable capacity of the TS7740 Encryption Capable Base Frame is approximately 28 TB.

TS7700 R3.0 also introduces the TS7720 Encryption Capable Base Frame and the TS7720 Encryption Capable Expansion Frame. These encryption capable frames require the installation of one TS7720 Cache Controller Model CS9. The TS7720 Encryption Capable Base Frame, identified by 3952 Model F05 feature #7331, also requires one TS7720 Server Model VEB and may include up to nine TS7720 Cache Module Model XS9. The TS7720 Encryption Capable Expansion Frame, identified by 3952 Model F05 feature #7332, may also include up to fifteen TS7720 Cache Module

Model XS9. The TS7720 Encryption Capable Expansion frame may be attached to any TS7720 Base Frame, identified by 3952-F05 feature #7322, or TS7720 Encryption Capable Base Frame, identified by 3952-F05 feature #7331. When the TS7720 Encryption Capable Expansion Frame is attached to the TS7720 Base Frame (feature #7322), installation of additional TS7720 SATA Cache Module (3956 model XS7) is not permitted. To attach the TS7720 Encryption Capable Expansion Frame to a TS7720 Encryption Capable Base Frame, nine TS7720 Model XS9 must be installed in the base frame.

Each Model CS9 and Model XS9 provides approximately 24 TB of usable capacity. The maximum supported usable capacity of the TS7720 Encryption Capable Base Frame is approximately 240 TB. The maximum supported usable capacity of the TS7720 Encryption Capable Expansion Frame is approximately 384 TB.

Refer to [Hardware requirements](#) below for additional configuration requirements of the encryption capable frames, and the configuration requirements of required components.

### **Disk-based encryption**

All TS7700 encryption capable base frames will support encryption for data at rest within the disk cache repositories. When encryption is activated, all user data written to disk cache is encrypted. Encryption provides additional protection for any removed disks that leave the customer account. Replication and remote mount activity move non-encrypted data. Encryption is accomplished through the use of security encryption support within the TS7720 Model CS9 and TS7740 Model CC9 cache controllers. This mechanism uses hardware within each disk drive to provide encryption support.

Disk-based encryption is activated with the purchase and installation of the "Enable Disk Encryption" feature #5272 on the TS7720 Server Model VEB installed in the TS7720 Encryption Capable Base Frame, or on the TS7740 Server Model V07 installed in the TS7740 Encryption Capable Base Frame. Additionally, each disk model installed in the system requires the "Encryption" feature #7404 to be purchased and installed. The "Enable Disk Encryption" and "Encryption" features may be installed with the initial system installation, or they may be purchased and installed at a later date. When disk-based encryption is enabled on a system already in use, all previously written user data is encrypted retroactively.

Disk-based encryption may not be enabled on TS7720 Encryption Capable Expansion Frames attached to TS7720 Base Frames, identified by 3952 Model F05 feature #7322.

Encryption keys for disk-based encryption are managed internally within the TS7700 system. Interactions with external key management systems are not supported for disk-based encryption in Release 3.0. Physical tape encryption continues to use external key management systems.

### **Support for up to 4 million logical volumes**

The ability to support up to 4 million logical volumes is available in R3.0. Only TS7740 Model V07 and TS7720 Model VEB servers will support more than 2 million volumes. Support for up to 1 million logical volumes is included in R3.0 base functionality. To add support for additional logical volumes, increments of feature #5270 may be installed on the TS7700 Server. Each increment of feature #5270 provides support for 200,000 logical volumes. Up to five feature #5270 may be installed on a TS7720 Model VEA or TS7740 Model V06 server, for a maximum of 2 million logical volumes. Feature #9461, 8 GB Memory Upgrade - Plant, or #3461, 8 GB Memory Upgrade - Field, is required on any Model VEA or Model V06 server supporting between 1 million and 2 million logical volumes. Up to fifteen feature #5270 may be installed on a TS7720 Model VEB or TS7740 Model V07 server. The following restrictions will apply:

- Grids containing systems using TS7740 Model V06 or TS7720 Model VEA servers will not support more than 2 million volumes.

- Merging of clusters will not be supported if the post-merge logical volume count exceeds 4 million.

### **Accessibility by people with disabilities**

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A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be requested at

[http://www.ibm.com/able/product\\_accessibility/index.html](http://www.ibm.com/able/product_accessibility/index.html)

### **Section 508 of the US Rehabilitation Act**

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IBM Virtualization Engine TS7720 Cache Controller Model CS9, TS7720 Cache Module Model XS9, IBM Virtualization Engine TS7740 Cache Controller Model CC9, and TS7740 Cache Module Model CX9, are available as of December 7, 2012, when used in accordance with IBM's associated documentation, of satisfying the applicable requirements of Section 508 of the Rehabilitation Act, provided that any assistive technology used with the product properly interoperates with it. A US Section 508 Voluntary Product Accessibility Template (VPAT) can be requested via

[http://www.ibm.com/able/product\\_accessibility/index.html](http://www.ibm.com/able/product_accessibility/index.html)

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## **Product positioning**

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The TS7700 family of systems combines disk storage and the unique performance and capacity of 3592 Tape Drives (in the TS7740) to help reduce the total cost of ownership of tape solutions for System z environments. The TS7700 Virtualization Engine tape solution is well suited for:

- Single or multisite disaster recovery
- Single or multisite data consolidation
- Single or multisite continuous data protection
- Single or multisite data sharing

The TS7700 is designed to provide the following benefits:

- Offers attachment to tape libraries (TS7740) or disk cache only (TS7720) virtual tape storage
- Helps lower operating costs, in areas such as:
  - Power
  - Maintenance
  - Operations and support staff
- Batch window reduction
- Reduction in the amount of floor space consumed by data protection operations
- Automated tape operation
- High data availability
- Data security through disk-based encryption (TS7720 and TS7740) and support for physical tape encryption (TS7740)
- Ability to provide fast access to data
- Cross server system z data sharing
- Remote replication for use with:
  - Geographically Dispersed Parallel Sysplex™ ( GDPS® )
  - Disaster backup and recovery
  - Remote tape vault

The TS7700 incorporates extensive self-management capabilities consistent with IBM on demand initiatives. These capabilities are designed to help reduce the cost

of a TS7700 solution and avoid the potential impact of human errors. A TS7700 can help improve the efficiency of mainframe tape operations by efficiently using disk storage, tape capacity, and tape speed, and by providing a large number of tape addresses. These benefits help make the TS7700 a suitable repository for local and remote backups, and archival data with near continuous data protection with automated failover and recovery.

The TS7740 model uses disk storage with the performance and capacity of TS1140 tape drives to help reduce the total cost of ownership of tape solutions for System z environments. The TS7720 model uses large capacity disk drives to provide high capacity repositories for customers with rapid recall requirements.

Multiple interconnected TS7700 systems (called clusters) use the Grid Communication feature for business continuance through metro and global volume replication. With the Grid Communication feature, a TS7700 system operates in a grid configuration by interconnecting up to six TS7700s and automatically maintains one to six volume replicas within the grid providing a flexible set of options for business continuance and hierarchal storage management. The redundant components of the TS7700 grid configuration can be separated, thus making it an excellent option for replication and disaster recovery, as well as local and metro availability. If you have, or plan to have, a GDPS operation, a TS7700 cluster is compatible with GDPS and is well suited for the tape workload because of its remote replication capability. Alternatively, the entire TS7700 cluster can be used in a local environment to help improve data availability and recoverability.

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## Statement of general direction

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IBM remains focused on supporting its mainframe storage customers. The TS7700 Virtualization Engine is the leading offering for mainframe virtual tape workloads because of capabilities such as its tiered hierarchy of disk and tape storage, and the ability to join multiple Virtualization Engines onto a grid to provide an enterprise level of business continuance. It is IBM's intent to enhance the IBM System Storage Virtualization Engine product family by offering an integrated data deduplication model.

IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM's sole discretion. Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision. The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remains at our sole discretion.

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## Product number

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Description	Machine type	Model	Feature	Plant or Field
TS7740 Cache Controller 13.2 TB SAS Storage Encryption Plant Install in F05	3956	CC9	7124	Plant
			7404	Both
			9352	Plant

Description	Machine type	Model	Feature	Plant or Field
TS7740 Cache Module 13.2 TB SAS Storage Encryption Plant Install in F05	3956	CX9	7124	Plant
			7404	Both
			9354	Plant

Field Merge in F05 9355 Plant

Description	Machine type	Model	Feature	Plant or Field
TS7720 Cache Controller	3956	CS9		
36 TB SAS Storage			7115	Plant
Encryption			7404	Both
Plant Install in F05			9352	Plant

Description	Machine type	Model	Feature	Plant or Field
TS7720 Cache Module	3956	XS9		
33 TB SAS Storage			7116	Plant
Encryption			7404	Both
Plant Install in F05			9354	Plant
Field Merge in F05			9355	Plant

Description	Machine type	Model	Feature	Plant or Field
Plant Install 3956 CS9	3952	F05	5651	Plant
Plant Install 3956 CC9			5652	Plant
Plant Install 3956 CX9			5653	Plant
Field Install 3956 CX9			5654	Field
Plant Install 3956 XS9			5655	Plant
Field Install 3956 XS9			5656	Field
TS7740 Encryption Capable Base Frame			7330	Plant
TS7720 Encryption Capable Base Frame			7331	Plant
TS7720 Encryption Capable Expansion Frame			7332	Plant
Ship with R3.0 Machine Code			9113	Plant

Description	Machine type	Model	Feature	Plant or Field
10Gb Grid Optical LW Connection	3957	V07, VEB	1035*	Both
Increased Logical Volumes			5270*	Both
Enable Disk Encryption			5272	Both
Ship with R2.1 Machine Code			9112*	Plant
Ship with R3.0 Machine Code			9113	Plant

\* This feature was previously announced on the designated model, but the description has changed.

### Business Partner information

If you are a Direct Reseller - System Reseller acquiring products from IBM , you may link directly to Business Partner information for this announcement. A PartnerWorld® ID and password are required (use IBM ID).

<https://www.ibm.com/partnerworld/mem/sla.jsp?num=112-160>

### Publications

The following TS7700 Virtualization Engine publication is available now:

Title	Order number
IBM Virtualization Engine TS7700 Series Introduction and Planning Guide	GA32-0567

To order, contact your IBM representative or access it on the web at

<http://publibfp.dhe.ibm.com/epubs/pdf/a320567e.pdf>

The following publications are available now. To order, contact your IBM representative.

Title	Part number
IBM Virtualization Engine TS7700 Customer InfoCenter CD	35P2674
IBM Virtualization Engine TS7700 Service InfoCenter CD	35P2675

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## **Services**

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## Technical information

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### Specified operating environment

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#### ***Physical specifications***

TS7720 Cache Controller 3956-CC9

- Width: 449 mm (17.7 in)
- Depth: 487 mm (19.2 in)
- Height: 88 mm (3.5 in)
- Weight: 25.9 kg (57.1 lb)

\* Fully configured

TS7720 Cache Module 3956-CX9

- Width: 449 mm (17.7 in)
- Depth: 487 mm (19.2 in)
- Height: 88 mm (3.5 in)
- Weight: 25.2 kg (55.5 lb)

\* Fully configured

TS7720 Cache Controller 3956-CS9

- Width: 449 mm (17.7 in)
- Depth: 540 mm (21.3 in)
- Height: 86 mm (3.4 in)
- Weight: 27.0 kg (59.6 lb)

TS7720 Cache Module 3956-XS9

- Width: 449 mm (17.7 in)
- Depth: 540 mm (21.3 in)
- Height: 86 mm (3.4 in)
- Weight: 26.3 kg (57.9 lb)

#### **TS7740 3952 Tape Frame Model F05 with feature #7330**

- Width: 644 mm (25 in)
- Depth: 1102 mm (43 in)
- Height: 1804 mm (71 in)
- Weight: 481.9 kg (1062 lb) \*

\* Fully configured

#### **TS7720 Base 3952 Tape Frame Model F05 with feature #7331**

- Width: 644 mm (25 in)
- Depth: 1102 mm (43 in)
- Height: 1804 mm (71 in)
- Weight: 669.1 kg (1475 lb) \*

\* Fully configured



## **TS7720 Storage Expansion 3952 Tape Frame Model F05 with feature #7332**

- Width: 644 mm (25 in)
- Depth: 1102 mm (43 in)
- Height: 1804 mm (71 in)
- Weight: 666.8 kg (1470 lb) \*

\* Fully configured

### ***Operating environment***

TS7720 Maximum configuration frame with all components (Total Frame including VEB, CS9, nine XS9, TSSC, and Integrated control path).

- Temperature: 10° to 32.0° C (50° to 89.6° F) up to 5,000 ft 10 to 28.0° C (50° to 82.4° F) 5,001 to 7,000 ft
- Relative humidity: 20% to 80%
- Heat output (caloric value): 11.0 kBTU/hr, 2.76 kcal/hr
- Wet bulb (caloric value): 23° C
- Electrical power: 3140 watts
- Capacity of exhaust: 700 m3/h
- Noise level: 58 db
- Leakage: 10 mA

TS7740 Maximum configuration frame with all components (Total Frame including V07, CC9, two CX9, TSSC, and Integrated control path).

- Temperature: 10° to 32.0° C (50° to 89.6° F) up to 5,000 ft 10 to 28.0° C (50° to 82.4° F) 5,001 to 7,000 ft
- Relative humidity: 20% to 80%
- Heat output (caloric value): 6.05 kBTU/hr, 1.52 kcal/hr
- Wet bulb (caloric value): 23° C
- Electrical power: 1786 watts (estimated)
- Capacity of exhaust: 385 m3/h
- Noise level: 56 db
- Leakage current: 10 mA

TS7720 Expansion Frame Maximum configuration frame with all components (Total Frame including CS9 and 15 XS9).

- Temperature: 10° to 32.0° C (50° to 89.6° F) up to 5,000 ft 10 to 28.0° C (50° to 82.4° F) 5,001 to 7,000 ft
- Relative humidity: 20% to 80%
- Heat output (caloric value): 11.8 kBTU/hr, 2.96 kcal/hr
- Wet bulb (caloric value): 23° C
- Electrical power: 3460 watts (estimated)
- Capacity of exhaust: 750 m3/h
- Noise level: 59 db
- Leakage current: 13.5 mA

### ***Hardware requirements***

#### **TS7720 Minimum configuration with R3.0 Machine Code**

- One 3952 Tape Frame Model F05 with the following required features:
  - TS7720 Encryption Capable Base Frame (#7331)

- Plant Install 3957 VEB (#5627)
- Plant Install 3956 CS9 (#5651)
- Integrated Control Path (#5758)
- Dual AC Power (#1903)
- Ship with R3.0 Machine Code (#9113)
- A power cord appropriate for the country of installation must be selected from feature #9954 through #9959, or #9966
- One TS7720 Server (3957 Model VEB) with the following required features:
  - 100MB/sec Throughput - Plant (#9268)
  - Mainframe Attach (#9000)
  - Ship with R3.0 Machine Code (#9113)
  - Plant Install in 3952 F05 (#9350)
  - Two of either 10Gb Grid Optical LW Connection (#1035), 1Gb Grid Dual Port Copper Connection (#1036), or 1Gb Grid Dual Optical SW Connection (#1037)
  - Either two of host to Virtualization Engine FICON cables (#0201 or #0203) or one No Factory Cables (#9700)
  - Two of either FICON Shortwave Attachment (#3441), or FICON Longwave Attachment (#3442), or FICON 10km Longwave Attachment (#3443)
  - Console Attachment (#2715)

**Note:** The obsolete TotalStorage Master Console for Service (#2713) does not support TS7700 solutions. 3957 Model VEB feature #2715 may not be attached to a TotalStorage Master Console for Service (#2713).

**Note:** The TS3000 System Console (#2721) may be installed on 3953 Model F05, connecting to the TS7720 Server using Console Attachment (#2715).

**Note:** The TS3000 System Console (#2730 and #2719) or TS3000 System Console with Internal Modem (#2732 and #2733) or Rackmount TS3000 System Console with USB modem (#2724 and #2734) may be installed on 3952 Tape Frame Model F05, connecting to the TS7720 Server using Console Attachment (#2715).

**Note:** When feature number 2715 is installed on 3957 Model VEB, the Console Upgrade (#2719) is required on the machine type model where feature #2718, #2720, #2721, or #2730 is installed.

- One TS7720 Cache Controller (3956 Model CS9) with the following required features:
  - 36 TB SAS Storage (#7115)
  - Encryption (#7404)
  - Plant Install in 3952 F05 (#9352)

Refer to [111-054](#), dated May 09, 2011, for the minimum configuration requirements for Machine Code R2.0/R2.1.

## **TS7720 upgrades**

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The following options may be installed to modify the minimum TS7720 Encryption capable configuration:

- 3952 Tape Frame Model F05
  - TS3000 System Console (TSSC) (#2732) with Internal Modem (#2733), or Rackmount TS3000 System Console (TSSC) (#2724) with USB Modem (#2734)
  - Redundant Power (#1904) is required when TSSC features are installed
- TS7720 Server (3957 Model VEB)
  - Grid Enablement (#4015) allows this TS7700 Server to communicate to other TS7700 Servers through the grid. Grid Enablement must be installed on each

TS7700 Server that participates in the communication grid. The customer must provide appropriate Ethernet cables to attach the Grid Connection adapters (#1036 or #1037) to the communication grid when Grid Enablement (#4015) is installed.

- Remove Cluster from a Grid (#4016) provides instructions to remove a cluster from a grid one time only. If the cluster rejoins a grid, and is to be removed from that grid in the future, another instance of #4016 must be purchased. #4016 is for Field Install only. Up to 99 instances of #4016 may be ordered for a single TS7720 server.
- Cluster Cleanup (#4017) facilitates a one time cluster cleanup. If the cluster is configured with #4015, Remove Cluster from a Grid (#4016) must be performed before Cluster Cleanup. Each instance of #4017 provides a single cleanup operation. If the cluster is returned to production, and requires cleanup in the future, another instance of #4017 must be purchased. #4017 is for Field Install only. Up to 99 instances of #4017 may be ordered for a single TS7720 server.
- Enable Dual Port Grid Connections (#1034) activates the second port on the dual port grid adapters (#1036 or #1037) to provide four active 1Gb Ethernet links for Grid communications.
- Two additional FICON attachments may be installed to provide a total of four FICON attachments on the TS7700 Server. Valid total quantities of FICON Shortwave Attachment (#3441), FICON Longwave Attachment (#3442), and FICON 10km Longwave Attachment (#3443) are two or four.
- Up to nine 100MB/sec Increment (#5268) may be installed.
- Additional increments of 200,000 logical volumes, Increased Logical Volumes (#5270), may be installed, up to a maximum quantity of 15.
- Selective Device Access Control (#5271) may be installed.
- Enable Disk Encryption (#5272) may be installed, only if the Model CS9 TS7720 Cache Controller is the only disk controller installed in the TS7720 system.
- When #5272 is installed on the Model VEB server, Encryption (#7404) is required on all 3956 Cache Controller Model CS9 and 3956 Cache Modules Model XS9 in the TS7720 system.
- TS7720 Cache Drawer
  - Up to nine 3956 Cache Drawers Model XS9 may be installed in the F05 frame with #7331. To include Model XS9s in a new cluster coming from the plant, include feature #9354, Plant Install in F05, on each 3956 Model XS9, and include one feature #5655, Plant Install 3956 XS9, on the 3952 Model F05 for each XS9.

Refer to Software Announcement [111-054](#), dated May 09, 2011, for the upgrade options on systems running Machine Code R2.0/R2.1.

### **TS7720 Encryption Capable Expansion frame**

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To attach a TS7720 Encryption Capable Expansion frame to a TS7720 base frame, configure the following:

- On TS7720 encryption capable base frame (3952 Tape Frame Model F05 with feature #7331), the following features are required in addition to the minimum configuration and optional requirements defined above:
  - Expansion Frame Attach (#9323)
  - Nine of #5655 plus #5656 are required
- On TS7720 base frame (3952 Tape Frame Model F05 with feature #7322), the following features are required in addition to the minimum configuration and optional requirements defined above:
  - Expansion Frame Attach (#9323)
- One 3952 Tape Frame Model F05 with the following required features:
  - TS7720 Encryption Capable Expansion Frame (#7332)

- One of Plant Install 3956 CS9 (#5651)
- Zero to fifteen of Plant Install 3956 XS9 (#5655)
- Zero to fifteen of Field Install 3956 XS9 (#5656)

**Note:** Valid quantities of #5655 plus #5656 are zero to fifteen.

- Dual AC Power (#1903)
- A power cord appropriate for the country of installation must be selected from feature #9954 through #9959, or #9966
- On the TS7720 Server (3957 Model VEA or 3957 Model VEB) installed in the TS7720 base frame (3952 Tape Frame Model F05 with features #9323 and either #7322 or #7331), the following features are required in addition to the minimum configuration and optional requirements defined above:
  - Dual Port FC HBA (#5240) on the 3957 Model VEA, or (#5241) on the 3957 Model VEB
  - 3957 Model VEA requires 8 GB memory upgrade (#3461 or #9461)

### **TS7740 minimum configuration with R3.0 machine code**

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- One 3952 Tape Frame Model F05 with the following required features:
  - TS7740 Base Frame (#7330)
  - Install 3957 V07 (#5629)
  - Plant Install 3956 CC9 (#5652)
  - Integrated Control Path (#5758)
  - Dual AC Power (#1903)
  - Ship with R3.0 Machine Code (#9113)
  - A power cord appropriate for the country of installation must be selected from features #9954 through #9959, or #9966
- One TS7740 Server (3957 Model V07) with the following required features:
  - One of 1 TB Cache Enablement (#5267)
  - One of 100MB/sec Increment (#5268)
  - Dual Port FC HBA (#5241)
  - Mainframe Attach (#9000)
  - Ship with R3.0 Machine Code (#9113)
  - Attach to TS3500 (#9219)
  - Plant Install in F05 (#9350)
  - Two of either 10Gb Grid Optical LW Connection (#1035), 1Gb Grid Dual Port Copper Connection (#1036), or 1Gb Grid Dual Optical SW Connection (#1037)
  - Either two of host to Virtualization Engine FICON cables (#0201 or #0203) or one No Factory Cables (#9700)
  - Two of either FICON Shortwave Attachment (#3441) or FICON Longwave Attachment (#3442), or FICON 10km Longwave Attachment (#3443)
  - Console Attachment (#2715)

**Note:** The obsolete TotalStorage Master Console for Service (#2713) does not support TS7700 solutions. 3957 Model V07 feature #2715 may not be attached to a TotalStorage Master Console for Service (#2713).

**Note:** The TS3000 System Console (#2730 and #2719) or TS3000 System Console with Internal Modem (#2732 and #2733) or Rackmount TS3000 System Console with USB modem (#2724 and #2734) may be installed on 3952 Tape Frame Model F05, connecting to the TS7740 Server using Console Attachment (#2715).

**Note:** When feature numbers 2714 or 2715 are installed on 3957 Model V07, the Console Upgrade (#2719) is required on the machine type model where feature #2718, #2720, #2721, or #2730 is installed.

- One TS7740 Cache Controller (3956 Model CC9) with the following required features:
    - 13.2 TB SAS Storage (#7124)
    - Plant Install in 3952 F05 (#9352)
  - Two 4Gb or 8Gb Fibre Channel switches are required:
    - Both switches must be the same type; mixing one 4Gb switch with one 8Gb switch is not supported
    - To install new switches in a 3584 L23 or D23 frame or reinstall switches removed from a different subsystem, the following features are required:
      - #4871 TS7700 BE SW Mounting Hardware
      - #1950 Power Distribution Units
      - One power cord feature #9954 through #9959 or #9966
    - Two new 8Gb FC switches may be ordered for the 3584 frames using feature #4875, BE 8Gb Switches
- Note:** If the TS7740 was previously attached to the TS3500 Tape Library through the 3953 Model L05 Library Manager, the customer may choose to leave the FC switches in the 3953 Model F05 Tape Frame, or the switches may be removed and reinstalled in the TS3500 Tape Library.
- If the switches remain in the 3953 Model F05, two of feature #3488, 4Gb Fibre Channel Switches, or #4897, Reinstall 4Gb Fibre Channel Switches, provide the switches
  - To remove the switches from the 3953 Model F05, order feature #4748, Remove 4Gb Switch, for each switch to be removed
  - The switches removed from the 3953 Model F05 may be installed in the 3584 Model L23 or D23 frame using feature number #4873, Reinstall TS7700 BE Switches
- One or more 3584 Model L23 or D23 frames with:
    - From four to sixteen 3592 tape drives: All attached tape drives must operate in the same mode, therefore 3592 Model E05 tape drives operating in native mode may not be intermixed with 3592 Model J1A or Model E06 / EU6 tape drives, 3592 Model E06 and EU6 tape drives, and 3592 Model E07 tape drives may not be intermixed with older generation 3592 tape drives
    - Up to sixteen feature #4874, Adjacent Frame Support for Back End Switches

Refer to Software Announcement [111-054](#), dated May 09, 2011 , for the minimum configuration requirements for Machine Code R2.0/R2.1.

## **TS7740 upgrades**

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The following options may be installed to modify the minimum TS7740 Encryption capable configuration:

- 3952 Tape Frame Model F05
  - TS3000 System Console (TSSC)(#2732) with Internal Modem (#2733), or Rackmount TS3000 System Console (TSSC) (#2724) with USB Modem (#2734)
  - Redundant Power (#1904) is required when TSSC features are installed
- TS7740 Server (3957 Model V07)
  - Grid Enablement (#4015) allows this TS7700 Server to communicate to other TS7700 Servers through the grid. Grid Enablement must be installed on each TS7700 Server that participates in the communication grid. The customer must provide appropriate Ethernet cables to attach the Grid Connection adapters (#1035 through #1037) to the communication grid when Grid Enablement (#4015) is installed.
  - Remove Cluster from a Grid (#4016) provides instructions to remove a cluster from a grid one time only. If the cluster rejoins a grid and is to be removed from that grid in the future, another instance of #4016 must be purchased.

#4016 is for field install only. Up to 99 instances of #4016 may be ordered for a single TS7740 server.

- Cluster Cleanup (#4017) facilitates a one time cluster cleanup. If the cluster is configured with #4015, Remove Cluster from a Grid (#4016) must be performed before Cluster Cleanup. Each instance of #4017 provides a single cleanup operation. If the cluster is returned to production and requires cleanup in the future, another instance of #4017 must be purchased. #4017 is for field install only. Up to 99 instances of #4017 may be ordered for a single TS7740 server.
- Enable Dual Port Grid Connections (#1034) activates the second port on the dual port grid adapters (#1036 or #1037) to provide four active 1Gb Ethernet links for Grid communications.
- Two additional FICON attachments may be installed to provide a total of four FICON attachments on the TS7700 Server. Valid total quantities of FICON Shortwave Attachment (#3441), FICON Longwave Attachment (#3442), and FICON 10km Longwave Attachment (#3443) are two or four.
- Additional 1 TB Cache Enablement (#5267) may be installed, up to a maximum quantity of 28.
- Additional 100MB/sec Increment (#5268) may be installed, up to a maximum quantity of 10.
- Additional increments of 200,000 logical volumes, Increased Logical Volumes (#5270), may be installed, up to a maximum quantity of 15.
- Selective Device Access Control (#5271) may be installed.
- Enable Disk Encryption (#5272) may be installed, only if the Model CC9 TS7720 Cache Controller is installed in the TS7740 system.
  - When #5272 is installed on the Model V07 server, Encryption (#7404) is required on the 3956 Cache Controller Model CC9 and any 3956 Cache Modules Model CX9 in the TS7720 system.
- Encryption Configuration (#9900) allows this TS7700 Server to be configured to support encryption for designated storage pools. To use encryption with the TS7700, all attached tape drives must be TS1120 encryption capable tape drives, or TS1130 or TS1140 Tape Drives. TS1120 drives must be operating in 3592 Model E05 native mode.
- TS7740 Cache Drawer
  - One or two additional 3956 Model CX9 Cache Drawers may be installed. 3956 Model CX9 Cache Drawers must be attached to a 3956 Model CC9 Cache Controller. Valid total quantities of TS7740 Cache Drawer Model CX9 are zero, one, and two. Each 3956 Model CX9 must contain feature #7124.

Refer to Software Announcement [111-054](#), dated May 09, 2011 , for the minimum configuration requirements for Machine Code R2.0/R2.1.

## Cables

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Refer to the *IBM Virtualization Engine TS7700 Introduction and Planning Guide (GA32-0568)* for cable planning information.

## Software requirements

Software support is available for System z FICON channel attachment to the TS7740 and TS7720 servers. Operating system software support is available for the following release levels:

Operating system	Release level
z/OS	V1R12, or later
z/VM	z/VM® 5.4.0, or later
z/VSE	V4.2, or later
z/TPF	V1.1, or later

No new host software support is being provided for Release 3.0 of the TS7700.

In general, the recommendation is to install the host software support. Refer to the "VTS", "PTP" and "3957" PSP buckets for the latest information on Software Maintenance.

With z/VM , the TS7740 and TS7720 are transparent to host software.

- z/VM V5R4, or later, with the PTFs for APAR VM64979 is required for both guest and native VM support providing base CP functions.
- Native VM Tape library support for these drives is provided by DFSMS/VM FL221 with PTFs for RMS APAR VM64773 and VM65005 and their prerequisite service.
- EREP V3.5 plus PTFs is required.

With z/VSE® , the TS7740 and TS7720 are transparent to host software. z/VSE supports the TS7740 and the TS7720 as a standalone system in transparency mode. z/VSE 5.1 or later supports COPY EXPORT and Multi Cluster GRID.

With z/TPF the TS7740 and TS7720 are supported in both a single node and a grid environment with the appropriate software maintenance. The category reserve and release functions are not supported by the TS7700.

### **Limitations**

Each TS7700 node must be located within 100 feet of the TSSC.

Clusters running R3.0 machine code can only be joined in a grid with clusters running either R2.1 or R2.0 machine code. No more than 2 machine code levels can be active across all clusters of a grid at any time.

Disk-based encryption requires Release 3.0 disk cache models to be installed as the exclusive disk cache models in the TS7700 system. Previous generation disk cache models do not support disk-based encryption.

TS7700 Release 3.0 machine code is not supported on TS7740 systems using the TS7740 Cache Controller Model CC6.

### **Planning information**

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#### **Customer responsibilities**

It is the customer's responsibility

- Provide CAT 5e or CAT 6 cables to attach the 1Gb Grid Dual Port Copper Connection (#1036) to the IP network when Grid Enablement (#4015) is installed. Cat 6 cables are recommended to avoid potential performance degradation with Cat 5e cables.
- Provide multi-mode fiber cables to attach the 1Gb Grid Dual Port Optical SW Connection (#1037) to the IP network when Grid Enablement (#4015) is installed.
- Provide single-mode fiber cable to attach the Grid Optical LW Connection (#1035) to the IP network when Grid Enablement (#4015) is installed.
- Obtain the appropriate directors, adapters, and cables for FICON channel attachment. The customer is also responsible for ordering tape media. For information on which directors and channel extenders are supported, consult this link

<http://www.ibm.com/support/techdocs/atmsastr.nsf/webindex/FQ116133>

To utilize the remote support facility, phone lines need to be installed close to the TS3500 Tape Library or TS7700 Server.

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Please contact IBM for information.

You are responsible for downloading or obtaining from IBM , and installing designated Machine Code (microcode, basic input/output system code (called BIOS), utility programs, device drivers, and diagnostics delivered with an IBM machine) and other software updates in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes; however, you may be charged for that service.

### **Cable orders**

FICON cables for host attachment are available with features on the TS7720 Server (3957 Model VEB) and TS7740 Server (3957 V07).

Refer to the *IBM Virtualization Engine TS7700 Introduction and Planning Guide (GA32-0568)* for cable planning information.

### **Direct customer support**

Eligible customers can obtain installation and usage assistance through ASK Support using the search word TS7700, TS7740, TS7720, 3956, or 3957.

### **Security, auditability, and control**

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This product uses the security and auditability features of hardware, host software, and/or application software to which it is attached.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

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## **Terms and conditions**

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**Volume orders:** Contact your IBM representative.

### **IBM Global Financing**

Yes

### **Warranty period**

One year

An IBM part or feature installed during the initial installation of an IBM machine is subject to a full warranty effective on the date of installation of the machine. An IBM part or feature that replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty effective on its date of installation. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature are the same as those for the machine in which it is installed.

### **Warranty service**

If required, IBM provides repair or exchange service depending on the types of warranty service specified for the machine. IBM will attempt to resolve your problem over the telephone, or electronically via an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM . You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.



Service levels are response-time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information.

### ***On-site Service***

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

Service level is:

- 24 hours per day, 7 days a week, 4 hour average, same day response.

### **Warranty service upgrades**

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During the warranty period, warranty service upgrades provide an enhanced level of On-site Service for an additional charge. Service levels are response-time objectives and are not guaranteed. See the Warranty services section for additional details.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM . You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.

### **Maintenance service options**

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#### ***On-site Service***

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose. The following on-site response-time objectives are available as warranty service upgrades for your machine. Available offerings are:

- 24 hours per day, 7 days a week, 4 hour average response
- 24 hours per day, 7 days a week, 2 hour average response

Models for which there is a maintenance charge:

Machine type	Model
3956	CS9
3956	XS9
3956	CC9
3956	CX9

### **Warranty service upgrades**

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#### ***Usage plan machine***

No

#### ***IBM hourly service rate classification***

Three

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

**Field-installable features**

No

**Model conversions**

No

**Machine installation**

Installation is performed by IBM . IBM will install the machine in accordance with the IBM installation procedures for the machine. In the United States, contact IBM at 1-800-IBM-SERV (426-7378). In other countries, contact the local IBM office.

Detailed physical planning information for the TS7700 Virtualization Engine is in the *IBM Virtualization Engine TS7700 Series Introduction and Planning Guide* (GA32-0567).

**Graduated program license charges apply**

No

**Licensed machine code**

IBM Machine Code is licensed for use by a customer on the IBM machine for which it was provided by IBM under the terms and conditions of the IBM License Agreement for Machine Code, to enable the machine to function in accordance with its specifications, and only for the capacity authorized by IBM and acquired by the customer. You can obtain the agreement at

[http://www.ibm.com/servers/eserver/support/machine\\_warranties/machine\\_code.html](http://www.ibm.com/servers/eserver/support/machine_warranties/machine_code.html)

IBM may release changes to the Machine Code.

You may also obtain updated code by contacting your IBM representative.

If the machine does not function as warranted and your problem can be resolved through application of Machine Code, IBM will install the Machine Code changes.

**Educational allowance**

A reduced charge is available to qualified education customers. The educational allowance may not be added to any other discount or allowance.

The educational allowance is 15% for the products in this announcement.

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**Pricing**

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**Product charges**

Description	Machine type	Model	Feature number	Field install only	Plant install only
TS7740 Cache Controller	3956	CC9			
13.2 TB SAS Storage	3956	CC9	7124	N	Y
Encryption	3956	CC9	7404	N	N
Plant Install in F05	3956	CC9	9352	N	Y

TS7740 Cache Module	3956	CX9				
13.2 TB SAS Storage Encryption	3956	CX9	7124	N	Y	
Plant Install in F05	3956	CX9	7404	N	N	
Field Merge in F05	3956	CX9	9354	N	Y	
TS7720 Cache Controller	3956	CS9				
36 TB SAS Storage Encryption	3956	CS9	7115	N	Y	
Plant Install in F05	3956	CS9	7404	N	N	
	3956	CS9	9352	N	Y	
TS7720 Cache Module	3956	XS9				
33 TB SAS Storage Encryption	3956	XS9	7116	N	Y	
Plant Install in F05	3956	XS9	7404	N	N	
Field Merge in F05	3956	XS9	9354	N	Y	
	3956	XS9	9355	N	Y	
Plant Install 3956 CS9	3952	F05	5651	N	Y	
Plant Install 3956 CC9	3952	F05	5652	N	Y	
Plant Install 3956 CX9	3952	F05	5653	N	Y	
Field Install 3956 CX9	3952	F05	5654	Y	N	
Plant Install 3956 XS9	3952	F05	5655	N	Y	
Field Install 3956 XS9	3952	F05	5656	Y	N	
TS7740 Encryption Capable	3952	F05	7330	N	Y	
Base Frame						
TS7720 Encryption Capable	3952	F05	7331	N	Y	
Base Frame						
TS7720 Encryption Capable	3952	F05	7332	N	Y	
Expansion Frame						
Ship with R3.0 Machine Code	3952	F05	9113	N	Y	
Enable Disk Encryption	3957	V07, VEB	5272	N	N	
Ship with R3.0 Machine Code	3957	V07, VEB	9113	N	Y	

Description	Machine type	Model	Feature number	Install Type	MES Removal	MES Removal Charge
13.2 TB SAS Storage Encryption	3956	CC9	7124	Plant	No	No
Plant Install in F05	3956	CC9	7404	Both	No	No
	3956	CC9	9352	Plant	No	No
13.2 TB SAS Storage	3956	CX9	7124	Plant	No	No

Encryption	3956	CX9	7404	Both	No	No
Plant Install in F05	3956	CX9	9354	Plant	No	No
Field Merge in F05	3956	CX9	9355	Plant	No	No
36 TB SAS Storage	3956	CS9	7115	Plant	No	No
Encryption	3956	CS9	7404	Both	No	No
Plant Install in F05	3956	CS9	9352	Plant	No	No
33 TB SAS Storage	3956	XS9	7116	Plant	No	No
Encryption	3956	XS9	7404	Both	No	No
Plant Install in F05	3956	XS9	9354	Plant	No	No
Field Merge in F05	3956	XS9	9355	Plant	No	No
Plant Install 3956 CS9	3952	F05	5651	Plant	No	No
Plant Install 3956 CC9	3952	F05	5652	Plant	No	No
Plant Install 3956 CX9	3952	F05	5653	Plant	No	No
Field Install 3956 CX9	3952	F05	5654	Field	No	No
Plant Install 3956 XS9	3952	F05	5655	Plant	No	No
Field Install 3956 XS9	3952	F05	5656	Field	No	No
TS7740 Encryption Capable	3952	F05	7330	Plant	No	No
TS7720 Encryption Capable	3952	F05	7331	Plant	No	No
TS7720 Encryption Capable	3952	F05	7332	Plant	No	No
Ship with R3.0 Machine Code	3952	F05	9113	Plant	No	No
Enable Disk Encryption	3957	V07, VEB	5272	Both	No	No
Ship with R3.0 Machine Code	3957	V07, VEB	9113	Plant	No	No

## Pricing terms

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Prices in the following PDF prices link are suggested list prices on day of announcement for the U.S. only. They are provided for your information only. Dealer prices may vary, and prices may also vary by country. IBM list price does not include tax or shipping and is subject to change without notice.

[ENUS-112-160-LIST\\_PRICES\\_2012\\_10\\_03.PDF](#)

## ServicePac prices

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For ServiceElect (ESA) maintenance service charges, contact IBM Global Services at 888-IBM-4343 (426-4343).

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