

IBM TS7700 R5.0 offering with POWER9 technology, higher density disk storage, and enhanced cybersecurity

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At a glance

IBM^(R) TS7700 Release 5.0 builds upon and expands the capabilities of earlier TS7700 offerings while extending enterprise storage system leadership for IBM Z^(R) virtual tape systems. TS7700 R5 is comprised of:

- TS7700 Server 3957 Model VED
- TS7700 Cache Controller 3956 Model CSB and Cache Module Model XSB
- TS7700 Tape Frame 3952 Model F06

TS7700 supports all the functionality of the previous TS7760 solution while delivering these additional enhancements:

- IBM POWER9TM server
 - All-flash POWER9 option (775 GB SSDs)
- Maximum repository capacity of more than 2.3 PB before compression
 - 10 TB 7.2K SAS Drives
 - Full AES256 Encryption
 - Local and external key management support
 - IBM Security Key Lifecycle Manager (SKLM) KMIP with Transport Layer Security protocol (TLS) 1.2 support (distributed SKLM only)
- DS8000^(R) object store
 - Reduction of host MIPs
 - Elimination of DFSMSHsm recycle processing
 - Coexistent object storage and FICON^(R) host attachment
- Secure data transfer
 - Encrypt data in flight between clusters in a grid using AES128 or AES256 bit encryption
- Operational administration efficiency
 - Remote Code Load designed to help reduce coordination costs
 - Capacity On Demand in 20 TB and 100 TB increments
 - Concurrent cache expansion without business interruption
 - Concurrent library service eliminates physical tape recovery downtime
- Enhanced data handling

- 200 times longer data retention with expire hold (10 to 2,000 years)
- 400% increase in disaster recovery testing availability with Write Protect Exclusion Categories (32 to 128)
- Single-phase and three-phase power support

Overview

IBM TS7770 is the seventh generation of IBM virtual tape system technology, delivering next-level cybersecurity while maintaining the reliability and availability of the mainframe enterprise storage platform to support business across hybrid multicloud deployments. TS7770 optimizes data protection and business continuity for IBM Z data while improving storage economics, system resiliency, and data stability for mission-critical workloads.

TS7770 is built on the IBM POWER9 platform and includes the following:

- Two 10 core, 3.8 GHz processors
- 64 GB DDR4 Memory
- 16 Gb FICON (up to 4 adapters, 2 ports per adapter, 512 paths per port)
- 1 Gb Copper and 10 Gb LW grid network (up to 4 ports total)
- 4 x 16 Gb FC attachment to disk cache and tape drives (up to 16 ports)
- SSD or SAS for pSeries storage
- Common DS8000 pSeries hardware, I/O bays, and adapters
- Single-phase power (30 A) and three-phase 400 V support
- Primary Ethernet and FC adapters integrated into pSeries slots

Product Preview

In the first half of 2020, IBM intends to release a second expansion frame for the TS7770. This second expansion frame will deliver a maximum capacity of 3.9 PB for one base frame with two fully populated expansion frames.

In the first half 2020, IBM also intends to release an iRPQ for the clients to install a TS7770 into their own customer-supplied 19-inch rack. This iRPQ-8B3721 will enable clients to order one TS7770 Server 3957 Model VED, one Cache Controller 3956 Model CSB, and one Cache Module Model XSB, as well as all other associated features to be installed in their own customer supplied rack.

Preview announcements provide insight into IBM plans and directions. General availability, prices, ordering information, and terms and conditions will be provided when the product is announced.

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Key requirements

TS7700 servers attach to FICON channels on select IBM Z servers and require the appropriate levels of IBM Z software.

16 Gb Fibre Channel switches are required when connecting TS7770 Model VED with a TS3500 or TS4500 tape library.

Additional features may be required on the TS7770 components or automation frames. See the [Technical information](#) section for details.

Planned availability date

November 22, 2019

Description

TS7770, built with POWER9 technology, delivers comprehensive next-level cybersecurity, higher performance, and denser disk capacity, as compared to the previous IBM TS7760 offering. Release 5.0 delivers host MIPS optimization with the new DS8000 object store and end-to-end data protection with the new secure data transfer, enabling data to be securely transferred between the clusters within the grid. TS7700 R5.0 machine code may also be installed on TS7760 Model VEC servers.

IBM POWER9 processor technology

IBM TS7770 Model VED features IBM POWER9 server technology, now available in all-flash offerings with six 775 GB SSDs. Model VED, driven by the POWER9 processor, delivers 99.9996% system availability, a reduction of processing times, and integrates industry-standard on-board encryption over the previous POWER8^(R)-based system.

Secure data transfer

Secure data transfer offers next-level cybersecurity with SP 800-131A-compliant encryption for secure file transfer between TS7700 clusters within a grid and logical volume data encryption, including remote reads, writes, and replication. Secure data transfer supports TLS 1.2 using AES128 or AES256 bit encryption and exploits the POWER8 (VEC) and POWER9 (VED) in-core cryptographic acceleration. Encryption settings may be enabled and disabled through the management interface concurrently. Clients can select default certificates or upload user-trusted certificates. There is minimal overhead in performance and CPU utilization when enabled. Secure data transfer is also available on TS7760 Model VEC servers running R5.0 code.

DS8000 object store

TS7700, in conjunction with DS8000 and DFSMSHsm, delivers DS8000 object store. DS8000 transparent cloud tiering (TCT) provides business efficiencies, flexibility, and a reduction in capital expenses by reducing CPU utilization by more than 50% when archiving large data sets.

This new feature enables DS8000 transparent cloud tiered object data and traditional FICON logical volume data to coexist within the same physical TS7700 cluster. No additional hardware is required as data movement is done through existing GRID interfaces between the DS8000 and the TS7700, and data is logically partitioned out of the existing resident cache. The DS8000 can target up to two TS7700 models within a grid for synchronous replication. Utilizing TS7700 as object storage is up to two times faster than conventional cloud storage systems. DS8000 object store is also available on TS7760 Model VEC servers running R5.0 code.

Capacity on Demand

Capacity on Demand allows clients to enable disk capacity in 20 TB and 100 TB increments concurrently.

- Ten of feature number 5262 for 20 TB are required before the first instance of feature number 5263 100 TB cache enablement may be installed.
 - The first 200 TB of the base frame is enabled through ten 20 TB increments.
 - Then 201 TB through 2.3 PB is enabled in 100 TB increments.
- At least 1 TB of licensed capacity must be enabled on the next set of drawer pairs (through feature numbers 5262 and 5263) before the next drawer pair may be installed. Adding physical drawer pairs without at least 1 TB of licensed capacity enabled is not supported.
- Feature numbers 5262 and 5263 should be ordered on 3957-VED.
- At least one feature number 5262 for 20 TB cache enablement increment minimum must be plant installed.

See the website in [IBM Knowledge Center](#) for details.

The TS7770 Cache Controller Model CSB and TS7770 Cache Module Model XSB

- Deliver up to 789 TB* usable capacity in a base frame only configuration (1 CSB + 9 XSBs)
- Deliver up to 2.3 PB usable capacity in a base frame with one expansion frame fully populated with 20 drawers (2 CSBs + 18 XSBs)

Release 5 delivers 10 TB 7.2K SAS disk drives with 157 TB usable capacity per drawer pair. Using the ENERGY STAR-compliant IBM Storwize[®] V5030E model, TS7770 cache enclosures must be installed in pairs, two drawers at a time. Additional pairs of XSB drawers now support concurrent expansion, which is unique to the TS7770 model.

*89 TB activated with first expansion frame

Cloud storage tier

Leveraging transparent cloud tiering for storage of virtual tape data in public or private clouds, the server-less direct data transfer from TS7700 to a cloud can improve business efficiency while reducing capital and operating expense. When data is stored in the cloud by a cluster, all clusters in the grid that are cloud-attached enabled have access to that object store instance. IBM COS and AWS S3 are supported.

Three-phase power distribution unit (PDU) and three-phase power cables

iRPQ 8B3722 provides a pair of three-phase PDUs for the TS7770 3952-F06 for clients who need 400 volt support. iRPQ 8B3723 provides a pair of 415 volt three-phase WYE power cables for TS7770 the 3952-F06. The cable is 4.3-meters (14.1-foot) long. The cable ships with the following connector: Hubbell Part Number: C532P6W. Male, Plug, 32A 220/380-240/415V, 4-Pole 5-Wire Grounding, Screw Terminals, Red, C-Series, Water Tight. This RPQ requires lab approval before ordering. Note when three-phase is selected the frame UPO switch will no longer control any power for the frame. Instead each three-phase PDU will have to have its power removed.

Connectivity

Dual-port 10 Gb long wavelength grid adapters are supported on TS7770 Model VED, in addition to the quad-port 1 Gb grid copper adapter. The Enable Second Port Grid Connections feature can be used with the 1 Gb and 10 Gb grid adapter to double the available grid links supported. TS7700 grid will support R5.0 systems to connect to grids with systems running up to two other levels of machine code, at R3.3 or higher.

16 Gb Fibre Channel HBAs are supported in TS7770 Model VED, with twice the connections over TS7760, delivering increased bandwidth for connections to the disk repository and to backend physical tape library and drives.

TS7700 R5.0 supports the ability to connect a TS4500 or TS3500 library with TS1100 family drives to a TS7770. Enable TS7760/TS7770 Tape Attach and Tape Library Attach are required on TS7700 Server Model VED to define a TS7770T. Fibre Channel switches must be installed in the tape library to complete the connection between the TS7700 and the tape drives. Model VED server requires 16 Gb Fibre Channel switches. These switches are installed in the same TS4500 frame with the tape drives, or in the TS3500 via a 3584 Model TR1 rack, and may be used with the TS7760T, as well as the TS7770T. See the [Hardware requirements](#) section for specific features required on machine type 3584 libraries.

Disk TS7770 partitions

Up to eight cache partitions, CP0 through CP7, may be defined in a TS7760T, TS7770T, TS7760C, TS7770C, or DS8K Object Storage enabled TS7700. Each tape or cloud partition has a client configurable capacity associated with it. The capacity or size assignment will determine how much content of the partition will reside in disk cache. Each partition's capacity is managed independently using its own size restraints, and maintains a segregated LRU algorithm taking only into account those volumes assigned to that partition. CP0 is viewed as the resident-only partition where CP1 through CP7 will be client-sized tape-managed partitions. The amount of capacity that remains within the disk cache after deducting the cumulative assigned capacities of CP1 through CP7 is the resulting size of the disk only residency partition CP0. Both PG0 and PG1 content will target a particular partition CP1 through CP7 and penalize only that partition with respect to capacity. When DS8000 object storage is enabled, one of the CP1 through CP7 partitions is reserved exclusively for DS8000 objects and can be sized dynamically like all other partitions. If neither tape attach or cloud storage tier is enabled, the DS8000 object storage enabled TS7770 will support partitions with CP1 being utilized for DS8000 objects.

Cache resident partition (CP0)

The cache resident partition will always be present with a minimum size of 10 TB and a maximum size of the disk capacity minus the size of any configured tape-managed partitions. The size of CP0 is calculated and is not configurable by the customer. The resident-only partition will be treated as a disk-only solution and all content residing within it will have automatic removal policy attributes associated with it. Pinned, retained, prefer keep, and prefer remove will apply to content contained within the resident-only partition.

Disk partitions (CP1 through CP7)

Disk partitions (CP1 through CP7) are available when the tape attach, cloud storage tier, or DS8000 Offload feature is installed. CP1 is automatically created with a default capacity of 3 TB when any of the mentioned features are installed. The client can alter the size of CP1 and create optional additional partitions CP2 through CP7 when tape attach or cloud storage tier is enabled. The size of each partition is defined in 1 TB increments. Content landing in CP1 through CP7 will require a preference group assignment of PG1 or PG0 similar to the previous TS7700 offering. Hierarchical storage management manages the content of each partition independently. When DS8000 object storage is enabled, one of the CP1 through CP7 partitions is reserved exclusively for DS8000 objects and can be sized dynamically like all other partitions. The DS8000 object storage partition is treated as a resident only partition.

See [IBM Knowledge Center](#) and other product planning documentation for additional information on management and use of TS7770T cache partitions and associated concepts.

Disk cache encryption

Disk cache encryption may be selected and enabled to deliver protection for data as it resides in the TS7770 disk repository. Options enable the user to choose encryption using externally managed keys, or using local or internally managed keys. All disk units in the entire TS7770 cluster must be encryption capable for

encryption to be enabled. Cache controller models CSB and their cache module models XSB are encryption-capable devices.

- The 3956-CSB Cache Controller maintains the encryption keys when feature 5272 Disk Enabled Encryption is selected.
- For feature 5276 Disk Encrypt-External Key Manager, encryption keys are maintained outside of the TS7700 and passed to the TS7700 from an encryption key manager. Only IBM SKLM and its predecessor Tivoli^(R) Key Lifecycle Manager will be supported.
- Unlike the previous 3956-CSA controller, encryption can not be retroactively enabled. Therefore, CSB/XSB drawers must be encryption enabled when shipped from manufacturing.
- To enable TS7770 disk-based encryption using externally managed keys feature number 5276, feature number 5272 must be initially plant-installed on the TS7700 server. This means that all TS7700 configurations with any encryption type enabled will always ship with local key management enabled first. Once a TS7770 with feature number 5272 is configured in a customer environment and able to communicate with an external key server, feature number 5276 can be activated to transition to external key management.
- Feature number 5272 Disk Enabled Encryption is not available for field Install on the TS7770.
- Feature number 7405 must be ordered on every 3956-CSB in the TS7770 configuration. Feature number 7405 will provide four USBs sticks per 3956-CSB used to store the local encryption keys. If external key management is later enabled, these USB sticks are no longer needed.
- For the TS7770 to successfully communicate with the SKLM servers, an X.509 encryption certificate is required. Every TS7770 system shipped with release 5 will contain a Public Key Cryptography Standards (PKCS) file using format #12, even if encryption is not enabled on the TS7770. Feature number 9277, PKCS #12 File - Plant, will be included on each of these systems to indicate the certificate file is installed.
- Disk encryption using externally managed keys with SKLM requires software entitlements for either all physical capacity installed in the TS7700 machine type 3956 or its usable capacity, depending on whichever SKLM pricing model is used. For more information about SKLM, see the [IBM Security Key Lifecycle Manager](#) website.

Section 508 of the US Rehabilitation Act

IBM TS7770 is capable as of November 22, 2019 , when used in accordance with associated IBM 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 Accessibility Conformance Statement can be requested on the [Product accessibility information](#) website.

Product positioning

The TS7700 family of systems combines disk storage and the unique performance and capacity of 3592 tape drives to help reduce the total cost of ownership of tape solutions for IBM Z environments. The TS7700 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 deliver the following benefits:

- Attachment to tape libraries or disk cache-only virtual tape storage
- Lower operating costs in areas including:

- 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 and support for physical tape encryption
- Ability to provide fast access to data
- Cross server IBM Z data sharing
- Remote replication for use with:
 - Geographically Dispersed Parallel Sysplex^(R)
 - Disaster backup and recovery
 - Remote tape vault

The TS7700 incorporates extensive self-management capabilities consistent.

Product number

The following are newly announced features and models on the specified models of the IBM System Storage^(R) 3952, 3956, and 3957 machine types:

Description	Machine type	Model	Feature
Single Phase PDU	3952	F06	1912
Install 3957 VED	3952	F06	5631
Plant Install 3956 CSB	3952	F06	5663
Plant Install 3956 XSB	3952	F06	5664
Field Install XSB	3952	F06	5665
Field Install 3956 CSB	3952	F06	5666
Integrated Control Path	3952	F06	5756
TS7700 Encryption Capable Base Frame	3952	F06	7335
TS7700 Encryption Capable Expansion Frame	3952	F06	7336
R5 Expansion Frame Attach	3952	F06	9336
Ship with R5.0 Machine Code	3952	F06	AGKT
TS7770 Cache Controller	3956	CSB	
TAA Compliance	3956	CSB	0983
120 TB (78.75 TB Usable) SAS Storage	3956	CSB	7119
Encryption CSB (USB Flash Drives (Four Pack))	3956	CSB	7405
Plant Install	3956	CSB	9352
Field merge	3956	CSB	9353

Description	Machine type	Model	Feature
Shipping and Handling - No Charge	3956	CSB	AG00
Shipping and Handling - CSB	3956	CSB	AGGU
TS7770 Cache Enclosure	3956	XSB	
TAA Compliance	3956	XSB	0983
120 TB (78.75 TB Usable) SAS Storage	3956	XSB	7119
Plant Install	3956	XSB	9354
Field Merge	3956	XSB	9355
Shipping and Handling - No Charge	3956	XSB	AG00
Shipping and Handling - XSB	3956	XSB	AGGV
Secure Data Transfer	3957	VEC	5281
DS8000 Object Store	3957	VEC	5282
Ship with R5.0 Machine Code	3957	VEC	AGKT
TS7770 Server	3957	VED	
9 MICRON LC/LC 31 METER	3957	VED	0201
50 MICRON LC/LC 31 METER	3957	VED	0203
TAA Compliance	3957	VED	0983
Enable Second Port Grid Connection	3957	VED	1034
10Gb Dual Port Grid Optical LW Connection	3957	VED	1038
1Gb Grid Quad Port Copper Connection	3957	VED	1039
US RoHS Indicator	3957	VED	1776
Enable FICON second port	3957	VED	3401
16 Gb SW FICON Adapter	3957	VED	3402
16 Gb LW FICON Adapter	3957	VED	3403
Grid Enablement	3957	VED	4015
Remove Cluster from Grid	3957	VED	4016
Cluster Cleanup	3957	VED	4017
Dual Port 16 Gb FC HBA	3957	VED	5243
20 TB Cache Enablement	3957	VED	5262
100 TB Cache Enablement	3957	VED	5263
100 MB/sec Increment	3957	VED	5268
Increased Logical Volumes	3957	VED	5270
Selective Device Access Control	3957	VED	5271

Description	Machine type	Model	Feature
Disk Enabled Encryption	3957	VED	5272
TS7760/TS7770 Tape Attach	3957	VED	5273
Enable 1 TB Pending Tape Capacity	3957	VED	5274
Additional Virtual Devices	3957	VED	5275
Disk Encrypt-External Key Mgr	3957	VED	5276
Cloud Enablement	3957	VED	5278
5 TB Active Premigration Queue	3957	VED	5279
Secure Data Transfer	3957	VED	5281
DS8000 Object Store	3957	VED	5282
Remote Code Load Exception	3957	VED	5904
600 GB HDDs in VED	3957	VED	8080
775 GB SSDs in VED	3957	VED	8081
Mainframe Attachment	3957	VED	9000
Tape Library Attach	3957	VED	9219
100 MB/s Throughput Plant	3957	VED	9268
PKCS #12 File - Plant	3957	VED	9277
Plant Install	3957	VED	9350
No Factory Cables	3957	VED	9700
Tape Encryption Config	3957	VED	9900
Remote Code Load Service	3957	VED	9904
Ship with R5.0 Machine Code	3957	VED	AGKT

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^(R) ID and password are required (use IBMid).

[BP Attachment for Announcement Letter 119-064](#)

Publications

The following TS7700 publication is now available.

Title	Order number
<i>IBM TS7700 Introduction and Planning Guide</i>	GA32-0567

To order, contact your IBM representative or access the [Introduction and Planning Guide](#) on the web.

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For details on available services, contact your IBM representative or go to the [IBM Global Technology Services^{\(R\)}](#) website.

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or go to the [Resiliency Services](#) website.

Details on education offerings related to specific products can be found on the [IBM authorized training](#) website.

Technical information

Specified operating environment

Physical specifications

Tape Frame 3952-F06

- Width: 616 mm (24.25 in.)

- Depth: 1425 mm (56.1 in.)
- Height: 1930.4 mm (76 in.)
- Weight: 746 kg (1645 lb)

TS7770 Cache Controller 3956-CSB

- Width: 483 mm (19.0 in.)
- Depth: 556 mm (21.9 in.)
- Height: 87 mm (3.4 in.)
- Weight: 27.7 kg (61.0 lb)

TS7770 Cache Module 3956-XSB

- Width: 483 mm (19.0 in.)
- Depth: 556 mm (21.9 in.)
- Height: 87 mm (3.4 in.)
- Weight: 26.7 kg (58.7 lb)

TS7770 Server 3957-VED

- Width: 482 mm (18.97 in.)
- Depth: 766.5 mm (30.2 in.)
- Height: 86.7 mm (3.4 in.)
- Weight: 30.4 kg (67 lb)

Operating environment

TS7770 Maximum configuration frame with all components

Total frame including VED, CSB, nine XSB, 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): 12.2 kBTU/hr, 3.06 kcal/hr
- Wet bulb (caloric value): 23° C
- Electrical power: 3480 watts
- Capacity of exhaust: 775 m3/h
- Noise level: 56 db at ambient 25°C and 65db at high temperature 32°C
- Leakage: 10 mA

Hardware requirements

TS7770 base frame configuration rules with R5.0 Machine Code

- One 3952 Tape Frame Model F06 with the following required features:
 - TS7770 Encryption-Capable Base Frame (#7335)
 - Plant Install 3957 VED (#5631)
 - Plant Instl CSB w 10 TB DDM (#5663)
 - Plant Instl XSB w 10 TB DDM (#5664)
 - Integrated Control Path (#5756)
 - Ship with R5.0 Machine Code (#AGKT)
 - Single Phase PDU (#1912) or Three Phase Power (iRPQ 8B3722 + iRPQ 8B3723)
 - A power cord appropriate for the country of installation must be selected from feature #9954 through #9959, or #9966

- TS3000 System Console (TSSC) (#2725) with Optical Drive (#2748), KVM (#5512), Redundant Power (#1904) - required
- One TS7770 Server (3957 Model VED) with the following required features:
 - One of 600GB HDDs in VED (#8080) or 775 GB SSDs in VED (#8081)
 - 100MB/sec Throughput - Plant (#9268)
 - Mainframe Attach (#9000)
 - Ship with R5.0 Machine Code (#AGKT)
 - Plant Install (#9350)
 - Two grid adapters: from the following list
 - 10 Gb Dual Port Grid Optical LW Connection (#1038)
 - 1 Gb Grid Quad Port Copper Connection (#1039)
 - Either two of host to TS7700 FICON cables (#0201 or #0203) or one No Factory Cables (#9700)
 - Two FICON adapters:
 - Two of 16 Gbps FICON Shortwave Attachment (#3402), or
 - Two of 16 Gbps FICON Longwave Attachment (#3403)
 - PKCS #12 File Plant (#9277)
- One TS7770 Cache Controller (3956 Model CSB) with the following required features:
 - 120 TB (78.75 TB Usable) SAS Storage (#7119)
 - Plant Install (#9352)
- One TS7770 Cache Controller (3956 Model XSB) with the following required features:
 - 120 TB (78.75 TB Usable) SAS Storage (#7119)
 - Plant Install (#9354)
- One #5262 20TB
 - 1 x #5262 minimum must be ordered on the 3957-VED
- One of (#9904) Remote Code Load Service or (#5904) Remote Code Load Exception

TS7770 upgrades

The following options may be installed to modify the minimum TS7770 encryption-capable configuration. These options may be installed in the plant or ordered as field upgrades unless explicitly stated otherwise.

- TS7700 Server (3957 Model VED)
 - Grid Enablement (#4015) enables the TS7770 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 (#1038 or #1039) 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. Feature 4016 is field install only. Up to 99 instances of 4016 may be ordered for a single TS7700 server.
 - Cluster Cleanup (#4017) facilitates a one-time cluster cleanup. If the cluster is configured with Grid Enablement (#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. Feature 4017 is field install only. Up to 99 instances of 4017 may be ordered for a single TS7700 server.

- Enable Second Port Grid Connections (#1034) activates the second port on the grid adapters to enable four active 1 Gb Ethernet links (with #1039) or four active 10 Gb Ethernet links (with #1038) for Grid communications.
- Two additional FICON attachments may be installed to provide a total of four FICON attachments on the TS7770 Server. Valid total quantities of 16 Gbps FICON Shortwave Attachment (#3402) or 16 Gbps FICON Longwave Attachment (#3403) are two or four.
- Enable FICON Second Port (#3401) may be used to activate two ports on 16 Gbps FICON adapter installed in the server.
- 20 TB Cache Enablement (#5262) and 100 TB Cache Enablement (#5263); one feature 5262 must be plant installed. Ten of feature 5262 are required before the first instance of feature 5263 may be installed. At least 1 TB of licensed capacity must be enabled before the next drawer pair may be purchased. Adding physical drawer pairs without at least 1 TB Fibre Channel enablement is not supported.
- Additional 100 MBps Increment (#5268) may be installed. The maximum number of feature 5268 is thirty-nine.
- 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.
- Disk Enabled Encryption (#5272) may be installed.
 - Feature 5272 is plant install only, and not field installable
 - When feature 5272 is installed, Encryption (#7405) is required on all 3956-Cache Controller CSB models in the TS7770 system, including expansion frames. Feature 7405 will provide four USBs for use with encryption keys.
- Disk Encrypt-External Key Mgr (#5276) may be installed.
 - When feature 5276 is ordered, feature 5272 is required and is plant installed only. If feature 5276 Disk Encryption-External Key Mgr is not installed, the box will default to Disk Enabled Encryption (#5272).
 - When feature 5276 is installed, Encryption (#7405) is required on all 3956-Cache Controller CSB models in the TS7770 system, including expansion frames. Feature 7405 will provide four USBs for use with encryption keys.
 - The user must secure IBM Security Key Lifecycle Manager V2 software entitlements for all hard disk drives installed in each model 3956-CSB and 3956-XSB device installed in this TS7770 system, including expansion frames.
- Additional Virtual Devices (#5275) may be installed, up to a maximum quantity of fifteen. Each increment of feature 5275 increases the number of available virtual tape drives by sixteen.
- Quad Port 16 Gbps FC HBA (#5243) is required to attach TS7770 Expansion frames to the base frame containing TS7700 Server Model VED. See below for additional expansion frame rules.
- Secure Data Transfer (#5281) may be installed to enable Grid Encryption for data in flight.
- DS8000 Object Store (#5282) may be installed to allow the TS7700 to store DFSMSHsm object data from the DS8000.
- TS7770 Cache Drawer
 - Up to nine 3956 Cache Drawers Model XSB may be installed in the feature 7335 F06 frame.
 - To include Model XSB in a new cluster coming from the plant, feature 5663, Plant Instl CSB with 10 TB DDM must be present in 3952 Model F06, and the following features are required:
 - Feature 7119, 120 TB (78.75 TB Usable) SAS Storage, on each 3956 Model XSB
 - Feature 9354, Plant Install, on each 3956 Model XSB
 - Feature 5664, Plant Instl XSB with 10 TB DDM, on 3952 Model F06 for each XSB configured

- To field install Model XSB with 10 TB disk drives in an existing TS7770 with feature 5665, Plant Instl CSB with 10 TB DDM, the following features are required:
 - Feature 7119, 120 TB (78.75 TB Usable) SAS Storage, on each 3956 Model XSB
 - Feature 9355, Field Merge, on each 3956 Model XSB
 - Feature 5665, Field Instl XSB w 10TB DDM, on the 3952 Model F06 for each XSB configured

TS7770 cloud attach

To create a cloud-attached TS7770, often referred to as a TS7770C, the following features are required and may be installed in the plant or in the field:

- Cloud Enablement (#5278) enables a TS7770 server to support the placing data into, and retrieving data from a cloud.
- 1 TB Active Premigration Queue (#5274) designates that up to 1 TB of data across all tape-managed and cloud-managed partitions may be waiting to be written to a physical tape cartridge. One instance of feature 5274 is required on a TS7770C. Up to 10 instances of feature 5274 may be installed. Feature 5279, 5 TB Active Premigration Queue, designates that up to 5 TB of additional data across all tape-managed and cloud-managed partitions may be waiting to be written to a physical tape cartridge. All 10 instances of feature 5274 are required before the first instance of feature 5279 may be installed. Up to 10 instances of feature 5279 may be installed. Once all 10 instances of feature 5274 and 10 instances of feature 5279 are installed, the size of the premigration queues is unconstrained by these features, and is limited only by the size of the disk repository.
- Cloud Storage Tier requires system to have a minimum 64 GB RAM. Memory Upgrade (#3466), adds 32 GB RAM to TS7700 Model 3957-VEC. Memory Upgrade is not required on the 3957-VED.

TS7770 tape attach

To create a tape-attached TS7770, often referred to as a TS7770T, the following features are required and may be installed in the plant or in the field:

- TS7760/TS7770 Tape Attach (#5273) enables a TS7770 server to recognize that physical tape drives have been attached to the cluster.
- 1 TB Active Premigration Queue (#5274) designates that up to 1 TB of data across all tape-managed and cloud-managed partitions may be waiting to be written to a physical tape cartridge. One instance of feature 5274 is required on a TS7770T. Up to 10 instances of feature 5274 may be installed.
- 5 TB Active Premigration Queue (#5279) designates that up to 5 TB of additional data across all tape-managed and cloud-managed partitions may be waiting to be written to a physical tape cartridge. All 10 instances of feature 5274 are required before the first instance of feature 5279 may be installed. Up to 10 instances of feature 5279 may be installed. Once all 10 instances of feature 5274 and 10 instances of feature 5279 are installed, the size of the premigration queues is unconstrained by these features, and is limited only by the size of the disk repository.
- Tape Library Attach (#9219)
- Two 16 Gb Fibre Channel switches are required:
 - Switches for a TS3500 library are installed in Model TR1 using the following features: TS7700 BE SW Mounting Hdw (#4879), Two of TS7700 BE 16 Gb Switch (#4880), Two of Power Distribution Units (#1751).
 - Switches for a TS4500 library are installed in model L25 or D25 using the following features: TS7700 BE SW Mounting Hdw (#4879), Two of TS7700 BE 16 Gb Switch (#4880).
- One or more TS3500 model L23 or D23 frames with from four to sixteen TS1120 thru TS1150 tape drives. One older generation of tape drives may be installed with TS1150 drives if required to read Gen 1 or 2 media. The combined

maximum number of drives remains at 16. A minimum of four TS1150 drives must be present and a minimum of two drives from the previous drive generation must be present. All Gen 1 and Gen 2 media will be marked as read only. All recalls from Gen 1 and Gen 2 media will be directed to the non-TS1150 drives. All recalls from Gen 3 or 4 media will be directed to the TS1150 drives. All writes and appends will be directed to TS1150 drives. Previously written content on Gen 3 media which requires appending will be written by the TS1150 drives in the E07 format.

- One or more TS4500 Model L25 or D25 frames with from four to sixteen TS1140 or TS1150 tape drives.
- Encryption Configuration (#9900) is optional for the TS7770T, and may be installed in the plant or in the field. Feature 9900 enables a TS7700 server to be configured to support physical tape encryption for designated storage pools. To use encryption with the TS7700, all attached tape drives must be TS1120 encryption-capable tape drives, or newer. TS1120 drives must be operating in 3592 Model E05 native mode. Physical tape encryption is independent of disk-based encryption.

TS7770 encryption-capable expansion frame

One TS7770 encryption-capable expansion frame may be attached to a TS7770 base frame running R5.0, or higher, machine code. The R5.0 expansion frame now supports a total of 20 drawers in one single frame. One Cache Controller Model CSB and one Cache Module Model XSB must be plant installed. The first CSB must have nine XSBs before the second CSB may be added. The second CSB may also have up to nine XSBs, for a total of 18 XSBs, using the following configurations:

- One 3952 Tape Frame Model F06 with the following required features:
 - TS7770 Encryption-Capable Expansion Frame (#7336)
 - Plant Instl CSB w 10 TB DDM (#5663)
 - Plant Instl XSB w 10TB DDM (#5664)
 - When one feature 5663 Plant Instl CSB and one feature 5664 Plan Instl XSB is configured, the following features may be included:
 - Zero to eight of Plant Instl XSB w 10 TB DDM (#5664)
 - Zero to eight of Field Instl XSB w 10 TB DDM (#5665)
 - When two feature 5663 Plant Instl CSBs are configured, the following features may be included:
 - Ten to eighteen of Plant Instl XSB w 10 TB DDM (#5664)
 - Ten to eighteen of Field Instl XSB w 10 TB DDM (#5665)
 - When quantity of feature 5663 is one, valid quantities of feature 5663 plus 5664 plus 5665 are 2, 4, 6, 8, and 10
 - When quantity of features 5663 and 5666 is two, valid quantities of features 5663 plus 5664 plus 5665 plus 5666 are 12, 14, 16, 18, and 20
 - To field install the second Model CSB with 10 TB disk drives in an existing TS7770 expansion frame with feature 5666, Field Instl CSB with 10 TB DDM, the following features are required:
 - Feature 5663, Plant Instl CSB
 - Feature 5664, Plant Instl XSB
 - Feature 7119, 120 TB (78.75 TB Usable) SAS Storage, on each 3956 Model CSB
 - Feature 9353, Field Merge, on each 3956 Model CSB
 - Feature 5666, Field Instl CSB with 10 TB DDM, on the 3952 Model F06 for each CSB configured
 - When feature 5666 is present, a minimum expansion frame
 - When feature 5666 Field Instl CSB is configured, ten to eighteen of Field Instl XSB w 10 TB DDM (#5665) may be included.
 - Single Phase Power (#1912) or Three Phase Power (iRPQ 8B3722 + iRPQ 8B3723)

- A power cord appropriate for the country of installation must be selected from feature 9954 through 9959, or 9966 or iRPQ 8B3723
- When the 7336 expansion frame feature is attached to a TS7770 encryption-capable base frame (3952 Tape Frame Model F06 with feature 7335), the following features are required on the base frame in addition to the minimum configuration and optional requirements defined above:
 - One of R5 Expansion Frame Attach (#9336)
 - When feature 5663 is present, nine of feature 5664 plus 5665 are required on the 7335 base frame
 - Feature 5243 is required on Model VED installed in this base frame

Software requirements

Software support is available for IBM Z FICON channel attachment to the TS7700. Operating system software support is available for the following release levels:

Operating system	Release level
z/OS ^(R)	V2R2, or later
z/VM ^(R)	V6.4.0, or later
z/VSE ^(R)	V6.2, or later
z/TPF	V1.1, or later

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

With z/OS there is no additional host support being provided for release 5 of the TS7700.

For z/VM, the TS7700 is transparent to host software and utilized as a set of 3490 tape drives with backing library controller. Support to allow a guest virtual machine to use the drives, and the support for base CP and CMS tape drive functions, is provided in the base code of the z/VM product. VM tape library controller support for these drives is provided by DFSMS/VM FL221 with PTFs for RMS APAR VM64773 and VM65005, and their prerequisite service.

z/VSE V6.2, or later, transparently support TS7700 R5.0 both as a standalone system and in a multi-cluster grid environment. z/VSE V6.2, or later, support the COPY EXPORT function.

With z/TPF, TS7700 is supported in both a single node and a grid environment with the appropriate software maintenance.

Limitations

Feature number 2725 TSSC and all associated features are required on every TS7770 3957-VED.

MES of the new 3956-CSB and 3956-XSB is not supported on the on TS7760 3957-VEC.

If either internal or external encryption is desired, feature number 5272 Disk Enabled Encryption must be plant-installed.

Encryption cannot be retroactively enabled on the TS7770 3957-VED. The Cache enclosures will need to be shipped from manufacturing with Disk Enabled Encryption feature number 5272.

Tape-attach feature number 5273 is mutually exclusive with cloud enablement feature 5278 and DS8000 Object Store feature 5282.

1 Gb Optical SW Grid Ethernet Adapter is not supported on the TS7770 3957-VED.

8 Gb FICON host attachments is not supported on the TS7770 3957-VED.

TS7700 R4.1.x, or higher, must be connected to TSSC feature 2725, or follow-on features. Earlier TSSC features are not supported.

Clusters running R4.1.x machine code can only be joined in a grid with clusters running R3.3, or higher, machine code. No more than three machine code levels can be active across all clusters of a grid at any time.

Cloud enablement feature 5278 requires minimum of 64 GB RAM. Memory upgrade feature 3466 adds 32 GB RAM, which is required to be installed prior to enabling feature 5278 on the TS7760 3957-VEC only. The TS7770 3957-VED comes with 64 GB of memory already installed.

Planning information

Client responsibilities

Client responsibilities include:

- Provide CAT 5e or CAT 6 cables to attach the 1 Gb Grid Dual Port Copper Connection (#1039) 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 single-mode fiber cable to attach the Grid Optical LW Connection (#1038) 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, see the [IBM Techdocs FAQ](#).

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. Contact IBM for more 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 TS7700 Server (3957 Model VED).

See the *IBM TS7700 Introduction and Planning Guide* (GA32-0567) for cable planning information.

Direct client support

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

Security, auditability, and control

This product uses the security and auditability features of hardware, host software, and 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.

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

IBM Systems Lab Services

For details on available services, contact your IBM representative or go to the [Lab Services](#) website.

Terms and conditions

Volume orders

Contact your IBM representative.

IBM Global Financing

Yes

Products - terms and conditions

Warranty period

Warranty and additional coverage options	Coverage summary¹
Warranty period:	1 year ²
Service level:	IBM On-Site, 24x7 Same Day
Service upgrade options	
Warranty service upgrade	Yes ¹
Maintenance services (Post-Warranty)	IBM On-Site Repair, Next Business Day and Same Day options
IBM Hardware Maintenance Services - committed maintenance ³	Yes

¹ See complete coverage details below

² Known exception: Turkey (Warranty period: 2 years)

³ Not offered in the US

One year

To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM. An IBM part or feature installed during the initial installation of an IBM machine is subject to the full warranty period specified by IBM. 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. 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 through 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.

If applicable to your product, parts considered Client Replaceable Units (CRUs) will be provided as part of the machine's standard warranty service.

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.

Warranty service will be provided with the prevailing warranty service type and service level available. If a customer requires On-site Code Load Service they will need to order chargeable feature number 5904 Remote Code Load Exception.

On-site Service

At IBM's discretion, 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:

- IBM On-site Repair 24 hours per day, 7 days a week, same day response.

International Warranty Service

International Warranty Service allows you to relocate any machine that is eligible for International Warranty Service and receive continued warranty service in any country where the IBM machine is serviced. If you move your machine to a different country, you are required to report the machine information to your Business Partner or IBM representative.

The warranty service type and the service level provided in the servicing country may be different from that provided in the country in which the machine was purchased. Warranty service will be provided with the prevailing warranty service type and service level available for the eligible machine type in the servicing country, and the warranty period observed will be that of the country in which the machine was purchased.

The following types of information can be found on the [International Warranty Service](#) website

- Machine warranty entitlement and eligibility
- Directory of contacts by country with technical support contact information
- Announcement Letters

Warranty service upgrades

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.

- On-Site Repair, 7 days a week, 24hrs/day, 2 hour response objective. Response times are objectives and are not guaranteed.

Maintenance service options

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:

- On-Site Repair, Monday through Friday (excluding holidays), 8am to 5pm, next business day.
- On-Site Repair, Monday through Friday (excluding holidays), 8am to 5pm, 4 hour response objective. Response times are objectives and are not guaranteed.
- On-Site Repair, 7 days a week, 24hrs/day.
- On-Site Repair, 7 days a week, 24hrs/day, 2 hour response objective. Response times are objectives and are not guaranteed.

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.

General terms and conditions

Field-installable features

Yes

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.

Graduated program license charges apply

No

Licensed Machine Code

IBM Machine Code is licensed for use by a client 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 client. You can obtain the agreement from the [License Agreement for Machine Code and Licensed Internal Code](#) website.

Access to Machine Code updates is conditioned on entitlement and license validation in accordance with IBM policy and practice. IBM may verify entitlement through customer number, serial number, electronic restrictions, or any other means or methods employed by IBM in its discretion.

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 your application of downloadable Machine Code, you are responsible for downloading and installing these designated Machine Code changes as IBM specifies.

If you would prefer, you may request IBM to install downloadable Machine Code changes; however, you may be charged for that service.

Remote Code Load

IBM will utilize remote code load (RCL), as the default method for code upgrades on entitled TS7770 Storage products. Any deviations requiring on-site SSR code upgrades will represent a chargeable feature that can be procured at the time of product purchase.

RCL has proven to be efficient and secure for both IBM and clients. RCL is fast and easy to coordinate because it does not require an onsite visit of an IBM services technician and is the preferred alternative to the existing on-premises microcode upgrade service. RCL is available on all TS7700 code levels and requires configuring Assist On-Site (AOS) or remote support center. This is the same secure connection method already used for the TS7700 system remote access for service. Feature number 9904 is the default delivery mechanism for Remote Code Load. If a customer requires on-site service they will need to order chargeable feature number 5904 Remote Code Load Exception. Both feature numbers 9904 and 5904 carry a maintenance charge post-warranty.

Educational allowance

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

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

Prices

For additional information and current prices, contact your local IBM representative or IBM Business Partner.

The following are newly announced features of the IBM System Storage 3952 machine type:

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
Single Phase PDU	F06	1912	Initial	No	No
Install 3957 VED	F06	5631	Initial	No	No
Plant Install 3956 CSB	F06	5663	Initial	No	No
Plant Install 3956 XSB	F06	5664	Initial	No	No
Field Install XSB	F06	5665	MES	No	No
Field Install 3956 CSB	F06	5666	MES	No	No
Integrated Control Path	F06	5756	Initial	No	No
TS7700 Encryption Capable Base Frame	F06	7335	Initial	No	No
TS7700 Encryption	F06	7336	Initial	No	No

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
Capable Expansion Frame					
R5 Expansion Frame Attach	F06	9336	Both	No	No
Ship with R5.0 Machine Code	F06	AGKT	Both	No	No

The following are newly announced features and models on the specified models of the IBM System Storage 3956 machine type:

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
TS7770 CACHE ENCLOSURE	XSB		Both	No	
TS7770 CACHE CONTROLLER	CSB		Both	No	
TAA Compliance	CSB	0983	Initial	No	No
120 TB (78.75 TB Usable) SAS Storage	CSB	7119	Initial	No	No
Encryption CSB (USB Flash Drives (Four Pack))	CSB	7405	Initial	No	No
Plant Install	CSB	9352	Initial	No	No
Field merge	CSB	9353	Initial	No	No
Shipping and Handling - No Charge	CSB	AG00	Initial	No	No
Shipping and Handling - CSB	CSB	AGGU	Initial	No	No
TAA Compliance	XSB	0983	Initial	No	No
120 TB (78.75 TB Usable) SAS Storage	XSB	7119	Initial	No	No
Plant Install	XSB	9354	Initial	No	No
Field Merge	XSB	9355	Initial	No	No
Shipping and	XSB	AG00	Initial	No	No

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
Handling - No Charge					
Shipping and Handling - XSB	XSB	AGGV	Initial	No	No

The following are newly announced features and model on the specified model of the IBM System Storage 3957 machine type:

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
TS7770 SERVER	VED		Both	No	
Secure Data Transfer	VEC	5281	Both	Yes	No
DS8000 Object Store	VEC	5282	Both	No	No
Ship with R5.0 Machine Code	VEC	AGKT	Both	No	No
9 MICRON LC/LC 31 METER	VED	0201	Both	No	No
50 MICRON LC/LC 31 METER	VED	0203	Both	No	No
TAA Compliance	VED	0983	Initial	No	No
Enable Second Port Grid Connection	VED	1034	Both	No	No
10Gb Dual Port Grid Optical LW Connection	VED	1038	Both	No	No
1Gb Grid Quad Port Copper Connection	VED	1039	Both	No	No
US RoHS Indicator	VED	1776	Initial	No	No
Enable FICON second port	VED	3401	Both	No	No
16 Gb SW FICON Adapter	VED	3402	Both	No	No
16 Gb LW FICON Adapter	VED	3403	Both	No	No
Grid Enablement	VED	4015	Both	No	No
Remove Cluster from Grid	VED	4016	MES	No	No

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
Cluster Cleanup	VED	4017	MES	No	No
Dual Port 16 Gb FC HBA	VED	5243	Both	No	No
20 TB Cache Enablement	VED	5262	Both	Yes	No
100 TB Cache Enablement	VED	5263	Both	Yes	No
100 MB/sec Increment	VED	5268	Both	Yes	No
Increased Logical Volumes	VED	5270	Both	Yes	No
Selective Device Access Control	VED	5271	Both	No	No
Disk Enabled Encryption	VED	5272	Initial	No	No
TS7760/TS7770 Tape Attach	VED	5273	Both	No	No
Enable 1 TB Pending Tape	VED	5274	Both	Yes	No
Additional Virtual Devices	VED	5275	Both	No	No
Disk Encrypt-External Key Mgr	VED	5276	Both	No	No
Cloud Enablement	VED	5278	Both	No	No
5 TB Active Premigration Queue	VED	5279	Both	Yes	No
Secure Data Transfer	VED	5281	Both	Yes	No
DS8000 Object Store	VED	5282	Both	No	No
Remote Code Load Exception	VED	5904	Both	No	No
600 GB HDDs in VED	VED	8080	Initial	No	No
775 GB SSDs in VED	VED	8081	Initial	No	No
Mainframe Attachment	VED	9000	Initial	No	No

Description	Model number	Feature numbers	Initial / MES / Both / Support	CSU	RP MES
Tape Library Attach	VED	9219	Both	No	No
100 MB/s Throughput Plant	VED	9268	Initial	No	No
PKCS #12 File - Plant	VED	9277	Initial	No	No
Plant Install	VED	9350	Initial	No	No
No Factory Cables	VED	9700	Initial	No	No
Tape Encryption Config	VED	9900	Both	Yes	No
Remote Code Load Service	VED	9904	Both	No	No
Ship with R5.0 Machine Code	VED	AGKT	Both	No	No

CSU = Customer setup

RP MES = Returnable parts MES

Alternative service

Machine type-model - Feature	IOR IBM same day on-site repair (IOR, 24 x 7)
3956-CSB	
3956-XSB	
3957-VED	
3957-VED - 1038	
3957-VED - 1039	
3957-VED - 3402	
3957-VED - 3403	
3957-VED - 4015	
3957-VED - 5243	
3957-VED - 5904	
3957-VED - 8080	
3957-VED - 8081	
3957-VED - 9904	

ServiceElect (ESA) charges

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

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Fax: 800-2IBM-FAX (242-6329)

For IBM representative: askibm@ca.ibm.com

For IBM Business Partner: pwcs@us.ibm.com

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[IBM United States](#)

Corrections

(Corrected on October 22, 2019)

The title has been updated.