IBM TotalStorage DS6000

Planning

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Note:
Before using this information and the product it supports, read the information in "Notices" on page 47.

Twenty-fifth Edition (April 2007)

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Notices and publication information

This section contains information about safety notices that are used in this guide, environmental notices for this product, publication information, and information about sending your comments to IBM.

Safety notices

Complete this task to find information about safety notices.

To find the translated text for a danger or caution notice:

1. Look for the identification number at the end of each danger notice or each caution notice. In the following examples, the numbers **1000** and **1001** are the identification numbers.

   DANGER

   A danger notice indicates the presence of a hazard that has the potential of causing death or serious personal injury.

   1000

   CAUTION:
   A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury.

   1001

2. Find the number that matches in the *IBM System Storage Solutions Safety Notices for IBM Versatile Storage Server and IBM System Storage Enterprise Storage Server*, GC26-7229.

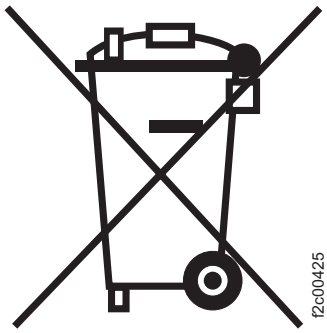
Environmental notices

This section identifies the environmental guidelines that pertain to this product.

Product recycling and disposal

This unit contains recyclable materials.

This unit must be recycled or discarded according to applicable local and national regulations. IBM® encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.



Notice: This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

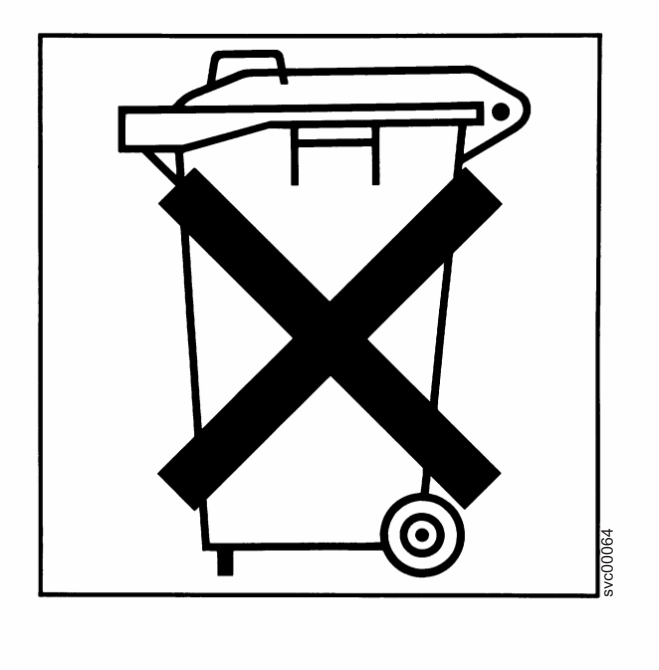
In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

This product may contain sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to http://www.ibm.com/ibm/environment/products/index.shtml or contact your local waste disposal facility.

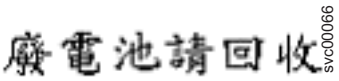
In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM Equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

In the Netherlands the following applies:



For Taiwan:

Please recycle batteries.



How to send your comments

Your feedback is important to help us provide the highest quality information. If you have any comments about this information or any other DS6000™ series documentation, you can submit them in the following ways:

- e-mail

  Submit your comments electronically to the following e-mail address:

  starpubs@us.ibm.com

  Be sure to include the name and order number of the book and, if applicable, the specific location of the text you are commenting on, such as a page number or table number.
- Mail

  Fill out the Readers' Comments form (RCF) at the back of this book. Return it by mail or give it to an IBM representative. If the RCF has been removed, you can address your comments to:

International Business Machines Corporation
RCF Processing Department
Department 61C
9032 South Rita Road
TUCSON AZ 85775-4401

Chapter 1. Planning

The topics in this section provide planning information related to your DS6000. Topics covered include physical configuration, licensed functions, delivery requirements, site requirements, migration, and ordering features.

Chapter 2. Planning the physical configuration

This section provides planning information to help you set up your DS6000 series environment. It also lists the feature codes that you will need to order the various features of your storage complex.

Disk drive module storage features

Use the disk drive module (DDM) storage feature codes to order the disk drive sets for your base enclosure or an expansion enclosure.

Disk drive sets contain 4 identical disk drives with the same capacity and rpm. FATA drives combine a fibre-channel interface with an ATA drive, which provides additional capacity to address specific application and business requirements. For Model 511 or 522, a minimum of one disk drive feature code (a total of 4 drives) is required for your DS6000 series configuration. If you select less than 4 disk drive feature codes, the remainder is populated by DDM blank feature codes.

Table 1 provides a list of the fibre-channel disk drive sets for the DS6000 series and the quantities per feature. You also can order additional storage capacity for an expansion enclosure.

Table 1. Fibre-channel disk drive sets for DS6000 series

Feature code	Description	Quantity
Models 511 and EX1		
2002	146 GB (10 000 rpm) disk drive set	4 per feature
2004	300 GB (10 000 rpm) disk drive set	4 per feature
2052	73 GB (15 000 rpm) disk drive set	4 per feature
2054	146 GB (15 000 rpm) disk drive set	4 per feature
2990	DDM blanks	4 per feature
3004	500 GB (7 200 rpm) FATA disk drive set	4 per feature
Models 522 and EX2		
2006	146 GB (10 000 rpm) disk drive set	4 per feature
2010	300 GB (10 000 rpm) disk drive set	4 per feature
2058	73 GB (15 000 rpm) disk drive set	4 per feature
2060	146 GB (15 000 rpm) disk drive set	4 per feature
2991	DDM blanks	4 per feature
3006	500 GB (7 200 rpm) FATA disk drive set	4 per feature

Capacity calculation guidelines

To help you determine the type and number of disk drives to add to your storage unit, calculate the physical and effective capacity of the disk drives.

Calculating physical and effective capacity

To calculate the total physical capacity of a DS6000 storage unit, multiply each disk drive set feature (4 identical disk drives with the same capacity and rpm) by its total physical capacity and sum the values.

The logical configuration of your DS6000 series storage affects the effective capacity of the disk drive set.

Specifically, effective capacities vary depending on the following:

- Data format

  Physical capacity can be logically configured as fixed block (FB) or count key data (CKD). Data accessed by open systems hosts or Linux on System z that support fibre channel protocol must be logically configured as FB. Data accessed by zSeries hosts with z/OS or z/VM must be configured as CKD.
- Array or rank configuration

  The disk drive arrays on the system can be contained in RAID ranks and RAID configurations. A rank can contain only one array.

Each RAID rank is divided into equal-sized segments known as extents. All extents are approximately 1 GB. However, FB extents are slightly larger than CKD extents.

Table 2 and Table 3 on page 5 list the effective capacity of DS6800 disk drive sets.

Table 2. Disk drive set capacity (RAID 10 arrays)

Disk size (GB) (See Note 2)	Total physical capacity per (GB) disk drive set (See Note 3)	Fixed block (FB) or count key data (CKD)	Effective capacity in GB (Number of Extents, see Note 1)			
			Ranks of RAID 10 arrays			
			1 + 1 (See Note 4)	2 + 2 (See Note 5)	3 + 3 (See Note 6)	4 + 4 (See Note 7)
73	292	FB	67.57 (62)	136.06 (127)	204.01 (190)	272.73 (254)
		CKD	64.33 (68)	135.28 (143)	201.50 (213)	268.67 (284)
146	584	FB	136.37 (127)	275.32 (256)	414.46 (386)	552.98 (515)
		CKD	134.33 (142)	271.50 (287)	408.67 (432)	545.85 (577)
300	1200	FB	281.32 (262)	561.27 (523)	845.03 (787)	1125.28 (1050)
		CKD	275.293 (291)	555.31 (587)	832.48 (880)	1110.61 (1174)
500	2000	FB	( )	( )	( )	( )
		CKD	( )	( )	( )	( )

Table 2. Disk drive set capacity (RAID 10 arrays) (continued)

Disk size (GB) (See Note 2)	Total physical capacity per (GB) disk drive set (See Note 3)	Fixed block (FB) or count key data (CKD)	Effective capacity in GB (Number of Extents, see Note 1)			
			Ranks of RAID 10 arrays			
			1 + 1 (See Note 4)	2 + 2 (See Note 5)	3 + 3 (See Note 6)	4 + 4 (See Note 7)

Notes:

1. All values for capacity and extent numbers are based on preliminary data.
2. Physical capacities are in decimal gigabytes (GB). One decimal GB is 1 000 000 000 bytes.
3. Although disk drive sets contain 4 drives, arrays use either 4 or 8 drives.
4. The array consists of 1 data drive that is mirrored to 1 copy drive. Two other drives in the disk drive set are used as spares.
5. The array consists of 2 data drives that are mirrored to 2 copy drives.
6. The array consists of 3 data drives that are mirrored to 3 copy drives. Two other drives in the disk drive set are used as spares.
7. The array consists of 4 data drives that are mirrored to 4 copy drives.

Table 3. Disk drive set capacity (RAID 5 arrays)

Disk size (GB) (See Note 2)	Total physical capacity (GB) per disk drive set (See Note 3)	Fixed block (FB) or count key data (CKD)	Effective capacity in GB (Number of Extents, see Note 1)			
			Ranks of RAID 5 arrays (See Note 4)			
			2 + P (See Note 5)	3 + P (See Note 6)	6 + P (See Note 7)	7 + P (See Note 8)
73	292	FB	136.06 (126)	204.01 (190)	410.17 (382)	477.82 (445)
		CKD	135.28 (141)	201.50 (212)	404.89 (427)	473.00 (499)
146	584	FB	275.32 (256)	414.46 (385)	830.00 (773)	968.52 (902)
		CKD	271.50 (287)	408.67 (432)	820.19 (866)	956.41 (1010)
300	1200	FB	561.27 (524)	845.03 (787)	1692.22 (1576)	1972.46 (1837)
		CKD	555.31 (587)	832.48 (881)	1669.70 (1765)	1947.83 (2059)
500	2000	FB	(877)	(1316)	(2634)	(3071)
		CKD	(982)	(1474)	(2950)	(3440)

Table 3. Disk drive set capacity (RAID 5 arrays) (continued)

Disk size (GB) (See Note 2)	Total physical capacity (GB) per disk drive set (See Note 3)	Fixed block (FB) or count key data (CKD)	Effective capacity in GB (Number of Extents, see Note 1)			
			Ranks of RAID 5 arrays (See Note 4)			
			2 + P (See Note 5)	3 + P (See Note 6)	6 + P (See Note 7)	7 + P (See Note 8)

Notes:

1. All values for capacity and extent numbers are based on preliminary data.
2. Physical capacities are in decimal gigabytes (GB). One decimal GB is 1 000 000 000 bytes.
3. Although disk drive sets contain 4 drives, arrays use either 4 or 8 drives.
4. In RAID 5 configurations, the parity information uses the capacity of one disk but is actually distributed across all of the disks within the array.
5. The array consists of 2 data drives and 1 parity drive. One other drive is used as a spare.
6. The array consists of 3 data drives and 1 parity drive.
7. The array consists of 6 data drives and 1 parity drive. One other drive is used as a spare.
8. The array consists of 7 data drives and 1 parity drive.

To estimate the usable storage capacity of a DS6000 storage unit, it is helpful to understand the rule of sparing disks.

- Each switched FC-AL loop will have up to two spares.
- The base frame will have one or two spares: one spare in 8 DDM configurations and two spares for other configurations. You may have three spares if your configuration is RAID-5 on 8 drives and then RAID-10 on 8 drives on the first enclosure for the loop.
- The first expansion frame is the second loop and will have one or two spares.

Fiber optic host cables

Each host port requires one LC-LC type fiber optic cable to attach to host systems or switches. Cables are available with two duplex LC-type connectors (LC-LC type) of various lengths.

The fiber optic host cables can be multimode 50 micrometers or 9.0 micrometers for distances up to 300 meters at 2 Gbps performance for the host port.

Table 4 lists the feature codes used to order 50 micron (multimode) host cables for use with the fibre-channel/FICON host shortwave small form-factor pluggable (SFP) feature (#1310 for model 1750-511 or #1320 for model 1750-522). The cables include an LC connector for attachment to the DS6800 with SFPs. The cables range from 2 meters to 31 meters in length.

Table 4. Shortwave fiber optic host cables feature codes for DS6800

Feature Code	Cable Type (LC-LC)	Quantity
Model 511		
1350	2M (50 micron) LC-LC cable	1 per feature
1351	7M (50 micron) LC-LC cable	1 per feature

Table 4. Shortwave fiber optic host cables feature codes for DS6800 (continued)

Feature Code	Cable Type (LC-LC)	Quantity
1352	31M (50 micron) LC-LC cable	1 per feature
Model 522		
1353	2M (50 micron) LC-LC cable	1 per feature
1354	7M (50 micron) LC-LC cable	1 per feature
1355	31M (50 micron) LC-LC cable	1 per feature

Table 5 lists the feature codes used to order a 9 micron (singlemode) host cable for use with the fibre-channel/FICON host longwave SFP feature (#1315 for model 1750-511 or #1325 for model 1750-522). The cables include an LC-type connector for attachment to the DS6800 SFPs and are available with an LC-type connector for attachment to servers and fabric components. The cables range from 2 meters to 31 meters in length.

Table 5. Longwave fiber optic host cables feature codes for DS6800

Feature Code	Cable Type (LC-LC)	Quantity
Model 511		
1360	2M (9 micron) LC-LC cable	1 per feature
1361	7M (9 micron) LC-LC cable	1 per feature
1362	31M (9 micron) LC-LC cable	1 per feature
Model 522		
1363	2M (9 micron) LC-LC cable	1 per feature
1364	7M (9 micron) LC-LC cable	1 per feature
1365	31M (9 micron) LC-LC cable	1 per feature

Fibre-channel host interposers

If you are attaching a host port to systems or switches using the larger SC-type connector, an LC-SC fibre-channel host interposer is required.

Table 6 lists the fibre-channel host interposers that you can order for your DS6000 series.

Table 6. Fibre-channel host interposer feature codes for DS6800

Feature Code	Cable Type (LC-SC)	Description
Model 511		
1370	50 micron LC-SC interposers	Attaches to a shortwave fiber optic cable
1371	9 micron LC-SC interposers	Attaches to a longwave fiber optic cable.
Model 522		
1372	50 micron LC-SC interposers	Attaches to a shortwave fiber optic cable

Table 6. Fibre-channel host interposer feature codes for DS6800 (continued)

Feature Code	Cable Type (LC-SC)	Description
1373	9 micron LC-SC interposers	Attaches to a longwave fiber optic cable.

Expansion enclosure cables

The DS6000 series provides device ports for attaching the expansion enclosure (1750-EX1 or 1750-EX2) to the DS6800 series.

Each connection from the DS6800 to the DS6000 expansion enclosure requires an LC-LC type connector on the fiber optic cable.

Four fiber optical expansion cables, offered in multiple lengths, are required to attach the DS6800 and the expansion enclosure. Each feature code contains four cables.

Table 7 lists the expansion cables that you can order.

Table 7. DS6000 expansion enclosure cable feature codes

Feature Code	Cable Type (LC-LC)	Quantity
Model EX1		
1380	2M (50 micron) fiber optic expansion cable	4 per feature
1381	7M (50 micron) fiber optic expansion cable	4 per feature
1382	31M (50 micron) fiber optic expansion cable	4 per feature
Model EX2		
1383	2M (50 micron) fiber optic expansion cable	4 per feature
1384	7M (50 micron) fiber optic expansion cable	4 per feature
1385	31M (50 micron) fiber optic expansion cable	4 per feature

Fibre-channel host attachment ports

Use these feature codes when you order fibre-channel host ports for your DS6800.

The DS6800 host interface requires a minimum of two host attachment ports to be enabled, one for each processor card. For the DS6800, a minimum of two SFP connectivity ports (one per processor card) and a maximum of eight SFPs are available for direct connection to host servers or switched SAN fabrics.

The SFPs are available for host connections in shortwave SFP pairs (feature number 1310 for model 1750-511 or feature number 1320 for model 1750-522) and longwave SFP pairs (feature number 1315 for model 1750-511 or feature number 1325 for model 1750-522). Shortwave SFPs are for use with fiber cable lengths of 300 meters or fewer. Longwave SFPs are used for cable distances up to 10 km (6.2 miles). If the DS6800 (1750-511 or 1750-522) is to be attached to the DS6000 expansion enclosure (1750-EX1 or 1750-EX2), eight shortwave SFPs will be included in the order of the DS6000 expansion enclosure.

Table 8 provides the feature codes for host connectivity ports.

Table 8. Host connectivity ports - shortwave for DS6800

Feature Code	Connectivity port	Quantity
Model 511		
1310	Shortwave SFP pair	2 per feature code
Model 522		
1320	Shortwave SFP pair	2 per feature code

Table 9 provides the feature codes for host connectivity ports.

Table 9. Host connectivity ports - longwave for DS6800

Feature Code	Connectivity port	Quantity
Model 511		
1315	Longwave SFP pair	2 per feature code
Model 522		
1325	Longwave SFP pair	2 per feature code

System rack feature codes

You can install the DS6000 series in a 2101-200 system rack or in a supported rack enclosure.

The feature code 0800, listed in Table 10, is used to indicate that the DS6000 series ordered will be assembled into an IBM System Storage™ 2101-200 System Rack by IBM manufacturing. When selecting this feature the DS6000 series, Machine Type 1750 must be included on the same system order as the 2101-200 Rack. This feature will be automatically added to DS6000 series orders using the ECFGSSG configurator.

The feature code 0801 is used to indicate that the DS6000 series ordered will be shipped as an assembled enclosure for field integration into a supported rack enclosure. Supported rack enclosures include the IBM 7014 RS/6000 Rack, and the IBM 9308 Netfinity Enterprise Rack. Field integration of the DS6000 series is customer setup, unless the DS6000 Installation Services are utilized. This feature will be automatically added to DS6000 series orders using the ECFGSSG configurator.

Use these feature codes when you order a system rack for your DS6000 series.

Table 10. System rack feature codes for DS6000 series

Feature Code	System rack
0800	Plant integrate into 2101-200 system rack
0801	Field integrate in supported rack enclosure

Power line cords

Each DS6000 series (Model 1750-511, 1750-522, 1750-EX1, or 1750-EX2) uses two standard power cords. You can connect the power cords to a primary power unit inside the rack, such as a properly grounded ac distribution unit, or to an external source, such as a properly grounded electrical outlet.

Power cords to connect the DS6000 series to a rack power distribution unit (PDU) that has IEC 320, sheet C13-type power outlets are shipped with each DS6000 series. If the DS6000 series will be installed in a rack with a PDU that has wall-type power outlets, power cords must be ordered with the DS6000 series models to connect to this type of PDU (PDU with wall-type power outlets).

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts, use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length, and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (within the U.S.), use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length, and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.), use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

The feature codes listed in Table 11 provide two power cords for the DS6000 series. You must specify the power cord appropriate for your country or region from the feature codes listed in this section. IBM power cords for a specific country or region are usually available only in that country or region. Only one of these feature codes can be selected.

Table 11. Power cord feature codes

Feature Code	Cord specifics	Used in these countries or regions
Models 511 and EX 1		
9800	125V/10A, 2.8M	Albania, Antigua, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Columbia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Eritrea, Grenadines, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea, Nicaragua, Mexico, Panama, Peru, Philippines, Saudi Arabia, St. Lucia, St. Vincent, Suriname, Taiwan, Trinidad, United States (U.S.), Venezuela, Vietnam

Table 11. Power cord feature codes (continued)

Feature Code	Cord specifics	Used in these countries or regions
9820	250V/10A, 2.8M	Afghanistan, Angola, Antilles, Arab Republic, Armenia, Austria, Belgium, Belarus, Bosnia, Botswana, Bulgaria, Burundi, Cameroon, Cape Verde Islands, Central Africa Republic, Congo, Czech Republic, Democratic Republic of Congo, Egypt, Estonia, Finland, France, French Polynesia, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Kazakhstan, Kyrgyzstan, Latvia, Lebanon, Lesotho, Liberia, Liechtenstein, Luxembourg, Macedonia, Mali, Mauritania, Moldavia, Morocco, Mozambique, Netherlands, Norway, Poland, Portugal, Republic of Djibouti, Romania, Russia, Rwanda, Sao Tome and Principe, Senegal, Serbia, Slovakia, Slovenia, Spain, Sudan, Swaziland, Sweden, Syria, Tunisia, Turkey, Ukraine, Uzbekistan, Zimbabwe
9821	250V/10A, 2.8M	Denmark
9825	250V/10A, 2.8M	Abu Dhabi, Bahrain, Brunei, Cyprus, Fiji, Gambia, Ghana, Hong Kong S.A.R. of China, Iraq, Ireland, Jordan, Kenya, Kuwait, Macao S.A.R of China, Malawi, Malaysia, Nepal, Nigeria, North Yemen, Oman, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Arab Emirates, United Kingdom (UK), Zambia
9827	250V/10A, 2.8M	Israel
9828	250V/10A, 2.8M	Switzerland
9829	250V/10A, 2.8M	Bangladesh, India, Myanmar, Pakistan, South Africa, Sri Lanka
9830	250V/10A, 2.8M	Chile, Ethiopia, Italy, Libya, Malta, Somalia
9831	250V/10A, 2.8M	Australia, New Zealand
9833	250V/10A, 2.8M	Thailand
9834	250V/10A, 2.8M	Argentina, Paraguay, Uruguay
9840	250V/10A, 2.8M	People's Republic of China
9841	125V/10A, 2.8M	Taiwan
9842	250V/10A, 2.8M	Brazil
9843	250V/10A, 2.8M	India
9844	250V/10A, 2.8M	Japan
9845	250V/10A, 2.8M	Korea
9986	250V/10A, 2.8M	U.S. Chicago
Models 522 and EX 2		

Table 11. Power cord feature codes (continued)

Feature Code	Cord specifics	Used in these countries or regions
9850	125V/10A, 2.8M	Albania, Antigua, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Canada, Cayman Islands, Columbia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Eritrea, Grenadines, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Mexico, Panama, Peru, Philippines, Saudi Arabia, St. Lucia, St. Vincent, Suriname, Taiwan, Trinidad, United States (U.S.), Venezuela, Vietnam
9870	250V/10A, 2.8M	Afghanistan, Angola, Antilles, Arab Republic, Armenia, Austria, Belgium, Belarus, Bosnia, Botswana, Bulgaria, Burundi, Cameroon, Cape Verde Islands, Central Africa Republic, Congo, Czech Republic, Democratic Republic of Congo, Egypt, Estonia, Finland, France, French Polynesia, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Kazakhstan, Kyrgyzstan, Latvia, Lebanon, Lesotho, Liberia, Liechtenstein, Luxembourg, Macedonia, Mali, Mauritania, Moldavia, Morocco, Mozambique, Netherlands, Norway, Poland, Portugal, Republic of Djibouti, Romania, Russia, Rwanda, Sao Tome and Principe, Senegal, Serbia, Slovakia, Slovenia, Spain, Sudan, Swaziland, Sweden, Syria, Tunisia, Turkey, Ukraine, Uzbekistan, Zimbabwe
9871	250V/10A, 2.8M	Denmark
9875	250V/10A, 2.8M	Abu Dhabi, Bahrain, Brunei, Cyprus, Fiji, Gambia, Ghana, Hong Kong S.A.R. of China, Iraq, Ireland, Jordan, Kenya, Kuwait, Macao S.A.R of China, Malawi, Malaysia, Nepal, Nigeria, North Yemen, Oman, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Arab Emirates, United Kingdom (UK), Zambia
9877	250V/10A, 2.8M	Israel
9878	250V/10A, 2.8M	Switzerland
9879	250V/10A, 2.8M	Bangladesh, Myanmar, Pakistan, South Africa, Sri Lanka
9880	250V/10A, 2.8M	Chile, Ethiopia, Italy, Libya, Malta, Somalia
9881	250V/10A, 2.8M	Australia, New Zealand
9883	250V/10A, 2.8M	Thailand
9884	250V/10A, 2.8M	Argentina, Paraguay, Uruguay
9890	250V/10A, 2.8M	People's Republic of China
9891	125V/10A, 2.8M	Taiwan
9892	250V/10A, 2.8M	Brazil
9893	250V/10A, 2.8M	India
9894	250V/10A, 2.8M	Japan
9895	250V/10A, 2.8M	Korea
9987	250V/10A, 2.8M	U.S. Chicago

Chapter 3. Activating licensed functions

This section contains information to help you activate your licensed functions.

To activate your licensed functions, you must perform the following actions:

- Obtain your feature activation codes.
- Apply the activation codes to your storage unit. You can apply the activation codes by importing a file that you download from the IBM Disk Storage Feature Activation (DSFA) Web site.

The initial enablement of any optional DS6000 licensed function is a concurrent activity (assuming the appropriate level of microcode is installed on the machine for the given function).

Chapter 4. Planning use of licensed functions

Licensed functions are storage unit system operating system and software functions. These include both required features and optional features.

The following categories represent the types of DS6000 series licensed functions that are available.

- **Operating environment licensing**

  You must order an operating environment license for every DS6800 system. The extent of IBM authorization acquired through the DS6800 feature codes (50*xx*) must cover the physical capacity of the DS6800 system, where system is defined as the base enclosure and all attached expansion enclosures.

- **DS6000 series Copy Services**

  The DS6000 series offers licensing options, which are available for the DS6800 FlashCopy® (point-in-time copy) feature codes 52*xx* and Remote Mirror and Copy feature codes 53*xx*, as follows:

  – If the function is used with open systems data only, a license is required for only the total physical capacity configured as Fixed Block (FB).

  – If the function will be used with zSeries® data only, a license is required for only the total physical capacity configured as Count Key Data (CKD).

  – If the function is used with both open systems and zSeries data, a license is required for the total physical capacity of the DS6800 system including the DS6000 Expansion Enclosures.

  In addition, the license scope (FB, CKD, or entire machine) is client managed through an IBM Web-based application. This allows you to change the license scope on a given machine as your business requirements change.

- **Parallel access volumes**

  The parallel access volume (PAV) function is an optional feature (code 51*xx*) that enables zSeries hosts to conduct multiple concurrent I/O operations. PAV requires the purchase of the FICON® attachment feature code 5915.

  A PAV license authorizes the use of PAV at the specified capacity. The authorization level provided by each feature code is stated within the feature code description. The unit represents physical capacity, where a TB (terabyte) equals one trillion bytes. The total authorization level for this licensed function is the sum of the units (terabytes) associated with all the purchased feature codes.

  These features can be purchased in any sequence or combination. The extent of IBM authorization is increased by purchasing additional feature codes.

  This licensed function is authorized on the basis of physical capacity and has a license scope of CKD. The total authorization level must be equal to or greater than the total amount of physical capacity within the DS6800 system that will be logically configured as CKD.

The following sections can assist you in planning your licensed functions.

Note: In the context of DS6800 licensed functions, a "DS6800 system" refers to the DS6800 base enclosure and all physically attached DS6000 expansion enclosures.

- Enablement

- Authorization
- Management
- Activation
- Enforcement
- License upgrades
- Deactivation

Enablement: Licensed functions for a DS6800 system can be enabled by acquiring the DS6800 licensed function feature codes.

Authorization: The acquisition of licensed function feature codes establishes the extent of IBM authorization level, or the license size in terms of physical capacity, for that licensed function. A DS6800 system's total authorization level for a given licensed function is the sum of the units that are associated with the acquired feature codes on that DS6800. Each licensed function feature code on a DS6800 establishes the authorization level for the entire DS6800 system. For example, a DS6800 system with a Model 511 or 522 base enclosure and two Model EX1 or EX2 expansion enclosures requires the acquisition of licensed function feature codes only on the Model 511 or 522. For licensed functions that are authorized on the basis of physical capacity, the authorization levels that are established by the feature codes on the Model 511 or 522 must also include the physical capacity of the attached Model EX1 or EX2 expansion enclosures. Each licensed function feature code is applicable to only one specific serial code for a DS6800 and is not transferable to other storage units.

Management: After licensed function feature codes are acquired, they are managed using the IBM Disk Storage Feature Activation (DSFA) Web site. Management activities include:

- Selection of a license scope and
- Assignment of a license value.

Activation: Licensed functions are activated by installing the feature activation codes on the DS6800 system. Feature activation codes are available on the IBM Disk Storage Feature Activation (DSFA) Web site.

Enforcement: The DS6800 Licensed Machine Code contains logic and other technology to maintain compliance with established authorization levels. You can logically configure physical capacity up to the extent of your authorization level for each storage type. If you have multiple licensed functions with the same license scope, the extent of IBM authorization is defined by the licensed function with the lowest authorization level.

License upgrades: The authorization level for a licensed function can be increased by acquiring additional licensed function feature codes.

License scope: The license scope refers to the types of storage and servers that the function can be used with:

ALL The function can be used with data from all attached servers.

CKD (count key data)
The function can be used with data only from FICON-attached servers.

FB (fixed block)
The function can be used with data only from fibre-channel-attached servers.

You do not select your license scope when you order licensed function feature codes. If a licensed function has multiple license scope options, you can select a license scope when you are retrieving your feature activation code from the DSFA Web site. However, you must consider license scope when you determine the authorization level that is required for your licensed functions. For example:

- Assume a 10 TB machine (total physical capacity) is logically configured as follows:
  - 5 TB of FB capacity
  - 5 TB of CKD capacity
- Point-in-time copy is used on some portion of data from both FICON-attached servers (CKD capacity) and fibre-channel-attached servers (FB capacity). This means the point-in-time copy scope must be selected as ALL within DSFA. As a result, a 10 TB point-in-time copy authorization level is required because the total configured FB and CKD capacity will be 10 TB.
- Remote mirror and copy is used only on some portion of data from fibre-channel-attached servers (FB capacity). This means the remote mirror and copy scope must be selected as FB within DSFA. As a result, only a 5 TB remote mirror and copy authorization level is required because the total configured FB capacity will be 5 TB.
- The following licensed function authorization levels are required:
  - 10 TB operating environment license
  - 10 TB point-in-time copy
  - 5 TB remote mirror and copy
  - FICON attachment.

You can logically configure physical capacity (disk drives) up to the extent of your authorization level for that storage type. If you have multiple licensed functions with the same license scope, the extent of IBM authorization is defined by the licensed function with the lowest authorization level. For example:

- Assume a 10 TB machine (total physical capacity) with the following licenses and license scope designations:
  - Operating environment license is 10 TB with scope = ALL
  - PAV is 7 TB with scope = CKD
  - Point-in-time copy is 9 TB with scope = ALL
  - Remote mirror and copy is 6 TB with scope = FB
- Point-in-time copy has the lowest ″ALL″ scope specification so that the amount of FC and CKD storage (total capacity) that can be configured is limited to 9 TB, even though the operating environment license value is 10 TB.
- Remote mirror and copy has the lowest ″FB″ scope specification so the amount of FB storage that can be logically configured is limited to 6 TB.
- PAV has the lowest ″CKD″ scope specification so that the amount of CKD storage that can be logically configured is limited to 7 TB.
- The scope selection for the activated licensed functions enables the following configurations:
  - Up to 7 TB of CKD capacity
  - Up to 6 TB of FB capacity
  - Up to only 9 TB of total capacity

Using DSFA, you can change the license scope at any time and obtain a new feature activation code to apply to your machine. Application of the new feature activation code to your machine is a nondisruptive activity for the following license scope changes:

- Changing CKD to ALL
- Changing FB to ALL

Applying the new feature activation code for the following license scope changes is a disruptive activity and requires a power cycle of the machine before the change is effective:

- Changing ALL to CKD
- Changing ALL to FB
- Changing CKD to FB
- Changing FB to CKD

Deactivation: A licensed function can be deactivated by accessing the DSFA Web site and changing the license value of zero (0.0 TB) or Off. A new feature activation code is generated and when you install it into your machine, the function is deactivated during the next initial machine load (IML) of the machine.

Note: Deactivation of a licensed function is a disruptive activity and requires a machine IML.

When you deactivate a licensed function using the DSFA Web site, the licensed function feature codes that you acquired remain assigned to the machine. This means that you do not need to reacquire the licensed function feature codes if you want to reactivate the licensed function at a future date.

You can reactivate a deactivated licensed function by accessing the DSFA Web site and changing the license value to a non-zero value. A new feature activation code is generated and when you install it into the machine, the function is activated. Reactivation is a nondisruptive activity.

Feature codes for operating environment licensing

You must order an operating environment licensing feature for every DS6000 series.

The operating environment license feature codes enable the use of the operating environment licensed function.

The feature codes are authorized based on physical capacity within the IBM Disk Storage Feature Activation (DSFA).

- If a FICON attachment feature code is present, the license scope is set to ALL. You can logically configure both FB and CKD capacity on the ALL setting.
- If a FICON attachment feature code is not present, the license scope is set to FB. You can logically configure only FB on the FB setting.

A license is required for the total physical capacity of the storage unit. The total authorization level must be greater than or equal to the total physical capacity of the unit.

Table 12 on page 19 lists the operating environment licensing feature codes for the DS6000 series.

Table 12. Operating environment licensing feature codes for DS6800

Feature code	Description
Model 511	
5000	OEL - 1 TB unit
5001	OEL - 5 TB unit
5002	OEL - 10 TB unit
5003	OEL - 25 TB unit
5004	OEL - 50 TB unit
Model 522	
5010	OEL - 1 TB unit
5011	OEL - 5 TB unit
5012	OEL - 10 TB unit
5013	OEL - 25 TB unit
5014	OEL - 50 TB unit

Copy Services functions

Review the types of DS6000 series Copy Services and identify those functions that you will use.

There are several types of Copy Services functions. Most users decide to use a combination of two or more types to form a comprehensive enterprise solution for disaster recovery, data duplication, and data migration.

Copy Services include the following types of functions:

- Point-in-time copy functions, which includes FlashCopy
- Remote mirror and copy functions, which includes Metro Mirror, Global Mirror, and Global Copy

The IBM TotalStorage® Productivity Center for Replication focuses on automating the administration and the configuration of these services: operational control, copy services tasks, and monitoring and managing the copy sessions.

TotalStorage Productivity Center for Replication software also provides replication for continuous management of two-site business operations. This provides disaster recovery management during planned and unplanned failover and failback automation, and monitoring of progress of the copy services so that you can verify the amount of replication that has completed and the amount of time remaining to complete the replication operation.

TotalStorage Productivity Center Replication is an optional capability of the DS6000 series. It is available through the IBM TotalStorage Productivity Center for Replication software program.

Feature codes for point-in-time copy

When you order point-in-time copy functions, you specify the feature code that represents the physical capacity you want to authorize for the function.

The point-in-time copy (PTC) license feature codes enable the use of the point-in-time copy licensed function.

The feature codes are authorized based on physical capacity.

- If you plan to use this licensed function with fibre-channel attached servers, the total authorization level must be greater than or equal to the total physical capacity of the storage unit that will be logically configured as fixed block.
- If you plan to use this licensed function with FICON attached servers, the total authorization level must be greater than or equal to the total physical capacity of the storage unit that will be logically configured as CKD.
- If you plan to use this licensed function with both fibre-channel and FICON attached servers, the total authorization level must be greater than or equal to the total physical capacity of the storage unit.

Note: If you are activating features for any of the licensed functions, such as Copy Services, all the features must have the same capacity, including the operating environment license feature.

You can combine feature codes to order the exact capacity that you need. For example, if you determine that you need 23 TB of point-in-time capacity, you can order two 5202 (Model 1750-511) or 5212 (Model 1750-522) features and three 5200 (Model 1750-511) or 5210 (Model 1750-522) features.

Table 13 provides the feature codes for the point-in-time copy function.

Table 13. Point-in-time copy (PTC) feature codes for DS6800

Feature code	Description
Model 511	
5200	PTC - 1 TB unit
5201	PTC - 5 TB unit
5202	PTC - 10 TB unit
5203	PTC - 25 TB unit
5204	PTC - 50 TB unit
Model 522	
5210	PTC - 1 TB unit
5211	PTC - 5 TB unit
5212	PTC - 10 TB unit
5213	PTC - 25 TB unit
5214	PTC - 50 TB unit

Feature codes for remote mirror and copy

When you order remote mirror and copy functions, you specify the feature code that represents the physical capacity to authorize for the function.

Note: If you are activating features for any of the licensed functions, such as Copy Services, all the features must have the same capacity, including the operating environment license feature.

The remote mirror and copy license feature codes enable the use of the following remote mirror and copy (RMC) licensed functions:

- IBM System Storage Metro Mirror (MM)
- IBM System Storage Global Mirror (GM)

- IBM System Storage Metro Global Mirror (MGM)

The feature codes are authorized based on physical capacity.

- If you plan to use this licensed function with fibre-channel attached servers, the total authorization level must be greater than or equal to the total physical capacity of the storage unit that will be logically configured as FB.
- If you plan to use this licensed function with FICON attached servers, the total authorization level must be greater than or equal to the total physical capacity of the storage unit that will be logically configured as CKD.
- If you plan to use this licensed function with both fibre-channel and FICON attached servers, the total authorization level must be greater than or equal to the total physical capacity of the storage unit.

Remote mirror and copy features must be purchased for both the primary and secondary DS6000 systems.

Remote mirroring solutions require the installation of at least one fibre-channel or FICON host port on each DS6000 system in the remote mirroring configuration to serve as the communications link between the primary and secondary machines. For higher availability, use more than one host port per DS6800 be used for the remote mirroring connectivity.

The fibre-channel ports used for remote mirror and copy can be configured as either a dedicated remote mirror link or as a shared port between remote mirroring and FCP data traffic.

Remote mirror and copy solutions are supported with the use of SAN fabric products, Dense Wavelength Division Multiplexing (DWDM) products, and channel extenders. To see a current list of supported environments, configurations, networks, and products, see the DS6000 series **Interoperability Matrix** at:

http://www.ibm.com/servers/storage/disk/ds6000/interop.html

Vendors must be consulted in regards to hardware and software prerequisites when using their products on the DS6000 system remote mirror and copy configuration. IBM is not responsible for third-party products.

IBM supports the use of remote mirror and copy over the network technologies that are currently supported by the channel extender products, including Fibre Channel, Ethernet/IP, ATM-OC3, and T1/T3. Evaluation, qualification, approval, and support of remote mirror and copy configurations using channel extender products are the sole responsibility of the channel extender vendor. The vendor should be contacted to obtain information about its distance capability, line quality requirements, as well as SAN and WAN attachment capabilities.

Global Mirror has the following additional prerequisites:

- The point-in-time copy function must be purchased for the secondary DS6800 system.
- If Global Mirror is used during failback on additional DS6800 machines, the point-in-time copy function authorization must also be purchased for the primary DS6800 machine.

In the event of a planned or unplanned outage, recovery procedures are required to achieve a consistent and restartable copy of the data at the remote site. Scripts and software can be used to help automate these procedures.

Table 14 provides the feature codes for the remote mirror and copy functions.

Table 14. Remote mirror and copy (RMC) feature codes for DS6800

Feature code	Description
Model 511	
5300	RMC - 1 TB unit
5301	RMC - 5 TB unit
5302	RMC - 10 TB unit
5303	RMC - 25 TB unit
5304	RMC - 50 TB unit
Model 522	
5310	RMC - 1 TB unit
5311	RMC - 5 TB unit
5312	RMC - 10 TB unit
5313	RMC - 25 TB unit
5314	RMC - 50 TB unit

Feature codes for parallel access volume

When you order the parallel access volume (PAV) function, you specify the feature code that represents the physical capacity allowed for the function.

The parallel access volume feature codes enable the use of the parallel access volume licensed function.

PAV requires the purchase of the FICON attachment feature number 5915 (Model 1750-511) or the FICON attachment feature number 5920 (Model 1750-522).

A license is required for the total physical capacity in the storage unit that is configured as count key data (CKD). The total authorization level must be greater than or equal to the total physical capacity of the unit.

Table 15 provides the feature codes for the parallel access volume function.

Table 15 provides the feature codes for the parallel access volume function.

Table 15. Parallel access volume (PAV) feature codes for DS6800

Feature code	Description
Model 511	
5100	PAV - 1 TB unit
5101	PAV - 5 TB unit
5102	PAV - 10 TB unit
5103	PAV - 25 TB unit
5104	PAV - 50 TB unit
Model 522	
5110	PAV - 1 TB unit
5111	PAV - 5 TB unit

Table 15. Parallel access volume (PAV) feature codes for DS6800 (continued)

Feature code	Description
5112	PAV - 10 TB unit
5113	PAV - 25 TB unit
5114	PAV - 50 TB unit

FICON attachment license

If you order the PAV function, you must also order a FICON attachment feature.

The FICON attachment license feature codes enable the use of the FICON attachment licensed function. This function enables you to configure count key data (CKD) on your DS6800 storage unit.

The FICON attachment licensed function is authorized for DS6800. Only one feature code is required per storage unit, regardless of the total physical capacity of the unit.

Table 16 provides the feature code for a FICON server attachment license.

Table 16. Server attachment license (FICON) for DS6800

Feature code	Server attachment license
Model 511	
5915	FICON attachment
Model 522	
5920	FICON attachment

Chapter 5. Delivery requirements

Before you receive your DS6000 series shipment, ensure that you meet all delivery requirements.

This section can help you ensure that you select a site that meets all requirements.

Receiving the DS6000 series shipment

The shipping carrier is responsible for delivering and unloading the DS6000 series as close to its final destination as possible. You must ensure that your loading ramp and your receiving area can accommodate your DS6000 series shipment.

Use the following steps to ensure that your receiving area and loading ramp can safely accommodate the delivery of your DS6000 series:

1. Find out the packaged weight and dimensions of the storage unit container and other containers that you will receive.
2. Ensure that your loading dock, receiving area, and elevators can safely support the packaged weight and dimensions of the shipping containers.

Shipment weights and dimensions

To help you plan for the delivery of your DS6000 series, you must ensure that your loading dock and receiving area can support the weight and dimensions of the packaged DS6000 shipments.

You receive one or more shipping containers for each DS6000 series that you order depending on whether you also ordered a 2101-200 rack. Depending on your order, you will receive the following:

- When you order the DS6000 series without a rack, the shipping container also includes ship group items such as power cords, CDs, and other ordered features or peripherals within the same container.
- When you order the DS6000 series with a 2101-200 rack, the ship group items such as power cords, CDs, and other ordered features or peripherals are packaged and shipped in a separate container.

Table 17 lists the final packaged dimensions and maximum packaged weight of a DS6000 series shipment without a 2101-200 rack. Table 18 on page 26 lists the final packaged dimensions and maximum packaged weight of a DS6000 that is installed in a fully loaded 2102-200 rack and that includes the ship group items.

Table 17. Packaged dimensions and weight for DS6000 series without a rack (all countries)

Shipping container	Packaged Dimensions (in millimeters and inches)	Maximum Packaged Weight (in kilograms and pounds)
Model 1750-511 or 1750-522 in a Nefab crate with EPE cushioning banded to pallet	**Length** 1000 mm (39.37 in.) **Width** 600 mm (23.62 in.) **Depth** 425 mm (16.73 in.)	70 kg (154.02 lb)

Table 17. Packaged dimensions and weight for DS6000 series without a rack (all countries) (continued)

Shipping container	Packaged Dimensions (in millimeters and inches)	Maximum Packaged Weight (in kilograms and pounds)
Model 1750-511 or 1750-522 in a corrugated HSC carton with EPE cushioning banded to pallet	**Length** 1000 mm (39.37 in.) **Width** 600 mm (23.62 in.) **Depth** 425 mm (16.73 in.)	65 kg (144.01 lb)

Table 18. Packaged dimensions and weight for the DS6000 series including the 2101-200 rack (all countries)

Shipping container	Packaged Dimensions (in millimeters and inches)	Maximum Packaged Weight for a Fully Loaded Rack (in kilograms and pounds)
Model 1750-511 or 1750-522 installed in a 2101-200 rack in a Nefab crate	**Length** 1295 mm (50.98 in.) **Width** 830 mm (32.68 in.) **Depth** 2005 mm (78.94 in.)	1000 kg (2204.59 lb)
Model 1750-511 or 1750-522 in a 2101-200 rack with fiberboard hood	**Length** 1295 mm (50.98 in.) **Width** 830 mm (32.68 in.) **Depth** 1975 mm (77.76 in.)	1000 kg (2204.59 lb)

Chapter 6. Planning for installation

Before you can start to set up your DS6000 series, you must verify that the prerequisite conditions for the DS6000 series are met.

The following planning guidelines can help you identify and gather the information required during the installation process.

1. Prepare your physical site to meet all area, environment, and power requirements.
2. Move the DS6000 series to your site. Ensure that you use safe practices when lifting.
3. Ensure that the floor area provides enough stability to support the weight of the fully configured DS6000 series and associated components.
4. Ensure that you have adequate rack space for your hardware.
5. Assemble the tools and equipment that you will need for installation. This includes the following items:
   a. Power cords
   b. Host fibre-channel and Ethernet interface cables
   c. Host SFPs
   d. Fibre-channel disk drives
   e. Antistatic protection
   f. The rack-mounting hardware that ships with the DS6000 series
   g. The IBM System Storage DS Storage Manager CD, which includes the DS Storage Manager software and firmware
   h. Flathead screwdriver
6. Identify a management client server and ensure that it meets the hardware and operating system compatibility requirements.
7. Gather the World Wide Port Names (WWPNs) of your open systems hosts that you want to attach to the DS6000 series.
8. Determine your storage configuration information, such as:
   a. RAID levels
   b. Arrays
   c. LUN sizes

Preparing the physical environment for your DS6000 series

This section provides information you need to ensure that your physical site meets the installation requirements for the DS6000 series.

Table 19 on page 28 provides the dimensions and weight of either a fully configured Model 1750-511 or 1750-522 or the Model 1750-EX1 or 1750-EX2 expansion enclosure.

Table 19. Dimensions and weight for Model 1750-511 or 1750-522 or Model 1750-EX1 or 1750-EX2 expansion enclosure

Height	Width	Depth	Maximum Weight (fully configured)
5.25 inches (0.134 meters)	18.80 inches (0.478 meters)	24.00 inches (0.610 meters)	109 lbs. (49.5 kg)

Service-clearance and floor-load requirements

For each DS6000 series model or expansion unit, service personnel must be able to open the front and rear covers to perform service.

Service clearance refers to the empty space in front of, next to, or behind a storage unit that a service person needs in order to access the unit. The service clearance of adjacent units can overlap. Weight distribution areas that are required to handle floor loading do not overlap.

Use the following minimum service clearances as you plan the placement of your system.

- At the front of the unit, allow a minimum of 121.9 cm (48-in.)
- At the rear of the unit, allow a minimum of 76.2 cm (30-in.)
- At each side of the unit, allow a minimum of 5.1 cm (2-in.)

Planning for environment requirements

Plan to locate your DS6000 series in a site that has the same environment for the base unit and any expansion units.

Operating environment

Table 20 describes the environment operating requirements for the DS6800 (Models 1750-511 and 1750-522). The 1750-EX1 and 1750-EX2 expansion units have the same environmental requirements.

Table 20. Operating environment

Powered on temperature limit	10 - 40°C (50 - 104°F)
Powered off temperature limit	10 - 52°C (50 - 126°F)
Recommended operating point	22°C (72°F)
Recommended operating range	20 - 25°C (68 - 77°F)
Maximum wet bulb temperature	27°C (80° F) **Note:** 1. The upper limit of dry bulb temperature must be derated (lowered) 1.0°C for every 137 meters of elevation above 915 meters. 2. The upper limit of wet bulb temperature must be derated (lowered) 1.0°C for every 274 meters of elevation above 305 meters.
Relative humidity	8 - 80 percent
Typical heat load	550 watts or 1880 Btu/hr
Electrical power	0.8 kVA

Table 20. Operating environment (continued)

Capacity of exhaust	1.8 cubic meters (64 cfm)
Leakage current	1.5 mA (100-127 V ac), 3 mA (200-240 V ac)
Maximum physical storage capacity	64 TB

Table 21 describes the acoustic declaration information for the DS6000 series.

Table 21. Acoustic declaration for the DS6000 series

Product Description	Declared A-Weighted Sound Power Level, LWAd (B)		Declared A-Weighted Sound Pressure Level, LpAm (dB)	
	Operating	Idling	Operating	Idling
DS6000 series when mounted in a 7014 rack with 16 DDMs	6.2	6.1	44	43

Notes:

1. LWAd is the statistical upper-limit A-weighted sound power level (rounded to the nearest 0.1 B).
2. LpAm is the mean A-weighted emission sound pressure level measured at the 1-meter bystand (rounded to the nearest dB).
3. 10 dB (decibel) = 1 B (bel).
4. All measurements made in conformance with ISO 7779 and declared in conformance with ISO 9296.

Power supply

The DS6000 series has built-in redundant, auto-sensing, auto-ranging power supplies. The power supplies are designed for operation on a voltage range of 90-257 V ac, 50-60 Hz.

Input voltage requirements

Specific input voltages are required for the DS6000 series.

Table 22 lists the input voltages and frequencies that the DS6000 series power line cords support. The values apply to both the primary line cords to any storage or expansion enclosure in a DS6000 series. DS6000 series power inputs are single phase.

Table 22. DS6000 series input voltage requirements

Characteristic	Value
Nominal input voltages	100-127 RMS V ac 200-240 RMS V ac
Minimum input voltage	90 RMS V ac
Maximum input voltage	264 RMS V ac
Input frequencies	50 ± 3.0 Hz 60 ± 3.0 Hz

Preparing the rack

Before you install the DS6000 series in a rack, you must prepare the rack.

The DS6000 series requires an Electronic Industries Association (EIA) 310-D Section 1 19-inch rack cabinet. The distance between EIA rails, from the front to the rear of the rack, is 69.5 centimeters (27.36 inches) minimum to 76.5 centimeters (30.12 inches) maximum. This rack conforms to the EIA standard. Where you place the support rails in the rack depends on where you intend to position the server or enclosure enclosure.

- Review the documentation that comes with your rack enclosure for safety and cabling considerations.
- To ensure rack stability, load the rack starting at the bottom.
- If you install multiple components in the rack, do not overload the power outlets.
- Always connect the enclosure server to a properly grounded outlet.
- Always connect the rack power to at least two different power circuits or sources. This reduces the chance of a simultaneous loss of both ac power sources.

Considering safety issues

You must consider various safety issues when you plan your DS6000 series location.

The following list identifies some of the safety issues you must consider:

- Fire suppression
- Earthquake safety

Providing a fire-suppression system

You are responsible for providing a fire suppression system for your DS6000 series.

IBM designs and manufactures equipment to internal and external standards that require certain environments for reliable operation. Because IBM does not test any equipment for compatibility with fire-suppression systems, IBM does not make compatibility claims of any kind. IBM does not provide recommendations on fire-suppression systems.

1. Consult your insurance underwriter, local fire marshal, or local building inspector about selecting a fire-suppression system that provides the proper level of coverage and protection.
2. See "Planning for environment requirements" on page 28 for the temperature and cooling requirements for your DS6000 series.

Considering earthquake preparedness alternatives

If you are installing your DS6000 series in an area that is prone to earthquakes, plan for special installation methods to minimize earthquake damage to your system.

An unsecured storage unit or expansion model can topple or be thrown around during an earthquake. This places both the unit and your personnel in danger. To help prevent damage, restrain your storage unit using one of the following two methods:

Restraint method
Allows some system movement and provides for both personnel safety and protection of your storage unit.

Hard mounting

Physically attaches your system to the floor. This method increases the safety of personnel during an earthquake. However, it also causes the most damage to the storage unit because the unit absorbs most of the shock. IBM does not support hard mounting.

Hard mounting your storage unit

If you decide to hard mount your storage unit (physically attach the unit to the floor), use these guidelines.

1. Take the following criteria into consideration when you hard mount the unit:

   Weight and dimensions of your storage unit

   See Dimensions and weight of individual models.

   Center of gravity

   Based on rear side orientation, the center of gravity is estimated to be approximately 101.6 cm (40 in.) up from the floor.

   Fundamental natural frequency

   The measured vertical resonance frequency is 11.81 Hz, on top of a horizontal frame member adjacent to one of the casters.

   Caster locations and cable openings

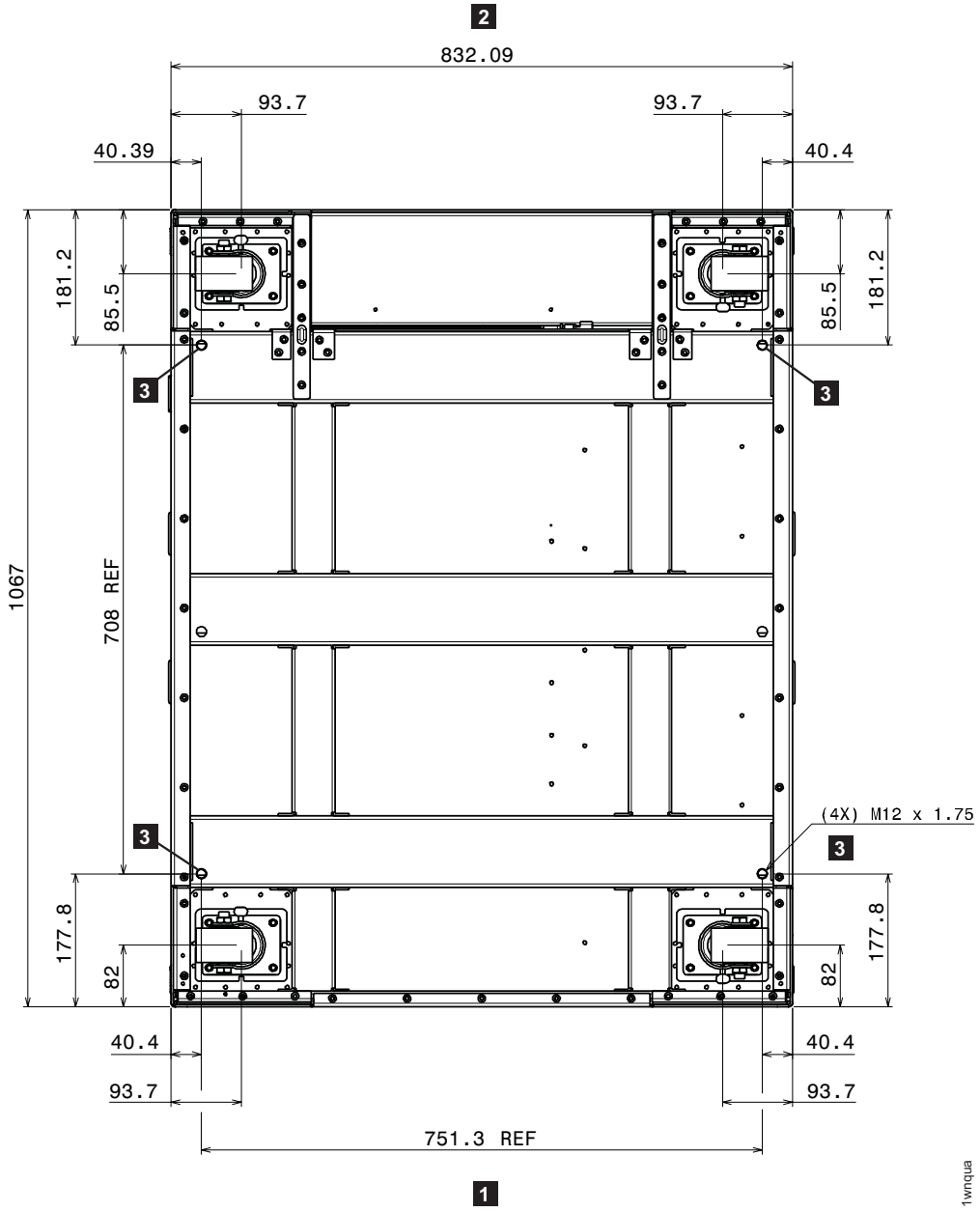
   Four casters are located under each corner of the frame. Each caster is located as follows:

   - 9.37 cm (3.7 in.) from the front or rear edge of the frame
   - 8.55 cm (3.4 in.) from the side frame

   The cable opening is centered in bottom, rear of the frame. The opening dimensions are as follows:

   - 16 cm (6.3 in.) high
   - 45.7 cm (18.0 in.) wide

2. Consider using the four M12 threaded holes on the underside of the model frame or expansion model frame (see Figure 1 on page 32). IBM uses the holes to fasten the frame to shipping containers during shipment from the assembly factory to the installation site. You might use these holes to fasten the unit to the floor. Keep in mind that IBM has not performed any earthquake testing using any hard mounting method or the use of these holes to fasten a unit to the floor. Before you use these holes for earthquake stability, contact a registered structural engineer or earthquake consultant to review such use.



Legend:

- **1**: Front of the unit
- **2**: Rear of the unit
- **3**: Four M12 threaded holes

Figure 1. Underside of a DS6000 unit (dimensions are in mm)

Chapter 7. Planning for network and communications requirements

You must locate your DS6000 series in a location that meets the network and communications requirements.

Keep in mind the following network and communications issues when you plan the location and interoperability of your storage complex:

- Management console network configuration
- Host attachment requirements
- Remote support connection requirements
- SAN considerations
- Dial-up modem connections

Management console network configuration

Network communication is an important aspect of management console configuration.

You must have a network connection between the processor cards and from the processor cards to the management console. You can create these connections in one of the following ways:

- Connecting the processor cards on your server enclosure and your management console to the same local area network.
- Connecting the two server enclosure processor cards to each other, which enables essential communication between the processor cards for correct operation while the server enclosure is powered on.

Management console network requirements

You must plan for the network requirements of the management console.

Each management console requires a dedicated connection to the network.

Note: If you will be accessing CLI or the Storage Manager and have a firewall between the management console and your network, you need to open the following TCP/IP ports prior to installation: 1718, 1720, 1722, 1750, 1755 and 8451-8455.

Host attachment communication requirements

This list describes requirements and other considerations for connecting host attachments in your network.

- You must use worldwide port names to uniquely identify fibre-channel adapter cards that are installed in your host system.
- For open-system hosts with fibre-channel adapters, keep in mind that fibre channel architecture provides a variety of communication protocols. Each interconnected storage unit within the architecture is referred to as a *node*, and each host is also a node. Each node corresponds to one or more ports. (In the case of fibre-channel I/O adapters, these ports are fibre-channel ports.) Each port attaches to a serial-transmission medium that provides duplex communication

with the node at the other end of the medium. You can configure your network structure based on one of three basic interconnection topologies (network structures):

- Point-to-point
- Switched fabric
- Arbitrated loop

See the *IBM System Storage DS6000 Host Systems Attachment Guide* for more information about these supported topologies.

- The maximum distance between a host fibre-channel port and the following network components is 300 meters (984 ft) with a shortwave adapter and 10 km (6.2 miles) with a longwave adapter.
  - Fabric switches
  - Fabric hubs
  - Link extenders
  - Storage unit fibre-channel port

  The maximum distance might be greater than 10 km (6.2 miles) when a link extender provides target initiator functions or controller emulation functions.

  Note: Do not use link extenders with emulation functions on links over which Remote Mirror and Copy operations are performed. This is because of the additional path delay that is introduced by these units.
- Because the fibre channel architecture allows any fibre-channel initiator to access any fibre-channel device, without access restrictions, this can represent a security exposure. You must set the fibre-channel access modes to the proper setting. See the *IBM System Storage DS6000 Host Systems Attachment Guide*, for more information about fibre-channel access modes.

Remote support and Call Home connection requirements

You must meet these requirements if you will use remote support or the Call Home feature.

You must provide an outside connection, such as one of the following:

- A virtual private network (VPN) connection over your local area network or over a dial-up connection through a modem that is connected to the management console. If you initiate a VPN connection over a modem, you must have an analog phone line that is available for the modem to connect to.
- An Internet connection through your firewall that allows IBM to connect to your storage management system.

SAN requirements and considerations

These requirements and considerations can help you plan for a DS6000 series that attaches to a SAN.

A fibre-channel storage area network (SAN) is a specialized, high-speed network that attaches servers and storage devices. With a SAN, you can perform an any-to-any connection across the network using interconnect elements such as routers, gateways, hubs, and switches.

When you connect your DS6000 storage units to a SAN, you must meet the following requirements:

- Fibre-channel I/O adapters must be configured to operate in a point-to-point mode fabric topology. See the *IBM System Storage DS6000 Host Systems Attachment Guide* for more information.

Also keep the following considerations in mind:

- Fibre-channel SANs can provide the capability to interconnect open systems and storage in the same network as S/390 and zSeries host systems and storage.
- A single fibre-channel I/O adapter can have physical access to multiple fibre-channel ports on the storage unit.

Feature codes for a modem

You can use a modem to create a dial-up virtual private network (VPN) connection for the Call Home feature, instead of using an Internet connection.

Table 23 provides the feature codes that you can use to order a modem.

Table 23. DS6000 modem feature codes

Feature Code	**Country Group**
Model 511	
1201	Argentina, Belize, Bolivia, Brazil, Canada, Chile, Columbia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Japan, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Taiwan, Uruguay, U.S.A., Venezuela
1202	Australia, New Zealand
1203	Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Italy, Kazakhstan, Korea, Latvia, Lebanon, Liechtenstein, Lithuania, Luxemburg, Morocco, Netherlands, Norway, Philippines, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Thailand, Turkey, Vietnam
1204	Cyprus, Egypt, Ireland, Kuwait, Malta, Oman, Saudi Arabia, South Africa, United Kingdom
1205	People's Republic of China, Hong Kong S.A.R. of China, Macao S.A.R. of China, Singapore
Model 522	
1211	Argentina, Belize, Bolivia, Brazil, Canada, Chile, Columbia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Japan, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Taiwan, Uruguay, U.S.A., Venezuela
1212	Australia, New Zealand
1213	Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Italy, Kazakhstan, Korea, Latvia, Lebanon, Liechtenstein, Lithuania, Luxemburg, Morocco, Netherlands, Norway, Philippines, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Thailand, Turkey, Vietnam
1214	Cyprus, Egypt, Ireland, Kuwait, Malta, Oman, Saudi Arabia, South Africa, United Kingdom
1215	People's Republic of China, Hong Kong S.A.R. of China, Macao S.A.R. of China, Singapore

Chapter 8. Planning your DS6000 series

This section provides the following planning information for your DS6000 series setup.

- Configuration methods for your storage complex
- Configuration work sheet
- Network settings work sheet
- Host attachment work sheet

Configuration work sheet

Complete the configuration work sheet by entering the information that you will need before installing the DS6000 series.

Use Table 24 to enter the information that you will need for installation.

Table 24. Configuration work sheet

Item or Setting	Instructions	Your information
Nickname	Create a storage unit nickname. The name is limited to 16 characters.	
Storage unit description	Optionally provide a storage unit description. The description field is limited to 256 characters.	
Processor card 1 IP Address	Record the dotted decimal IP address that you are assigning for Processor card 0 in the DS6800. The current IP address is the default address.	
Processor card 2 IP Address	Provide the dotted decimal address that you are assigning to Processor card 1 in the DS6800. The current IP address is the default address.	
Storage unit model, machine type, serial number (MTMS)	Record the storage unit model, machine type, and serial number	
Ethernet configuration settings	Record the Ethernet settings for the DS6800 controller and the switch. The DS6800 controller and the switch Ethernet settings must be the same. If you set both to auto-negotiate, you can avoid manually configuring both sides of the Ethernet link. **Note:** If you are running code bundle 6.2.2.49, set the controllers and switch to manual.	

Network settings work sheet

Complete the network settings work sheet to define your network settings that you need if the DS6000 series is connected to a network.

Use Table 25 to enter the information that you need to define your network.

Table 25. Network settings work sheet

Item or Setting	Instructions	Your information
Processor card 1 IP Address	Provide the dotted decimal IP address that you are assigning for Processor card 0 in the DS6800. The current IP address can either be the default address (if a new address has not been specified) or a user-defined address (if the default address had been changed).	
Processor card 2 IP Address	Provide the dotted decimal address that you are assigning to Processor card 1 in the DS6800. The current IP address can either be the default address (if a new address has not been specified) or a user-defined address (if the default address had been changed).	
Gateway 1	Provide the dotted decimal or symbolic name address of the gateway (for example, 9.113.155.254 or sanjosegate).	
Subnet mask	Provide the dotted decimal address of Subnet (network) mask.	
Primary domain name server (DNS)	Provide the domain server name and IP address. You must fill-in either the host name or IP address, or both.	
Alternate domain name server (DNS)	You can optionally provide an alternate DNS. You must fill-in either the server name or IP address, or both.	
Maximum transmission unit (bytes)	You can optionally provide the maximum rate for transmission. The valid range is 1 to 9000 bytes.	
Simple Network Management Protocol (SNMP) destination	Provide the host names or the dotted decimal addresses of the destinations that are to receive SNMP (for example, **destination.com** or **9.113.152.254**).	
Simple Mail Transfer Protocol (SMTP)	Provide either the SMTP server name or the SMTP IP address.	

Host attachment work sheet

Use the host attachment work sheet to record and organize the information that you need as you map host servers to the DS6000 series drives.

Use Table 26 to enter the information that you need to map your host servers.

Table 26. Host attachment work sheet

Host Name	Number of Ports	Worldwide Port Name

Configuring your DS6000 series

This section provides an overview of the methods that you can use to configure a DS6000 series.

You can use one of the following three methods to configure your storage complex:

- Simulated configuration
- Real-time configuration
- Express configuration

Simulated configuration overview

You can use the simulated (offline) configuration method to create or import a new simulated instance of your DS6000 series.

Use the simulated configuration method to perform the following tasks:

- Import a physical or a logical configuration, or both, from an existing storage server.
- Apply logical configurations to a new or fully deconfigured storage server.
- Collect communication settings for the storage complex and the management system.
- Apply communication settings as part of the logical configuration process.
- From a single interface, work with a new storage complex or storage unit, and view existing storage complexes and storage units.
- Create, save, and open configuration documents for later reference and retention purposes.
- Print configuration reports.

- Export configuration data in a spreadsheet ready format.

Real-time configuration overview

You can use the real-time (online) configuration method to manage physical and logical configurations from existing storage complexes, storage servers, and storage units over your network.

Use the real-time configuration method to perform the following tasks:

- Construct and apply valid logical configuration actions on new or fully deconfigured storage servers at the time that each action is initiated.
- Complete and apply valid logical configuration actions on existing storage complexes, storage servers, and storage units at the time that each action is initiated.
- Collect communication settings for the storage complex and the storage manager.
- Apply communication settings as part of the logical configuration process.

Express configuration overview

Express configuration provides the simplest and fastest method to configure a storage complex.

Some configuration methods require extensive time. Because there are many complex functions that are available to you, you are required to make several decisions during the configuration process. However, with the express configuration method, the storage server makes several of those decisions for you, decreasing the number of steps that are required to configure volumes and hosts. This eliminates extensive configuration process time and simplifies the task for you.

The express configuration method is ideal for the following users:

- Novice users with little knowledge of storage concepts who want to quickly and easily set up and begin using storage
- Expert users who want to quickly configure a storage complex by allowing the storage server to make decisions for the best storage appropriation

Using the express configuration method, you can perform the following tasks:

- Configure open systems, iSeries, and zSeries volumes
- Create a volume group
- Create a host
- Map a volume group to a host attachment

Chapter 9. Data migration

The planning and methods of data migration for the DS6000 vary by machine type and operating system. The following topics provide a guide that you can use to determine the best method for migrating your data.

Planning data migration

The planning and methods of data migration for the DS6000 vary by environment. The DS6000 supports over 90 operating systems. You can migrate data to a storage unit from these host and operating system environments.

When you plan for data migration, consider the following factors:

Note: The following lists do not cover every possibility. They provide a high-level view of some of the tools and factors that you can consider when moving data.

- The system:
  - Is it a z/Series or UNIX-based system? You might use IBM System Storage Remote Mirror and Copy functions such as Metro Mirror and Global Mirror or some variation of a logical volume manager.
  - Is it zSeries? You will probably use DFDSS, though there are many choices.
  - Is it VM? You might use DASD Dump Restore or PTAPE.
  - Is it VSE? You might use the VSE fastcopy or ditto commands.

  Your system administrator selects the data migration method that is the best compromise between efficiency and impact on the users of the system.
- The storage unit:
  - Are the storage units involved the same with the same level of licensed management code?
  - Are the storage units different? In which case you want to ensure that the new configuration is large enough to accommodate the existing data. You also want to ensure that the virtual disks are similar in configuration to the disk drives that they are replacing.
- Time and complexity involved:
  - Typically data migration requires that updates or changes cease while the movement occurs. Also, depending on the amount of data that you are moving and your migrating method, data could be unavailable for an extended period of time, perhaps several hours.
  - Could the complexity and time involved require the services of IBM through International Global Services? Contact your IBM representative for more information.

How to select a data migration method

Your system administrator selects the data migration method that is the best compromise between efficiency and impact on the users of the system.

Most methods of data migration affect the everyday operation of a computer system. When data is moved, the data must be in a certain state, typically requiring that updates or changes cease while the movement occurs. Depending on

the amount of data that you are moving and your migrating method, data could be unavailable for an extended period of time, perhaps several hours. The following factors might contribute to the migration time:

- Creating new logical volumes or file systems
- Modifying configuration files
- Receiving integrity checks

The following items are more than likely among the topics considered by your system administrator to determine the best method to use to migrate your data:

- Management software provides simple robust methods that you can generally use during production without disturbing users.
- The AIX® logical volume manager (LVM) provides methods that you can use at any time without disrupting user access to the data. You might notice a small performance degradation, but this is preferable to shutting down databases or requiring users to log off the system.

  Notes:

  - AIX and HP-UX 11.*xx* ship with logical volume management (LVM) software as part of the base operating system. LVM provides complete control over all disks and file systems that exist on an AIX system. HP-UX has similar volume management software.
  - Sun Microsystems has a basic volume management product called Solstice, which is available for the Solaris systems.
- Methods that use backup and restore procedures generally have the most impact on the system usage. They require that databases and file systems be in quiescent states to ensure a valid snapshot of the data.

Chapter 10. Planning considerations for Copy Services

An understanding of Copy Services guidelines and considerations helps you plan and manage your environment.

Guidelines and recommendations for using Copy Services functions

This section contains some guidelines and recommendations that you should consider before you use the point-in-time function (FlashCopy) and remote mirror and copy features such as Metro Mirror, Global Copy, and Global Mirror.

Before you can use Copy Services functions, you must obtain the feature activation keys by connecting to the IBM Disk Storage Feature Activation (DSFA) Web site at http://www.ibm.com/storage/dsfa. After you obtain the feature activation keys, you must enter them in the DS Storage Manager Web interface. This allows you to use the licensed features (remote mirror and copy and point-in-time copy) of Copy Services. The activation keys are required for both the source and target storage units for the remote mirror and copy feature.

You can use either the DS Storage Manager or DS CLI interfaces to manage Copy Services functions.

Point-in-time function (FlashCopy)

FlashCopy operations provide the ability to create point-in-time copies. As soon as the FlashCopy operation is processed, both the source and target volumes are available for application use.

- Identify the source volumes and target volumes for FlashCopy relationships. You should select FlashCopy target volumes in different ranks for better performance.
- Create a FlashCopy relationship without a background copy. This option allows for a more efficient use of the storage unit's resources when a physical copy of the source volume is not needed.
- Identify the LSSs that contain the desired source volumes and target volumes. Distribute the FlashCopy pairs evenly across LSSs for better performance.
- Understand FlashCopy data consistency considerations. There are environments where data is stored in server memory cache and written to disk at some later time. Buffers for a database management subsystem (DBMS) or metadata for a journaled file system are two examples of these environments. If a FlashCopy operation copies a source volume to a target volume but buffers from the DBMS or metadata from the journaled file system are not flushed first, you might have to perform an incremental update. For a DBMS, you might have to back out of current transactions. For a journaled file system, you might have to run the `fsck` utility on the target volume.

  To avoid these types of restart actions, ensure that all data that is related to the FlashCopy source volume has been written to disk before you perform the FlashCopy operation. For a DBMS, you can quiesce the subsystem or use a DBMS command such as DB2's LOG SUSPEND. For a journaled file system, you can unmount the source volume before you perform a FlashCopy operation.

Note: If you are going to automate your FlashCopy procedures, consider verifying the data consistency on your target volumes frequently. On some systems, such as AIX, Windows®, and Linux®, before performing FlashCopy operations, you must quiesce your applications that access FlashCopy source volumes. The source volumes must then be unmounted during the FlashCopy establishment. This is to ensure that there is no data in the buffers that could be flushed to the target volumes and potentially corrupt them.

- You can establish multiple FlashCopy relationships (up to 12) at one time using the same source volume. Among all the FlashCopy relationships using the same source volume, only one can be an incremental FlashCopy.
- You can use an existing Metro Mirror source volume as a FlashCopy target volume. This allows you to create a point-in-time copy using a target volume of a FlashCopy pair and then mirror that data to a source Metro Mirror volume at a remote location.

Remote mirror and copy functions

Before you use remote mirror and copy functions, consider the following requirements and guidelines:

- The source and target volumes in a Metro Mirror relationship must be the same storage type: fixed block or count-key data.
- The source and target logical volumes must be the same size or the target must be larger in size to establish a FlashCopy or Metro Mirror relationships.
- Ensure that you have a sufficient number of FCP paths established between the source and target site logical subsystems. This is especially important in configurations where the same logical subsystems manage both source and target volumes.

  In addition, if you plan to use functions such as Metro Mirror and Global Copy modes between a pair of storage units, establish separate logical paths over separate physical paths for the copy pairs managed by each of the modes. In other words, for your Metro Mirror copy pairs, use one set of logical and physical paths between the source and target LSSs. For your Global Copy copy pairs, use another set of logical and physical paths between the source and target storage units. By keeping the paths separate for the two copy modes, the updates to Global Copy target volumes minimize the effect on the I/O performance of the Metro Mirror pairs. This recommendation applies only to environments where the distance between source and target storage units do not exceed the synchronous range.
- For Metro Mirror environments, distribute the work loads by not directing all updates to a small set of common volumes on a single target storage unit. The performance impact at the target site storage unit adversely affects the performance at the source site.
- If you plan to use Global Mirror, consider the following guidelines:
  - FlashCopy is required at the remote site if you are planning to return control to your local site using Global Mirror after a planned or unplanned outage.
  - An LSS to LSS association must be established with the master for each subordinate storage unit that is available on the master storage unit.

  After determining that your system meets the requirements for running Global Mirror, you must set up your environment for this processing.

  Figure 2 on page 45 shows what a typical Global Mirror configuration looks like.

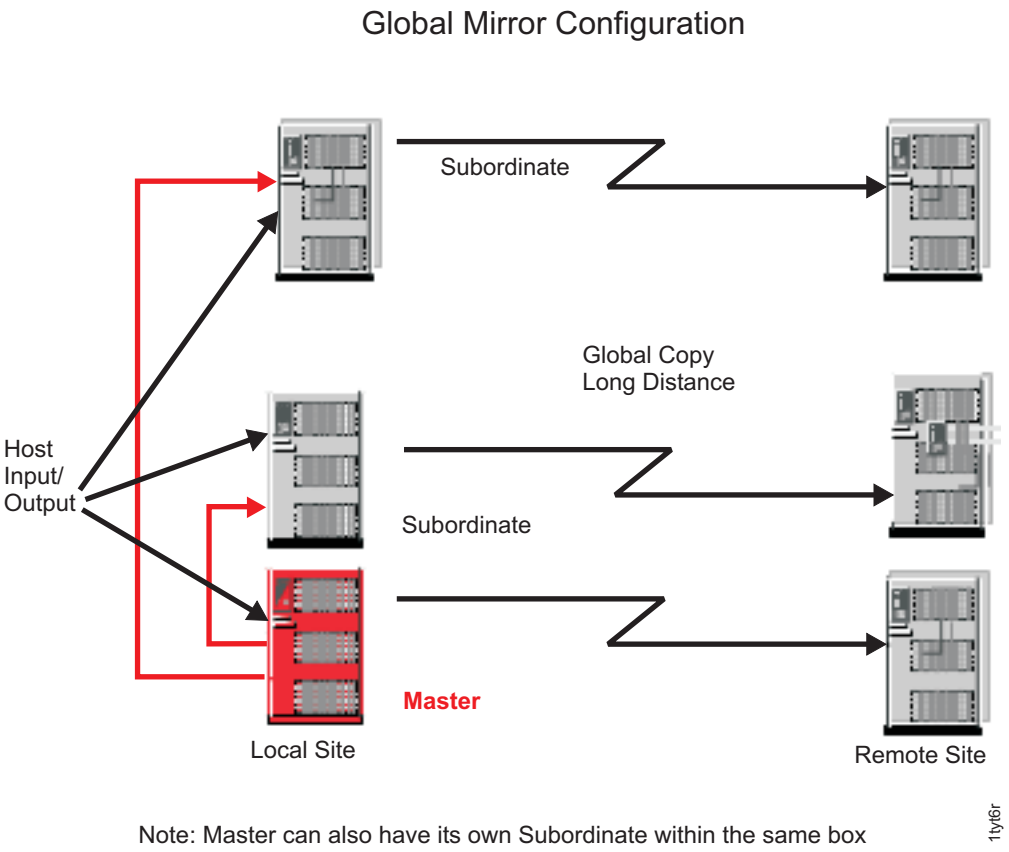


Figure 2. Global Mirror Configuration

Ethernet adapters for TotalStorage Productivity Center for Replication

Communication with the TotalStorage Productivity Center for Replication requires the addition of multiport Ethernet adapters.

Two Ethernet adapters are required for each DS6000 Storage Image to communicate with the TotalStorage Productivity Center for Replication V3.1. One port on each Ethernet adapter must connect to an external IP network. For information about creating a secure network , access the following Web site: http://www-1.ibm.com/support/docview.wss?rs=1114&uid=ssg1S1002693.

The Ethernet cards are 2-port cards; the lower-numbered port is the top port. You must provide Ethernet cables from their network to each Ethernet adapter port.

Note: The lower-numbered port is the only port that you can configure and cable.

For single SFI machines, the Ethernet card must be installed in Slot 1 of each CEC. See Table 27.

Table 27. CEC - Ethernet card slot selection for single SFI

CEC	Slot
XC1	1
XC2	1

For dual SFI machines, the Ethernet cards must be installed in both CECs for the selected path (SFI). See Table 28.

Table 28. CEC - Ethernet card slot selection for dual SFI

CEC	Path or SFI	Slot
XC1	″B″ or SFI-1	1
	″A″ or SFI-2	5
XC2	″A″ or SFI-2	1
	″B″ or SFI-1	5

Use the IBM System Storage DS Storage Manager to configure and enable the Ethernet ports. You will need to reference the *IBM System Storage DS6000 Command-Line Interface User's Guide* for further network port commands and configuration instructions.

1. Select **Storage Image** → **Configure Network Port**. A window with a tab for each network port is displayed. The first time you perform this task, the tabs all contain default values of zero.
2. Select **Enable Port** to enable the following fields: IP address, Network settings, Gateway, Subnet mask, Primary DNS, and Alternate DNS. These field values are assigned by the network administrator.
3. Select **OK** to save your changes. For each network port:
   - A location must be present.
   - The IP address, gateway, and subnet mask fields remain empty when unconfigured.
   - The Primary DNS and alternate DNS fields are optional.

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Accessibility

Accessibility features provide users who have disabilities with the ability to successfully access information and use technology.

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

Features

These are the major accessibility features in the IBM System Storage DS6000 information:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. IBM Home Page Reader version 3.0 has been tested.
- You can operate features using the keyboard instead of the mouse.

Navigating by keyboard

You can use keys or key combinations to perform operations and initiate menu actions that can also be done through mouse actions. You can navigate the IBM System Storage DS6000 information from the keyboard by using the shortcut keys for your browser or Home Page Reader. See your browser Help for a list of shortcut keys that it supports. See the following Web site for a list of shortcut keys supported by Home Page Reader: http://www-306.ibm.com/able/solution_offerings/keyshort.html

Accessing the publications

You can find HTML versions of the IBM System Storage DS6000 information at the following Web site: http://www.ehone.ibm.com/public/applications/publications/cgibin/pbi.cgi

You can access the information using IBM Home Page Reader 3.0.

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Industry Canada compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

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This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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Germany compliance statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit.

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 89/336/EWG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der IBM gesteckt/eingebaut werden.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: "Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 89/336/EWG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336) für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Japanese Voluntary Control Council for Interference (VCCI) class A statement

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Korean Ministry of Information and Communication (MIC) statement

Please note that this device has been certified for business use with regard to electromagnetic interference. If you find this is not suitable for your use, you may exchange it for one of residential use.

Taiwan class A compliance statement

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