

Bull ESCALA

Expandable Storage Plus 2104 Models DS4 and TS4
Hardware Technical Information

Bull



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Hardware

November 2003

**BULL CEDOC
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Environmental notices and statements

This section describes the environmental notices and statements.

Fire suppression systems

A fire suppression system is the responsibility of the customer. The customer's own insurance underwriter, local fire marshal, or a local building inspector, or both, should be consulted in selecting a fire suppression system that provides the correct level of coverage and protection. 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 nor does IBM provide recommendations on fire suppression systems.

Product recycling

This unit contains recyclable materials. Recycle these materials where processing sites are available and according to local regulations. In some areas, IBM provides a product take-back program that ensures proper handling of the product. Contact your IBM representative for more information.

About this document

This document introduces the Expandable Storage Plus 2104 Model DS4 and Model TS4 (hereafter referred to as the 2104 Model DS4 and Model TS4).

Who should read this document

This document is intended for system designers, programmers, engineers, and other professionals who need to understand the 2104 Model DS4 and Model TS4.

Additional information

This section contains the following information:

- A list of the documents in the 2104 Model DS4 and Model TS4 library
- A list of the related documents
- The available Web sites
- Information about how to send your comments

2104 Model DS4 and Model TS4 library

The following documents contain information related to this product:

- *Expandable Storage Plus 2104 Model DS4 and Model TS4 Hardware Technical Information*, 86 A1 16EM
- *Expandable Storage Plus 2104 Model DS4 and Model TS4 Operator's Guide*, 86 A1 17EM
- *Expandable Storage Plus 2104 Model DS4 Installation Guide*, 86 A1 14EM
- *Expandable Storage Plus 2104 Model TS4 Installation Guide*, 86 A1 15EM
- *Expandable Storage Plus 2104 Model DS4 and Model TS4 Service Guide*, 86 A1 18EM
- *Expandable Storage Plus 2104 Model DS4 and Model TS4 Translated Safety Notices*, 86 X1 16EM

Related documents

The following documents contain information related to this product:

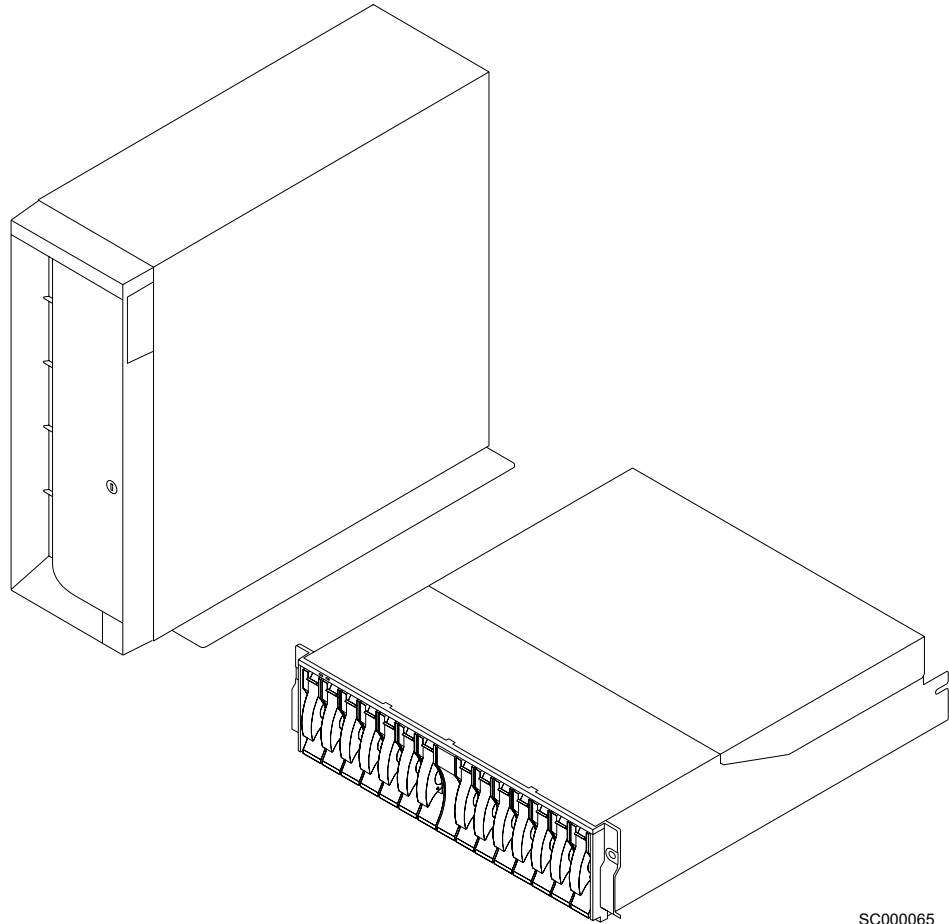
- The operator's guide for your system
- The user's guide for your using system SCSI attachment (for example, your SCSI adapter)
- The site and hardware planning information for your system
- The problem solving guide and reference for your system
- The *7014 Model T00 and T42 Rack Installation and Service Guide*, 86 A1 94KX

The following documents contain information related to the Expandable Storage Plus disk enclosures that attach to the RISC systems:

- *Diagnostic Information for Multiple Bus Systems*, 86 A1 26HX
- *Site Preparation for Rack Systems*, 86 A1 30PX
- *Adapters Information for Multiple Bus Systems*, 86 A1 27HX

Chapter 1. Introduction

This section describes the 2104 Model DS4 and Model TS4 and their components. Figure 1 shows the 2104 Model DS4 and Model TS4.



SC000065

Figure 1. 2104 Model TS4 (on the left) and 2104 Model DS4 (on the right)

2104 Model DS4

The 2104 Model DS4 is a rack-mounted SCSI disk enclosure that you can attach to any RS/6000 or IBM™ eServer pSeries computer that provides support for any of the Small Computer System Interface (SCSI) adapters listed in “SCSI adapters and cables” on page 21.

Figure 2 shows a fully configured 2104 Model DS4.

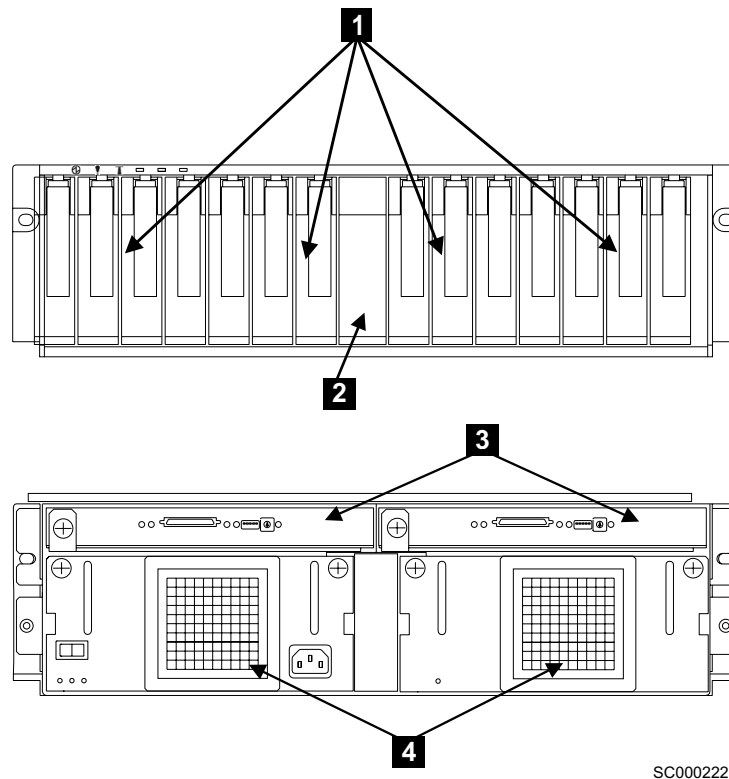


Figure 2. 2104 Model DS4 from the front (top) and back (bottom)

Fourteen device slots **1** are at the front of a 2104 Model DS4. In a fully configured 2104 Model DS4, each slot contains a SCSI disk drive module. If a 2104 Model DS4 is not fully configured, each slot that does not contain a SCSI disk drive module must contain a dummy disk drive module.

Note: At least one SCSI disk drive module must be present in each 2104 Model DS4.

Each disk drive module connects to a backplane that is mounted vertically about halfway between the front and back of the 2104 Model DS4.

The 14 device slots are divided into two groups of 7 slots. Between the two groups of slots there is a SCSI bus bridge **2** card. The SCSI bus bridge card assigns the disk drive modules to a SCSI bus, in accordance with the settings of the SCSI bus split switch on the SCSI interface card **3**.

On the back of the backplane are connectors for two SCSI interface cards **3**, fan-and-power-supply assembly **4** (left), and fan assembly **4** (right).

The 2104 Model DS4 has either two fan-and-power-supply assemblies or one fan-and-power-supply assembly and one fan assembly. Either option provides all the necessary power and cooling for the 2104 Model DS4.

The SCSI interface cards are used to connect host machines to the 2104 Model DS4. These cards contain logic that provides information about what is happening in the 2104 Model DS4 and the status of components within it.

The SCSI interface cards **3** also contain switches that control which SCSI bus mode is selected, how the 2104 Model DS4 is supplied with power, and what enclosure services are enabled. It also contains a rotary switch that you use to set the ID of the 2104 Model DS4.

2104 Model TS4

The 2104 Model TS4 is a deskside SCSI disk enclosure that you can attach to any RS/6000 or IBM *@server* pSeries computer that provides support for any of the SCSI adapters listed in “SCSI adapters and cables” on page 21.

Figure 3 shows a fully configured 2104 Model TS4.

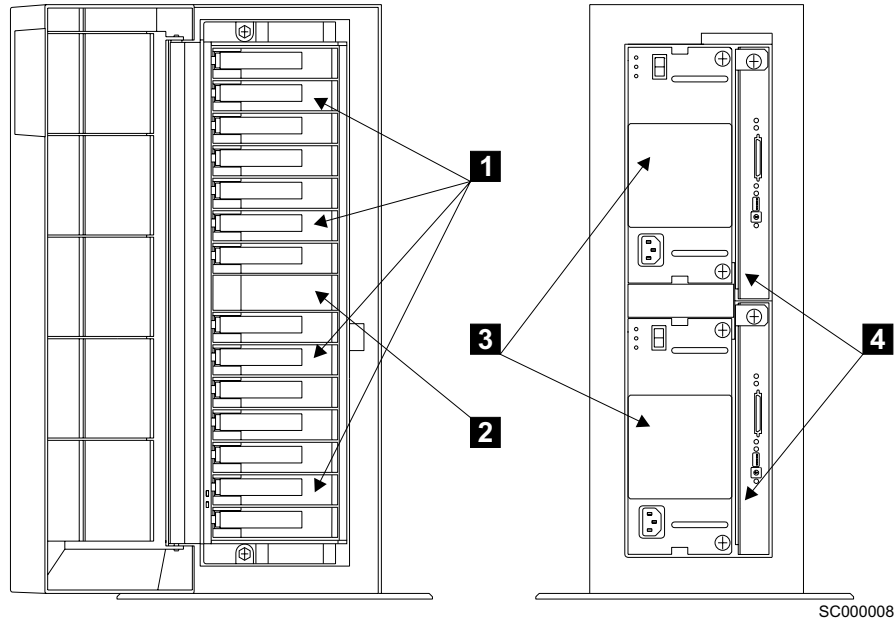


Figure 3. 2104 Model TS4 from the front (left) and back (right)

Fourteen device slots **1** are at the front of a 2104 Model DS4. In a fully configured 2104 Model TS4, each slot contains a SCSI disk drive module. If a 2104 Model TS4 is not fully configured, each slot that does not contain a SCSI disk drive module must contain a dummy disk drive module.

Note: At least one SCSI disk drive module must be present in each 2104 Model TS4.

Each disk drive module connects to a backplane that is mounted vertically about halfway between the front and back of the 2104 Model TS4.

The 14 device slots are split into two groups of seven slots. Between the two groups of slots, there is a SCSI bus bridge card **2**. The SCSI bus bridge card assigns the disk drive modules to a SCSI bus, in accordance with the settings of the SCSI bus split switch on the SCSI interface card.

On the back of the backplane are connectors for two fan-and-power-supply assemblies **3** and two SCSI interface cards **4**.

The 2104 Model TS4 can have either two fan-and-power-supply assemblies or one fan-and-power-supply assembly and one fan assembly. Either option provides all the necessary power and cooling for the 2104 Model TS4.

The SCSI interface cards are used to connect host machines to the 2104 Model TS4. These cards contain logic that provides information about what is happening in the 2104 Model TS4, and controls the operation of the subsystem.

The SCSI interface cards also contain switches that control which SCSI bus mode is selected, how the 2104 Model TS4 is supplied with power, and what enclosure services are enabled. It also contains a rotary switch that you use to set the ID of the 2104 Model TS4.

SCSI disk drive modules

Each 2104 Model DS4 or Model TS4 includes from 1 to 14 SCSI disk drive modules. In your initial order, you can select the capacity of these disk drive modules. Each disk slot contains either a disk drive module or a dummy disk drive module. You can replace any dummy disk drive module with a disk drive module, or any disk drive module with a dummy disk drive module, but there must always be at least one disk drive module in each 2104 Model DS4 or Model TS4 disk enclosure, and every disk slot must contain either a disk drive module or a dummy disk drive module. You can install the additional disk drive modules yourself.

Table 1 lists the IBM disks (SCSI Ultra 320) that are allowed.

Table 1. SCSI Ultra 320 disk drive modules

Nominal capacity	Nominal speed in RPM	Feature number
36.4 GB	10000	4036
73.4 GB	10000	4073
146.8 GB	10000	4146
36.4 GB	15000	4536
73.4 GB	15000	4573

You can obtain the latest product information from the following Web site:

www.ibm.com/storage/

SCSI interface cards

Attached to the back of the backplane in a fully configured 2104 Model DS4 or Model TS4 are two SCSI interface cards. You can use both cards to connect host machines to the 2104 Model DS4 or Model TS4 disk enclosure. A SCSI interface card provides the following functionality:

- Supports SCSI Enclosure Services at the SCSI node at address 15 on the external SCSI bus
- Reads the Vital Product Data (VPD) for the backplane, the fan-and-power-supply assembly, the fan assembly, the SCSI interface card, and the SCSI bus bridge card
- Inputs the fan-and-power-supply assembly fault lines
- Controls the fan-and-power-supply assembly fault LEDs and the fan assembly fault LED
- Controls the fault LED at the front of the 2104 Model DS4 or Model TS4
- Monitors the Early Power-Off Warning (EPOW) signal from the power supplies and passes this information to the disks when needed
- Supports hot plugging of disk drive modules
- Detects and indicates faults within itself
- Supports low-voltage differential (LVD) Ultra 320 SCSI (320 MB per second data rate)

Note: Single-ended (SE) SCSI is not supported.

The other SCSI interface card detects and indicates only faults within itself. However, if the first SCSI interface card fails, the second SCSI interface card provides all the functions previously provided by the other SCSI interface card.

If the 2104 Model DS4 or Model TS4 contains only one SCSI interface card, the SCSI interface card provides all the functions listed previously.

Switches that are accessible from the back of the 2104 Model DS4 or Model TS4 are provided to indicate the following states:

- Whether power to the 2104 Model DS4 or Model TS4 is turned on or off automatically when the host computer is switched on or off
- Whether the disk drive modules are started automatically when you turn on power to the 2104 Model DS4 or Model TS4
- Whether the disk drive modules are all started simultaneously or sequentially
- Whether enclosure services can operate
- Which enclosure services, ANSI SCSI-3 Enclosure Services (SES) or Conner/Intel SCSI-accessed Fault-tolerant Enclosures (SAF-TE), can operate
- The ID of the 2104 Model DS4 or Model TS4

Switches that are accessible only when the SCSI interface card has been removed from the 2104 Model DS4 or Model TS4 are provided to indicate the following states:

- That the order of the SCSI addresses is reversed
- Whether the setting of the LEDs is for a rack-mounted unit or for a deskside unit
- Whether the 2104 Model DS4 or Model TS4 is configured as single SCSI bus mode or dual SCSI bus mode

Fan-and-power-supply assemblies

Attached to the back of the backplane in a fully configured 2104 Model DS4 or Model TS4 are two fan-and-power-supply assemblies.

Each fan-and-power-supply assembly provides enough power for the 2104 Model DS4 or Model TS4, so it is possible for there to be just one fan-and-power-supply assembly in a 2104 Model DS4 or Model TS4. The second fan-and-power-supply assembly is replaced by a fan assembly. The fan-and-power-supply assembly provides the power for the fan assembly through the 2104 Model DS4 or Model TS4 backplane.

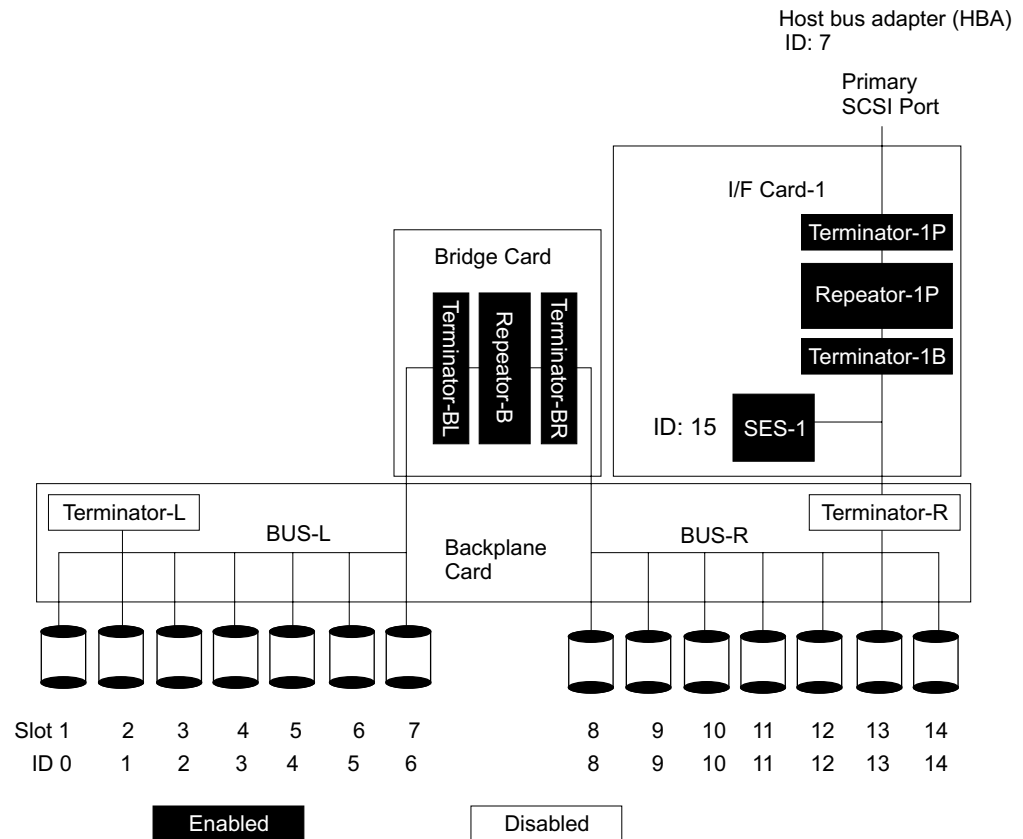
SCSI bus bridge card

The SCSI bus bridge card is located centrally in the front of a 2104 Model DS4 or Model TS4. The SCSI bus bridge card controls the SCSI bus configuration of the 2104 Model DS4 or Model TS4. It assigns the disk drive modules to a SCSI bus, in accordance with the settings of the SCSI bus split switch on the SCSI interface card.

SCSI bus configurations

The three valid configurations are as follows:

- Single bus, one initiator (SCSI ID 7), 14 disk drive modules (SCSI IDs 0 through 6, and 8 through 14). See Figure 4.
- Single bus, two initiators (SCSI IDs 5 and 6), 12 disk drive modules (SCSI IDs 0 through 4, and 8 through 14). See Figure 5 on page 10.
- Dual bus, two initiators (SCSI IDs 7 (x2), 2 groups of 7 disk drive modules (SCSI IDs 0 through 6, and 8 through 14). See Figure 6 on page 11.



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Figure 4. Single bus, one initiator, 14 disk drive modules

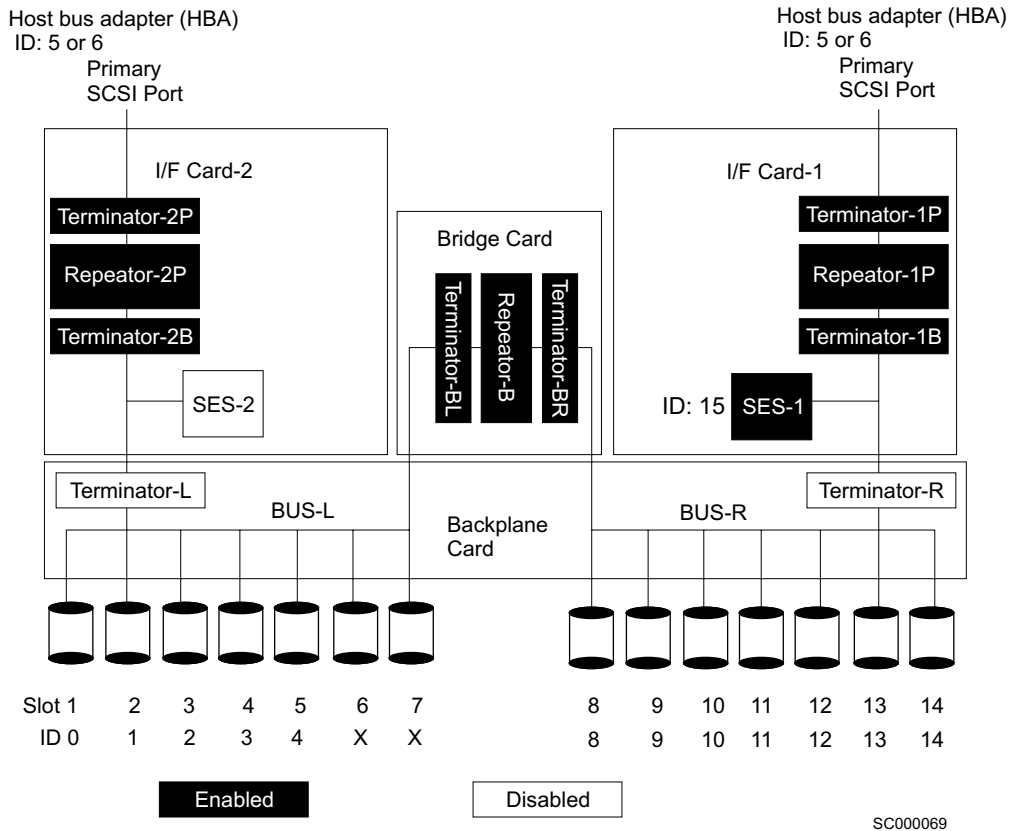


Figure 5. Single bus, two initiators, 12 disk drive modules

Notes:

1. The two host bus adapters cannot have the same SCSI address.
2. Disk drive slots 6 and 7 (SCSI IDs 5 and 6) have dummy disk drive modules installed in them. SCSI ID is reserved.
3. In this configuration, you cannot use SCSI addresses 5 and 6 for disk drive modules.

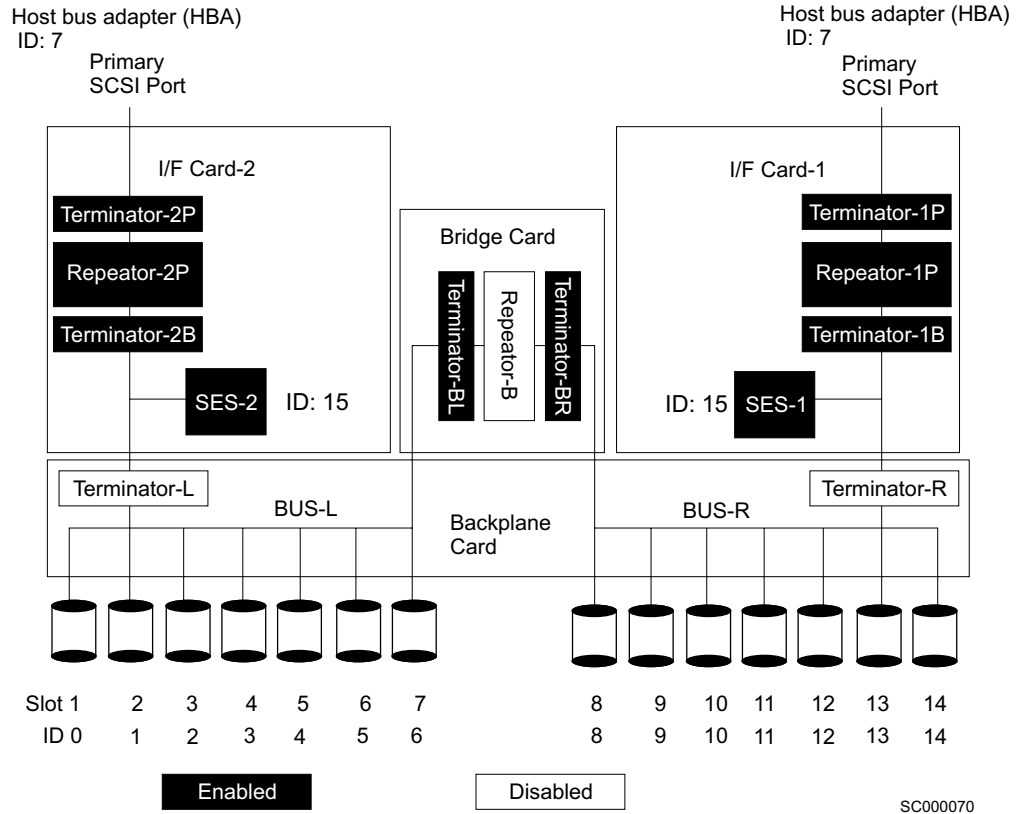


Figure 6. Dual bus, two initiators, 14 (2 x 7) disk drive modules

Chapter 2. Product characteristics

This section describes the physical characteristics of the 2104 Model DS4 and Model TS4, and their environmental and power requirements.

Dimensions

Table 2 lists the dimensions for the 2104 Model DS4 and Model TS4.

Table 2. 2104 Model DS4 and Model TS4 dimensions

Model	Height	Width	Depth
Model DS4	128 mm (5.0 in.) 3 EIA units	445 mm (18 in.)	552 mm maximum (22 in.)
Model TS4	529 mm (21 in.)	281 mm at foot (11 in.)	594 mm (23.5 in.)

Weight

Table 3 lists the weights of the 2104 Model DS4 and Model TS4.

Table 3. Weight of a 2104 Model DS4 and Model TS4

Model	Configuration	Disk drive modules	Weight (kg)
2104 Model DS4 (ac model)	Minimum	1	21.5 kg (48 lb)
	Maximum	14	36.9 kg (82 lb)
2104 Model DS4 (dc model)	Minimum	1	21.7 kg (48 lb)
	Maximum	14	37.4 kg (83 lb)
2104 Model TS4	Minimum	1	39.3 kg (87 lb)
	Maximum	14	54.7 kg (121 lb)

Service clearances

Table 4 lists the service clearances for the 2104 Model DS4 and Model TS4.

Table 4. Service clearances for the 2104 Model DS4 and Model TS4

Model	Service Clearance
2104 Model DS4	The minimum is 114 cm (45 in.) front and 81 cm (32 in.) rear when mounted in a rack.
2104 Model TS4	The minimum is 1 m (39 in.) front, back, and on each side.

Environment

This section describes the 2104 Model DS4 and Model TS4 environment.

Temperature and humidity

Table 5 lists the 2104 Model DS4 and Model TS4 environmental limits.

Table 5. Environmental limits

Environment	Air temperature	Relative humidity	Maximum wet bulb
Operating	10°C to 40°C (50°F to 104°F)	8% to 80% noncondensing	27°C (80°F)
Recommended operating point	22°C (72°F)	45%	
Recommended operating range	20°C to 25°C (68°F to 77°F)	40% to 50%	
Nonoperating	10°C to 52°C (50°F to 126°F)	8% to 80% noncondensing	27°C (80°F)
Storing	1°C to 60°C (34°F to 140°F)	5% to 80% noncondensing	29°C (84°F)
Shipping	-40°C to 60°C (-40°F to 140°F)	5% to 100% condensing but not precipitating	29°C (84°F)

Notes:

1. The recommended operating temperature is 22°C (72°F) or lower. At lower temperatures, the risk of failure in the unit is reduced. If the operating temperature is above 22°C (72°F) for long periods of time, the 2104 Model DS4 and Model TS4 are exposed to a greater risk of failure from external causes.
2. The nonoperating environment must not exceed the operating environment limits for longer than 60 days.
3. The storage environment must not exceed the operating environment limits for longer than 1 year.
4. Substantial deviations from the recommended operating range, in either direction, if sustained for extended periods of time, will expose the 2104 Model DS4 and Model TS4 to greater risk of failure from external causes.

Altitude

Altitude (from sea level) limits for both models are as follows:

Operating: 0 to 2133 m (0 to 7000 ft)

Nonoperating: -304.8 m to 12 192 m (-1000 to 40 000 ft)

Note: The upper dry bulb temperature limit of the rack-mounted unit is lowered by 1°C (2°F) for every 137 meters (450 ft) above 915 meters (3000 ft). The upper wet bulb temperature limit is lowered by 1°C (2°F) for every 274 meters (900 ft) above 305 meters (1000 ft).

Heat output, airflow, and cooling

The maximum heat output of either 2104 Model DS4 or Model TS4 is 330 watts (1126 BTU/hr).

Each 2104 Model DS4 or Model TS4 requires an airflow of 1.55 m³ (40 cubic ft) per minute.

When racks that contain many 2104 Model DS4s are to be installed together, the following requirements must be met to ensure that the 2104 Model DS4s are adequately cooled:

- The airflow is in at the front of the rack and out at the back. To avoid moving exhaust air to the intake of another piece of equipment, racks should be positioned in alternate rows, back-to-back and front-to-front.
- The front of racks should be positioned on floor-tile seams, with a full line of perforated tiles immediately in front of the racks.
- Where racks are in rows front-to-front or back-to-back, there should be a gap of at least 1220 mm (48 in.) separating the rows.
- To ensure proper airflow within each rack, the rack filler plates must be installed in unused positions. Also, all the gaps in the front of the racks must be sealed, including the gaps between the 2104 Model DS4s.

Electrical power

Electrical power is supplied to each 2104 Model DS4 or Model TS4 by either one or two fan-and-power-supply assemblies. These fan-and-power-supply assemblies convert the input voltage to dc for distribution within the 2104 Model DS4 or Model TS4.

One fan-and-power-supply assembly provides enough power for a fully populated 2104 Model DS4 or Model TS4.

If two fan-and-power-supply assemblies are present in the 2104 Model DS4 or Model TS4, each disk drive module receives power from both fan-and-power-supply assemblies. If one fan-and-power-supply assembly fails, all disk drive modules can continue to operate.

Input-voltage requirements

This section lists the power line disturbance limits.

Main ac supply

Fan-and-power-supply assemblies can run uninterrupted with ac inputs from 90 to 260 volts and from 47 to 63 Hz.

The 2104 Model DS4 or Model TS4 is designed to operate within the limits of power line disturbance listed in Table 6.

Table 6. Power line disturbance limits

Transient voltage (rms)	Duration	Frequency	Nominal voltage (rms)
287 V	2.0 s	47 to 63 Hz	240 V
70 V	2.0 s	47 to 63 Hz	100 V
65 V	0.5 s	47 to 63 Hz	100 V
0 V	20 ms	–	100 V

-48 volts dc supply

For 2104 Model DS4 units with the optional -48 V power supply feature, the input voltage must be in the range -40 V to -60 V.

The 2104 Model DS4 is designed to operate within the limits of power line disturbance listed in Table 7.

Table 7. Power line disturbance limits

Transient voltage	Duration	Frequency	Nominal voltage
-65 V dc	1.0 s	N/A	<=60 V dc
-38 V dc	2.0 s	N/A	>=40 V dc
-35 V dc	0.5 s	N/A	>=40 V dc
0 V dc	3 ms	N/A	>=40 V dc

Power input

Table 8 shows the power input that is needed for a 2104 Model DS4 or Model TS4. The values shown are for a 2104 Model DS4 or Model TS4 in which 14 disk drive modules are installed.

Table 8. Power input

Description	Operating (100 disk ops per second)	Two power supplies (100 disk ops per second)
100 V ac input	410 W	210 W each
240 V ac input	430 W	220 W each

Power factor

Power factor correction is applied within the fan-and-power-supply assemblies of each 2104 Model DS4 or Model TS4. This maintains the power factor of the unit at not less than 0.95 at 50% of maximum load.

Output protection

Each fan-and-power-supply assembly has over-current and over-voltage protection.

Early power-off warning (EPOW)

Each fan-and-power-supply assembly provides an EPOW signal to the controlling SCSI interface card. When both fan-and-power-supply assemblies signal an EPOW, the controlling SCSI interface card signals an EPOW to each disk drive within the 2104 Model DS4 or Model TS4.

Power control

Each fan-and-power-supply assembly in the 2104 Model DS4 or Model TS4 has a dc on/standby switch.

The power to the 2104 Model DS4 or Model TS4 is also controlled by the power control switch on the SCSI interface card.

Power sequencing

The power sequencing of the disk drive modules in a 2104 Model DS4 or Model TS4 is controlled by the settings of the drive auto-start and select enclosure services switches on the SCSI interface card listed in Table 9.

Table 9. Switch summary drive-auto-start-1 and drive-auto-start-2

Drive auto-start switch No. 1	Drive auto-start switch No. 2	Description
OFF	OFF	Immediate Spin Up mode. The spindle of the disk drives starts when power is applied to the drives.
OFF	ON	START MOTOR command mode. The drive spindle does not start until the START MOTOR command is received from the host.
ON	OFF	Delay Motor Start mode. The drive spindle startup is delayed by SCSI ID times 12 seconds after you turn on the power.
ON	ON	Reserved.

Auto restart

The 2104 Model DS4 or Model TS4 automatically restarts when input power is restored within specification after a power failure. The disk drive module motors start under the control of the using system.

Chapter 3. Physical connections

Figure 7 shows the following external connectors on the 2104 Model DS4: SCSI connectors **1** and mainline power connectors **2**.

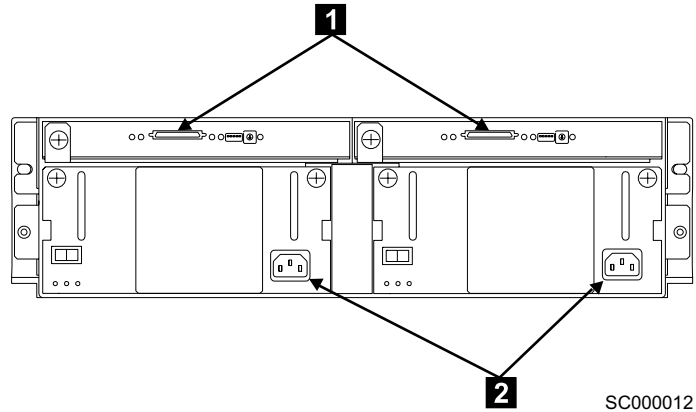


Figure 7. Back of a 2104 Model DS4 that shows the external connectors

Figure 8 shows the external connectors of the 2104 Model TS4. **1** are mainline power connectors and **2** are SCSI connectors.

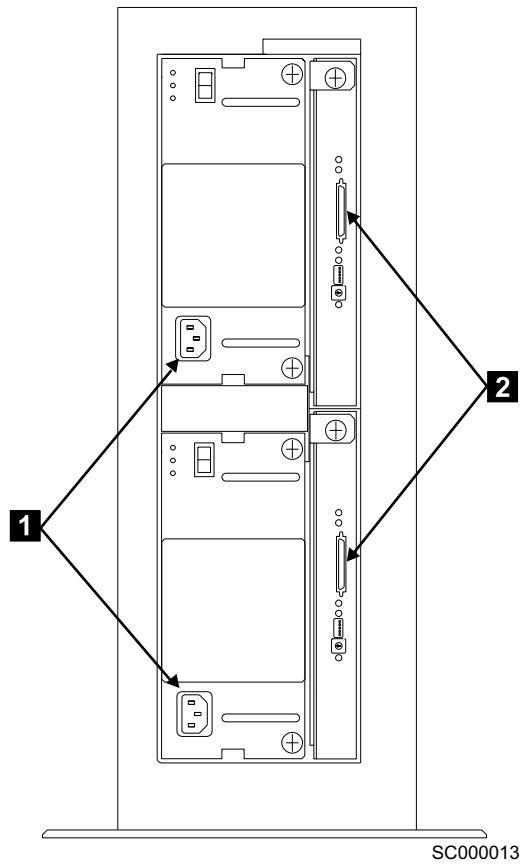


Figure 8. Back of a 2104 Model TS4 that shows the external connectors

This section provides information about these connectors.

SCSI adapters and cables

An RS/6000 or IBM @server pSeries computer running AIX uses the following adapters to connect to the 2104 Model DS4 or Model TS4:

- PCI 4-Channel Ultra3 SCSI RAID Adapter/A (feature code 2498, type number 4-X)
- PCI-X Dual Channel Ultra320 SCSI Adapter (feature code 5712, type number 5702)
- PCI Dual-Channel Ultra3 SCSI Adapter (feature code 6203, type number 4-Y)
- PCI-X Dual-Channel Ultra320 SCSI RAID Adapter (feature code 5703, type number 5703)
- PCI Dual-Channel Ultra2 SCSI Adapter (feature code 6205, type number 4-R)

An RS/6000 or IBM @server pSeries computer running Linux on pSeries uses one of the following SCSI adapters to connect to the 2104 Model DS4 or Model TS4:

- PCI-X Dual Channel Ultra320 SCSI Adapter (feature code 5712, type number 5702)
- PCI-X Dual-Channel Ultra320 SCSI RAID Adapter (feature code 5703, type number 5703)
- PCI Dual-Channel Ultra3 SCSI Adapter (feature code 6203, type number 4-Y)

The SCSI cables that these adapters support are listed in Table 10.

Table 10. SCSI cables

Cable length	Feature code	Part number
20 meters	5320	09L3307
10 meters	5310	09L3305
5 meters	5305	09L3303
3 meters	5303	09L3301
1 meter	5301	09L3299

You can obtain the latest product information from the following Web site:

www.storage.ibm.com/hardsoft/products/expplus/techinfoman.pdf

Mainline power connectors

This section describes the main ac power supply on a 2104 Model DS4 or Model TS4 and the -48 V power connector on each fan-and-power-supply assembly in a 2104 Model DS4.

Main ac power supply on a 2104 Model DS4 or Model TS4

A mainline power connector is on each fan-and-power-supply assembly. The connector is a 10-amp, three-pin, polarized, IEC 320 input connector. See Figure 9, in which **1** is the ground connection, **2** is the neutral connection, and **3** is the live connection.

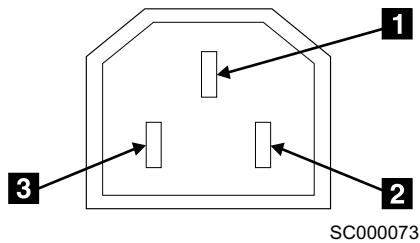


Figure 9. AC mainline power connector

-48 V power supply

There is one -48 V power connector on each fan-and-power-supply assembly in a 2104 Model DS4 that has this optional feature. This permits the 2104 Model DS4 or Model TS4 to be connected to the -48 V dc rack power distribution panel. The connector is a 12-pin connector. See Figure 10.

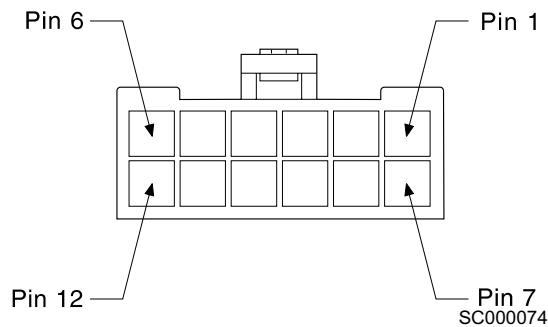


Figure 10. -48 V power connector (viewed from the back of the 2104 Model DS4 or Model TS4)

Table 11 shows the pin assignment for the pins.

Table 11. Pin assignment for the pins

Pin	Assignment	Pin	Assignment
1	Frame ground	7	Frame ground
2	Not used	8	Not used
3	-48 V return (0 V)	9	-48 V return (0 V)
4	-48 V return (0 V)	10	-48 V return (0 V)
5	-48 V in	11	-48 V in
6	-48 V in	12	-48 V in

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声明

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VS07171L

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