

Introducing the IBM DS8882F Rack Mounted Storage System

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Storage



International Technical Support Organization

Introducing the IBM DS8882F Rack Mounted Storage System

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Note: Before using this information and the product it supports, read the information in “Notices” on page v.

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Preface

This IBM® Redpaper™ publication presents and positions the DS8882F.

The DS8882F adds a modular rack-mountable enterprise storage system to the DS8880 family of all-flash enterprise storage systems.

The modular system can be integrated into 16U contiguous space of an existing IBM z14™ Model ZR1 (z14 Model ZR1), IBM LinuxONE™ Rockhopper II (z14 Model LR1), or other standard 19-inch wide rack.

The DS8882F allows you to take advantage of the performance boost of DS8880 all-flash enterprise systems and advanced features while limiting datacenter footprint and power infrastructure requirements.

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DS8882F introduction

This chapter gives a brief overview of the DS8882F and positioning. Each of the following topics is further developed in subsequent chapters:

- ▶ Chapter 1, “DS8882F introduction” on page 1
- ▶ Chapter 2, “DS8882F hardware configuration” on page 5
- ▶ Chapter 3, “DS8882F installation and integration” on page 25

1.1 DS8882F overview

The IBM DS8880F family now offers a new all-flash array model, DS8882F, to meet the demand for higher-speed storage in a smaller footprint.

The DS8882F adds a modular rack-mountable enterprise storage system to the 533x all-flash machine type family. As such, it does not come in its own rack, but can be integrated into existing 19-inch form factor racks. It is designed for clients with small capacity requirements looking to boost performance, in particular in mainframe environments.

Figure 1-1 shows front and rear views of the DS8882F.



Figure 1-1 DS8882F front (left) and rear (right) views

The DS8882F Rack Mounted Storage System supports continuous operation, data security, and data resiliency. For high-availability, the hardware components are redundant.

The modular system can be integrated into a 16U contiguous space of an existing IBM z14 Model ZR1 (z14 Model ZR1), IBM LinuxONE Rockhopper™ II (z14 Model LR1), or other standard 19-inch wide rack that conforms to EIA 310D specifications. For detailed information on how to integrate the DS8882F, see Chapter 3, “DS8882F installation and integration” on page 25.

The DS8882F enables you to take advantage of the DS8880 advanced features, while limiting datacenter footprint and power infrastructure requirements. The modular system contains POWER8® processor nodes, an I/O enclosure, High Performance Flash Enclosures Gen2, a management enclosure (which includes the Hardware Management Consoles (HMCs), Ethernet Switches, and Rack Power Control (RPCs)), and battery backup modules to power the DS8882F modules and to protect data if there is a loss of input power.

For detailed information about the DS8882F Architecture, Hardware, and components, see Chapter 2, “DS8882F hardware configuration” on page 5.

The DS8882F provides a mid-level product with the same advanced functions (with the exception of zHyperlink support) as larger DS8880 family systems, with support for both IBM Z® Systems or distributed hosts. It is an ideal replacement for older IBM Storage systems, such as IBM DS6000™, DS8100/DS8300, and small-capacity DS8700 and DS8800 Systems with comparable capacity requirements.

1.2 Product highlights

The DS8882F delivers the following hardware features:

- ▶ Six-core processors with options of 64 GB, 128 GB, and 256 GB memory combinations
- ▶ Support for 8 or 16 FCP/FICON® Ports
- ▶ Support for one high-performance flash enclosure (HPFE) Gen2 pair that can be populated with either high-performance or high-capacity drive sets, and a maximum raw capacity of 737.28 TB raw capacity based on the 15.36 TB high-capacity flash drives
- ▶ The following high-performance flash drive sets: 400 GB, 800 GB, 1600 GB, and 3200 GB
- ▶ Three high-capacity flash drive set options: 3.84 TB, 7.68 TB, and 15.36 TB
- ▶ Battery backup units that protect the write in-flight in the event of a power loss
- ▶ Compact 16U of contiguous space in a conforming 19 inch rack
- ▶ Same advanced functions (except zHyperLink support) as the rest of the DS8880F family members

Functions are licensed as for the others DS8880 models:

- ▶ **Base Function**

The Base Function license is required for each DS8882F storage system. The licensed functions include Database Protection, Encryption Authorization, Easy Tier®, I/O Priority Manager, the Operating Environment License, and Thin Provisioning.

- ▶ **z-synergy Services**

The z-synergy Services include z/OS® functions that are supported on the storage system. The licensed functions include transparent cloud tiering, High Performance FICON for z Systems, HyperPAV, PAV, and z/OS Distributed Data Backup.

- ▶ **Copy Services**

Copy Services features help you implement storage solutions to keep your business running 24 hours a day, 7 days a week by providing data duplication, data migration, and disaster recovery functions. The licensed functions include Global Mirror, Metro Mirror, Metro/Global Mirror, Point-in-Time Copy/IBM FlashCopy®, z/OS Global Mirror, Safeguarded Copy, and z/OS Metro/Global Mirror Incremental Resync (RMZ).

You can use the DS8000 Storage Management GUI and the DS command-line interface (DS CLI) to manage and logically configure the storage system.



DS8882F hardware configuration

This chapter describes the hardware components of the IBM DS8882F. It describes each of the eight 2U modules that make up the DS8882F. It provides insights into the architecture and individual components.

For a 3D interactive view of the DS8882F, click the following link:

[DS8882F 3D View](#)

2.1 DS8882F machine types

There are several machine type options available for the DS8882F. Table 2-1 lists the available hardware machine types and their corresponding function authorization machine types.

Table 2-1 Available hardware and function-authorization machine types

Hardware		Licensed functions	
Hardware machine type	Available hardware models	Corresponding function authorization machine type	Available function authorization models
5331 (1-year warranty period)	983	9046 (1-year warranty period)	LF8
5332 (2-year warranty period)		9047 (2-year warranty period)	
5333 (3-year warranty period)		9048 (3-year warranty period)	
5334 (4-year warranty period)		9049 (4-year warranty period)	

The machine types for the DS8882F specify the service warranty period. The warranty is used for service entitlement checking when notifications for service are called home. The DS8882F model 983 reports 2107 as the machine type to attached host systems.

2.2 DS8882F hardware components

The DS8882F is an entry-level, high-performance storage system that includes only High Performance Flash Enclosures Gen2. The DS8882F hardware components are consistent with the rest of the DS8880 all-flash family. The I/O enclosure, management enclosure, and power supplies have been repackaged to make the DS8882F modular.

The DS8882F storage system features 6-core processors and supports one High Performance Flash Enclosure Gen2 pair with up to 48 Flash Tier 0, Flash Tier 1, or Flash Tier 2 drives.

The DS8882F consists of eight 2U modules which are installed into a conforming 19-inch rack. See Chapter 3, “DS8882F installation and integration” on page 25 for more detailed information about installing into a conforming 19-inch rack.

The DS8882F includes the following components:

- ▶ Two 2U POWER8 processor nodes (CECs)
- ▶ One High-Performance Flash Enclosure (HPFE) Gen2 pair
- ▶ One 2U I/O enclosure
- ▶ One 2U management enclosure
- ▶ Two 2U 3000VA Battery Back Up Modules

Figure 2-1 shows the DS8882F eight 2U modules that make up the 16U of contiguous space, and the order in which they must be installed.

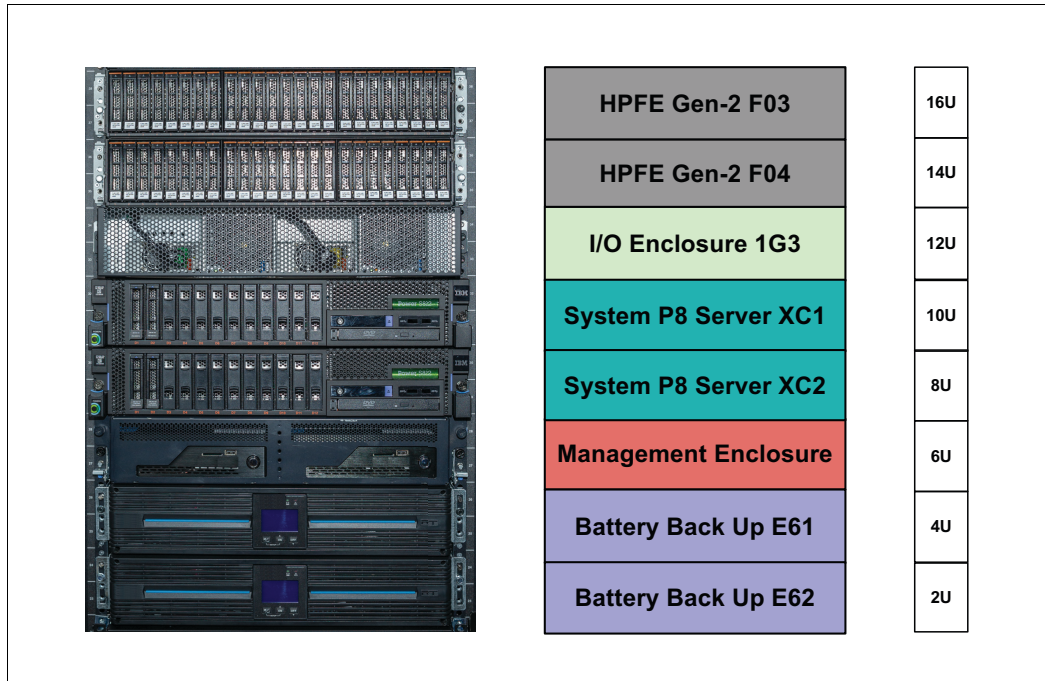


Figure 2-1 DS8882F eight 2U modules

2.2.1 High Performance Flash Enclosure Gen2 pair

The top 2 modules that make up the DS8882F are the HPFE Gen2 pair. The HPFE Gen2 is a 2U flash enclosure that is installed in pairs. For Release 8.5, the DS8882F supports only one HPFE Gen2 pair.

The HPFE Gen2 pair contains the following hardware components:

- ▶ Two 2U 24-slot serial-attached SCSI (SAS) flash drive enclosures. Each of the two enclosures contains the following components:
 - Two power supplies with integrated cooling fans
 - Two SAS expander modules with two x4 SAS ports each
 - One midplane or backplane for plugging components that accommodate the flash drives, SAS expander modules, and power supplies
 - 24 2.5-inch flash drives (or drive fillers)

The two 2U HPFE Gen2 modules are positioned as the top two modules in the DS8882F.

For more detailed information about the High Performance Flash Enclosures Gen2, see *DS8880 High-Performance Flash Enclosure Gen2*, REDP-5422.

Figure 2-2 shows views of HPFE Gen2 front (top) and rear (bottom).



Figure 2-2 HPFE Gen2 front (top) and rear (bottom)

DS8882F flash drives

The DS8882F provides a choice of the following drives with the HPFE Gen2:

- ▶ 2.5-inch High Performance Flash Tier 0 drives
 - 400 GB
 - 800 GB
 - 1.6 TB
 - 3.2 TB
- ▶ 2.5-inch High Capacity Flash Tier 1 drives
 - 3.8 TB
- ▶ 2.5-inch High Capacity Flash Tier 2 drives
 - 7.6 TB
 - 15.36 TB

Note: Intermix of High Performance Flash Tier 0 drives with High Capacity Flash Tier 1 and Flash Tier 2 drives is not supported in a HPFE G2 pair.
All flash drives in DS8882F are Full Drive Encryption (FDE) capable.

Flash drives are ordered in drive sets of 16. The HPFE Gen2 pair can contain 16, 32, or 48 flash drives (1, 2 or 3 drive sets). All flash drives in an HPFE Gen2 pair must be the same type. Half the drive set is installed in each enclosure of the pair.

Figure 2-3 shows the HPFE Gen2 flash drive install order.

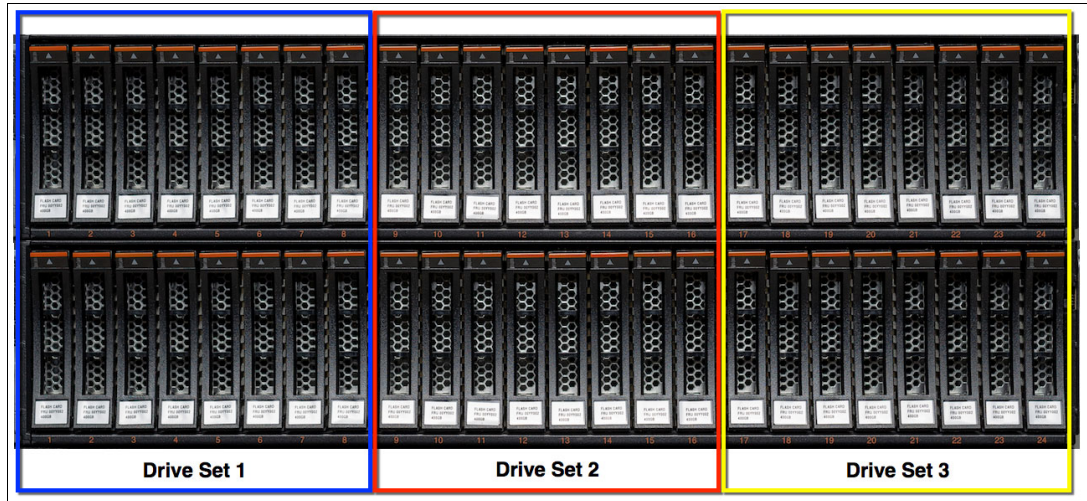


Figure 2-3 Flash drive set install order

Table 2-2 lists the DS8882F feature codes for flash drive sets for HPFE Gen2.

Table 2-2 DS8882F feature codes for flash-drive sets for HPFE Gen2

Feature code	Disk size	Drive type	RAID support
1610	400 GB	Flash Tier 0	5,6,10
1611	800 GB	Flash Tier 0	5,6,10
1612	1.6 TB	Flash Tier 0	6,10 ^{1,2}
1613	3.2 TB	Flash Tier 0	6,10 ^{1,2}
1623	3.84 TB	Flash Tier 1	6,10 ^{1,2}
1624	7.68 TB	Flash Tier 2	6 ^{1,2}
1625	15.36 TB	Flash Tier 2	6 ^{1,2}

Note:

- RAID 5 is not supported for drives larger than 1 TB, and requires a request for price quote (RPQ).
- RAID 6 is the default and preferred RAID type for all drives larger than 1 TB, and it is the only supported RAID type for 7.68 TB and 15.36 TB drives.
- Within a High Performance Flash Enclosure Gen2 pair, no intermix of High Performance Flash (Tier 0) with High Capacity Flash (Tier 1 and Tier 2) is supported.

Storage enclosure fillers

Storage enclosure fillers fill empty drive slots in the storage enclosures.

The fillers ensure sufficient airflow across populated storage. For HPFE Gen2, one filler feature provides a set of 16 fillers (feature code 1699).

RAID capacities for DS8882F

Use the following information to calculate the physical and effective capacity for the HPFE Gen2.

The default and preferred RAID type for all drives larger than 1 TB is RAID 6, and it is the only RAID type supported for 7.6 TB and 15.36 TB drives. RAID 5 is not supported for drives larger than 1 TB, and requires a request for price quote (RPQ).

Table 2-3 lists the DS8882F effective RAID capacities.

Table 2-3 RAID capacities for HPFE Gen2

Flash Tier 0, Flash Tier 1, Flash Tier 2 drive disk size	Physical capacity of Flash Tier 0, Flash Tier 1, Flash Tier 2 drive sets	Rank Type	Effective capacity of one rank in number of extents					
			Raid-10 arrays		Raid-5 arrays		Raid-6 arrays	
			3+3	4+4	6+P	7+P	5+P+Q	6+P+Q
400 GB	6.4 TB	FB Lg Ext	1049	1410	2132	2493	1771	2132
		FB Sm Ext	67170	90285	136507	159607	113393	136495
		CKD Lg Ext	1177	1582	2392	2797	1987	2392
		CKD Sm Ext	62388	83858	126797	148256	105328	126787
800 GB	12.8 TB	FB Lg Ext	2133	2855	4300	5023	3578	4300
		FB Sm Ext	136542	182781	275254	321475	229015	275239
		CKD Lg Ext	2392	3203	4823	5633	4013	4823
		CKD Sm Ext	126821	169768	255651	298601	212705	255655
1.6 TB	25.6 TB	FB Lg Ext	4301	5746	n/a	n/a	7197	8636
		FB Sm Ext	275284	367771	n/a	n/a	460243	552727
		CKD Lg Ext	4824	6445	n/a	n/a	8065	9686
		CKD Sm Ext	255684	341586	n/a	n/a	427475	513372
3.2 TB	51.2 TB	FB Lg Ext	8637	11527	n/a	n/a	14417	17307
		FB Sm Ext	552771	737753	n/a	n/a	922733	1107703
		CKD Lg Ext	9687	12928	n/a	n/a	16170	19412
		CKD Sm Ext	513414	685225	n/a	n/a	857029	1028843
3.84 TB	61.4 TB	FB Lg Ext	10371	13839	n/a	n/a	17308	20776
		FB Sm Ext	663766	885747	n/a	n/a	1107725	1329703
		CKD Lg Ext	11632	15522	n/a	n/a	19412	23302
		CKD Sm Ext	616506	822682	n/a	n/a	1028848	1235028

Flash Tier 0, Flash Tier 1, Flash Tier 2 drive disk size	Physical capacity of Flash Tier 0, Flash Tier 1, Flash Tier 2 drive sets	Rank Type	Effective capacity of one rank in number of extents					
			Raid-10 arrays		Raid-5 arrays		Raid-6 arrays	
			3+3	4+4	6+P	7+P	5+P+Q	6+P+Q
7.68 TB	123 TB	FB Lg Ext	n/a	n/a	n/a	n/a	34650	41587
		FB Sm Ext	n/a	n/a	n/a	n/a	2217663	2661631
		CKD Lg Ext	n/a	n/a	n/a	n/a	38863	46643
		CKD Sm Ext	n/a	n/a	n/a	n/a	2059760	2472118
15.36 TB	246 TB	FB Lg Ext	n/a	n/a	n/a	n/a	68980	82782
		FB Sm Ext	n/a	n/a	n/a	n/a	4414735	5298103
		CKD Lg Ext	n/a	n/a	n/a	n/a	77365	92846
		CKD Sm Ext	n/a	n/a	n/a	n/a	4100392	4920882

2.2.2 DS8882F 2U I/O enclosure

The DS8882F I/O enclosure holds the I/O adapters and provides connectivity between the I/O adapters and the processor nodes.

Unlike other DS8880 models, which have I/O enclosures installed in pairs, the DS8882F I/O enclosure is unique, in that it is a single 2U container. Internally, the DS8882F I/O enclosure contains two *logical I/O enclosures* that provide the same functionality as a DS8880 I/O enclosure pair. The DS8882F I/O enclosure supports less I/O adapters than other DS8880 I/O enclosure pairs.

Because the DS8882F system modules can be mounted in any conforming rack, the I/O enclosure is designed to create a compact container for the I/O adapters.

The I/O adapters in the I/O enclosures can be either flash RAID adapters or host adapters. Each I/O enclosure supports a Flash RAID adapter pair, which are imbedded into the base expander PCIe adapter, and one or two host adapters pairs.

Figure 2-4 shows the DS8882F 2U I/O enclosure, front (top) and rear (bottom) views.

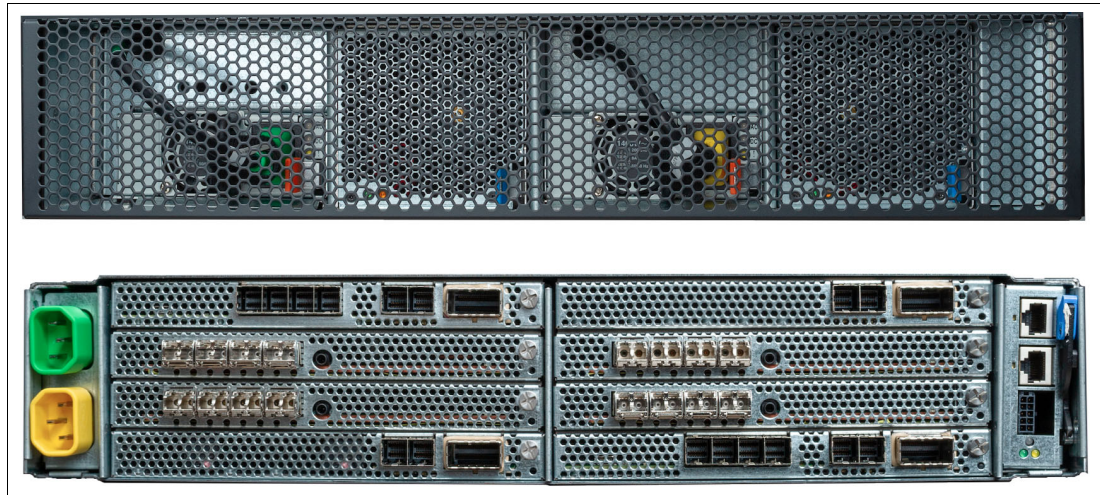


Figure 2-4 DS8882F 2U I/O enclosure, front and rear view

The DS8882F I/O enclosure supports two configurations. The I/O enclosure base configuration contains the following components:

- ▶ A pair of base PCIe expander adapters:
 - Has imbedded flash RAID adapters providing SAS connectivity to the HPFE Gen2 enclosures
 - Provides PCIe connectivity between the processor nodes and the embedded RAID adapters as well as the adjacent host adapters (HA)
- ▶ First pair of 4-port 16 Gb host adapters
- ▶ Power control network (PCN) adapter
- ▶ Redundant power supplies (PSUs)
- ▶ Redundant fans for enclosure cooling

Figure 2-5 shows the DS8882F I/O enclosure base configuration with imbedded flash RAID adapter pair, and the first 4 port 16 Gbps host adapter pair.

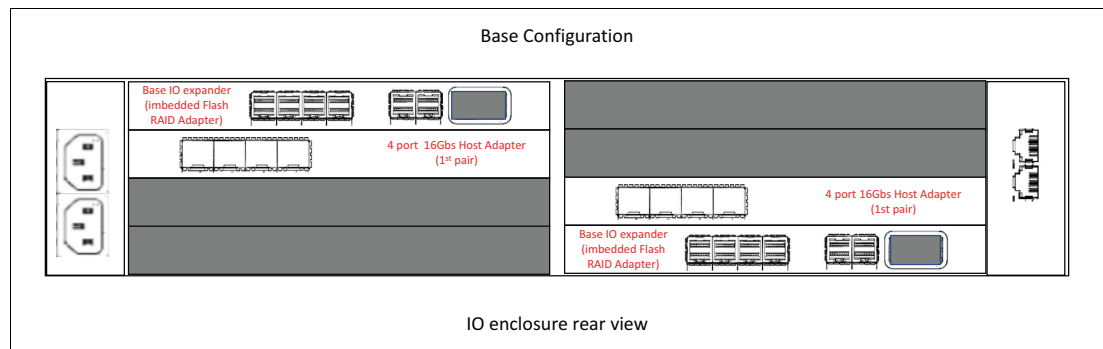


Figure 2-5 DS8882F I/O enclosure base configuration

PCIe connectivity is from the 4-port PCIe adapters in the processor nodes to the base PCIe I/O expander. There is a separate PCIe connection to each base, which provides redundant access to each RAID adapter for failover, and also shared access to the attached host adapter. Failover occurs during code load, or during node failure and service actions.

The base configuration supports the flash RAID adapter pair and the first host adapter pair. There is one flash RAID adapter and one host adapter in each logical I/O enclosure. This configuration ensures continued availability during service actions of one of the base PCIe I/O expanders.

Failure and subsequent service action of a PCIe I/O expander makes all adapters in the logical I/O enclosure unavailable.

Note: For continued availability during a logical I/O enclosure or a host adapter failure, ensure host connectivity has a redundant path to a different host adapter in the other logical I/O enclosure.

Figure 2-6 shows the PCIe connectivity from the processor nodes to the DS8882F 2U I/O enclosure. The base configuration is shown.

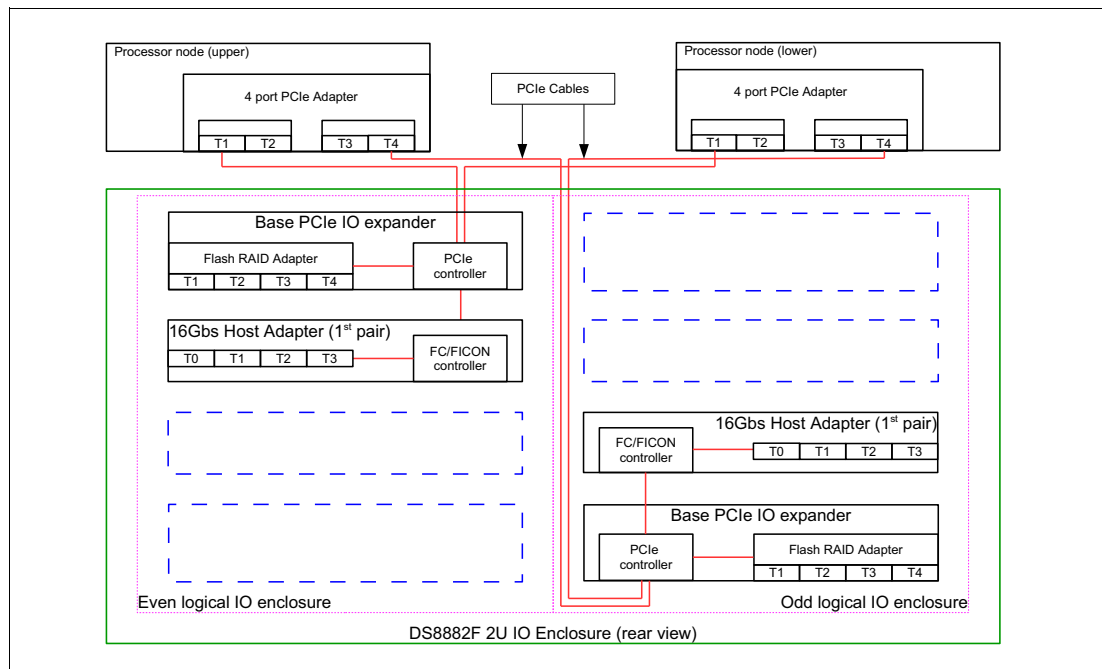


Figure 2-6 DS8882F PCIe connectivity, base configuration

The I/O enclosure full (expanded) configuration contains the following components:

- ▶ All of the base configuration and, in addition:
 - Second pair of I/O expanders without the embedded RAID adapter:
 - Provides additional PCIe connectivity to the processor nodes
 - Required to support the second pair of HAs
 - Second pair of 4-port 16 Gb host adapters

Figure 2-7 shows the DS8882F I/O enclosure full (expanded) configuration with two pairs of 4-port 16 Gbps host adapters.

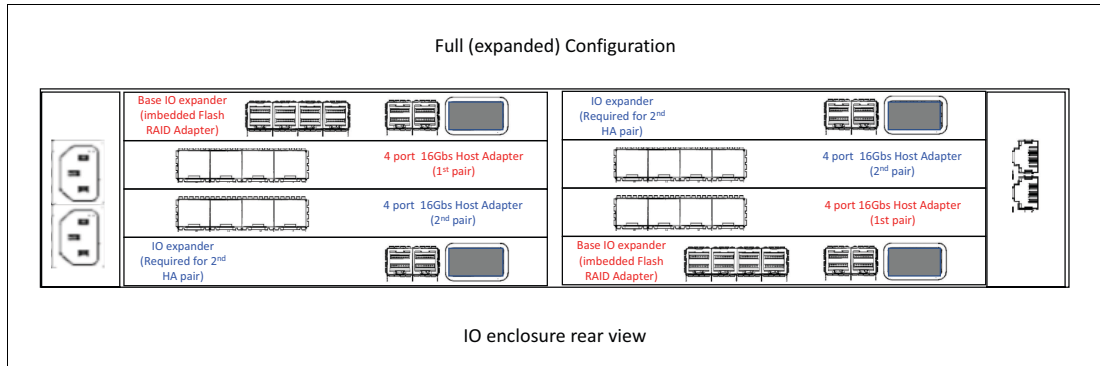


Figure 2-7 DS8882F IO enclosure full configuration

The full or expanded configuration supports the flash RAID adapter pair and the first and second host adapter pair. There are one flash RAID adapter and two host adapters in each logical I/O enclosure.

Figure 2-8 shows the PCIe connectivity from the processor nodes to the DS8882F 2U I/O enclosure. The full or expanded configuration is shown.

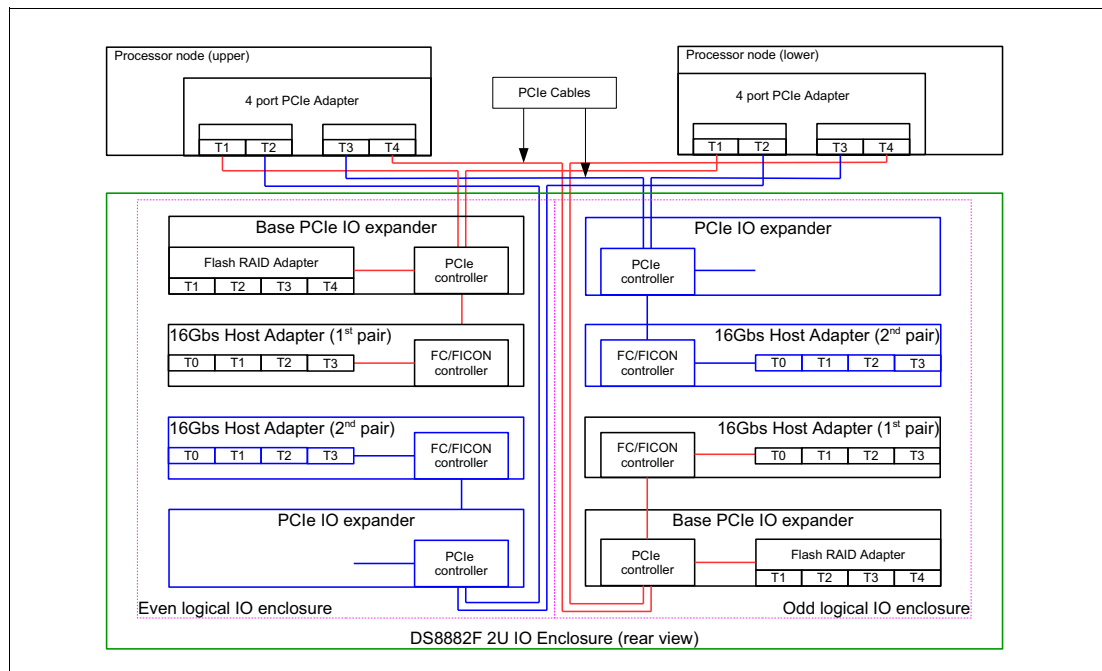


Figure 2-8 DS8882F PCIe connectivity, full configuration

Fibre Channel (SCSI-FCP and FICON) host adapters and cables

The DS8882F Fibre Channel host adapters enable attachment to Fibre Channel (SCSI-FCP) and FICON servers, and SAN fabric components. They can also be used for remote mirror and copy control paths between DS8000 series storage systems.

The DS8882F host adapters are 4-port 16 Gbps, similar to those in other DS8880 models, however they have been repackaged to fit into the 2U I/O enclosure. The DS8882F host adapters can be long wave or short wave.

Supported protocols include the following types:

- ▶ SCSI-FCP upper layer protocol (ULP) on point-to-point and fabric
- ▶ FICON ULP on point-to-point and fabric topologies

Note: The 16 Gbps host adapter does not support arbitrated loop topology at any speed.

Host Adapter plug order

The DS8882F host adapter plug order is with respect to base configuration or full configuration.

The location codes for the first HA pair installed (base configuration) are:

- ▶ U1600-1G3-ssssss-P1-C3 and U1600-1G4-ssssss-P1-C6
 - Shown in red in Figure 2-9

The location codes for the second HA pair installed (full configuration) are:

- ▶ U1600-1G3-ssssss-P1-C5 and U1600-1G4-ssssss-P1-C4
 - Shown in blue in Figure 2-9

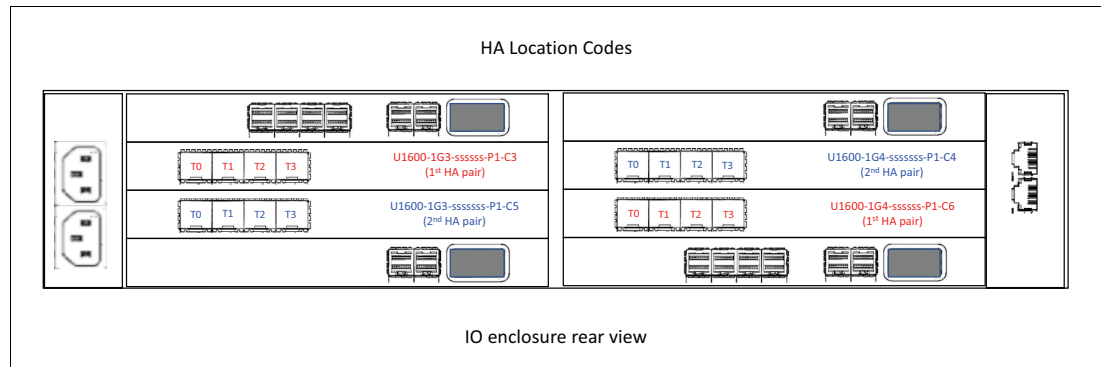


Figure 2-9 DS8882F Host adapter location codes

Fibre channel port identification

The DS8882F fibre channel ports can be identified by the physical host adapter port location code identified in Figure 2-9 in the previous section. Table 2-4 shows the a cross reference of host adapter port physical location to fibre channel port ID for the first HA pair included with the base configuration.

Table 2-4 Host adapter port physical location code to fibre channel port ID - First HA Pair

Host adapter location	Host adapter port	Fibre channel port ID
U1600-1G3-ssssss-C3	T0	I0230
	T1	I0231
	T2	I0232
	T3	I0233
U1600-1G4-ssssss-C6	T0	I0340
	T1	I0341
	T2	I0342
	T3	I0343

Table 2-5 shows a cross reference of host adapter port physical location to fibre channel port ID for the second HA pair included with the full configuration.

Table 2-5 Host adapter port physical location code to fibre channel port ID - Second HA Pair

Host adapter location	Host adapter port	Fibre channel port ID
U1600-1G3-sssssss-C5	T0	I0240
	T1	I0241
	T2	I0242
	T3	I0243
U1600-1G4-sssssss-C4	T0	I0330
	T1	I0331
	T2	I0332
	T3	I0333

Figure 2-10 shows the Fibre Channel ports displayed from the Storage Manager GUI. The ports highlighted are those of the first HA pair installed with the base configuration. The FC port logical ID is the left column, and the far right column shows the physical location code of the FC ports.

ID	State	Protocol	WWPN	Type	Speed	Location Code
I0230	✓ Communication established	SCSI FCP	50:05:07:63:07:13:15:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C3-T0
I0231	✓ Communication established	SCSI FCP	50:05:07:63:07:13:55:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C3-T1
I0232	✓ Communication established	SCSI FCP	50:05:07:63:07:13:95:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C3-T2
I0233	✓ Communication established	FICON	50:05:07:63:07:13:D5:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C3-T3
I0240	✓ Communication established	FICON	50:05:07:63:07:14:15:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C5-T0
I0241	✓ Unconfigured	Undefined	50:05:07:63:07:14:55:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C5-T1
I0242	✓ Communication established	SCSI FCP	50:05:07:63:07:14:95:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C5-T2
I0243	⊗ No light detected	SCSI FCP	50:05:07:63:07:14:D5:1B	Long Wave	16 Gbps	U1600.1G3.RJBAY02-P1-C5-T3
I0330	✓ Communication established	FICON	50:05:07:63:07:1B:15:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C4-T0
I0331	✓ Unconfigured	Undefined	50:05:07:63:07:1B:55:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C4-T1
I0332	✓ Communication established	SCSI FCP	50:05:07:63:07:1B:95:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C4-T2
I0333	✓ Unconfigured	Undefined	50:05:07:63:07:1B:D5:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C4-T3
I0340	✓ Communication established	SCSI FCP	50:05:07:63:07:1C:15:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C6-T0
I0341	✓ Communication established	SCSI FCP	50:05:07:63:07:1C:55:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C6-T1
I0342	✓ Communication established	SCSI FCP	50:05:07:63:07:1C:95:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C6-T2
I0343	✓ Communication established	FICON	50:05:07:63:07:1C:D5:1B	Long Wave	16 Gbps	U1600.1G4.RJBAY02-P1-C6-T3

Figure 2-10 Fibre channel ports view from DS GUI

Fiber channel cables

A Fibre Channel cable is required to attach each Fibre Channel adapter port to a server or fabric component port. The Fibre Channel cables can be 50 or 9 micron, OM3 or higher fiber graded, single or multimode cables.

For more information about DS8882F host adapter and fibre channel cable features, see “Planning for host connectivity” on page 29.

Flash RAID Adapters

The flash RAID adapters are a PCIe adapter that are physically imbedded into the base PCIe I/O expanders, which are installed in the DS8882F 2U I/O enclosure.

The flash RAID adapter has a PCIe3 eight-lane connection internally to the I/O expander. The main processor is a RAID engine that provides RAID and sparing management to the flash drives in the HPFE Gen2 flash enclosures.

The flash RAID adapter has four SAS ports, which provide connectivity from the RAID adapter to the HPFE Gen2 enclosures.

The flash RAID adapters are installed as a pair, one in each of the logical I/O enclosures. This is known as a *device adapter pair* (DA pair). Logical configuration should be balanced across the DA pair for load balancing and the highest throughput.

The redundant DA pair ensures continued availability in the event of a flash RAID adapter or a logical I/O enclosure failure.

Figure 2-11 illustrates the processor nodes to flash RAID adapter PCIe connectivity, and the flash RAID adapter to HPFE Gen2 pair SAS connectivity.

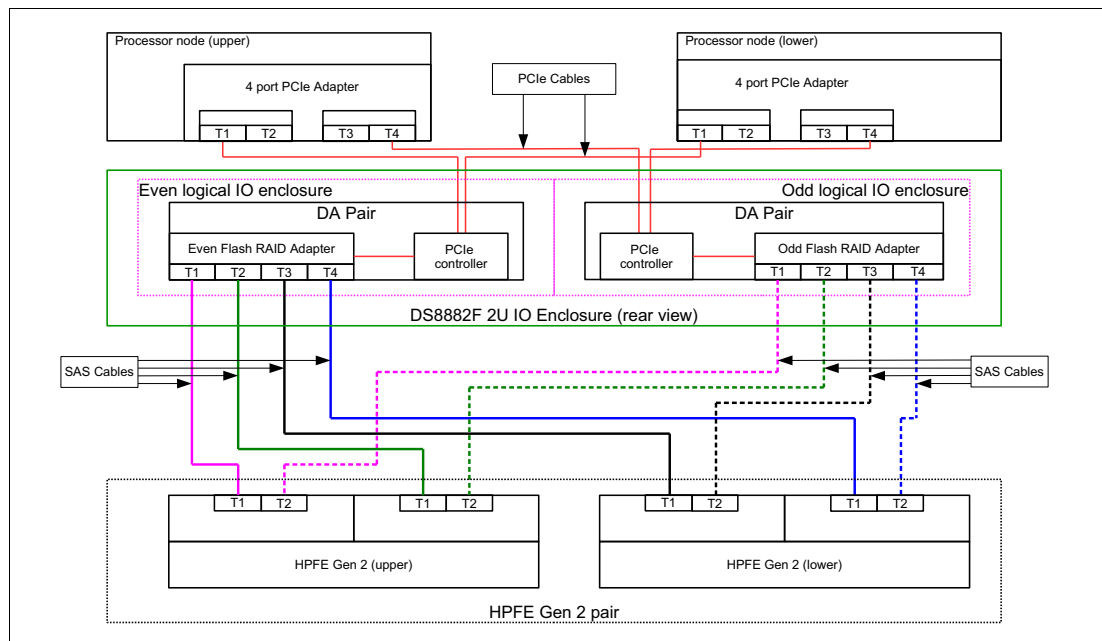


Figure 2-11 DS8882F flash RAID adapter connectivity

2.2.3 IBM POWER8-based servers

A pair of POWER8-based servers, also known as *processor nodes*, are at the heart of all of the IBM DS8880F models. The DS8882F shares the same processor nodes that are used in the DS8884F.

The two POWER8 servers share the load of receiving and moving data between the attached hosts and the storage arrays. However, they are also redundant, so that if either server fails, the system operations fail over to the remaining server and continue to run without any host interruption.

The DS8882F configuration uses Power S822 servers, each with a single, Dual Chip Module (DCM), 6-core 3.89 GHz processor.

The DS8882F processor nodes support a maximum of eight DDR4 Custom DIMMs (CDIMMs), with a maximum memory size of 128 GB per node.

The DS8882F processor node is a 2U high enclosure, and features the following configuration:

- ▶ Eight DDR4 CDIMM slots
- ▶ One storage cage with two hard disk drives
- ▶ Two PCIe x16 Gen3 slots
- ▶ Four PCIe x8 Gen3 slots

- ▶ Two power supplies with integrated cooling

The two 2U processor nodes are positioned below the I/O enclosure, and above the management enclosure. Figure 2-12 shows the front view of the DS8882F Processor node.



Figure 2-12 DS8882F Processor node front view

For more information about the server hardware that is used in the DS8884, see *IBM Power System S822 Technical Overview and Introduction*, REDP-5102.

Processor memory

The DS8882F configuration offers up to 256 GB of total system memory. Each processor node contains half of the total system memory. All memory that is installed in each processor node is accessible to all processors in that node. The absolute addresses that are assigned to the memory are common across all processors in the node. The set of processors is referred to as a *symmetric multiprocessor* (SMP) system.

The POWER8 processor that is used in the DS8882F operates in simultaneous multithreading (SMT) mode, which runs multiple instruction streams in parallel. The number of simultaneous instruction streams varies according to processor and Licensed Internal Code (LIC) level. SMT mode enables the POWER8 processor to maximize the throughput of the processor cores by offering an increase in core efficiency.

The following DS8882F memory upgrades can be performed non disruptively from 32 GB to 64 GB or 128 GB per node.

Caching is a fundamental technique for reducing I/O latency. Like other modern caches, the DS8882F processor nodes contain volatile memory that is used as a read and write cache, and nonvolatile memory that is used to maintain and back up a second copy of the write cache. If power is lost, the DS8882F battery backup modules provide power to the processor nodes running until all data in nonvolatile storage (NVS) is written to the processor nodes' internal disks.

The NVS scales to the processor memory that is installed, which also helps to optimize performance. DS8882F NVS is 1/16 of installed processor node memory, with a minimum of 4 GB per node.

Flexible service processor

Each POWER8 processor complex is managed by a service processor that is called a *flexible service processor* (FSP). The FSP is an embedded controller that is based on an IBM PowerPC® processor.

The FSP controls power and cooling for the processor nodes. The FSP performs predictive failure analysis for installed processor hardware, and performs recovery actions for processor or memory errors. The FSP monitors the operation of the firmware during the boot process, and can monitor the operating system for loss of control and take corrective actions.

Figure 2-13 shows the rear view of the DS8882F processor node.

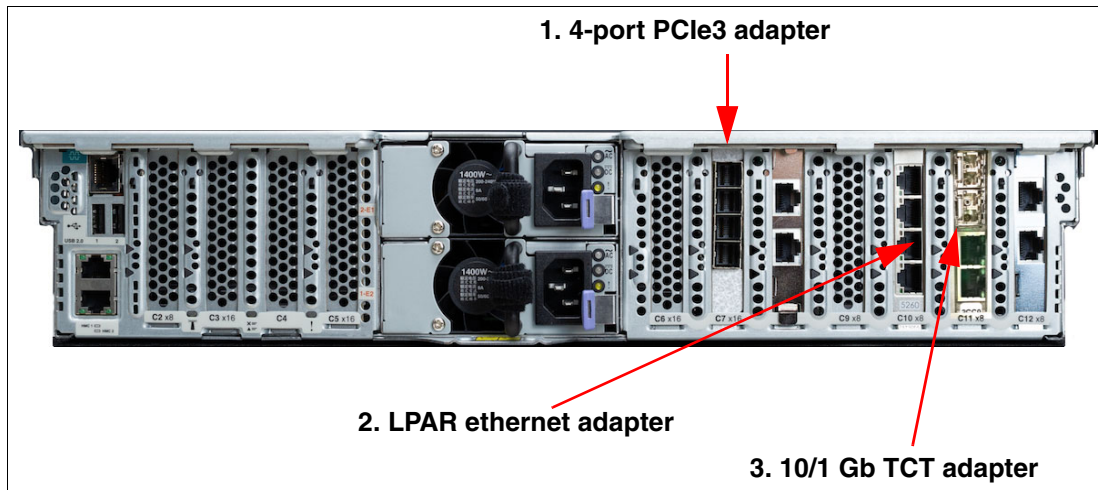


Figure 2-13 DS8882F processor node rear view

It shows the following adapters, as numbered:

1. Peripheral Component Interconnect Express adapter

Each DS8882F processor node contains a single 4-port PCIe3 adapter. These adapters allow point-to-point connectivity between the processor nodes and the I/O enclosure and I/O adapters.

2. Ethernet connections

Each POWER8 processor complex has a single 4-port 1 Gb ethernet adapter installed. Two of these ports connect to the internal network switches described in “Ethernet switches” on page 22.

Additionally, The bottom two unused connections are available for Transparent Cloud Tiering (TCT). These are the bottom 2 ports of the LPAR ethernet adapter, and were the original low-speed TCT connections.

3. TCT connections

An optional high-speed ethernet adapter feature can be ordered for Transparent Cloud Tiering (TCT), which provides two 10 Gbps LC connections and two RJ-45 1 Gbps connections (FC 3600).

These ports are the 2 high-speed and 2 low-speed TCT connections, an optional chargeable hardware feature. In summary, there are 6 TCT connections available, 2 low-speed included, and optionally, 2 high-speed and 2 low-speed.

2.2.4 Management enclosure

The DS8882F management enclosure is a 2U chassis containing the following components:

- ▶ Two Hardware Management Consoles (HMCs)
- ▶ Two Ethernet switches
- ▶ Two power control cards (RPCs)
- ▶ Two power supply units (PSUs) to power the management enclosure components
- ▶ One Local/Remote switch assembly
- ▶ Internal cabling for communications and power for each of the components

The DS8882F management enclosure is unique and does not exist in other DS8880 models.

Because the DS8882F system modules can be mounted in any conforming rack, the management enclosure is designed to create a compact container for all essential system management components, which would otherwise be mounted around the rack as in the other DS8880 models.

Figure 2-14 shows the layout of the components of the management enclosure.

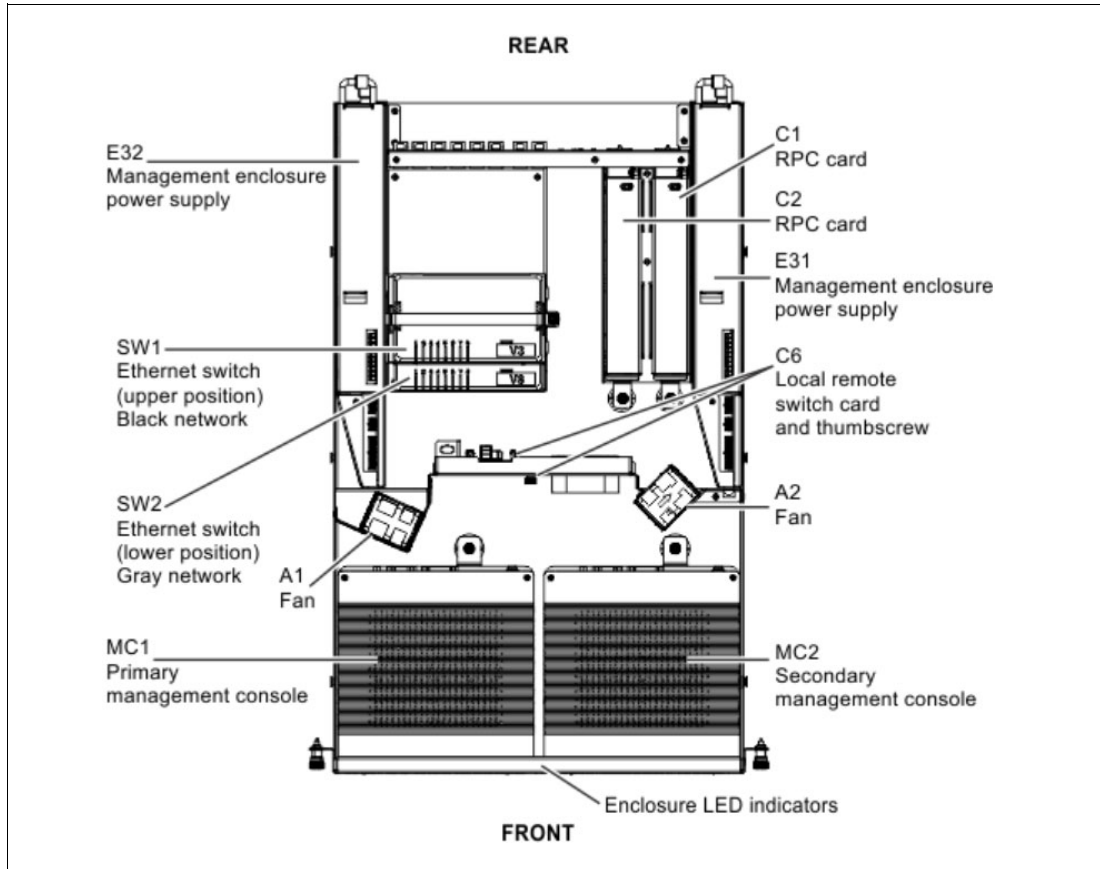


Figure 2-14 DS8882F management enclosure component layout

The management enclosure provides internal communications to all of the modules of the DS8882F system. The management enclosure also provides external connectivity using two ethernet cables from each HMC for remote management, and provides keyboard/mouse and video connectivity from each HMC for local management. Cables are routed from the management consoles to the rear of the management enclosure through a cable management arm (CMA).

Figure 2-15 shows the front view of the 2U management enclosure.



Figure 2-15 DS8882F management enclosure (front view)

Figure 2-16 shows a rear view of the DS8882F management enclosure, the rear tailgate connectors, and the installed components.



Figure 2-16 DS8882F management enclosure (rear view)

Management consoles

The management console is also referred to as the *Hardware Management Console* (or HMC). It supports the DS8882F hardware and firmware installation and maintenance activities.

The HMC connects to the customer network, and provides access to functions that can be used to manage the DS8882F. Management functions include logical configuration, problem notification, call home for service, remote service, and Copy Services management.

Management functions can be performed from the DS8000 Storage Management GUI, DS command-line interface (DS CLI), or other storage management software that supports the DS8882F.

Clients who use the DS8880 advanced functions, such as Metro Mirror or FlashCopy, for example, can communicate to the storage system with Copy Services Manager (CSM).

The Management Console provides connectivity between the DS8882F and Encryption Key Manager servers, if used.

The Management Console also provides the functions for remote call-home and remote support connectivity.

To provide continuous availability of access to the management console functions, the DS8882F order must include the second management console.

Ethernet switches

The DS8882F management enclosure has two 8-port Ethernet switches. The two switches provide two redundant *private* management networks. Each processor node includes connections to each switch to allow each server to access both private networks. These networks cannot be accessed externally, and no external connections are allowed. External client network connection to the DS8882F system is through dedicated connections to each of the management consoles.

Figure 2-17 shows the connections at the rear of the DS8882F management enclosure.

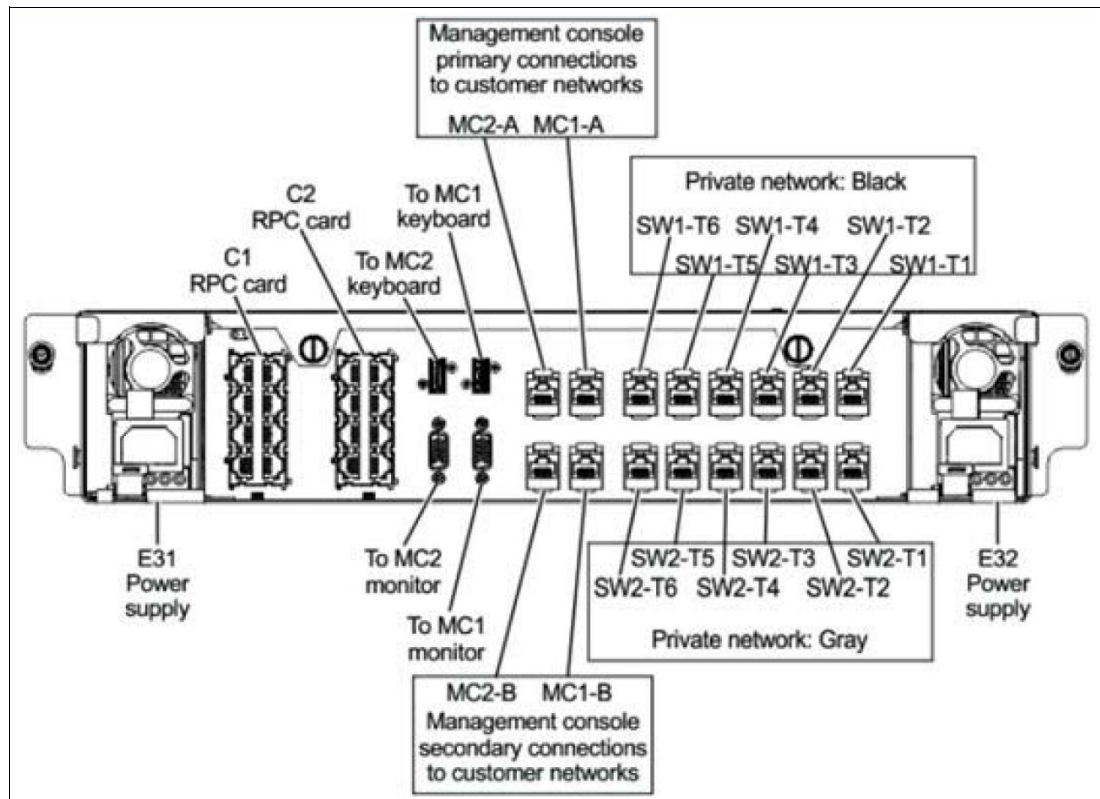


Figure 2-17 Management enclosure connections

2.2.5 Power subsystem

Two redundant 3000VA battery backup modules supply 230 V AC power to the DS8882F storage system.

Figure 2-18 Shows the front and rear views of the DS8882F Battery Backup module.



Figure 2-18 DS8882F battery backup module (Front and rear view)

Each battery back up module has a serial connection to a power control card (RPC) located in the management enclosure. This connection provides information about battery status.

Each battery backup module also provides an ethernet connection. There are two redundant private ethernet networks. Each battery backup module connects to a separate private network, providing communications from the battery backup modules to the HMCs. All configuration, event monitoring, error status, and firmware updates are done through the ethernet connection path.

The DS8882F battery back up modules help to protect data during a loss of external power. In the event of loss of input power to both battery backup modules, the internal batteries are used to maintain power to the processor complexes and I/O enclosure long enough to allow the contents of NVS memory (modified data that is not yet destaged from cache to the storage enclosures) to be written to the internal hard drives in the processor complexes. This process is also known as *fire hose dump*.

The DS8882F then gracefully powers off. After power has been restored, the preserved modified data is destaged.

Power input and distribution

Each battery backup module requires input power from a single-phase line cord.

Important: To avoid any single point of failure, independent power feeds to each DS8882F power supply are required. At least one of the feeds should have power conditioning to ensure an acceptable level of power quality, such as specified in standards ANSI C84.1 and EN 50160.

Further, each power source must have its own circuit breaker.

For more information about power input requirements, see “Planning for power requirements” on page 28.

Power is distributed from the battery backup modules to the six modules in the DS8882F, providing redundant input power to each module.

Figure 2-19 shows the DS8882F power distribution from the redundant battery backup modules.

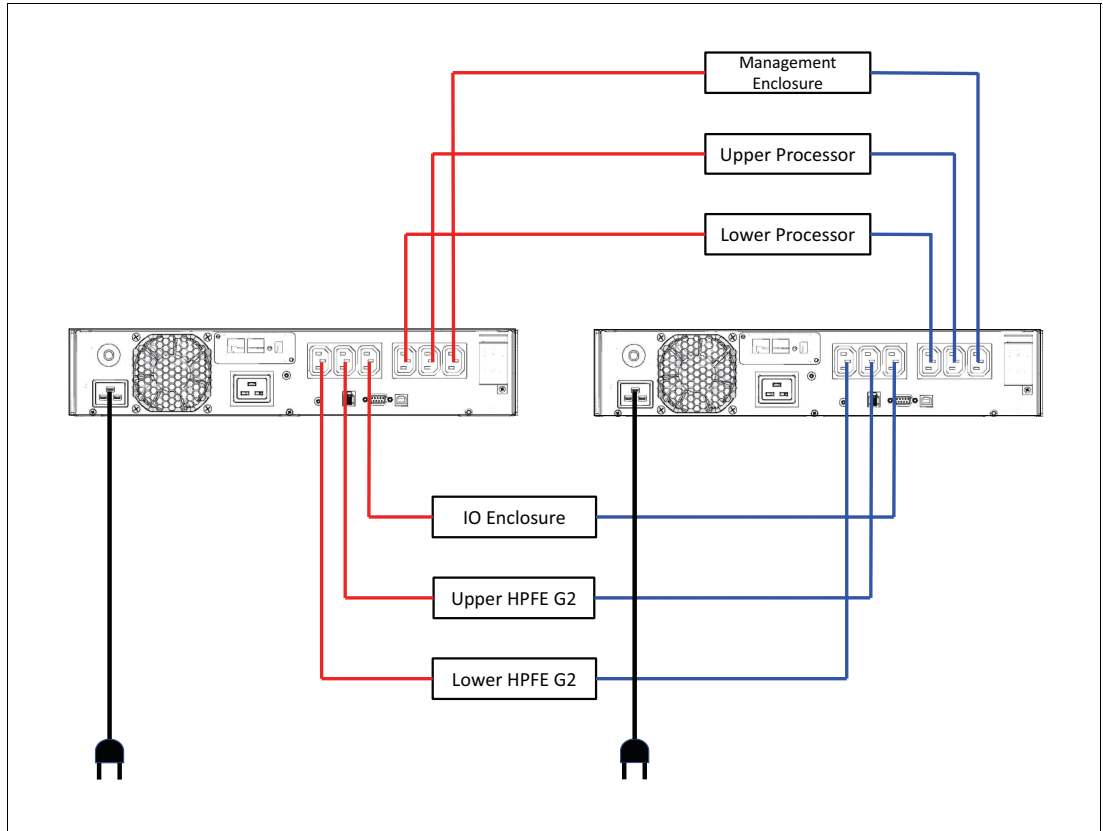


Figure 2-19 DS8882F redundant power distribution



DS8882F installation and integration

The DS8882F Rack Mounted storage system can be integrated into 16U contiguous space of an existing IBM z14 Model ZR1 (z14 Model ZR1), IBM LinuxONE Rockhopper II (z14 Model LR1), or other standard 19-inch wide rack that conforms to EIA 310D specifications.

This chapter provides information about installation and integration.

3.1 DS8882F integration

The DS8882F model 983 is a rack mountable system consisting of eight 2U modules.

There are three different rack integration scenarios:

- ▶ An existing IBM z14 Model ZR1 (z14 Model ZR1) - Feature Code 0937
- ▶ An existing IBM LinuxONE Rockhopper II (z14 Model LR1) - Feature Code 0938
- ▶ Other standard 19-inch wide rack that conforms to EIA 310D specifications - Feature Code 0939. The rack must have:
 - 19-inch EIA rails
 - Minimum rail depth of 720 mm
 - Maximum rail depth of 780 mm

The first 2 scenarios are identical from a DS8882F perspective, can be considered the same process, and are described in 3.2, “Integrating the DS8882F into z14 Model ZR1 or LR1 Rack” on page 31.

The third scenario is described in 3.3, “Integrating the DS8882F into a standard 19 inch rack” on page 38.

This section details common items to be understood for both scenarios.

3.1.1 Planning the DS8882F installation and integration

The DS8882F arrives in boxes on a pallet. The boxes contain all eight 2U modules, which constitute the complete system, as well as all required cabling and any additional features that might have been ordered.

The system needs to be assembled into the rack that has been designated for the DS8882F. The system must be installed by IBM Service Representatives. The designated rack must have 16U of contiguous dedicated space.

When ordering the DS8882F, a field merge feature code is required to indicate what rack scenario to use for installing the DS8882F. A Feature Code (FC) 0937 or FC 0938 indicates that the intended installation is for an IBM z14 Model ZR1 (z14 Model ZR1) or IBM LinuxONE Rockhopper II (z14 Model LR1), respectively. This choice drives a few unique features for this scenario and excludes others. See 3.2, “Integrating the DS8882F into z14 Model ZR1 or LR1 Rack” on page 31.

Conversely, if FC 0939 is selected, other optional features are available for selection as well. See 3.3, “Integrating the DS8882F into a standard 19 inch rack” on page 38. Regardless of which rack scenario is selected for the DS8882F, there are some common physical planning requirements to be considered.

Planning for floor loading and rack space

When planning the location of the DS8882F system, consider the following requirements that relate to floor types, floor loads, and space.

The eight 2U modules each have a specified position within the 16U. No spaces or any other components can be inserted into the 16U of contiguous space.

Figure 3-1 on page 27 shows the eight 2U modules that make up the DS8882F and the order that they must be installed.

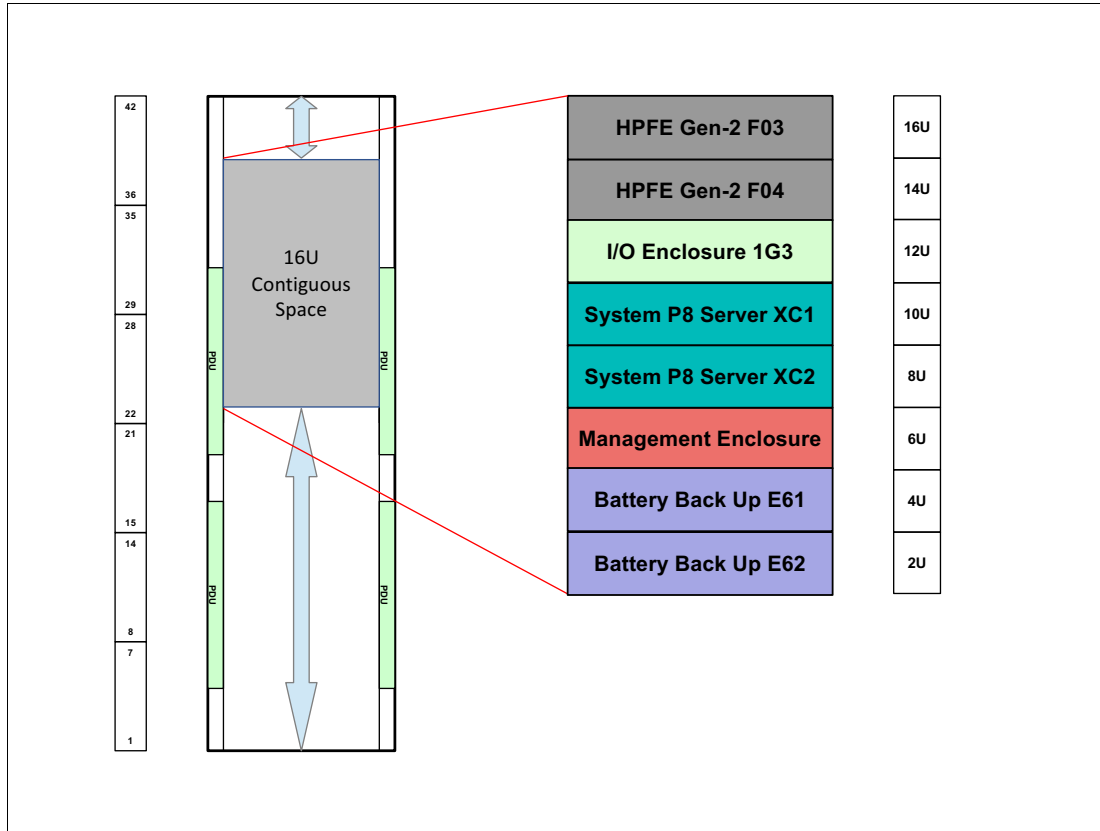


Figure 3-1 DS8882F system rack layout

The intended installation site must accommodate the following criteria:

- ▶ Weight distribution area that is needed to meet floor load requirements
 - The floor of the installation site must meet the floor-load requirements for the existing z14 Model ZR1 or z14 Model LR1 or other standard 19-inch wide frame, plus the additional weight of the DS8882F.
- ▶ Service clearance requirements

Table 1 displays the DS8882F dimensions and weight.

Table 1 DS8882F Dimensions and weight

Dimensions		Maximum Weight
Height without optional keyboard and display	71.1 cm (28 in.)	242.7 kg (535 lb)
Height with optional keyboard and display	75.6 cm (29.8 in.)	
Distance between rack front and rear EIA rails	70.1 - 78 cm (27.6 - 30.7 in.)	
Minimum distance from cabinet rear rail to rear door	20.3 cm (8 in.)	
Minimum distance from cabinet front rail to front door	5 cm (2 in.)	

3.1.2 Planning for power requirements

The DS8882F *requires* two independent power outlets for the two power cords.

Important: To eliminate a single point of failure, independent power feeds to each DS8882F power supply are required. At least one of the feeds must have power conditioning to ensure an acceptable level of power quality, such as specified in standards ANSI C84.1 and EN 50160.

Further, each power source must have its own circuit breaker.

Power connector requirements

Ensure that you order the appropriate power cords for your outlets, based on the country or region requirements.

The default power cord feature code is FC 1029. This is a single-phase 2.5 m (8 ft) power cord, 125 - 250 V, 16 A IEC 60320-2-2.

Note: FC 1029 power cords are *only* appropriate for racks with PDUs that have C20 outlets, unlike the z14 model ZR1 installation (feature code 0937) and the z14 model LR1 installation (feature code 0938).

For power cord feature codes, connector diagrams, and countries and regions in which each connector type is commonly used, see *DS8882F Introduction and Planning Guide*, GC27-9529.

Input power requirements

The DS8882F supports single phase power. Table 3-2 lists the supported input voltages and frequencies.

Table 3-2 DS8882F Single-phase input voltages and frequencies

Characteristic	Voltage (single phase)
Nominal input voltages	200-240 RMS V AC
Minimum tolerated input voltage	180 RMS V AC
Maximum tolerated input voltage	256 RMS V AC
System maximum current rating	14.4 Amps
Recommended wall breaker rating (1 ph)	15 - 20 Amps
Steady-state input frequencies	50 ± 3 or 60 ± 3.0 Hz
PLD input frequencies	< 20 milliseconds

Power consumption and environmental information

When planning the power requirements, consider the power consumption and other environmental points of the DS8882F.

Table 3-3 provides the DS8882F power consumption and environmental information.

Table 3-3 DS8882F Power Consumption and environmental information

Measurement	Unit of measure	Value
Peak electric power	kilovolt amperes (kVA)	3.0
Thermal load	British thermal units (BTU) per hour	10236
Capacity of exhaust	Cubic meters per minute (cubic feet per minute or CFM)	22.7 (800)
Ground leakage current	Milliamperes (mA)	11
Startup current	Amperes (A or amp)	≤ 100
Startup current duration	Microseconds (μs or μsec)	< 200

3.1.3 Planning for host connectivity

The DS8882F host connectivity is provided by two or four 16 Gbps Fibre Channel host adapters (HAs). Table 3-4 shows the available feature codes for the DS8882F HAs.

Table 3-4 Feature codes for DS8882F fibre channel host adapters

Feature Code ^{1 2}	Description	Receptacle type
3354	4-port, 16 Gbps shortwave FCP and FICON host adapter Minimum quantity is 2	LC
3454	4-port, 16 Gbps longwave FCP and FICON host adapter Minimum quantity is 2	LC
Note:		
1. Longwave and shortwave host adapter intermix is only supported if a pair of each is ordered.		
2. The 16 Gbps adapter does not support arbitrated loop topology at any speed.		

For more detailed information about DS8882F host adapters refer to Chapter 2, “DS8882F hardware configuration” on page 5.

To connect the hosts to the DS8882F, fibre channel (SCSI-FCP or FICON) cables must be provided. To connect fibre channel host adapters to a server or fabric port, provide the following cables:

- ▶ For shortwave Fibre Channel host adapters, provide a 50-micron, multimode OM3 or higher fiber-optic cable that ends in an LC connector.
- ▶ For longwave Fibre Channel host adapters, provide a 9-micron, single-mode OS1 or higher fiber-optic cable that ends in an LC connector.

Table 3-5 lists the fiber-optic cables that are available for order from IBM for the DS8882F.

Table 3-5 Feature codes for Fibre Channel cables for the DS8882F

Feature code	Cable type	Cable length	Compatible Fibre Channel host adapter features
1410	50 micron OM3 or higher Fibre Channel cable, multimode	40 m (131 ft)	Shortwave Fibre Channel or FICON host adapter (feature code 3354)
1413		3 m (10 ft)	
1420	9 micron OS1 or higher Fibre Channel cable, single mode	31 m (102 ft)	Longwave Fibre Channel or FICON adapter (feature code 3454)
1423		3 m (10 ft)	

Feature code 1413 and 1423 3m fibre channel cables

These cables are new for Release 8.5 and available for all DS8880 models. The two short cable features are particularly relevant to the DS8882F when integrated into the same rack as the host, such as in the case of the integration into the IBM z14 Model ZR1 (z14 Model ZR1) or the IBM LinuxONE Rockhopper II (z14 Model LR1).

For more information about host adapter and fiber channel cable features, see the *DS8882F Introduction and Planning Guide*, GC27-9529.

Note: When integrated in the z14 model ZR1 or LR1 rack, it is expected that this will be the host system that connects to the DS8882F.

However, that does not exclude the connectivity to other System Z or distributed systems outside the z14 rack.

Additionally, the DS8882F supports connectivity to other DS8000 systems with Copy Services.

3.1.4 Planning external connectivity

The DS8882F provides external connectivity for:

- ▶ Keyboard and monitor to each HMC
 - ~900mm (3 feet) of video cable to each HMC is available for a monitor.
 - ~900mm (3 feet) of USB cable to each HMC is available for a keyboard/mouse function.

Note: A keyboard/mouse and monitor are required for installation and service of the DS8882F.

- ▶ Ethernet connectivity
 - ~900mm (3 feet) of ethernet cables are provided for remote connectivity to the customer networks.
 - There is 2 ethernet cables available to each HMC.

For information about keyboard and monitor options for connection to z14 Model ZR1 or z14 Model LR1, see 3.2, “Integrating the DS8882F into z14 Model ZR1 or LR1 Rack” on page 31.

For information about keyboard and monitor options for connection to other standard 19-inch wide rack, see 3.3, “Integrating the DS8882F into a standard 19 inch rack” on page 38.

3.1.5 Planning for safety and service

The DS8882F requires two service representatives to install the modules into the designated rack. The DS8882F can be installed in 16U of contiguous space at any height in the rack. However, because of the weight of the components and accessibility requirements for service, consider the position where the DS8882F is installed in the rack.

Ensure an approved safety appliance is available for installation and service. Table 3-6 provides a list of safety equipment that can be ordered with the DS8882F.

Table 3-6 *Optional safety equipment*

Feature code	Description
1101	5 ft. ladder for servicing components at a height of 35U or more
1102	3 ft. platform ladder for servicing components at a height of 20U or more
1103	Rolling step stool

3.2 Integrating the DS8882F into z14 Model ZR1 or LR1 Rack

Both options are described in the following section.

3.2.1 IBM z14 Model ZR1 and LinuxONE Rockhopper II

In April 2018, IBM announced a new model for the z14 family with a lower cost and point of entry to extend the IBM Z to clients of all sizes.

The IBM z14 Model ZR1 (z14 Model ZR1) and IBM LinuxONE Rockhopper II (z14 Model LR1), deliver secure capabilities in a smaller, industry-standard, 19-inch frame, which can easily co-exist with other platforms in a cloud data center. It can be the base for an integrated hybrid cloud for mission-critical core business workloads that demand maximum security. The introduction of the z14 ZR1 also demonstrates that IBM no longer distinguishes between “midrange” and “high end” systems.

The z14 Model ZR1 is housed in an industry-standard, 19-inch rack form factor. The design has power distribution unit (PDU)-based power, with redundant power, cooling, and line cords. These factors result in lower power costs, reduce footprint cost, and install in virtually any existing data center.

The new 19-inch rack design opens a new opportunity for IBM Z, by allowing the ability to integrate the DS8882F enterprise storage system into the IBM z14 models ZR1/LR1 16U of reserved space.

To enable the DS8882F to be installed into the IBM z14 Model ZR1 (z14 Model ZR1), IBM LinuxONE Rockhopper II (z14 Model LR1), the z14 system must have Feature Code 0617 (FC 0617) for 16U reserved space

The FC 0617 provides several hardware pre-requisites from the z14 perspective:

- ▶ Limits the hardware in the z14 to:
 - The CEC cage
 - No more than two I/O cages
- ▶ Provides the second PDU pair:
 - The second PDU is installed as part of FC 0617
 - The second PDU pair is required for the z14 second I/O cage

Note: The second PDU pair cannot be used by the DS8882F.

- ▶ Provides the rack enclosure fibre channel cable management system

Figure 3-2 shows a block diagram and a front view image of a z14 model ZR1 with FC 0617.

Figure 3-3 on page 33 shows the z14 rack enclosure fibre channel cable management system. This is intended to dress and route host fibre channel cables from the z14 Model ZR1 or the z14 Model LR1 to the DS8882F.

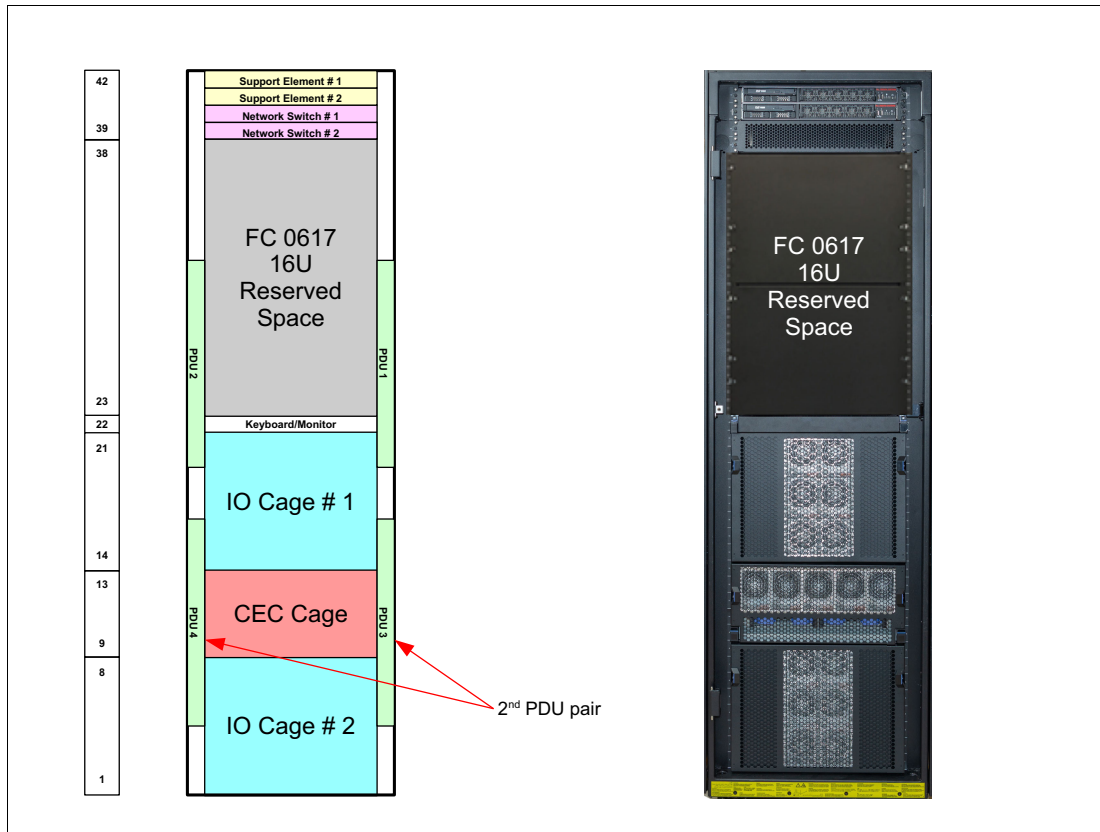


Figure 3-2 z14 model ZR1 feature code 0617 16U reserved space

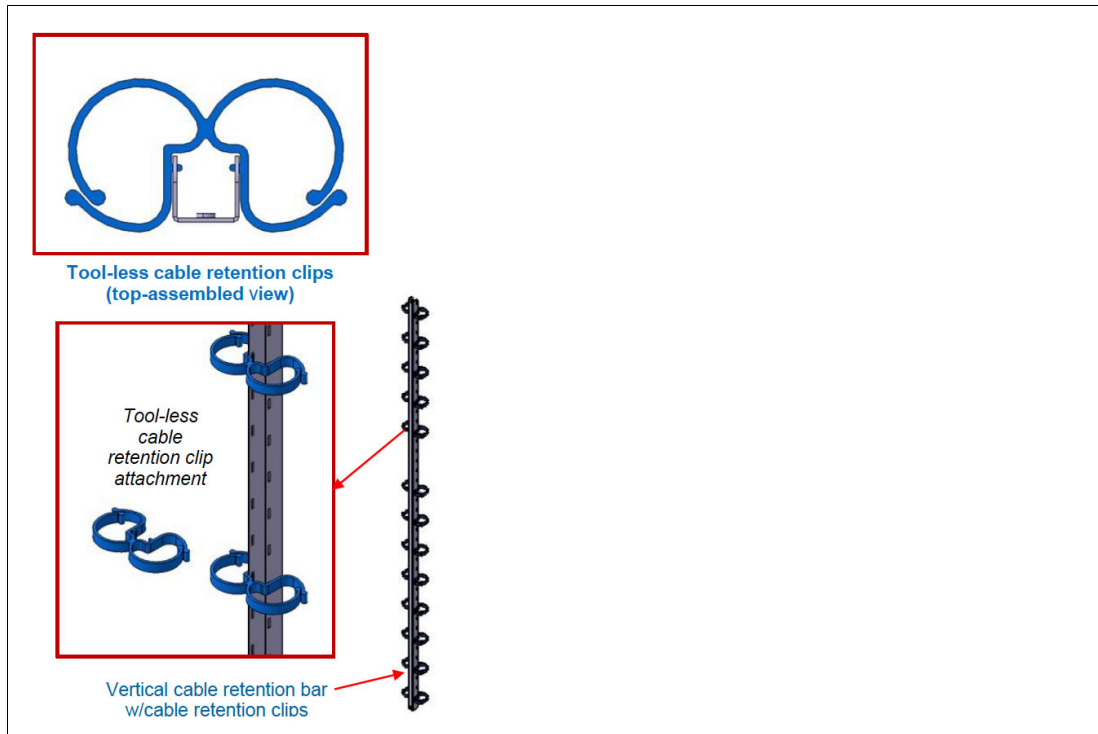


Figure 3-3 FC 0617 provides the z14 fiber channel cable management system

3.2.2 Integrating the DS8882F into the z14 model ZR1 or LR1

The DS8882F modular system can be integrated into 16U contiguous space of an existing IBM z14 Model ZR1 (z14 Model ZR1) or IBM LinuxONE Rockhopper II (z14 Model LR1), with Feature Code 0617, 16U reserved space feature.

When ordering the DS8882F to be integrated into an existing z14 Model ZR1 or z14 Model LR1, the appropriate DS8882F field merge feature must be ordered:

- ▶ An existing IBM z14 Model ZR1 (z14 Model ZR1) - Feature Code 0937
- ▶ An existing IBM LinuxONE Rockhopper II (z14 Model LR1) - Feature Code 0938

Note: Both of these feature codes are associated with physically identical systems from a DS8882F hardware perspective, except to identify the intended host system. This section will treat both feature codes as one.

Feature code 0937 or 0938 adds 2 KVM converter cables to the system components. These cables provide connectivity from each of the DS8882F HMCs video and USB cables to the z14 system KVM switch. These connections allow the DS8882F to share the z14 system keyboard and monitor.

Feature code 0937/0938 also prevent ordering of feature code 1765 optional 1U keyboard and display. The z14 already provides a keyboard and monitor, there is no room to install feature code 1765.

All internal and inter-module cables required for the DS8882F are shipped with the DS8882F. When installed in the z14, the cables are dressed and routed within the defined 16U of reserved space.

Two service representatives are required to install the DS8882F into the z14 system. The optional safety equipment described in 3.1.5, “Planning for safety and service” on page 31, should not be required. The first z14 model ZR1 and LR1 installed at a your site should be provided with the z14 model 3907 lift tool shown in Figure 3-4.

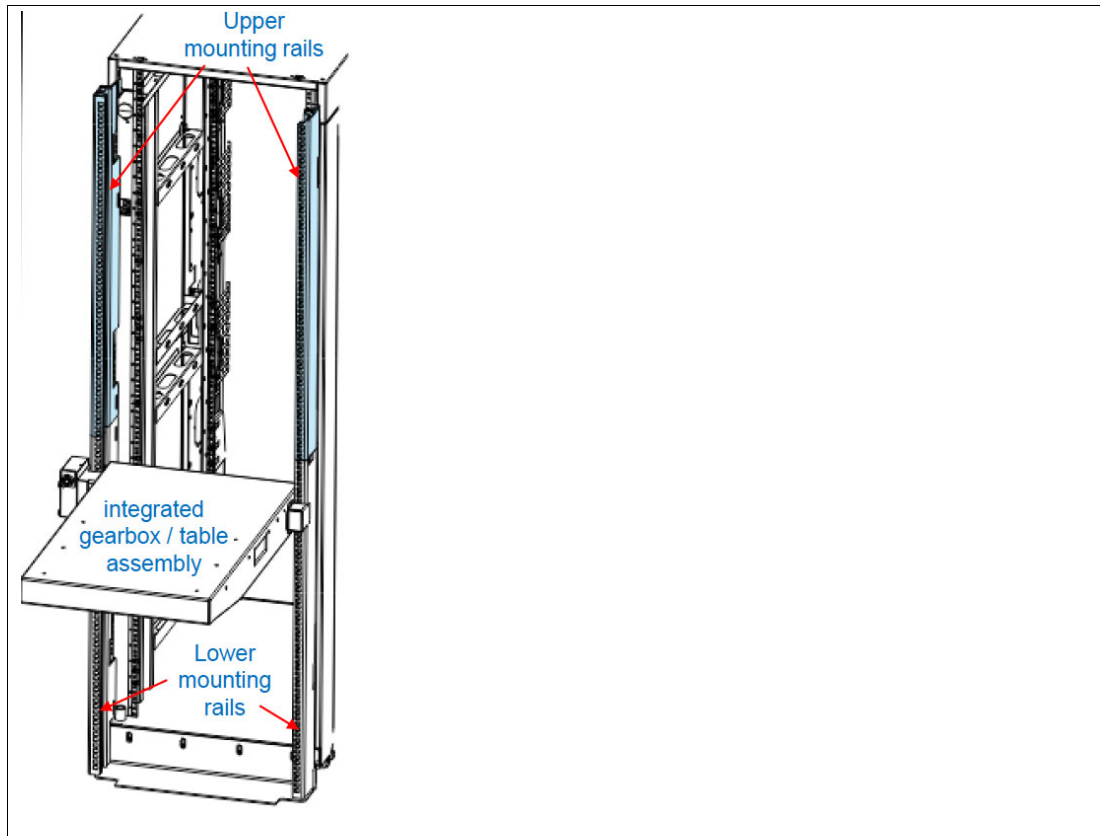


Figure 3-4 z14 service lift tool

The z14 models ZR1 and LR1 systems have their power provided by two pairs of power distribution units (PDUs). These will be independently powered from your facility power.

Two *additional* independent power outlets are required for the two DS8882F power cords.

The default power cord feature code for DS8882F is FC 1029. This is a single-phase 2.5 m (8 ft.) power cord, 125 - 250 V, 16 A IEC 60320-2-2.

Note: FC 1029 power cords are *only* appropriate for racks with PDUs that have C20 outlets, unlike the z14 model ZR1 installation (feature code 0937) and the z14 model LR1 installation (feature code 0938).

For power cord feature codes, connector diagrams, and countries and regions in which each connector type is commonly used, see *DS8882F Introduction and Planning Guide*, GC27-9529, and search for “Feature codes for power cords”.

Figure 3-5 shows a block diagram showing the z14 ZR1 or LR1 16U reserved space (FC 0617) and where the DS8882F modules will fit into this space. The eight 2U DS8882F modules must be installed in the order shown.

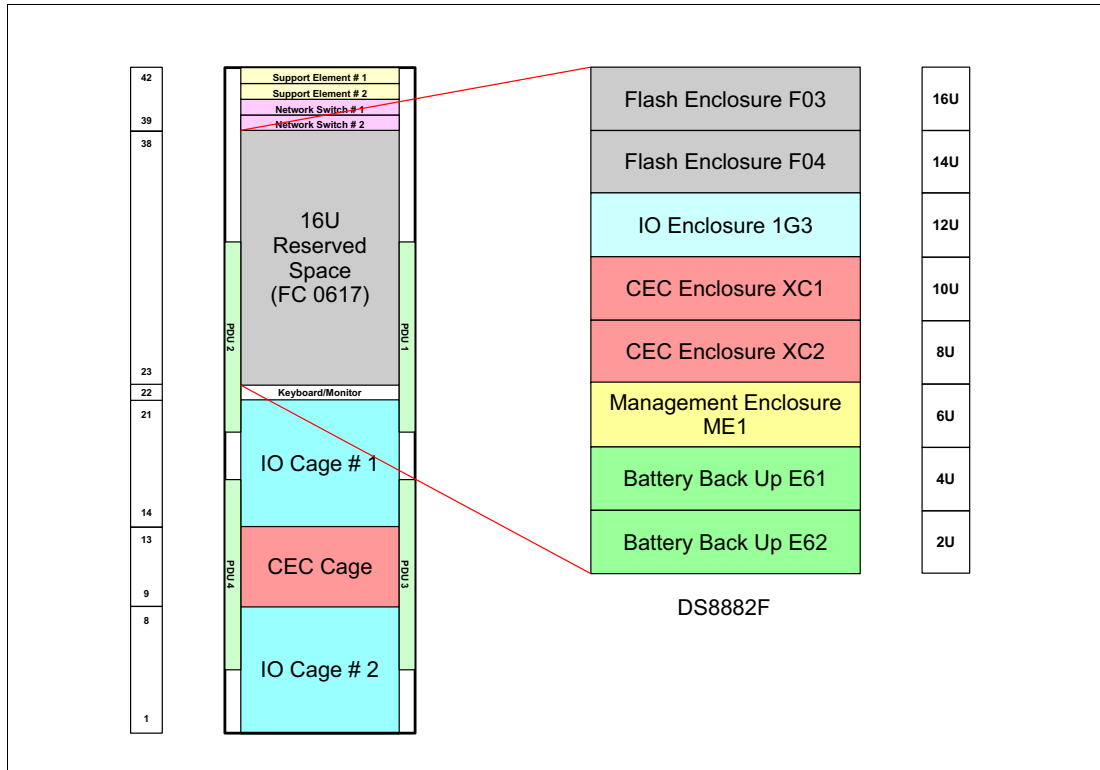


Figure 3-5 Block diagram of z14 ZR1 or LR1 16U reserved space and DS8882F modules

Figure 3-6 on page 36 shows a front view and Figure 3-7 on page 37 shows a rear view, of the DS8882F installed into the z14 ZR1 16U reserved space. All cables for the DS8882F have been removed from the images to provide visibility to the DS8882F modules.

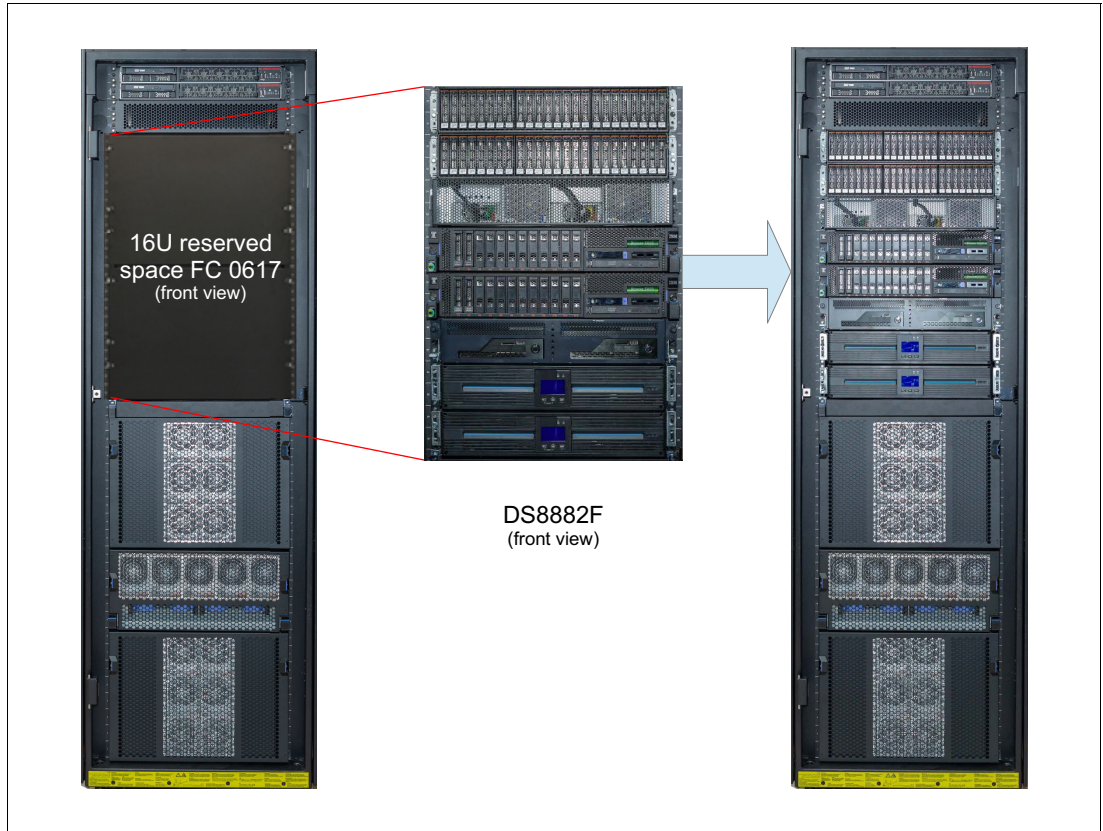


Figure 3-6 DS8882F integrated into a z14 ZR1 front view

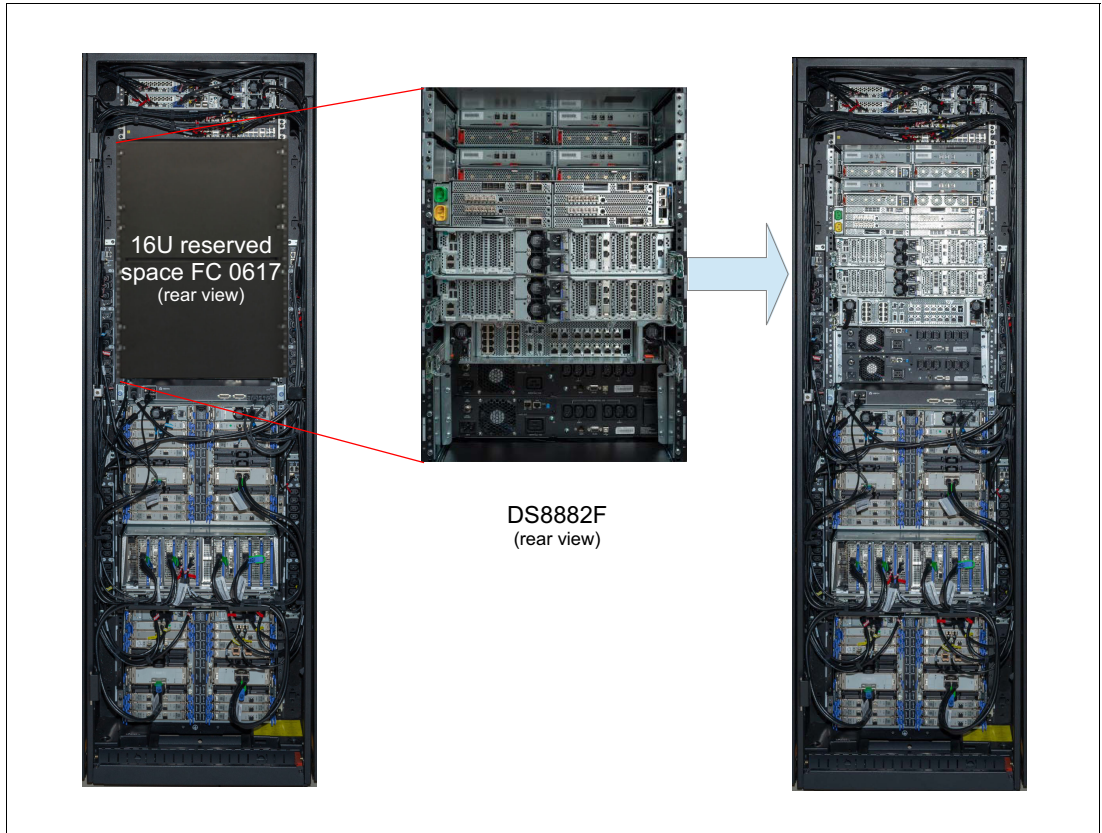


Figure 3-7 DS8882F integrated into a z14 ZR1 rear view

3.3 Integrating the DS8882F into a standard 19 inch rack

The DS8882F can be integrated into 16U contiguous space of an existing, customer-supplied, standard 19-inch wide rack that conforms to EIA 310D specification.

When ordering the DS8882F to be integrated into a conforming standard 19-inch wide rack, the DS8882F field merge feature code 0939 must be ordered.

The standard 19-inch wide rack must conform to EIA 310D specifications:

- ▶ 19-inch EIA rails
- ▶ Minimum rail depth of 720 mm
- ▶ Maximum rail depth of 780 mm

The eight 2U DS8882F modules must be integrated into 16U contiguous space of the intended rack in the specified order. Figure 3-8 shows a block diagram presenting the DS8882F in a standard 19 inch rack.

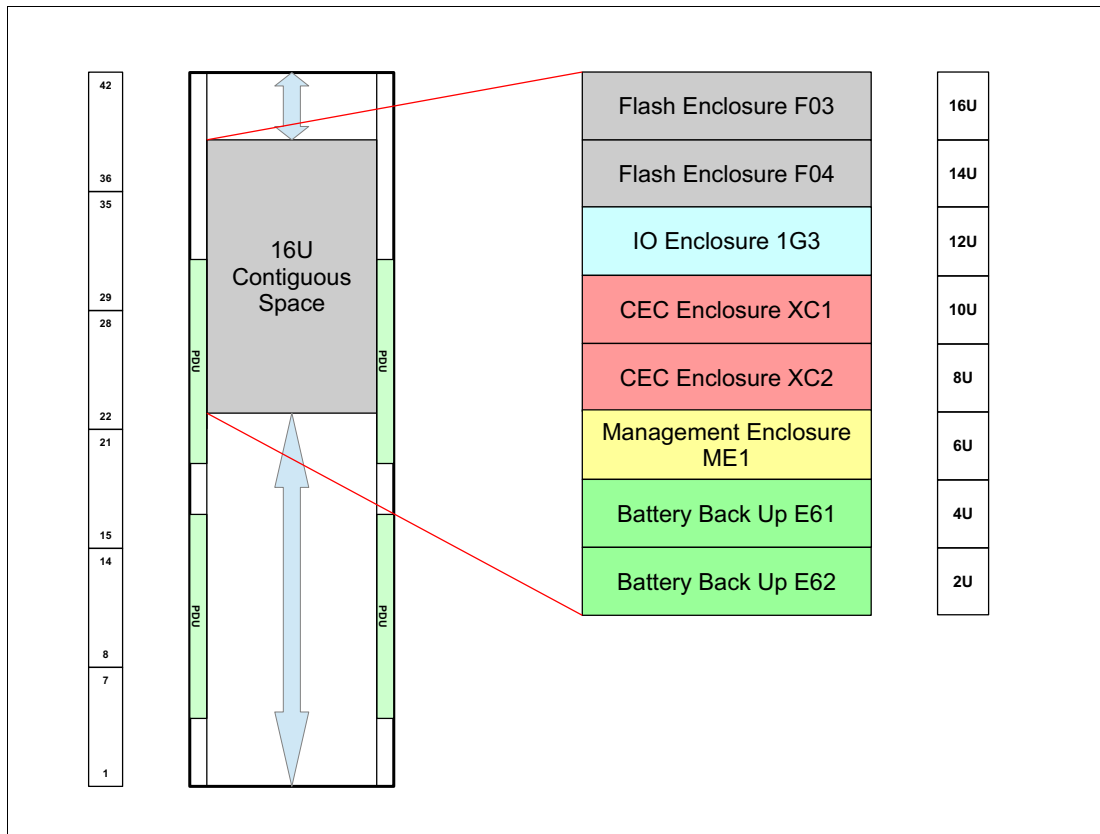


Figure 3-8 DS8882F in a standard 19 inch rack

3.3.1 Planning the installation into a conforming standard 19-inch rack

A keyboard/mouse and monitor *must* be available to install and service the DS8882F.

The standard 19-inch wide rack installation (feature code 0939) supports an optional 1U keyboard and display (feature code 1765). The 16U contiguous space requirement does not include space for the optional keyboard and display, but they are not required to reside contiguously with the DS8882F.

For accessibility, the keyboard and display must be mounted at a height of 38 - 117 cms (15 - 46 inches). If a keyboard and display is added, ensure that adequate space is provided to accommodate them.

Note: Optional feature code 1765 (1U keyboard and display) cannot be added between modules of the DS8882F in the 16U of contiguous space.

Alternatively, the Customer can provide their own keyboard and display solution. The video connection should be a SVGA connector. The USB connection should support keyboard and mouse functionality. See “Planning external connectivity” on page 30.

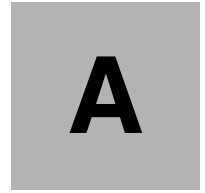
When the DS8882F is integrated into a conforming standard 19-inch wide rack, host connectivity can be to:

- ▶ Any supported distributed systems, residing inside or outside the same rack
- ▶ IBM Z hosts
- ▶ Other DS8000 systems through Copy Services.

For more information about supported host connectivity, see the *DS8882F Introduction and Planning Guide*, GC27-9529.

The DS8882F requires two service representatives to install into the designated rack. Although the DS8882F can be installed in 16U of contiguous space at any height in the rack, due to the weight of the components and accessibility for service, consider the position in the rack where it is installed.

Ensure an approved safety appliance is available for installation and service. Table 3-6 on page 31 provides a list of safety equipment that may be ordered with the DS8882F.



Remote Code Load

For the DS8882F and other DS8880 models, IBM is adopting Remote Code Load (RCL) as the default delivery and installation of microcode upgrades.

This appendix describes the process.

Remote Code Load

With Remote Code Load (RCL), IBM provides an efficient and secure method to update the DS8000 systems microcode in a concurrent way without interrupting business operations.

Important: IBM is adopting RCL as the default delivery for DS8880 code upgrades.

Remote Code Load (RCL) is the trusted process of having IBM support personnel securely connect to a DS8000 system, enable the remote acquisition, perform the distribution and activation of License Internal Code (LIC) bundles, and Install Corrective Service (ICS) images.

The Remote Code Load process is concurrent; it can be run without interruptions in the business operations. This process consists of the following steps, also illustrated in Figure A-1:

1. IBM Remote Support work with IBM Technical Advisors for the planning of the microcode update. This ensure that the client's environment is considered in the planning phase.
2. When a remote code load is agreed upon and scheduled, an IBM trained resource in the support center initiates a session with the target HMC.
3. During the agreed upon window, IBM directs the HMC to acquire the code images from the FixCentral repository and prepare for code activation.
4. During the customer maintenance window, IBM initiates the activation request, moving the HMC(s) and DS8000 to the new target microcode level.

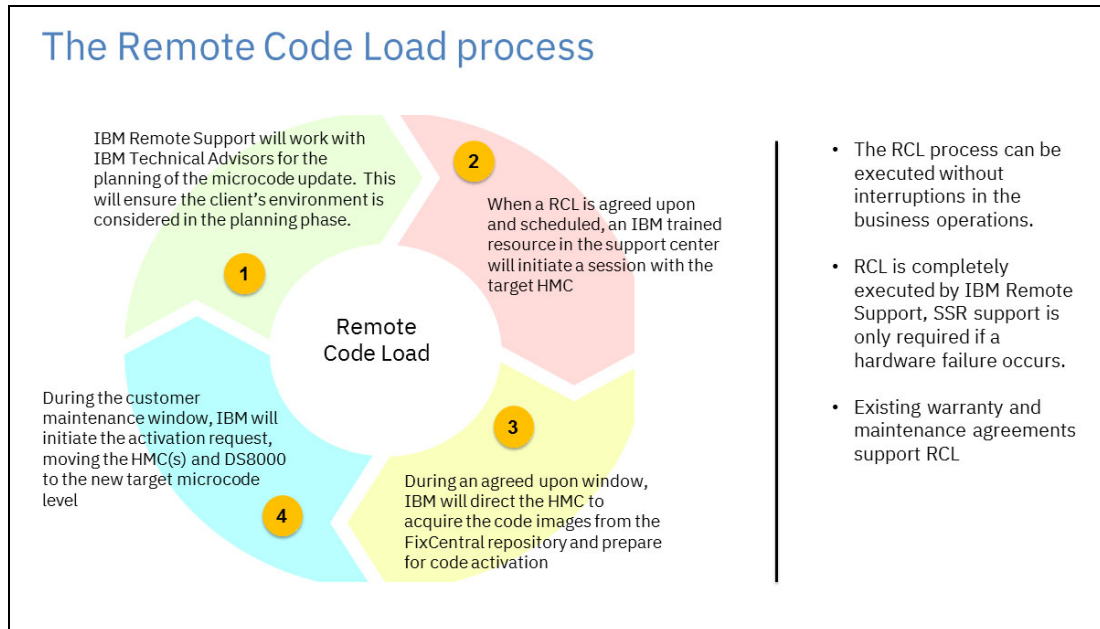


Figure A-1 Remote Code Load process

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this paper.

IBM Redbooks

The following IBM Redbooks publications provide additional information about the topic in this document. Note that some publications referenced in this list might be available in softcopy only.

- ▶ *IBM DS8880 Architecture and Implementation (Release 8.3)*, SG24-8323
- ▶ *DS8880 High-Performance Flash Enclosure Gen2*, REDP-5422
- ▶ *IBM DS8880 Product Guide (Release 8.3)*, REDP-5344
- ▶ *IBM Power System S822 Technical Overview and Introduction*, REDP-5102

You can search for, view, download or order these documents and other Redbooks, Redpapers, Web Docs, drafts, and additional materials, at the following website:

ibm.com/redbooks

Other publications

These publications are also relevant as further information sources:

- ▶ *DS8882F Introduction and Planning Guide*, GC27-9529
- ▶ *IBM DS8880 Introduction and Planning Guide*, GC27-8525
- ▶ *IBM DS8000 Host Systems Attachment Guide*, SC27-8527
- ▶ *Command-Line Interface User's Guide*, SC27-8526

Online resources

These websites are also relevant as further information sources:

- ▶ IBM Knowledge Center for DS8880 R8.5
https://www.ibm.com/support/knowledgecenter/ST5GLJ_8.5.0

Help from IBM

IBM Support and downloads

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