

System Storage DS3000 Series DC Power Supply Models Installation Information

Attention:

- Only trained service personnel other than IBM[®] service technicians are authorized to install and remove the -48 volt dc power supply and make the connections to and disconnections from the -48 volt dc power source. IBM service technicians are not certified or authorized to install or remove the -48 volt power cable. The customer is responsible for ensuring that only trained service personnel install or remove the -48 volt power cable.
- Do not use both ac and dc power supplies in the same chassis. Install two dc power supplies or two ac power supplies, but not a combination.

Use this document with the documentation that comes with your IBM System Storage $^{\text{TM}}$ DS3000 series storage enclosure. The information in this document replaces the instructions in the storage enclosure documentation for cabling and replacing the power supply.

Notes:

- 1. To reduce the risk of electric shock or energy hazards:
 - Use a double-pole circuit breaker that is rated at 20 amps.
 - Use only the dc power cord that comes with the storage enclosure.

For more information, see Statement 34 on page 6.

2. If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power cord wires. The ring terminals must be UL approved.

DC power supply and fans

The storage enclosure has two removable -48 volt dc power-supply units. Each power-supply unit contains one 530-watt power supply and two fans. The four fans pull air through the drives from front to back across the drives.

The fans provide redundant cooling, which means that if one of the fans in either fan housing fails, the remaining fans continue to provide sufficient cooling to operate the storage enclosure. If one power supply is turned off or malfunctions, the other power supply maintains electrical power to the storage enclosure. To preserve the optimal airflow, do not remove a failed power-supply unit from the chassis until you are ready to replace it with a new power-supply unit.

The illustrations in this document might differ slightly from your hardware.

Figure 1 shows the dc power-supply unit components.



Figure 1. DC power-supply unit components

Power and site wiring requirements for dc power-supply models

The storage enclosure uses wide-ranging redundant power supplies that automatically accommodate voltages to the dc power source. The dc power supplies operate within the ranges that are specified in Table 1. The dc power supplies require a reliably grounded safety extra low voltage (SELV) source and an approved and rated disconnect device for the -48 volt line.

The agency rating for the storage enclosure (dc models) is 12.8 amps at -42 volts to -60 volts dc. This is the overall maximum operating current for the storage enclosure with dc power supplies.

Electrical requirements

The following table describes the electrical requirements for the dc power-supply models.

Table 1. DC power-supply electrical requirements

| Specification | Requirement |
|---------------------------|------------------------|
| Operating voltage | -42 volts to -60 volts |
| Nominal voltage | -48 volts |
| Idle current | 8.1 A |
| Maximum operating current | 12.8 A |

DC power recovery

If a total dc power failure occurs, after normal power is restored, the storage enclosure performs power-up recovery procedures automatically without operator intervention.

Power cords and receptacles

The storage enclosure comes with two dc power cords, which are used to connect the storage enclosure to the dc power source. See "Cabling the dc power-supply models" on page 3 for more information.

Cabling the dc power-supply models

The following sections describe how to connect a dc power supply to a dc power source.

Redundant dc cabling

In a redundant dc cabling scheme, the storage enclosure is connected to the dc power source, using the two dc power cords that come with the unit. In the redundant dc cabling example shown in Figure 2, the left dc power source is connected to the dc power connector in each left dc power supply. The right dc power source is connected to the dc power connector in each right dc power supply. This cabling scheme protects against any single failure such as a failed dc power source, dc power supply, or dc power cord.



Figure 2 illustrates redundant dc power-supply cabling.

Figure 2. Redundant dc power-supply cabling scheme

DC power-supply connector-pin descriptions

The following illustration shows the dc power-supply connector-pin positions.



Figure 3. DC power-supply connector-pin positions

The following table describes the dc power-supply connector pins.

Table 2. DC power-supply connector-pin descriptions

| Pin number | Description | Wire color |
|------------|----------------------------------|------------|
| 1 | Pin 1: -48 volt dc | Brown |
| 2 | Pin 2: Positive return (POS RTN) | Blue |
| 3 | Pin 3: Ground (GND) | Green |

Connecting a dc power supply to a dc power source

Statement 29:



CAUTION:

This equipment is designed to permit the connection of the earthed conductor of the dc supply circuit to the earthing conductor at the equipment.

This equipment is designed to permit the connection of the earthed conductor of the dc supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:

- This equipment shall be connected directly to the dc supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the dc supply system earthing electrode conductor is connected.
- This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same dc supply circuit and the earthing conductor, and also the point of earthing of the dc system. The dc system shall not be earthed elsewhere.
- The dc supply source shall be located within the same premises as this equipment.
- Switching or disconnecting devices shall not be in the earthed circuit conductor between the dc source and the point of connection of the earthing electrode conductor.

Statement 31:



DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded power source.
- Connect to properly wired power sources any equipment that will be attached to this product.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached ac power cords, dc power sources, network connections, telecommunications systems, and serial cables before you open the device covers, unless you are instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following table when you install, move, or open covers on this product or attached devices.

To Connect:

- 1. Turn OFF all power sources and equipment that is to 1. Turn OFF all power sources and equipment that is to be attached to this product.
- 2. Attach signal cables to the product.
- 3. Attach power cords to the product.
 - For ac systems, use appliance inlets.
 - For dc systems, ensure correct polarity of -48 V dc connections: RTN is + and -48 V dc is -. Earth ground should use a two-hole lug for safety.
- 4. Attach signal cables to other devices.
- 5. Connect power cords to their sources.
- 6. Turn ON all the power sources.

To Disconnect:

- be attached to this product.
 - For ac systems, remove all power cords from the chassis power receptacles or interrupt power at the ac power distribution unit.
 - For dc systems, disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the dc cables.
- 2. Remove the signal cables from the connectors.
- 3. Remove all cables from the devices.

Statement 33:



CAUTION:

This product does not provide a power-control button. Turning off blades or removing power modules and I/O modules does not turn off electrical current to the product. The product also might have more than one power cord. To remove all electrical current from the product, make sure that all power cords are disconnected from the power source.



Statement 34:



CAUTION:

To reduce the risk of electric shock or energy hazards:

- This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and IEC 60950-1, First Edition, The Standard for Safety of Information Technology Equipment.
- Connect the equipment to a properly grounded safety extra low voltage (SELV) source. A SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).
- Incorporate a readily available approved and rated disconnect device in the field wiring.
- See the specifications in the product documentation for the required circuit-breaker rating for branch circuit overcurrent protection.
- Use copper wire conductors only. See the specifications in the product documentation for the required wire size.
- See the specifications in the product documentation for the required torque values for the wiring-terminal screws.

To connect the dc power supply to the dc power source, connect the positive return and ground lines of the dc power cord to the terminals that are marked "POS RTN" and "GND" on the dc power source, as shown in Figure 4.



Figure 4. DC wiring from a storage enclosure to a dc power source

Cut the wires to the correct length, but do not cut them shorter than 150 mm (6 in.). If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power-cord wires. The ring terminals must be UL approved. The minimum nominal thread diameter of a pillar or stud type of terminal must be 4 mm; for a screw type of terminal, the minimum diameter must be 5.0 mm.

For maximum protection against power loss, connect each of the two dc power supplies to a different power source.

DC power-supply LEDs

The following illustration shows the dc power-supply LEDs.



Figure 5. DC power-supply LEDs

DC power LED (green)

When this green LED is lit, it indicates that the storage enclosure is turned on and is supplying both 5-volt and 12-volt dc power to the storage enclosure.

OK to remove LED (blue)

When this blue LED is lit, it indicates that it is safe to remove the dc power-supply unit.

Note: The OK to remove LED is not supported on EXP3000 series storage enclosure models that are attached to controllers other than the DS3000 series. For more information, see the *Installation*, *User's*, *and Maintenance Guide* that comes with the storage enclosure.

Fault LED (amber)

When this amber LED is lit, it indicates that a power supply or fan has failed or that a redundant power supply is not turned on.

DC input power LED (green)

When this green LED is lit, it indicates that the storage enclosure is receiving dc power.

Note: Although the symbols for the dc power LED and the dc input power LED are similar, the LEDs serve different purposes. The dc input power LED indicates that dc inputs to the dc power supply are present and good. The dc power LED indicates that the dc output from the dc power supply to the internal circuitry is good.

Replacing a dc power supply

The power-supply units are customer replaceable units (CRUs) and do not require preventive maintenance. Use only the supported power-supply units for the specific storage enclosure. The DC power supply and dc power cord part numbers are listed in the following table.

| Description | Part number |
|-----------------|-------------|
| DC power supply | 39R6541 |
| DC power cord | 42D3295 |

Table 3. DC power supply and dc power cord part number listing

Note: For a detailed list of the storage enclosure replaceable parts, see the *Installation*, *User's*, *and Maintenance Guide* that comes with the storage enclosure.

Each power supply has a built-in sensor that detects the following conditions:

- Over-voltage
- Over-current
- Overheated power supply

If any of these conditions occurs, one or both power supplies will shut down. If the power remains off (does not automatically restart), make sure that the environment is optimal (no overheating has occurred, all electrical receptacles are working, and so on). For more information, see the *Installation*, *User's*, *and Maintenance Guide* that comes with the storage enclosure.

If both power supplies fail, or if the power supplies cannot maintain an internal temperature below 70°C (158°F), the power supplies in the storage enclosure will automatically shut down (an overtemperature condition). If this occurs, you must cool the storage enclosure and then restart it. For more information, see the *Installation*, *User's*, *and Maintenance Guide* that comes with the storage enclosure.

Attention: The fans in the power-supply units draw in fresh air and force out hot air. The power-supply units are hot-swappable and redundant; however, if the fans in one power-supply unit fail, you must replace the entire failed power-supply unit within 72 hours to maintain redundancy and optimum cooling. Do not remove the failed power-supply unit until you have the replacement power-supply unit. When you do remove the failed power-supply unit, be sure to install the second power-supply unit within 10 minutes to prevent any overheating due to the interruption to the airflow that cools the storage enclosure.

Do not run the storage enclosure without adequate ventilation and cooling, because it might cause damage to the internal components and circuitry.

Removing a dc power supply

To remove a dc power-supply unit, complete the following steps.

Attention: To prevent damage to the storage enclosure components from overheating, replace a failed dc power-supply unit within 10 minutes of removal. If replacing it will take longer than 10 minutes, stop all I/O activity to the storage enclosure and turn off the power until you have completed the replacement.

- 1. Read the *Installation, User's, and Maintenance Guide* that comes with the storage enclosure for removal guidelines and safety information.
- 2. Check the fault LED to locate the failed power supply. If a fault is detected, the amber fault LED is lit.
- **3**. Make sure that the OK to remove LED is lit. Do not remove the power supply if the LED is off. For more information about the OK to remove LED, see "DC power-supply LEDs" on page 7.

Note: The OK to remove LED is not supported on EXP3000 series storage enclosure models that are attached to controllers other than the DS3000 series. For more information, see the *Installation*, *User's*, *and Maintenance Guide* that comes with the storage enclosure.

- 4. Turn off the circuit breaker for the dc power source to which the failed power supply is connected.
- 5. Disconnect the power cord from the dc power source.
- 6. Turn off the power switch and disconnect the power cord from the power supply that has failed.
- 7. On the left side of the power supply, press the orange release tab to the right just enough to release the handle; then, rotate the handle downward.

Statement 33:



CAUTION:

This product does not provide a power-control button. Turning off blades or removing power modules and I/O modules does not turn off electrical current to the product. The product also might have more than one power cord. To remove all electrical current from the product, make sure that all power cords are disconnected from the power source.



8. Slowly pull the handle away from the chassis to remove the power-supply unit, as shown in Figure 6.



Figure 6. Replacing a dc power-supply unit

9. Place the power-supply unit on a level surface.

Installing a replacement dc power supply

To install a replacement dc power supply after you have removed a dc power supply that has failed, complete the following steps:

- 1. Unpack the new power-supply unit. Save all packing material in case you have to return the failed power-supply unit.
- 2. Turn off the power switch on the new unit.
- **3**. Slide the new power-supply unit into the power-supply bay. Make sure that the handle is pulled straight out as you slide the power-supply unit into the bay.
- 4. Make sure that the guide pins on the side of the power supply fit into the notches along the sides of the power-supply bay.
- 5. Push the handle upward to fully latch it into place. Gently push the front of the power-supply unit to make sure that it is fully seated.

- 6. Connect the other ends of the dc power cord to the dc power source. Cut the wires to the correct length, but do not cut them shorter than 150 mm (6 in.). If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power cord wires. The ring terminals must be UL approved. The minimum nominal thread diameter of a pillar or stud type of terminal must be 4 mm; for a screw type of terminal, the minimum diameter must be 5.0 mm.
- 7. Reconnect the dc power cord to the dc power supply.
- 8. Turn on the circuit breaker for the dc power source to which the new power supply is connected.
- 9. Turn on the power switch on the new dc power supply.
- **10**. Check the power and fault LEDs on the new power-supply unit. Depending on the status of the power and fault LEDs, use one of the following procedures:
 - The fault LED is lit and the dc power and dc input power LEDs are off: Perform the following tasks to solve the problem:
 - Make sure that the power-supply power switch is turned on.
 - Make sure that there is dc power at the source and no circuit breaker has tripped.
 - Make sure that the power cord is working and is fully connected to the power-supply dc connector.
 - Make sure that the power cord is connected correctly to the dc power source.
 - Reinstall the dc power-supply unit.

Go to step 11.

- The dc input power LED and dc power LED are on and the fault LED is off: Go to step 11.
- The fault LED and dc input power LED are on but the dc power LED is off: The power supply is faulty. Turn off the power switch and contact your IBM technical-support representative for another power supply.
- 11. Check the status of each component in the storage enclosure. If any amber LEDs are lit on any of the components, run the storage-management software and complete any other recovery procedures. If a problem is still indicated, contact your IBM technical-support representative.

First Edition (July 2007)

IBM and System Storage are trademarks of International Business Machines Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

© Copyright International Business Machines Corporation 2007. All rights reserved.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

(1P) P/N: 43W7830

