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被要求採取某些適當的對策。
Contents

Chapter 1: 6540 COMMAND MODULE SITE PREPARATION

Module Features .................................................................................................................. 1-1
Area Requirements ............................................................................................................. 1-3
   Dimensions ..................................................................................................................... 1-3
   Weight ............................................................................................................................ 1-4
   Shipping Dimensions .................................................................................................... 1-4
Environmental Requirements and Specifications .............................................................. 1-5
   Temperature and Humidity ........................................................................................... 1-5
   Altitude .......................................................................................................................... 1-6
   Airflow and Heat Dissipation ....................................................................................... 1-6
   Acoustic Noise .............................................................................................................. 1-7
Electrical Requirements ...................................................................................................... 1-7
   Site Wiring and Power ................................................................................................. 1-7
   AC Power Recovery ..................................................................................................... 1-8
   Power Cords and Receptacles ..................................................................................... 1-8

Chapter 2: FLX280 COMMAND MODULE SITE PREPARATION

Module Features .................................................................................................................. 2-1
Area Requirements ............................................................................................................. 2-3
   Dimensions ..................................................................................................................... 2-3
   Weight ............................................................................................................................ 2-4
   Shipping Dimensions .................................................................................................... 2-4
Environmental Requirements and Specifications .............................................................. 2-5
   Temperature and Humidity ........................................................................................... 2-5
   Altitude .......................................................................................................................... 2-5
   Airflow and Heat Dissipation ....................................................................................... 2-6
   Acoustic Noise .............................................................................................................. 2-6
Electrical Requirements ...................................................................................................... 2-7
   Site Wiring and Power ................................................................................................. 2-7
   Power Input .................................................................................................................... 2-8
### Chapter 3: 6140 Array Module Site Preparation

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Features</td>
<td>3-1</td>
</tr>
<tr>
<td>Area Requirements</td>
<td>3-4</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3-4</td>
</tr>
<tr>
<td>Weight</td>
<td>3-5</td>
</tr>
<tr>
<td>Shipping Dimensions</td>
<td>3-5</td>
</tr>
<tr>
<td>Environmental Requirements and Specifications</td>
<td>3-6</td>
</tr>
<tr>
<td>Temperature and Humidity</td>
<td>3-6</td>
</tr>
<tr>
<td>Altitude</td>
<td>3-7</td>
</tr>
<tr>
<td>Airflow and Heat Dissipation</td>
<td>3-7</td>
</tr>
<tr>
<td>Acoustic Noise</td>
<td>3-8</td>
</tr>
<tr>
<td>Electrical Requirements</td>
<td>3-8</td>
</tr>
<tr>
<td>Site Wiring and Power</td>
<td>3-8</td>
</tr>
<tr>
<td>Power Input</td>
<td>3-9</td>
</tr>
<tr>
<td>AC Power Input</td>
<td>3-9</td>
</tr>
<tr>
<td>DC Power Input</td>
<td>3-10</td>
</tr>
<tr>
<td>Power Factor Correction</td>
<td>3-10</td>
</tr>
<tr>
<td>AC Power Cords and Receptacles</td>
<td>3-10</td>
</tr>
<tr>
<td>Optional DC Power Connector Cables and Source Wires</td>
<td>3-10</td>
</tr>
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</table>

### Chapter 4: FLX240 Array Module Site Preparation

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Features</td>
<td>4-2</td>
</tr>
<tr>
<td>Area Requirements</td>
<td>4-3</td>
</tr>
<tr>
<td>Dimensions</td>
<td>4-3</td>
</tr>
<tr>
<td>Weight</td>
<td>4-4</td>
</tr>
<tr>
<td>Shipping Dimensions</td>
<td>4-4</td>
</tr>
<tr>
<td>Environmental Requirements and Specifications</td>
<td>4-5</td>
</tr>
<tr>
<td>Temperature and Humidity</td>
<td>4-5</td>
</tr>
<tr>
<td>Altitude</td>
<td>4-5</td>
</tr>
<tr>
<td>Airflow and Heat Dissipation</td>
<td>4-6</td>
</tr>
<tr>
<td>Acoustic Noise</td>
<td>4-6</td>
</tr>
</tbody>
</table>
Chapter 5: FLX240 Drive Limited Array Module Site Preparation

Module Features ................................................................. 5-1
Area Requirements .............................................................. 5-3
  Dimensions ....................................................................... 5-3
  Weight ............................................................................ 5-4
  Shipping Dimensions .......................................................... 5-4
Environmental Requirements and Specifications ................. 5-5
  Temperature and Humidity .................................................... 5-5
  Altitude ........................................................................... 5-5
  Airflow and Heat Dissipation .............................................. 5-6
  Acoustic Noise ................................................................. 5-6
Electrical Requirements ........................................................ 5-7
  Site Wiring and Power ....................................................... 5-7
  Power Input ....................................................................... 5-8
  Power Factor Correction .................................................... 5-8
  Power Cords and Receptacles ............................................. 5-8

Chapter 6: CSM200 Drive Module Site Preparation

Module Features ........................................................................ 6-2
Area Requirements .................................................................... 6-4
  Dimensions ....................................................................... 6-4
  Weight ............................................................................ 6-5
  Shipping Dimensions .......................................................... 6-5
Environmental Requirements and Specifications ..................... 6-6
  Temperature and Humidity .................................................... 6-6
  Altitude ........................................................................... 6-6
  Airflow and Heat Dissipation .............................................. 6-7
  Acoustic Noise ................................................................. 6-7
Electrical Requirements ...........................................................................................................6-8
Site Wiring and Power ..................................................................................................................6-8
Power Input ..................................................................................................................................6-9
  AC Power Input .......................................................................................................................6-9
  DC Power Input .......................................................................................................................6-9
Power Factor Correction .............................................................................................................6-9
AC Power Cords and Receptacles .............................................................................................6-10
Optional DC Power Connector Cables and Source Wires ..........................................................6-10

Chapter 7: FLC200 DRIVE MODULE SITE PREPARATION

Module Features .........................................................................................................................7-2
Area Requirements .....................................................................................................................7-3
  Dimensions ............................................................................................................................7-3
  Weight ..................................................................................................................................7-4
  Shipping Dimensions ..............................................................................................................7-4
Environmental Requirements and Specifications .................................................................7-5
  Temperature and Humidity .....................................................................................................7-5
  Altitude .................................................................................................................................7-5
  Airflow and Heat Dissipation ...............................................................................................7-6
  Acoustic Noise ......................................................................................................................7-6
Electrical Requirements .............................................................................................................7-7
  Site Wiring and Power ............................................................................................................7-7
  Power Input ..........................................................................................................................7-8
  Power Factor Correction .......................................................................................................7-8
  Power Cords and Receptacles ...............................................................................................7-8

Chapter 8: FLA300 DRIVE MODULE SITE PREPARATION

Module Features .........................................................................................................................8-2
Area Requirements .....................................................................................................................8-3
  Dimensions ..........................................................................................................................8-3
  Weight ..................................................................................................................................8-4
  Shipping Dimensions ..............................................................................................................8-4
Environmental Requirements and Specifications .................................................................8-5
  Temperature and Humidity .....................................................................................................8-5
Chapter 9: FLA200 Drive Module Site Preparation

Module Features ................................................................. 9-2
Area Requirements ................................................................. 9-3
Dimensions.................................................................................. 9-3
Weight....................................................................................... 9-4
Shipping Dimensions ................................................................. 9-4
Environmental Requirements and Specifications .................. 9-5
Temperature and Humidity ......................................................... 9-5
Altitude..................................................................................... 9-5
Airflow and Heat Dissipation ..................................................... 9-6
Acoustic Noise ........................................................................ 9-6
Electrical Requirements ............................................................. 9-7
Site Wiring and Power ............................................................... 9-7
Power Input ............................................................................ 9-8
Power Factor Correction ........................................................... 9-8
Power Cords and Receptacles ..................................................... 9-8
List of Figures

Chapter 1: 6540 COMMAND MODULE SITE PREPARATION

- Figure 1-1. Front and Back Views of the 6540 Command Module ........................................... 1-2
- Figure 1-2. 6540 Command Module Dimensions .................................................................. 1-3
- Figure 1-3. 6540 Command Module Airflow ........................................................................ 1-6

Chapter 2: FLX280 COMMAND MODULE SITE PREPARATION

- Figure 2-1. Front and Back Views of the FLX280 Command Module ................................. 2-2
- Figure 2-2. FLX280 Command Module Dimensions ............................................................ 2-3
- Figure 2-3. FLX280 Command Module Airflow ................................................................... 2-6

Chapter 3: 6140 ARRAY MODULE SITE PREPARATION

- Figure 3-1. Front and Back Views of the Rackmount 6140 Array Module (Two Host Ports) ........................................................................................................................................ 3-2
- Figure 3-2. Front and Back Views of the Rackmount 6140 Array Module (Four Host Ports) ........................................................................................................................................ 3-2
- Figure 3-3. Front and Back Views with the Optional DC Power Connectors (Four Host Ports) ........................................................................................................................................ 3-3
- Figure 3-4. 6140 Array Module Dimensions ........................................................................ 3-4
- Figure 3-5. 6140 Array Module Airflow ............................................................................. 3-7
- Figure 3-6. Optional DC Power Connector Cable and Source Wires ................................ 3-11

Chapter 4: FLX240 ARRAY MODULE SITE PREPARATION

- Figure 4-1. Front and Back Views of the Rackmount FLX240 Array Module ..................... 4-2
- Figure 4-2. FLX240 Array Module Dimensions .................................................................... 4-3
- Figure 4-3. FLX240 Array Module Airflow .......................................................................... 4-6

Chapter 5: FLX240 DRIVE LIMITED ARRAY MODULE SITE PREPARATION

- Figure 5-1. Front and Back Views of the Rackmount FLX240 Drive Limited Array Module ........................................................................................................................................ 5-2
- Figure 5-2. FLX240 Drive Limited Array Module Dimensions ............................................ 5-3
- Figure 5-3. FLX240 Drive Limited Array Module Airflow .................................................. 5-6
Chapter 6: CSM200 DRIVE MODULE SITE PREPARATION

Figure 6-1. Front and Back Views of the Rackmount CSM200 Drive Module ..................... 6-2
Figure 6-2. Front and Back Views of the CSM200 Drive Module with the Optional
DC Power Connectors ............................................................................................................. 6-3
Figure 6-3. CSM200 Drive Module Dimensions ................................................................. 6-4
Figure 6-4. CSM200 Drive Module Airflow ......................................................................... 6-7
Figure 6-5. Optional DC Power Connector Cable and Source Wires ............................... 6-10

Chapter 7: FLC200 DRIVE MODULE SITE PREPARATION

Figure 7-1. Front and Back Views of the Rackmount FLC200 Drive Module ..................... 7-2
Figure 7-2. FLC200 Drive Module Dimensions .................................................................. 7-3
Figure 7-3. FLC200 Drive Module Airflow ........................................................................... 7-6

Chapter 8: FLA300 DRIVE MODULE SITE PREPARATION

Figure 8-1. Front and Back Views of the Rackmount FLA300 Drive Module ..................... 8-2
Figure 8-2. FLA300 Drive Module Dimensions ................................................................. 8-3
Figure 8-3. FLA300 Drive Module Airflow ........................................................................... 8-6

Chapter 9: FLA200 DRIVE MODULE SITE PREPARATION

Figure 9-1. Front and Back Views of the Rackmount FLA200 Drive Module ..................... 9-2
Figure 9-2. FLA200 Drive Module Dimensions ................................................................. 9-3
Figure 9-3. FLA200 Drive Module Airflow ........................................................................... 9-6
List of Tables

Chapter 1: 6540 Command Module Site Preparation
Table 1-1. 6540 Command Module Weights ................................................................. 1-4
Table 1-2. 6540 Command Module Component Weights ............................................. 1-4
Table 1-3. 6540 Command Module Shipping Carton Dimensions ................................ 1-4
Table 1-4. 6540 Command Module Temperature and Humidity Requirements .............. 1-5
Table 1-5. 6540 Command Module Altitude Ranges ..................................................... 1-6
Table 1-6. 6540 Command Module Power and Heat Dissipation ................................. 1-7
Table 1-7. 6540 Command Module Sound Levels ....................................................... 1-7

Chapter 2: FLX280 Command Module Site Preparation
Table 2-1. FLX280 Command Module Weights ............................................................. 2-4
Table 2-2. FLX280 Command Module Component Weights ......................................... 2-4
Table 2-3. FLX280 Command Module Shipping Carton Dimensions ............................. 2-4
Table 2-4. FLX280 Command Module Temperature and Humidity Requirements .......... 2-5
Table 2-5. FLX280 Command Module Altitude Ranges ............................................... 2-5
Table 2-6. FLX280 Command Module Sound Levels .................................................... 2-6
Table 2-7. FLX280 Command Module AC Power Requirements ................................. 2-8

Chapter 3: 6140 Array Module Site Preparation
Table 3-1. 6140 Array Module Weight ................................................................. 3-5
Table 3-2. 6140 Array Module Component Weights .................................................... 3-5
Table 3-3. 6140 Array Module Shipping Carton Dimensions ....................................... 3-5
Table 3-4. 6140 Array Module Temperature and Humidity Requirements ..................... 3-6
Table 3-5. 6140 Array Module Altitude Ranges ........................................................... 3-7
Table 3-6. 6140 Array Module Sound Levels ............................................................... 3-8
Table 3-7. 6140 Array Module AC Power Requirements .............................................. 3-9

Chapter 4: FLX240 Array Module Site Preparation
Table 4-1. FLX240 Array Module Weights ................................................................. 4-4
Table 4-2. FLX240 Array Module Component Weights ............................................. 4-4
Table 4-3. FLX240 Array Module Shipping Carton Dimensions ................................... 4-4
Table 4-4. FLX240 Array Module Temperature and Humidity Requirements .............. 4-5
Table 4-5. FLX240 Array Module Altitude Ranges .............................................................. 4-5
Table 4-6. FLX240 Array Module Sound Levels ................................................................. 4-6
Table 4-7. FLX240 Array Module AC Power Requirements .............................................. 4-8

Chapter 5: FLX240 DRIVE LIMITED ARRAY MODULE SITE PREPARATION
Table 5-1. FLX240 Drive Limited Array Module Weights ................................................... 5-4
Table 5-2. FLX240 Drive Limited Array Module Component Weights ............................... 5-4
Table 5-3. FLX240 Drive Limited Array Module Shipping Carton Dimensions .................. 5-4
Table 5-4. FLX240 Drive Limited Array Module Temperature and Humidity Requirements 5-5
Table 5-5. FLX240 Drive Limited Array Module Altitude Ranges ...................................... 5-5
Table 5-6. FLX240 Drive Limited Array Module Sound Levels .......................................... 5-7
Table 5-7. FLX240 Drive Limited Array Module AC Power Requirements ........................ 5-8

Chapter 6: CSM200 DRIVE MODULE SITE PREPARATION
Table 6-1. CSM200 Drive Module Weights ........................................................................ 6-5
Table 6-2. CSM200 Drive Module Component Weights ...................................................... 6-5
Table 6-3. CSM200 Drive Module Shipping Carton Dimensions .......................................... 6-5
Table 6-4. CSM200 Drive Module Temperature and Humidity Requirements ..................... 6-6
Table 6-5. CSM200 Drive Module Altitude Ranges ............................................................... 6-6
Table 6-6. CSM200 Drive Module Sound Levels ................................................................. 6-7
Table 6-7. CSM200 Drive Module AC Power Requirements ............................................... 6-9

Chapter 7: FLC200 DRIVE MODULE SITE PREPARATION
Table 7-1. FLC200 Drive Module Weights ........................................................................ 7-4
Table 7-2. FLC200 Drive Module Component Weights ...................................................... 7-4
Table 7-3. FLC200 Drive Module Shipping Carton Dimensions .......................................... 7-4
Table 7-4. FLC200 Drive Module Temperature and Humidity Requirements ..................... 7-5
Table 7-5. FLC200 Drive Module Altitude Ranges ............................................................... 7-5
Table 7-6. FLC200 Drive Module Sound Levels ................................................................. 7-6
Table 7-7. FLC200 Drive Module AC Power Requirements ............................................... 7-8
Chapter 8: FLA300 Drive Module Site Preparation
Table 8-1. FLA300 Drive Module Weights ................................................................. 8-4
Table 8-2. FLA300 Drive Module Component Weights .............................................. 8-4
Table 8-3. FLA300 Drive Module Shipping Carton Dimensions ................................. 8-4
Table 8-4. FLA300 Drive Module Temperature and Humidity Requirements .......... 8-5
Table 8-5. FLA300 Drive Module Altitude Ranges ................................................... 8-5
Table 8-6. FLA300 Drive Module Sound Levels ....................................................... 8-6
Table 8-7. FLA300 Drive Module AC Power Requirements ........................................ 8-8

Chapter 9: FLA200 Drive Module Site Preparation
Table 9-1. FLA200 Drive Module Weights ................................................................. 9-4
Table 9-2. FLA200 Drive Module Component Weights .............................................. 9-4
Table 9-3. FLA200 Drive Module Shipping Carton Dimensions ................................. 9-4
Table 9-4. FLA200 Drive Module Temperature and Humidity Requirements .......... 9-5
Table 9-5. FLA200 Drive Module Altitude Ranges ................................................... 9-5
Table 9-6. FLA200 Drive Module Sound Levels ....................................................... 9-6
Table 9-7. FLA200 Drive Module AC Power Requirements ........................................ 9-8
Document Conventions

Definitions of Safety Notices

**DANGER** Indicates an imminently hazardous situation that will result in death or severe personal injury.

**WARNING** Indicates a potentially hazardous situation that could result in death or severe personal injury.

**CAUTION** Indicates a potentially hazardous situation that could result in moderate or minor personal injury.

Definitions of Informational Notices

**CAUTION** Indicates a potentially hazardous situation that could result in data loss (or other interruption) or equipment damage.

**IMPORTANT** Indicates information or criteria that is necessary to perform a procedure correctly.

**NOTE** Indicates a clarification of a concept or presents a maintenance tip.

Typographic Conventions

*Italic* indicates the title of documents, variables and placeholders in text, emphasized words, and new terms.

**Bold** indicates choices in procedures and other emphasized text.

*Monospace* indicates arguments, code examples, command-line text, command options, commands, directories, error messages, file names, folders, on-screen text, and user input.

*Monospace italic* indicates command variables in code, parameters, and placeholders and variables in code.

*Monospace bold* indicates keywords and values.
# Revision Record

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<th>Date</th>
<th>Affected Pages or Remarks</th>
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<td>Third edition</td>
<td>August 2006</td>
<td>Added DC power information to the 6140 array module chapter and the CSM200 drive module chapter</td>
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**Part Number:** EH1711-1-E3
About This Document

This document defines the hardware, power, and environmental requirements that must be met prior to installation of the following products:

- The 6540 command module
- The FLX280 command module
- The 6140 array module
- The FLX240 array module
- The FLX240 Drive Limited array module
- The CSM200 drive module
- The FLC200 drive module
- The FLA300 drive module
- The FLA200 drive module

Use this document prior to delivery and installation to ensure that the appropriate and required preparations have been completed. This book does not explain procedures for installing the hardware modules, or installing and configuring the software. Read the Storage System Product Release Notes for any updated information regarding hardware, software, or firmware products that might not be covered in this document.

Intended Readers

This document is intended for system administrators and service personnel who are directly involved in the planning or installation of storage area network (SAN) hardware or storage arrays, including the products listed above. The reader must have a basic knowledge of SAN hardware functionality (controllers, drives, and hosts) and SAN cabling techniques, and be familiar with cabinet installations. The reader also must understand disk array, Redundant Array of Independent Disks (RAID), network, and Fibre Channel technologies.
This chapter provides site specifications for the 6540 command module. Before installing the command module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.

Module Features

The 6540 command module is a compact, rackmounted unit that provides high-capacity disk storage for Fibre Channel environments. The 6540 command module includes the following components:

- One front cover
- Two controller CRUs
- Two power supply-fan CRUs
- One interconnect-battery CRU

The power supply-fan CRUs and interconnect-battery CRUs are located behind the front cover. The two controller CRUs are accessed from the back of the chassis.

The 6540 command module contains two power supply-fan CRUs that house power supplies and fans in removable enclosures. One power supply-fan CRU can maintain electrical power and cooling to the command module if the other power supply-fan CRU is turned off or malfunctions.

Figure 1-1 on page 1-2 shows front and back views of the 6540 command module.
Figure 1-1 Front and Back Views of the 6540 Command Module
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the 6540 command module and associated equipment; sufficient space to install, operate, and service the command module; and sufficient ventilation to provide a free flow of air to the command module.

Dimensions

Figure 1-2 shows the dimensions of the 6540 command module, which conforms to the 48.26-cm (19-in.) rack standard.
Weight

The total weight of the 6540 command module depends on the number of components installed. Table 1-1 shows the maximum, empty, and shipping weights for the command module in different configurations. Table 1-2 shows the weight of each component.

### Table 1-1 6540 Command Module Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
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<tr>
<td></td>
<td>Maximum(^a)</td>
</tr>
<tr>
<td>6540 command module, rack mount</td>
<td>36.5 kg (80.5 lb)</td>
</tr>
</tbody>
</table>

\(^a\) Maximum weight indicates a command module with all of the components installed (fully loaded).

\(^b\) Empty weight indicates a command module with all of the components removed.

\(^c\) Shipping weight indicates the maximum weight of the command module and all shipping material.

### Table 1-2 6540 Command Module Component Weights

<table>
<thead>
<tr>
<th>Unit</th>
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</tr>
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<tbody>
<tr>
<td>Controller CRU</td>
<td>6.24 kg (13.75 lb)</td>
</tr>
<tr>
<td>Power supply-fan CRU</td>
<td>3.72 kg (8.2 lb)</td>
</tr>
<tr>
<td>Interconnect-battery CRU (with two batteries installed)</td>
<td>4.08 kg (9.0 lb)</td>
</tr>
<tr>
<td>Battery CRU</td>
<td>1.13 kg (2.5 lb)</td>
</tr>
</tbody>
</table>

### Shipping Dimensions

Table 1-3 shows shipping carton dimensions for the 6540 command module. The height shown includes the height of the pallet.

### Table 1-3 6540 Command Module Shipping Carton Dimensions

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.4 cm (17.5 in.)</td>
<td>62.2 cm (24.5 in.)</td>
<td>78.7 cm (31.0 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the 6540 command module, and heat and sound conditions that are generated by normal operation of the command module.

Temperature and Humidity

Table 1-4 shows the acceptable temperature and humidity ranges in which the 6540 command module is designed to operate.

The 6540 command module is designed to operate in a broad spectrum of partially air-conditioned office and commercial environments.

Table 1-4 6540 Command Module Temperature and Humidity Requirements

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>Operating range</td>
<td>0°C to 40°C (32°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td><strong>Relative humidity</strong></td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td>(no condensation)</td>
<td>Storage range</td>
<td>10% to 93%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3048 m (3280 ft to 10,000 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.
Altitude

Table 1-5 shows the acceptable altitudes for operating, storing, and shipping the 6540 command module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>

Airflow and Heat Dissipation

Figure 1-3 shows the intended airflow for an 6540 command module. Allow at least 76 cm (30 in.) in front of the command module and at least 61 cm (24 in.) behind the command module for service clearance, proper ventilation, and heat dissipation.
Table 1-6 shows the KVA, watts, and Btu calculations for the 6540 command module. These values were measured during module qualification. These tabulated power and heat dissipation values are the maximum measured operating power. Maximum configuration units are typically operated at higher data rates or have larger random access memory (RAM) capacities.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>KVA</th>
<th>Watts (AC)</th>
<th>Btu per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller CRU</td>
<td>0.240</td>
<td>235</td>
<td>804</td>
</tr>
</tbody>
</table>

**Acoustic Noise**

Table 1-7 shows the maximum sound levels emitted by the 6540 command module. Under normal operating conditions, the command module is suitable for use in general office installations and retail applications.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.0 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>

**Electrical Requirements**

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the 6540 command module.

**Site Wiring and Power**

The 6540 command module uses wide-ranging redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies operate within the range of 90 VAC to 264 VAC, at a minimum frequency of 50 Hz and a maximum frequency of 60 Hz. There is no limit to how frequently voltage levels can fluctuate within the specified range. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

The agency ratings for the 6540 command module are 5.25 A at 100 VAC and 2.65 A at 240 VAC. These ratings are the overall maximum currents for this system.
Consider the following information when preparing the 6540 command module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  **NOTE**  *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the command module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The command module can withstand the following applied voltage interruptions.
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the command module automatically performs a power-on recovery sequence without operator intervention after power is restored.

**AC Power Recovery**

After normal power is restored after a total AC power failure, the 6540 command module performs power-on recovery procedures automatically without operator intervention.

**Power Cords and Receptacles**

Each 6540 command module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in a command module to an independent, external power source, such as a wall receptacle or uninterruptible power supply (UPS).

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the command module.
This chapter provides site specifications for the FLX280 command module. Before installing the command module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.

Module Features

The FLX280 command module is a compact unit that manages high-performance storage arrays to provide storage in a Fibre Channel environment. Each FLX280 command module contains the following components:

- Two controllers
- One power supply-fan CRU
- Two power supplies
- One controller fan
- One alarm system
- Two to eight Small Form-factor Pluggable (SFP) minihubs

An optional backup battery can be added for data cache protection.

The command module is equipped with Ethernet connections that provide for out-of-band storage array management, configuration, and fault isolation (over a network separate from the storage array I/O path). The command module is also equipped with serial connections that provide for diagnostic support (with the help of a trained Customer and Technical Support representative).

Figure 2-1 on page 2-2 shows front and back views of the FLX280 command module.
Figure 2-1 Front and Back Views of the FLX280 Command Module
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the FLX280 command module and associated equipment; sufficient space to install, operate, and service the command module; and sufficient ventilation to provide a free flow of air to the command module.

Dimensions

Figure 2-2 shows the dimensions of the FLX280 command module.
Weight

The total weight of the FLX280 command module depends on the number of components installed. Table 2-1 shows the maximum, empty, and shipping weights for the command module. Table 2-2 shows the weight of each component.

Table 2-1  FLX280 Command Module Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLX280 command module, rackmount</td>
<td></td>
</tr>
<tr>
<td>Maximum&lt;sup&gt;a&lt;/sup&gt;</td>
<td>40.4 kg (89.0 lb)</td>
</tr>
<tr>
<td>Empty&lt;sup&gt;b&lt;/sup&gt;</td>
<td>13.2 kg (29.0 lb)</td>
</tr>
<tr>
<td>Shipping&lt;sup&gt;c&lt;/sup&gt;</td>
<td>54.0 kg (119.0 lb)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Maximum weight indicates a command module with all of the components installed (fully loaded).

<sup>b</sup>Empty weight indicates a command module with all of the components removed.

<sup>c</sup>Shipping weight indicates the maximum weight of the command module and all shipping materials.

Table 2-2  FLX280 Command Module Component Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>10.9 kg (24.0 lb)</td>
</tr>
<tr>
<td>Controller</td>
<td>3.0 kg (6.6 lb)</td>
</tr>
<tr>
<td>Controller fan</td>
<td>0.9 kg (1.9 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>1.5 kg (3.3 lb)</td>
</tr>
<tr>
<td>Power supply-fan CRU</td>
<td>1.8 kg (4.1 lb)</td>
</tr>
<tr>
<td>SFP minihub</td>
<td>0.6 kg (1.3 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 2-3 shows shipping carton dimensions for the FLX280 command module. The height shown includes the height of the pallet.

Table 2-3  FLX280 Command Module Shipping Carton Dimensions

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.4 cm (17.5 in.)</td>
<td>62.2 cm (24.5 in.)</td>
<td>78.7 cm (31.0 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the FLX280 command module, and heat and sound conditions that are generated by normal operation of the command module.

Temperature and Humidity

Table 2-4 shows the acceptable temperature and humidity ranges in which the FLX280 command module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Operating range</td>
<td>0 °C to 40 °C (32 °F to 104 °F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10 °C (18 °F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>−10 °C to 65 °C (14 °F to 149 °F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15 °C (27 °F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>−40 °C to 65 °C (−40 °F to 149 °F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20 °C (36 °F) per hour</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td>(no condensation)</td>
<td>Storage range</td>
<td>10% to 93%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26 °C (79 °F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3048 m (3280 ft to 10,000 ft) above sea level, lower the environmental temperature 1.7 °C (3.3 °F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 2-5 shows the acceptable altitudes for operating, storing, and shipping the FLX280 command module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
Airflow and Heat Dissipation

Figure 2-3 shows the intended airflow for an FLX280 command module. Allow at least 76 cm (30 in.) in front of the command module and at least 61 cm (24 in.) behind the command module for service clearance, proper ventilation, and heat dissipation.

The FLX280 command module dissipates heat at a rate of 786.6 Btu per hour (0.230 kVA or 228.0 W).

![FLX280 Command Module Airflow](image)

Acoustic Noise

Table 2-6 shows the maximum sound levels emitted by the FLX280 command module.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.5 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>65 dBA</td>
</tr>
</tbody>
</table>
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the FLX280 command module.

Site Wiring and Power

The FLX280 command module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Consider the following information when preparing the command module installation site:

• **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  **NOTE**  
  *Protective ground* is also known as safety ground or chassis ground.

• **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the command module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

• **Power interruptions** – The command module can withstand the following applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

• **Power failures** – If a total power failure occurs, the command module automatically performs a power-on recovery sequence without operator intervention after power is restored.
Power Input

The AC power source must provide the correct voltage, current, and frequency specified on the module and serial number label. Table 2-7 shows the limits within which the FLX280 command module can run without interruption.

Table 2-7 FLX280 Command Module AC Power Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 VAC</td>
<td>180 to 264 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Nominal current</td>
<td>2 A(^a)</td>
<td>1 A(^b)</td>
</tr>
</tbody>
</table>

\(a\). Typical voltage: 120 VAC, 60 Hz at 0.70 power supply efficiency and 0.99 power factor.
\(b\). Typical voltage: 240 VAC, 60 Hz at 0.70 power supply efficiency and 0.99 power factor.

Each power supply contains one 3-A slow-blow fuse.

Power Factor Correction

Power factor correction is applied within the power supply-fan CRU of each FLX280 command module, which maintains the power factor of the command module at greater than 0.99 with nominal input voltage.

Power Cords and Receptacles

Each FLX280 command module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in a command module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the command module.
This chapter provides site specifications for the 6140 array module. Before installing the array module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.

Module Features

The 6140 array module is a compact unit that manages high-performance storage arrays to provide storage in a Fibre Channel environment. The 6140 array module is available as a rackmount or deskside model. The 6140 array module contains the following components:

- Two to sixteen drives
- One or two controllers
- Two or four host ports (depending on model)
- Two AC power supplies and two fans contained in the power-fan CRU

NOTE You can order two optional DC power supplies (–48 VDC) with two fans contained in the power-fan CRU in place of the AC power supplies and fans.

The array modules are equipped with Ethernet connections. These Ethernet connections provide for out-of-band storage array management, configuration, and fault isolation. Ethernet connections provide coverage over a network separate from the storage array I/O path. The array modules are also equipped with serial connections that provide for diagnostic support (with the help of a trained Customer and Technical Support representative).

Figure 3-1 and 3-2 on page 3-2 shows the front and back views of the rackmount 6140 array module.
Figure 3-1  Front and Back Views of the Rackmount 6140 Array Module (Two Host Ports)

Figure 3-2  Front and Back Views of the Rackmount 6140 Array Module (Four Host Ports)
Front View
1. Drive CRU
2. Alarm Mute Switch
3. Link Rate Switch

Back View
4. ESM CRU
5. Power Supply / Fan
6. AC Power Connector
7. AC Power Switch
8. Host Connectors 1–4
9. RS232 Connector
10. Drive Channels
11. 7-Segment Tray IDs
12. (Optional) Two DC Power Connectors

Figure 3-3  Front and Back Views with the Optional DC Power Connectors (Four Host Ports)
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the 6140 array module and associated equipment; sufficient space to install, operate, and service the array module; and sufficient ventilation to provide a free flow of air to the array module.

Dimensions

Figure 3-4 shows the dimensions of the deskside model (top) and the rackmount model (bottom) of the 6140 array module.

![6140 Array Module Dimensions](image-url)
Weight

The total weight of the 6140 array module depends on the number of components installed. Table 3-1 shows the maximum, empty, and shipping weights for the array module in different configurations. Table 3-2 shows the weight of each component.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6140 array module, rackmount</td>
<td>Maximum(^a)</td>
</tr>
<tr>
<td></td>
<td>Empty(^b)</td>
</tr>
<tr>
<td></td>
<td>Shipping(^c)</td>
</tr>
<tr>
<td>38.5 kg (85.0 lb)</td>
<td>15.9 kg (35.0 lb)</td>
</tr>
</tbody>
</table>

\(^a\) Maximum weight indicates an array module with all of the drives and other components installed.
\(^b\) Empty weight indicates an array module with all of the components removed.
\(^c\) Shipping weight indicates the maximum weight of the array module and all shipping material.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>2.2 kg (4.9 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>3.6 kg (7.95 lb)</td>
</tr>
<tr>
<td>Battery backup</td>
<td>0.5 kg (1.2 lb)</td>
</tr>
<tr>
<td>Drive</td>
<td>0.75 kg (1.65 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 3-3 shows shipping carton dimensions for the 6140 array module. The height shown includes the height of the pallet.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.7 cm (18.0 in.)</td>
<td>62.6 cm (24.5 in.)</td>
<td>80.7 cm (31.75 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the 6140 array module, and heat and sound conditions that are generated by normal operation of the array module.

**Temperature and Humidity**

Table 3-4 shows the acceptable temperature and humidity ranges in which the 6140 array module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating range</td>
<td>Temperaturea</td>
<td>10°C to 40°C (50°F to 104°F) without the battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10°C to 35°C (50°F to 95°F) with the battery</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td>Storage range</td>
<td>Temperaturea</td>
<td>−10°C to 50°C (14°F to 122°F) without the battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>−10°C to 45°C (14°F to 113°F) with the battery (three-month maximum)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td>Transit range</td>
<td>Temperaturea</td>
<td>−40°C to 60°C (−40°F to 140°F) without the battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>−20°C to 60°C (−4°F to 140°F) with the battery (one-week maximum)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td>Relative humidity (no condensation)</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 3.3°C (1.8°F) for every 1000 m (3280 ft) above sea level.
Environmental Requirements and Specifications

Altitude

Table 3-5 shows the acceptable altitudes for operating, storing, and shipping the 6140 array module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below to 3,000 m (9,840 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below to 3,000 m (9,840 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>

Airflow and Heat Dissipation

Figure 3-5 shows the intended airflow for a rackmount model of the 6140 array module. Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for proper ventilation and heat dissipation.

The 6140 array module dissipate heat at a rate of 1571 Btu per hour (0.467 kVA or 460 W).
Acoustic Noise

Table 3-6 on page 3-8 shows the maximum sound levels emitted by the 6140 array module at 25°C (77°F).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.5 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>65 dBA</td>
</tr>
</tbody>
</table>

Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, optional DC power requirements (–48 VDC), and power cord routing instructions for the 6140 array module.

Site Wiring and Power

The 6140 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

**IMPORTANT** Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer’s documentation for specific DC power source requirements.

Consider the following information when preparing the array module’s installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

  **NOTE** *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the array modules, isolate their power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).
• **Power interruptions** – The array module can withstand the following applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

• **Power failures** – If a total power failure occurs, the array module automatically perform a power-on recovery sequence without operator intervention after power is restored.

### Power Input

The AC power source, or the optional DC power source, must provide the correct voltage, current, and frequency specified on the array module nameplate label and the serial number label.

#### AC Power Input

Table 3-7 shows the AC power limits within which the 6140 array module can run without interruption.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>115 VAC</td>
<td>230 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>3.81 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.98 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>3.96 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.06 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum surge current</td>
<td>5.52 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.72 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Typical voltage: 115 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

<sup>b</sup> Typical voltage: 230 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

Each power supply contains one 15-A slow-blow fuse.
**DC Power Input**

The DC power limits within which the 6140 array module can run without interruption include the following:

- Nominal voltage
  - Low range: –36 VDC
  - High range: –72 VDC
- Operating current: 17 A maximum

**Power Factor Correction**

Power factor correction is applied within the AC power-fan CRU of each 6140 array module, which maintains the power factor of the unit at greater than 0.96 with nominal input voltage.

**AC Power Cords and Receptacles**

The 6140 array module is shipped with two AC power cords. The AC power cords are appropriate for use in a typical outlet in the destination country. Each AC power cord connects one of the power supplies in the array module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord or a power distribution unit (PDU), you do not need the AC power cord that is shipped with the array module.

**Optional DC Power Connector Cables and Source Wires**

The 6140 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The power connector cable plugs into the DC power connector on the back of the array module (Figure 3-3 on page 3-3). The three source wires on the other end of the power connector cable connect the module to centralized DC power plant equipment, typically through a bus bar above the cabinet. A qualified service person is required to make this DC power connection. Figure 3-6 on page 3-11 shows the DC connector cable and the source wires.

Two (or optionally, four) DC power connector cables are provided with each array module. There are two DC power connectors on the back of each array module’s two DC power supplies if additional redundancy is required.
NOTE  It is not mandatory that the second DC power connection on the array module’s DC power supplies be connected. The second DC power connection is provided for additional redundancy only and may be connected to a second DC power bus.

1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green/Yellow Wire
4. DC Power Connector

Figure 3-6  Optional DC Power Connector Cable and Source Wires
FLX240 Array Module Site Preparation

This chapter provides site specifications for the FLX240 array module. Before installing the array module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.
Module Features

The FLX240 array module is a compact unit that manages high-performance storage arrays to provide storage in a Fibre Channel environment. The FLX240 array module is available in both a deskside and a rackmount model. Each FLX240 array module contains the following components:

- Two to fourteen disk drives
- One or two controllers
- Two power supplies
- Two fans

The array module is equipped with Ethernet connections that provide for out-of-band storage array management, configuration, and fault isolation (over a network separate from the storage array I/O path). The array module is also equipped with serial connections that provide for diagnostic support (with the help of a trained Customer and Technical Support representative).

Figure 4-1 shows the front and back views of the rackmount FLX240 array module.

![Figure 4-1 Front and Back Views of the Rackmount FLX240 Array Module](image-url)
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the FLX240 array module and associated equipment; sufficient space to install, operate, and service the array module; and sufficient ventilation to provide a free flow of air to the array module.

Dimensions

Figure 4-2 shows the dimensions of the deskside model (left) and the rackmount model (right) of the FLX240 array module.
Weight

The total weight of the FLX240 array module depends on the number of components installed. Table 4-1 shows the maximum, empty, and shipping weights for the array module in different configurations. Table 4-2 shows the weight of each component.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>FLX240 array module, deskside</td>
<td>54.9 kg (121 lb)</td>
</tr>
<tr>
<td>FLX240 array module, rackmount</td>
<td>42.2 kg (93 lb)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Maximum weight indicates an array module with all of the drives and other components installed.

<sup>b</sup> Empty weight indicates an array module with all of the components removed.

<sup>c</sup> Shipping weight indicates the maximum weight of the array module and all shipping material.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>2.31 kg (5.10 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.44 kg (5.39 lb)</td>
</tr>
<tr>
<td>Fan</td>
<td>1.01 kg (2.23 lb)</td>
</tr>
<tr>
<td>Drive</td>
<td>1.04 kg (2.29 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 4-3 shows shipping carton dimensions for the FLX240 array module. The height shown includes the height of the pallet.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.45 cm (17.5 in.)</td>
<td>62.23 cm (24.5 in.)</td>
<td>74.93 cm (29.5 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the FLX240 array module, and heat and sound conditions that are generated by normal operation of the array module.

Temperature and Humidity

Table 4-4 shows the acceptable temperature and humidity ranges in which the FLX240 array module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperaturea</td>
<td>Operating range</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td>Relative humidity (no condensation)</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 4-5 shows the acceptable altitudes for operating, storing, and shipping the FLX240 array module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
Airflow and Heat Dissipation

Figure 4-3 shows the intended airflow for both a deskside model and a rackmount model of the FLX240 array module. Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for proper ventilation and heat dissipation.

The FLX240 array module dissipates heat at a rate of 1289 Btu per hour (0.393 kVA or 378 W).

![Figure 4-3 FLX240 Array Module Airflow](image)

Acoustic Noise

Table 4-6 shows the maximum sound levels emitted by the FLX240 array module.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.0 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the FLX240 array module.

Site Wiring and Power

The FLX240 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Consider the following information when preparing the array module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  **NOTE**  
  *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the array module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The array module can withstand the following applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention after power is restored.
Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label. Table 4-7 shows the limits within which the FLX240 array module can run without interruption.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 VAC</td>
<td>180 to 264 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>2.50 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.33 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>3.01 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.57 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*<sup>a</sup>* Typical voltage: 115 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

*<sup>b</sup>* Typical voltage: 230 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

Each power supply contains one 10-A slow-blow fuse.

Power Factor Correction

Power factor correction is applied within the power supply-fan CRU of each FLX240 array module, which maintains the power factor of the unit at greater than 0.96 with nominal input voltage.

Power Cords and Receptacles

Each FLX240 array module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in an array module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the array module.
Module Features

The FLX240 Drive Limited array module is a compact unit that manages high-performance storage arrays to provide storage in a Fibre Channel environment. The FLX240 Drive Limited array module is available in both a deskside and a rackmount model. The FLX240 Drive Limited array module contains the following components:

- Two to fourteen disk drives
- Two controllers
- Two power supplies
- Two fans

The array module is equipped with Ethernet connections that provide for out-of-band storage array management, configuration, and fault isolation (over a network separate from the storage array I/O path). The array module is also equipped with serial connections that provide for diagnostic support (with the help of a trained Customer and Technical Support representative).

Figure 5-1 on page 5-2 shows the front and back views of the rackmount FLX240 Drive Limited array module.
Figure 5-1  Front and Back Views of the Rackmount FLX240 Drive Limited Array Module
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the FLX240 Drive Limited array module and associated equipment; sufficient space to install, operate, and service the array module; and sufficient ventilation to provide a free flow of air to the array module.

Dimensions

Figure 5-2 shows the dimensions of the deskside model (left) and the rackmount model (right) of the FLX240 Drive Limited array module.

![Figure 5-2 FLX240 Drive Limited Array Module Dimensions](image-url)
Weight

The total weight of the FLX240 Drive Limited array module depends on the number of components installed. Table 5-1 shows the maximum, empty, and shipping weights for the array module. Table 5-2 shows the weight of each component.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>FLX240 Drive Limited array module, deskside</td>
<td>54.9 kg (121 lb)</td>
</tr>
<tr>
<td>FLX240 Drive Limited array module, rackmount</td>
<td>42.2 kg (93 lb)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Maximum weight indicates an array module with all of the drives and other components installed.

<sup>b</sup> Empty weight indicates an array module with all of the components removed.

<sup>c</sup> Shipping weight indicates the maximum weight of the array module and all shipping material.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td>2.31 kg (5.10 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.44 kg (5.39 lb)</td>
</tr>
<tr>
<td>Fan</td>
<td>1.01 kg (2.23 lb)</td>
</tr>
<tr>
<td>Drive</td>
<td>1.04 kg (2.29 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 5-3 shows shipping carton dimensions for the FLX240 Drive Limited array module. The height shown includes the height of the pallet.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.45 cm (17.5 in.)</td>
<td>62.23 cm (24.5 in.)</td>
<td>74.93 cm (29.5 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the FLX240 Drive Limited array module, and heat and sound conditions that are generated by normal operation of the array module.

Temperature and Humidity

Table 5-4 shows the acceptable temperature and humidity ranges in which the FLX240 Drive Limited array module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Operating range</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td>(no condensation)</td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 5-5 shows the acceptable altitudes for operating, storing, and shipping the FLX240 Drive Limited array module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
**Airflow and Heat Dissipation**

Figure 5-3 shows the intended airflow for both a deskside model and a rackmount model of the FLX240 Drive Limited array module. Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for proper ventilation and heat dissipation.

The FLX240 Drive Limited array module dissipates heat at a rate of 1081 Btu per hour (0.320 kVA or 316 W).

![Figure 5-3 FLX240 Drive Limited Array Module Airflow](image)

**Acoustic Noise**

Table 5-6 on page 5-7 shows the maximum sound levels emitted by the FLX240 Drive Limited array module.
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the FLX240 Drive Limited array module.

Site Wiring and Power

The FLX240 Drive Limited array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Consider the following information when preparing the array module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  **NOTE**  
  
  *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the array module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The array module can withstand the following applied voltage interruptions:

  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention after power is restored.

---

Table 5-6  FLX240 Drive Limited Array Module Sound Levels

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.0 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>

---

Storage System Site Preparation Guide 5-7
Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label. Table 5-7 shows the limits within which the FLX240 Drive Limited array module can run without interruption.

Table 5-7  FLX240 Drive Limited Array Module AC Power Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 V AC</td>
<td>180 to 264 V AC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>2.44 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.27 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>2.89 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.49 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum surge current</td>
<td>4.10 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.06 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>Typical voltage: 115 V AC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.
<sup>b</sup>Typical voltage: 230 V AC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

Each power supply contains one 10-A slow-blow fuse.

Power Factor Correction

Power factor correction is applied within the power supply-fan CRU of each FLX240 Drive Limited array module, which maintains the power factor of the array module at greater than 0.96 with nominal input voltage.

Power Cords and Receptacles

Each FLX240 Drive Limited array module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in an array module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the array module.
This chapter provides site specifications for the CSM200 drive module. Before installing the drive module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.
Module Features

The CSM200 drive module is a compact deskside unit or rackmount unit that houses drives to provide storage in a Fibre Channel environment. Each CSM200 drive module contains the following components.

- Two to sixteen disk drives
- One or two environmental services monitors (ESMs)
- Two power-fan CRUs

You can order two optional DC power supplies (–48 VDC) with two fans in the power-fan CRU in place of the AC power supplies and fans.

Figure 6-1 shows the front and back views of the rackmount CSM200 drive module.
Figure 6-2 Front and Back Views of the CSM200 Drive Module with the Optional DC Power Connectors

Front View
1. Drive CRU
2. Alarm Mute Button
3. Link (Data) Rate Switch (4/2 Gb/s)

Back View
4. ESM CRU
5. Power-Fan CRU
6. AC Power Connector
7. Power Switch
8. In/Out Ports
9. Serial Port
10. In/Out Ports (Reserved for future use)
11. Tray ID/Diagnostic Display (Set automatically)
12. (Optional) Two DC Power Connectors
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the CSM200 drive module and associated equipment; sufficient space to install, operate, and service the drive module; and sufficient ventilation to provide a free flow of air to the drive module.

Dimensions

Figure 6-3 shows the dimensions of the deskside model (top) and the rackmount model (bottom) of the CSM200 drive module.
Weight

The total weight of the CSM200 drive module depends on the number of components installed. Table 6-1 shows the maximum, empty, and shipping weights for the drive module in different configurations. Table 6-2 shows the weight of each component.

Table 6-1  CSM200 Drive Module Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>CSM200 drive module, rackmount</td>
<td>38.5 kg (85.0 lb)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Maximum weight indicates a drive module with all of the components installed (fully loaded).

<sup>b</sup> Empty weight indicates a drive module with all of the components removed.

<sup>c</sup> Shipping weight indicates the maximum weight of the drive module and all shipping material.

Table 6-2  CSM200 Drive Module Component Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>0.75 kg (1.65 lb)</td>
</tr>
<tr>
<td>ESM</td>
<td>1.88 kg (4.15 lb)</td>
</tr>
<tr>
<td>Power-fan</td>
<td>3.60 kg (7.95 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 6-3 shows shipping carton dimensions for the CSM200 drive module. The height shown includes the height of the pallet.

Table 6-3  CSM200 Drive Module Shipping Carton Dimensions

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.7 cm (18.0 in.)</td>
<td>62.6 cm (24.5 in.)</td>
<td>80.7 cm (31.75 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the CSM200 drive module, and heat and sound conditions that are generated by normal operation of the drive module.

Temperature and Humidity

Table 6-4 shows the acceptable temperature and humidity ranges in which the CSM200 drive module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Operating range</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td>Relative humidity (no condensation)</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

<sup>a</sup> If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 6-5 shows the acceptable altitudes for operating, storing, and shipping the CSM200 drive module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
Airflow and Heat Dissipation

Figure 6-4 shows the intended airflow for a rackmount model of the CSM200 drive module. Allow at least 76 cm (30 in.) in front of the drive module and at least 61 cm (24 in.) behind the drive module for service clearance, proper ventilation, and heat dissipation.

The CSM200 drive module dissipates heat at a rate of 1517 Btu per hour (0.454 kVA or 444.0 W).

Acoustic Noise

Table 6-6 shows the maximum sound levels emitted by the CSM200 drive module at 25°C (77°F).

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.5 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>65 dBA</td>
</tr>
</tbody>
</table>
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, optional DC power requirements (–48 VDC), and power cord routing instructions for the CSM200 drive module.

Site Wiring and Power

The CSM200 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

IMPORTANT Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer’s documentation for specific DC power source requirements.

Consider the following information when preparing the drive module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

  **NOTE** Protective ground is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the drive module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The drive module can withstand the following applied voltage interruptions:
  
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after power is restored.
Power Input

The AC power sources or the optional DC power sources must provide the correct voltage, current, and frequency specified on the drive module nameplate label.

AC Power Input

Table 6-7 shows the AC power input limits within which the CSM200 drive module can run without interruption.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 V AC</td>
<td>180 to 264 V AC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>3.78 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.98 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>3.90 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.06 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum surge current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(16-drive spin up)</td>
<td>5.25 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.67 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Typical current: 115 V AC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

<sup>b</sup> Typical current: 230 V AC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

Each power supply contains one 15-A slow-blow fuse.

DC Power Input

The DC power limits within which the CSM200 drive module can run without interruption include the following:

- Nominal voltage
  - Low range: –36 VDC
  - High range: –72 VDC

- Operating current: 17 A maximum

Power Factor Correction

Power factor correction is applied within the AC power-fan CRU of each CSM200 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.
AC Power Cords and Receptacles

Each CSM200 drive module is shipped with two AC power cords. The AC power cords are appropriate for use in a typical outlet in the destination country. Each AC power cord connects one of the power supplies in a drive module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the drive module.

Optional DC Power Connector Cables and Source Wires

The CSM200 drive module is shipped with –48-VDC power connector cables if the DC power option is ordered. The power connector cable plugs into the DC power connector on the back of the drive module (Figure 6-2 on page 6-3). The three source wires on the other end of the power connector cable connect the drive module to centralized DC power plant equipment, typically through a bus bar above the cabinet. A qualified service person is required to make this DC power connection. Figure 6-5 shows the DC connector cable and the source wires.

Two (or optionally, four) DC power connector cables are provided with each drive module. There are two DC power connectors on the back of each drive module’s two DC power supplies if additional redundancy is required.

NOTE

It is not mandatory that the second DC power connection on the drive module’s DC power supplies be connected. The second DC power connection is provided for additional redundancy only and may be connected to a second DC power bus.

![Figure 6-5 Optional DC Power Connector Cable and Source Wires](image-url)

1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green/Yellow Wire
4. DC Power Connector
This chapter provides site specifications for the FLC200 drive module. Before installing the drive module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.
Module Features

The FLC200 drive module is a compact deskside unit or rackmount unit that houses Serial Advanced Technology Attachment (SATA) drives to provide storage in a Fibre Channel environment. Each FLC200 drive module contains the following components:

- Two to fourteen disk drives
- One or two environmental services monitors (ESMs)
- Two power supplies
- Two fans

Figure 7-1 shows the front and back views of the rackmount FLC200 drive module.

Figure 7-1  Front and Back Views of the Rackmount FLC200 Drive Module
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the drive module and associated equipment; sufficient space to install, operate, and service the drive module; and sufficient ventilation to provide a free flow of air to the unit.

Dimensions

Figure 7-2 shows the dimensions of the deskside model (left) and the rackmount model (right) of the FLC200 drive module.
Weight

The total weight of the FLC200 drive module depends on the number of components installed. Table 7-1 shows the maximum, empty, and shipping weights for the drive module in different configurations. Table 7-2 shows the weight of each component.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum(^{a})</td>
</tr>
<tr>
<td>FLC200 drive module, deskside</td>
<td>52.7 kg (116.0 lb)</td>
</tr>
<tr>
<td>FLC200 drive module, rackmount</td>
<td>40.0 kg (88.0 lb)</td>
</tr>
</tbody>
</table>

\(^{a}\)Maximum weight indicates a drive module with all of the components installed (fully loaded).
\(^{b}\)Empty weight indicates a drive module with all of the components removed.
\(^{c}\)Shipping weight indicates the maximum weight of the drive module and all shipping material.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>0.98 kg (2.15 lb)</td>
</tr>
<tr>
<td>ESM</td>
<td>1.65 kg (3.65 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.44 kg (5.39 lb)</td>
</tr>
<tr>
<td>Fan</td>
<td>1.01 kg (2.23 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 7-3 shows shipping carton dimensions for the FLC200 drive module. The height shown includes the height of the pallet.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.45 cm (17.5 in.)</td>
<td>62.23 cm (24.5 in.)</td>
<td>74.93 cm (29.5 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the FLC200 drive module, and heat and sound conditions that are generated by normal operation of the drive module.

Temperature and Humidity

Table 7-4 shows the acceptable temperature and humidity ranges in which the FLC200 drive module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Operating range</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
</tbody>
</table>

Relative humidity (no condensation)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Operating range</th>
<th>20% to 80%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 7-5 shows the acceptable altitudes for operating, storing, and shipping the FLC200 drive module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
Airflow and Heat Dissipation

Figure 7-3 shows the intended airflow for both a deskside model and a rackmount model of the FLC200 drive module. Allow at least 76 cm (30 in.) in front of the drive module and at least 61 cm (24 in.) behind the drive module for service clearance, proper ventilation, and heat dissipation.

The FLC200 drive module dissipates heat at a rate of 1078 Btu per hour (0.329 kVA or 316.0 W).

Acoustic Noise

Table 7-6 shows the maximum sound levels emitted by the FLC200 drive module.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.0 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the FLC200 drive module.

Site Wiring and Power

The FLC200 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Consider the following information when preparing the drive module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  **NOTE**  
  *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the drive module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The drive module can withstand the following applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after power is restored.
### Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label. Table 7-7 shows the limits within which the FLC200 drive module can run without interruption.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 VAC</td>
<td>180 to 264 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>2.65 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.31 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>2.78 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.43 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum surge current</td>
<td>4.00 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.03 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

a. Typical current: 115 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.
b. Typical current: 230 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

Each power supply contains one 10-A slow-blow fuse.

### Power Factor Correction

Power factor correction is applied within the power supply-fan CRU of each FLC200 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

### Power Cords and Receptacles

Each FLC200 drive module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in a drive module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the drive module.
This chapter provides site specifications for the FLA300 drive module. Before installing the drive module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.
Module Features

The FLA300 drive module is a compact deskside unit or rackmount unit that houses SATA drives to provide storage in a Fibre Channel environment. Each FLA300 drive module contains the following components:

- Two to fourteen disk drives
- One or two switched environmental services monitors (ESMs)
- Two power supplies
- Two fans

Figure 8-1 shows the front and back views of the rackmount FLA300 drive module.

Figure 8-1 Front and Back Views of the Rackmount FLA300 Drive Module
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the FLA300 drive module and associated equipment; sufficient space to install, operate, and service the drive module; and sufficient ventilation to provide a free flow of air to the drive module.

Dimensions

Figure 8-2 shows the dimensions of the deskside model (left) and the rackmount model (right) of the FLA300 drive module.

![Figure 8-2 FLA300 Drive Module Dimensions](image-url)
Weight

The total weight of the FLA300 drive module depends on the number of components installed. Table 8-1 shows the maximum, empty, and shipping weights for the drive module in different configurations. Table 8-2 shows the weight of each component.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum</td>
</tr>
<tr>
<td>FLA300 drive module, deskside</td>
<td>52.7 kg (116.0 lb)</td>
</tr>
<tr>
<td>FLA300 drive module, rackmount</td>
<td>40.0 kg (88.0 lb)</td>
</tr>
</tbody>
</table>

a. Maximum weight indicates a drive module with all of the components installed (fully loaded).
b. Empty weight indicates a drive module with all of the components removed.
c. Shipping weight indicates the maximum weight of the drive module and all shipping material.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>0.98 kg (2.15 lb)</td>
</tr>
<tr>
<td>ESM</td>
<td>1.65 kg (3.65 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.44 kg (5.39 lb)</td>
</tr>
<tr>
<td>Fan</td>
<td>1.01 kg (2.23 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 8-3 shows shipping carton dimensions for the FLA300 drive module. The height shown includes the height of the pallet.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.45 cm (17.5 in.)</td>
<td>62.23 cm (24.5 in.)</td>
<td>74.93 cm (29.5 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the FLA300 drive module, and heat and sound conditions that are generated by normal operation of the drive module.

Temperature and Humidity

Table 8-4 shows the acceptable temperature and humidity ranges in which the FLA300 drive module is designed to operate.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature(^a)</td>
<td>Operating range</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td>Relative humidity (no condensation)</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

\(^a\)If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 8-5 shows the acceptable altitudes for operating, storing, and shipping the FLA300 drive module.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
Airflow and Heat Dissipation

Figure 8-3 shows the intended airflow for both a deskside model and a rackmount model of the FLA300 drive module. Allow at least 76 cm (30 in.) in front of the drive module and at least 61 cm (24 in.) behind the drive module for service clearance, proper ventilation, and heat dissipation.

The FLA300 drive module dissipates heat at a rate of 1259 Btu per hour (0.384 kVA or 369.0 W).

![Figure 8-3 FLA300 Drive Module Airflow](image)

Acoustic Noise

Table 8-6 shows the maximum sound levels emitted by the FLA300 drive module.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.0 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the FLA300 drive module.

Site Wiring and Power

The FLA300 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Consider the following information when preparing the drive module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  **NOTE**  
  *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the drive module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The drive module can withstand the following applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after power is restored.
Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label. Table 8-7 shows the limits within which the FLA300 drive module can run without interruption.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 VAC</td>
<td>180 to 264 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>2.90 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.49 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>3.26 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.67 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum surge current</td>
<td>4.57 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.06 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Typical current: 115 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

<sup>b</sup> Typical current: 230 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

Each power supply contains one 10-A slow-blow fuse.

Power Factor Correction

Power factor correction is applied within the power supply-fan CRU of each FLA300 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

Power Cords and Receptacles

Each FLA300 drive module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in a drive module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the drive module.
FLA200 Drive Module Site Preparation

This chapter provides site specifications for the FLA200 drive module. Before installing the drive module, you must either verify that your planned installation site meets these requirements or prepare the site so that it does meet these requirements. Preparations might involve meeting area requirements, environmental requirements, and electrical requirements for module installation, service, and operation.
Module Features

The FLA200 drive module is a compact deskside unit or rackmount unit that houses drives to provide storage in a Fibre Channel environment. Each FLA200 drive module contains the following components:

- Two to fourteen disk drives
- One or two environmental services monitors (ESMs)
- Two power-fan CRUs

*Figure 9-1* shows the front and back views of the rackmount FLA200 drive module.

*Figure 9-1*  Front and Back Views of the Rackmount FLA200 Drive Module
Area Requirements

The floor space at the installation site must provide enough strength to support the weight of the FLA200 drive module and associated equipment; sufficient space to install, operate, and service the drive module; and sufficient ventilation to provide a free flow of air to the drive module.

Dimensions

Figure 9-2 shows the dimensions of the deskside model (left) and the rackmount model (right) of the FLA200 drive module.

Figure 9-2 FLA200 Drive Module Dimensions
Weight

The total weight of the FLA200 drive module depends on the number of components installed. Table 9-1 shows the maximum, empty, and shipping weights for the drive module in different configurations. Table 9-2 shows the weight of each component.

Table 9-1  FLA200 Drive Module Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum(^a)</td>
</tr>
<tr>
<td>FLA200 drive module, deskside</td>
<td>53.1 kg (117.0 lb)</td>
</tr>
<tr>
<td>FLA200 drive module, rackmount</td>
<td>40.4 kg (89.0 lb)</td>
</tr>
</tbody>
</table>

\(^a\) Maximum weight indicates a drive module with all of the components installed (fully loaded).

\(^b\) Empty weight indicates a drive module with all of the components removed.

\(^c\) Shipping weight indicates the maximum weight of the drive module and all shipping material.

Table 9-2  FLA200 Drive Module Component Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive</td>
<td>1.00 kg (2.2 lb)</td>
</tr>
<tr>
<td>ESM</td>
<td>1.59 kg (3.7 lb)</td>
</tr>
<tr>
<td>Power supply</td>
<td>2.45 kg (5.39 lb)</td>
</tr>
<tr>
<td>Fan</td>
<td>1.01 kg (2.23 lb)</td>
</tr>
</tbody>
</table>

Shipping Dimensions

Table 9-3 shows shipping carton dimensions for the FLA200 drive module. The height shown includes the height of the pallet.

Table 9-3  FLA200 Drive Module Shipping Carton Dimensions

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.45 cm (17.5 in.)</td>
<td>62.23 cm (24.5 in.)</td>
<td>74.93 cm (29.5 in.)</td>
</tr>
</tbody>
</table>
Environmental Requirements and Specifications

This section describes the environmental conditions that are prerequisite to installing the FLA200 drive module, and heat and sound conditions that are generated by normal operation of the drive module.

Temperature and Humidity

Table 9-4 shows the acceptable temperature and humidity ranges in which the FLA200 drive module is designed to operate.

Table 9-4   FLA200 Drive Module Temperature and Humidity Requirements

<table>
<thead>
<tr>
<th>Condition</th>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperaturea</td>
<td>Operating range</td>
<td>10°C to 40°C (50°F to 104°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>10°C (18°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>–10°C to 65°C (14°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>15°C (27°F) per hour</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>–40°C to 65°C (~–40°F to 149°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum rate of change</td>
<td>20°C (36°F) per hour</td>
</tr>
<tr>
<td>Relative humidity (no condensation)</td>
<td>Operating range</td>
<td>20% to 80%</td>
</tr>
<tr>
<td></td>
<td>Storage range</td>
<td>10% to 90%</td>
</tr>
<tr>
<td></td>
<td>Transit range</td>
<td>5% to 95%</td>
</tr>
<tr>
<td></td>
<td>Maximum dew point</td>
<td>26°C (79°F)</td>
</tr>
<tr>
<td></td>
<td>Maximum gradient</td>
<td>10% per hour</td>
</tr>
</tbody>
</table>

a. If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

Altitude

Table 9-5 shows the acceptable altitudes for operating, storing, and shipping the FLA200 drive module.

Table 9-5   FLA200 Drive Module Altitude Ranges

<table>
<thead>
<tr>
<th>Environment</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Storage</td>
<td>30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level</td>
</tr>
<tr>
<td>Transit</td>
<td>30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level</td>
</tr>
</tbody>
</table>
Airflow and Heat Dissipation

Figure 9-3 shows the intended airflow for both a deskside model and a rackmount model of the FLA200 drive module. Allow at least 76 cm (30 in.) in front of the drive module and at least 61 cm (24 in.) behind the drive module for service clearance, proper ventilation, and heat dissipation.

The FLA200 drive module dissipates heat at a rate of 1229 Btu per hour (0.375 kVA or 3660.0 W).

Acoustic Noise

Table 9-6 shows the maximum sound levels emitted by the FLA200 drive module.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound power</td>
<td>6.0 bels</td>
</tr>
<tr>
<td>Sound pressure</td>
<td>60 dBA</td>
</tr>
</tbody>
</table>
Electrical Requirements

This section provides information regarding site power and wiring, AC power requirements, and power cord routing instructions for the FLA200 drive module.

Site Wiring and Power

The FLA200 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Consider the following information when preparing the drive module installation site:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

  NOTE  
  *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the drive module, isolate its power source from large switching loads (such as air-conditioning motors, elevator motors, and factory loads).

- **Power interruptions** – The drive module can withstand the following applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds

- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after power is restored.
Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label. Table 9-7 shows the limits within which the FLA200 drive module can run without interruption.

Table 9-7  FLA200 Drive Module AC Power Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>90 to 136 VAC</td>
<td>180 to 264 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 to 60 Hz</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Idle current</td>
<td>2.93 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.27 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum operating current</td>
<td>3.18 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.37 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Maximum surge current</td>
<td>5.85 A&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.36 A&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Typical current: 115 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.
<sup>b</sup> Typical current: 230 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

Each power supply contains one 10-A slow-blow fuse.

Power Factor Correction

Power factor correction is applied within the power supply-fan CRU of each FLA200 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

Power Cords and Receptacles

Each FLA200 drive module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each power cord connects one of the power supplies in a drive module to an independent, external power source, such as a wall receptacle or UPS.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the power cords that are shipped with the drive module.
Index

A
AC power recovery
  6540 command module  1-8
acoustic noise
  CSM200 drive module  6-7
  FLA300 drive module  8-6
  FLC200 drive module  7-6
  FLX240 array module  4-6
  FLX240 Drive Limited array module  5-6
  FLX280 command module  2-6
  6140 array module  3-8
  6540 command module  1-7
  9170-014 drive module  9-6
airflow
  CSM200 drive module  6-7
  FLA300 drive module  8-6
  FLC200 drive module  7-6
  FLX240 array module  4-6
  FLX240 Drive Limited array module  5-6
  FLX280 command module  2-6
  6140 array module  3-8
  6540 command module  1-7
  9170-014 drive module  9-6
altitude
  CSM200 drive module  6-6
  FLA300 drive module  8-5
  FLC200 drive module  7-5
  FLX240 array module  4-5
  FLX240 Drive Limited array module  5-5
  FLX280 command module  2-5
  6140 array module  3-7
  6540 command module  1-6
  9170-014 drive module  9-5
area requirements
  CSM200 drive module  6-4
  FLA300 drive module  8-3
  FLC200 drive module  7-3
  FLX240 array module  4-3
  FLX240 Drive Limited array module  5-3
  FLX280 command module  2-3
  6140 array module  3-4
  6540 command module  1-3
  9170-014 drive module  9-3

C
CSM200 drive module
  acoustic noise  6-7
  airflow  6-7
  altitude  6-6
  area requirements  6-4
DC power option
  connector cables  6-10
  electrical requirements  6-9
  feature  6-2
  power input  6-9
  power source  6-10
  site wiring  6-8, 6-10
  source wires  6-10
dimensions  6-4
electrical requirements  6-8
environmental requirements  6-6
features  6-2
heat dissipation  6-7
humidity  6-6
power  6-8
power cords  6-10
power factor correction  6-9
power input  6-9
power receptacles  6-10
shipping dimensions  6-5
site wiring  6-8
specifications  6-6
temperature  6-6
weight  6-5

D
DC power option
  CSM200 drive module
    connector cables  6-10
    electrical requirements  6-8
    feature  6-2
power input 6-9
power source 6-8
site wiring 6-8
source wires 6-10
6140 array module
connector cables 3-10
electrical requirements 3-8
feature 3-1
power input 3-10
power source 3-8
site wiring 3-8
source wires 3-10
dimensions
CSM200 drive module 6-4
FLA300 drive module 8-3
FLC200 drive module 7-3
FLX240 array module 4-3
FLX240 Drive Limited array module 5-3
FLX280 command module 2-3
6140 array module 3-4
6540 command module 1-3
9170-014 drive module 9-3

E
-electrical requirements
  CSM200 drive module 6-8
    DC power option 6-8
  FLA300 drive module 8-7
  FLC200 drive module 7-7
  FLX240 array module 4-7
  FLX240 Drive Limited array module 5-7
  FLX280 command module 2-7
  6140 array module 3-8
    DC power option 3-8
  6540 command module 1-7
  9170-014 drive module 9-7
-environmental requirements
  CSM200 drive module 6-6
  FLA300 drive module 8-5
  FLC200 drive module 7-5
  FLX240 array module 4-5
  FLX240 Drive Limited array module 5-5
  FLX280 command module 2-5
  6140 array module 3-6
  6540 command module 1-5
  9170-014 drive module 9-5

F
-features
  CSM200 drive module 6-2
  FLA300 drive module 8-2
  FLC200 drive module 7-2
  FLX240 array module 4-2
  FLX240 Drive Limited array module 5-1
  FLX280 command module 2-1
  6140 array module 3-1
  6540 command module 1-1
  9170-014 drive module 9-2

FLA300 drive module
  acoustic noise 8-6
  airflow 8-6
  altitude 8-5
  area requirements 8-3
  dimensions 8-3
  electrical requirements 8-7
  environmental requirements 8-5
  features 8-2
  heat dissipation 8-6
  humidity 8-5
  power 8-7
  power cords 8-8
  power factor correction 8-8
  power input 8-8
  power receptacles 8-8
  shipping dimensions 8-4
  site wiring 8-7
  specifications 8-5
  temperature 8-5
  weight 8-4

FLC200 drive module
  acoustic noise 7-6
  airflow 7-6
  altitude 7-5
  area requirements 7-3
  dimensions 7-3
  electrical requirements 7-7
  environmental requirements 7-5
  features 7-2
  heat dissipation 7-6
  humidity 7-5
  power 7-7
  power cords 7-8
power factor correction 7-8
power input 7-8
power receptacles 7-8
shipping dimensions 7-4
site wiring 7-7
specifications 7-5
temperature 7-5
weight 7-4
FLX240 array module
acoustic noise 4-6
airflow 4-6
altitude 4-5
area requirements 4-3
dimensions 4-3
electrical requirements 4-7
environmental requirements 4-5
features 4-2
heat dissipation 4-6
humidity 4-5
power 4-7
power cords 4-8
power factor correction 4-8
power input 4-8
power receptacles 4-8
shipping dimensions 4-4
site wiring 4-7
specifications 4-5
temperature 4-5
weight 4-4

FLX240 Drive Limited array module
acoustic noise 5-6
airflow 5-6
altitude 5-5
area requirements 5-3
dimensions 5-3
electrical requirements 5-7
environmental requirements 5-5
features 5-1
heat dissipation 5-6
humidity 5-5
power 5-7
power factor correction 5-8
power input 5-8
shipping dimensions 5-4
site wiring 5-7
specifications 5-5
temperature 5-5
weight 5-4

FLX280 command module
acoustic noise 2-6
airflow 2-6
altitude 2-5
area requirements 2-3
dimensions 2-3
electrical requirements 2-7
environmental requirements 2-5
features 2-1
heat dissipation 2-6
humidity 2-5
power 2-7
power cords 2-8
power factor correction 2-8
power input 2-8
power receptacles 2-8
shipping dimensions 2-8
site wiring 2-7
specifications 2-5
temperature 2-5
weight 2-4

H
heat dissipation
CSM200 drive module 6-7
FLA300 drive module 8-6
FLC200 drive module 7-6
FLX240 array module 4-6
FLX240 Drive Limited array module 5-6
FLX280 command module 2-6
6140 array module 3-7
6540 command module 1-6
9170-014 drive module 9-6
humidity
CSM200 drive module 6-6
FLA300 drive module 8-5
FLC200 drive module 7-5
FLX240 array module 4-5
FLX240 Drive Limited array module 5-5
FLX280 command module 2-5
6140 array module 3-6
6540 command module 1-5
9170-014 drive module 9-5
P
power
  CSM200 drive module 6-8
  DC power option 6-2
  FLA300 drive module 8-7
  FLC200 drive module 7-7
  FLX240 array module 4-7
  FLX240 Drive Limited array module 5-7
  FLX280 command module 2-7
  6140 array module 3-8
  6140 array module, DC power option 3-1
  6540 command module 1-7
  9170-014 drive module 9-7
power connectors
  DC power option
    CSM200 drive module 6-10
    6140 array module 3-10
power cords
  CSM200 drive module 6-10
  FLA300 drive module 8-8
  FLC200 drive module 7-8
  FLX240 array module 4-8
  FLX240 Drive Limited array module 5-8
  FLX280 command module 2-8
  6540 command module 1-8
  9170-014 drive module 9-8
power factor correction
  CSM200 drive module 6-9
  FLA300 drive module 8-8
  FLC200 drive module 7-8
  FLX240 array module 4-8
  FLX240 Drive Limited array module 5-8
  FLX280 command module 2-8
  6140 array module 3-10
  9170-014 drive module 9-8
power input
  CSM200 drive module 6-9
  FLA300 drive module 8-8
  FLC200 drive module 7-8
  FLX240 array module 4-8
  FLX240 Drive Limited array module 5-8
  FLX280 command module 2-8
  6140 array module 3-9
  9170-014 drive module 9-8

S
shipping dimensions
  CSM200 drive module 6-5
  FLA300 drive module 8-4
  FLC200 drive module 7-4
  FLX240 array module 4-4
  FLX240 Drive Limited array module 5-4
  FLX280 command module 2-4
  6140 array module 3-5
  6540 command module 1-4
  9170-014 drive module 9-4
site wiring
  CSM200 drive module 6-8
  FLA300 drive module 8-7
  FLC200 drive module 7-7
  FLX240 array module 4-7
  FLX240 Drive Limited array module 5-7
  FLX280 command module 2-7
  6140 array module 3-8
  6540 command module 1-7
  9170-014 drive module 9-7
specifications
  CSM200 drive module 6-6
  FLA300 drive module 8-5
  FLC200 drive module 7-5
  FLX240 array module 4-5
  FLX240 Drive Limited array module 5-5
  FLX280 command module 2-5
  6140 array module 3-6
  6540 command module 1-5
  9170-014 drive module 9-5

T
temperature
  CSM200 drive module 6-6
FLA300 drive module 8-5
FLC200 drive module 7-5
FLX240 array module 4-5
FLX240 Drive Limited array module 5-5
FLX280 command module 2-5
6140 array module 3-6
6540 command module 1-5
9170-014 drive module 9-5

W
weight
CSM200 drive module 6-5
FLA300 drive module 8-4
FLC200 drive module 7-4
FLX240 array module 4-4
FLX240 Drive Limited array module 5-4
FLX280 command module 2-4
6140 array module 3-5
6540 command module 1-4
9170-014 drive module 9-4

Numerics
6140 array module
acoustic noise 3-8
airflow 3-7
altitude 3-7
area requirements 3-4
DC power option
connector cables 3-10
electrical requirements 3-10
feature 3-1
power input 3-10
power source 3-10
site wiring 3-8
source wires 3-10
dimensions 3-4
electrical requirements 3-8
environmental requirements 3-6
features 3-1
heat dissipation 3-7
humidity 3-6
power 3-8
power factor correction 3-10
power input 3-9

shipping dimensions 3-5
site wiring 3-8
specifications 3-6
temperature 3-6
weight 3-5

6540 command module
AC power recovery 1-8
acoustic noise 1-7
airflow 1-6
altitude 1-6
area requirements 1-3
dimensions 1-3
electrical requirements 1-7
environmental requirements 1-5
features 1-1
heat dissipation 1-6
humidity 1-5
power 1-7
power cords 1-8
power receptacles 1-8
shipping dimensions 1-4
site wiring 1-7
specifications 1-5
temperature 1-5
weight 1-4

9170-014 drive module
acoustic noise 9-6
airflow 9-6
altitude 9-5
area requirements 9-3
dimensions 9-3
electrical requirements 9-7
environmental requirements 9-5
features 9-2
heat dissipation 9-6
humidity 9-5
power 9-7
power cords 9-8
power factor correction 9-8
power input 9-8
power receptacles 9-8
shipping dimensions 9-4
site wiring 9-7
specifications 9-5
temperature 9-5
weight 9-4