StorNext M660 Site Planning Guide

The StorNext M660 Metadata Appliance combines the high-performance, heterogeneous software file sharing and tiered, vendor-agnostic archiving benefits found in Quantum's StorNext data management software with the simplicity of purpose-built hardware.

The StorNext M660 Metadata Appliance is offered in four models: M661, M662, M661XL, and M662XL.

This guide provides an overview of site characteristics, physical requirements, and environmental specifications essential for the installation of the StorNext M660 Metadata Appliance.

Note: Content in this document applies to both Lattus and non-Lattus systems unless otherwise noted.

Included with the StorNext M660

The StorNext M660 is fully configured and pre-tested in the factory. Each StorNext M660 system comes with an accessory kit containing rack-mount hardware and the *StorNext M660 User Essentials* document.

The StorNext M660 comes factory-installed with the following:

- One High Availability License for each MDC node
- 10 SAN Client (any OS) Licenses for each MDC node
- One StorNext Gateway License for each MDC node
- One Distributed Data Mover (DDM) License for the secondary MDC node (supported on the standby MDC node)

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Professional Installation Requirements

The StorNext M660 Metadata Appliance requires onsite professional installation via Quantum or via a trained Quantum ASSP partner. The two StorNext Installation order part numbers are:

| Part Number | Description |
|-----------------|--|
| SSP6H-NSYN-000x | Quantum StorNext M660 Metadata Appliance Initial Onsite Installation and Configuration |
| SSP6H-NSYN-000x | Quantum StorNext M660 Metadata Appliance and Expansion Unit, Initial Onsite Installation & Configuration |

For more information about the ASSP program, see <u>Quantum ASSP Program</u> on page 22.

Site Requirements

Quantum installation must be purchased with the StorNext M660.

Installation sites will need the following:

- A Storage Area Network (SAN) array compatible with QLogic 8 Gb Fibre Channel HBA
- A compatible SAN switch
- A standard 19-inch rack
- Power outlet compatibility with North American type NEMA 5-15P plugs or European CEE 7/7 plugs, or NEMA C13/14 if plugging into a rack power distribution unit (PDU).
- 100-240 VAC, 50-60 HZ
 - A base system can draw up to:
 - 9.4 A at 100 VAC
 - 4.0 A at 240 VAC
 - With an expansion unit, can draw up to:
 - 12.3 A at 100 VAC
 - 5.1 A at 240 VAC

Shipping Information

The StorNext M660 ships on a pallet.

- When packaged, the base system weighs a total of 250.2 lbs (113.5 kg).
- When packaged, the base system and expansion unit weigh a total of 325.2 lbs (147.5 kg).

Note: The optional metadata expansion unit (purchased separately) ships in a box measuring 31 x 24 x 10 in (79 x 61 x 25 cm) and weighs 75 lbs (34 kg).

StorNext M660 System Components

The StorNext M660 system consists of two MDC nodes, a metadata array, and an optional metadata expansion unit (see <u>Figure 1</u> and <u>Figure 2</u>).

Figure 1 StorNext M660 System Components (Base System)



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Figure 2 StorNext M660 System Components (Base System with Expansion)



To see the front view of the MDC Nodes and the metadata array storage, see Figure 3 and Figure 4 on page 6.



System Software

Empty Drive Slots

| ltem | Indicators, Button, or Connector | lcon | Description |
|------|-------------------------------------|------|--|
| 1 | Power-on indicator/ power button | Ċ | The power-on indicator lights when the system power is on. The power button controls the power supply output to the system. When the system bezel is installed, the power button is not accessible. Note: To perform a graceful shutdown, press and release the power button. Note: To force an ungraceful shutdown, press and hold the power button for 5 seconds. |
| 2 | System identification button | 0 | The identification buttons on the front and back panels can be used to locate a particular system within a rack. When one of these buttons is pushed, the LCD panel on the front and the blue system status indicator on the back blink until one of the buttons is pushed again. |
| 3 | LCD menu buttons | | Allow you to navigate the control panel LCD menu |

| ltem | Indicators, Button, or Connector | lcon | Description |
|------|-------------------------------------|--------|--|
| 4 | LCD panel | | Provides system ID, status information, and system error messages |
| | | | The LCD lights blue during normal system operation. The LCD lights amber when the system needs attention, and the LCD panel displays an error code followed by descriptive text. |
| | | | Note: If the system is connected to AC power and an error has been detected, the LCD lights amber, regardless of whether the system has been powered on. |
| 5 | USB connectors (2) | ● ↓ | Connect USB devices to the system (USB 2.0 compliant) |
| 6 | System service tag pull tab | | A slide-out panel for system information including the Express Service tag, embedded NIC MAC address, and iDRAC Enterprise card MAC address |
| 7 | Optical drive | | SATA optical DVD drive |

Figure 4 StorNext M660 Metadata Storage (Front View)



StorNext M660 Metadata Appliance Network Ports The number of customer-facing network ports depends on the model type. By default, each M660 model ships with two bonded network interfaces: Bond 0 and Bond 1. All ports are customer-configurable. Instructions for changing the default configuration are located in the "Step 3 - System" section of the *StorNext Configuration Wizard* chapter in the current *StorNext User's Guide*.

<u>Figure 5</u> shows the eleven 1 GbE customer-facing Ethernet ports on the StorNext M661 and M661XL. Each customer-facing port is numbered and color-coded by function as described in <u>Table 1</u> on page 8.

Figure 5 StorNext M661 and M661XL Network Ports

| | | 2 3 4 5 6 7 2 1 1 1 1 1 1 1 1 1 1 | B | |
|----------|------------|--|---|--|
| A | 1 8 9 B | | B | |

The default StorNext M661 and M661XL network interface configuration is as follows:

- Two interfaces, Eth2 and Eth3, are bonded together by default into bond0 for the Metadata network. This bond can be broken in the GUI and the Service menu. When not bonded, Eth2 will be configured as a standalone port, and Eth3 will be deconfigured and not used by the system.
- Two interfaces, Eth1 and Eth4, are bonded together into bond1 for GUI/ management. This bond can be broken in the GUI and the Service Menu. When not bonded, Eth1 will be configured as a standalone port and Eth4 will be deconfigured and not used by the system.
- The remaining seven ports can be configured through the GUI in various combinations and bonds for gateway port access.

<u>Table 1</u> identifies the logical port configuration, port function and default bonding for the StorNext M661 and M661XL.

Table 1 StorNext M661 andM661XL NetworkConfiguration

| Ethernet Port Number | Logical Ethernet Port Number | Physical Port Location | Port Function | Bond |
|----------------------------|------------------------------------|---------------------------|--|---|
| D | N/A | iDRAC Port | Service | N/A |
| S | eth0 | Integrated Port 1 | Service | N/A |
| 1 | eth1 | Integrated Port 2 | GUI and Management (Configurable from Service Menu) | Bond 1 When not bonded, eth1 is usable and eth4 is not usable |
| 2 | eth2 | Slot 2, Port 1 | Metadata (Configurable from | When not bonded, eth2 is usable and eth3 is not usable |
| 3 | eth3 | Slot 2, Port 2 | Service Menu) Bond 0 When not bonded, etl | Bond 0 When not bonded, eth3 is not used |
| 4 | eth4 | Slot 2, Port 3 | GUI and Management (Configurable from Service Menu) | Bond 1 When not bonded, eth4 is not used |
| 5 | eth5 | Slot 2, Port 4 | | |
| 6 | eth6 | Slot 2, Port 5 | | |
| 7 | eth7 | Slot 2, Port 6 | | |
| 8 | eth8 | Slot 1, Port 1 | Gateway | User Configurable from GUI |
| 9 | eth9 | Slot 1, Port 2 | | |
| 10 | eth10 | Slot 1, Port 3 | | |
| 11 | eth11 | Slot 1, Port 4 | | |

Figure 6 shows the two 10 GbE and seven 1 GbE customer-facing Ethernet ports on the StorNext M662 and M662XL. Each customer-facing port is numbered and color-coded by function as described in Table 2 on page 10.

Figure 6 StorNext M662 and M662XL Network Ports



StorNext M662, M662XL or M665 SSD network ports

- Two interfaces, Eth2 and Eth3, bonded together into bond0 for the Metadata network. This bond can be broken in the GUI and the **Service Menu**. When not bonded, Eth2 will be configured as a standalone port and Eth3 will be deconfigured and not used by the system.
- Two interfaces, Eth1 and Eth4, are bonded together into bond1 for GUI/ management. This bond can be broken in the GUI and the Service Menu. When not bonded, Eth1 will be configured as a standalone port and Eth4 will be deconfigured and not used by the system.
- The remaining ports may be configured through the GUI in various combinations and bonds for gateway port access.
- For non-Lattus systems, the two 10 GbE ethernet ports, Eth8 and Eth9 may be used for high-speed LAN Client connectivity when the M662 and M662XL are enabled for use as a Gateway system. These may be set as bonded or not bonded in the StorNext GUI.

For Lattus Systems

 For Lattus systems, the two 10 GbE ethernet ports, Eth8 and Eth9 are used to connect the M662 and M662XL to the Lattus Interconnect switch. These may be set as bonded or not bonded in the StorNext GUI.

Note: For Lattus systems ONLY: You cannot bond Eth8 and Eth9 10 GbE ports when using the Lattus interconnect switch, which doesn't support bonding.

• The remaining ports, Eth5 through Eth7, are not used in Lattus systems. They can be bonded together into a single bond (bond2), and, in non-Lattus systems, can be configured via the GUI in various combinations and bonds for gateway port access.

<u>Table 2</u> identifies the logical port configuration, port function and default bonding for the StorNext M662 and M662XL.

Table 2 StorNext M662, M662XL or M665 SSD Network Configuration

| Ethernet Port Number | Logical Ethernet Port Number | Physical Port Location | Port Function | Bond |
|----------------------------|------------------------------------|-----------------------------------|--|--|
| D | N/A | iDRAC Port | Service | NZA |
| S | eth0 | Integrated Port 1 | Scivice | N/A |
| 1 | eth1 | Integrated Port 2 | GUI and Management (Configurable from Service Menu) | Bond 1 When not bonded, eth1 is usable and eth4 is not usable |
| 2 | eth2 | Slot 2, Port 1 | Metadata (Configurable from | Bond O When not bonded, eth2 is usable |
| 3 | eth3 | Slot 2, Port 2 | Service Menu) | and eth3 is not usable. |
| 4 | eth4 | Slot 2, Port 3 | GUI and Management (Configurable from Service Menu) | Bond 1 - When not bonded, eth1 is usable and eth4 is not usable. |
| 5 | eth5 | Slot 2, Port 4 | Gateway (Non-Lattus Systems) | |
| 6 | eth6 | Slot 2, Port 5 | Not Used (Lattus Systems) | |
| 7 | eth7 | Slot 2, Port 6 | Not osed (Editos Systems) | |
| 8 | eth8 | Slot 1, Port 1 (10 GbE) | Lattus Public Network Interconnect 1 (Lattus Systems) Gateway (Non-Lattus Systems) | Can be bonded or not bonded - when not bonded, both ports are usable. Gateway and Lattus are User Configurable from |
| 9 | eth9 | Slot 1, Port 2 (10 GbE) | OR SMB or NFS (NAS Systems) Lattus Public Network Interconnect 2 (Lattus Systems) | the StorNext GUI; NAS Access is enabled from the Service Menu and Configurable from the NAS CLI |

Note: For detailed information on M660 SAN, SAS, and Lattus cabling, see the current *StorNext M660 Metadata Appliance Hardware Guide*.

StorNext M660 Specifications

This section outlines environmental specifications including EMI certification, power ratings, shock and vibration data, and other general StorNext M660 Metadata appliance specifications.

EMI Certification

This product is certified under the regulatory model name E19S.

| Appliance | |
|---------------------------------|---|
| Hardware | 6U for base system, and 8U with expansion unit. Dual metadata controllers (MDCs) with automatic failover One dedicated metadata array |
| Software included in base price | 10 File System SAN client licenses for each MDC node One High Availability license for each MDC node One StorNext Gateway with unlimited DLC clients for each MDC node Distributed Data Mover (DDM) license for secondary MDC node |
| Hardware reliability | Dual metadata controllers with automatic failover Redundant power supplies Redundant cooling fans Automated SAS I/O path failover Two hot spare drives in the metadata storage 4 GB mirrored RAID battery-backed cache Two drives: RAID 1 for metadata and boot disks |

| Appliance Software Environment | | |
|--------------------------------|---|--|
| StorNext version | Initial release: StorNext 4.3.1 | |
| Number of user file systems | M661 and M662: Four with the base unit, and eight with the expansion unit M661XL and M662XL: Eight with the base unit, and sixteen with the expansion unit | |
| Client OS support | Linux, Windows, AIX, HP-UX, UNIX, Solaris, and Mac OS | |

-

| Appliance Physical Characteristics | | |
|------------------------------------|--|--|
| Width (side to side) | 17.7 in (45 cm) | |
| Depth (front to back) | 26.8 in (68.1 cm) | |
| Height | For the base unit, 10.5 in (26.7 cm) For the expansion unit, 14.0 in (35.2 cm) | |
| Weight (standalone) | Each MDC node weighs 37.3 lbs (16.9 kg). The Metadata Array weighs 58.6 lb (26.6 kg). The Expansion Unit weighs 57 lb (25.9 kg). | |

| Appliance Cables | |
|--------------------|---|
| Ethernet | For the StorNext M661 and M661XL, 22 Ethernet cables with RJ45 connectors |
| | For the StorNext M662 and M662XL with optical, 4 optical Ethernet cables with LC connectors, and 14 Ethernet cables |
| | For the StorNext M662 and M662XL with Twinax copper, 4 Twinax Copper Ethernet cables with SFP+ connectors, and 14 Ethernet cables |
| Fibre Channel (FC) | 8 optical Fibre Channel cables with LC connectors |
| SAS | For StorNext M660 base, 4 SAS cables for metadata array to MDC node cabling. |
| | For StorNext M660 expansion, 2 SAS cables for metadata expansion to metadata array cabling. |

| Electrical per MDC Node | |
|------------------------------|--|
| North American power | Two NEMA 5-15P power cords |
| | Two NEMA c13 to C14 power cords (rack power) |
| European power | Two CEE 7/7 power cords |
| | • Two NEMA c13 to C14 power cords (rack power) |
| Input voltage | 100 to 240 VAC |
| Frequency | 50 to 60 Hz |
| Rated current | 10.0 - 5.0 amps |
| Operating current | 3.1 - 1.3 amps |
| Maximum power consumption | 295 watts |

| Customer-facing Ports, Per MDC Node | |
|-------------------------------------|--|
| Fibre Channel I/O | Four 8 Gb Fibre Channel ports |
| Ethernet I/O | For the StorNext M661 and M661XL, eleven 1 GbE ports |
| | For the StorNext M662 and M662XL, two 10 GbE ports and seven 1 GbE ports |

| Electrical per Metadata Array | | |
|-------------------------------|--|--|
| North American power | Two NEMA 5-15P power cords Two NEMA c13 to C14 power cords (rack power) | |
| European power | Two CEE 7/7 power cords Two NEMA c13 to C14 power cords (rack power) | |
| Input voltage | 100 to 240 VAC | |
| Frequency | 50 to 60 Hz | |
| Rated current | 7.0 – 2.9 amps | |
| Operating current | 3.6 - 1.5 amps | |
| Maximum power consumption | 347 watts | |

| Metadata Array and Metadata Expansion Unit | |
|--|--|
| Array chassis | 2U chassis with 24 2.5"-slots |
| Array drives | Twenty-four 2.5" SAS drives |
| RAID configuration | RAID 1 array, plus two hot spares |
| Metadata & Journal | Each file system is stored on dedicated RAID 1 stripe |
| SAS I/O | For the metadata array, two SAS controllers with two 6 Gb SAS connections each |
| | For the metadata expansion unit, two ESM cannisters with two 6 Gb SAS connections each |

| Electrical per Metadata Expansion Unit | |
|--|--|
| North American power | Two NEMA 5-15P power cords Two NEMA c13 to C14 power cords (rack power) |
| European power | Two CEE 7/7 power cords Two NEMA c13 to C14 power cords (rack power) |
| Input voltage | 100 to 240 VAC |

| Electrical per Metadata Expansion Unit | |
|--|----------------|
| Frequency | 50 to 60 Hz |
| Rated current | 7.0 – 2.9 amps |
| Operating current | 2.8 - 1.2 amps |
| Maximum power consumption | 270 watts |

| Electrical per Base System | |
|------------------------------|----------------|
| Input voltage | 100 to 240 VAC |
| Frequency | 50 to 60 Hz |
| Operating current | 9.4 - 4.0 amps |
| Maximum power consumption | 939 watts |

| Electrical per Base System and Expansion Unit | |
|---|------------------|
| Input voltage | 100 to 240 VAC |
| Frequency | 50 to 60 Hz |
| Operating current | 12.3 - 5.1 amps |
| Maximum power consumption | 1209 watts |
| Maximum inrush current | 29.4 - 12.2 amps |

| Climatic Environment | |
|----------------------|---|
| Temperature | Operating: 50 °F to 95 °F (10 °C to 35 °C) with a maximum temperature gradation of 10 °C per hour |
| | Note: 35 °C (95 °F) is the maximum temperature for the StorNext M660 at sea level. For altitudes above 2,950 ft (899.2 m), decrease the operating temp 0.9 °C for every 1,000 ft (304.8 m) of altitude. |
| | Shipping and Storage: -4 °F to 140 °F (-20 °C to 60 °C) |
| Relative Humidity | Operating: 20% to 80%, non-condensing |
| | Shipping and Storage: 5% to 95%, non- condensing |
| Altitude | • Operating: -50 ft to 10,000 ft (-16 m to 3,048 m) |
| | Shipping and Storage: -50 ft to 35,000 ft (-16 m to 10,600 m) |
| Heat | Base System Operating BTUs: 3205 BTUs |
| | Base and Expansion System Operating BTUs: 4127 BTUs |

| Shock and Vibration | |
|---------------------|--|
| Maximum Vibration | Operational: 0.26 G's random vibration, 5 to 350 Hz |
| | Non-operational: 0.5 G's random vibration, 5 to 350 Hz |
| Maximum Shock | Operational: 2 G's for 11ms, 1/2 sine Non-operational: 3.5 G's for 11ms, 1/2 sine |

| Acoustic | |
|-----------|---|
| Operating | Sound pressure level 72 dBA maximum, any operation position |

| EMC/Safety/Immunity Standards | Quantum conforms to the latest version of the following standards: |
|----------------------------------|---|
| | Emissions and Safety • CNS 13438 Class A • CISPR 22 Class A • EN55022 Class A • FCC Part 15 Class A/ICES-003 Class A • VCCI Class A • KN22 Class A • AS/NZS 3548 |
| | Safety • IEC 60950-1 • UL60950-1/CSA 60950-1 • SABS IEC 60950 |
| | Immunity EN55024/KN24: EN 61000-3-2 - Harmonic current emissions test EN 61000-3-3 - Voltage fluctuations and flicker in low-voltage supply systems test |

EMC/Safety/Immunity Compliance Standards

Selecting an Installation Location

When choosing an installation site for the StorNext M660 system, consider the following requirements:

- <u>Rack Space Requirements</u>
- Internal Rack Dimensions on page 19
- Supported Rack Rail Hole Types on page 19
- <u>Component Weights</u> on page 20
- <u>Clearance Information</u> on page 20

| Rack Space Requirements | This section provides information about the rack space requirements, and specific details about the StorNext M660 components and configuration options. |
|----------------------------|---|
| | A base StorNext M660 system occupies 6U of rack space and should be racked with the metadata array between the two MDC nodes, as shown in <u>Figure 7</u> on page 18. |
| | The StorNext M660, with the optional expansion unit, requires 8U of rack space and should be racked with the metadata expansion unit above MDC node 2 (the bottom node), and the metadata array racked below MDC node 2 (the top node), as shown in <u>Figure 8</u> on page 19. |

Note: If capacity expansion is a possibility, consider leaving 2U of rack space open above the bottom system node.

Selecting an Installation Location

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Figure 7 Rack Configuration for Base StorNext M660 System



Figure 8 Rack Configuration of StorNext M660 with Expansion



Internal Rack Dimensions

The minimum rack space required for the StorNext M660 follows:

- Width 19 inches (48.3 cm)
- Depth 28.4 inches (72.06 cm)
- Height 6U (8U with optional Metadata Expansion Unit, shown in Figure 8.)

Supported Rack Rail Hole Types

- 10-32/M5 Mounting Hardware Supported
- Square Holes
- Circular Through Holes (un-threaded)

Component Weights

The out-of-box weight of the following components are:

- MDC Nodes 37.3 lbs (16.9 kg) each
- Metadata Storage Metadata Array 58.6 lb (26.6 kg); Expansion Unit 57 lb (25.9 kg)

Clearance Information

For proper air flow, the following clearances are required for the front and back of the StorNext M660 system:

- Doors removed 6.5 inches (16.5 cm)
- Doors installed Front and Back: 23 inches (58.4 cm)

Service and Warranty

| StorNext M660 customers may choo or a warranty uplift that offers exter support. All add-on StorNext software featur | ose to purchase additional years of Bronze support, nded hours and more comprehensive on-site |
|--|---|
| All add-on StorNext software featur | |
| level of the StorNext M660; similarly terminate with the StorNext M660 s the same for all components. | es must be purchased with the equivalent service y, all add-on StorNext software licenses must co- service contract, so that the termination dates are |
| For questions about support or cove Quantum customer support. | erage in any of the Quantum service zones, contact |
| Warranty coverage or uplifts may ne Quantum representative for more ir and service coverage that is availabl | ot be available in all areas. Please contact your local nformation concerning areas and type of warranty e. |
| The StorNext M660 includes one years support plans are also available—ar | ar of Bronze Support as a product warranty. Uplift nd advisable: |
| Next Business Day Gold: 7x24xN | IBD on-site hardware repair |
| Gold Support: 7x24x4hr on-site | hardware repair |
| • Extension of Bronze: 5x9xNBD c | on-site hardware repair |
| Service renewal prices are the same as the initial prices and are sold on an annual basis | |
| All add-on StorNext software featur level of the StorNext M660; similarly terminate with the StorNext M660 s the same for all components. | es must be purchased with the equivalent service y, all add-on StorNext software licenses must co- service contract, so that the termination dates are |
| Equivalent service levels between St are: | orNext Software and the StorNext M660 appliance |
| Software Service Levels | StorNext M660 Service Levels |
| Silver (5x9 telephone) | Bronze (5x9xNBD on-site) |
| Gold (7x24 telephone) | Next Business Day Gold (7x24x4hr on-site) |
| | An dut on StorNext M660; similarly terminate with the StorNext M660 is the same for all components. For questions about support or cover Quantum customer support. Warranty coverage or uplifts may nee Quantum representative for more in and service coverage that is available. The StorNext M660 includes one years support plans are also availablear • Next Business Day Gold: 7x24xM • Gold Support: 7x24x4hr on-site • Extension of Bronze: 5x9xNBD or Service renewal prices are the same All add-on StorNext M660; similarly terminate with the StorNext M660 is the same for all components. Equivalent service levels between Stare: Silver (5x9 telephone) Gold (7x24 telephone) |

Warranty coverage or service uplifts may not be available in all areas. Contact your Quantum representative for information concerning available warranty and service coverage.

Installation and Integration Services

Installation and integration of the StorNext M600 Metadata Appliance will be performed by Quantum Professional Services or a Quantum Authorized Software Service Provider (ASSP). Phone support for the installation process is available via the Quantum or ASSP support number for your area. Quantum World Wide phone support is as follows:

Americas:

800-284-5101 (toll free) or 949-725-2100

Europe, Middle East and Africa:

00800-4-782-6886 (toll free) or +49 6131 3241 1164

Asia Pacific:

+800 7826 8887 (toll free) or +603 7953 3010

Quantum ASSP Program The Quantum Authorized Software Service Provider (ASSP) program has been extended to cover both StorNext software as well as the StorNext M660 Metadata Appliance. Quantum ASSP partners will be eligible to offer first tier support on the StorNext M660 once they've been trained and certified on the StorNext M660 product.

Quantum ASSP partners who have been trained on the installation and configuration of the StorNext M660 may also choose to offer their own professional onsite installation services for the StorNext M660 product.

For inquiries about the Quantum ASSP program for StorNext, contact your local Quantum representative.

StorNext M660 Documents

For the complete list of documentation for the StorNext M660 Metadata Appliance, click the **Documentation** tab on the following web page:



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For assistance, contact the Quantum Customer Support Center: USA: 1-800-284-5101 (toll free) or +1-720-249-5700 EMEA: +800-7826-8888 (toll free) or +49-6131-3241-1164 APAC: +800-7826-8887 (toll free) or +603-7953-3010 Worldwide: http://www.quantum.com/ServiceandSupport

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About Quantum

Quantum is a proven global expert in Data Protection and Big Data management, providing specialized storage solutions for physical, virtual and cloud environments. From small businesses to major enterprises, more than 50,000 customers trust Quantum to help maximize the value of their data by protecting and preserving it over its entire lifecycle. With Quantum, customers can Be Certain they're able to adapt in a changing world—keeping more data longer, bridging from today to tomorrow, and reducing costs. See how at www.quantum.com/BeCertain.

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