

NetCache™ Appliance C3100/C6100 Series Hardware Guide

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Preface

About this guide

This guide describes how to install a C3100/C6100 series NetCache™ appliance, connect it to the network, and start up the system.

Audience

This guide is for qualified system administrators and service personnel who are familiar with NetCache appliances. The procedures in this guide describe replacement, upgrade, and maintenance tasks for personnel with the following skills and experience:

- ◆ Working familiarity with small computer system hardware and operation
- ◆ Basic understanding of common networking concepts and practices
- ◆ Working familiarity with accepted tools and procedures for installing and operating sensitive electronic equipment

Terminology

This guide uses the following terms:

- ◆ *C3100/C6100* refers to a C3100/C6100 series NetCache appliance.
- ◆ *C3100/C6100 series system* refers, at a minimum, to a C3100/C6100 series NetCache appliance and a connected Fibre Channel disk storage shelf.
- ◆ *Disk shelf* refers to any Fibre Channel disk shelf.
- ◆ A *loop* consists of the C3100/C6100 connected to one or more disk shelves.

Formatting conventions

The following table lists the kinds of formatting this guide uses to identify special information.

Formatting convention	Type of information
<i>Italic type</i>	◆ Words or characters that require special attention. ◆ File names and path names. ◆ Placeholders for information you must supply. For example, if the guide says to enter the arp -d <i>hostname</i> command, you enter the characters “arp -d” followed by the actual name of the host. ◆ Man page names. ◆ Book titles in cross-references.
Monospaced font	◆ Command and daemon names. ◆ Information displayed on the system console or other computer monitors. ◆ The contents of files.
Bold monospace font	Words or characters you type. What you type is always shown in lowercase letters, unless you must type it in uppercase letters for it to work properly.

Special messages

This guide contains special messages that are described as follows:

Note

A note contains important information that helps you install or operate the system efficiently.

Caution

A caution contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.

WARNING

A warning contains instructions that you must follow to avoid personal injury.

Safety Information

Safety rules

You must follow these safety rules when working with this equipment:

WARNING

Failure to follow the directions contained in the following statements could result in bodily harm or loss of life.

- ◆ When installing disk shelves and a filer or NetCache™ appliance into a movable cabinet or rack, install the equipment from the bottom up for best stability.
- ◆ DC-based systems must be installed in a restricted access location.
- ◆ To reduce the risk of personal injury from hot surfaces, allow the internal components time to cool before touching them or installing options.
- ◆ To reduce the risk of personal injury or damage to the equipment, ensure that the equipment is properly supported or braced when installing options.
- ◆ This equipment is designed for connection to a grounded outlet. The grounding type plug is an important safety feature. To avoid the risk of electrical shock or damage to the equipment, do not disable this feature.
- ◆ This equipment is furnished with one or more replaceable batteries. There is danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Warning for units with two power supplies

If your filer, NetCache appliance, or disk shelf has two power supplies and you need to turn the unit off, heed the following warning:

WARNING

This unit has more than one power supply cord. To reduce the risk of electrical shock, disconnect all power supply cords before servicing.

AVERTISSEMENT

Cet appareil comporte plus d'un cordon d'alimentation. Afin de prévenir les chocs électriques, débrancher tous les cordons d'alimentation avant d'effectuer le dépannage.

ACHTUNG

Dieses Gerät besitzt zwei Netzanschlussleitungen. Vor Wartung alle Anschlüsse vom Netz trennen.

About this chapter

This chapter specifies the preparation requirements for a first-time installation of a C3100/C6100 series system.

The preparation requirements include tabulated descriptions of site requirements, lists of required tools and equipment, and a plan for the installation of the C3100/C6100 system.

Topics in this chapter

This chapter provides information about the following topics:

- ◆ [“Preparing your site”](#) on page 2
- ◆ [“Required tools and equipment”](#) on page 6
- ◆ [“Planning and organizing the installation”](#) on page 8

Preparing your site

About this section

This section tabulates the following information:

- ◆ C3100/C6100 dimensions
- ◆ C3100/C6100 weight
- ◆ Environmental requirements for operating or storing your C3100/C6100 system
- ◆ Space requirements for installing your C3100/C6100 system
- ◆ Electrical requirements for your C3100/C6100 system

C3100/C6100 dimensions

The following table lists the dimensions of the C3100/C6100 series NetCache appliance.

Dimensions	U.S.	Metric
Height	8.75 in. or 5U, where 1U = 1.75 in.	22.23 cm
Width	17 in.	43.18 cm
Depth	24 in.	61 cm

C3100/C6100 weight

The C3100/C6100 NetCache appliance weighs 66 lbs (29.94 kg).

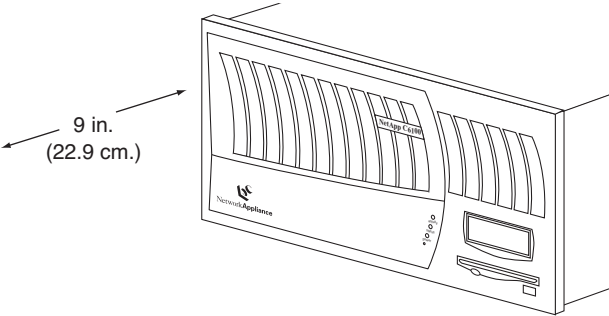
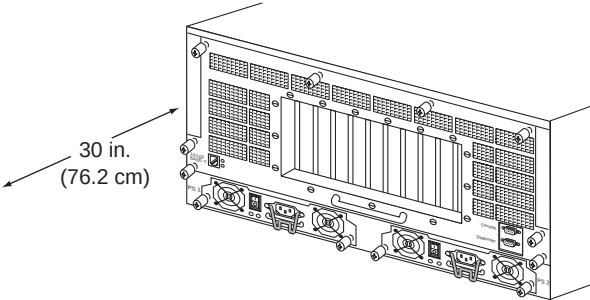
Environmental conditions

The following table lists the maximum environmental conditions that your site must meet to properly run or store your NetCache appliance.

Environmental condition	Operating condition	Storage condition
Temperature range	50° F to 104° F (10° C to 40° C)	-4° F to 149° F (-20° C to 65° C)

Environmental condition	Operating condition	Storage condition
Relative humidity (noncondensing)	10% to 90%	10% to 90% in original shipping container; otherwise, 50% or less

Space requirements The following table describes the recommended minimum clearance for the C3100/C6100 NetCache appliance.

Recommended minimum clearance	U.S.	Metric
Front clearance  A perspective view of the front of the NetCache appliance. A double-headed arrow indicates a clearance of 9 in. (22.9 cm) in front of the main ventilation grille. The appliance has a 'NetCache' logo on the left and a 'NetCache' label on the right.	9 in.	22.9 cm
Rear clearance  A perspective view of the rear of the NetCache appliance. A double-headed arrow indicates a clearance of 30 in. (76.2 cm) behind the unit. The rear panel features numerous ports, including Ethernet, serial, and power connectors, along with cooling fans.	30 in.	76.2 cm

Electrical requirements

You can order your C3100/C6100 for AC or DC power.

AC power: The following table lists the electrical requirements for AC power.

Condition	Requirement
AC Power supply	100 to 240V AC single phase
Maximum rated current per AC input	5A at 100 to 240V AC
Typical current per AC input	2A at 100V AC
Inrush current	40A maximum at 110V AC per power supply 50A maximum at 220V AC per power supply
Frequency	50 to 60 Hz

DC power: The following table lists the electrical requirements for DC power.

Condition	Requirement
DC power supply	–40 to –60V DC
Maximum rated current per DC input	5A at –40V
Typical current per DC input	4A at –48V DC
Inrush current	15A/100 msec for 48V _{in} per power supply (for reference, 25A/100 msec for 78V)

Power requirements

The following table lists the power requirements for both AC and DC NetCache appliances.

Power	Rating
Watts	300 max. (with Power Factor correction)
BTU/hr	1,025 max.

Freestanding equipment rack

The freestanding equipment rack must meet the following requirements:

- ◆ A width of 19 inches (48.26 cm)
- ◆ Front installation rails compliant with EIA standard RS-310-C
- ◆ Adequate space for air circulation directly above the C3100/C6100 ventilation holes

If you install a device above the NetCache appliance, leave at least 0.5 inches (1.3 cm) of space directly above the ventilation holes. You can install equipment directly on the unvented area as long as it does not extend over and block the ventilation holes on the NetCache appliance.

Required tools and equipment

Required tools and equipment for installation

To install the C3100/C6100 system components in an equipment rack, you need the following tools and equipment:

- ◆ Phillips screwdrivers (#0, #1, and #2)
- ◆ #10-32 steel screws for fastening the C3100/C6100 to the rack
- ◆ Antistatic wrist strap and grounding leash

Caution

The C3100/C6100 uses electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can damage these components. Wear an antistatic wrist strap and grounding leash so that you are appropriately grounded before touching any electronic components.

Required wiring for a DC power supply

Network Appliance does not supply the three-conductor power supply cable that connects to a DC power source. To connect the DC terminals on the power supply to the DC power source, you must fabricate a three-conductor cable that meets the following requirements.

Recommended wire gauge: 12 AWG with color-coded insulation. Use the color coding scheme used by the facility in which the C3100/C6100 is installed.

Ring terminals: Each wire should be terminated with a ring terminal that accommodates #6 screws and has the following properties:

- ◆ Outer ring maximum diameter—0.30 inch
- ◆ Inner ring—Clearance hole for #6-32 stud
- ◆ Insulated grip sleeve

Maximum distance between power supply and source: The following table lists the maximum distance between the power supply and the DC source based on wire length calculations for 12 AWG wire. You can use lower number gauge (higher current capacity) wire if a proper size terminal lug is available.

Note

For detailed information about calculating DC wire lengths, see [“Calculating the length of the DC wires”](#) on page 63.

Wire type	Maximum distance ^{1, 2}
12 AWG (2.05 mm diameter) copper wire	47 ft (14.3m) at 25° C or 38.5 ft (11.7m) at 70° C

1. Maximum distance is equal to half the calculated maximum wire length. This is because the wire length includes the distance from one power supply terminal to the DC bus and back to the power supply. For example, a maximum distance of 47 feet corresponds to a maximum wire length of 94 feet.
2. Calculated wire length is based on a 2V allowed input voltage drop and a maximum input current of 12A (at input voltage V_{min} of 40V).

To configure your system, you need the following equipment:

- ◆ Network Appliance supports the following types of console/terminal devices:
 - ❖ ASCII terminal (also referred to as an *ANSI terminal*)
 - ❖ Serial concentrator
 - ❖ Communications server

Note

To use a serial concentrator or communications server, you need the documentation for those devices.

- ◆ Null modem cable (optional)

Note

If the DB-9 to DB-9 straight-through serial cable for an ASCII terminal connection provided with your C3100/C6100 is not compatible with your terminal connector, you need a null modem cable or a DB-9 to DB-25 serial cable.

Planning and organizing the installation

Preparing for the installation

This section identifies the components you require for your C3100/C6100 system and the rules and regulations you must observe for proper installation. It also provides an overview of the entire system installation process and the appropriate documentation references for the procedures.

For detailed information

For detailed information about the planning and organizing of your installation, see the following topics:

- ◆ [“Gathering system components”](#) on page 9
- ◆ [“Installation rules and restrictions”](#) on page 10
- ◆ [“Understanding the entire system installation process”](#) on page 11

Gathering system components

About system components

A C3100/C6100 system consists of a C3100/C6100 NetCache appliance and connected disk shelves.

To gather all the hardware components for your C3100/C6100 system, you need to

- ◆ Check the contents of your shipment package
- ◆ Gather the system components

Checking shipment package contents

Make sure that your shipment package includes the following items, in addition to this *C3100/C6100 Series Hardware Guide*:

- ◆ One C3100/C6100 NetCache appliance ordered to your network and storage specifications
- ◆ A DB-9 to DB-9 straight-through serial cable for an ASCII terminal connection
- ◆ Cables for connecting the C3100/C6100 to the disk shelves
- ◆ A disposable antistatic wrist strap and grounding leash
- ◆ A braided copper cable and Phillips head screws (provided by Network Appliance) for
 - ❖ Grounding the second Fibre Channel loop
 - ❖ Grounding the C3100/C6100 to disk shelf 0 in the first loop when the distance between the C3100/C6100 and disk shelf 0 exceeds 0.8m

Gathering other components

Disk shelves: You can use previously purchased Fibre Channel disk shelves with your C3100/C6100. The *System Configuration Guide* at <http://now.netapp.com> lists the Fibre Channel disk shelves supported by the C3100/C6100.

Installation rules and restrictions

General rules and restrictions

You must observe the following rules and restrictions when installing a C3100/C6100 system:

- ◆ You must wear an antistatic wrist strap when you handle electronic equipment.
- ◆ You must work with another person.

WARNING

The C3100/C6100 is extremely heavy. To avoid injuring yourself or damaging the C3100/C6100, you must work with at least one other person when you install the C3100/C6100 in the rack.

- ◆ If you have a DC system, you must cover the terminal block on each power supply with the provided cover.

WARNING

To protect yourself from possible electric shock, it is important that the terminal blocks are covered when the C3100/C6100 is connected to the DC power source.

- ◆ You must ground the Fibre Channel disk shelves to the C3100/C6100. All instructions for grounding are in the disk shelf guide.
- ◆ You must install only the number of disk shelves supported by your C3100/C6100 model. Go to the *System Configuration Guide* at <http://now.netapp.com> to determine the current storage limit for your model.

Rules for arranging the components in the racks

You must observe the following rules when arranging the system components in the rack:

- ◆ In a freestanding equipment rack, install either the C3100/C6100 or a Telco shelf at the bottom of the rack. Installing the C3100/C6100 or Telco shelf at the bottom of the rack adds support for the disk shelves.
- ◆ The Fibre Channel disk shelves must be installed and connected in the freestanding equipment rack in sequential order (see your disk shelf guide for further details).
- ◆ Disk shelf 0 must be connected to the C3100/C6100 series NetCache appliance. For more information, see your disk shelf hardware guide.

Understanding the entire system installation process

Overview of the installation and documentation sources

The simplicity of the system installation depends on your specific system needs.

The following table is a guide to understanding the system installation process. It lists the procedures for a complete system installation and the documentation source for each procedure.

Stage	Procedure	For instructions, go to . . .
1	Install the C3100/C6100 in a freestanding rack.	Chapter 2, “ Installing the C3100/C6100 ,” on page 17
2	Install the disk shelves in the rack.	Hardware guide for your Fibre Channel disk shelf
3	Connect the disk shelves to the C3100/C6100.	Hardware guide for your Fibre Channel disk shelf
4	Ground the Fibre Channel disk shelves and C3100/C6100.	Hardware guide for your Fibre Channel disk shelf
5	Connect the C3100/C6100 to the network.	Chapter 3, “ Connecting the C3100/C6100 to a Network ,” on page 19
6	Connect the C3100/C6100 to a power source.	Chapter 4, “ Powering On the C3100/C6100 System ,” on page 25
7	Configure the system.	<i>Getting Started Guide</i>

About this chapter

This chapter describes your options for positioning the C3100/C6100 in the rack and how to install a C3100/C6100 in a freestanding 19-inch equipment rack.

Installing the C3100/C6100 in a rack

Positioning your C3100/C6100

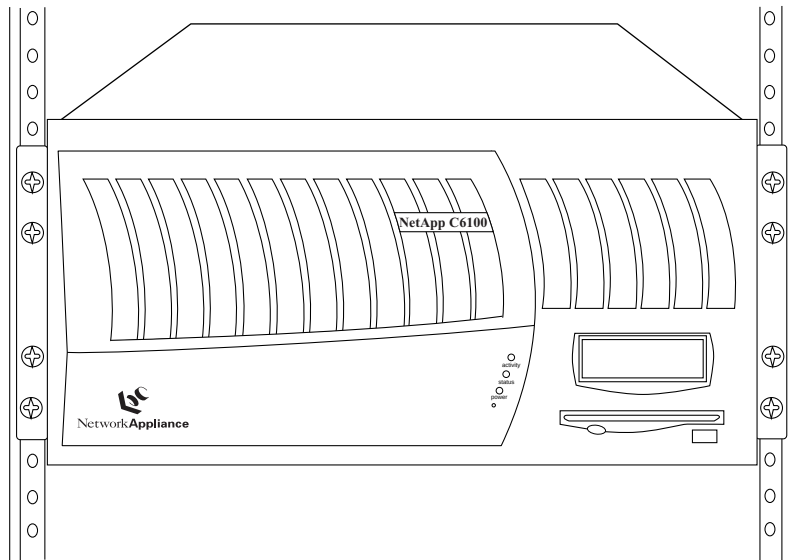
The C3100/C6100 has adjustable installation brackets that enable you to install it in one of three horizontal positions in the rack:

WARNING

When you install disk shelves and a C3100/C6100 into a rack, you must install the equipment from the bottom up to ensure the greatest stability.

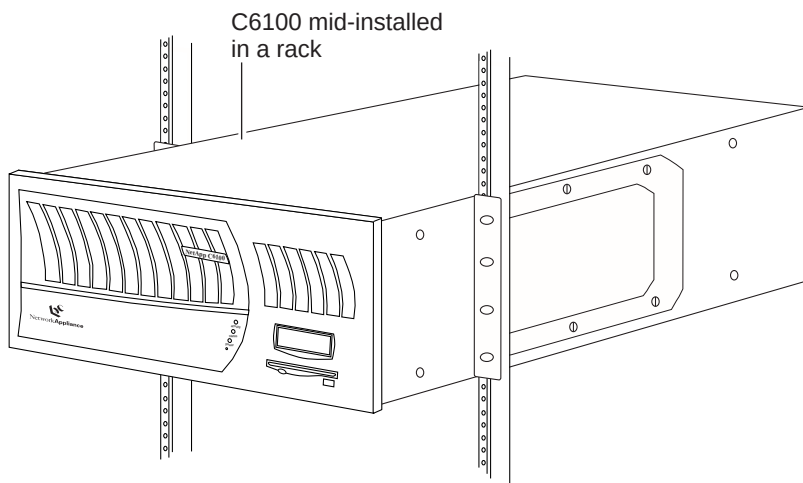
- ◆ Front-installed position—The brackets lie flush with the C3100/C6100 front panel.

The C3100/C6100 is shipped with the brackets in this position. The following figure shows a front-installed C6100.



- ◆ Two mid-installed positions—You can move the brackets to extend the C3100/C6100 4.75 inches or 9.5 inches in front of the rack, providing more room to service the C3100/C6100 from the back.

The following illustration shows a C6100 mid-installed in a rack (4.75 inches).



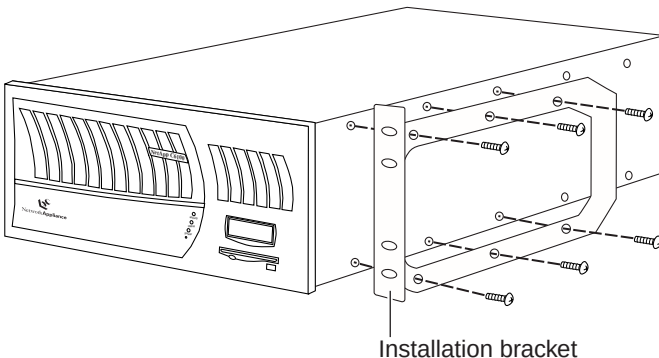
WARNING

To avoid injuring yourself or damaging the C3100/C6100, you must work with at least one other person when you install the C3100/C6100 in the rack.

Moving the brackets for a mid-install position

If you want to mid-install the C3100/C6100 in a rack, you must move the brackets on the sides of the C3100/C6100 from the default position.

To move the brackets, complete the following steps.

Step	Action
1	Put on an antistatic wrist strap and attach the grounding leash so that you are properly grounded.
2	Use a #2 Phillips screwdriver to remove the installation brackets attached to each side of the C3100/C6100.  The diagram shows a perspective view of the C3100/C6100 device. On the right side, there are two vertical installation brackets. Each bracket has four screws attached to it, which are shown being removed from the device's side panel. The label 'Installation bracket' points to one of the brackets.
3	For each bracket, select a position 4.75 inches or 9.5 inches from the first hole on one side of the C3100/C6100 and align the bracket holes with the C3100/C6100 holes.
4	Attach each bracket to the C3100/C6100 by inserting screws into the bracket and C3100/C6100 holes and tightening the screws.

Installing the C3100/C6100

To install the C3100/C6100 in a 19-inch equipment rack, complete the following steps.

Step	Action
1	Put on an antistatic strap and grounding leash.
2	Select four holes on each front rack rail. These holes should have the same spacing as the holes on the C3100/C6100 brackets.
3	Align the rack holes with the C3100/C6100 bracket holes. Work with one side bracket at a time. The person assisting you should stand behind the rack to help support the weight of the C3100/C6100.
4	Insert the #10 steel screws into the bottom holes on each side first and tighten them using a #2 Phillips screwdriver. Note _____The rack can support the weight of the C3100/C6100 when the C3100/C6100 is attached by the bottom screws. You do not need another person to hold the C3100/C6100 after the bottom screws are secured. _____
5	Insert and tighten the remaining screws.
6	See the appropriate Fibre Channel disk shelf hardware guide for information about ◆ Installing disk shelves in a 19-inch equipment rack ◆ Connecting disk shelves to your C3100/C6100 ◆ Grounding diskshelves

About this chapter This chapter discusses the types of Ethernet connections supported by your C3100/C6100 and describes how to connect to each type for Ethernet connection.

Topics in this chapter This chapter provides information about the following topics:

- ◆ “[Types of Ethernet networks supported](#)” on page 20
- ◆ “[Connecting with 10Base-T/100Base-TX](#)” on page 22
- ◆ “[Connecting with GbE](#)” on page 24

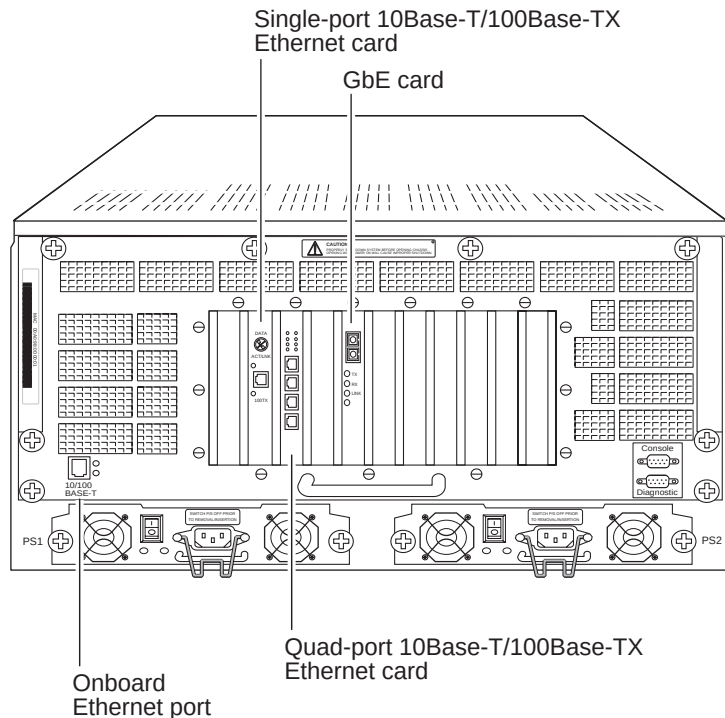
Types of Ethernet networks supported

Supported Ethernet connections

Your C3100/C6100 has an onboard 10Base-T/100Base-TX port and supports the following types of Ethernet network interface cards (NICs):

- ◆ Single-port 10Base-T/100Base-TX
- ◆ Quad-port 10Base-T/100Base-TX
- ◆ Gigabit Ethernet (GbE)

The following illustration of the C6100 shows the location of the onboard Ethernet port and shows one quad-port 10Base-T/100Base-TX NIC in slot 3, one single-port 10Base-T/100Base-TX NIC in slot 2, and one GbE NIC in slot 5. For the C3100, the same interface cards connect to slots 4, 5, and 10, respectively.



Note

For specific information about the NICs supported by your C3100/C6100, see the *System Configuration Guide* at <http://now.netapp.com>.

Ethernet cabling requirements

The following table lists the cabling requirements for Ethernet connections.

Note_____

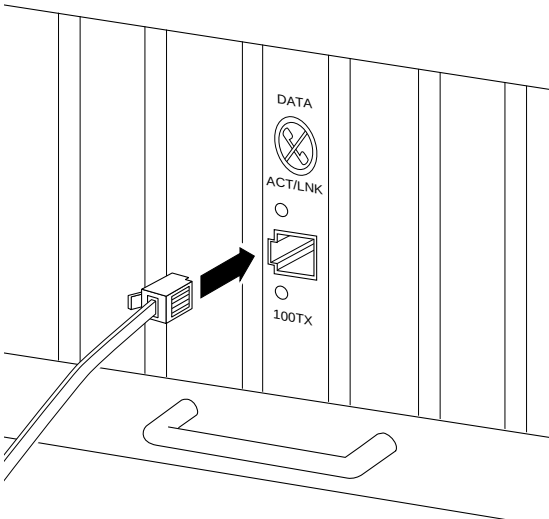
Do not exceed the maximum cable length specification.

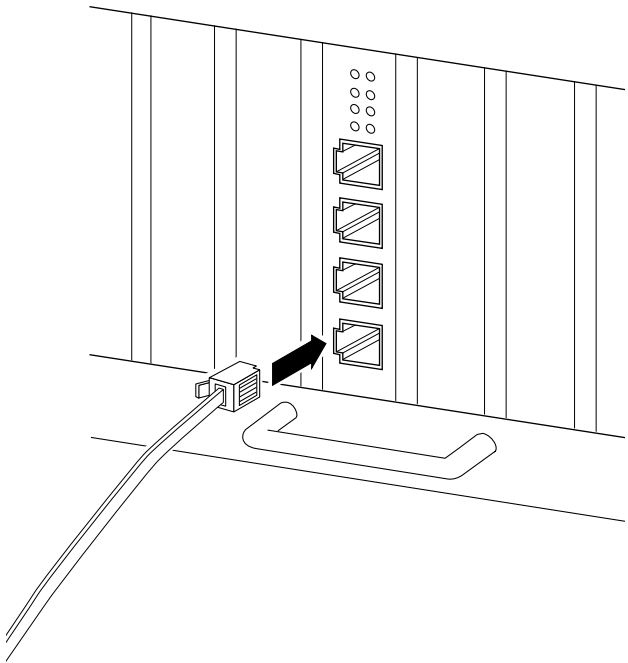
Ethernet port	Cabling requirements	
10 Base-T/ 100Base-TX	Category 3 (10Base-T only) or 5 (10Base-T/100Base-TX) unshielded twisted-pair (UTP) cable with RJ-45 connectors	
GbE	Type of cable	Max. distance
	50 micron multimode fiber optic cable with SC connector	550m
	62.5 micron multimode fiber optic cable with SC connector	220m

Connecting with 10Base-T/100Base-TX

Connecting to a 10Base-T/100Base-TX network

To connect the C3100/C6100 to a 10Base-T/100Base-TX Ethernet network, complete the following step.

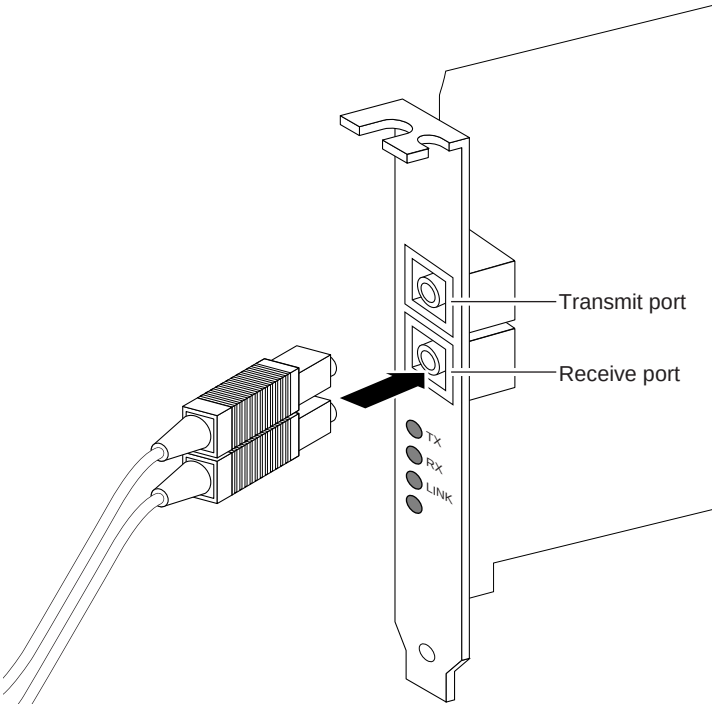
Step	Action	
1	If your Ethernet port is . . .	Then . . .
	The C3100/C6100 onboard Ethernet port, labeled 10Base-T/100Base-TX	Push the cable with the RJ-45 connector into the onboard Ethernet port on the C3100/C6100, until it clicks and locks into place.
	A single-port 10Base-T/100Base-TX NIC	Push the cable with the RJ-45 connector into the RJ-45 port on the NIC, until it clicks and locks into place.
The following illustration shows a UTP cable with an RJ-45 connector connecting to a single-port 10Base-T/100Base-TX NIC. 		

Step	Action
	A quad-port 10Base-T/ 100Base-TX NIC Push the cables with the RJ-45 connector into the RJ-45 ports on the NIC until they click and lock into place. The following illustration shows a UTP cable with an RJ-45 connector connecting to one of the ports on a quad-port 10Base-T/100Base-TX NIC.  The illustration shows a side view of a network interface card (NIC) with four RJ-45 ports. A UTP cable with an RJ-45 connector is shown being inserted into the bottom-most port. A thick black arrow points from the cable's connector towards the port, indicating the direction of insertion. Above the ports, there are five small circles, likely representing status LEDs. The NIC is mounted on a panel with vertical dividers.

Connecting with GbE

Connecting to a GbE network

To connect the C3100/C6100 to a GbE network, complete the following step.

Step	Action
1	Push the cable with the SC connector into the ports on the GbE NIC, until it clicks and locks into place. 

About this chapter

This chapter describes how to power on the system, including establishing a console connection to the C3100/C6100, which enables you to view system messages as the C3100/C6100 system boots.

Topics in this chapter

This chapter provides information about the following topics:

- ◆ [“Establishing a console/terminal connection to the C3100/C6100”](#) on page 26
- ◆ [“Connecting the C3100/C6100 system to a power source”](#) on page 29

Establishing a console/terminal connection to the C3100/C6100

About establishing a console/terminal connection

You establish a console/terminal connection to the C3100/C6100 for the following reasons:

- ◆ To observe the system responses on the terminal screen when the system is started
- ◆ To configure the C3100/C6100 after you start it

Protocol used by console port

The console port on your C3100/C6100 uses the three-wire protocol, for which your C3100/C6100 uses only the RD, TD, and SG pins.

Note—
The C3100/C6100 ignores the DCD, DSR, CTS, and RI input pins. You must set the flow control of your console/terminal to *none* and configure the console/terminal to ignore the DTR and RTS output pins.

List of pin settings

The following table lists pin settings defined by RS-232 for DB-9 and DB-25 ports.

Note—
The DB-25 pin settings are listed in case you have a 25-pin console/terminal.

The arrows in the table represent the following directions:

- ← Into the C3100/C6100
- Out from the C3100/C6100

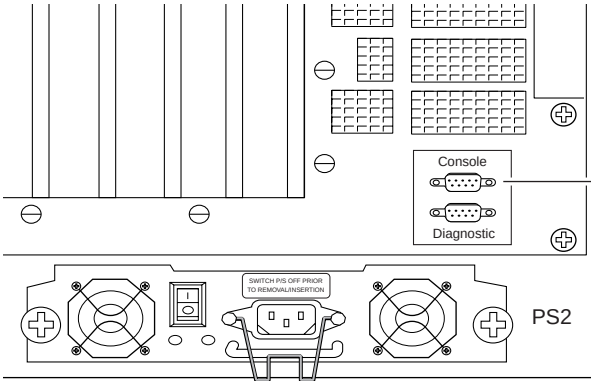
DB-9 pins	DB-25 pins	Name	Direction	Description
1	20	DTR	→	Data Terminal Ready
2	3	RD	←	Receive Data

DB-9 pins	DB-25 pins	Name	Direction	Description
3	2	TD	→	Transmit Data
4	8	DCD	←	Data Carrier Detect
5	7	SG	N/A	Signal Ground
6	6	DSR	←	Data Set Ready
7	5	CTS	←	Clear to Send
8	4	RTS	→	Request to Send
9	22	RI	←	Ring Indicator

Connecting an ASCII terminal

To connect an ASCII terminal to the C3100/C6100, complete the following steps.

Step	Action	
1	Verify that the following communication settings are the same on the terminal and the C3100/C6100.	
	Parameter	Settings
	Baud rate	9600
	Data bits	8
	Parity	None
	Stop bits	1
	See the documentation for your terminal for information about verifying or changing the settings.	

Step	Action
2	Connect one end of the DB-9 to DB-9 serial cable to the port labeled Console on your C3100/C6100 and the other end to your ASCII terminal. The following illustration shows the location of the Console port.  Console port

Connecting the C3100/C6100 system to a power source

Sequence for powering on units

You must power on the units in your system in this sequence:

1. Disk shelves first
2. C3100/C6100 second

Caution

You must power on the C3100/C6100 after the disk shelves.

The disk shelves and disk drives require time to power on, reset, and prepare to respond to the C3100/C6100. The C3100/C6100 expects these units to be ready for input/output when it powers on and performs its reset and self-test.

What the power-on process does

The power-on process for a new installation automatically

- ◆ Checks all connections to the C3100/C6100
- ◆ Runs the setup program

Powering on the disk shelves

To power on the disk shelves, see your Fibre Channel disk shelf guide.

Powering on the C3100/C6100

For instructions about connecting your C3100/C6100 to power, go to one of the following sections:

- ◆ [“Connecting the C3100/C6100 to AC power”](#) on page 30
- ◆ [“Connecting the C3100/C6100 to DC power”](#) on page 32

Connecting the C3100/C6100 to AC power

Connecting and powering on an AC system

To connect the C3100/C6100 to an AC power source, complete the following steps.

Step	Action
1	Make sure that the power switch on each power supply is in the Off (O) position.
2	Connect the socket end of the supplied power cord to the recessed power plug on the power supply.
3	Secure the power cord with the retaining clip on the power supply.
4	Plug the other end of the power cord into a grounded electrical outlet.
5	If the C3100/C6100 has a second power supply, repeat Steps 1 through 4. Caution_____ To obtain power supply redundancy, you must connect the second power supply to a separate AC circuit. _____
6	Turn the power switch on the power supplies to the On (I) position. Result: The system verifies the C3100/C6100 hardware and loads the operating system.

Step	Action
7	Make sure that the following LEDs illuminate: ◆ Front panel LEDs ◆ Power supply LEDs ◆ Network port LEDs The LED responses are described in “LED responses at startup” on page 36. Note_____ If the LEDs do not illuminate, contact Network Appliance Technical Support. _____
8	Check the startup messages as they appear on the console or LCD. The startup messages are described in “System messages at startup” on page 45. Note_____ If the startup messages do not appear, contact Network Appliance Technical Support. _____
9	Go to the <i>Getting Started Guide</i> when the following default host name prompt appears on the console screen: toaster>

Connecting the C3100/C6100 to DC power

About DC power supply cabling

Network Appliance does not supply the three-conductor power supply cable that connects to a DC power source. To connect the DC terminals on the power supply to the DC power source, you must fabricate a three-conductor cable that meets the requirements described in [“Required wiring for a DC power supply”](#) on page 6.

DC power supply connection requirements

You can use the DC power supply in both positive and negative ground installations. For example, the DC power system in telephone central offices (telco facilities) typically uses a positive ground and negative power source (–48V). The steps required to connect the power supplies are described in [“Connecting and powering on a DC system”](#) on page 33.

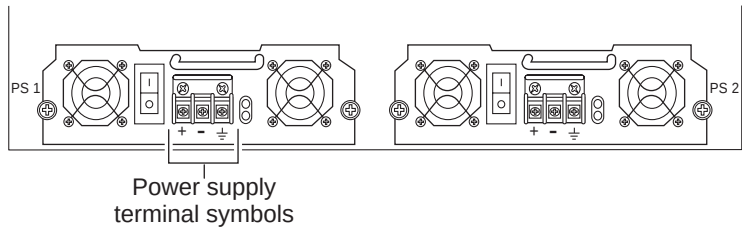
For positive ground systems: Connect the power supply terminals as described in the following table in the order listed.

Power supply terminal	to	DC bus terminal
Ground ($\perp$)	→	System ground ($\perp$)
Positive (+)	→	+ terminal of the 48V power source
Negative (–)	→	– terminal of the 48V power source

For negative ground systems: Connect the power supply terminals as described in the following table in the order listed.

Power supply terminal	to	DC bus terminal
Ground ($\perp$)	→	System ground ($\perp$)
Negative (–)	→	– terminal of the 48V power source
Positive (+)	→	+ terminal of the 48V power source

The following illustration shows the two DC power supplies. The labels for the positive (+), negative (–), and ground ($\perp$) terminals are below the terminals.



Connecting and powering on a DC system

To connect the DC power supply and power on the C3100/C6100, complete the following steps.

WARNING _____
The DC power source must have a 20A circuit breaker.

Step	Action
1	Make sure that the DC power supplies on the C3100/C6100 and the DC power source are off.
2	Remove the terminal cover from the power supply terminal block and set it aside.
3	Connect the first DC power supply to a DC bus by connecting the power supply terminals, as described in “ DC power supply connection requirements ” on page 32. WARNING _____ Be sure to connect the power supply terminals correctly depending on whether the installation site is positive ground or negative ground.
4	Use the same method to connect the second power supply to the same or a second DC bus, if available.

Step	Action
5	Cover the power supply terminal block with the terminal cover that you set aside. WARNING _____ To protect yourself from possible electric shock, it is important that the terminal blocks are covered when the C3100/C6100 is connected to the DC power source.
6	Make sure that all disk shelf and NetCache appliance power switches are turned off, then turn on the DC power source.
7	Turn the power switch on the power supplies to the On (I) position. Result: The system verifies the hardware and loads the operating system.
8	Make sure that the front panel, power supply, and network LEDs illuminate. LED responses are described in “LED responses at startup” on page 36. Note _____ If the LEDs do not illuminate, first verify that your power supplies are connected with the proper polarity, as described in “DC power supply connection requirements” on page 32. If the connections are correct and the LEDs still do not illuminate, contact Network Appliance Technical Support.
9	Check the startup messages as they appear on the console or LCD. The startup messages are described in “System messages at startup” on page 45. Note _____ If the startup messages do not appear, contact Network Appliance Technical Support.
10	Go to the <i>Getting Started Guide</i> when the following default host name prompt appears on the console screen: <pre>toaster></pre>

About this chapter

This chapter describes the following startup responses from your C3100/C6100:

- ◆ LED responses from the various hardware components on your C3100/C6100
- ◆ System messages displayed on
 - ❖ C3100/C6100 LCD
 - ❖ Console connected to the C3100/C6100

Topics in this chapter

This chapter provides information about the following topics:

- ◆ “[LED responses at startup](#)” on page 36
- ◆ “[System messages at startup](#)” on page 45

LED responses at startup

About this section

This section describes the LED startup responses from the C3100/C6100 and components.

For detailed information

For detailed information about the LED startup responses, see

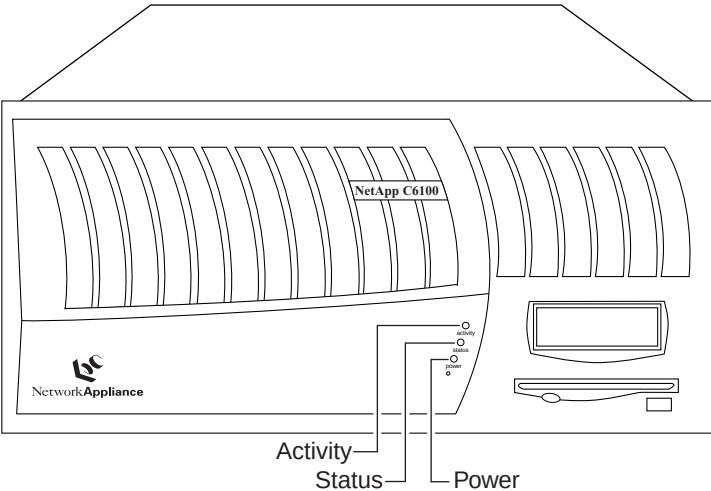
- ◆ [“Front panel LEDs”](#) on page 37
- ◆ [“Power supply LEDs”](#) on page 39
- ◆ [“Network connection LEDs”](#) on page 41

LED responses at startup

Front panel LEDs

Location of front panel LEDs

The following illustration shows the LEDs on the front panel.



Description of front panel LEDs

The following table describes the LEDs on the front panel.

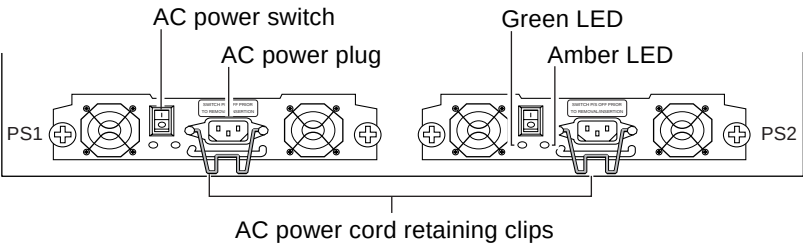
LEDs	State of illumination	Explanation
Activity	Green	Operation/activity is normal.
	Flashing	CPU or network activity is detected.
	Off	No activity is detected.

LEDs	State of illumination	Explanation
Status	Green	The system is operating normally.
	Amber	The Status LED turns amber when you turn on the C3100/C6100 and stays lit while the operating system is loading. Note_____ If the Status LED remains amber, a fault occurred or the system halted. The C3100/C6100 LCD identifies the reason for the continued state of illumination. _____
Power	Green	The system is on.
	Off	The system is off.

About this section This section describes the LED responses for the AC or DC power supplies in your C3100/C6100 NetCache appliance. For each of the following, the location of the LEDs is identified and the LED functionality is described:

- ◆ “AC power supply LEDs” on page 39
- ◆ “DC power supply LEDs” on page 40

AC power supply LEDs **Location of LEDs:** The following illustration shows the AC power supply LEDs on the back panel.

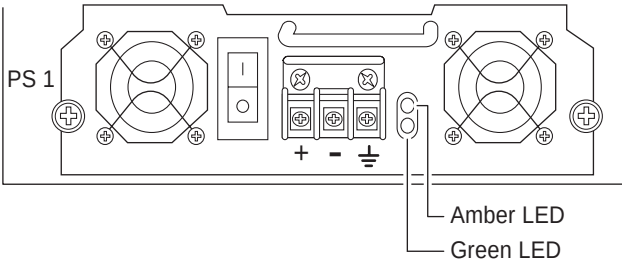


Description of LEDs: The following table describes the AC power supply LEDs.

LED	State of illumination	Explanation
Amber	On	Power supply is receiving AC power.
	Off	AC power is not present.
Green	On	Power supply output is good.
	Off	Power supply output is bad.

DC power supply LEDs

Location of LEDs: The following illustration shows the DC power supply LEDs on the back panel.



Description of LEDs: The following table describes the DC power supply LEDs.

LED	State	Indicates
Amber	On	Input voltage from the DC power source is good; that is, it meets specifications.
	Off	Input voltage from the DC power source does not meet specifications (–40V DC to –60V DC). Check the input voltage with a voltmeter. If the voltage does not meet specifications, correct it. If it does, the power supply is the source of the problem. Replace the power supply.
Green	On	Output voltages from the power supply to the C3100/C6100 are good; that is, they meet specifications.
	Off	A problem exists with the power supply or C3100/C6100. First try changing the power supply. If the green LED still does not illuminate, the C3100/C6100 could be bad (for example, shorted or overloading the power supply).

Network connection LEDs

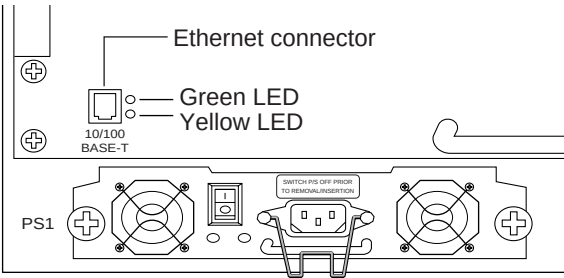
About this section

This section describes the LED responses for the network connections supported by the C3100/C6100. For each of the following types of network connections, the location of the LEDs is identified and the LED functionality is described:

- ◆ “Onboard 10Base-T/100Base-TX Ethernet port”
- ◆ “Single-port 10Base-T/100Base-TX NIC LEDs” on page 42
- ◆ “Quad 10Base-T/100Base-TX NIC” on page 43
- ◆ “GbE NIC” on page 44

Onboard 10Base-T/100Base-TX Ethernet port

Location of LEDs: The onboard 10Base-T/100Base-TX Ethernet port has two LEDs, as shown in the following illustration.

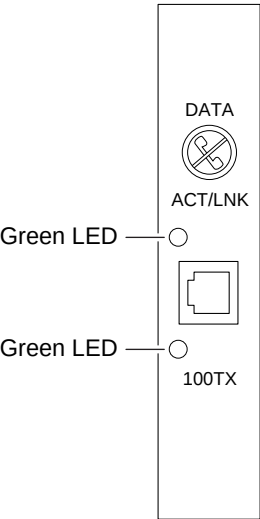


Description of LEDs: The following table describes the LEDs for the onboard 10Base-T/100Base-TX Ethernet port.

LEDs	State of illumination	Explanation . . .
Green	On	Valid network connection.
	Off	No Ethernet connection is present.
Amber	On	Transmitting and receiving data.
	Off	Idle.

Single-port 10Base-T/100Base-TX NIC LEDs

Location of LEDs: The following illustration shows the one port with two LEDs on the single-port 10Base-T/100Base-TX Ethernet NIC.

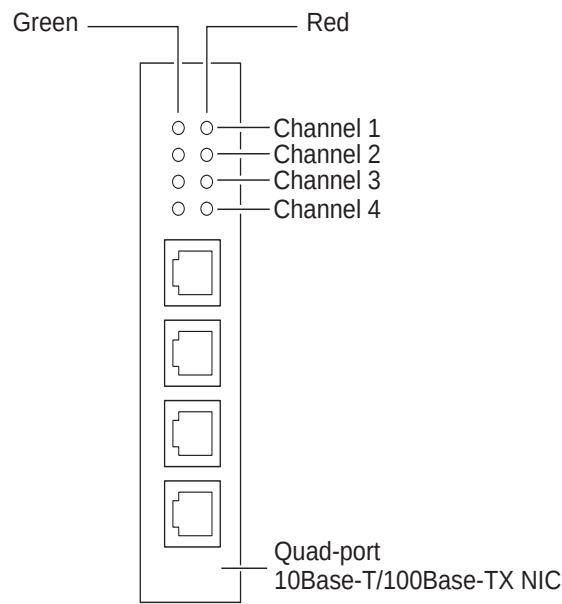


Description of LEDs: The following table describes the LEDs on the single-port 10Base-T/100Base-TX Ethernet NIC.

LEDs	State of illumination	Explanation . . .
ACT/LNK	On	Valid network connection.
	Off	One of three scenarios: ◆ Idle ◆ There is no power ◆ Faulty cable connection
	Flashing	Transmitting and receiving data.
100TX	On	Operating at 100 Mbps.
	Off	Operating at 10 Mbps.

Quad-port 10Base-T/100Base-TX NIC

Location of LEDs: The quad-port 10Base-T/100Base-TX Ethernet NIC has four ports for four channels, with the top port assigned to the first channel. The following illustration shows each port with corresponding pair of green and red LEDs.



Description of LEDs: The following table describes the function of the LEDs.

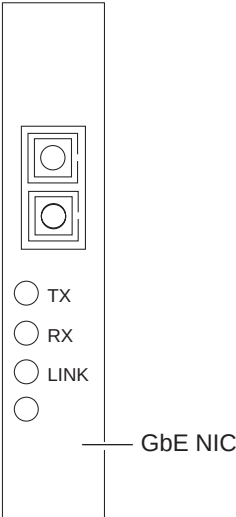
LEDs	State of illumination	Explanation . . .
Green	On Solid	Link is up.
	On Flashing	Network activity.
	Off	Cabling problems.
Red	On	Operating at 100 Mbps.
	Off	Operating at 10 Mbps.

GbE NIC

Location of LEDs: The following illustration shows the one port and four LEDs on the GbE NIC.

Note_____

The C3100/C6100 only uses the RX, TX, and LINK LEDs.



Description of LEDs: The following table describes the LEDs on the GbE NIC.

LEDs	State	Explanation . . .
TX	On	Transmitting data.
	Off	Idle.
RX	On	Receiving data.
	Off	Idle.
LINK	On	Valid network connection.
	Off	One of two scenarios: ◆ Configuration is invalid ◆ Connections need to be checked

System messages at startup

Types of startup messages

When you power on the C3100/C6100 the system console and LCD display two types of startup messages:

- ◆ Power-On Self-Test (POST) messages
- ◆ Boot messages

POST messages

When you turn on the power, the C3100/C6100 checks the hardware on the motherboard by running a series of POSTs from the PROM (Programmable Read-Only Memory). The exact messages that appear on your system console depend on your system configuration. Verify that the memory size displayed is what you expect for your C3100/C6100.

Example: The following is an example of the POST messages that appear on the C6100 system console:

Header:

```
Intel Open Firmware by FirmWorks
Copyright 1995-2001 FirmWorks, Network Appliance. All Rights
Reserved.
Firmware release x.x_il
Press <DEL> to abort boot, <ESC> to skip POST
```

Post messages:

```
Memory size is 3072 MB
Testing SIO
Testing LCD
Probing devices
Testing 3072 MB
Complete
Finding image...
Starting
```

Note

The C3100/C6100 LCD displays only the POST messages without the preceding header.

Boot messages

The boot messages appear after the hardware passes all POSTs and the C3100/C6100 begins to load the operating system.

Example: The following message is an example of the boot message that appears on the system console when a C6100 is successfully started for the first time. The exact boot messages that appear on your system console depend on your system configuration.

Boot messages

```
NetApp Release x.x.x: Thu August 10 04:06:00: PST 2000
Copyright (c) 1992-2000 Network Appliance, Inc.
Starting boot on Thu August 10 23:42:47 GMT 2000

System ID: 0016777216 ()
slot 0: System Board
    Memory Size:          3 GB
slot 0: Ethernet Controller e0
    MAC Address:          00:c0:94:00:13:12 (auto-100tx-fd-up)
slot 1: Fibre Channel Host Adapter 3(Qlogic ISP2200)
    Firmware rev:        2.0.25
    Host Loop Id:         119
    FC Node Name:         2:100:00e08b:001bc1
    Cacheline size: 8      FC Packet size: 2048
    6 Disks: 102.0GB
    1 shelf with EDM
slot 3: Ethernet Controller e3
    MAC Address:          00:a0:92:f7:62:56 (tp-down)
slot 4: Fibre Channel Host Adapter 3(Qlogic ISP2200)
    Firmware rev:        2.0.25
    Host Loop Id:         119
    FC Node Name:         2:100:00e08b:001bc1
    Cacheline size: 8      FC Packet size: 2048
    6 Disks: 102.0GB
    1 shelf with EDM
slot 11: NVRAM
    Memory Size:          128 MB
Please enter the new hostname [ ]:
```

About this chapter

This section identifies and describes the different types of error messages that appear on the LCD and suggests corrective actions for the problems.

Note

If you contact Network Appliance Technical Support for service, report both the LCD message and the console message. Most LCD messages are truncated versions of console messages that provide more information about the error condition than the LCD messages.

Topics in this chapter

This chapter provides information about the following topics:

- ◆ “[POST error messages](#)” on page 48
- ◆ “[Boot error messages](#)” on page 52
- ◆ “[All other error messages](#)” on page 57

References

The following table lists the guides that can help you with some of the corrective actions.

If you are troubleshooting . . .	Then . . .
C3100/C6100 series hardware problems and need to open the C3100/C6100	See the <i>C3100/C6100 Field Service Guide</i>
Fibre Channel disk shelf problems	See your disk shelf hardware guide.
Software problems	See the <i>NetCache Appliance Administration Guide</i>

POST error messages

About POST error messages

POST error messages might appear when the C3100/C6100 checks the hardware on the motherboard by running a series of POSTs from the PROM.

List of POST error messages: The following table describes the error messages that might appear on the LCD if the C3100/C6100 encounters errors during the POSTs.

POST error message	Explanation	Fatal?	Corrective action
<i>*SIO error</i>	The C3100/C6100 SIO or ISA bridge chip failed its timer interrupt test. The system cannot operate properly without this function.	Yes	Replace the motherboard.
<i>*Watchdog failed</i>	The C3100/C6100 watchdog reset hardware, which is used to reset the C3100/C6100 from a system hang condition, is not functioning properly.	No	Replace the motherboard.
<i>*CPU speed err</i>	The CPU's measured clock speed does not match the expected value for the C3100/C6100 model. This indicates problems with system clocks and/or buses.	No	Replace the motherboard.
<i>*Fans stopped</i>	One or more chassis fans have stopped spinning or are spinning too slowly. If two or more chassis fans fail, the system does not boot.	Maybe	Replace the chassis fan subassembly containing the failed fan.

POST error message	Explanation	Fatal?	Corrective action
<i>*CPU0 fan stopped</i> <i>*CPU1 fan stopped</i>	The CPU cooling fan stopped spinning or is spinning too slowly. This can damage the CPU chip.	Yes	1. Power off the C3100/C6100. 2. Replace the CPU fan or replace the motherboard.
<i>*Overtemp alert</i>	The internal temperature sensor detected a dangerously high temperature that can damage the system components inside the chassis.	Yes	1. Power off the C3100/C6100. 2. Reduce the ambient temperature to 40° C or lower. 3. Make sure that you have proper air circulation through the C3100/C6100. If the temperature inside the C3100/C6100 is not excessively hot, the sensor itself might have failed. 4. Replace the motherboard.
<i>*PS #1 failed</i> <i>*PS #2 failed</i>	If the C3100/C6100 has a second power supply, one of the power supplies failed and the C3100/C6100 is running on the second power supply.	No	Replace the failed power supply.
<i>*No power info</i>	The system is clearly running but no information about the power supply is being reported. Something is wrong with the power supply or the status reporting circuitry.	No	Replace the power supply or the motherboard.

POST error message	Explanation	Fatal?	Corrective action
<i>*2V power bad</i> <i>*3V power bad</i> <i>*5V power bad</i> <i>*+12V power bad</i> <i>*-12V power bad</i>	One (or more) of the power voltages is bad. This could be due to a malfunctioning power supply or power-regulation device.	Yes	Replace the power supply or the motherboard.
<i>*Clock bogus; date reset</i>	The system real-time clock contains an invalid date value. The system does not boot, but the date is reset to January 1, 1970, to enable a subsequent boot.	Yes	Reboot the C3100/C6100 and reset the date immediately to avoid file system problems.
<i>*Clock error</i>	The system real-time clock is not operating (counting) correctly.	Yes	Replace the motherboard.
<i>*Clock is dead</i> <i>*Clock battery is dead</i>	The system real-time clock failed and its battery expired.	Yes	Replace the failed RTC battery or replace the motherboard.
<i>*Env-A stat err</i> <i>*Env-B stat err</i> <i>*Env-C stat err</i> <i>*Env-D stat err</i>	One of four environmental status monitors on the C3100/C6100 cannot properly monitor its environmental health.	Yes	Replace the motherboard.
<i>*Env-A rupt err</i> <i>*Env-B rupt err</i> <i>*Env-C rupt err</i> <i>*Env-D rupt err</i>	One of four environmental status monitors on the C3100/C6100 cannot interrupt the processor, which prevents the C3100/C6100 from properly monitoring its environmental health.	Yes	Replace the motherboard.

POST error message	Explanation	Fatal?	Corrective action
<i>*FP button stuck</i>	The front panel Reset button is stuck.	Yes	1. Make sure that the button is not stuck. 2. Replace the LED/LCD subassembly. 3. Replace the motherboard.
<i>*FLPY init fail</i> <i>*FLPY regerror</i> <i>*FLPY seek err</i> <i>*FLPY track err</i> <i>*FLPY head err</i> <i>*FLPY format err</i> <i>*FLPY read err</i> <i>*FLPY setup err</i>	These messages indicate that the diskette drive subassembly failed.	No	Replace the diskette drive subassembly or replace the motherboard.
<i>*LCD won't open</i> <i>*LCD cmd stall</i> <i>*LCD cursor err</i> <i>*LCD data error</i>	The system LCD device is not operating correctly. All subsequent POST messages are displayed on the console.	No	Replace the LED/LCD subassembly or replace the motherboard.

Boot error messages

About boot error messages

Boot error messages might appear after the hardware passes all POSTs and the C3100/C6100 begins to load the operating system.

List of boot error messages: The following table describes the error messages that might appear on the LCD if the C3100/C6100 encounters errors while starting up.

Boot error message	Explanation	Fatal?	Corrective action
<i>No /etc/rc</i>	The <i>/etc/rc</i> file is corrupted.	No	1. At the <code>hostname></code> prompt, enter setup. 2. As the system prompts for system configuration information, use the information you recorded in the C3100/C6100 configuration information worksheet in the <i>Getting Started Guide</i>. For more information about the C3100/C6100 setup program, see the <i>NetCache Appliance Administrator's Guide</i>.
<i>No /etc/rc, running setup</i>	The system cannot find the <i>/etc/rc</i> file and automatically starts setup.	No	As the system prompts for system configuration information, use the information you recorded in the C3100/C6100 configuration information worksheet in the <i>Getting Started Guide</i>. For more information about the C3100/C6100 setup program, see the <i>NetCache Appliance Administrator's Guide</i>.

Boot error message	Explanation	Fatal?	Corrective action
<i>Cannot initialize labels</i>	When the system tries to create a new file system, it cannot initialize the disk labels.	Yes	Usually, you do not need to create and initialize a file system; do so only after consulting Network Appliance Technical Support.
<i>Cannot read labels</i>	When the C3100/C6100 tries to initialize a new file system, it has a problem reading the disk labels it wrote to the disks. This problem might be because ◆ The system fails to read the disk size ◆ The written disk labels were invalid	Yes	Usually, you do not need to create and initialize a file system; do so only after consulting Network Appliance Technical Support.
<i>Disk label processing failed</i>	The C3100/C6100 detects that the disk is not in the correct drive bay.	Yes	Make sure that the disk is in the correct bay.
<i>Dirty shutdown in degraded mode</i>	The file system is inconsistent because you did not shut down the system cleanly when it was in degraded mode.	Yes	Contact Network Appliance Technical Support for instructions about repairing the file system.
<i>No disk controllers</i>	The system cannot detect any FC-AL disk controllers.	Yes	Turn off the power on the C3100/C6100 and verify that all NICs are properly seated in the appropriate expansion slots.
<i>No disks</i>	The system cannot detect any FC-AL disks.	Yes	Verify that all disks are properly seated in the drive bays.

Boot error message	Explanation	Fatal?	Corrective action
<i>Drive %s.%d not supported</i>	%s—The FC-AL disk number. %d—The disk ID number. The system detects an unsupported disk drive.	Yes	1. Remove the drive immediately or the system drops down to the PROM monitor within 30 seconds. 2. Check the <i>System Configuration Guide</i> at http://now.netapp.com to verify support for your disk drive.
<i>FC-AL loop down, adapter %d</i>	The system cannot detect the FC-AL loop or adapter.	Yes	1. Identify the adapter by entering the following command: diskInfo.HostAdapter 2. Turn off the power on the C3100/C6100 and verify that the adapter is properly seated in the expansion slot. 3. Verify that all Fibre Channel cables are connected.

Boot error message	Explanation	Fatal?	Corrective action
<i>File system might be scrambled</i>	One of the following errors causes the file system to be inconsistent:		
	◆ An unclean shutdown when the C3100/C6100 is in degraded mode and when NVRAM is not working.	Yes	Contact Network Appliance Technical Support to learn how to start the system from a system boot diskette and repair the file system.
	◆ The number of disks detected in the disk array is different from the number of disks recorded in the disk labels. The system cannot start when more than one disk is missing.	Yes	Make sure that all disks on the system are properly installed in the disk shelves.
	◆ The system encounters a read error while reconstructing parity.	Yes	Contact Network Appliance Technical Support for help.
	◆ A disk failed at the same time the system crashed.	Yes	Contact Network Appliance Technical Support to learn how to repair the file system.
<i>Invalid PCI card slot %d</i>	%d—The expansion slot number. The system detects an adapter that is not supported by Network Appliance.	Yes	Replace the unsupported adapter with an adapter that is included in the <i>System Configuration Guide</i> at http://now.netapp.com .
<i>Configuration exceeds max PCI space</i>	The memory space for mapping PCI adapters has been exhausted, because either ◆ There are too many PCI adapters are in the system ◆ An adapter is demanding too many resources	Yes	Verify that all expansion adapters in the C3100/C6100 are supported. Contact Network Appliance Technical Support for help. Have a list ready of all expansion adapters installed in the C3100/C6100.

Boot error message	Explanation	Fatal?	Corrective action
<i>No network interfaces</i>	The system cannot detect any network interfaces.	Yes	Turn off the system and verify that all NICs are seated properly in the appropriate expansion slots. If the problem persists, contact Network Appliance Technical Support.
<i>No NVRAM present</i>	The system cannot detect the NVRAM adapter.	Yes	Make sure that the NVRAM adapter is securely installed in expansion slot 11.
<i>Replace NVRAM battery</i>	The NVRAM battery is low. The system shuts down immediately.	Yes	Replace the battery.
<i>Replace %s</i>	%s—The number of NVRAM batteries. The C3100/C6100 has a single NVRAM battery.	Yes	Replace the battery.
<i>NVRAM #n downrev</i>	n—The serial number of the NVRAM adapter. The NVRAM adapter is an early revision that cannot be used with the system.	Yes	Check the console for information about which revision of the NVRAM adapter is required. Replace the NVRAM adapter.
<i>NVRAM test failed</i>	The system NVRAM produces an error when the system is starting.	Yes	Contact Network Appliance Technical Support if this message appears.
<i>Unsupported NVRAM size %dMB</i>	%d—The amount of memory on the NVRAM adapter. The specified size is not supported.	Yes	Verify that the system has 128 MB of NVRAM.

All other error messages

About all other error messages

Other error messages might appear when the system is operating, when it has halted, or when it is restarting because of system problems.

List of all other error messages: The following table describes all other error messages that might appear on the LCD during C3100/C6100 operation.

Error message	Explanation	Fatal?	Corrective action
<i>Disk n is broken</i>	<i>n</i> —The RAID group disk number. The solution depends on whether you have a hot spare in the system.	No	See the <i>NetCache Appliance Administration Guide</i> for information about how to locate a disk based on the RAID group disk number and how to replace a faulty disk.
<i>Fans stopped; replace them</i>	One of the fan subassemblies of the C3100/C6100 failed.	No	Replace the failed fan subassembly as soon as possible.
<i>Backplane Fans non-functional</i>	The fan subassembly of the C3100/C6100 failed.	Yes	Replace all fan subassemblies immediately.
<i>Power supply degraded</i>	One of the power supply units is turned off, has been removed from the C3100/C6100, or has failed.	No	Verify that both power supplies are installed and turned on. If you still get this error, replace the power supplies one at a time to determine the failed power supply.
<i>CPU fan has failed</i>	The CPU fan failed. The system automatically shuts down.	Yes	Replace the CPU fan before you restart the system.

Error message	Explanation	Fatal?	Corrective action
<i>Dumping core</i>	The system is dumping core after a system crash.	Yes	If you enabled the autosupport feature, your NetCache appliance automatically reports the problem to Network Appliance Technical Support. If you did not enable the autosupport feature, write down the system crash message that appears on the system console and report the problem to Network Appliance Technical Support.
<i>Disk hung during swap</i>	A disk error occurred as you were hot swapping a disk.	Yes	1. Disconnect the disk shelf from the power supply. 2. Wait 15 seconds to allow all disks to spin down. 3. Reconnect the power source to the disk shelf. 4. Restart the system by entering the following command: boot
<i>Error dumping core</i>	The system cannot dump core during a system crash and restarts without dumping core.	Yes	Report the problem to Network Appliance Technical Support.
<i>Panicking</i>	The system is crashing. If the system does not hang while crashing, the message <code>Dumping core</code> appears.	Yes	Report the problem to Network Appliance Technical Support.

Error message	Explanation	Fatal?	Corrective action
<i>System too hot</i>	The temperature sensor indicates that the system temperature is too high.	Yes	Verify that the ventilation holes on the top cover of the system are not blocked. If the ventilation holes are not blocked and the problem persists, contact Network Appliance Technical Support for help.

About this appendix The information in this appendix discusses how to determine the power line lengths running from the C3100/C6100 to the power source.

Topics in this chapter

This chapter discusses the following topics:

- ◆ “[Recommended AC power line sizes](#)” on page 62
- ◆ “[Calculating the length of the DC wires](#)” on page 63

Recommended AC power line sizes

About AC power feeds

Longer AC power feeds must be properly designed to preserve voltage levels to the equipment. The wiring from the breaker panel to the power strip, which supplies power to the C3100/C6100 and disk shelves, can often exceed 50 feet.

Note

Total AC wire length = breaker to wall or ceiling outlet + extension cable or ceiling drop.

Recommended conductor size

The following table lists the recommended conductor size for a 2% voltage drop for a particular distance in feet (taken from the *Radio Engineer's Handbook*).

110V, single-phase	20A circuit	30A circuit	40A circuit	50A circuit
25 ft	12 AWG	10 AWG	8 AWG	8 AWG
50 ft	8 AWG	6 AWG	6 AWG	4 AWG
75 ft	6 AWG	4 AWG	4 AWG	2 AWG

220V, single-phase	20A circuit	30A circuit	40A circuit	50A circuit
25 ft	14 AWG	12 AWG	12 AWG	10 AWG
50 ft	12 AWG	10 AWG	8 AWG	8 AWG
75 ft	10 AWG	8 AWG	6 AWG	6 AWG

Wire gauge approximates

The following table lists the approximate equivalent of American Wire Gauge (AWG) to Harmonized Cordage.

AWG	8	10	12
Harmonized, mm-mm	4.0	2.5	1.5

Calculating the length of the DC wires

Variable definitions to use	To calculate the maximum combined length of the positive and negative wires between the DC source and DC power supplies, use the following variable definitions:	
◆	V_{SOURCE}	Voltage across the internal source resistance
◆	V_{OC}	Voltage across an open circuit of the input source
◆	V_{LOAD}	Voltage across a load, R_{TEST} , connected to the input source
◆	R_{TEST}	Test resistor of known value, that is, 10Ω at 300W
◆	R_{CABLE}	DC resistance of the cable at a given length
◆	R_{SOURCE}	DC resistance of the source
◆	R_{TOTAL}	Combined DC resistance of the cable and DC source: $R_{TOTAL} = R_{SOURCE} + R_{CABLE}$
◆	$V = IR$	Ohm's Law
◆	$V_{OC} = V_{SOURCE} + V_{LOAD}$	Kirchoff's Voltage Law

Calculating the length

The following two examples show how to calculate the maximum combined length of the positive and negative wires that connect the DC power supply to the DC source.

Example 1: This example uses the following given information:

Given

$V_{\text{DROP}} = 2\text{V}$	Maximum voltage drop through input source and cable
$V_{\text{MIN}} = 40\text{V}$	Minimum input voltage
$I_{\text{MAX}} = 8.6\text{V}$	Maximum input current at 40V
$V_{\text{OC}} = 48\text{V}$	Measured
$V_{\text{LOAD}} = 47.5\text{V}$	Measured
$R_{\text{TEST}} = 10\Omega$	(300W)

Solution

$$V_{\text{DROP}} = I_{\text{MAX}} R_{\text{TOTAL}}$$

$$2 = 8.6 R_{\text{TOTAL}}$$

$$R_{\text{TOTAL}} = 2/8.6$$

$$R_{\text{TOTAL}} = .233\Omega$$

$$V_{\text{LOAD}} = I R_{\text{TEST}}$$

$$I = V_{\text{LOAD}}/R_{\text{TEST}}$$

$$V_{\text{OC}} = V_{\text{SOURCE}} + V_{\text{LOAD}}$$

$$V_{\text{OC}} = IR_{\text{S}} + V_{\text{LOAD}}$$

$$R_{\text{S}} = \frac{V_{\text{OC}} - V_{\text{LOAD}}}{I}$$

$$R_{\text{S}} = \frac{(V_{\text{OC}} - V_{\text{LOAD}})}{V_{\text{LOAD}}/R_{\text{TEST}}}$$

$$R_{\text{S}} = \frac{V_{\text{OC}} - V_{\text{LOAD}}}{V_{\text{LOAD}}} \times R_{\text{TEST}}$$

$$= \frac{48\text{V} - 47.5\text{V}}{47.5\text{V}} \times 10\Omega$$

$$= 0.105\Omega$$

$$R_{\text{TOTAL}} = R_{\text{CABLE}} + R_{\text{SOURCE}}$$

$$R_{\text{CABLE}} = R_{\text{TOTAL}} - R_{\text{SOURCE}}$$

$$R_{\text{CABLE}} = 0.233\Omega - 0.105\Omega$$

$$= 0.128\Omega$$

For example, if you have a solid strand 12-gauge wire at room temperature, use the following calculation.

$$\text{Total cable length} = \frac{R_{\text{CABLE}}}{\text{DC resis.}^1}$$

$$\text{Total cable length} = \frac{.128\Omega}{.0017\Omega/\text{ft}} = 75 \text{ ft}$$

AWG	Strand	DC resistance ¹ (Ω/ft)		Total cable length ² (ft)	
		25° C	75° C	25° C	75° C
12	Solid	.0017	.0020	75	64
12	7/20	.0015	.0018	85	71
12	19/25	.0017	.0020	75	64
12	65/30	.0018	.0022	71	58
12	165/34	.0016	.0019	80	67

1. Data from Alpha Wire, wire manufacturer
2. Combined positive and negative run

Example 2: This example uses the following given information:

Given

$$V_{\text{DROP}} = 2\text{V} \quad \text{Maximum voltage drop through input source and cable}$$

$$V_{\text{MIN}} = 40\text{V} \quad \text{Minimum input voltage}$$

$$I_{\text{MAX}} = 8.6\text{V} \quad \text{Maximum input current at 40V}$$

$$R_{\text{SOURCE}} \cong 0$$

Solution

$$V_{\text{DROP}} = I_{\text{MAX}} R_{\text{TOTAL}}$$

$$2 = 8.6 R_{\text{TOTAL}}$$

$$R_{\text{TOTAL}} = 2/8.6$$

$$R_{\text{TOTAL}} = .233\Omega$$

$$R_{\text{TOTAL}} = R_{\text{SOURCE}} + R_{\text{CABLE}}$$

$$R_{\text{CABLE}} = R_{\text{TOTAL}} = .233\Omega$$

For example, if you have a solid strand 12-gauge wire at room temperature, use the following calculation:

$$\text{Total cable length} = \frac{R_{\text{CABLE}}}{\text{DC resis.}^1}$$

$$\text{Total cable length} = \frac{.233\Omega}{.0017\Omega/\text{ft}} = 136 \text{ ft}$$

AWG	Strand	DC resistance ¹ (Ω/ft)		Total cable length ² (ft)	
		25° C	75° C	25° C	75° C
12	Solid	.0017	.0020	136	116
12	7/20	.0015	.0018	155	129
12	19/25	.0017	.0020	136	116
12	65/30	.0018	.0022	129	105
12	165/34	.0016	.0019	145	122

1. Data from Alpha Wire, wire manufacturer
2. Combined positive and negative run

About using other wire sizes

If you need a longer run for your combined positive and negative DC wires, choose a wire with a lower resistance and calculate the total cable length. For example, a solid #10 AWG has a lower DC resistance than a solid #12 AWG.

About this appendix This appendix lists the regulatory notices you need to be aware of when installing and operating your Network Appliance equipment.

Regulatory notices

FCC notices (U.S. only)

Network Appliance devices are designed for a CFR 47 (Code Federal Regulations) Part 15 Class A environment.

The FCC and Network Appliance guarantee the user's rights to operate this equipment only if the user complies with the following rules and regulations:

- ◆ Install and operate this equipment in accordance with the specifications and instructions in this guide.
- ◆ Modify this equipment only in the ways specified by Network Appliance.
- ◆ Use shielded cables with metallic RFI/EMI connector hoods to maintain compliance with applicable emissions standards.
- ◆ If the system has nine or more Fibre Channel disk shelves, install the system in two or three NetApp System Cabinets to maintain performance within Part 15 of CFR 47 regulations.

Compliance with Part 15 of CFR 47

This equipment has been tested and found compliant with Part 15 of the CFR 47 rules for Class A digital devices. These rules are designed to provide reasonable protection from interference to electronics equipment operated in a commercial environment.

Operation of this device is subject to the following two conditions:

- ◆ This device cannot cause harmful interference.
- ◆ This device must accept any interference received, including interference that may cause undesired operation.

Compliance with ICES-003

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A conforme à la norme NMB-003 du Canada.

Compliance with EN regulations

Marking by the symbol  indicates compliance of this Network Appliance device to the EMC Directive and the Low Voltage Directive of the European Union. Such marking is indicative that this Network Appliance device meets the technical standards listed in “Declaration of Conformity,” later in this appendix.

Caution

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Bureau of Standards, Metrology, and Inspections notice (BSMI, Taiwan only)

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Translation of the BSMI notice:

Warning: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Declaration of Conformity

**Network Appliance, Inc.,
495 East Java Drive
Sunnyvale, California, 94089, U.S.A.,**

declare under our sole responsibility that the products

Type of equipment	Description	Model number	Year of manufacture
Network caching appliance	NetCache appliance C3100/C6100 Series	C3100 and C6100	2000 and 2001

to which this declaration relates conform to the following standards:

EN 60950:1992, with A1-A4, A11, Information Technology Equipment (Safety)

EN 55022:1998, Emissions Requirements for Information Technology Equipment

EN 50024:1998, Immunity Requirements for Information Technology Equipment

EN 60825-1, Safety of Laser/LED Equipment

IEC 1000-3-2:1995 Limits for Harmonic Current Emissions

IEC 1000-3-3:1994 Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems

following the provisions of the directives listed below:

73/23/EEC, Low Voltage Directive (Product Safety)

89/336/EEC, Electromagnetic Compatibility Directive

Part number: 210-00126

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