Nortel Secure Router 8012

Hardware Description

Release: 5.3
Document Revision: 01.03

www.nortel.com

NN46240-303 324566-A

Nortel Secure Router 8012
Release: 5.3
Publication: NN46240-303
Document Revision: 01.03
Document status: Standard
Document release date: 6 April 2009

Printed in Canada, India, and the United States of America

ATTENTION
For information about the safety precautions, read "Safety messages" in this guide.

For information about the software license, read "Software license" in this guide.

Contents

Figures

Tables

Contents

About this document

Purpose

This document introduces the Nortel Secure Router 8012 hardware, including the power module, the heat dissipation system, the board, and the equipment cable.

Related versions

The following table lists the product versions related to this document.

Product Name	Version
Nortel Secure Router 8012	V200R005

Intended audience

This document is intended for the following audience:

- installers
- network operators
- network administrators
- network maintenance engineers

Organization

This document consists of five chapters and is organized as follows.

Chapter	Description
1 Overview	This chapter describes the device structure, the system configuration, and the physical specifications.
2 Power supply	This chapter describes the DC and AC power modules, including the front panel, the functions, and the technical specifications.

Chapter	Description
3 Heat dissipation system	This chapter describes the heat dissipation system, including the front panel, the functions and the technical specifications.
4 Boards	This chapter describes the classification of the boards, the slot allocation, the interface types, and the allocation on the boards. It also describes each board according to the functions, the front panel, the interface description, the attributes, and the technical specifications.
5 Cables	This chapter describes the external cables, including the structure and the technical specifications.
Appendixes A to C	These sections contain a list of indicators, a list of boards, and a list of acronyms and abbreviations. For daily maintenance, you can use these sections to quickly find information about the device.

Conventions

This section describes the symbol and text conventions used in this document.

Symbol conventions

Symbol	Description
 DANGER	Indicates a hazard with a high level of risk that, if not avoided, can result in death or serious injury.
 WARNING	Indicates a hazard with a medium or low level of risk that, if not avoided, can result in minor or moderate injury.
 CAUTION	Indicates a potentially hazardous situation that, if not avoided, can cause equipment damage, data loss, and performance degradation, or unexpected results.
 TIP	Indicates a tip that may help you solve a problem or save time.
 NOTE	Provides additional information to emphasize or supplement important points of the main text.

General conventions

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman font.

Convention	Description
Boldface	Names of files, directories, folders, and users are in **boldface**. For example, log on as the user **root**.
Italic	Book titles are in *italics*.
`Courier New`	Terminal display is in `Courier New` font.

Command conventions

Convention	Description
Boldface	The keywords of a command line are in **boldface**.
Italic	Command arguments are in *italics*.
[ ]	Items (keywords or arguments) in square brackets [ ] are optional.
{ x | y | ... }	Alternative items are grouped in braces and separated by vertical bars. You select one item.
[x | y | ...]	Optional alternative items are grouped in square brackets and separated by vertical bars. You select one item or no item.
{ x | y | ... } *	Alternative items are grouped in braces and separated by vertical bars. You can select a minimum of one item or a maximum of all items.
&<1-n>	The parameter before the ampersand sign (&) can be repeated 1 to *n* times.
#	A line starting with the number sign (#) contains comments.

GUI conventions

Convention	Description
Boldface	Buttons, menus, parameters, tabs, windows, and dialog box titles are in **boldface**. For example, click **OK**.
>	Multilevel menus are in **boldface** and separated by the right-angled bracket sign (>). For example, choose **File** > **Create** > **Folder**.

Keyboard operation

Format	Description
Key	Press the key. For example, press **Enter** and press **Tab**.
Key 1+Key 2	Press the keys concurrently. For example, **Ctrl+Alt+A** means press the three keys concurrently.
Key 1, **Key 2**	Press the keys in sequence. For example, **Alt**, **A** means press the two keys in sequence.

Mouse operation

Action	Description
Click	Select and release the primary mouse button without moving the pointer.
Double-click	Press the primary mouse button twice quickly without moving the pointer.
Drag	Press and hold the primary mouse button and move the pointer to a new position.

Update history

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Updates in Issue 01 (2008-06-06)

This is the first commercial release of this document.

Contents

Figures

Tables

1 Overview

About this chapter

The following table lists the contents of this chapter.

Title	Description
1.1 Introduction	This section describes the features of the Secure Router 8012.
1.2 Structure	This section describes the appearance and hardware structure of the Secure Router 8012.
1.3 System configuration and physical specifications	This section describes the system configuration and physical specifications of the Secure Router 8012.

1.1 Introduction

The Nortel Secure Router 8012 is a high-end router developed by Nortel and designed for the carrier aggregation layer and the enterprise backbone layer network. The Secure Router 8012 features include high performance, double Routing Process Units (RPUs), double Network Process Units (NPUs), and hot backup.

The Secure Router 8012 has a modularized structure and provides the High-speed Interface Card (HIC) and the Flexible Interface Card (FIC).

The hardware structure of the Secure Router 8012 provides the following attributes:

- It supports hot swapping.
- The backplane is in the middle. The boards are inserted in the backplane horizontally, allowing easy configuration and maintenance.
- The fan is located to the left of the router backplane. Multiple fans provide heat dissipation.

The Secure Router 8012 also provides an effective monitoring system through the main control module on the RPU. The RPU can manage, monitor, and maintain the board, the fan module, and the power module.

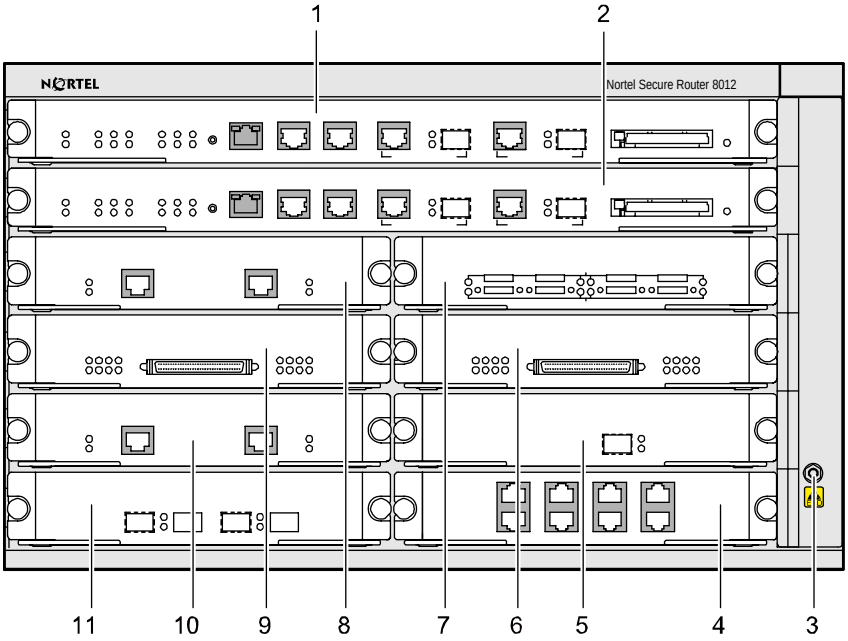
The Secure Router 8012 adheres to electromagnetic compatibility (EMC) and Underwriters Laboratories Inc. (UL) standards. The entire system reaches the module-class shield level. Every front panel is made of steel sheet to isolate the electromagnetic wave between boards.

1.2 Structure

The Secure Router 8012 provides the backplane in the middle and an integrated chassis with the board inserted horizontally. The chassis is 6 U in height (1 U = 44.45 millimeters [mm]) and can be mounted in a 19-inch standard cabinet or on the workbench.

Front panel

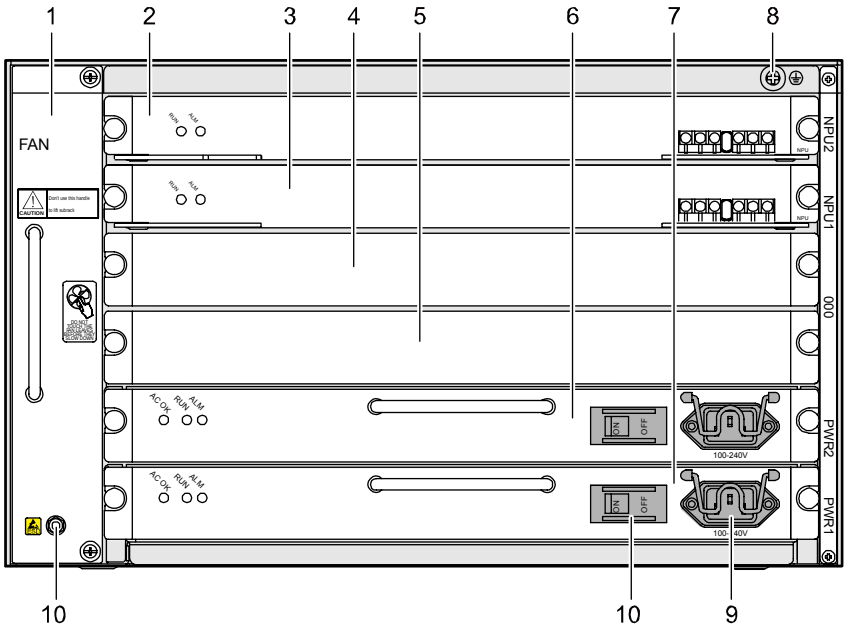
Figure 1-1 Front panel of the Secure Router 8012



1. RPU 2-slot 10
2. RPU 1-slot 9
3. ESD-preventive wrist strap jack
4. FIC/HIC interface module –slot 2
5. FIC/HIC interface module –slot 4
6. FIC interface module –slot 6
7. FIC interface module –slot 8
8. FIC/HIC interface module –slot 7
9. FIC/HIC interface module –slot 5
10. FIC/HIC interface module –slot 3
11. FIC/HIC interface module –slot 1

Rear panel

Figure 1-2 Rear panel of the Secure Router 8012



1. Fan module
2.NPU 1
3. NPU 2
4.Filler panel
5.Filler panel
6. Power module 1 (PWR1)
7.Power module 2 (PWR2)
8. Grounding screw
9. AD Power interface
10. Power switch
11. ESD-preventive wrist strap jack

The Secure Router 8012 has an integrated cabinet. The following table provides information about the main components.

Table 1-1 Secure Router 8012 components

Name	Description	Detail
Power module	The power module is located in the two slots at the bottom of the back panel of the cabinet. Every cabinet must be configured with two power modules that are in 1+1 backup mode. The Secure Router 8012 provides an AC or DC power module.	See Chapter 2, “Power supply.”
Fan module	The fan module is located to the left of the backplane and is used for heat dissipation. Every cabinet must be configured with one fan module.	See Chapter 3, “Heat dissipation system.”
Board	The four types of boards are RPU, NPU, FIC, and HIC, which can be inserted into the board slots.	See Chapter 4, “Boards.”
Cable	This component contains the internal power cable, fiber, and the external whole-set cable.	See Chapter 5, “Cable.”

1.3 System configuration and physical specifications

1.3.1 System configuration

The following table shows the system configuration data.

Table 1-2 System configuration data

Item	Secure Router 8012
Number of slots	12
Maximum number of interface boards	8
Fan backup	Redundancy backup 2 x 4
Power backup	DC or AC power supply modules in 1+1 redundancy backup
Fixed interface	1 AUX port 1 console port One 10/100/1000Base-TX Ethernet interface Two 100/1000M Ethernet interfaces
CPU	PowerPC 7447 967 MHz
Boot ROM	512 KB x 2
SDRAM	512 MB (default), can be expanded to 2 GB
NVRAM	512 KB
Flash	64 MB
Packet transmission rate	6 Mpps
Switching capacity	16 Gbit/s
Transmission attribute	1Gigabit Ethernet (GE) wire speed transmission
Mean Time Between Failure (MTBF)	More than 34.34 years
Mean Time To Repair (MTTR)	Less than 60 minutes
Availability	More than 0.99999

NOTE

- Synchronous Dynamic Random Access Memory (SDRAM) stores the communication data between the system and CPU.
- Non-Volatile Random Access Memory (NVRAM) stores critical files, such as the configuration files and the record of the system running state.
- Flash memory stores the operating system and the application program files.
- Boot ROM stores the boot file for system startup.

1.3.2 Physical specifications

The following table describes the physical specifications of the Secure Router 8012.

Table 1-3 Physical specifications

Item		Secure Router 8012
Cabinet structure		Integrated cabinet, 6 U high
Dimension	Height (H)	263.9 mm
	Width (W)	436.2 mm
	Depth (D)	480.0 mm
Input voltage	AC	Rated voltage range: 100 V AC to 240 V AC, 50/60Hz Maximum voltage range: 90 V AC to 264 V AC, 50/60Hz
	DC	Rated voltage range: –48 V DC Maximum voltage range: –72 V DC to –36 V DC
Maximum configuration weight		32 kg
Maximum power consumption		320 watts (W)
Module consumption	RPU	30 W
	NPU	58 W
Operating temperature	Long term	0℃ to 45℃
	Short term	–5℃ to 55℃
Storage temperature		–40℃ to 70℃
Relative humidity (RH)	Long term	5% RH to 85% RH (non-condensing)
	Short term	0% RH to 95% RH (non-condensing)
Storage relative humidity		0% RH to 95% RH
Long-term operating altitude		< 3000 meters (m)
Storage altitude		< 5000 m

NOTE

- The temperature and humidity are measured at 1.5 m over the floor and 0.4 m in front of the cabinet. There should be no protection board at the front or back of the cabinet.
- Short-term operation means that the continuous working time does not exceed 48 hours and the accumulated time per year does not exceed 15 days.

Contents

Figures

Tables

2 Power supply

About this chapter

The following table shows the contents of this chapter.

Title	Description
2.1 Appearance and front panel	This section describes the appearance and the front panel of the power module.
2.2 Functions	This section describes the functions of the power module.
2.3 Technical specifications	This section describes the technical specifications of the power module.

2.1 Appearance and front panel

2.1.1 Appearance

The Secure Router 8012 provides two types of power module: AC input and DC input. Figure 2-1 shows the appearance of the AC power module. Figure 2-2 shows the appearance of the DC power module.

Figure 2-1 Appearance of the AC power supply module

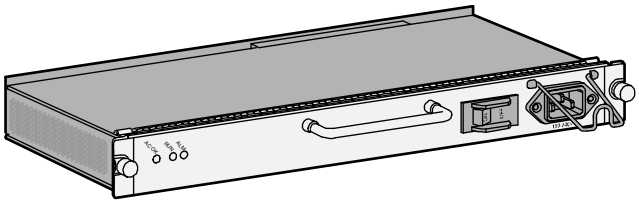
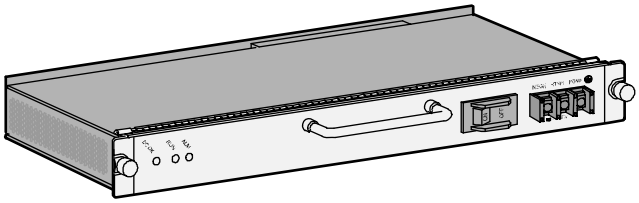


Figure 2-2 Appearance of the DC power supply module



2.1.2 Front panel

Figure 2-3 shows the appearance of the front panel of the AC power module. Figure 2-4 shows the appearance of the front panel of the DC power module.

Figure 2-3 Front panel of the AC power module

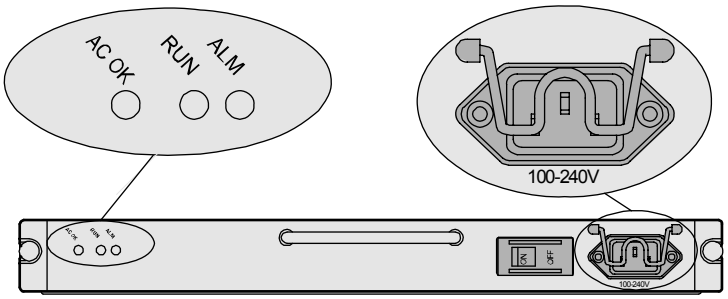


Figure 2-4 Front panel of the DC power module

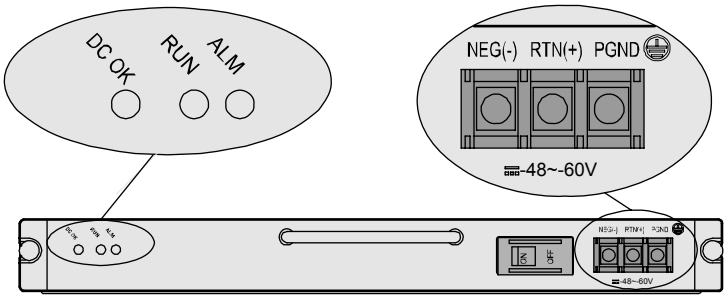


Table 2-1 Relationship of the terminal block connection of the power input cable

Identifier of the terminal block	Input cable name	Input cable color	Input cable interface
RTN (+)	Power grounding cable	Black	Core end terminal
NEG (-)	Power cable	Blue	
PGND	Protection grounding cable	Yellow and green	Need not be connected.

NOTE
- RTN: Return
- NEG: Negative
- PGND: Protection Ground

As shown in Table 2-2 and Table 2-3, you can view the running state of the power module on the indicators of the Routing Process Unit (RPU) front panel.

Table 2-2 Description of the indicators on the AC power supply module

Name	Color	Description
AC OK	Green	The power module input LED (only for the AC power module). Constant ON means the voltage input is normal (100 V to 240 V), and OFF means the voltage input is not normal.
RUN	Green	The power module indicators. Constant ON means the power module runs normally, and OFF means the power module has faults.
ALM	Red	The power module fault indicator. Constant ON means the power module has faults or is not in position.

Table 2-3 Description of the indicators on the DC power supply module

Indicator	Color	Description
DC OK	Green	The DC input state indicator (only for the DC power module). Constant ON means the voltage input is normal (-48 V to -60 V), and OFF means the voltage input is not normal.
RUN	Green	The power module LED. Constant ON means the power module runs normally, and OFF means the power module has faults.
ALM	Red	The power module failure LED. Constant ON means the power module has faults or is not in position.

The running state of the power module is available from the indicators on the RPU front panel. For more information, see Chapter 4, “Boards.”

2.2 Functions

On the Secure Router 8012, the two types of power modules (AC input and DC input) are inserted into the backplane from the back.

In normal situations, two power modules work in 1+1 hot backup mode. The AC and DC power modules are the PSR550-A and the PSR550-D respectively. The power line uses the –48V feeder cable of D 3PIN.

The power module has the following functions:

- When power input is interrupted or an error occurs with one power module, the other module is not affected and can provide power to the entire system. If the system needs to be powered off, you must power off all the configured power modules.
- The power module provides protection functions, including input over-voltage protection, input under-voltage protection, output over-flow protection, output over-voltage protection, output short-circuit protection, and over-heat protection.
- The power module supports the hot swap feature. Switching the power module does not affect the running system.

NOTE

If you want to install a Secure Router 8012 in the communication equipment room, make sure that the power distribution cabinet can provide a lightning protection box or arrester against the current of 20 KA and above.

2.3 Technical specifications

The following table describes the technical specifications of the power module.

Table 2-4 Technical specificationss of the power module

Item		Technical specifications
Dimensions		40.14 mm (H) x 350.00 mm (W) x 224.30 mm (D)
Weight		1.5 kg
Input rated voltage Input voltage	AC	100 V AC to 240 V AC 50/60 Hz
	DC	–48 V DC to –60 V DC
Maximum input current Input surge current	AC	85 V AC to 264 V AC 50/60 Hz
	DC	–36V DC to –72V DC
Maximum output current	AC	10 A
	DC	25 A
Input surge current		36 A
Maximum output current		60 A (3.3 V) 20 A (5 V) 30 A (12 V)
Maximum output power		550 W

Contents

Figures

Tables

3 Heat dissipation system

About this chapter

The following table lists the contents of this chapter.

Title	Description
3.1 Appearance and front panel	This section describes the appearance and the front panel of the heat dissipation system.
3.2 Functions	This section describes the functions of the heat dissipation system.
3.3 Technical specifications	This section describes the technical specifications of the heat dissipation system.

The Secure Router 8012 heat dissipation system consists of the following components:

- fan module
- air filter

The air filter and the fan module are placed separately. The air filter is located to the right of the cabinet backplane. You can clean the air filter by removing it from the back of the cabinet. For information about replacing and cleaning the air filter, see *Nortel Secure Router 8012 – Installation* (NN46240-301).

This chapter describes the fan function, appearance, front panel, and technical specifications for the Secure Router 8012.

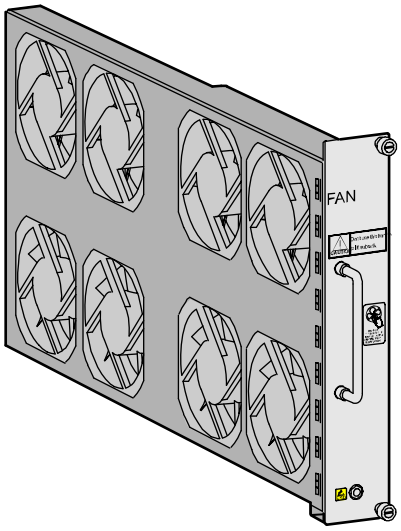
3.1 Appearance and front panel

3.1.1 Appearance

The fan of the Secure Router 8012 is located to the left of the cabin backplane. It ventilates the panel and dissipates heat. The fan supports hot swapping.

The fan module contains the fan frame and the fan components. Figure 3-1 shows the appearance of the fan module.

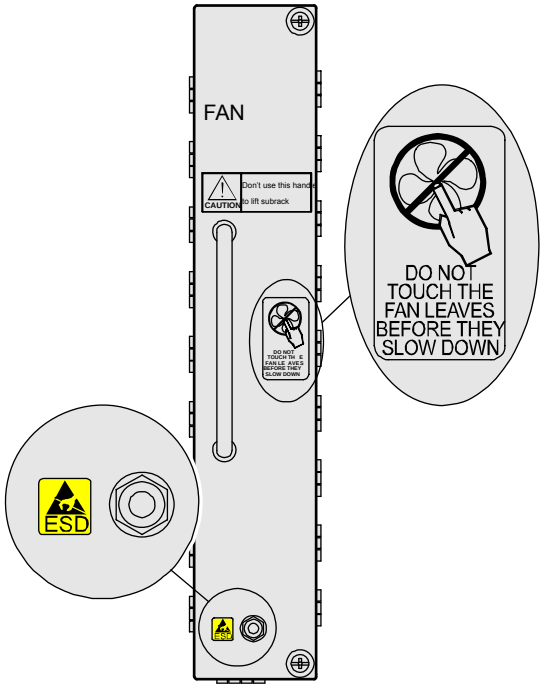
Figure 3-1 Appearance of the fan in the Secure Router 8012



3.1.2 Front panel

Figure 3-2 shows the fan module front panel.

Figure 3-2 Appearance of the fan front panel of the Secure Router 8012



The warning indicators for the state of the fan module are located on the Routing Process Unit (RPU) front panel. Table 3-1 describes the fan module indicators on the RPU.

Table 3-1 Description of the fan module indicators

Name	Color	Description
RUN	Green	Constant ON means the fan is operating normally.
ALM	Red	ON means an error occurred on the fan.

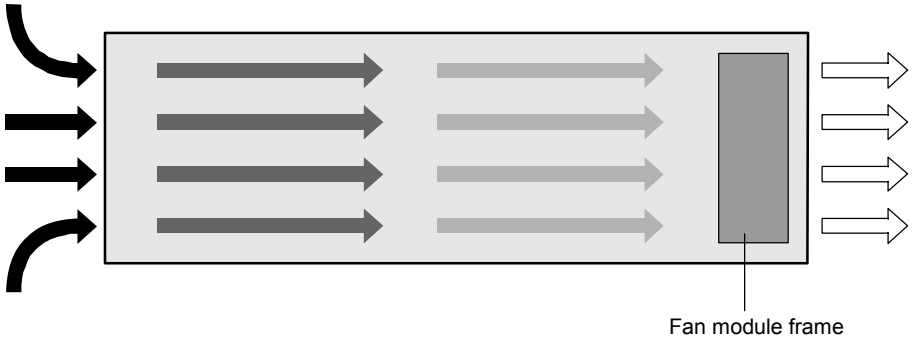
3.2 Functions

The revolution of the fan module is controlled by the RPU. Properly working fans keep the Secure Router 8012 operating at the normal temperature. The fan module functions include the following:

- The fan module can modify the revolution automatically. It configures two parameters, the low-temperature threshold and the high-temperature threshold. The low-temperature threshold and the high-temperature threshold correspond with revs of 100% and 50% respectively. For temperature operation requirements, see Chapter 1, “Overview.”
- As the failure of one fan does not affect the operation of other fans, the system can still operate at the normal temperature.
- The system sends out rotation stop alarm signals if any fan fails.

The heat dissipation system of the Secure Router 8012 ventilates the Secure Router 8012. From the top, the air flow enters the Secure Router 8012 from the left and exits from the right. Figure 3-3 shows the air flow inside the Secure Router 8012.

Figure 3-3 Air flow inside the Secure Router 8012



3.3 Technical specifications

Table 3-2 shows the technical specifications of the fan module.

Table 3-2 Technical specifications of the fan module

Item	Specifications
Dimensions	259.45 mm (H) x 47.70 mm (W) x 462.65 mm (D)
Power consumption	38.4 W
Maximum blast pressure	75 Pa
Maximum blast volume	921.6 m^3/h
Maximum noise	60 dB
Maximum rev	3800 RPM
Operating voltage range	7.0 V to 13.8 V DC
Operating voltage	12 V DC

Contents

Figures

Tables

4 Boards

About this chapter

The following table shows the contents of this chapter.

Title	Description
4.1 Introduction	This section describes the classification of boards by their function and the models of each type of board; the slots where the boards are inserted; the logical relationship between boards; the appearance of boards; and the classification of boards by interface.
4.2 RPUs	This section describes the functions, front panel, interfaces, and technical specifications of the Routing Process Unit (RPU).
4.3 NPUs	This section describes the functions, panel, and technical specifications of the Network Process Unit (NPU).
4.4 10/100Base-TX electrical interface module	This section describes the functions and front panel of the 10/100Base-TX electrical interface module, and the attributes of the interfaces.
4.5 100Base-FX Ethernet optical interface module	This section describes the functions and front panel of the 100Base-FX Ethernet optical interface module, and the attributes of the interfaces.
4.6 1000Base-X Ethernet optical interface module	This section describes the functions and front panel of the 1000Base-X Ethernet optical interface module, and the attributes of the interfaces.
4.7 Channelized and unchannelized E1/T1 interface module	This section describes the functions and front panel of the channelized and unchannelized E1/T1 interface module, and the attributes of the interfaces.
4.8 Channelized E3 interface modules	This section describes the functions and front panel of the channelized E3 interface module, and the attributes of the interfaces.

Title	Description
4.9 Synchronous serial port module	This section describes the functions and front panel of the synchronous serial port module, and the attributes of the interfaces.
4.10 Channelized and unchannelized POS optical interface modules	This section describes the functions and front panel of the channelized and unchannelized Packet Over SDH/SONET (POS) optical interface module, and the attributes of the interfaces.
4.11 HSSI interface module	This section describes the functions and front panel of the High Speed Serial Interface (HSSI) interface module, and the attributes of the interfaces.
4.12 IPSec encryption HIC module	This section describes the functions and front panel of the IP Security (IPSec) encryption High-speed Interface Card (HIC), and the attributes of the module.

4.1 Introduction

This section describes the Secure Router 8012 boards, including board classification, slot arrangement, board appearance, interface type, and interface distribution.

4.1.1 Board classification and slot arrangement

Board classification

The Secure Router 8012 supports the following board types:

- Routing Process Unit (RPU)
- Network Process Unit (NPU)
- Flexible Interface Card (FIC), including:
  - 4-port multiprotocol synchronous serial interface module (4SAE)
  - 4-port unchannelized E1 module (4E1)
  - 4-port channelized E1 module (4CE1)
  - 8-port unchannelized E1 module (8E1)
  - 8-port channelized E1 module (8CE1)
  - 1-port channelized E3 module (1CE3)
  - 4-port channelized T1 module (4CT1)
  - 8-port channelized T1 module (8CT1)
  - 1-port channelized POS optical interface module (1CPOS[E])
  - 1-port HSSI interface module (1HSSI)
  - 2-port HSSI interface module (2HSSI)

NOTE

The Secure Router 8012 with the host software version VRP5.30-23134002 or later supports the HSSI interface.

- High-speed Interface Card (HIC), including:
  - 2-Port 100M Ethernet High Speed Electrical Interface Card (RJ45)for Secure Router 8002, 8004, and 8008 (2xFE UTP)
  - 4-Port 100M Ethernet High Speed Electrical Interface Card (RJ45) for Secure Router 8002, 8004, and 8008 (4xFE UTP)
  - 8-port 100M Ethernet High Speed Electrical interface Card (RJ45)for Secure Router 8002, 8004, and 8008 (8xFE UTP)
  - 2-Port Fast Ethernet High Speed Optical Interface Card (SFP) for Secure Router 8002, 8004, and 8008 (2xFE Optical)
  - 4-Port Fast Ethernet High Speed Optical Interface Card (SFP) for Secure Router 8002, 8004, and 8008 (4xFE Optical)
  - 8-Port Fast Ethernet High Speed Optical Interface Card (SFP) for Secure Router 8002, 8004, and 8008 (8xFE Optical)
  - High Speed 1-port 1000M Ethernet card(SFP) for Secure Router 8002, 8004, and 8008 (1xGig E (SFP))
  - High Speed 2-port 1000M Ethernet card(SFP) for Secure Router 8002, 8004, and 8008 (2xGig E (SFP))

- High Speed 1-port 155M POS card(SFP) for Secure Router 8002, 8004, and 8008 (1x155 POS)
- High Speed 2-port 155M POS card(SFP) for Secure Router 8002, 8004, and 8008 (2x155 POS)
- High Speed 4-port 155M POS card(SFP) for Secure Router 8002, 8004, and 8008 (4x155 POS)
- 1-port OC-3/STM-1 CPOS-Channelized E1 Optical Interface Board(SFP) for Secure Router 8012 (1xOC3/STM1 ATM(SFP))
- 1-port OC-3/STM-1 CPOS-Channelized T1-Optical Interface Board(SFP) (1xOC3/STM1 CPOSCT1 (SFP))
- 16-port Channelized E1-DB78-75ohm,Interface Board for Secure Router 8012 (16xCE1 DB78 75ohm)
- 16-port Channelized T1-DB78-120ohm,Interface Board for Secure Router 8012 (16xCT1 DB78 120ohm)
- 1-port OC-3/STM-1 ATM High Speed Optical Interface Board(SFP) for Secure Router 8012 (1xOC3/STM1 ATM(SFP))
- 2-port OC-3/STM-1 ATM High Speed Optical Interface Board(SFP) for Secure Router 8012 (2xOC3/STM1 ATM(SFP))
- 4-port OC-3/STM-1 ATM (HIC) High Speed Optical Interface Board(SFP) for Secure Router 8012 (4xOC3/STM1 ATM (HIC) (SFP))
- 1-port 155M POS (HIC) High Speed Optical Interface Board(SFP) for Secure Router 8012 (1xSTM1/POS-SFP-HIC-SR8012)
- 2-port 155M POS (HIC) High Speed Optical Interface Board(SFP) for Secure Router 8012 (2xSTM1/POS-SFP-HIC-SR8012)
- 4-port 155M POS (HIC) High Speed Optical Interface Board(SFP) for Secure Router 8012 (4xSTM1/POS-SFP-HIC-SR8012)
- IPSEC High Speed Interface Board for Secure Router 8002, 8004, and 8008 (IPSec Module)

Slot arrangement

Figure 4-1 shows the board slots of the Secure Router 8012.

Figure 4-1 Arrangement of the Secure Router 8012 slots on the backplane (front view)

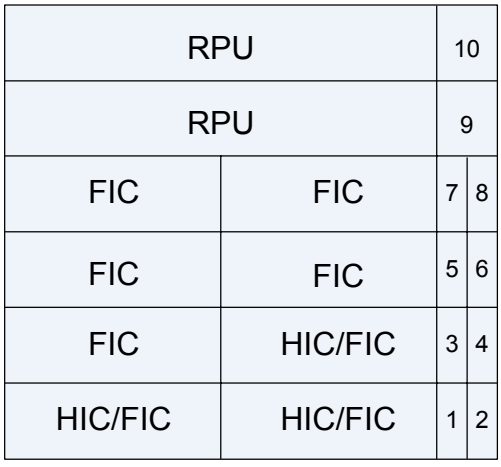
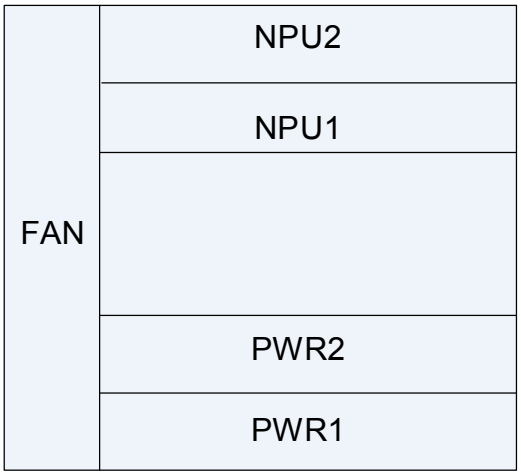


Figure 4-2 Arrangement of the Secure Router 8012 slots on the backplane (rear view)



You can insert the RPU into slots 9 and 10 on the top of the front panel of the chassis. You can insert the NPU into the two slots on the top of the rear panel of the chassis. The slots for NPUs and RPUs are positioned back to back.

You can insert an FIC into any of the slots 1 to 8.

You can insert an HIC into any of the slots 1, 2, 3, 4, 5, and 7. The type of HIC, however, is determined by the working mode of the router.

The Secure Router 8012 can operate in two modes: ordinary mode and extended mode. For information about the differences between the two modes, see Table 4-1.

CAUTION

Before hot swapping, run the **preplug slot** *Existing slot number* command in the system view. When information appears indicating that hot swapping is permitted, you can insert or remove boards. Nortel recommends that you substitute the same type of boards during hot swapping.

- To switch from ordinary mode (3HIC) to extended mode (6HIC), first remove the non-extendable HIC from slot 1. Otherwise, you cannot switch from ordinary mode to extended mode.
- To switch from extended mode (6HIC) to ordinary mode (3HIC), first remove the extendable HICs from slots 1, 3, 5, and 7. Otherwise, you cannot switch from extended mode to ordinary mode.

Table 4-1 Working modes of the Secure Router 8012

Working mode	Condition
Ordinary	One of the following HICs is inserted in slot 1: 2xFE UTP, 4xFE UTP, 8xFE UTP, 2xFE UTP, 4xFE UTP, 8xFE Optical, 1xGig E (SFP), 2xGig E (SFP), 2x155 POS, 4x155 POS, 2xOC3/STM1, 4xOC3/STM1 ATM (HIC) (SFP), or IPSec Module.

Working mode	Condition
Extended	One of the following HICs is inserted in any of the slots 1, 3, 5, and 7: 16xCE1 DB78 75ohm, 16xCT1 DB78 120ohm, 1xOC3/STM1 CPOSCE1(SFP), 1xOC3/STM1 CPOSCT1 (SFP), 1xOC3/STM1 ATM(SFP), or 1x155 POS HIC.

Based on the working mode, the slots allow different HICs, as shown in Table 4-2.

Table 4-2 Allowed HICs in different modes of the Secure Router 8012

Working mode	Slot number			
	1	2 and 4	3, 5, and 7	6 and 8
Ordinary (3 HICs)	Any of the following HICs: 2xFE UTP SR8002/4/8 4xFE UTP SR8002/4/8 8xFE UTP 2xFE UTP-SFP SR8002/4/8 4xFE UTP-SFP SR8002/4/8 8xFE Optical 1xGig E (SFP) 2xGig E (SFP) 2x155 POS 4x155 POS 2xOC3/STM1 4xOC3/STM1 ATM (HIC) (SFP) IPSec Module	Any of the HICs or FICs	Any of the FICs, but not HICs	Any of the FICs, but not HICs
Extended (6 HICs)	Any of the following HICs: 16xCE1 DB78 75ohm 16xCT1 DB78 120ohm 1xOC3/STM1 CPOSCE1(SFP) 1xOC3/STM1 CPOSCT1 (SFP)	Any of the HICs or FICs	Any of the FICs, or any of the following HICs: 16xCE1 DB78 75ohm 16xCT1 DB78 120ohm 1xOC3/STM1 CPOSCE1(SFP) 1xOC3/STM1	Any of the FICs, but not HICs

Working mode	Slot number			
	1	2 and 4	3, 5, and 7	6 and 8
	1xOC3/STM1 ATM(SFP) 1x155 POS		CPOSCT1 (SFP) 1xOC3/STM1 ATM(SFP) 1x155 POS	

NOTE

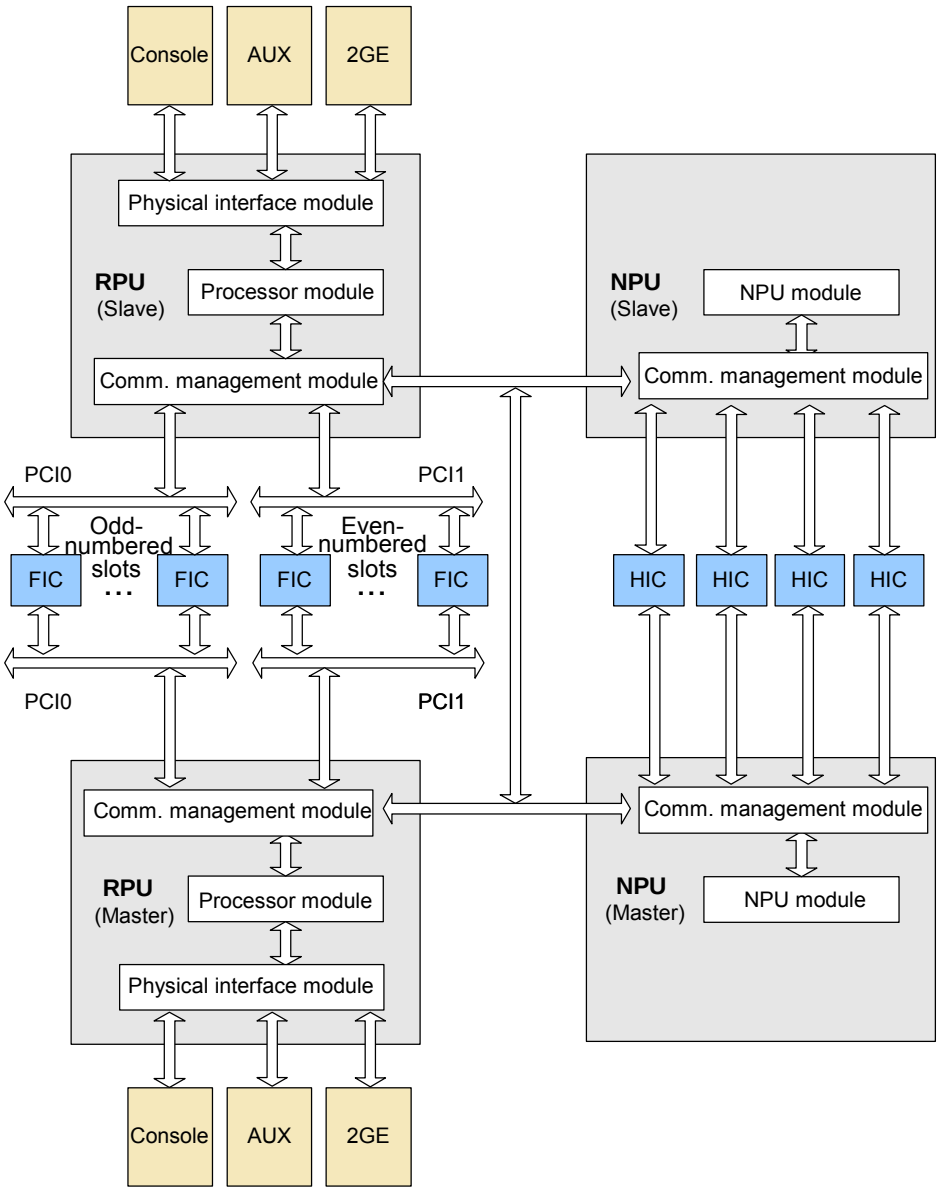
During initialization, the system mode is determined as follows: The router scans slot 1, 3, 5, and 7 in sequence; when the first HIC is found, the router determines the system working mode according to the card type; in the successive scanning, if the router finds that an HIC in a slot breaks the card mixture rule, the slot is marked as ABNORMAL and is not initialized.

During hot swapping, the system mode is determined as follows: The router detects whether the type of card that is inserted into slot 1, 3, 5, or 7 conflicts with the current system mode; if yes, the slot is marked as ABNORMAL and is not initialized.

4.1.2 Logical relationship among boards

Figure 4-3 shows the logical relationship among the boards of a Secure Router 8012.

Figure 4-3 Logical relationship among the boards of a Secure Router 8012



4.1.3 Board appearance

CAUTION

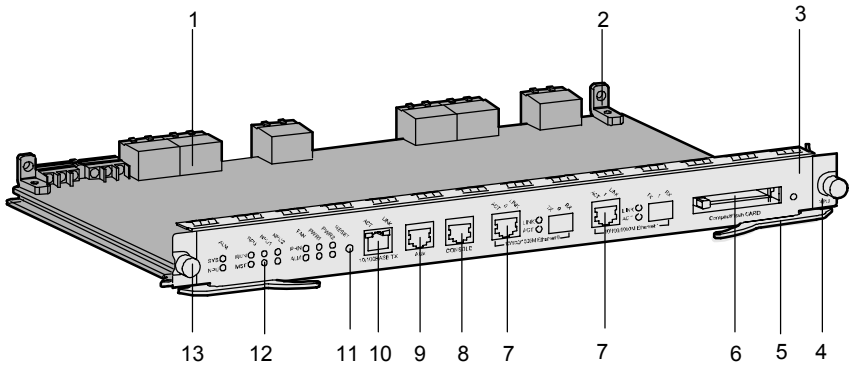
Wear an electrostatic discharge (ESD)-preventive wrist strap and keep it well grounded whenever you touch the board to prevent the ESD from damaging the board.

WARNING

Do not let your eyes near or stare at the optical interface or the fiber interface. The laser beam is harmful to your eyes.

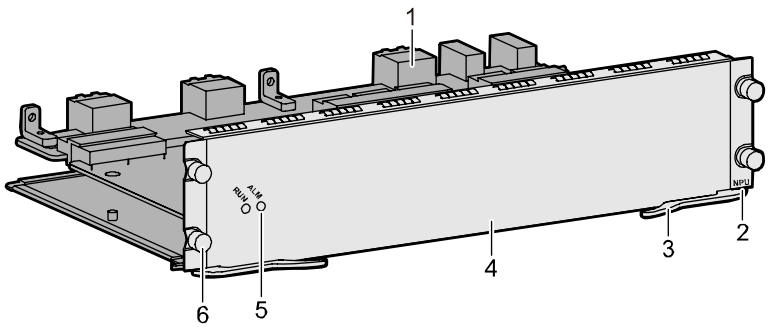
Figure 4-4, Figure 4-5, and Figure 4-6 show the appearance of the RPU, NPU, and HIC/FIC, using the the 8FE as an example.

Figure 4-4 Components on an RPU



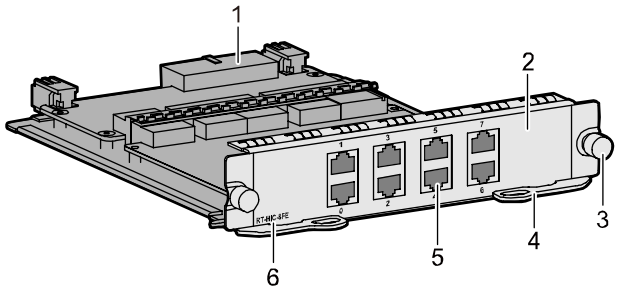
1. Connector
2.Guiding jack
3.Board
4.Board silkscreen
5. Handle
6. Reserved interface
7. 100/1000M Ethernet interface
8. CONSOLE port
9. AUX port
10. 10/100/1000M Ethernet interface
11. Reset key
12. Indicator
13. Captive screw

Figure 4-5 Components on an NPU board



1. Connector
2. Board silkscreen
3. Handle
4. Board
5. Indicator
6. Captive screw

Figure 4-6 Components on an HIC/FIC



1. Connector
2. Front panel
3. Captive screw
4. Handle
5. Interface
6. Board silkscreen

Table 4-3 shows the board dimensions.

Table 4-3 Board dimensions

Name	Dimensions
RPU	399.15 mm (W) x 236 mm (D) x 35.06 mm (H)
NPU	372.45 mm (W) x 238 mm (D) x 35.06 mm (H)
HIC/FIC	198.55 mm (W) x 243.19 mm (D) x 40.14 mm (H)

4.1.4 Interface types and distribution on the boards

All interfaces are integrated on the board and imported from the board. Table 4-4 shows the interface distribution on the boards.

Table 4-4 Interface distribution on the boards

Interface classification	Interface name	Interface attribute	Interface type	Board name
Optical interface	100Base-FX Ethernet optical interface	Single-mode optical interface	LC	RT-HIC-2FE-SFP RT-HIC-4FE-SFP RT-HIC-8FE-SFP
		Multi-mode optical interface	LC	RT-HIC-2FE-SFP RT-HIC-4FE-SFP RT-HIC-8FE-SFP

Interface classification	Interface name	Interface attribute	Interface type	Board name
	1000Base –FX Ethernet optical interface	Single-mode optical interface	LC	RT-HIC-1GE RT-HIC-2GE RPU
		Single-mode long-haul optical interface		
		Single-mode ultra long-haul optical interface		
		Multi-mode optical interface		
	FIC low-speed 155M ATM optical interface	Single-mode optical interface	SC	1ATM-OC3SM
		Single-mode long-haul optical interface		1ATM-OC3SML
		Multi-mode optical interface		1ATM-OC3MM
	HIC high-speed 155M ATM optical interface	Single-mode short-haul optical interface	LC	RT-HIC-1ATM RT-HIC-2ATM RT-HIC-4ATM
		Single-mode long-haul optical interface		
		Single-mode ultra long-haul optical interface		
		Multi-mode optical interface		
	POS optical interface	Single-mode short-haul optical interface	LC	1CPOS(E) RT-HIC-1POS RT-HIC-2POS RT-HIC-4POS RT-HIC-CPE1 RT-HIC-CPT1
		Single-mode long-haul optical interface		
		Single-mode ultra long-haul optical interface		
		Multi-mode optical interface		
Electrical interface	10/100Base-TX FE electrical Interface	10M/100 Mbit/s autosensing	RJ45	RT-HIC-2FE RT-HIC-4FE RT-HIC-8FE

Interface classification	Interface name	Interface attribute	Interface type	Board name
Serial port	High-speed synchronous serial port	DTE/DCE	DB-28	4SAE
Electrical interface of maintenance	Ethernet interface	10M/100M/1000M bit/s autosensing	RJ45	RPU
	Console interface	—	RJ45	RPU
	AUX interface	—	RJ45	RPU
	E1/CE1 T1/CT1	• 75 Ω coaxial cable • 120 Ω shielded twisted pair (STP)	• Coaxial connector • RJ45	4E1/4CE1/8E1/8CE1 /RT-HIC-16CE1 4CT1/8CT1/ RT-HIC-16CT1

4.2 RPUs

This section introduces the functions of the Routing Process Unit (RPU), the boards, the interfaces, and the technical specifications for the Secure Router 8012.

The RPU is located in either of the two slots on the top of the chassis. The RPU is installed in the front panel and corresponds with the NPU in the system. The Secure Router 8012 has two types of RPUs: ERPUA (with a memory of 512 MB) and ERPUB (with a memory of 1 GB). For normal operation, the master RPU and slave RPU must be the same type.

4.2.1 Functions

The RPU is the main control board of the Secure Router 8012. It consists of the PowerPC processor, system controller bridge, storage, and other attached devices. The RPU monitors the system ports, manages the equipment, and processes various software protocols.

The RPU has the following functions:

- processes the routing protocol
- receives and sends the FIC packets
- manages the interface state
- monitors the state of the power system
- monitors the state of the fan system
- monitors the system temperature
- supports the configuration and management of the active and standby NPUs
- configures and manages the high-speed interface

- supports the active and standby switchover
- supports hot swapping
- supports the hot and cool backup

In addition, the RPU provides two Gigabit Ethernet (GE) ports. It supports the exclusion of the optical function and the electrical function on the GE port; that is, you cannot use the optical function and the electrical function on the GE port at the same time..

4.2.2 Front panel

Figure 4-7 shows the appearance of the panel. Table 4-5 describes the components.

Figure 4-7 Appearance of the RPU front panel

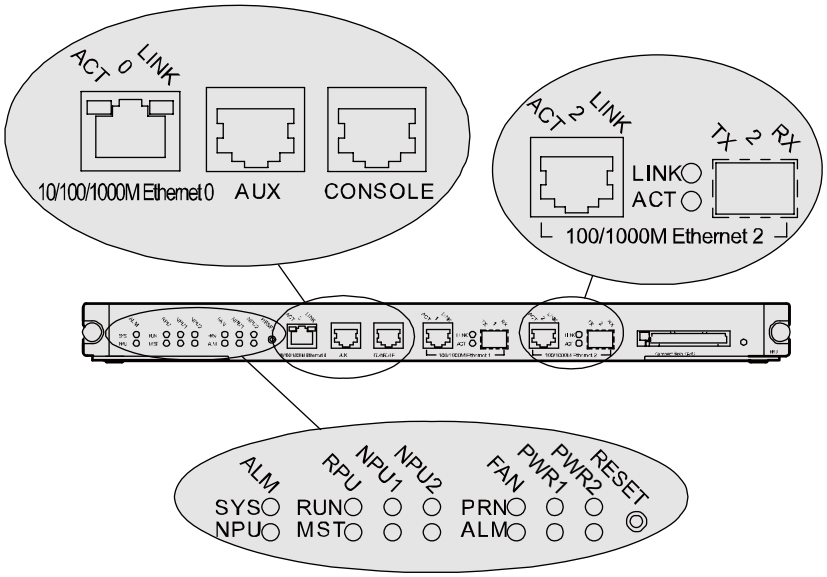


Table 4-5 Description of the components on the front panel of an RPU

Name	Silkscreen	Description
ALM (red)	SYS	The system running LED, including the fan, power supply, and NPU warnings. Constant ON means the CPU received a warning.
	NPU	The NPU failure LED. Constant ON means the NPU failed.
RPU (green)	RUN	The system running LED. Blinking means the CPU works normally. Constant ON or OFF means the CPU failed.
	MST	The standby state LED. On means that the board is the master RPU.

Name	Silkscreen	Description
NPU1 (green)	RUN	The system running LED. Blinking means the CPU is in normal operation. Constant ON or OFF means the CPU failed.
	MST	The standby state LED. On means that the board is the master NPU.
NPU2 (green)	RUN	The system running LED. Blinking means the CPU is in normal operation. Constant ON or OFF means the CPU failed.
	MST	The standby state LED. On means that the board is the master NPU.
FAN	PRN (green)	The fan position LED. Constant ON means the fan is in position or has failed.
	ALM (red)	The fan warning LED. Constant ON means the fan is not in position or its rotation is obstructed.
PWR1	PRN (green)	The LED of the first power module in position. Constant ON means the power module is in position. Constant OFF means the power module is not in position.
	ALM (red)	The first power module failure LED. Constant ON means that the power module is disabled or has failed.
PWR2	PRN (green)	The LED of the second power module in position. Constant ON means the power module is in position. Constant OFF means the power module is not in position.
	ALM (red)	The second power module failure LED. Constant ON means that the power module is disabled or has failed.
RESET		The RPU hardware reset button, which is used to restart the device.
10/100/1000M Ethernet 0 LED	LINK (green)	OFF means the link is not connected and ON means the link is connected.
	ACT (yellow)	OFF means no data is being transmitted or received on the interface, and blinking means data is being transmitted and received.
100/1000M Ethernet 1 LED	LINK (green)	OFF means the link is not connected and ON means the link is connected.
	ACT (yellow)	OFF means no data is being transmitted and received on the interface, and blinking means data is being transmitted and received.
100/1000M Ethernet 2 LED	LINK (green)	OFF means the link is not connected and ON means the link is connected.

Name	Silkscreen	Description
	ACT (yellow)	OFF means no data is being transmitted and received on the interface, and blinking means data is being transmitted and received.

4.2.3 Interfaces

Table 4-6 describes the interfaces on the RPU and their usage.

Table 4-6 The interfaces on the RPU and their usage

Item	Description
Console port	The local debugging serial port. It is used to connect the serial port of a PC. The terminal emulation program can run on the PC. It can be used as the command line interface (CLI) and also for board or system debugging, testing, serial port printing, background operation, troubleshooting, and online upgrading.
AUX port	The AUX port is also called the remote debugging physical interface. It provides remote configuration, connects the modem, and establishes the connection with the remote router by dialing. When faults occur on the console port, you can use the AUX port as the console port.
10/100/1000M Ethernet port	Provides the remote logon Telnet function and can be used for board or system debugging, testing, background operation, fault diagnosis, online upgrading, and remote operation.
100/1000M Ethernet port	Similar to the 10/100/1000M Ethernet port, this port is used for debugging.
Compact flash card	Reserved as the interface.

4.2.4 Interface attributes

Table 4-7 shows the attributes of the console port.

Table 4-7 Console interface attributes

Attribute	Description
Connector type	RJ45
Standard	RS-232
Baud rate	9600 bit/s to 115 200 bit/s

	9600 bit/s by default

Table 4-8 shows the atttributes of the AUX port.

Table 4-8 AUX interface attributes

Attribute	Description
Connector type	RJ45
Standard	Asynchronous EIA/TIA-232
Baud rate	300 bit/s to 115 200 bit/s
Supported protocols	Point-to-Point Protocol (PPP) Serial Line Internet Protocol (SLIP) Multilink Protocol (MP)

Table 4-9 shows the attributes of the 10/100/1000M Ethernet port.

Table 4-9 Attributes of the 10/100/1000M Ethernet interface

Attribute	Description
Connector type	RJ45
Supported frame format	Ethernet_II Ethernet_SNAP IEEE 802.2 IEEE 802.3
Operating mode	10/100/1000 Mbit/s autosensing Full duplex Half duplex
Supported network protocol	IP

Table 4-10 shows the attributes of the 100/1000M Ethernet interface.

Table 4-10 Attributes of the 100/1000M Ethernet interface

Attribute	Description	
Connector type	Small Form-Factor Pluggable (SFP) optical module	
Number of interfaces	2	1
Supported frame format	Ethernet_II	

Attribute	Description
	Ethernet_SNAP
Working mode	100/1000 Mbit/s autosensing Full duplex
Supported network protocol	IP

4.2.5 Technical specifications

Table 4-11 shows the technical specifications of the RPU board.

Table 4-11 Technical specifications of the RPU

Parameter	Description
Silkscreen	RPU
Power consumption	35 W
Dimensions	399.15 mm (W) x 236 mm (D) x 35.06 mm (H)
Height of the front panel	35.06 mm

4.3 NPUs

This section introduces the functions of the Network Process Unit (NPU), the board, and the technical specifications for the Secure Router 8012.

The board is located in the back slot on the bottom of the chassis. An NPU is installed in the system from the back and sits back-to-back with the RPU.

4.3.1 Functions

An NPU consists of the network processor module, the Field Programmable Gate Array (FPGA) module, the storage module, and the other attached devices. The board implements expedited forwarding of data packets, including IP forwarding, Multiprotocol Label Switching (MPLS) forwarding, multicast forwarding, and Quality of Service (QoS). The forwarding rate can reach 6 Mpps.

The NPU has the following functions:

- inputs the service data convergence and outputs the service data division
- provides the upstream and downstream of the data convergence module with the QoS guarantee
- encapsulates and decapsulates the data frame after HIC and FIC data enters the network process module

- encapsulates and decapsulates the data frame after high-speed interface control packets enter the network process module
- periodically detects the state of the network process module and queries the board version
- updates the Erasable Programmable Logic Device (EPLD) and FPGA, and implements the online loop and offline loop of FPGA in the board
- monitors the temperature
- supports resetting of the service interface board and other main modules
- supports the CABwatch debugging tool provided by IBM

4.3.2 Front panel

Figure 4-8 shows the appearance of the NPU front panel.

Figure 4-8 Appearance of the NPU front panel

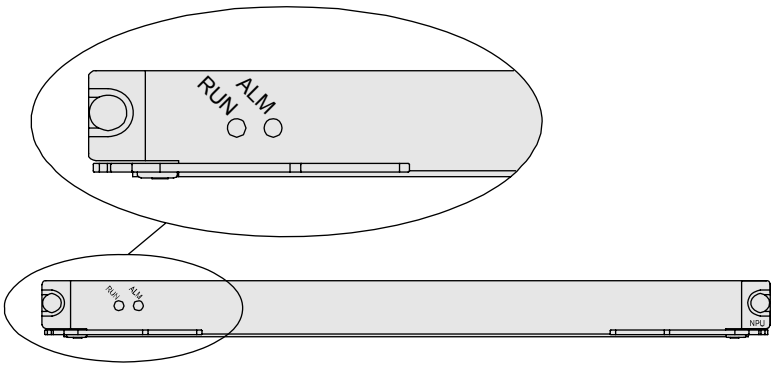


Table 4-12 describes the NPU indicators.

Table 4-12 Description of the NPU indicators

Component	Description
RUN (green)	The running LED. Blinking means the NPU works normally. Constant OFF means the NPU is not in position or failed.
ALM (red)	The alarm LED. Constant ON means NPU failed.

The NPU does not provide external interfaces.

4.3.3 Technical specifications

Table 4-13 describes the NPU technical specifications.

Table 4-13 Description of the NPU technical specifications

Parameter	Description
Silkscreen	NPU
Power consumption	58 W
Dimension	372.45 mm (W) x 238 mm (D) x 35.06 mm (H)
Height of the front panel	35.06 mm

4.4 10/100Base-TX electrical interface module

The 10/100Base-TX electrical interface modules of the Secure Router 8012 are as follows:

- 2-port 10/100Base-TX Fast Ethernet electrical interface module (RT-HIC-2FE)
- 4-port 10/100Base-TX Fast Ethernet electrical interface module (RT-HIC-4FE)
- 8-port 10/100Base -TX Fast Ethernet electrical interface module (RT-HIC-8FE)

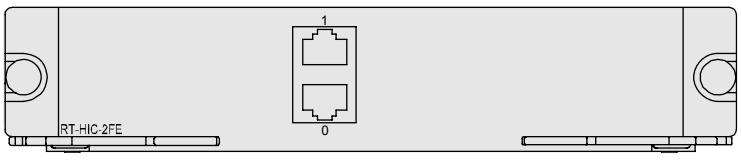
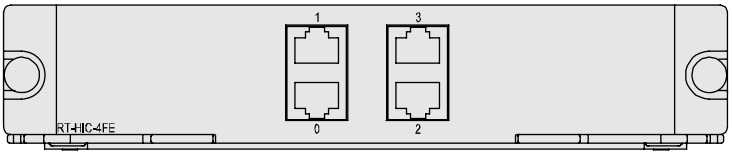
4.4.1 Functions

The 10/100Base-TX Ethernet electrical interface module provides Fast Ethernet (FE) interfaces that connect a router and a LAN.

4.4.2 Front panel

Table 4-14 shows the appearance of the 10/100Base-TX Ethernet electrical interface.

Table 4-14 Description of the 10/100Base-TX Ethernet electrical interface module

Silkscreen	Appearance of the front panel
RT-HIC-2FE	
RT-HIC-4FE	

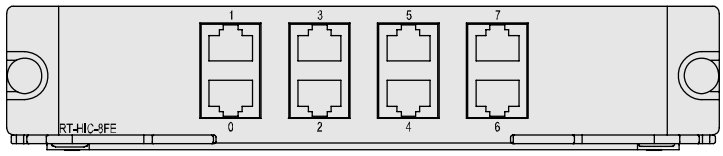
RT-HIC-8FE	

Table 4-15 describes the indicators of the10/100Base-TX Ethernet electrical interface module.

Table 4-15 Description of indicators of the 10/100Base-TX Ethernet electrical interface module

LED	Description
LINK	OFF means the link is not connected and ON means the link is connected.
ACT	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted or received. A high frequency of blinking means a large data flow.

4.4.3 Interface attributes

Table 4-16 shows the attributes of the 10/100Base-TX Ethernet electrical interface.

Table 4-16 Attributes of the 10/100Base-TX Ethernet electrical interface module

Attribute	Description
Connector type	RJ45
Cable type	Standard Ethernet cable
Transmission distance	100 m (with Category 5 twisted pair cable)
Operating mode	Full duplex/Half duplex 10M/100 Mbit/s autonegotiation
Compliant standard	IEEE 802.3u
Supported frame format	Ethernet_II Ethernet_SNAP
Supported network protocol	IP

4.5 100Base-FX Ethernet optical interface module

The 100Base-FX Ethernet optical interface modules of the Secure Router 8012 are as follows:

- 2-port 100Base-FX Ethernet single/multi-mode optical interface module (RT-HIC-2FE-SFP)
- 4-port 100Base-FX Ethernet single/multi-mode optical interface module (RT-HIC-4FE-SFP)
- 8-port 100Base-FX Ethernet single/multi-mode optical interface module (RT-HIC-8FE-SFP)

4.5.1 Functions

The 100Base-FX Ethernet optical interface module provides the optical interface. The optical interface enables routers to communicate with the LAN based on the high reliability and high transmission quality of the fiber.

4.5.2 Front panel

Table 4-17 shows the appearance of the 100Base-FX Ethernet optical interface module.

Table 4-17 Description of the 100Base-FX Ethernet optical interface module

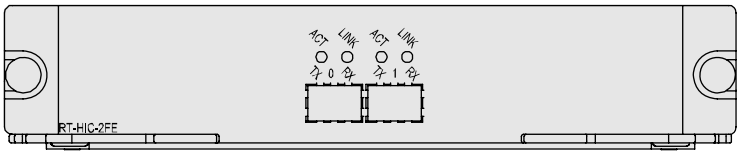
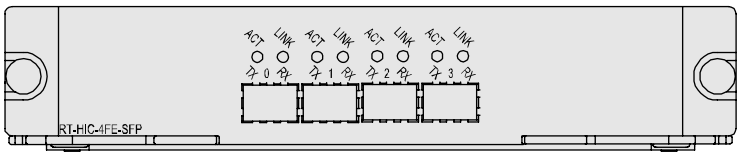
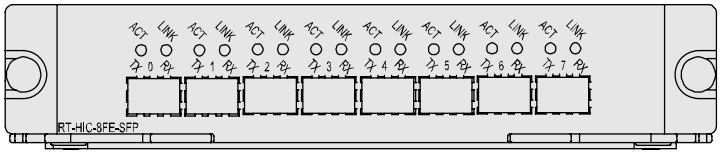
Silkscreen	Appearance of the front panel
RT-HIC-2FE-SFP	
RT-HIC-4FE-SFP	
RT-HIC-8FE-SFP	

Table 4-18 describes the indicators of the 100Base-FX Ethernet optical interface module.

Table 4-18 Description of the indicators of the 100Base-FX Ethernet optical interface module

Indicator	State and significance
LINK	OFF means the link is not connected and ON means the link is connected.
ACT	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted or received.

4.5.3 Interface attributes

Table 4-19 shows the attributes of the 100Base-FX Ethernet optical interface. The SFP optical module is configured separately and its attributes are shown in Table 4-20.

Table 4-19 Attributes of the 100Base-FX Ethernet optical interface

Item	Description
Duplex mode	Full duplex
Rate	100 Mbit/s
Applicable standard	IEEE 802.3u
Supported frame format	Ethernet_II Ethernet_SNAP
Supported network protocol	IP

Table 4-20 Attributes of the 100Base-FX Ethernet interface SFP optical module

Item		Description			
Maximum transmission distance		2 km	15 km	40 km	80 km
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Optical fiber type		Multimode	Single-mode	Single-mode	Single-mode
Transmitting power	Minimum	–19 dBm	–15 dBm	–5 dBm	–5 dBm
	Maximum	–14 dBm	–8 dBm	0 dBm	0 dBm
Receiver sensitivity		–30 dBm	–31 dBm	–37 dBm	–37 dBm
Sender type		LD	LED		
Connector type		LC			

4.6 1000Base-X Ethernet optical interface module

The 1000Base-X Ethernet optical interface modules of the Secure Router 8012 are as follows:

- 1-port 1000Base-X Ethernet optical interface module (RT-HIC-1GE)
- 2-port 1000Base-X Ethernet optical interface module (RT-HIC-2GE)

4.6.1 Functions

The 1000Base-X Ethernet optical interface module provides the Gigabit Ethernet (GE) optical interface that enables communication between routers and the LAN.

4.6.2 Front panel

Table 4-21 shows the appearance of the 1000Base-X Ethernet optical interface module.

Table 4-21 Description of the 1000Base-X Ethernet optical interface module

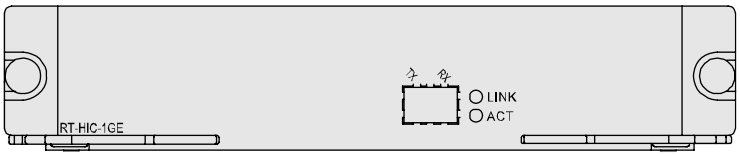
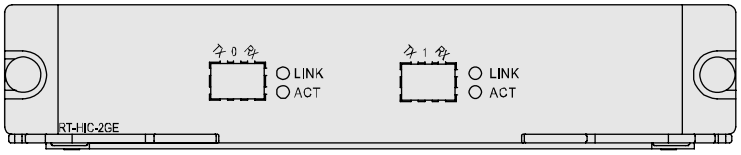
Silkscreen	Appearance of the front panel
RT-HIC-1GE	
RT-HIC-2GE	

Table 4-22 describes the indicators of the 1000Base-X Ethernet optical interface module.

Table 4-22 Description of the indicators of the 1000Base-X Ethernet optical interface module

Indicator	State and significance
LINK	OFF means the link is not connected and ON means the link is connected.
ACT	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted or received.

4.6.3 Interface attributes

Table 4-23 shows the attributes of the 1000Base-X Ethernet optical interface. The SFP optical module is configured separately and its attributes are shown in Table 4-24.SFP electrical module is configured separately and its attributes are shown in Table 4-25.

Table 4-23 Attributes of the 1000Base-X Ethernet optical interface module

Item	Description	
	2GE	1GE
Connector type	LC	

Item	Description	
	2GE	1GE
Interface number	2	1
Duplex mode	Full duplex	
Rate	1.25 Gbit/s	
Standard compliance	IEEE 802.3z	
Frame format	Ethernet_II Ethernet_SNAP	
Network protocol	IP	

Table 4-24 Attributes of the 1000Base-X Ethernet interface SFP optical module

Item	Description					
Transmission distance	0.55 km	10 km	40 km	40 km	80 km	100 km
Central wavelength	850 nm	1310 nm	1310 nm	1550 nm	1550 nm	1550 nm
Minimum output power	–9.5 dBm	–9.5 dBm	–5 dBm	–4.0 dBm	–5.0 dBm	–5 dBm
Maximum output power	0 dBm	–3.0 dBm	–2 dBm	0 dBm	–2.0 dBm	0 dBm
Receiver sensitivity	–17.0 dBm	–20.0 dBm	–23 dBm	–22.0 dBm	–23.0 dBm	–30.0 dBm
Optical fiber type	Multimode	Single-mode	Single-mode	Single-mode	Single-mode	Single-mode
Connector type	LC					

Table 4-25 Attributes of SFP electrical interface module of 1000Base-X Ethernet interface

Item	Description
Transmission distance	100 m
Duplex	Full-duplex
Connector type	RJ-45

Item	Description
Rate	1000 Mbit/s

4.7 Channelized and unchannelized E1/T1 interface module

The channelized and unchannelized E1/T1 interface modules of the Secure Router 8012 are as follows:

- FIC
  - 4-port unchannelized E1 module (4E1)
  - 4-port channelized E1 module (4CE1)
  - 8-port unchannelized E1 module (8E1)
  - 8-port channelized E1 module (8CE1)
  - 4-port channelized T1 module (4CT1)
  - 8-port channelized T1 module (8CT1)
- HIC
  - 16-port channelized E1 module (RT-HIC-16CE1)
  - 16-port channelized T1 module (RT-HIC-16CT1)

4.7.1 Functions

Channelized and unchannelized E1/T1 interface modules can transmit, receive, and process E1/T1 data flow. The channelized E1/T1 module offers access to CE1/CT1 and implements the Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) function.

The functions are as follows:

- supports the internal and external clocks
- supports the working modes of the remote loops, the local loops, and the frame loops
- supports various link layer protocols, such as PPP, Frame Relay, and High-level Data Link Control (HDLC)

The primary differences between unchannelized E1 interface modules and channelized E1 interface modules are as follows:

- Unchannelized interface modules support binding only once. That is, multiple unchannelized interface modules can be bound with one channel with a speed of 2.048 Mbit/s.
- Channelized interface modules support multiple bindings. That is, 31 channels can be bound into several groups.

The channelized T1 module supports two working modes: T1 mode and CT1 mode:

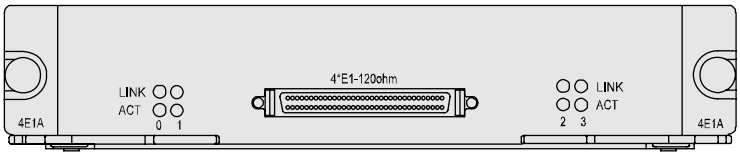
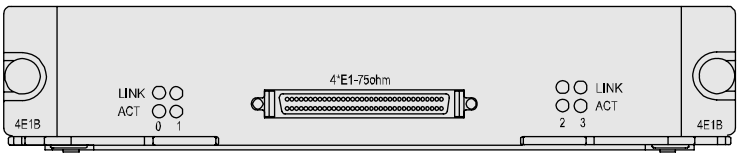
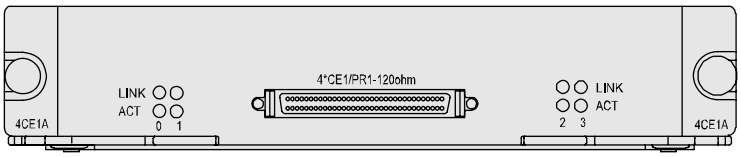
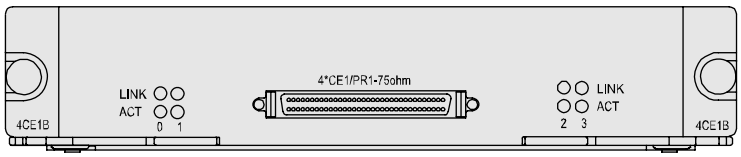
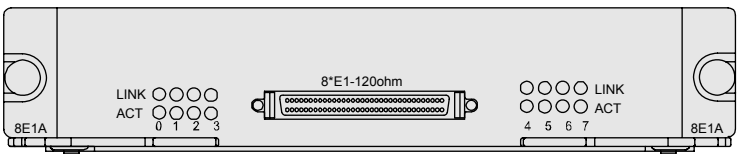
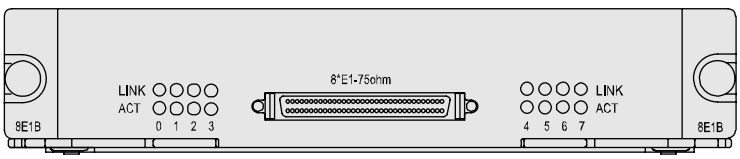
- In T1 mode, channels can be bound only once; that is, channels can be bound into one group with a speed of 1544 kbit/s.

- In CT1 mode, the 24 channels can be regrouped as required and can be bound multiple times.

4.7.2 Front panel

Table 4-26 shows the appearance of the channelized and unchannelized E1 interface modules. Table 4-27 shows the appearance of the channelized T1 interface modules.

Table 4-26 Description of the channelized and unchannelized E1 interface modules

Silkscreen	Appearance of the front panel
4E1A	
4E1B	
4CE1A	
4CE1B	
8E1A	
8E1B	

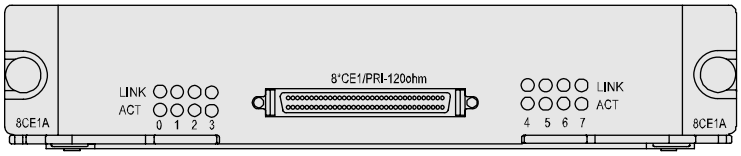
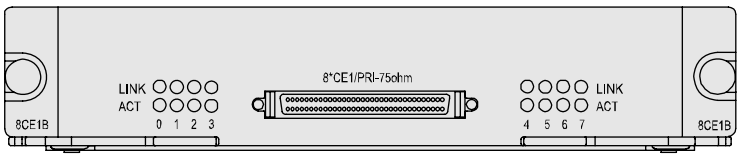
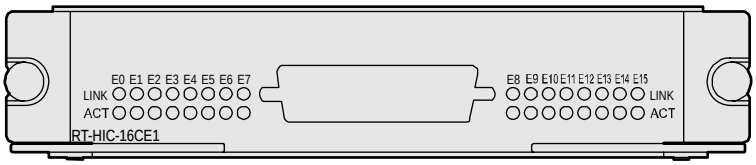
Silkscreen	Appearance of the front panel
8CE1A	
8CE1B	
RT-HIC-16CE1	

Table 4-27 Description of the channelized T1 interface modules

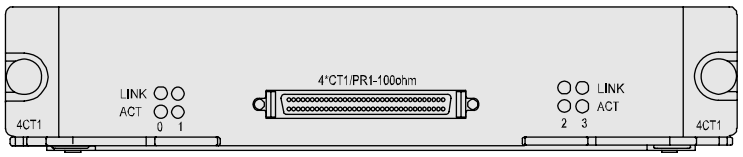
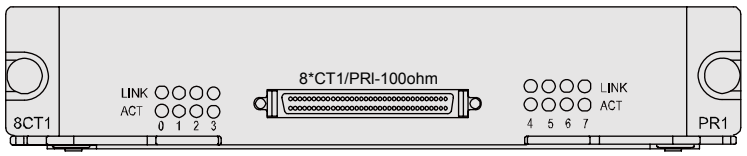
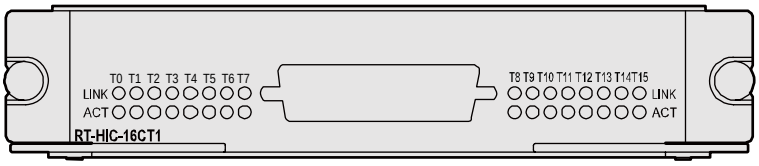
Silkscreen	Appearance of the Front Panel
4CT1	
8CT1	
RTP-HIC-16CT1	

Table 4-28 describes the indicators of channelized and unchannelized E1/T1 interface modules.

Table 4-28 Description of the indicators of channelized and unchannelized E1/T1 interface modules

Indicator	State and significance
LINK	If the indicator is ON, the link is connected. If the indicator is OFF, the link is disconnected.
ACT	If the indicator is OFF, no data is being transmitted or received. If the indicator is flashing, data is being transmitted or received.
0–3 (4E1/T1)	The indicators corresponding to the relevant port number.
0–7 (8E1/T1)	
E0–E15 (16E1/T1)	

4.7.3 Interface attributes

Table 4-29 shows the attributes of the channelized and unchannelized E1/T1 interface module.

Table 4-29 Attributes of the channelized and unchannelized E1/T1 interface modules

Attribute	Description			
	4/8E1	4/8/16CE1	4/8CT1	16CT1
Connector type	• DB-68 (4/8E1,4/8CE1 and 4/8CT1) • DB-78 (16CE1 and 16CT1)			
Operating mode	E1	E1 and CE1	T1 and CT1	
Transmission rate	• In E1 mode: 2048 kbit/s • In CE1 mode: N x 64 kbit/s (N = 1 to 31)		• In T1 mode: 1544 kbit/s • In CT1 mode: N x 56 kbit/s and N x 64 kbit/s (N = 1 to 24)	
Cable model	75 coaxial cable 120 shielded twisted pair cable		120 shielded twisted pair cable	
Maximum transmission distance	75 coaxial cable: 0.5 km 120 shielded twisted pair cable 0.15 km		0.15 km	
Interface standard	ITU-T G.703 and ITU-T G.704			
Supported network protocol	IP			
Other supported protocols	PPP, LAPB, X.25, Frame Relay, HDLC, and MP (16CE1/16CT1 supports PPP, HDLS, and MP.)			

NOTE

When the router works in CT1 mode, the default setting is binding time slots as N x 56 kbit/s (N = 1 to 24).

4.8 Channelized E3 interface modules

There is one type of channelized E3 interface module: the 1-port channelized E3 module (1CE3).

4.8.1 Functions

The channelized E3 interface module supports channelized E3 and unchannelized E3 operation modes. In channelized operating mode, the E1 channels can be configured with time slot binding.

The channelized E3 interface module provides the following functions:

- In E3 operating mode, it transmits and processes E3 high-speed data flows and provides access to E3 data flows.
- In CE3 operating mode, it provides N x 64 kbit/s (N = 1 to 31) low-speed access services.

NOTE

E3 means the thrice primary rate (34.368 Mbit/s) of E series in the time division multiplexing system. One E3 channel can be channelized into 16 E1s. Each E1 supports both E1 and CE1 operating modes.

4.8.2 Front panel

Table 4-30 shows the appearance of the channelized E3 interface module.

Table 4-30 Description of the channelized E3 interface module

Name	Appearance of the Front Panel
1CE3	

Table 4-31 describes the indicators of the channelized E3 interface module.

Table 4-31 Description of the indicators of the channelized E3 interface module

LED	Description
LINK	OFF means the link is not connected and ON means the link is connected.
ACT	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted or received.

4.8.3 Interface attributes

Table 4-32 shows the attributes of the channelized E3 interface module.

Table 4-32 Attributes of the channelized E3 interface module

Attribute	Description
	1CE3
Connector type	SMB
Cable type	75-ohm coaxial cable
Operating mode	E3, CE3, and CE1
Interface rate	• E3 mode: 34.368 Mbit/s • CE3 mode: 16 E1 channels with a rate of 2.048 Mbit/s per E1 channel • CE1 mode: N x 64 kbit/s (N = 1 to 31)
Max. transmit distance	0.1 km
Interface standard	ITU-T G.703 and G.704
Supported network protocol	IP
Other supported protocols	PPP, MP, Frame Relay, Multiple Frame Relay (MFR), and HDLC

4.9 Synchronous serial port module

There is one type of synchronous serial interface module for the Secure Router 8012: the 4-port enhanced high-speed synchronous serial interface card (4SAE).

4.9.1 Functions

The 4SAE supports the synchronous working mode. Its main function is to receive, send, and process the synchronous serial data flow and to support the modes of Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE).

The functions of the interface are as follows:

- supports local loopback
- automatically identifies the V.35 and V.24 cables
- supports various link layer protocols, such as PPP, Frame Relay, and HDLC

DTE and DCE

Generally, the 4SAE card is connected with a modem and serves as a dialing port. In this case, you need to set the appropriate baud rate.

The synchronous serial port can work in either DTE mode or DCE mode. For two directly connected devices, one device works in DTE mode and the other works in DCE mode . In this case, the DCE device offers the synchronous clock and specifies the baud rate, while the DTE device receives the synchronous clock and performs communication based on the specified baud rate.

The router usually serves as a DTE device. For the type (DCE or DTE) of the device connected with the router, refer to the manual accompanying the device.

Table 4-33 describes the specified device types.

Table 4-33 Typical DTE and DCE devices

Device type	Interface type	Typical device
DTE	Pin (male)	PC and router
DCE	Hole (female)	Modem, multiplexer, and Channel Service Unit/Data Service Unit (CSU/DSU)

Synchronous interface rate and transmission distance

In different working modes, the synchronous serial port supports different electric signal standards and baud rates. The configured baud rate and the selected cable determine the maximum transmission distance of the signal. For the relationship between cable type, baud rate, and maximum transmission distance of signals, see Table 4-34.

CAUTION

If the V.24 cable is used, the serial interface baud rate cannot exceed 64 kbit/s.

Table 4-34 V.24/V.35 cable rate and transmission distance

V.24		V.35	
Baud rate	**Maximum transmission distance**	**Baud rate**	**Maximum transmission distance**
2400 bit/s	60 m	2400 bit/s	1250 m
4800 bit/s	60 m	4800 bit/s	625 m
9600 bit/s	30 m	9600 bit/s	312 m
19200 bit/s	30 m	19 200 bit/s	156 m

V.24		V.35	
38400 bit/s	20 m	38 400 bit/s	78 m
64000 bit/s	20 m	56 000 bit/s	60 m
115200 bit/s	10 m	64 000 bit/s	50 m
—	—	2 048 000 bit/s	30 m

4.9.2 Front panel

Table 4-35 shows the appearance of the synchronous serial port module.

Table 4-35 Description of the synchronous serial port module

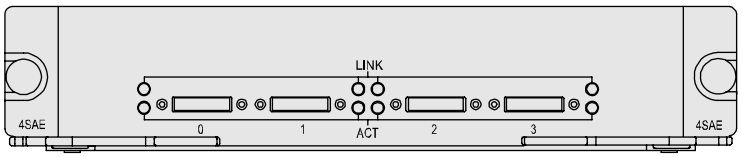
Silkscrern	Appearance of the front panel
4SAE	

Table 4-36 describes the indicators of a synchronous serial port module.

Table 4-36 Description of the indicators of a synchronous serial port module

Indicator	State and Significance
LINK	If the indicator is ON, the link is connected. If the indicator is OFF, the link is disconnected.
ACT	If the indicator is OFF, no data is being transmitted or received. If the indicator is flashing, data is being transmitted or received.

4.9.3 Interface attributes

Table 4-37 shows the attributes of the synchronous serial port.

Table 4-37 Attributes of the 4SAE interface module

Attribute	Description	
Connector type	DB-28	
Interface standard and working mode	V.24	V.35
	DTE and DCE	DTE

Attribute	Description	
		DCE
Minimum baud rate	1200 bit/s	1200 bit/s
Maximum baud rate	64 kbit/s	2.048 Mbit/s
Cable type	V.24 DTE cable V.24 DCE cable V.35 DTE cable V.35 DCE cable	
Supported protocol	PPP, HDLC, Frame Relay, MFR, and MP	

4.10 Channelized and unchannelized POS optical interface modules

The channelized and unchannelized POS optical interface modules of the Secure Router 8012 are as follows:

- FIC
  - 1-port channelized POS optical module (1CPOS[E])
- HIC
  - 1-port unchannelized POS/155M optical interface module (RT-HIC-1POS)
  - 2-port unchannelized POS/155M optical interface module (RT-HIC-2POS)
  - 4-port unchannelized POS/155M optical interface module (RT-HIC-4POS)
  - 1-port channelized POS optical interface E1 module (RT-HIC-CPE1)
  - 1-port channelized POS optical interface T1 module (RT-HIC-CPT1)

4.10.1 Functions

The Packet over SDH/SONET (POS) interface is a high-speed transport interface that uses the SONET/SDH network as the transport interface. In the sending direction, the POS interface encapsulates IP data packets received from the Network Process Unit (NPU) with the PPP or HDLC protocol, and then maps the encapsulated data packets to the payload of the SONET/SDH frame for transmission on the optical network. In the receiving direction, the POS interface receives optical signals, processes them through reverse operations, and then sends them to the NP.

The POS interface board can be used to connect Secure Router 8012 routers to SONET/SDH devices, or to connect Secure Router 8012 routers directly.

One POS interface module can be channelized into 63 E1 channels, or 84 T1 channels.

The functions of interface are as follows:

- supports hardware flow control and software resetting
- supports various link layer protocols, such as PPP, Frame Relay, and HDLC
- supports the working modes of FPGA loopback, the system-side loopback of the physical chip, and the line-side loopback

4.10.2 Front panel

Table 4-38 shows the appearance of channelized and unchannelized POS optical interface modules.

Table 4-38 Description of channelized and unchannelized POS optical interface modules

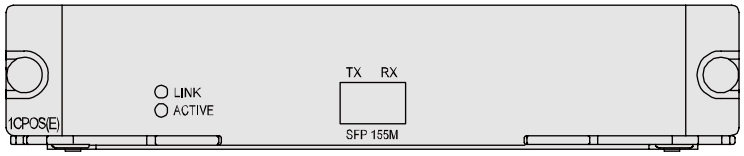
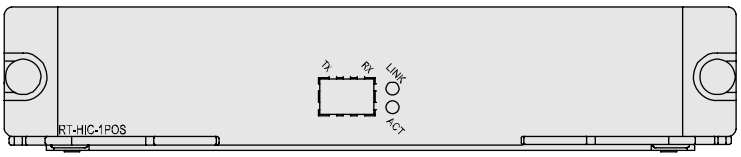
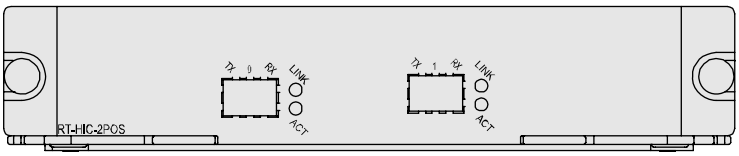
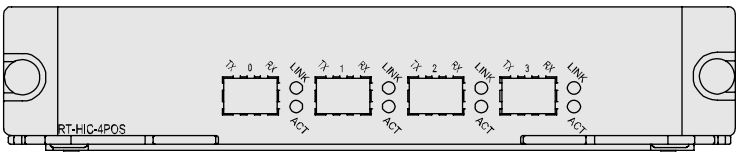
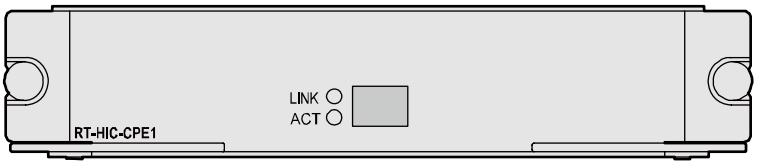
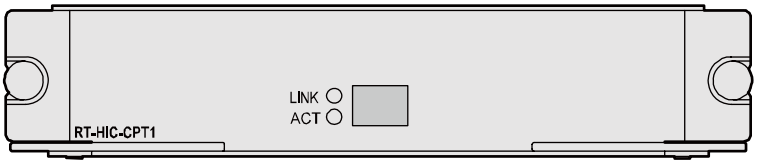
Silkscreen	Appearance of the front panel
1CPOS(E)	
RT-HIC-1POS	
RT-HIC-2POS	
RT-HIC-4POS	
RT-HIC-CPE1	
RT-HIC-CPT1	

Table 4-39 describes the indicators of channelized and unchannelized POS optical interface modules.

Table 4-39 Description of the indicators on the front panel of POS optical interface modules

Indicator	State and Significance
LINK	If the indicator is ON, the link is connected. If the indicator is OFF, the link is disconnected.
ACT	If the indicator is OFF, no data is being transmitted or received. If the indicator is flashing, data is being transmitted or received.

4.10.3 Interface attributes

Table 4-40 shows the attributes of channelized and unchannelized POS optical interface modules. The SFP optical module is configured separately and its attributes are shown in Table 4-20.

Table 4-40 Attributes of channelized and unchannelized POS optical interface modules

Item	Description
Rate	155 Mbit/s
Operating mode	Unchannelized: 155 Mbit/s and full-duplex Channelized: 63 E1 channels or 84 T1 channels
Applicable standard	STM-1/OC-3c SONET/SDH IETF RFC1619/1661/1662
Supported network protocol	IP
Supported protocols	PPP, HDLC, Frame Relay, and MFR (Only 1CPOS(E) supports Frame Relay and MFR.)

4.11 HSSI interface module

The HSSI interface modules of the Secure Router 8012 are as follows:

- 1-port HSSI interface (1HSSI)
- 2-port HSSI interface (2HSSI)

4.11.1 Functions

The High Speed Serial Interface (HSSI) is connected by the HSSI cable. In the sending direction, the IP data packet is encapsulated with PPP or HDLC and sent to the HSSI interface line after being transmitted into electrical signals. In the receiving direction, data is transmitted into the electrical signals and is processed with the HDLC frame. The device extracts the IP data packet in the reverse process and forward the IP data packet.

The Secure Router 8012 with HSSI can be connected to the DCE equipment (CSU/DSU) as the DTE equipment, or it can be connected with the DTE equipment back-to-back.

The functions of interface are as follows:

- The HSSI interface level is ECL. The highest rate is 52 Mbit/s and the maximum transmission distance is 50 inches (15 m).
- HSSI supports two loop working modes: the physical chip self-loop and the line self-loop.
- The interface supports many link layer protocols, such as PPP and HDLC.
- The interface supports auto-identification of DTE and DCE and chooses the clock automatically.

4.11.2 Front panel

Table 4-41 shows the appearance of the HSSI interface module.

Table 4-41 Description of the HSSI front panel

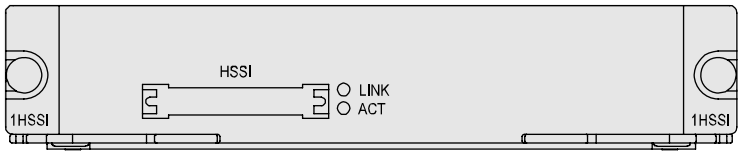
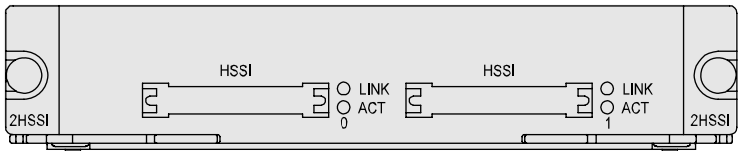
Silkscreen	Appearance of the front panel
1HSSI	
2HSSI	

Table 4-42 describes the indicators of the HSSI interface module.

Table 4-42 Description of the indicators of the HSSI front panel

Indicator	State and significance
LINK	If the indicator is ON, the link is connected. If the indicator is OFF, the link is disconnected.
ACT	If the indicator is OFF, no data is being transmitted or received. If the indicator is flashing, data is being transmitted or received.

4.11.3 Interface attributes

Table 4-43 shows the attributes of the HSSI interface module.

Table 4-43 Attributes of the HSSI interface module

Item	Description
Type	HSSI electrical interface
Rate	52 Mbit/s
Working mode	Unchannelized: 51.84M
Standard compliance	Compliant with STS-1
Supported network protocol	IP
Supported link layer protocols	PPP HDLC

4.12 IPSec encryption HIC module

4.12.1 Function

The encryption HIC module supports IPSec. It speeds up IP packet encryption through hardware processing, providing the router with high-performance, reliable encryption.

4.12.2 Front panel

Table 4-44 shows the front panel of an IPSec encryption HIC module.

Table 4-44 Front panel of an IPSec encryption HIC module

Silkscreen	Appearance
RT-HIC-HPSEC	

Table 4-45 describes the indicators of an IPSec encryption HIC module.

Table 4-45 Description of the indicators of an IPSec encryption HIC module

Indicator	State and significance
LINK	If the indicator is OFF, the link is disconnected. If the indicator is ON, the link is connected.
ACT	If the indicator is OFF, no data is being transmitted or received. If the

	indicator flashes, data is being transmitted or received.

4.12.3 Module attributes

Table 4-46 shows the attributes of the IPSec encryption HIC module.

Table 4-46 Attributes of the IPSec encryption HIC module

Item	Description
Supported protocol	IPSec/IKE
Supported maximum concurrent IPSec connections	• Site-to-Site: 5000 • Virtual Private Dial-up Network (VPDN): 12 000
Hardware algorithm	Encryption algorithms: DES, 3DES, AES128, AES192, and AES256 Encryption mode: CBC

Contents

Figures

Tables

5 Cables

About this chapter

The following table shows the contents of this chapter.

Title	Description
5.1 DC power cable	This section describes the structure of a DC power cable.
5.2 AC power cable	This section describes the structure of an AC power cable.
5.3 Console port cable	This section describes the structure of the console communication cable.
5.4 Auxiliary port communication cable	This section describes the structure of the AUX communication cable.
5.5 Ethernet cable	This section describes the structure of the Ethernet cable.
5.6 Optical fiber	This section describes the optical fiber and connector.
5.7 Channelized and unchannelized E1/T1 interface cable	This section describes the structure and model of the channelized and unchannelized E1/T1 interface cable.
5.8 Channelized E3 interface cable	This section describes the structure of the channelized E3 interface cable.
5.9 Synchronous serial interface cable	This section describes the structure of the synchronous serial interface cable.
5.10 HSSI cable	This section describes the structure and category of the High Speed Serial Interface (HSSI) cable.

5.1 DC power cable

5.1.1 Introduction

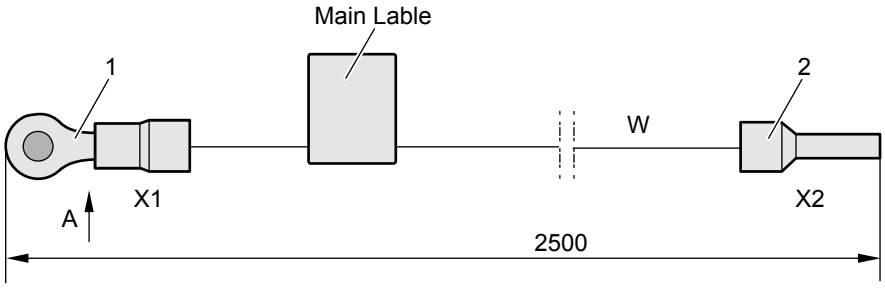
The Direct Current (DC) power input range is from –36 V DC to –72 V DC.

The DC power cable contains the –48 V power cable NEG (–) and the ground (GND) power cable RTN (+).The power cable transfers the –48 V DC power from the DC distribution equipment to the terminal block of the Secure Router 8012 power module, supplying power for the Secure Router 8012 equipment.

5.1.2 Structure

The wiring terminal of the Secure Router 8012 power module is the OT bare pressure terminal. Figure 5-1 shows the outline of the DC power cable.

Figure 5-1 DC power cable



W	Electronic and electrical cable-600 V-10 A WG-blue round-OEM dedicated
X1	Bare pressed OT terminal-6 mm^2-M4-tin electroplating-round preinsulated terminal-12 to 10 A WG-yellow
X2	Ordinary terminal-single core cold pressed terminal-6mm^2-0.02 m-30A-inserting depth 12 mm-black

5.2 AC power cable

5.2.1 Introduction

The Alternating Current (AC) power cable ranges from 85 V AC to 264 V AC and 50/60 Hz.

The power cable transmits the AC to the terminal block of the Secure Router 8012 power module to supply power to the entire Secure Router 8012.

Nortel recommends that you use the grounding single-phase three-line power supply. The grounding point of the power supply in the building must be reliable grounding. The power grounding cable of the power supplying system is buried in the ground during the construction of the building. You must ensure that the power supplies are grounded before you connect the AC power cable of the Secure Router 8012 routers.

5.2.2 Structure

The Secure Router 8012 AC power cable includes the local-standard cable for Europe, North America, and the United Kingdom, as well as the Chinese standard AC power cable.

5.3 Console port cable

5.3.1 Introduction

The console cable connects the Secure Router 8012 console port to the serial port of the console device for transmitting equipment configuration data.

The console cable is an 8-core shielded cable. One end uses the RJ45 connector that is connected to the console port of the Routing Process Unit (RPU). The other end has two connectors with DB9 (female) and DB25 (female), and is connected to the serial port of the computer. You can use either of them to connect the computer serial port as required.

5.3.2 Structure

Figure 5-2 shows the console port cable.

Figure 5-2 Console port cable

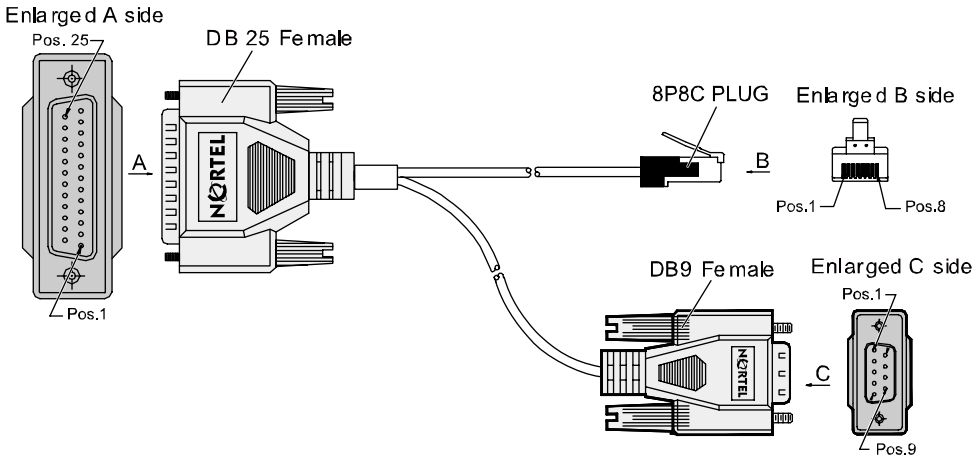


Table 5-1 shows the pin assignment of the console port cables.

Table 5-1 Pin assignment of console cables

RJ45	Signal Direction	DB25	DB9	Signal
1	→	5	8	CTS(Clear to Send)
2	→	6	6	DSR(Data Set Ready)
3	→	3	2	RXD(Receive Data)

RJ45	Signal Direction	DB25	DB9	Signal
4	-	7	5	GND
5	-	8	1	GND
6	←	2	3	TXD(Transmit Data)
7	←	20	4	DTR(Data Terminal Ready)
8	←	4	7	RTS(Request to Send)

5.4 Auxiliary port communication cable

5.4.1 Introduction

The auxiliary (AUX) port cable connects the Secure Router 8012 AUX port to the modem for remote transmission of configuration data.

The AUX port cable is an 8-core shielded cable. One end uses the RJ45 connector that is connected to the AUX port of the Routing Process Unit (RPU). The other end has two connectors with DB9 (female) and DB25 (female), and is connected to the computer serial port. You can use either of them to connect the computer serial port as required.

5.4.2 Structure

The structure of the AUX cable is the same as that of the console cable, as shown in Figure 5-2. Table 5-2 shows the pin assignment of the AUX cables.

Table 5-2 Pin assignment of AUX cables

RJ45	Signal direction	DB25	DB9	Signal
1	→	4	7	RTS
2	→	20	4	DTR
3	→	2	3	TXD
4	←	8	1	DCD
5	-	7	5	GND
6	←	3	2	RXD
7	←	6	6	DSR
8	←	5	8	CTS

5.5 Ethernet cable

5.5.1 Introduction

The Ethernet cable consists of two types: straight-through cable and crossover cable.

Straight-through cable

Straight through cable is also called standard cable. The wire sequences of the twisted pairs crimped in the RJ45 connectors at both ends are the same. Straight-through cable connects a terminal device (a PC or the router) to a hub or a LAN switch. The cables delivered with the equipment are straight-through cables.

Crossover cable

Crossover cable is also called direct connection cable. The wire sequences of the twisted pairs crimped in the RJ45 connectors at both ends are different. Crossover cable connects two terminal devices (a PC or the router).

5.5.2 Structure

Both straight-through cable and crossover cable use shield cables and RJ45 connectors. Figure 5-3 and Figure 5-4 show the pin assignment.

Figure 5-3 Schematic diagram of straight-through cable

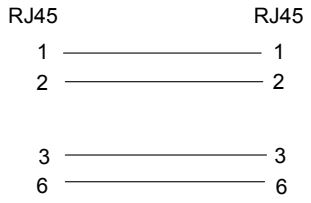


Figure 5-4 Schematic diagram of crossover cable

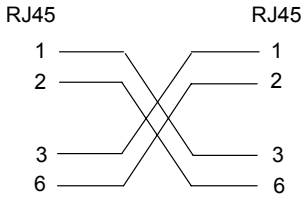


Table 5-3 and Table 5-4 describe the pin assignment of straight-through cable and crossover cable.

Table 5-3 Pin assignment of straight-through cable

RJ45	Signal	Category 5 Twisted Pair	Signal Direction	RJ45
1	TX+	White (Orange)	→	1
2	TX-	Orange	→	2
3	RX+	White (Green)	←	3
4	-	Blue	-	4
5	-	White (Blue)	-	5
6	RX-	Green	←	6
7	-	White (Brown)	-	7
8	-	Brown	-	8

Table 5-4 Pin assignment of crossover cable

RJ45	Signal	Category 5 Twisted Pair	Signal Direction	RJ45
1	TX+	White (Green)	→	3
2	TX-	Green	→	6
3	RX+	White (Orange)	←	1
4	-	Blue	-	4
5	-	White (Blue)	-	5
6	RX-	Orange	←	2
7	-	White (Brown)	-	7
8	-	Brown	-	8

NOTE

Refer to the previous table to differentiate and produce two Ethernet cables. If you do not arrange the line order according to this chromatogram, the communication quality can be affected although the two ends are connected.

5.6 Optical fiber

5.6.1 Introduction

The Secure Router 8012 uses the optical module on different optical interfaces. Table 5-5 shows the corresponding optical fiber.

Table 5-5 Relationship between the interface type and corresponding optical fiber

Interface type	Fiber transmission mode	Optical connectors	Transmission Distance
FIC ATM 155M optical interface	Single-mode/multi-mode	SC/PC	5 m, 10 m, and 20 m
HIC ATM 155M optical interface	Single-mode/multi-mode	LC/PC	5 m, 10 m, and 20 m
Ethernet optical interface	Single-mode/multi-mode	LC/PC	5 m, 10 m, and 20 m
Gigabit Ethernet interface	Single-mode/multi-mode	LC/PC	5 m, 10 m, and 20 m
POS optical interface	Single-mode/multi-mode	LC/PC	5 m, 10 m, and 20 m

SFP is the plug-in type. You can plug both multi-mode modules and single-mode modules into the interface board. Different optical modules and optical connectors require different fiber. The multi-mode interface module connects with the multi-mode fiber; the single-mode module connects with the single–mode fiber.

The interfaces of FIC low-speed ATM 155M optical modules are equipped with a Square Connector (SC) optical connector as shown in Figure 5-5. Therefore, Nortel recommends that you use the fiber with SC/PC optical connectors. In addition, the optical interfaces of 100Base-FX Ethernet optical interface module, Gigabit Ethernet optical interface module, the HIC high-speed ATM 155M optical interface module and POS optical interface module should use the Lucent Connector (LC) optical connector as shown in Figure 5-6. Therefore, Nortel recommends that you use the fiber with LC/PC optical connectors.

5.6.2 Optical connector

The Secure Router 8012 uses two types of optical connectors:

- SC/PC optical connector
- LC/PC optical connector

The following sections describe their outlines, operations, and precautions for plugging in and unplugging the connectors.

Figure 5-5 shows the outline of the SC/PC optical connectors.

Figure 5-5 SC/PC optical connector

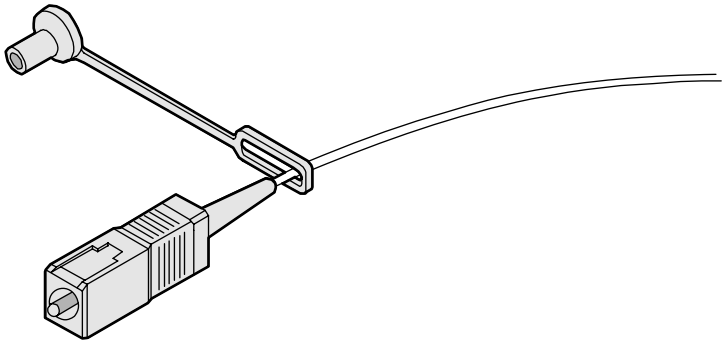
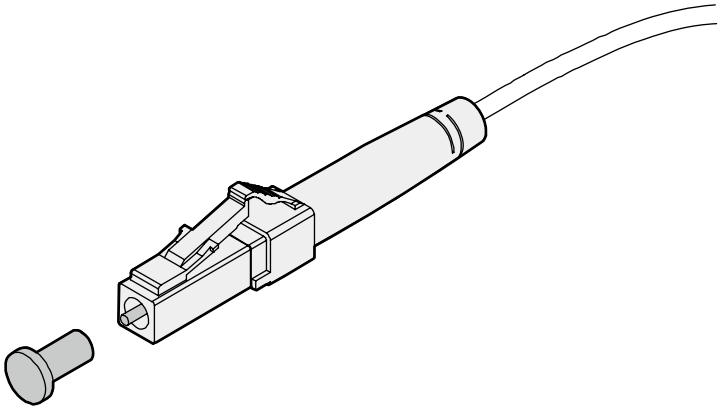


Figure 5-6 shows the outline of the LC/PC optical connectors.

Figure 5-6 LC/PC optical connector



When you plug in or unplug LC/PC and SC/PC optical connectors, you do not need to rotate them... The operation procedures and precautions are as follows:

- When plugging in the fiber connector, be careful to align the fiber head with the optical interface, and push in the fiber with proper force.
- When pulling the fiber out, press the clip first, and then pull the fiber connector slightly and unplug the connector.

5.7 Channelized and unchannelized E1/T1 interface cable

5.7.1 4E1/4CE1 interface cable

The Secure Router 8012 provides two types of 4-port interface cables as shown in Figure 5-7 and Figure 5-8. They are the 4-port E1/CE1 coaxial cable and 4-port E1/CE1 shielded twisted-pair cable. E1 cable and CE1 cable are compatible.

Figure 5-7 The 75-ohm 4E1/4CE1 coaxial cable

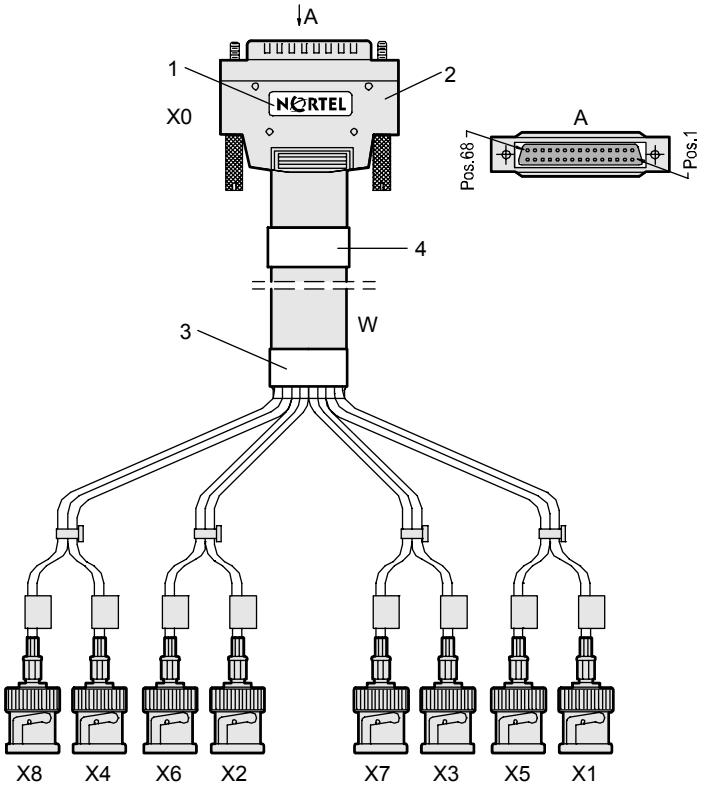


Figure 5-8 The 120-ohm 4E1/4CE1 shielded twisted-pair cable

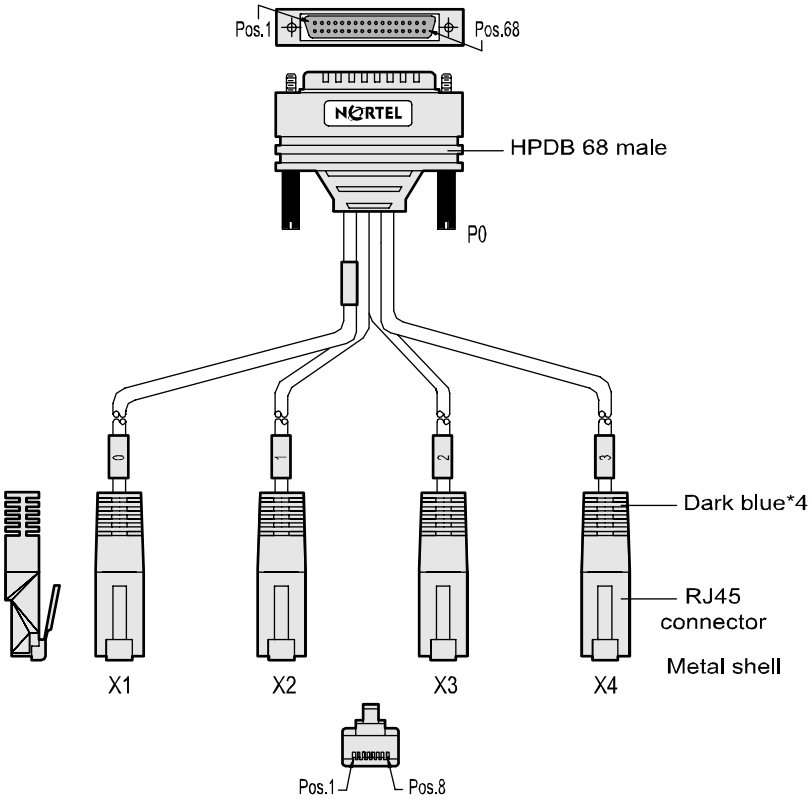


Table 5-6 and Table 5-7 show the pin assignment of 4E1/4CE1 coaxial and twisted-pair cables.

Table 5-6 Pin assignment of 4E1/4CE1 coaxial cable

DB68	Signal	Direction	BNC
1	AGND	—	—
2	AGND	—	—
3	TxTip3	→	No. 3 transmission
4	TxRing3	→	No. 3 transmission
5	AGND	—	—
6	AGND	—	—
10	—	—	—
11	TxTip2	→	No. 2 transmission
12	TxRing2	→	No. 2 transmission
13	AGND	—	—
14	AGND	—	—

DB68	Signal	Direction	BNC
19	TxTip1	→	No. 1 transmission
20	TxRing1	→	No. 1 transmission
21	AGND	—	—
22	AGND	—	—
27	TxTip0	→	No. 1 transmission
28	TxRing0	→	No. 1 transmission
29	AGND	—	—
30	AGND	—	—
35	AGND	—	—
36	RxShield3	—	—
37	RxTip3	←	No. 3 reception
38	RxRing3	←	No. 3 reception
43	AGND	—	—
44	RxShield2	—	—
45	RxTip2	←	No. 2 reception
46	RxRing2	←	No. 2 reception
51	AGND	—	—
52	RxShield1	—	—
53	RxTip1	←	No. 1 reception
54	RxRing1	←	No. 1 reception
55	AGND	—	—
59	AGND	—	—
60	RxShield0	—	—
61	RxTip0	←	No. 0 reception
62	RxRing0	←	No. 0 reception
67	AGND	—	—
68	AGND	—	—

Table 5-7 Pin assignment of 4E1/4CE1 shielded twisted-pair cable

DB68	Signal	Direction	Signal	RJ45
1	AGND	—	—	—
2	AGND	—	—	—
3	TxTip3	→	RxTip3	4
4	TxRing3	→	RxRing3	5
36	RxShield3	←	TxShield3	3
37	RxTip3	←	TxTip3	1
38	RxRing3	←	TxRing3	2
7	TxShield3	→	RxShield3	6
5	AGND	—	—	—
6	AGND	—	—	—
11	TxTip2	→	RxTip2	4
12	TxRing2	→	RxRing2	5
44	RxShield2	←	TxShield2	3
45	RxTip2	←	TxTip2	1
46	RxRing2	←	TxRing2	2
15	TxShield2	→	RxShield2	6
13	AGND	—	—	—
14	AGND	—	—	—
19	TxTip1	→	RxTip1	4
20	TxRing1	→	RxRing1	5
52	RxShield1	←	TxShield1	3
53	RxTip1	←	TxTip1	1
54	RxRing1	←	TxRing1	2
23	TxShield1	→	RxShield1	6
21	AGND	—	—	—
22	AGND	—	—	—
26	TxShield0	→	RxShield0	6
27	TxTip0	→	RxTip0	4
28	TxRing0	→	RxRing0	5
60	RxShield0	←	TxShield0	3

DB68	Signal	Direction	Signal	RJ45
61	RxTip0	←	TxTip0	1
62	RxRing0	←	TxRing0	2
30	AGND	—	—	—
35	AGND	—	—	—
43	AGND	—	—	—
51	AGND	—	—	—
59	AGND	—	—	—
67	AGND	—	—	—
68	AGND	—	—	—

5.7.2 8E1/8CE1 interface cable

The Secure Router 8012 provides two types of 8-port interface cables as shown in Figure 5-9 and Figure 5-10. They are the 8-port E1/CE1 coaxial cable and the 8-port E1/CE1 shielded twisted-pair cable. E1 and CE1 cable are compatible.

Figure 5-9 75-ohm 8E1/8CE1 coaxial cable

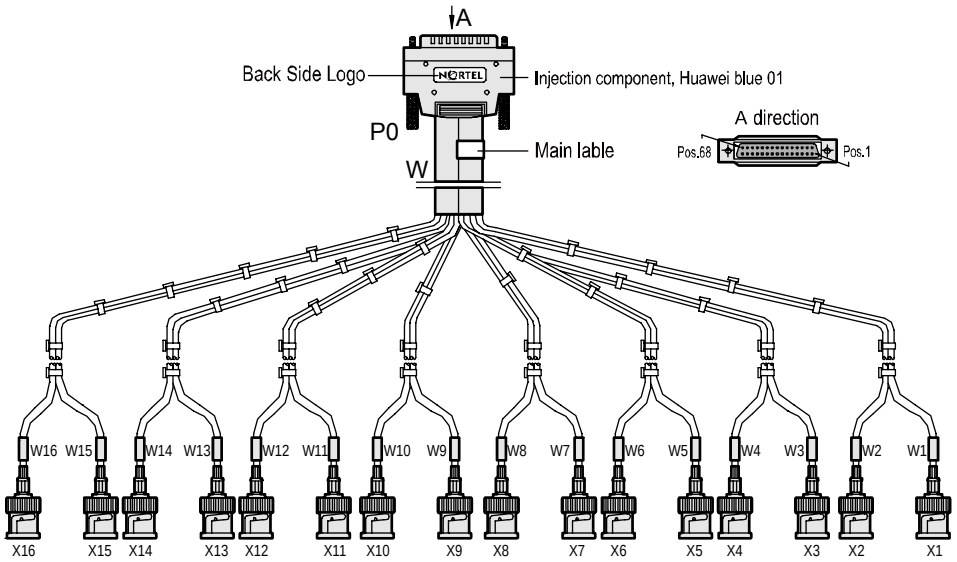


Figure 5-10 120-ohm 8E1/8CE1 shielded twisted-pair cable

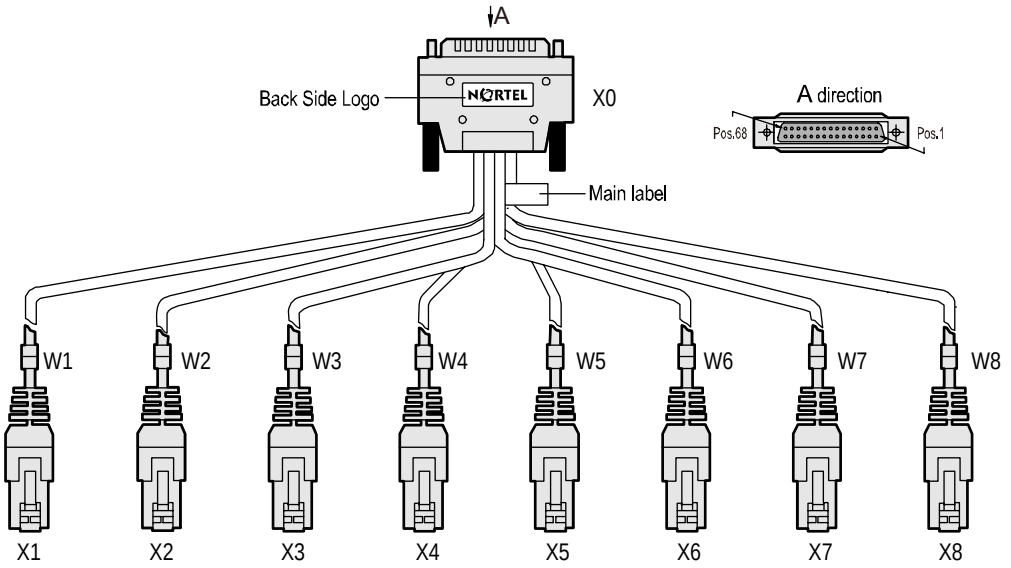


Table 5-8 and Table 5-9 show the pin assignment of 8E1/8CE1 coaxial and twisted-pair cables.

Table 5-8 Pin assignment of 8E1/8CE1 coaxial cable

DB68	Signal	Direction	Signal	BNC
1	DGND	—	—	—
2	DGND	—	—	—
47	CAB_ID0	—	—	—
55	CAB_ID1	→ PIN68	DGND	—
63	CAB_ID2	→ PIN67	DGND	—
3	TxTip3	→	TxTip3	No.3 transmission
4	TxRing3	→	TxRing3	No.3 transmission
37	RxTip3	←	RxTip3	No.3 reception
38	RxRing3	←	RxRing3	No.3 reception
5	PGND	—	—	—
6	PGND	—	—	—
11	TxTip2	→	TxTip2	No.2 transmission
12	TxRing2	→	TxRing2	No.2 transmission
45	RxTip2	←	RxTip2	No.2 reception
46	RxRing2	←	RxRing2	No.2 reception
13	PGND	—	—	—

DB68	Signal	Direction	Signal	BNC
14	PGND	—	—	—
19	TxTip1	→	TxTip1	No.1 transmission
20	TxRing1	→	TxRing1	No.1 transmission
53	RxTip1	←	RxTip1	No.1 reception
54	RxRing1	←	RxRing1	No.1 reception
21	PGND	—	—	—
22	PGND	—	—	—
27	TxTip0	→	TxTip0	No.0 transmission
28	TxRing0	→	TxRing0	No.0 transmission
61	RxTip0	←	RxTip0	No.0 reception
62	RxRing0	←	RxRing0	No.0 reception
30	PGND	—	—	—
29	PGND	—	—	—
9	TxTip7	→	TxTip7	No.7 transmission
10	TxRing7	→	TxRing7	No.7 transmission
41	RxTip7	←	RxTip7	No.7 reception
42	RxRing7	←	RxRing7	No.7 reception
17	TxTip6	→	TxTip6	No.6 transmission
18	TxRing6	→	TxRing6	No.6 transmission
49	RxTip6	←	RxTip6	No.6 reception
50	RxRing6	←	RxRing6	No.6 reception
25	TxTip5	→	TxTip5	No.5 transmission
26	TxRing5	→	TxRing5	No.5 transmission
57	RxTip5	←	RxTip5	No.5 reception
58	RxRing5	←	RxRing5	No.5 reception
33	TxTip4	→	TxTip4	No.4 transmission
34	TxRing4	→	TxRing4	No.4 transmission
65	RxTip4	←	RxTip4	No.4 reception
66	RxRing4	←	RxRing4	No.4 reception
35	PGND	—	—	—
39	PGND	—	—	—

DB68	Signal	Direction	Signal	BNC
43	PGND	—	—	—
51	PGND	—	—	—
59	PGND	—	—	—
67	DGND	—	—	—
68	DGND	—	—	—

Table 5-9 Pin assignment of 8E1/8CE1/8CT1 shielded twisted-pair cable

DB68	Signal	Direction	Signal	RJ45
1	DGND	—	—	—
2	DGND	—	—	—
47	CAB_ID0	→ PIN1	DGND	—
55	CAB_ID1	→ PIN68	DGND	—
63	CAB_ID2	→ PIN67	DGND	—
3	TxTip3	→	TxTip3	4
4	TxRing3	→	TxRing3	5
7	TxShield3	→	TxShield3	6
36	RxShield3	←	RxShield3	3
37	RxTip3	←	RxTip3	1
38	RxRing3	←	RxRing3	2
5	PGND	—	—	—
6	PGND	—	—	—
11	TxTip2	→	TxTip2	4
12	TxRing2	→	TxRing2	5
15	TxShield2	→	TxShield2	6
44	RxShield2	←	RxShield2	3
45	RxTip2	←	RxTip2	1
46	RxRing2	←	RxRing2	2
13	PGND	—	—	—
14	PGND	—	—	—
19	TxTip1	→	TxTip1	4

DB68	Signal	Direction	Signal	RJ45
20	TxRing1	→	TxRing1	5
23	TxShield1	→	TxShield1	6
52	RxShield1	←	RxShield1	3
53	RxTip1	←	RxTip1	1
54	RxRing1	←	RxRing1	2
21	PGND	—	—	—
22	PGND	—	—	—
27	TxTip0	→	TxTip0	4
28	TxRing0	→	TxRing0	5
31	TxShield0	→	TxShield0	6
60	RxShield0	←	RxShield0	3
61	RxTip0	←	RxTip0	1
62	RxRing0	←	RxRing0	2
30	PGND	—	—	—
29	PGND	—	—	—
9	TxTip7	→	TxTip7	4
10	TxRing7	→	TxRing7	5
8	TxShield7	→	TxShield7	6
40	RxShield7	←	RxShield7	3
41	RxTip7	←	RxTip7	1
42	RxRing7	←	RxRing7	2
17	TxTip6	→	TxTip6	4
18	TxRing6	→	TxRing6	5
16	TxShield6	→	TxShield6	6
48	RxShield6	←	RxShield6	3
49	RxTip6	←	RxTip6	1
50	RxRing6	←	RxRing6	2
25	TxTip5	→	TxTip5	4
26	TxRing5	→	TxRing5	5
24	TxShield5	→	TxShield5	6
56	RxShield5	←	RxShield5	3

DB68	Signal	Direction	Signal	RJ45
57	RxTip5	←	RxTip5	1
58	RxRing5	←	RxRing5	2
33	TxTip4	→	TxTip4	4
34	TxRing4	→	TxRing4	5
32	TxShield4	→	TxShield4	6
64	RxShield4	←	RxShield4	3
65	RxTip4	←	RxTip4	1
66	RxRing4	←	RxRing4	2
35	PGND	—	—	—
39	PGND	—	—	—
43	PGND	—	—	—
51	PGND	—	—	—
59	PGND	—	—	—
67	DGND	—	—	—
68	DGND	—	—	—

5.7.3 16CE1 interface cable

There are two types of 16-port CE1 (16CE1) interface cables for the Secure Router 8012: the 16CE1 coaxial cable and the 16CE1 shielded twisted-pair cable. They connect the 75 Ω unshielded interface module and the 120 shielded interface module respectively, as shown in Figure 5-11 and Figure 5-12.

Figure 5-11 75-ohm 16CE1 coaxial cable

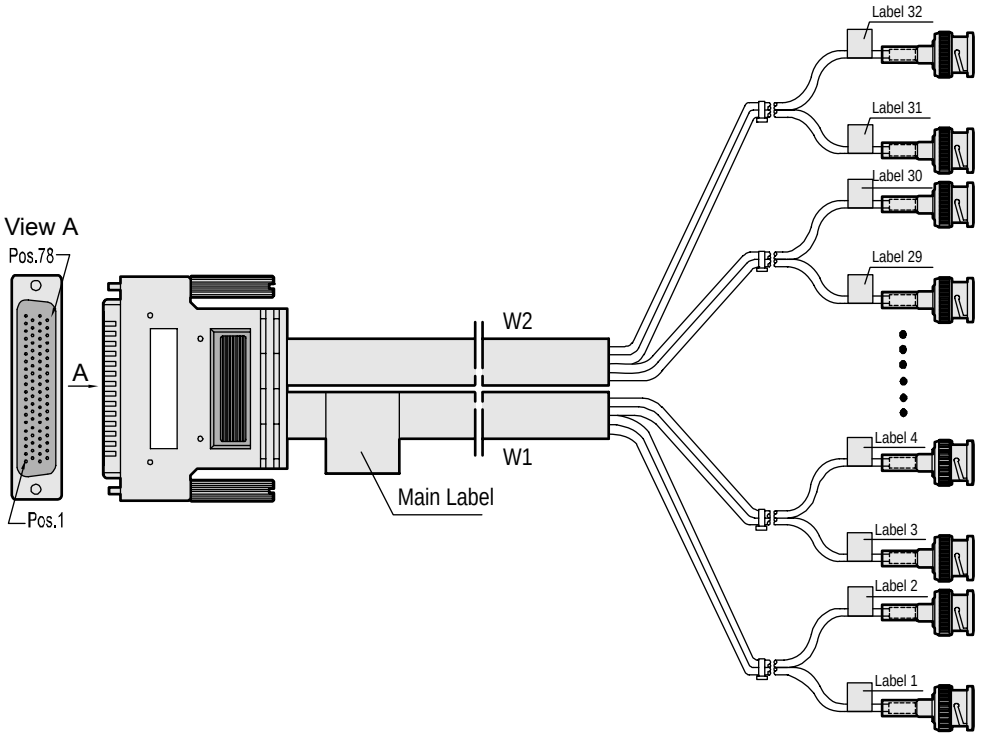


Figure 5-12 120-ohm 16CE1 shielded twisted-pair cable

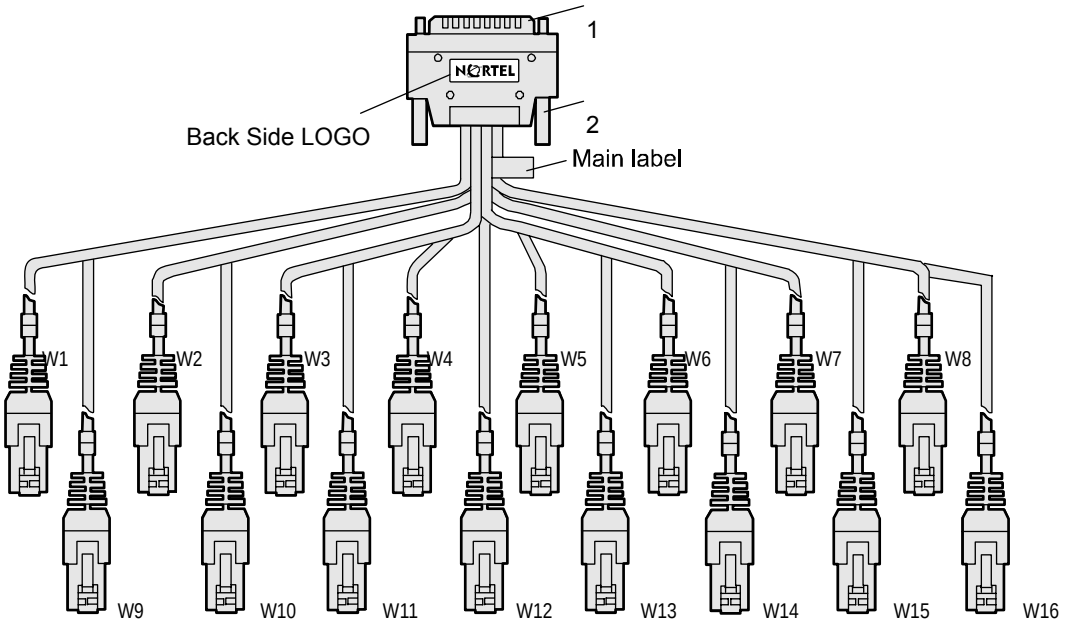


Table 5-10 Pin assignment of the 16CE1 coaxial cable

DB78	Signal	Signal direction	Signal	BNC
2	RxTip1	←	—	—
22	RxRing1	←	RxRing1	No. 1 reception
41	TxTip1	→	—	—
61	TxRing1	→	TxRing1	No. 1 transmission
3	RxTip2	←	—	—
23	RxRing2	←	RxRing2	No. 2 reception
42	TxTip2	→	—	—
62	TxRing2	→	TxRing2	No. 2 transmission
4	RxTip3	←	—	—
24	RxRing3	←	RxRing3	No. 3 reception
43	TxTip3	→	—	—
63	TxRing3	→	TxRing3	No. 3 transmission
5	RxTip4	←	—	—
25	RxRing4	←	RxRing4	No. 4 reception
44	TxTip4	→	—	—
64	TxRing4	→	TxRing4	No. 4 transmission
6	RxTip5	←	—	—
26	RxRing5	←	RxRing5	No. 5 reception
45	TxTip5	→	—	—
65	TxRing5	→	TxRing5	No. 5 transmission
7	RxTip6	←	—	—
27	RxRing6	←	RxRing6	No. 6 reception
46	TxTip6	→	—	—
66	TxRing6	→	TxRing6	No. 6 transmission
8	RxTip7	←	—	—
28	RxRing7	←	RxRing7	No. 7 reception
47	TxTip7	→	—	—
67	TxRing7	→	TxRing7	No. 7 transmission
9	RxTip8	←	—	—
29	RxRing8	←	RxRing8	No. 8 reception

DB78	Signal	Signal direction	Signal	BNC
48	TxTip8	→	—	—
68	TxRing8	→	TxRing8	No. 8 transmission
12	RxTip9	←	—	—
31	RxRing9	←	RxRing9	No. 9 reception
51	TxTip9	→	—	—
70	TxRing9	→	TxRing9	No. 9 transmission
13	RxTip10	←	—	—
32	RxRing10	←	RxRing10	No. 10 reception
52	TxTip10	→	—	—
71	TxRing10	→	TxRing10	No. 10 transmission
14	RxTip11	←	—	—
33	RxRing11	←	RxRing11	No. 11 reception
53	TxTip11	→	—	—
72	TxRing11	→	TxRing11	No. 11 transmission
15	RxTip12	←	—	—
34	RxRing12	←	RxRing12	No. 12 reception
54	TxTip12	→	—	—
73	TxRing12	→	TxRing12	No. 12 transmission
16	RxTip13	←	—	—
35	RxRing13	←	RxRing13	No. 13 reception
55	TxTip13	→	—	—
74	TxRing13	→	TxRing13	No. 13 transmission
17	RxTip14	←	—	—
36	RxRing14	←	RxRing14	No. 14 reception
56	TxTip14	→	—	—
75	TxRing14	→	TxRing14	No. 14 transmission
18	RxTip15	←	—	—
37	RxRing15	←	RxRing15	No. 15 reception

DB78	Signal	Signal direction	Signal	BNC
57	TxTip15	→	—	—
76	TxRing15	→	TxRing15	No. 15 transmission
19	RxTip16	←	—	—
38	RxRing16	←	RxRing16	No. 16 reception
58	TxTip16	→	—	—
77	TxRing16	→	TxRing16	No. 16 transmission
1	CABLE_TYPE_SEL0	←PGND	—	—
10	PGND	—	—	—
11	CABLE_TYPE_SEL1	←NULL	—	—
20	PGND	—	—	—
21	PGND	—	—	—
30	PGND	—	—	—
39	PGND	—	—	—
40	PGND	—	—	—
49	PGND	—	—	—
50	PGND	—	—	—
59	PGND	—	—	—
60	PGND	—	—	—
69	PGND	—	—	—
78	PGND	—	—	—

Table 5-11 Pin assignment of the 16CE1 shielded twisted-pair cable

DB78	Signal	Signal direction	Signal	RJ45
2	RxTip1	←	RxTip1	1
22	RxRing1	←	RxRing1	2
41	TxTip1	→	TxTip1	4
61	TxRing1	→	TxRing1	5
3	RxTip2	←	RxTip2	1

DB78	Signal	Signal direction	Signal	RJ45
23	RxRing2	←	RxRing2	2
42	TxTip2	→	TxTip2	4
62	TxRing2	→	TxRing2	5
4	RxTip3	←	RxTip3	1
24	RxRing3	←	RxRing3	2
43	TxTip3	→	TxTip3	4
63	TxRing3	→	TxRing3	5
5	RxTip4	←	RxTip4	1
25	RxRing4	←	RxRing4	2
44	TxTip4	→	TxTip4	4
64	TxRing4	→	TxRing4	5
6	RxTip5	←	RxTip5	1
26	RxRing5	←	RxRing5	2
45	TxTip5	→	TxTip5	4
65	TxRing5	→	TxRing5	5
7	RxTip6	←	RxTip6	1
27	RxRing6	←	RxRing6	2
46	TxTip6	→	TxTip6	4
66	TxRing6	→	TxRing6	5
8	RxTip7	←	RxTip7	1
28	RxRing7	←	RxRing7	2
47	TxTip7	→	TxTip7	4
67	TxRing7	→	TxRing7	5
9	RxTip8	←	RxTip8	1
29	RxRing8	←	RxRing8	2
48	TxTip8	→	TxTip8	4
68	TxRing8	→	TxRing8	5
12	RxTip9	←	RxTip9	1
31	RxRing9	←	RxRing9	2
51	TxTip9	→	TxTip9	4
70	TxRing9	→	TxRing9	5

DB78	Signal	Signal direction	Signal	RJ45
13	RxTip10	←	RxTip10	1
32	RxRing10	←	RxRing10	2
52	TxTip10	→	TxTip10	4
71	TxRing10	→	TxRing10	5
14	RxTip11	←	RxTip11	1
33	RxRing11	←	RxRing11	2
53	TxTip11	→	TxTip11	4
72	TxRing11	→	TxRing11	5
15	RxTip12	←	RxTip12	1
34	RxRing12	←	RxRing12	2
54	TxTip12	→	TxTip12	4
73	TxRing12	→	TxRing12	5
16	RxTip13	←	RxTip13	1
35	RxRing13	←	RxRing13	2
55	TxTip13	→	TxTip13	4
74	TxRing13	→	TxRing13	5
17	RxTip14	←	RxTip14	1
36	RxRing14	←	RxRing14	2
56	TxTip14	→	TxTip14	4
75	TxRing14	→	TxRing14	5
18	RxTip15	←	RxTip15	1
37	RxRing15	←	RxRing15	2
57	TxTip15	→	TxTip15	4
76	TxRing15	→	TxRing15	5
19	RxTip16	←	RxTip16	1
38	RxRing16	←	RxRing16	2
58	TxTip16	→	TxTip16	4
77	TxRing16	→	TxRing16	5
1	CABLE_TYPE_SEL0	←PGND	—	—
10	PGND	—	—	—

DB78	Signal	Signal direction	Signal	RJ45
11	CABLE_TYPE_SEL1	←PGND	—	—
20	PGND	—	—	—
21	PGND	—	—	—
30	PGND	—	—	—
39	PGND	—	—	—
40	PGND	—	—	—
49	PGND	—	—	—
50	PGND	—	—	—
59	PGND	—	—	—
60	PGND	—	—	—
69	PGND	—	—	—
78	PGND	—	—	—

5.7.4 4CT1/8CT1 interface cable

The 4CT1/8CT1 interface module of Secure Router 8012 is connected with the 120-ohm shielded twisted-pair cable.

Figure 5-8 shows the outline of the 4CT1 cable and Table 5-7 shows the pin assignment. Figure 5-10 shows the outline of the 8CT1 cable and Table 5-9 shows the pin assignment.

5.7.5 16CT1 interface cable

The 16CT1 interface cable for the Secure Router 8012 is a 120-ohm shielded twisted-pair cable. Figure 5-12 shows the outline of the 16CT1 cable and Table 5-11 shows the pin assignment.

5.8 Channelized E3 interface cable

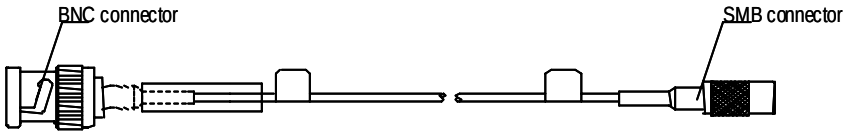
5.8.1 Introduction

The 1CE3 interface module provides two SMB interfaces, which are connected to the Tx end and Rx end of the peer device. The interfaces work in 75-ohm unbalanced transfer mode and are connected with the peer device through a pair of 75-ohm unbalanced coaxial cables.

5.8.2 Structure

Figure 5-13 shows the outline of the 1CE3 interface cable.

Figure 5-13 E3 interface cable



5.9 Synchronous serial interface cable

5.9.1 Introduction

Every 4SAE interface is 28-core connectors. One end is the DB28 connector to connect with the router, and the other end differs according to the network segment. Both are 3 m in length.

The synchronous serial port cable consists of the following types:

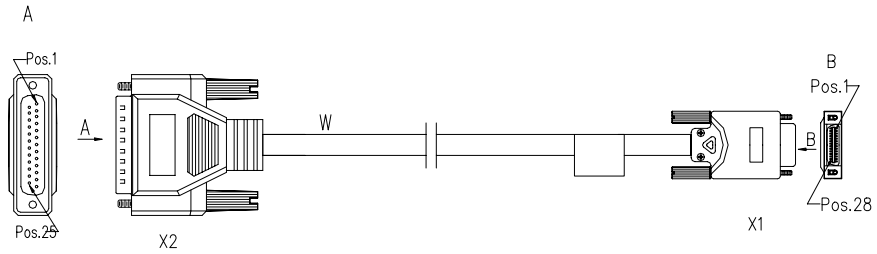
- V.24 (EIA/TIA-232 DTE cable: DB-25 (male) plug at the network end
- V.24 (EIA/TIA-232) DCE cable: DB-25 (female) receptacle at the network end
- V.35 DTE cable: 34PIN (male) plug at the network end
- V.35 DCE cable: 34PIN (female) receptacle at the network end

5.9.2 Structure

The outline of the synchronous serial port cable is as follows:

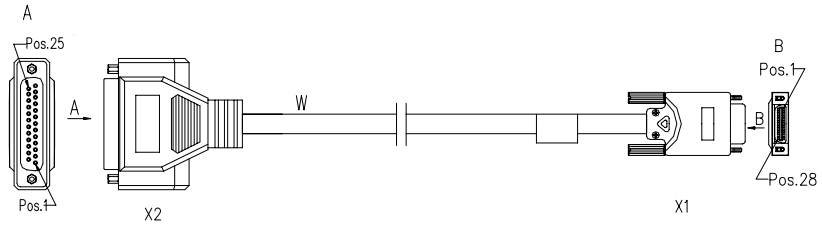
- V.24 DTE cable

Figure 5-14 V.24 DTE cable



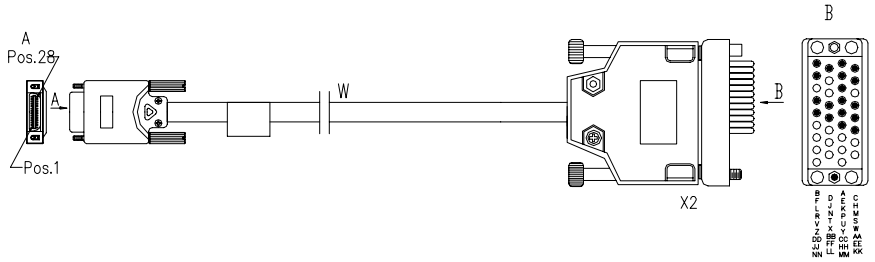
- V.24 DCE cable

Figure 5-15 V.24 DCE cable



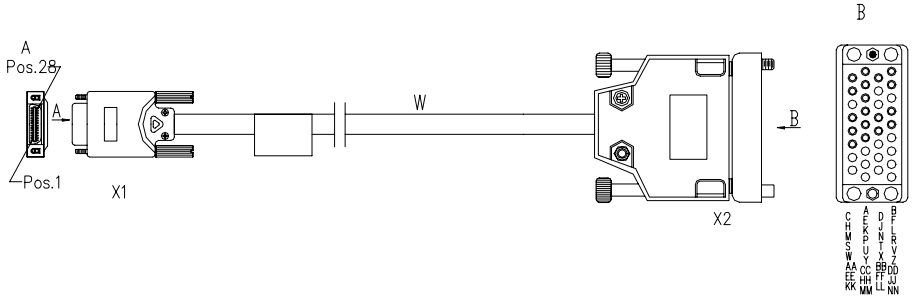
- V.35 DTE cable

Figure 5-16 V.35 DTE cable



- V.35 DCE cable

Figure 5-17 V.35 DCE cable



The following tables show the pin assignments for synchronous serial port cable.

Table 5-12 Pin assignment of the V.24 DTE cable

DB-28	Signal	Signal direction	DB-25	Signal
6	GND	—	7	Circuit GND

DB-28	Signal	Signal direction	DB-25	Signal
21	GND	—	1	Shield GND
1	TxD+	→	2	TxD
19	RxD+	←	3	RxD
13	RTS+	→	4	RTS
23	CTS+	←	5	CTS
27	DTR+	→	20	DTR
25	DSR+	←	6	DSR
17	RxC+	←	17	RxC
3	TxC+	←	15	TxC
15	TxCE+	→	24	ETC
11	DCD+	←	8	DCD
22	LL	→	18	LIST

Table 5-13 Pin assignment of the V.24 DCE cable

DB-28	Signal	Signal direction	DB-25	Signal
6	GND	—	7	Circuit GND
21	GND	—	1	Shield GND
19	RxD+	←	2	TxD
1	TxD+	→	3	RxD
23	CTS+	←	4	RTS
13	RTS+	→	5	CTS
25	DSR+	←	20	DTR
27	DTR+	→	6	DSR
15	TxCE+	→	17	RxC
3	TxC+	→	15	TxC
17	RxC+	←	24	ETC
11	DCD+	→	8	DCD
22	LL	←	18	LIST

Table 5-14 Pin assignment of the V.35 DTE cable

DB-28	Signal	Signal direction	DB-25	Signal
6	GND	—	A	Circuit GND
21	GND	—	B	Shield GND
1	TxD+	→	P	SD+
2	TxD-	→	S	SD-
19	RxD+	←	R	RD+
20	RxD-	←	T	RD-

Table 5-15 Pin assignment of the V.35 DCE cable

DB-28	Signal	Signal direction	DB-25	Signal
6	GND	—	A	Circuit GND
21	GND	—	B	Shield GND
19	RxD+	←	P	TxD+
20	RxD-	←	S	TxD-
1	TxD+	→	R	RxD+
2	TxD-	→	T	RxD-
23	CTS+	←	C	RTS
13	RTS+	→	D	CTS
25	DSR+	←	H	DTR
27	DTR+	→	E	DSR
15	TxCE+	→	V	SCR+
16	TxCE+	→	X	SCR-
3	TxC+	→	Y	SCT+
4	TxC+	→	AA	SCT-
17	RxC+	←	U	SCTE+
18	RxC-	←	W	SCTE-
11	DCD+	→	F	RLSD
22	LL	←	J	LL

5.10 HSSI cable

5.10.1 Introduction

High Speed Serial Interface cable has two types: the DTE-to-DCE cable (HSSI interface cable) and the DTE-to-DTE cable (null modem cable). All are 3 m in length.

DTE-to-DCE cable

DTE-to-DCE cable is the straight-through cable. The line sequences of the twisted pairs in the (DB-50) SCSI-II connectors at the two ends are the same. They are used for the connection between the HSSI interface and the communication device in the middle.

DTE-to-DTE cable

DTE-to-DTE cable is the crossover cable. The line sequences of the twisted pairs in the (DB-50) SCSI-II connectors at the two ends are different. They are used for back-to-back connection among the DTE devices.

5.10.2 Structure

DTE-to-DCE cable and DTE-to-DTE cable are both shielded twisted-pair cables. They use the (DB-50) SCSI-II and have similar pin assignment as shown in Figure 5-18.

Figure 5-18 DTE-to-DCE cable

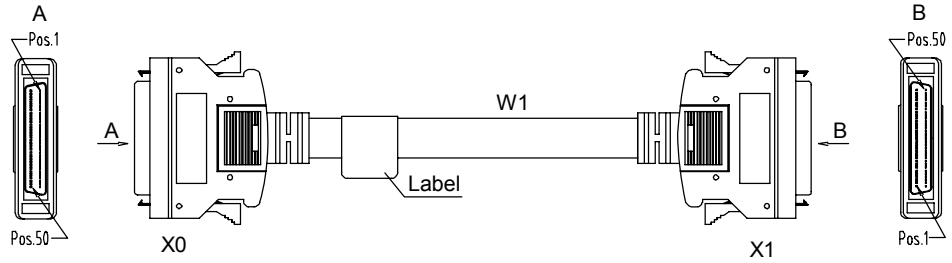


Table 5-16 shows the pin assignment of DTE-to-DCE cables (HSSI interface cable). Table 5-17 shows the pin assignment of DTE-to-DTE cables (null modem cable).

Table 5-16 Pin assignment of the DTE-to-DCE cable (HSSI interface cable)

Relation	Color	(DB50) SCSI-II	Signal	Direction	(DB50)SCSI-II	Signal
Pair 1	White	1	SG	—	1	SG
	Blue	26	SG		26	SG
Pair 2	White	2	RT+	←	2	RT+
	Orange	27	RT-		27	RT-

Relation	Color	(DB50) SCSI-II	Signal	Direction	(DB50)SCSI-II	Signal
Pair 3	White	3	CA+	←	3	CA+
	Green	28	CA-		28	CA-
Pair 4	White	4	RD+	←	4	RD+
	Brown	29	RD-		29	RD-
Pair 5	White	5	LC+	←	5	LC+
	Gray	30	LC-		30	LC-
Pair 6	Red	6	ST+	←	6	ST+
	Blue	31	ST-		31	ST-
Pair 7	Red	7	SG	—	7	SG
	Orange	32	SG		32	SG
Pair 8	Red	8	TA+	→	8	TA+
	Green	33	TA-		33	TA-
Pair 9	Red	9	TT+	→	9	TT+
	Brown	34	TT-		34	TT-
Pair 10	Red	10	LA+	→	10	LA+
	Gray	35	LA-		35	LA-
Pair 11	Black	11	SD+	→	11	SD+
	Blue	36	SD-		36	SD-
Pair 12	Black	12	LB+	→	12	LB+
	Orange	37	LB-		37	LB-
Pair 13	Black	13	SG	—	13	SG
	Green	38	SG		38	SG
Pair 14	Black	14	Ancillary to DCE	—	14	Ancillary to DCE
	Brown	39	Ancillary to DCE		39	Ancillary to DCE
Pair 15	Black	15	Ancillary to DCE	—	15	Ancillary to DCE
	Gray	40	Ancillary to DCE		40	Ancillary to DCE
Pair 16	Yellow	16	Ancillary to DCE	—	16	Ancillary to DCE

Relation	Color	(DB50) SCSI-II	Signal	Direction	(DB50)SCSI-II	Signal
	Blue	41	Ancillary to DCE		41	Ancillary to DCE
Pair 17	Yellow	17	Ancillary to DCE	—	17	Ancillary to DCE
	Orange	42	Ancillary to DCE		42	Ancillary to DCE
Pair 18	Yellow	18	Ancillary to DCE	—	18	Ancillary to DCE
	Green	43	Ancillary to DCE		43	Ancillary to DCE
Pair 19	Yellow	19	SG	←	19	SG
	Brown	44	SG		44	SG
Pair 20	Yellow	20	Ancillary from DCE	—	20	Ancillary from DCE
	Gray	45	Ancillary from DCE		45	Ancillary from DCE
Pair 21	Violet	21	Ancillary from DCE	—	21	Ancillary from DCE
	Blue	46	Ancillary from DCE		46	Ancillary from DCE
Pair 22	Violet	22	Ancillary from DCE	—	22	Ancillary from DCE
	Orange	47	Ancillary from DCE		47	Ancillary from DCE
Pair 23	Violet	23	Ancillary from DCE	—	23	Ancillary from DCE
	Green	48	Ancillary from DCE		48	Ancillary from DCE
Pair 24	Violet	24	Ancillary from DCE	—	24	Ancillary from DCE
	Brown	49	Ancillary from DCE		49	Ancillary from DCE
Pair 25	Violet	25	SG	—	25	SG
	Gray	50	SG		50	SG

Table 5-17 Pin assignment of the DTE-to-DTE cable (null modem cable)

Relation	Color	(DB50) SCSI-II	Signal	Direction	(DB50) SCSI-II	Signal
Pair 1	White	1	SG	—	1	SG
	Blue	26	SG	—	26	SG
Pair 2	White	2	RT+	←	9	TT+
	Orange	27	RT-	←	34	TT-
Pair 3	White	3	CA+	←	8	TA+
	Green	28	CA-	←	33	TA-
Pair 4	White	4	RD+	←	11	SD+
	Brown	29	RD-	←	36	SD-
Pair 5	White	5	LC+	Not connected	10	LA+
	Gray	30	LC-	Not connected	35	LA-
Pair 6	Red	6	ST+	Not connected	6	ST+
	Blue	31	ST-	Not connected	31	ST-
Pair 7	Red	7	SG	—	7	SG
	Orange	32	SG	—	32	SG
Pair 8	Red	8	TA+	→	3	CA+
	Green	33	TA-	→	28	CA-
Pair 9	Red	9	TT+	→	2	RT+
	Brown	34	TT-	→	27	RT-
Pair 10	Red	10	LA+	Not connected	5	LC+
	Gray	35	LA-	Not connected	30	LC-
Pair 11	Black	11	SD+	→	4	RD+
	Blue	36	SD-	→	29	RD-
Pair 12	Black	12	Loopback (not connected)	—	12	Loopback (not connected)

Relation	Color	(DB50) SCSI-II	Signal	Direction	(DB50) SCSI-II	Signal
	Orange	37	Loopback (not connected)	—	37	Loopback (not connected)
Pair 13	Black	13	SG	—	13	SG
	Green	38	SG	—	38	SG
Pair 14	Black	14	Not used	—	14	Not used
	Brown	39	Not used	—	39	Not used
Pair 15	Black	15	Not used	—	15	Not used
	Gray	40	Not used	—	40	Not used
Pair 16	Yellow	16	Not used	—	16	Not used
	Blue	41	Not used	—	41	Not used
Pair 17	Yellow	17	Not used	—	17	Not used
	Orange	42	Not used	—	42	Not used
Pair 18	Yellow	18	Not used	—	18	Not used
	Green	43	Not used	—	43	Not used
Pair 19	Yellow	19	SG	—	19	SG
	Brown	44	SG	—	44	SG
Pair 20	Yellow	20	Not used	—	20	Not used
	Gray	45	Not used	—	45	Not used
Pair 21	Violet	21	Not used	—	21	Not used
	Blue	46	Not used	—	46	Not used
Pair 22	Violet	22	Not used	—	22	Not used
	Orange	47	Not used	—	47	Not used
Pair 23	Violet	23	Not used	—	23	Not used
	Green	48	Not used	—	48	Not used
Pair 24	Violet	24	Not used	—	24	Not used
	Brown	49	Not used	—	49	Not used

Relation	Color	(DB50) SCSI-II	Signal	Direction	(DB50) SCSI-II	Signal
Pair 25	Violet	25	SG	—	25	SG
	Gray	50	SG	—	50	SG

NOTE

Refer to the previous table to produce two Ethernet cables. Arrange the line order according to this chromatogram.

Contents

Tables

A List of indicators

A.1 Board indicators

A.1.1 RPU indicators

Table A-1 shows the status and description of RPU indicators.

Table A-1 Discription of the RPU front panel components

Name	Silkscreen	Description
ALM (red)	SYS	The system running LED, including the fan, power supply, and Network Process Unit (NPU) warnings. Constant ON means the CPU has received a warning.
	NPU	The NPU failure LED. Constant ON means the NPU failed.
RPU (green)	RUN	The system running state LED. Blinking means the CPU works normally. Constant ON or OFF means the CPU failed.
	MST	The standby state LED. On means that the board is the master RPU.
NPU1 (green)	RUN	The system running state LED. Blinking means the CPU is in normal operation. Constant ON or OFF means the CPU failed.
	MST	The standby state LED. On means that the board is the master NPU.
NPU2 (green)	RUN	The system running state LED. Blinking means the CPU is in normal operation. Constant ON or OFF means the CPU failed.
	MST	The standby state LED. On means that the board is the master NPU.
FAN	PRN (green)	The LED of the fan position. Constant ON means the fan is in position.

Name	Silkscreen	Description
	ALM (red)	The fan warning LED. Constant ON means the fan is not in position or has failed.
PWR1	PRN (green)	The LED of the first power module in position. Constant ON means the power module is in position. Constant OFF means the power module is not in position.
	ALM (red)	The first power module failure LED. Constant ON means the power module disabled or has failed.
PWR2	PRN (green)	The LED of the second power module in position. Constant ON means the power module is in position. Constant OFF means the power module is not in position .
	ALM (red)	The second power module failure LED. Constant ON means the power module disabled or has failed.
10/100/1000M Ethernet 0	LINK (green)	OFF means the link is not connected and ON means the link is connected.
	ACT (yellow)	OFF means no data is being transmitted on the interface and blinking means data is being transmitted or received.
100/1000M Ethernet 1	LINK (green)	OFF means the link is not connected and ON means the link is connected.
	ACT (yellow)	OFF means no data is being transmitted on the interface and blinking means data is being transmitted or received.
100/1000M Ethernet 2	LINK (green)	OFF means the link is not connected and ON means the link is connected.
	ACT (yellow)	OFF means no data is being transmitted on the interface and blinking means data is being transmitted or received.

A.1.2 NPU indicators

Table A-2 shows the status and description of NPU indicators.

Table A-2 Description of NPU indicators

Name	Description
RUN (Green)	The running LED. Blinking means the NPU works normally. Constant OFF means the NPU is not in position or it failed.
ALM (Red)	The alarm LED. Constant ON means the NPU failed.

A.1.3 HIC/FIC indicators

Table A-3 shows the status and description of HIC/FIC indicators.

Table A-3 HIC/FIC indicators

Name	Description
LINK (Green)	OFF means the link is not connected and ON means the link is connected.
ACT (Yellow)	OFF means no data is being transmitted or received on the interface and blinking means data is being transmitted or received.

A.2 Fan module indicators

The indicators of the fan module are located on the RPU front panel. Table A-4 shows the status and description of the indicators.

Table A-4 Indicators of the fan module

Name	Color	Description
RUN	Green	Constant ON means the fan is operating normally.
ALM	Red	ON means the FAN has failed.

A.3 Power module indicators

Table A-5 shows the status and description of the power module indicators.

Table A-5 Indicators of the power module

Name	Color	Implication
AC OK	Green	The power module input LED (only for the AC power module). Constant ON means the voltage input is normal (100 V to 240 V), and OFF means the voltage input is not normal.
DC OK	Green	The power module input LED (only for the DC power module). Constant ON means the voltage input is normal (-48 V to -60 V), and OFF means the voltage input is not normal.
RUN	Green	The power module indicators. Constant ON means the power module runs normally, and OFF means the power module has faults.

Name	Color	Implication
ALM	Red	The power module fault indicator. Constant ON means the power module has faults.

The running state of the power module is available from the indicators on the RPU front panel. Table A-6 shows the status and description of the indicators.

Table A-6 Indicators of the power module on the RPU front panel

Type	Silkscreen	Description
PWR1 LED	PRN (green)	The LED of the first power module in position. Constant ON means the power module is in position. Constant OFF means the power module is not in position.
	ALM (red)	The first power module failure LED. Constant ON means the power module failed.
PWR2 LED	PRN (green)	The LED of the second power module in position. Constant ON means the power module is in position. Constant OFF means the power module is not in position.
	ALM (red)	The second power module failure LED. Constant ON means the power module failed.

Contents

Tables

B List of boards

B.1 Boards

Table B-1 lists the boards supported by the Secure Router 8012.

Table B-1 Boards supported by the Secure Router 8012

Silkscreen	Full name
RPU	Routing Process Unit
NPU	Network Process Unit
4CE1	4-port channelized E1 module
4E1	4-port unchannelized E1 module
8CE1	8-port channelized E1 module
8E1	8-port unchannelized E1 module
16xCE1 DB78 75ohm	16-port Channelized E1-DB78-75ohm,Interface Board for the Secure Router 8012
4CT1	4-port channelized T1 module
8CT1	8-port channelized T1 module
1xOC3/STM1 CPOSCT1(SFP)	11-port OC-3/STM-1 CPOS-Channelized T1-Optical Interface Board(SFP) for the Secure Router 8012
1CE3	1-port channelized E3 module
4SAE	4-port enhanced high-speed synchronous serial interface module
1AE3	1-port ATM over E3 module
1xOC3/STM1 ATM(SFP)	1-port OC-3/STM-1 ATM High Speed Optical Interface Board(SFP) for the Secure Router 8012
2xOC3/STM1 ATM(SFP)	2-port OC-3/STM-1 ATM High Speed Optical Interface Board(SFP) for the Secure Router 8012

Silkscreen	Full name
4xOC3/STM1 ATM (HIC) (SFP)	4-port OC-3/STM-1 ATM (HIC) High Speed Optical Interface Board(SFP) for the Secure Router 8012
1CPOS(E)	1-port channelized POS optical module
2xFE UTP	2-Port 100M Ethernet High Speed Electrical Interface Card (RJ45) for the Secure Router 8002, 8004, and 8008
4xFE UTP	4-Port 100M Ethernet High Speed Electrical Interface Card (RJ45) for the Secure Router 8002, 8004, and 8008
8xFE UTP	8-port 100M Ethernet High Speed Electrical interface Card (RJ45) for the Secure Router 8002, 8004, and 8008
2xFE Optical	2-Port Fast Ethernet High Speed Optical Interface Card (SFP) for the Secure Router 8002, 8004, and 8008
4xFE Optical	4-Port Fast Ethernet High Speed Optical Interface Card (SFP) for the Secure Router 8002, 8004, and 8008
8xFE Optical	8-Port Fast Ethernet High Speed Optical Interface Card (SFP) for the Secure Router 8002, 8004, and 8008
1xGig E (SFP)	High Speed 1-port 1000M Ethernet card(SFP) for the Secure Router 8002, 8004, and 8008
2xGig E (SFP)	High Speed 2-port 1000M Ethernet card(SFP) for the Secure Router 8002, 8004, and 8008
1x155 POS	High Speed 1-port 155M POS card(SFP) for the Secure Router 8002, 8004, and 8008
2x155 POS	High Speed 2-port 155M POS card(SFP) or the Secure Router 8002, 8004, and 8008
4x155 POS	High Speed 4-port 155M POS card(SFP) for the Secure Router 8002, 8004, and 8008
1xOC3/STM1 CPOSCE1(SFP)	1-port OC-3/STM-1 CPOS-Channelized E1 Optical Interface Board(SFP) for the Secure Router 8012
1xOC3/STM1 CPOSCT1(SFP)	1-port OC-3/STM-1 CPOS-Channelized T1-Optical Interface Board(SFP) for the Secure Router 8012
1xSTM1/POS-SFP-HIC-SR8012	1-port 155M POS (HIC) High Speed Optical Interface Board(SFP) for the Secure Router 8012
2xSTM1/POS-SFP-HIC-SR8012	2-port 155M POS (HIC) High Speed Optical Interface Board(SFP) for the Secure Router 8012
4xSTM1/POS-SFP-HIC-SR8012	4-port 155M POS (HIC) High Speed Optical Interface Board(SFP) or the Secure Router 8012
1HSSI	1-port HSSI interface module
2HSSI	2-port HSSI interface module

Silkscreen	Full name
IPSec Module	IPSEC High Speed Interface Board for the Secure Router 8002, 8004, and 8008

B.2 RPU

Table B-2 lists the attributes of the console port.

Table B-2 Console interface attributes

Attribute	Description
Connector type	RJ-45
Standard	RS-232
Baud rate	9600 bit/s to 115 200 bit/s 9600 bit/s by default

Table B-3 lists the attributes of the AUX port.

Table B-3 AUX interface attributes

Attribute	Description
Connector type	RJ-45
Standard	Asynchronous EIA/TIA-232
Baud rate	300 to 115 200 bit/s
Supported protocol	PPP SLIP MP

Table B-4 lists the attributes of the 10/100/1000M Ethernet port.

Table B-4 10/100/1000M Ethernet interface attributes

Attribute	Description
Connector type	RJ-45
Standard	MDI

Supported frame format	Ethernet_II Ethernet_SNAP IEEE 802.2 IEEE 802.3
Operating mode	10/100/1000 Mbit/s autosensing Full duplex Half duplex
Supported network protocol	IP

Table B-5 lists the attributes of the 100/1000M Ethernet interface

Table B-5 Attributes of the 100/1000M Ethernet interface

Attribute	Description
Connector type	SFP optical module
Number of interfaces	2
Supported frame format	Ethernet_II Ethernet_SNAP
Working mode	100M/1000 Mbit/s autosensing Full duplex
Supported network protocol	IP

B.3 10/100Base-TX FE electrical interface module

Table B-6 lists the attributes of the 10/100Base-TX FE electrical interface.

Table B-6 Attributes of 10/100Base-TX FE electrical interfaces

Attribute	Description
Connector type	RJ45
Cable type	Standard Ethernet cable
Transmission distance	100 m (with Category 5 UTP cable)
Operating mode	Full duplex/half duplex 10M/100 Mbit/s auto-negotiation

Attribute	Description
Compliant standard	IEEE 802.3u
Supported frame format	Ethernet_II Ethernet_SNAP
Supported network protocol	IP

B.4 100Base-FX Ethernet optical interface module

Table B-8 lists the attributes of the 100Base-FX Ethernet optical interface.

Table B-7 Attributes of the 100Base-FX Ethernet optical interface

Item	Description
Interface type	SFP optical interface. For the module configuration, see Table B-8.
Duplex mode	Full duplex
Rate	100 Mbit/s
Applicable standard	IEEE 802.3u
Supported frame format	Ethernet_II Ethernet_SNAP
Supported network protocol	IP

Table B-8 Attributes of the 100M-FX Ethernet interface SFP optical module

Item		Description			
Maximum transmission distance		2 km	15 km	40 km	80 km
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Optical fiber type		Multimode	Single-mode	Single-mode	Single-mode
Output power	Minimum	–19 dBm	–15 dBm	–5 dBm	–5 dBm
	Maximum	–14 dBm	–8 dBm	0 dBm	0 dBm
Receiver sensitivity		–30 dBm	–31 dBm	–37 dBm	–37 dBm
Sender type		LD	LED		

Connector type	LC

B.5 1000Base-X Ethernet optical interface module

Table B-9 lists the attributes of the 1000Base-X Ethernet optical interface.

Table B-9 Attributes of the 1000Base-X Ethernet interface module

Item	Description	
	2GE	**1GE**
Interface type	SFP interface (Configure this module separately. See Table B-10 for attributes of SFP optical module and Table B-11 for attributes of SFP electrical interface module.)	
Interface number	2	1
Duplex mode	Full duplex	
Rate	1.25 Gbit/s	
Standard compliance	IEEE 802.3z	
Frame format	Ethernet_II Ethernet_SNAP	
Network protocol	IP	

Table B-10 Attributes of the SFP optical module of the 1000Base-X Ethernet interface

Attributes	Description					
Transmission distance	0.55 km	10 km	40 km	40 km	80 km	100 km
Central wavelength	850 nm	1310 nm	1310 nm	1550 nm	1550 nm	1550 nm
Minimum output power	–9.5 dBm	–9.5 dBm	–5 dBm	–4.0 dBm	–5.0 dBm	–5 dBm
Maximum output power	0 dBm	–3.0 dBm	–2 dBm	0 dBm	–2.0 dBm	0 dBm
Receiver sensitivity	–17.0 dBm	–20.0 dBm	–23 dBm	–22.0 dBm	–23.0 dBm	–30.0 dBm

Attributes	Description					
Optical fiber type	Multimode	Single-mode	Single-mode	Single-mode	Single-mode	Single-mode
Connector type	LC					

Table B-11 Attributes of SFP module of 1000Base-X Ethernet electrical interface

Item	Description
Transmission distance	100 m
Duplex	Full-duplex
Connector type	RJ-45
Rate	1000 Mbit/s

B.6 Channelized and unchannelized E1/T1 interface module

Table B-12 lists the attributes of the channelized and unchannelized E1/T1 Interface.

Table B-12 Attributes of channelized and unchannelized E1/T1 interface

Attribute	Description			
	4/8E1	4/8/16CE1	4/8CT1	16CT1
Connector type	• DB-68 (4/8E1,4/8CE1 and 4/8CT1) • DB-78 (16CE1 and 16CT1)			
Operating mode	E1	E1 and CE1	T1 and CT1	
Transmission rate	• In E1 mode: 2048 kbit/s • In CE1 mode: N x 64 kbit/s (N = 1 to 31)		• In T1 mode: 1544 kbit/s • In CT1 mode: N x 56 kbit/s and N x 64 kbit/s (N = 1 to 24)	
Cable model	75 coaxial cable 120 Ωshielded twisted pair cable		120 shielded twisted pair cable	
Maximum transmission distance	75Ω coaxial cable: 0.5 km 120Ω shielded twisted pair cable 0.15 km		0.15 km	

Attribute	Description			
	4/8E1	4/8/16CE1	4/8CT1	16CT1
Interface standard	ITU-T G.703 and ITU-T G.704			
Supported network protocol	IP			
Other supported protocols	PPP, LAPB, X.25, Frame Relay, HDLC, and MP (16CE1/16CT1 supports PPP, HDLC, and MP.)			

NOTE
When the router works in CT1 mode, the default setting is binding time slots as N x 56 kbit/s (N = 1 to 24).

B.7 Channelized E3 interface modules

Table B-13 lists the attributes of the channelized E3 interface module.

Table B-13 Attributes of the channelized E3 interface module

Attribute	Description
	1CE3
Connector type	SMB
Cable type	75-ohm coaxial cable
Operating mode	E3, CE3, and CE1
Interface rate	E3 mode: 34.368 Mbit/s CE3 mode: providing 16 E1 channels with a rate of 2.048 Mbit/s per E1 channel CE1 mode: N x 64 kbit/s (N = 1 to 31)
Max. transmit distance	0.1 km
Interface standard	ITU-T G.703 and G.704
Supported network protocol	IP
Other supported protocols	PPP, MP, Frame Relay, MFR, and HDLC

B.8 Synchronous serial port module

Table B-14 lists the attributes of the synchronous serial port.

Table B-14 Attributes of the 4SAE interface

Attribute	Description	
Connector type	DB-28	
Interface standard and working mode	V.24	V.35
	DTE and DCE	DTE DCE
Minimum baud rate (bit/s)	1200	1200
Maximum baud rate (bit/s)	64 k	2.048 M
Cable type	V.24 DTE cable V.24 DCE cable V.35 DTE cable V.35 DCE cable	
Supported protocols	PPP HDLC Frame Relay MFR MP	

B.9 ATM 155M optical interface module

Table B-15 shows the attributes of the optical interface module.

Table B-15 Attributes of the ATM 155M optical interface

Attribute	Description
Interface rate	155 Mbit/s
Interface standard	SONET/SDH
Supported service type	ATM Traffic Constant Bit Rate (CBR) rt_Variable Bit Rate-Real Time (VBR) nrt_Variable Bit Rate-Non Real Time (VBR) Unspecified Bit Rate (UBR)

Supported protocols	IPoA IPoEoA PPPoA PPPoEoA **NOTE** The HIC high-speed ATM 155M optical interface supports only IPoA.

The FIC low-speed ATM 155M SFP optical module is placed inside. The attributes of this module are shown in Table B-16.

Table B-16 Attributes of the SFP optical module with the ATM 155M optical interface

Item		Description		
		Multi-mode optical interface	**Single-mode optical interface**	**Single-mode optical interface with long haul**
Connector type		SC	SC	SC
Transmitting power	Minimum	–15 dBm	–19 dBm	–5 dBm
	Maximum	–8 dBm	–14 dBm	0 dBm
Receiver sensitivity	Minimum	–28 dBm	–30 dBm	–34 dBm
	Maximum	–8 dBm	–14 dBm	–10 dBm
Sender type		LED	LD	LD
Wavelength		1310 nm		
Maximum transmission distance		2 km	15 km	30 km

The HIC high-speed ATM 155M SFP optical module is provided separately. The attributes of this module are shown in Table B-17.

Table B-17 Attributes of the HIC high-speed ATM 155M SFP optical module

Item		Description			
Maximum transmission distance		2 km	15 km	40 km	80 km
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Optical fiber type		Multimode	Single-mode	Single-mode	Single-mode
Output power	Minimum	–19 dBm	–15 dBm	–5 dBm	–5 dBm

	Maximum	–14 dBm	–8 dBm	0 dBm	0 dBm
Receiver sensitivity		–30 dBm	–31 dBm	–37 dBm	–37 dBm
Sender type		LD	LED		
Connector type		LC			

B.10 Channelized and unchannelized POS optical interface module

Table B-18 lists the attributes of the channelized and unchannelized POS optical interface.

Table B-18 Attributes of the channelized and unchannelized POS optical interface

Item	Description
Rate	155 Mbit/s
Operating mode	Unchannelized: 155 Mbit/s and full duplex channelized: 63 E1 channels or 84 T1 channels
Applicable standard	STM-1/OC-3c SONET/SDH Supporting IETF RFC1619/1661/1662
Supported network protocol	IP
Supported protocols	PPP HDLC Frame Relay MFR (Only 1CPOS(E) supports Frame Relay and MFR.)

Table B-19 Attributes of the SFP optical module of the channelized/unchannelized POS optical interface

Item		Description			
Maximum transmission distance		2 km	15 km	40 km	80 km
Central wavelength		1310 nm	1310 nm	1310 nm	1550 nm
Optical fiber type		Multimode	Single-mode	Single-mode	Single-mode
Output power	Minimum	–19 dBm	–15 dBm	–5 dBm	–5 dBm
	Maximum	–14 dBm	–8 dBm	0 dBm	0 dBm

Item	Description			
Receiver sensitivity	–30 dBm	–31 dBm	–37 dBm	–37 dBm
Sender type	LD	LED		
Connector type	LC			

B.11 HSSI interface module

Table B-20 shows the attributes of the HSSI interface.

Table B-20 Attributes of the HSSI interface

Item	Description
Type	HSSI electrical interface
Rate	52 Mbit/s
Working mode	Unchannelized: 51.84M
Standard compliance	Compliant with STS-1
Supported network protocol	IP
Supported link layer protocols	PPP HDLC

B.12 IPSec encryption HIC

Table B-21 lists the attributes of the IPSec encryption HIC.

Table B-21 Attributes of the IPSec encryption HIC

Item	Description
Supported protocol	IPSec/IKE
Supported maximum concurrent IPSec connections	• Site-to-Site: 5000 • Virtual Private Dial-up Network (VPDN): 12 000
Hardware algorithm	Encryption algorithms: DES, 3DES, AES128, AES192, AES256, and SCB2 Encryption mode: CBC

Contents

C Acronyms and abbreviations

A	
AC	Alternating Current
ATM	Advanced Traffic Management
AUX	Auxiliary (port)
C	
CPU	Central Processing Unit
CSU	Channel Service Unit
D	
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Circuit-terminating Equipment
DSR	Data Set Ready
DSU	Data Service Unit
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
E	
EMC	Electro Magnetic Compatibility
EPLD	Erasable Programmable Logic Device
F	
FE	Fast Ethernet

FIC	Flexible Interface Card
FPGA	Field Programmable Gate Array
G	
GE	Gigabit Ethernet
GND	Ground
H	
HDLC	High-level Data Link Control
HIC	High-speed Interface Card
I	
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISDN	Integrated Services Digital Network
L	
LAN	Local Area Network
LC	Lucent Connector
LD	Laser Diode
LED	Light-emitting diode
M	
MFR	Multiple Frame Relay
MP	Multilink Protocol
MPLS	Multiprotocol Label Switching
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
N	
NEG	Negative
NPU	Network Process Unit

NVRAM	Non-Volatile Random Access Memory
O	
ODF	Optical Distribution Frame
P	
PC	Personal Computer
PGND	Protection Ground
POS	Packet Over SDH/SONET
PPP	Point-to-Point Protocol
PPPoA	Point to Point Protocol over ATM Adaptation Layer 5
PRI	Primary Rate Interface
Q	
QoS	Quality of Service
R	
RH	Relative Humidity
RJ45	Registered Jack 45
RPM	Round Per Minute
RPU	Routing Process Unit
S	
SA	Security Association
SC	Square Connector
SDH	Synchronous Digital Hierarchy
SDRAM	Synchronous Dynamic Random Access Memory
SFP	Small Form-Factor Pluggable
SLIP	Serial Line Internet Protocol
SMB	Sub-miniature B
SNAP	Sub Network Access Point
SONET	Synchronous Optical Network
ST	Segment Type

U

UBR	Unspecified Bit Rate
UL	Underwriter Laboratories Inc.

V

VBR	Variable Bit Rate

Contents

Index

R

S

T

V

Nortel Secure Router 8012

Hardware Description

Printed in Canada, India, and the United States of America

Release:5.3
Publication: NN46240-303
Document Revision: 01.03
Document status: Standard
Document release date: 6 April 2009

To provide feedback or to report a problem in this document, go to www.nortel.com/documentfeedback.

www.nortel.com

ATTENTION
For information about the safety precautions, read "Safety messages" in this guide.

For information about the software license, read "Software license" in this guide.