Netcrypt Overlay Bulk Encryptor Installation and Operation Guide

Please Read

Important

Please read this entire guide. If this guide provides installation or operation instructions, give particular attention to all safety statements included in this guide.

Notices

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Contents

Safety Precautions

Read, Retain, and Follow These Instructions

Carefully read all safety and operating instructions before operating this product. Follow all operating instructions that accompany this product. Retain the instructions for future use. Give particular attention to all safety precautions.

Warning and Caution Icons

WARNING:

Avoid personal injury and product damage! Do not proceed beyond any icon until you fully understand the indicated conditions.

The following icons alert you to important information about the safe operation of this product:

You will find this icon in the literature that accompanies this product. This icon indicates important operating or maintenance instructions.

You may find this icon affixed to this product and in this document to alert you of electrical safety hazards. On this product, this icon indicates a live terminal; the arrowhead points to the terminal device.

You may find this icon affixed to this product. This icon indicates a protective earth terminal.

You may find this icon affixed to this product. This icon indicates excessive or dangerous heat.

You may find this symbol affixed to this product and in this document. This symbol indicates an infrared laser that transmits intensity-modulated light and emits invisible laser radiation and an LED that transmits intensity-modulated light.

Heed All Warnings

Adhere to all warnings on the product and in the operating instructions.

Avoid Electric Shock

Follow the instructions in this warning.

WARNING:

To reduce risk of electric shock, perform only the instructions that are included in the operating instructions. Refer all servicing to qualified service personnel.

Servicing

WARNING:

Avoid electric shock! Opening or removing the cover may expose you to dangerous voltages.

Do not open the cover of this product and attempt service unless instructed to do so in the operating instructions. Refer all servicing to qualified personnel only.

Cleaning, Water, Moisture, Open Flame

To protect this product against damage from moisture and open flames, do the following:

- Before cleaning, unplug this product from the AC outlet. Do *not* use liquid or aerosol cleaners. Use a dry cloth for cleaning.
- Do not expose this product to moisture.
- Do not place this product on a wet surface or spill liquids on or near this product.
- Do not place or use candles or other open flames near or on this product.

Ventilation

To protect this product against damage from overheating, do the following:

- This product has openings for ventilation to protect it from overheating. To ensure product reliability, do not block or cover these openings.
- Do not open this product unless otherwise instructed to do so.
- Do not push objects through openings in the product or enclosure.

Placement

To protect this product against damage from breakage, do the following:

- Place this product close enough to a mains AC outlet to accommodate the length of the product power cord.
- Route all power supply cords so that people cannot walk on, or place objects on, or lean objects against them. This can pinch or damage the cords. Pay particular attention to cords at plugs, outlets, and the points where the cords exit the product.
- Make sure the mounting surface or rack is stable and can support the size and weight of this product.

WARNING:

Avoid personal injury and damage to this product! An unstable surface may cause this product to fall.

When moving a cart that contains this product, check for any of the following possible hazards:

- Move the cart slowly and carefully. If the cart does not move easily, this condition may indicate obstructions or cables that you may need to disconnect before moving this cart to another location.
- Avoid quick stops and starts when moving the cart.
- Check for uneven floor surfaces such as cracks or cables and cords.

WARNING:

Avoid personal injury and damage to this product! Move any appliance and cart combination with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart to overturn.

Fuse

When replacing a fuse, heed the following warnings.

WARNING:

Avoid electric shock! Always disconnect all power cables before you change a fuse.

WARNING:

Avoid product damage! Always use a fuse that has the correct type and rating. The correct type and rating are indicated on this product.

Grounding This Product (U.S.A. and Canada Only)

Safety Plugs

If this product is equipped with either a three-prong (grounding pin) safety plug or a two-prong (polarized) safety plug, do not defeat the safety purpose of the polarized or grounding-type plug. Follow these safety guidelines to properly ground this product:

- For a 3-prong plug (consists of two blades and a third grounding prong), insert the plug into a grounded mains, 3-prong outlet.

  Note: This plug fits only one way. The grounding prong is provided for your safety. If you are unable to insert this plug fully into the outlet, contact your electrician to replace your obsolete outlet.
- For a 2-prong plug (consists of one wide blade and one narrow blade), insert the plug into a polarized mains, 2-prong outlet in which one socket is wider than the other.

Note: If you are unable to insert this plug fully into the outlet, try reversing the plug. The wide blade is provided for your safety. If the plug still fails to fit, contact an electrician to replace your obsolete outlet.

Grounding Terminal

If this product is equipped with an external grounding terminal, attach one end of an 18-gauge wire (or larger) to the grounding terminal; then, attach the other end of the wire to an earth ground, such as an equipment rack that is grounded.

20050727 Headend/Rack

About This Guide

Introduction

This guide describes at a high level the capabilities, physical connections, applications, and operational theory of a Netcrypt™ Overlay Bulk Encryptor (NOBE). It also provides installation, provisioning, operation, maintenance, and troubleshooting procedures, as well as technical specifications.

Purpose

This guide provides detailed specifications and component descriptions for the NOBE. This guide also includes all of the procedures that enable you to install, provision, and operate the NOBE within your DBDS. Call center personnel can use this guide to assist them with common troubleshooting procedures.

Scope

This guide discusses the following topics in relation to the NOBE:

- Operational theory
- Component descriptions
- Installation procedures
- Operation procedures
- Maintenance and repair procedures
- Troubleshooting guidelines
- Customer support information
- Technical specifications

Audience

This guide is written for system administrators of the Digital Broadband Delivery System (DBDS), operators of the Digital Network Control System (DNCS), call center personnel, and system operators who are responsible for installing, operating, maintaining, and troubleshooting the NOBE.

Related Publications

You may find the following publications useful as resources when you implement the procedures in this document.

- *DBDS Alarm Manager 1.0 Alarm Troubleshooting Help* (part number 749254)
- *Digital Network Control System Online Help (PC) Version 4.3.0.3* (part number 4019356)
- *Netcrypt Bulk Encryptor Software Installation Instructions* (part number 4021238)
- *Netcrypt Overlay Bulk Encryptor Software Version 1.0 Release Notes* (part number 4012216)

*The *Digital Network Control System Online Help for System Release* 4.3 should already be installed on your DNCS. The PC version is a separate CD that allows you to view the same online Help on a PC separate from the DNCS workstation.

Document Version

This is the second release of this document.

1

Introducing the NOBE

Introduction

This chapter provides a high-level overview of the capabilities, physical connections, applications, and operational theory of a NOBE. This chapter also provides illustrations and descriptions of front and back panel components.

Use the information in this chapter to gain an understanding of NOBE operation that you can draw on when provisioning the unit or setting up sessions and connections on it. The information in this chapter can also help you effectively troubleshoot a NOBE.

In This Chapter

NOBE Functional Overview

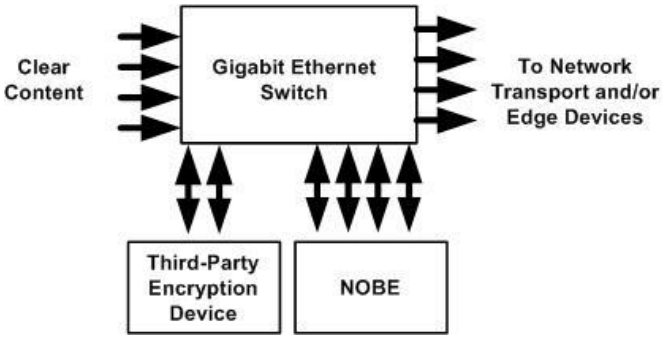
The NOBE is a powerful network-attached encryption device designed for broadcast applications in systems that use MPEG transport over UDP, IP, and Ethernet. The unit is supported in DBDS System Release (SR) 4.3 and later.

The NOBE is designed to be used in an Overlay™ environment where different conditional access (CA) systems, such as Motorola DigiCipher and Cisco PowerKEY™, coexist in a coherent manner. Overlay technology assumes that a PowerKEY DBDS network is laid over an existing but different cable network, such as a Motorola network. This technology gives cable service providers the ability to offer value-added services and technologies that Explorer® Digital Home Communication Terminals (DHCTs) provide and still support existing third-party DHCTs.

Although compact, the NOBE is capable of encrypting a maximum of 17 multi-program transport streams suitable for digital broadcast.

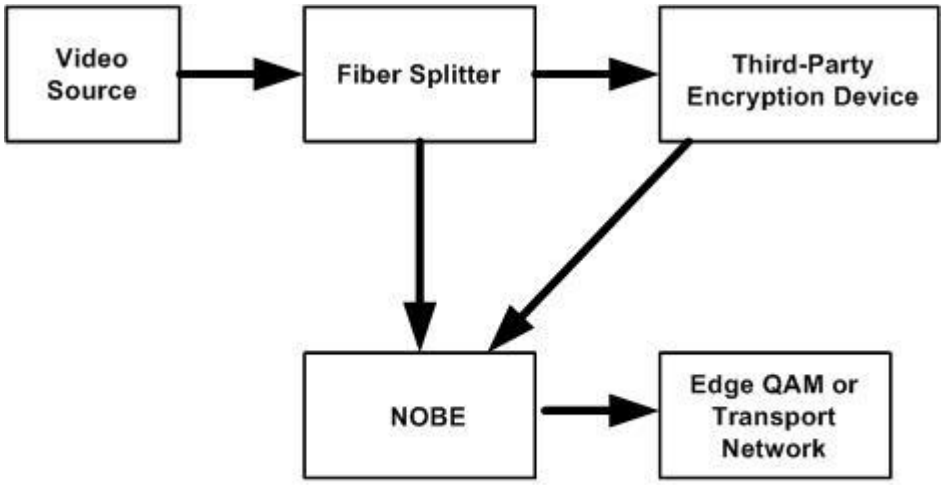
Network-Attached Encryption

The NOBE is designed to be connected to a switch or router network using four Gigabit Ethernet (GbE) ports in bi-directional mode as shown in the following figure. In this application, Quadrature Amplitude Modulation (QAM) modulator edge devices are connected to other ports on the GbE switch either directly or remotely through other network transport equipment. Clear content arrives from video sources and is sent to both the NOBE and the third-party encryption device, such as the SmartStream Encryptor Modulator (SEM), through the switch. The third-party encryption device encrypts the content and sends it to the NOBE, again through the switch. The NOBE then has both a clear copy and an encrypted copy of the same program stream, and it creates a partially encrypted output stream, which is sent back to the GbE switch for distribution through other ports. Any combination of ports can be used.



Operation Without a Switch

In addition to Network-Attached mode, the NOBE also supports the use of unidirectional GbE interconnects without a switch. When operating without a switch, the clear copy and encrypted copy of the program streams arrive on separate GbE links, and the partially encrypted output stream leaves the NOBE on a third GbE link, as shown in the following diagram.

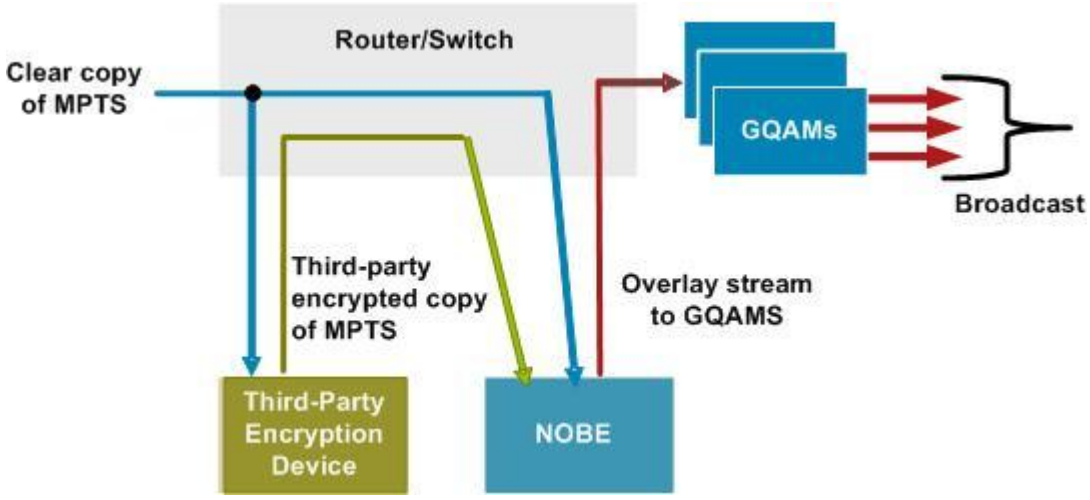


Note: All connections are unidirectional GbE.

Partial Encryption

The partially encrypted stream allows Cisco and third-party DHCTs to receive a digital broadcast that is compatible with their compliant CA system. To generate a partially encrypted stream, requires that the NOBE receive a clear copy and an encrypted copy of the same program stream. From the clear stream, the NOBE selects and encrypts critical packets of the elementary streams and picks the corresponding critical packets of the third-party-encrypted stream. Then, the NOBE multiplexes the PowerKEY-encrypted portion, the equivalent third-party encrypted packets, and the rest of the stream still in the clear to form the partially encrypted RF output stream, or Overlay stream.

When a transport stream route (TSR) is set up, the entire stream is passed through, including PIDs not referenced in the PAT. The entire TSR, including Overlay programs, is dejittered to remove network and packet jitter in order to provide a constant bit rate (CBR) output stream.



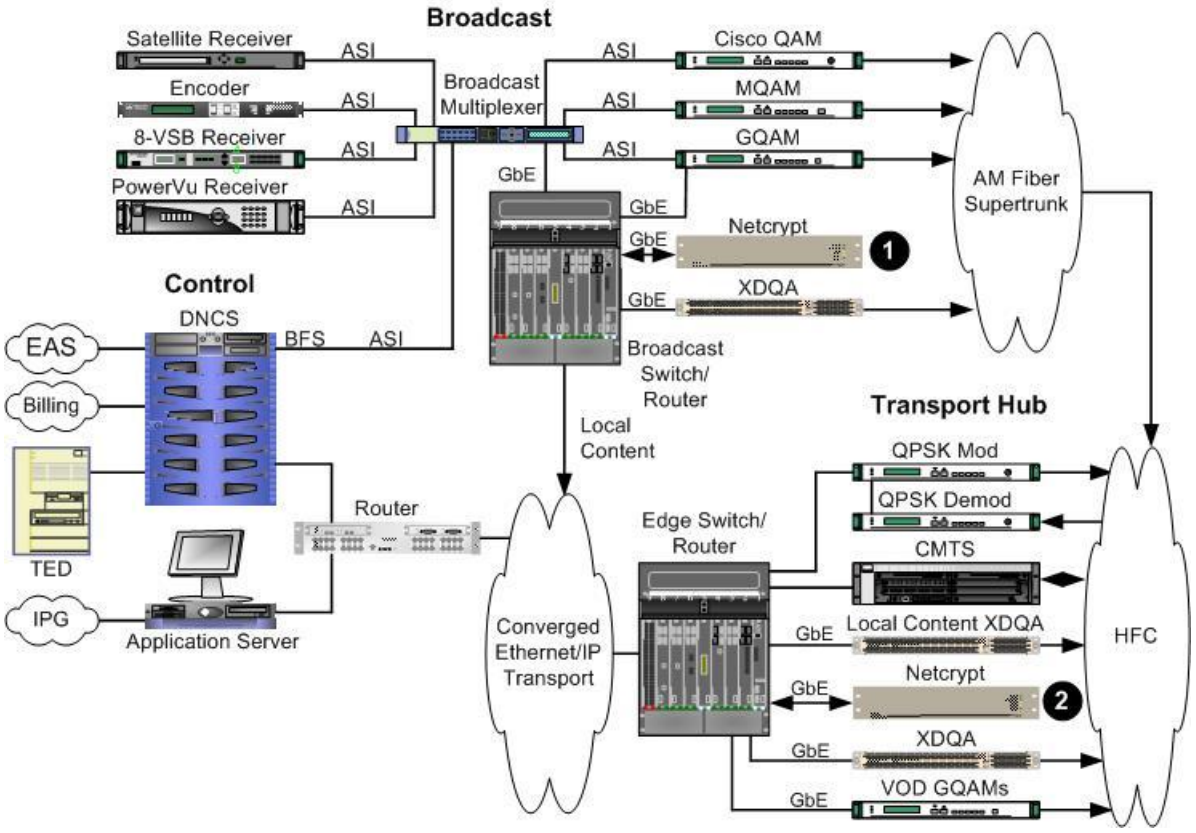
Physical Overview

The back panel of the NOBE has eight sockets for GbE connections. Four are supported today and four are not used. In addition to the GbE connectors, the back of the unit has two 10/100BASE-T Ethernet ports. One of these ports is used for DNCS control of the unit. The other port is not used.

The NOBE takes up two rack units of space. Indicators on the front and back panels provide a concise, at-a-glance status of the unit. For more information, see ***Front Panel Overview*** (on page 14) and ***Back Panel Overview*** (on page 15), later in this chapter.

System Use

Depending on the application and system architecture, the NOBE can be used in either headends or hubs, as shown in the following illustration. With any-to-any network connectivity, a NOBE located anywhere in the Network may be used to encrypt streams for broadcast applications.



1 The NOBE shown in the headend is used to encrypt broadcast streams that will be modulated in the xDQA below it or in the Local Content xDQA that is shown in the Transport Hub.

2 The NOBE shown in the Transport Hub may be used for local broadcast streams that are bound for either of the xDQAs in the Transport Hub.

Theory of Operation

As a network-attached bulk encryptor, the NOBE was designed to benefit from the added flexibility of MPEG-2 transport over UDP/IP/GbE and to support multi-program transport streams (MPTSs).

MPEG-2 Transport and Gigabit Ethernet

A key feature of MPEG-2 Transport is the ability to carry multiple programs over a single connection or RF carrier. The combination of one or more programs into a common stream is referred to as a transport stream. Each transport stream is uniquely identified by a transport stream identifier (TSID). Programs in a transport stream must all travel together. That is, they must all go from the same source to the same destinations. Recombining programs into new transport streams in order to add new content or send programs to different destinations requires MPEG multiplexing, as illustrated on the following page.

Carrying MPEG-2 Transport over UDP, IP, and GbE adds a new dimension of flexibility. By using new "tags," such as destination UDP port or IP multicast address, transport streams can be distinguished. This enables carrying multiple transport streams on a single "wire." Transport streams may be recombined and split without the need for multiplexing. Using standard IP/Ethernet switches and routers, you can add and drop programs, and connect any source to any destination without "MPEG-aware" processing.

MPTSs are the traditional method of carrying programs in a transport stream. The MPTS continues to be useful, for example, at the RF output of a QAM modulator. Asynchronous Serial Interfaces (ASI) support only one transport stream, so the only way to carry multiple programs is an MPTS. MPTSs are also useful for carrying a statistically-multiplexed group of channels from a multiplexer to a QAM modulator, either over an ASI link (as shown in the figure on the following page) or even over UDP/IP/GbE.

Broadcast Applications

In order to encrypt a broadcast stream using a NOBE, operators use the DNCS to set up an encrypted Continuous Feed (CF) session on the NOBE. The bulk encryptor supports multi-program transport streams (MPTSs). It also supports IP unicast as well as IP multicast addresses at either input or output. However, some table-based QAM modulators (TB-QAM modulators) currently support only unicasts.

By default a NOBE blocks all programs for which there is no session. However, it is possible for a NOBE to pass all programs in a specified transport stream, unencrypted, by creating a TSR, as described Unicast and Multicast Behavior. It is also possible to pass individual programs "in the clear" by creating unencrypted CF sessions.

At CF session setup time, a number of address and header information must be provided. This information is summarized in Summary of Addresses and Stream Header Information.

Network Considerations

The network considerations discussed in this section help operators understand both the operation of the NOBE and the data that operators must enter in the DNCS when provisioning the unit or setting up sessions and connections on it.

GbE Transport Network Clouds: Specifying NOBE-to-QAM Connectivity

It is possible to design a network so that any NOBE can reach any QAM modulator. However, for a variety of reasons, such as the physical or logical locations of bulk encryptors, the network design, limitations of transport networks, or load balancing, some networks may require that connectivity be restricted. With SR 2.6/3.6/4.1 and later, the DNCS uses a "GbE transport" concept and tool to specify and limit network connectivity.

As the following illustration shows, network connectivity between each NOBE and other devices in the network is specified by creating one or more "GbE transport" networks or "clouds" on the DNCS. Note that the GbE transport cloud is a logical concept, not a physical device. A cloud may be composed of one or more switches, routers, and transport devices. Any-to-any physical connectivity may exist, yet the DNCS will not configure a connection where a GbE transport cloud does not indicate connectivity. In the examples that follow, all ports on NOBEs are connected to the same GbE transport clouds. In reality they may be connected to different clouds. When two or more ports are connected to the same cloud, the DNCS balances the session load among the commonly connected ports. In reviewing the following examples, keep in mind that the methods described in the examples can be combined in new and different ways not covered in the examples.

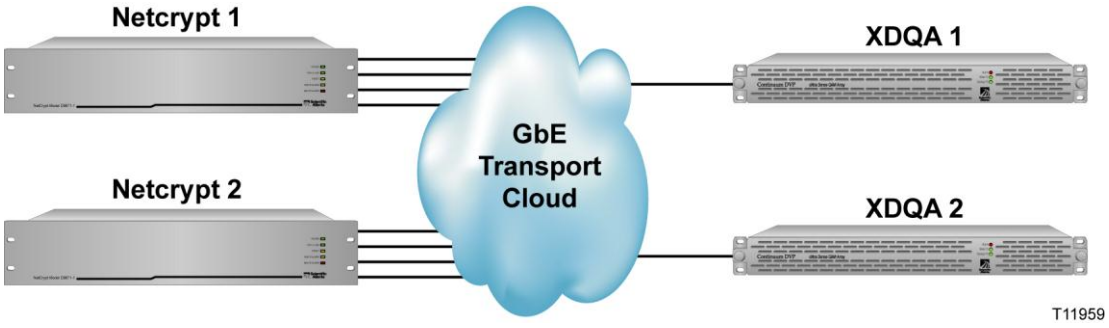
Using GbE Transport Clouds to Specify Any-to-Any Connectivity

Any-to-any connectivity would be specified by creating one GbE transport cloud and connecting every port of every NOBE and QAM modulator to that cloud, as shown in the first example below.

Each port of a NOBE must be connected to ports on one or more GbE Transport clouds.

Each GbE Transport cloud may have an arbitrary number of ports.

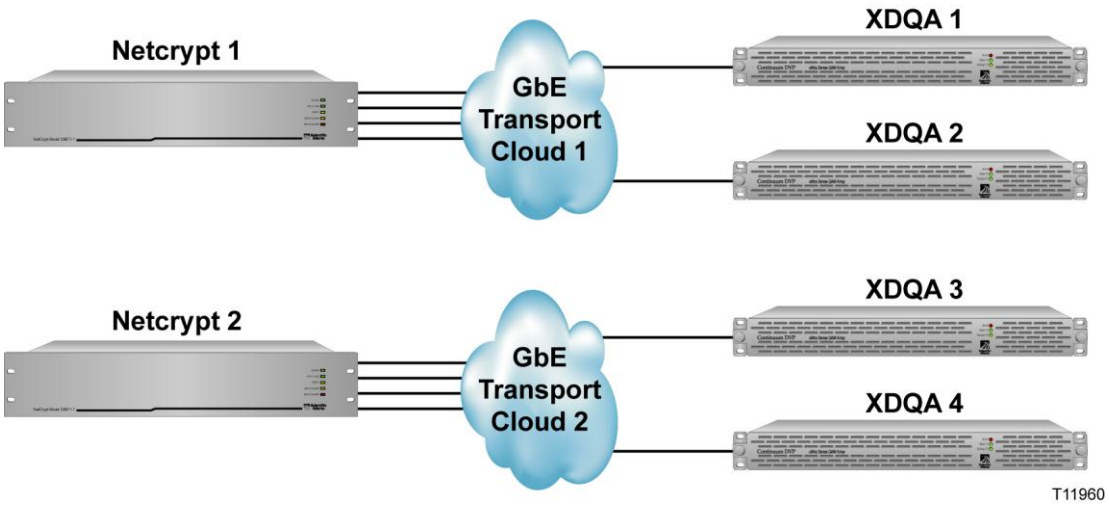
Each QAM (session-based or table-based) that is reachable from a GbE Transport cloud must also be connected to a port on one or more clouds.



Using GbE Transport Clouds to Control and Manage Network Connectivity

In a physical network implementation, any QAM may be reachable from a particular NOBE. Nevertheless, limiting a NOBE to a subset of QAMs through the use of GbE transport clouds may be useful for load-balancing, traceability, or other reasons. This is illustrated in the example below. Here, the DNCS will only use NOBE1 for streams bound for XDQA1 or XDQA2. Similarly, NOBE2 will only be used for streams bound for XDQA3 or XDQA4.

In this example, the NOBEs may be physically located either in the headend or at hubs along with their corresponding xDQAs. However, regardless of their physical location and connectivity, through the specification and use of DNCS GbE Transport Network Clouds, operators have a method for fine-grain control of NOBE bandwidth.



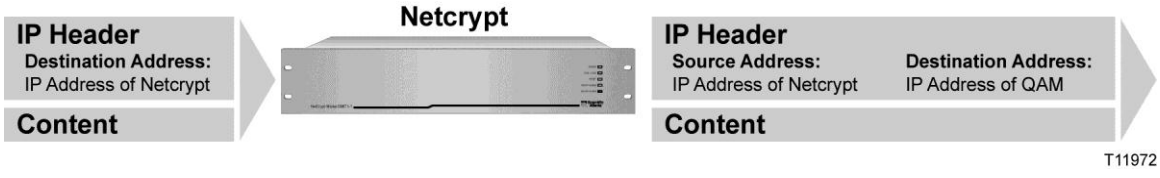
Host Network Behavior

The network behavior of the NOBE is that of a host, not a router. That is, unicast content that passes through the NOBE must be addressed to the NOBE, not to the ultimate destination, such as a set-top or other edge device.

Address fields of IP headers that send content through a NOBE illustrate the host behavior of the NOBE.

Unicast content that passes through a NOBE has the IP address of that NOBE in the destination IP address field of the IP header.

Unicast content output from a NOBE has the IP address of that NOBE in the source IP address field of the IP header, and the IP address of the QAM modulator in the destination IP address field of the IP header.



Layer 2/3 Networks and Address Resolution Protocol

The NOBE follows standard network rules and uses Address Resolution Protocol (ARP) to resolve required MAC addresses:

- In bi-directional Layer 2 networks, QAM modulators must respond to ARP requests.
- In Layer 3 networks, the assigned gateway must respond to ARP requests.

QAM modulators on the other side of one-way transport networks must be assigned IP addresses on different networks than the NOBE. Per network rules, this will cause the NOBE to issue an ARP request using its gateway IP address — not the IP address of a QAM modulator. In this case, the gateway, which may be the transport network, must support ARP.

It is recommended to connect the Netcrypt GbE ports to a Layer 3 router, as opposed to a Layer 2 switch. It is best to assign IP addresses out of separate subnets. The use of a /30 subnet mask minimizes wasted IP addresses. If the GbE interfaces are placed in the same Layer 3 VLAN, then the routing switch requires static MAC addresses

If Netcrypt GbE ports are connected to a Layer 2 switch, then static MAC addresses must be used in the switch due to the "one-way" nature of most MPEG traffic.

Unicast and Multicast Behavior

IP unicast and IP multicast addresses are supported at either or both of the NOBE input and output for sessions and Transport Stream Routes (TSRs). Streams may be received by the NOBE as unicast and output as multicast or vice versa. The NOBE can support a total of 17 TSRs.

The current release of the NOBE supports Internet Group Management Protocol version 2 and version 3 (IGMPv2 and IGMPv3).

NOBE Ports

As shown to the right, the NOBE has four active GbE ports. There is a MAC address assigned to each port. Operators must assign an IP address to any port they have provisioned on the DNCS Administrative Console. In a Layer 3 (routed) network, operators must provide a gateway IP address for any port they provision on the DNCS Administrative Console.

The first four ports of NOBE are active GbE ports. These ports behave independently. Content coming in on any one port is processed and leaves using the same port. Routing between ports is not supported.

Note: GbE ports 5 to 8 are not active.

GbE Headroom

In designing a content routing and transport network, operators should provide some amount of headroom at all GbE ports. Bursty traffic can cause the instantaneous Ethernet frame arrival rate to exceed 1 Gb/s, even when the average rate is well below this. When this occurs, the switch or router will buffer some of the frames up to the memory capacity of the dedicated or shared buffer on the switch/router. When this capacity is exceeded, the switch/router discards the frames. As a result, it is possible to experience video glitching and macroblocking even though the switch/router and NOBE all can handle the full GbE rate. The required amount of headroom can vary between 0 to 40 percent of the port capacity, or even more, depending on the burstiness of the source or VOD server.

MPEG Transport Layer Rules

The NOBE is intended as a network device. Although as a transport stream encryptor it is necessary to perform some operations at the MPEG transport layer, the intent is to minimally alter the transport streams. The following list describes some rules of MPEG transport layer operation to which the NOBE adheres:

- By default, the NOBE blocks all input streams and programs from appearing at the output. It passes only streams and programs for which there exists either a defined session (broadcast or VOD) and a Transport Stream Route (TSR). The TSR concept has been added to the DNCS and NOBE to enable an operator to instruct a NOBE to pass all programs within a single or multi-program transport stream from a specified set of input addresses (unicast or multicast) to a specified set of output addresses.
- If sessions are created for fewer than all of the programs in an MPTS, then only the programs for which sessions are created will have overlay sessions. The rest will be passed through with the TSR. PSI is altered to correctly reflect the programs that appear at the output.
- After a TSR is created, and subsequently a session is set up to encrypt a program within the same transport stream, then the output destination addresses must be the same. Otherwise the session setup will fail. The same applies to the reverse order of session setup and TSR creation.
- The NOBE performs insertion of Entitlement Control Messages (ECMs) into encrypted streams for which sessions have been set up. It performs the required modifications of the PSI to reflect this.
- The NOBE performs no remapping of MPEG PNs or PIDs.
- The NOBE performs no remapping of MPEG program numbers or PIDs.
- The entire TSR is dejittered.
- Overlay TSRs are limited to 17 and will be stuffed out to the QAM rate specified on the DNCS Administrative Console.
- Since no remapping of MPEG PIDs occurs in the NOBE, in order to prevent MPEG PID conflicts when ECMs are inserted, a range of PIDs must be reserved for ECM use in the NOBE. Sources must not be allowed to use PIDs in this range. The range is entered in the DNCS when operators add a Netcrypt element to the DNCS.
- The SEM should be configured for no dejitter delay (0 milliseconds) and no PID remapping.
- Rate shaping on the MPTS being fed into the NOBE must allow adequate bandwidth for the Overlay data. See ***Overlay Headroom Requirements*** (on page 13).

Overlay Headroom Requirements

In order to avoid a QAM over-provision condition, the data rate of each MPTS must be less than or equal to the QAM data rate. The NOBE, however, adds overlay data to each MPTS, and so each incoming MPTS rate must be reduced in order to allow for this additional overhead. This reduction, called overlay headroom, must be maintained. When the overlay headroom falls below this threshold, the encryption percentage is temporarily reduced in order to avoid dropping packets. This encryption percentage dialback will occur to the point where all packets are sent in the clear. It is therefore very important to provide adequate headroom for the overlay operation.

If, for example, an MPTS that is destined for a 256 QAM modulator contains 12 programs with one 3 Mbps video and one 200 kbps audio channel, the required headroom would be determined as follows:

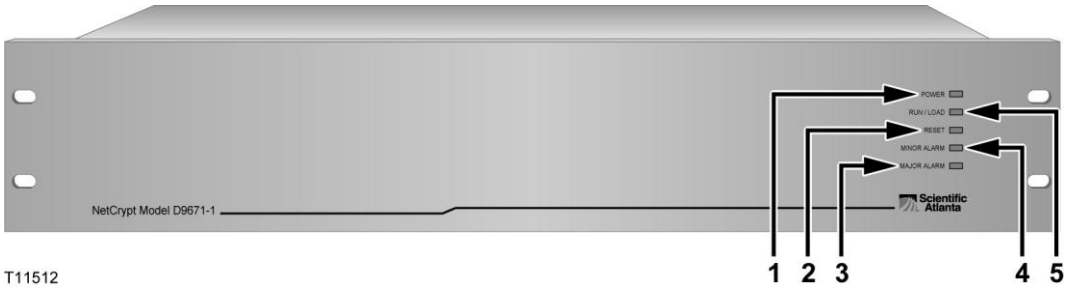
- The overlay data that is added to the MPTS must be estimated; this data includes **PowerKEY encrypted video** and **encrypted audio** packets as well as Cisco **ECM** and **PMT PIDs**.
- Since video is unviewable when 4 percent of data is encrypted, we can estimate the Overlay headroom needed for **PowerKEY encrypted video** as 0.12 Mbps (3.0 x 0.04 = 0.12 Mbps).
- When only the audio start packets are encrypted (with the remaining audio packets in the clear), the audio is unintelligible. These packets occur in the audio stream at a rate of 47 kbps, regardless of the audio data rate. Therefore, Overlay headroom required for each audio PID is 47 kbps, and we can estimate Overlay headroom for **encrypted audio** as 0.047.
- The **ECM** and **PMT PIDs** are minor and can be estimated to be 0.01 Mbps each.
- Using these figures, we can determine the amount of Overlay headroom as indicated here:
  - The MPTS Overlay Headroom = 12 programs (0.12 + 0.047 + 0.01 + 0.01) = 2.25 Mbps
  - Allow 38.8 Mbps for the full 256 QAM data rate
  - Therefore the MPTS feeding the NOBE would need to be groomed to 36.5 Mbps (38.8 – 2.25 = 36.5 Mbps).

Note: The audio encryption percentage on the overlay session setup screen should always be configured to 98%. This value signals the NOBE to only encrypt the start packets. Use of any other encryption percentage value could result in audio being intelligible.

Front Panel Overview

Front Panel Diagram

This illustration shows the front panel components of the NOBE. The following table describes the labeled components.



Front Panel Indicators

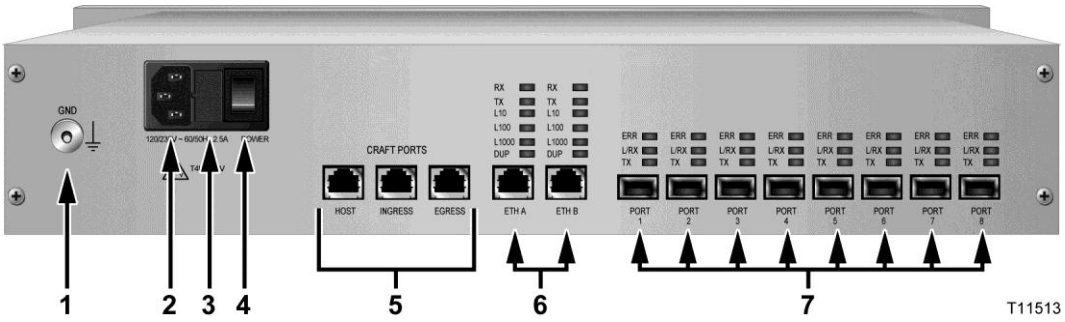
The following table provides front panel alarm and component descriptions that correspond to each number in the preceding labeled diagram of each type of NOBE.

Item	Indicator	Description
1	POWER (green)	Turns solid green when the unit is receiving power
2	RUN/LOAD (green)	■ Turns solid green during normal run mode. ■ Blinks green during code downloads.
3	RESET (yellow)	Turns yellow when the NOBE is reset from the DNCS or when it is reset from the back panel (by turning power off and on again).
4	MINOR ALARM (yellow)	Turns yellow for a minor alarm condition. Minor alarms indicate a less critical error condition. The NOBE may continue to operate with some loss of functionality. The LED turns off when all minor alarms have cleared.
5	MAJOR ALARM (red)	Turns red for a major alarm condition. Major alarms occur for hardware or software conditions that indicate a serious disruption of service or the malfunctioning or failure of important circuits. The LED turns off when all major alarms have cleared.

Back Panel Overview

Back Panel Components

This illustration shows the back panel components of the NOBE. The following table describes the labeled areas.



Back Panel Components

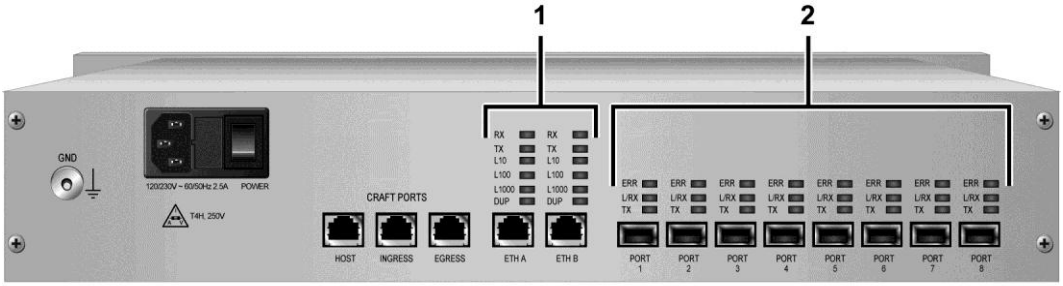
The following table describes the back panel components of the NOBE.

Item	Component	Description
1	GND	Ground screw or grounding the NOBE
2	AC Power Inlet	100–240 VAC 50/60 Hz 2.5 A
3	Fuse Holder	Two 4.0 A SLO BLO 250 V fuses (Cisco part number 188106)
4	Power Switch	On/off rocker-type power switch
5	CRAFT PORTs	■ **HOST:** RS-232 serial port using an RJ-45 jack ■ **INGRESS:** RS-232 serial port using an RJ-45 jack ■ **EGRESS:** RS-232 serial port using an RJ-45 jack
6	10/100/1000BASE-T port (2)	■ **ETHA:** Ethernet port shares data with DNCS Ethernet hub. ■ **ETHB:** Ethernet port is not used with the NOBE.

Item	Component	Description
7	Active GbE Transceiver Ports (4), Port 1 to Port 4	Each GbE transceiver port (CH0 to CH7) is capable of transmitting and receiving MPEG transport stream data in UDP/IP over the GbE interface. By inserting a Small Form-factor Pluggable (SFP) module into a GbE port, you can use duplex multimode or single-mode fiber optic cables or Category 5e or better copper cables. **Notes:** ■ A total of 8 SFP sockets are provided: Ports 1 to 4 are active today. Ports 5 to 8 are not used. ■ There are four SFP modules included with a NOBE unit. They are selected when ordering the NOBE and are shipped with the NOBE. Extra SFP modules may be ordered separately.

Back Panel Indicators

This illustration shows the back panel indicators for the NOBE.



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Back Panel Indicators

The following table describes the back panel indicators of the NOBE.

Item	Indicator	Description
1	DUP	Lights to indicate that the link is operating in full duplex mode.
	L1000	Lights to indicate a traffic speed of 1000 Mbps (GbE).
	L100	Lights to indicate a traffic speed of 100 Mbps (fast Ethernet).
	L10	Lights to indicate a traffic speed of 10 Mbps (Ethernet).
	TX	Lights when transmitting data.
	RX	Lights when receiving data.
2	TX	Blinks when transmitting data.
	L/RX	■ Lights when a valid Ethernet link connection exists. ■ Blinks when receiving data.
	ERR	Lights when an error is detected on the link.

2

Installing the NOBE

Introduction

This chapter describes how to install the NOBE into a rack and how to connect the unit to the other components within the DBDS.

Note: Refer to Appendix A for additional technical specifications and requirements to help you install and configure the NOBE in your system.

In This Chapter

NOBE Installation Overview

This section summarizes the tasks required to install a NOBE in a DBDS. The following sections in this chapter provide detailed instructions for completing the tasks summarized here.

Read this entire guide before installing the NOBE so that you are able to safely perform all installation tasks. When reading this guide, give particular attention to all safety statements.

Before You Begin

Before you begin, make certain that you have completed the following tasks:

- You have obtained a copy of your network map.
- You have access to the Digital Network Control System Online Help for System Release 2.8/3.8/4.3.
- You or your system administrator has installed NOBE software onto the DNCS.

Note: For assistance installing NOBE software on the DNCS, refer to *Netcrypt Overlay Bulk Encryptor Software Version 1.0 Release Notes* (part number 4012216)

Overview of Tasks Required to Install a NOBE in a DBDS

The following instructions summarize the tasks required to install a NOBE in a DBDS. This chapter provides detailed instructions for each task.

Important: When connecting cabling, allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.

1. Verify that your system meets the installation requirements.
2. Unpack and inspect the unit.
3. Record the Media Access Control (MAC) addresses from the label on the underside of each NOBE and provide this information to the person who will provision the unit on the DNCS. Typically, a system administrator or DNCS operator is responsible for provisioning hardware devices on the DNCS.
4. Install the NOBE into a rack.
5. Connect the NOBE to an earth ground and then the power cord.
6. Connect the bulk encryptor to the DNCS through the ETHA Ethernet port.
7. Connect the GbE ports according to your network wiring diagram.
8. Define the MPEG input sources, add service groups (if using VOD or xOD), and provision the NOBE using DNCS Element Provisioning according to your network wiring diagram.

9 Power on the NOBE.

Note: When power is applied to the unit for the first time, Netcrypt software is automatically downloaded from the DNCS to the unit.

10 Ensure that the NOBE boots correctly and check for alarms at the DNCS.

11 Use one of the following methods to verify the output of the NOBE:

- Use an Ethernet analyzer to verify the output of the NOBE.
- Use a local DHCT to verify the output of the QAM edge device that is connected to the NOBE.

Unpack and Inspect the NOBE

Carrier's Responsibility

We thoroughly inspect and carefully pack all products before shipment. The carrier is responsible for safe shipping and delivery.

Important: Retain all boxes for future equipment shipping needs. The boxes are designed for shipping the NOBE.

Unpacking and Inspecting Procedure

Follow these steps to unpack and inspect the NOBE.

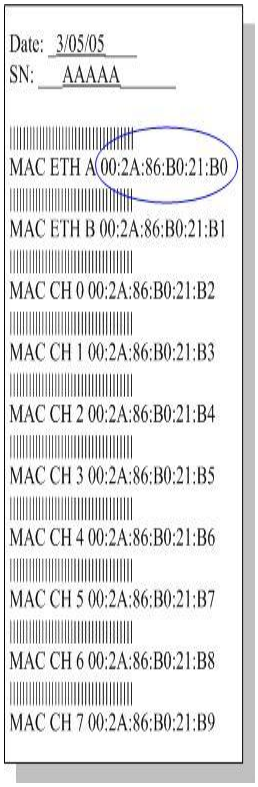
1. Review the Safety Precautions portion of this guide (page vi).
2. Inspect the shipping carton for visible damage.
3. Open the shipping carton.
4. Remove all packing material.
5. Inspect the product for visible damage.
6. Inspect for loose items that may indicate concealed damage.
7. Inspect for missing parts using the packing slip as a guide.
8. Now that you have finished unpacking and inspecting the NOBE, record the Media Access Control (MAC) GbE addresses so that you or your system administrator has easy access to this information. Go to ***Record the MAC Addresses*** (on page 23).

Record the MAC Addresses

This section contains instructions for recording the MAC and GbE addresses so that you or your system administrator has easy access to this information. These addresses are needed to provision (configure) the NOBE on the DNCS.

Locating the MAC Address

A label similar to the following example is on the underside of the NOBE and contains the MAC addresses. As this example shows, each MAC address contains 12 characters.



Recording the MAC Address

Follow these steps to record the MAC addresses so they are readily available to provision the NOBE on the DNCS.

1. If you have not already done so, unpack and inspect the NOBE. Refer to ***Unpack and Inspect the NOBE*** (on page 22).
2. Locate the label containing the MAC addresses on the underside of the NOBE chassis.

3 Record GbE MAC addresses here:

- GbE MAC Address 1 _____
- GbE MAC Address 2 _____
- GbE MAC Address 3 _____
- GbE MAC Address 4 _____
- GbE MAC Address 5 _____
- GbE MAC Address 6 _____
- GbE MAC Address 7 _____
- GbE MAC Address 8 _____

4 Record the DNCS Control (ETHA) MAC address here:

_____

Note: You do not need to record the SCS Interface (ETHB) MAC address because the NOBE does not use the SCS interface.

5 Now that you have recorded the MAC addresses, you are ready to install the NOBE into a rack. Go to ***Install the NOBE Into a Rack*** (on page 25).

Install the NOBE Into a Rack

The front bezel of the NOBE mounts to the front of the equipment rack. The NOBE fits into an Electronic Industries Alliance (EIA) RS-310 rack mount.

Installation Requirements

This section lists the power, rack, and environmental conditions necessary for installing and operating the NOBE.

Power Requirements Table

The following table describes the power specifications for the NOBE.

Item	Specification
Supply Voltage	100–240 VAC 50/60Hz 2.5 A
Fuses, two	4.0 A SLO BLO 250 V AC
Line Frequency	47 to 63 Hz
Power Required	300 VA (maximum)
Power Dissipated	275 Watts (maximum)
In Current	■ 35 amps maximum, Vin = 100 VAC ■ 75 amps maximum, Vin = 240 VAC

Rack Requirements Table

The following table lists the rack requirements for the NOBE.

Item	Specification
Rack Mount Type	EIA RS-310
Height	3.5 in./88.9 mm
Width	19 in./482.6 mm
Depth	22.5 in./571.5 mm
Weight	24.5 lb/11.10 kg

Environmental Requirements Table

The following table lists the environmental for the NOBE.

Item	Specification
Operating Temperature	0°C (32°F) to 50°C (122°F) **CAUTION:** **Avoid damage to this product! Your warranty is void if you operate this product above the maximum specified operating temperature.** **Do not obstruct air vents or fan vents on the sides of the unit. Otherwise damage can occur to the unit.** **Important:** You must use the supplied notched rack mounts (Cisco part numbers 734845 and 734846) to mount the NOBE in the rack. These rack mounts allow correct air circulation through the unit.
Storage Temperature Range	-10°C (14°F) to 70°C (158°F)
Operating Humidity	5% to 95%, non-condensing
Vibration Susceptibility	No data errors with a chassis vibration of 0.5 Gs. No data errors with a vibration frequency of 10 Hz to 400 Hz
Electrostatic Shock Susceptibility	No damage sustained from five discharges of 15 KV IEC electrostatic discharge model (150pF + 150 W) to all exposed connections

Installing the NOBE into a Rack

Follow these steps to install a NOBE into a rack.

CAUTION:

- **Do not tangle or strain interconnecting cables.**
- **Use the notched rack mounts that are supplied to provide additional support and to allow correct air circulation through the unit. Do not obstruct the air vents or fan vents on the sides of the unit. Otherwise, damage can occur to the unit.**

1 Install the rack mounts.

Important: You must use the supplied rack mounts (Cisco part numbers 734845 and 734846). We recommend that you use four mounting screws per rack unit so that a total of eight screws secure each set of rack mounts for the NOBE. These rack mounts provide additional support along with the following:

- A stationary assembly that attaches to the rack, but not to the NOBE, and supports the unit when it is inside the rack
- Correct air circulation through the unit

  Note: Using the supplied rack mounts as described above allows you to stack NOBEs without requiring ventilation space between them.

2 Place the NOBE in the rack on the rack mounts.

3 Insert a mounting screw through each of the four-bezel mounting holes on the front panel of the NOBE and then into the rack.

4 Firmly tighten each mounting screw.

5 Now that you have mounted the bulk encryptor into a rack, you are ready to connect a power source to the NOBE. Go to ***Connect an AC Power Source*** (on page 28).

Connect an AC Power Source

This section contains instructions for connecting an earth ground and an AC power source to the NOBE.

WARNING:

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into the laser beam or view the beam directly with optical instruments. Doing so may pose an eye hazard.

Connecting an Earth Ground

Important: Make certain to allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.

Follow these steps to connect an earth ground to the NOBE.

1. Place a ground wire onto the ground lug (marked **GND**) on back of the NOBE; then, use your fingers to tighten the ground lug to secure the ground wire.
2. Connect the other end of the ground wire to the rack or earth ground.

Connecting an AC Power Source

Important: Make certain to allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.

Perform the following steps to connect a power source to the NOBE.

1. Verify that the power switch on the back of the unit is placed in the **Off** position.
2. Connect the power cord to the power inlet on the back of the unit.
3. Connect the other end of the power cord to an AC electrical outlet.
4. Keep the power switch in the **Off** position until you are ready to power on the unit.
5. Now that you have connected the power source to the unit, you are ready to begin connecting the ETHA Ethernet port. Go to ***Connect the ETHA Ethernet Port for DNCS Control*** (on page 29), next in this chapter.

Connect the ETHA Ethernet Port for DNCS Control

Description

In order to operate properly, the NOBE must be connected to the DNCS control network. This connection allows operators and system administrators to use the DNCS to perform software downloads, provision the NOBE, set up sessions, monitor alarms, and check system performance. The unit cannot operate autonomously without this connection.

Connecting the ETHA Ethernet Port for DNCS Control

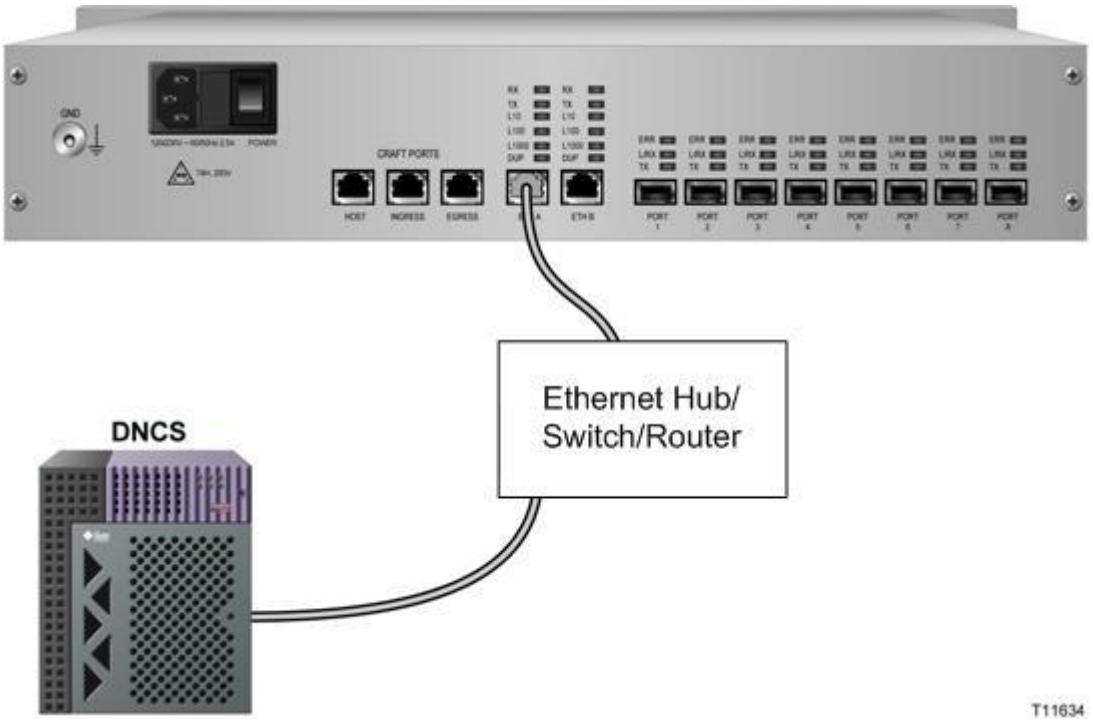
Important: Make certain to allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.

Follow these steps to connect the NOBE to the Ethernet network.

1. Connect the ETHA port on DNCS directly to the control network hub, switch, or router.
2. Connect the 10/100BASE-T port on the NOBE to the Ethernet hub, switch, or router, using Ethernet 10/100BASE-T wiring with RJ-45 connectors.

   Note: Use a screened or shielded cable, CAT-5 or better.
3. Go to ***Connect the GbE Ports*** (on page 31).

The following illustration shows an example of a 10/100BASE-T Ethernet connection to the DNCS. With this connection, you can establish communication between the DNCS and a NOBE that has been provisioned on the DNCS.



Connect the GbE Ports

Description

The NOBE uses four GbE bi-directional ports to transmit and receive MPEG-2 transport streams encapsulated in User Datagram Protocol/Internet Protocol (UDP/IP) over Ethernet. These ports are labeled Port 1 to Port 4 on the back of the NOBE. Ports 5 to 8 are not used.

The NOBE is intended for network-attached operation as described in Chapter 1. Bidirectional ports allow input and output streams to share the same ports between the NOBE and a network element, such as a switch or router. This section lists typical input source and output devices.

Important: The NOBE must be connected to an input source or output device through a switch or router. The NOBE is not intended for direct connection to a content source, such as a VOD server, or to an output device.

Input Devices (Sources)

The NOBE is compatible with MPEG-2 data in UDP/IP over GbE, such as from the following types of GbE-compliant transmitting devices:

- Satellite receivers
- Ad insertion equipment
- Statistical multiplexers and other MPEG stream groomers with GbE outputs

Output Devices

After receiving and encrypting (if necessary) MPEG-2 programs, the NOBE unicasts or multicasts MPEG-2 data to the following types of GbE-compliant receiving devices:

- TB-QAM modulators that are GbE-compliant, such as Cisco's eXtra Dense QAM Array (xDQA)
- Other edge devices supporting MPEG-2 transport streams encapsulated in UDP/IP/Ethernet

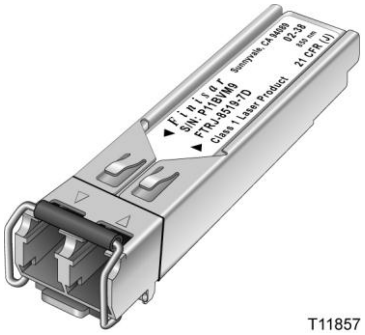
SFP Module Provides Flexibility for Cable Connections

By inserting an SFP module into a GbE port, you can use either of the following types of fiber optic or copper cables:

- **Fiber optic cables:** 850 nm or 1350 nm fiber optic cables
- **Copper cables:** Category 5e (CAT5e) or better cables

Note: SFP modules are hot-insertable and hot-removable. Removing an SFP module does not interrupt the operation of streams carried on other modules.

SFP Fiber Optic Module



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SFP Copper Module

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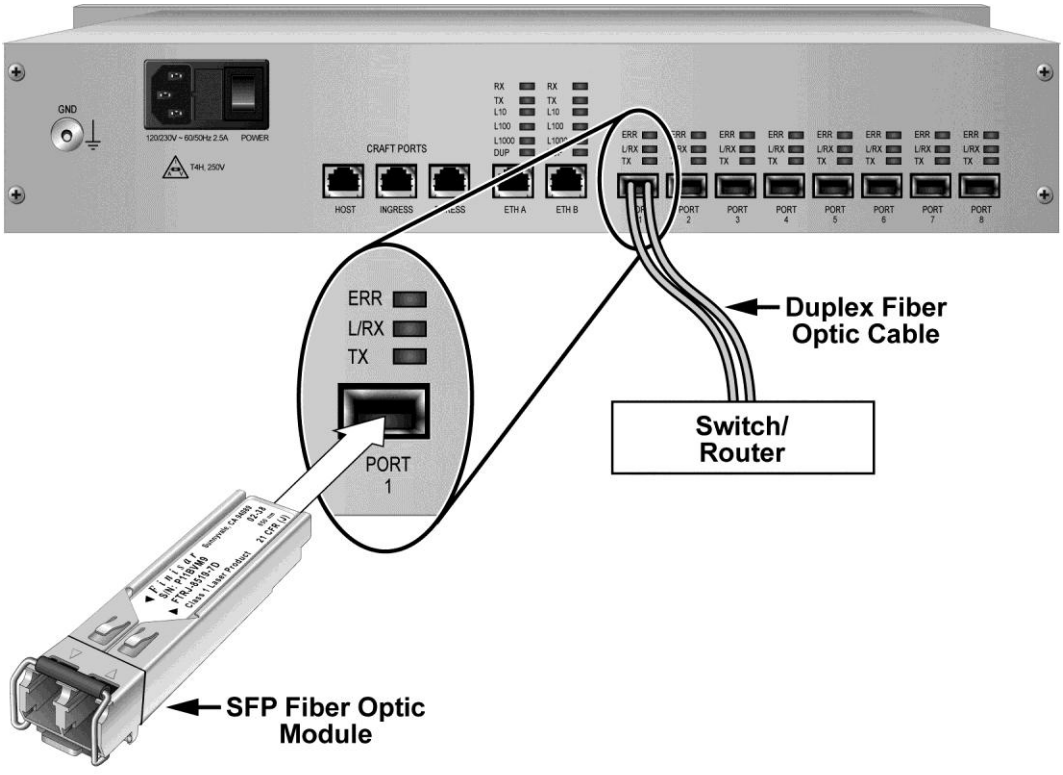
Connecting the GbE Ports

This section describes how to connect both input and output devices to GbE bi-directional ports using duplex fiber optic or copper cables.

Duplex Fiber Optic Connections

The following illustration shows an example of a GbE connection for the NOBE using duplex fiber optic cables. As the illustration shows, the NOBE must be connected to an input source or output device through a switch or router. Do not directly connect the NOBE to a content source or to an output device.

Important: Make certain to allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.



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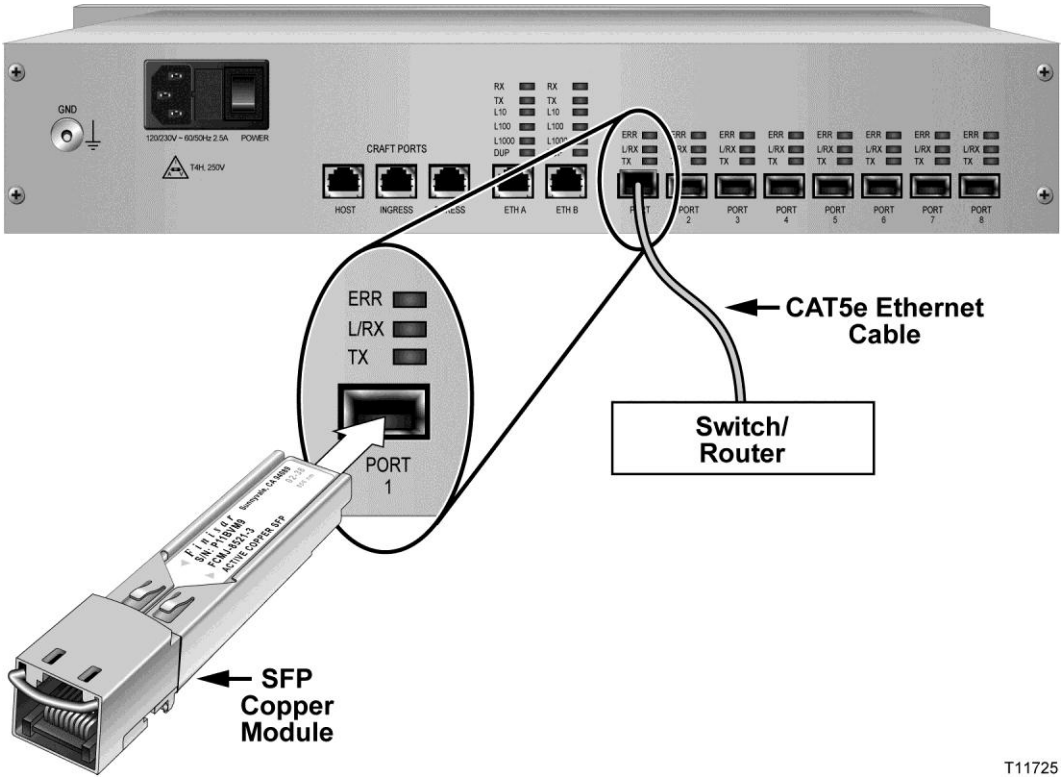
Category-5e Copper Connections

The following illustration shows an example of a GbE connection for the NOBE using CAT5e copper cables. As the illustration shows, the NOBE must be connected to an input source or output device through a switch or router. Do not directly connect the NOBE to a content source or to an output device.

Important: Make certain to allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.



To Connect Input and Output Devices to GbE Ports

Follow these instructions to connect input and output devices to GbE ports using fiber optic or copper cables.

Important: Make certain to allow enough cable length to be able to slide the NOBE out of the rack for repairs. Sufficient cable length allows you to make some repairs without powering off the unit and disrupting services to customers.

WARNING:

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into the laser beam or view the beam directly with optical instruments. Doing so may pose an eye hazard.

Note: SFP modules are hot-insertable and hot-removable, which means you can remove and replace an SFP module without powering down the bulk encryptor or interrupting encryption functions. In addition, removing an SFP module does not interrupt the operation of streams carried on other modules.

1. Remove the SFP module from its protective packaging.
2. Insert the SFP module into one of the four active GbE ports until the module clicks firmly in place.

The first four ports of NOBE are active GbE ports. GbE ports 5 to 8 are not used.

3. If necessary, remove the rubber dust plug from the SFP module port, and store it for later use.
4. Follow these instructions to connect the NOBE to the switch or router:
   - **Fiber-optic SFP modules.** Insert the fiber-optic duplex connector into the SFP module. Then insert the other end of the fiber-optic cable into a fiber-optic receptacle on the switch or router.
   - **Copper SFP modules.** Insert the RJ-45 cable connector into the SFP module. Then insert the other end of the cable into an RJ-45 receptacle on the switch or router.
5. To connect another SFP module to another GbE port, repeat steps 1 to 4.

6 Has the NOBE been provisioned in the DNCS?

- If **yes**, go to step 7.
- If **no**, contact your system administrator or DNCS operator and request that the NOBE be provisioned in the DNCS.

Notes:

- System administrators or DNCS operators typically provision a NOBE in the DNCS at the same time that they load Netcrypt software onto the DNCS.
- Refer to Chapter 3 for assistance provisioning the NOBE on the DNCS.

7 Has Netcrypt software been loaded onto the DNCS?

- If **yes**, go to step 8.
- If **no**, contact your system administrator or DNCS operator and request that NOBE software be loaded onto the DNCS.

Note: Refer to *Netcrypt Overlay Bulk Encryptor Software Version 1.0 Release Notes* (part number 4012216) for instructions on installing Netcrypt software on the DNCS.

8 Turn power on to the NOBE by moving the **Power** switch on the back of the unit to the **On** position. The NOBE automatically downloads the Netcrypt software from the DNCS to the bulk encryptor.

9 Verify the output of the NOBE by using one of the following methods:

- Use an Ethernet analyzer (sometimes referred to as an Ethernet sniffer) to verify the output of the NOBE. For assistance, refer to the documentation provided by the vendor of the Ethernet analyzer.
- Use a local DHCT to verify the output of the QAM edge device that is connected to the NOBE.

3

Provisioning the NOBE and Associated Devices

This chapter provides instructions for using new windows, buttons, and other tools on the DNCS Administrative Console to provision (configure) a NOBE as a DBDS network element. This chapter also provides instructions for provisioning devices that provide data to a NOBE as well as devices that receive data from a NOBE.

Notes:

- See Appendix A for the technical specifications of the NOBE and consult your network wiring diagram when you provision the bulk encryptor to ensure a proper allocation of bandwidth.
- For more information about the DNCS and operating the DNCS software, refer to *Netcrypt Overlay Bulk Encryptor Software Version 1.0 Release Notes* (part number 4012216).

In This Chapter

Become Familiar With DNCS Tools

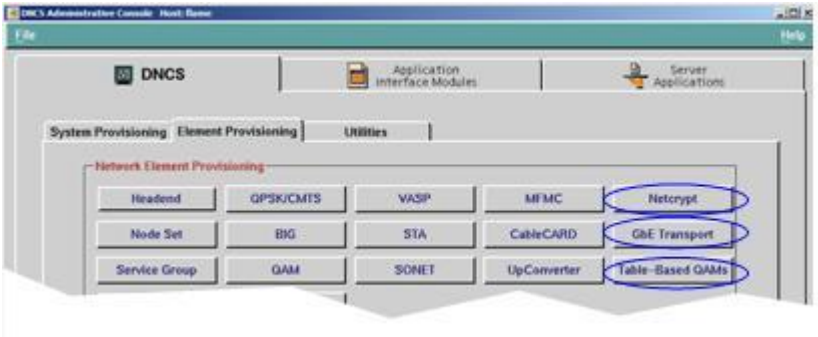
When the **DBDS Network Overlay** and **Overlay Netcrypt Bulk Encryptor** optional features are enabled on the DNCS, new buttons, windows, and fields are added to the DNCS Administrative Console to help you manage NOBEs and related devices. This section describes the windows, buttons, and other tools that you will use to manage NOBEs and related devices.

Note: Optional support for NOBEs is available to systems operating with SR 4.3 or a later system release.

Buttons used to Provision NOBEs and Related Elements

You will use the following buttons to provision NOBE and related devices:

- Clicking **Netcrypt** displays the Netcrypt List window, which lists all the NOBEs provisioned on the DNCS.
- Clicking **GbE Transport** displays the GbE Transport List window, which lists all the GbE transport network clouds provisioned on the DNCS. GbE transport network clouds allow operators to specify or limit the connectivity between NOBEs and QAM modulators in the system. See ***Network Considerations*** (on page 7) for information.
- Clicking **Table-Based QAMs** displays the Table-Based QAMs List window, which lists all the Table-Based QAM (TB-QAM) elements that have been added to the DNCS. Unlike most other DNCS elements, the DNCS does not actually provision, control, or communicate with TB-QAM elements. Instead, the DNCS uses information about a TB-QAM element to direct program streams to the TB-QAM element when required.



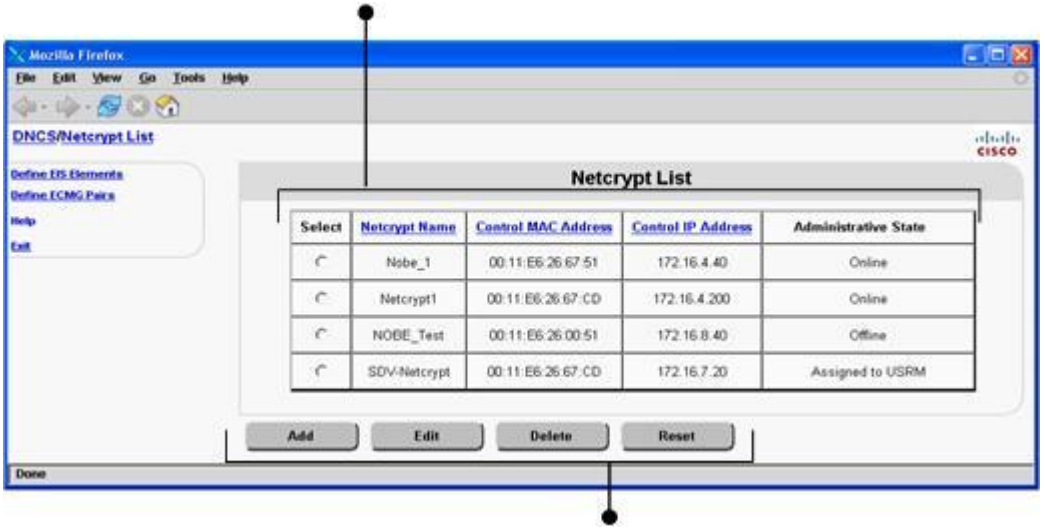
Windows Used to Provision NOBEs and Related Elements

If the **DBDS Network Overlay** and **Overlay Netcrypt Bulk Encryptor** optional features are enabled on the DNCS, new windows are accessible from the DNCS Administrative Console. This section describes the new windows that are available.

Netcrypt List Window

From the Netcrypt List window, you can provision new Netcrypt elements, such as NOBEs, and change or delete existing ones.

The fields in the Netcrypt List window display information about each NOBE provisioned on the DNCS.



Click a button at the bottom of the window provision a new NOBE element and to change, delete, or reset existing NOBE elements.

Fields on the Netcrypt List Window

The fields on the Netcrypt List window display the following information about each NOBE that has been provisioned on the DNCS.

Netcrypt Name — The name assigned to this NOBE. We recommend that you establish a naming scheme that allows you to easily identify this NOBE and where it resides. For example, a name of **NOBE43hub1** could represent a NOBE whose IP address ends in 43 and resides in Hub 1.

Note: You can use up to 20 alphanumeric characters in this field.

Control MAC Address	The MAC address of the control port (ETHA) for this NOBE **Note:** This address was recorded in Chapter 2 by the person who installed the NOBE in the headend or hub.
Control IP Address	The IP address of this NOBE (assigned to port ETHA) **Note:** You can obtain this address from your network map or from your system administrator.
Administrative State	Indicates whether this NOBE is online (active) or offline (inactive).

Selections on the Netcrypt List Window

Most of the selections in the left pane of the Netcrypt List are not used with the NOBE.

Define EIS elements (used only for optional SimulCrypt support)	You do not need to provision an EIS connection because the NOBE does not use this option.
Define ECMG pairs (used only for optional SimulCrypt support)	You do not need to provision an ECMG pair because the NOBE does not use this option.
Help	Displays the DNCS Online Help
Exit	Closes the Netcrypt List window.

Buttons on the Netcrypt List Window

The buttons at the bottom of the Netcrypt List window allow you to perform the following tasks.

Add	Provision a new NOBE on the DNCS
Edit	Display additional information about the NOBE you selected and change (edit) some of the information.
Delete	Delete an existing NOBE element from the DNCS
Reset	Reset (reboot) a NOBE. When a unit that is properly provisioned reboots or powers up for the first time, it automatically downloads software that has been assigned to it

GbE Transport List Window

From the GbE Transport List window, you can provision a new GbE transport network cloud and change or delete existing GbE transport network clouds. GbE transport network clouds carry sessions from the NOBEs in your system to hubs. See ***Network Considerations*** (on page 7) for more information.

Use the File menu to provision a new GbE transport network cloud and to change or delete existing GbE transport network clouds.

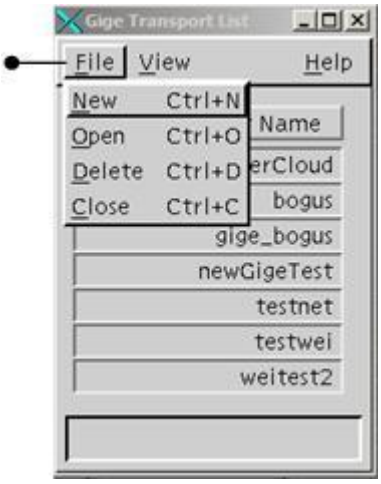
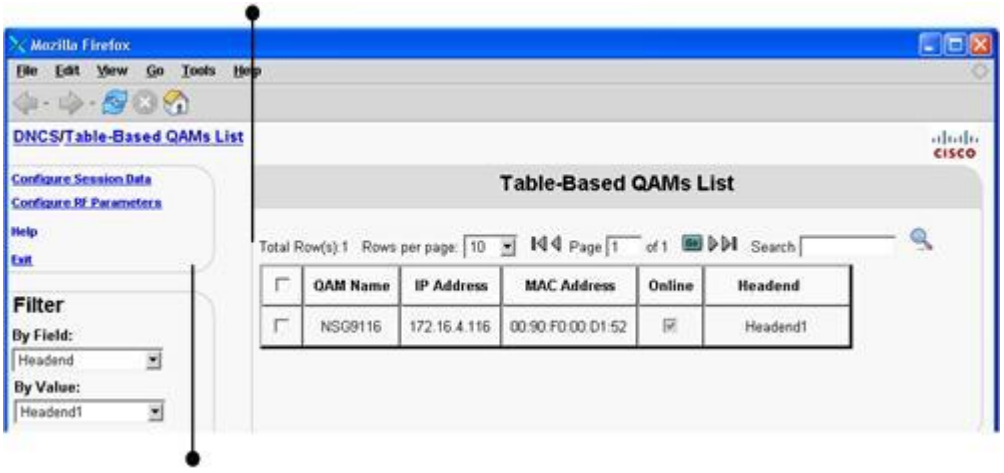


Table-Based QAMs List Window

From the Table-Based QAMs List window, you can enter information about new TB-QAMs, and change or delete information about existing TB-QAMs.

The fields in the Table-Based QAMs List window display information about each TB QAM element that has been added to the DNCS.

Note: When entering data in this window, keep in mind that the DNCS does not actually provision or communicate with the TB QAMs listed in this window. Instead, the DNCS uses the information you enter here to direct program streams to TB QAMs when required. TB QAMs are provisioned independently from the DNCS.



Select a device in the list and then click an option from the left pane to define the session data or RF parameters for an existing TB-QAM.

Fields on the Table-Based QAMs List Window

The fields on the Table-Based QAMs List window display the following information about each TB-QAM element that has been added to the DNCS.

QAM Name The name you want to assign to this TB-QAM. We recommend that you establish a naming scheme that allows you to easily identify this TB-QAM and where it resides. For example, a name of **XDQA43hub1** could represent a TB-QAM whose IP address ends in 43 and resides in Hub 1

Note: You can use up to 20 alphanumeric characters in this field.

IP Address The IP address of the GbE interface for this TB-QAM modulator

Note: You can obtain this address from your network map or from your system administrator.

MAC Address The MAC address of the GbE interface for this TB-QAM. Make certain to separate each pair of characters in the 12-character address with a colon, for example 00:00:00:00:00:00

Online Indicates whether this TB-QAM is online. If so, a checkmark appears in the Online box. If this TB-QAM is offline, the box is empty

Headend The headend where the TB-QAM resides

Selections on the Table-Based QAMs List Window

The selections in the left pane of the Table-Based QAMs List window allow you to perform the following tasks for any QAM you have selected.

Configure Session Data Enter mapping tables for a TB QAM modulator. The DNCS uses mapping table data to direct program streams to TB QAM modulators

Note: Mapping table data is provided by the manufacturer of the TB QAM and is used to define static "session pipes" through a TB QAM.

Configure RF Parameters Enter RF output configuration information for a TB QAM modulator into the DNCS. The DNCS uses this information to direct program streams to TB-QAMs when required. The DNCS uses these parameters to provide "tuning" information to allow DHCTs to tune and receive content from TB-QAMs

Help Display *DNCS Online Help* for your particular system release

Exit Close the Table-Based QAMs List window.

Filter Selections on the Table-Based QAMs List Window

The Filter selections in the left pane of the Table-Based QAMs List window allow you to display Table-Based QAMs based on your filter criteria.

By Field	By Value	Examples
QAM Name	Enter any part of a QAM name in the By Value field to have the filter display QAMs whose names match any portion of the text entered in this field. **Important:** This field is case-sensitive and accepts letters and numbers.	If you enter **te** in the By Value field, the Filter finds and displays QAMs with any of the following names: ■ **te**n ■ **te**stqam However, a QAM named **Testqam** would not be shown, since the search is case-sensitive.
Headend	Select any of the headends shown in the list.	The Filter finds all the table-based QAMs assigned to the selected headend.
IP	Enter any part of an IP address in the By Value field to have the filter display QAMs with IP addresses that match any portion of the text entered in this field. **Note:** This field accepts only numbers.	If you enter **4** in the By Value field, the Filter finds and displays QAMs that have any of the following IP addresses: 172.17.**4**.125 172.1**4**.5.32 172.17.5.5**4**

Buttons on the Table-Based QAMs List Window

The buttons on the bottom of the Table-Based QAMs List window allow you to perform the following tasks.

Add	Add a new TB-QAM element to the DNCS **Note:** When entering data in this window, keep in mind that the DNCS does not actually provision or communicate with the TB-QAMs listed in this window. Instead, the DNCS uses the information you enter to direct program streams to TB-QAMs when required.
Edit	Display additional information about the TB QAM you selected and change (edit) some of the information.
Delete	Delete an existing TB QAM element from the DNCS

Changes to the DNCS Control Window

When the optional Netcrypt package is installed on your DNCS, the pkeManager (PowerKEY Element Manager) process appears in the DNCS Control window. The pkeManager process manages and maintains requests/reservations for stream/session encryption on our Netcrypt and PCG devices.

Just like other processes on the DNCS Control window, the Status button for the pkeManager process is green when this process is running, yellow when it is shutting down or starting up, and red when it is stopped.

You can stop or restart the pkeManager process just as you can other processes on the DNCS Control window.

Note: For assistance stopping and restarting a process, refer to *Digital Network Control System Online Help for System Release 2.8/3.8/4.3*.

Provisioning Overview

This section provides an overview of how to provision a NOBE on the DNCS. It also describes how to provision devices that provide data to a NOBE and the devices that receive data from a NOBE.

Why Provision a NOBE?

Provisioning a NOBE establishes communication between the DNCS and the bulk encryptor and allows the bulk encryptor to automatically download software from the DNCS. Without DNCS control, the NOBE is inoperable.

Before You Begin

Before you begin provisioning a NOBE and its associated devices, first make certain that you have completed the following tasks:

- You have verified that the NOBE is installed and is powered down.
- You have obtained a copy of your network map.

Note: If you cannot locate your network map, contact Cisco Services for assistance.

Overview of Provisioning a NOBE and Associated Devices

Follow these steps to provision a NOBE and its associated devices.

1. Make certain that all the devices you will provision have been installed in your headend or hub. If necessary, refer to the vendor's document for assistance in installing these devices.
2. Provision one MPEG Source element for each device that provides the NOBE with data. The DNCS uses the generic term MPEG Source to represent any device that generates MPEG output, such as a broadcast multiplexer.

   Note: For assistance provisioning an MPEG Source element, refer to *Digital Network Control System Online Help for System Release 2.8/3.8/4.3* or a later version.
3. Provision a Netcrypt element by completing the following tasks.

   Note: These tasks are described in detail in Provision a Netcrypt Element on the DNCS.

   a. Add a Netcrypt element to the DNCS, but do not place the element online.

   b. Provision the Ethernet ports on the Netcrypt element.

   c. Verify that the NOBE has successfully booted, and place the Netcrypt element online.

4 Enter information about the TB-QAMs that receive NOBE data into the DNCS. For assistance, see ***Add Table-Based QAM Information to the DNCS*** (on page 51).

5 Provision GbE transport network elements to specify the connectivity between a NOBE and other devices, such as TB-QAMs. For assistance, see ***Create GbE Transport Network Elements*** (on page 57).

6 After provisioning a NOBE and its associated devices, set up CF sessions and TSRs on the NOBE. For assistance, see ***Setting Up CF Sessions and Transport Stream Routes on a NOBE*** (on page 61).

Provision a Netcrypt Element on the DNCS

This section provides instructions for completing each of the following tasks that are required to provision a Netcrypt element on the DNCS. Provisioning a Netcrypt element on the DNCS establishes communication between the DNCS and the NOBE. Without DNCS control, the NOBE is inoperable.

1. Add a Netcrypt element to the DNCS, but do not place the element online.
2. Provision the Ethernet ports on the Netcrypt element.
3. Verify that the NOBE has successfully booted, and place the Netcrypt element online.

Adding a Netcrypt Element to the DNCS

Follow these instructions to add a Netcrypt element to the DNCS.

1. From the Element Provisioning tab on the DNCS Administrative Console, click **Netcrypt**. The Netcrypt List window opens and shows any Netcrypt elements that have been provisioned on the DNCS.
2. Click **Add**. The New Netcrypt window opens.
3. Follow these instructions to enter data in the fields of the Netcrypt Provisioning area on the New Netcrypt window:
   - **Netcrypt Name –** Enter a name for the unit that is consistent with the naming scheme used on your network map. We recommend that you establish a naming scheme that allows you to easily identify the unit and where it resides. For example, a name of **NOBE43hub1** could represent a NOBE whose IP address ends in 43 and processes data for Hub 1.

     Note: You can use up to 20 alphanumeric characters in this field.
   - **Administrative State –** Leave the default setting (Offline) as it is currently set. Later, when the NOBE is completely provisioned and successfully booted, you will change this setting to Online.
   - **Netcrypt MAC Address –** Enter the MAC Address of the control port (ETHA) for this NOBE. Make certain to separate each pair of characters in the 12-character address with a colon, for example 00:00:00:00:00:00.

     Note: This address was recorded in Chapter 2 by the person who installed the NOBE in the headend or hub.
   - **Netcrypt IP Address –** Enter the IP address of the control port (ETHA) for this NOBE. (You can obtain this address from your network map or from your system administrator.)
   - **Subnet Mask –** Enter the subnet mask for this subnet.
   - **Model Type** - Select **Overlay Netcrypt**.

- **Default Gateway –** If your system uses a default gateway, enter the IP address of your default gateway. This is required for a network using routers (layer 3).
- **Headend –** Select the headend where this NOBE resides.
- **Configuration File –** If any other value other than nobe.config is shown in this field, delete it and enter **nobe.config**.

  Note: When power is applied to the NOBE for the first time, or when the unit is rebooted, it uses the nobe.config file to determine if the correct version of code has been installed on the unit. If the NOBE determines that an incorrect version of code has been installed, it requests that the correct code be downloaded.
- **Simulcrypt Enabled** - Verify that this option is not selected (disabled). This option should never be selected when provisioning a NOBE.

4 Follow these instructions to enter data in the fields of the Reserved ECM PID Range area on the New Netcrypt window:

- **Start of Reserved PIDs –** Enter the first PID that you want to reserve. For example, if you want to reserve PIDs 99 to 103, type 99 in this field.
- **Number of Reserved PIDs –** Enter the number of PIDs that you want to reserve. For example, if you want to reserve PIDs 99 to 103, enter 5 in this field.

Note: Reserving PIDs prevents a PID conflict by instructing the bulk encryptor to use reserved PIDs for ECM insertion. If a PID from the reserved range is used in existing streams, a PID conflict may occur. For more information, see ***MPEG Transport Layer Rules*** (on page 12).

5 Leave the fields in the Constraints area of the New Netcrypt window with their default settings.

Note: The settings in the Constraints area are required only for devices that use the SimulCrypt Support option. NOBEs do not use the SimulCrypt Support option.

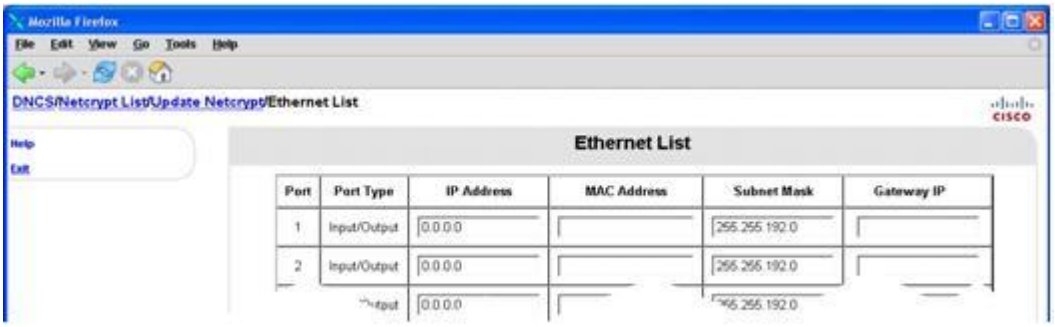
6 Click **Save**. The New Netcrypt Element window closes and the Netcrypt element you saved appears in the list.

7 Continue provisioning this Netcrypt element by configuring the Ethernet ports for this bulk encryptor. Go to ***Provisioning Gigabit Ethernet Ports for a Netcrypt Element*** (on page 49).

Provisioning Gigabit Ethernet Ports for a Netcrypt Element

After the Netcrypt element is listed in the Netcrypt List window, follow these instructions to provision the Gigabit Ethernet ports for the Netcrypt element you added to the New Netcrypt Element window.

1 From the Netcrypt List window, click the **Select** button next to the NOBE whose ports you want to configure, and click **Edit**. The Update Netcrypt window, similar to the following example, opens for this Netcrypt element.



2 Click **Ethernet Ports**. The Ethernet ports window opens for this Netcrypt element.

3 Follow these instructions to configure the Ethernet ports by entering data in the fields that do not already contain data:

- **IP Address –** Enter the IP address assigned to each GbE port that this NOBE uses.
- **MAC Address –** Enter the MAC address of each GbE port that this NOBE uses. Make certain to separate each pair of characters in the 12-character address with a colon, for example 00:00:00:00:00:00.
- **Subnet Mask –** If your system uses a subnet mask and it does not appear in this field, enter the subnet mask that this port uses.
- **Gateway IP –** If your system uses routers, enter the gateway IP address for each GbE port.

4 Click **Save**. The DNCS saves the information you entered and updates the window to display the ports you defined.

5 Go to *Placing a NOBE Online* (on page 50).

Placing a NOBE Online

After you have configured the GbE ports that the NOBE uses, place the Netcrypt element online in the DNCS. The process applies to a NOBE that has successfully booted and is capable of communicating with the DNCS, that is, the bulk encryptor can be reached by sending a ping.

Important: If this NOBE was just installed in your headend or hub and you are placing it online for the first time, make certain that the unit has completed its boot process and downloaded the Netcrypt software before placing the NOBE online. (The NOBE automatically downloads Netcrypt software when power is applied to the unit.)

Follow these instructions to place a NOBE that has successfully booted online in the DNCS.

1 Did you confirm that this NOBE has successfully booted?

- If **yes**, go to the next step in this procedure.
- If **no**, verify that the NOBE has successfully booted.

2 In the path at the top of the window, click **Update Netcrypt**. The Update Netcrypt window opens for this NOBE.

3 In the Netcrypt Provisioning area, find the Administrative State option and select **Online** and then click **Save**. The system saves this change, places the unit online, and opens the Netcrypt List window.

4 Do you need to provision another Netcrypt element?

- If **yes**, click **Add** and begin provisioning another Netcrypt element. For assistance, go to ***Provision a Netcrypt Element on the DNCS*** (on page 47).
- If **no**, you have provisioned elements for all the NOBE in your system. Click **Exit** to close the Netcrypt List window.

5 Now that you have provisioned this NOBE, add information about the xDQA to the DNCS. Go to ***Add Table-Based QAM Information to the DNCS*** (on page 51).

Add Table-Based QAM Information to the DNCS

This section provides instructions for completing the following tasks that are required in order to add TB-QAM modulator information to the DNCS. The DNCS uses this information to direct program streams to a TB-QAM that a NOBE feeds.

1 Add a TB-QAM modulator element to the DNCS.

2 Enter the RF parameters for a TB-QAM modulator.

3 Enter the mapping table for a TB-QAM modulator.

Although adding TB-QAM information to the DNCS is very similar to provisioning elements on the DNCS, the results are different: Unlike most DNCS elements, the DNCS does not control TB-QAMs. Instead, the DNCS uses the information you have entered about TB-QAMs to direct program streams to TB-QAMs when required.

Adding a TB-QAM Modulator Element to the DNCS

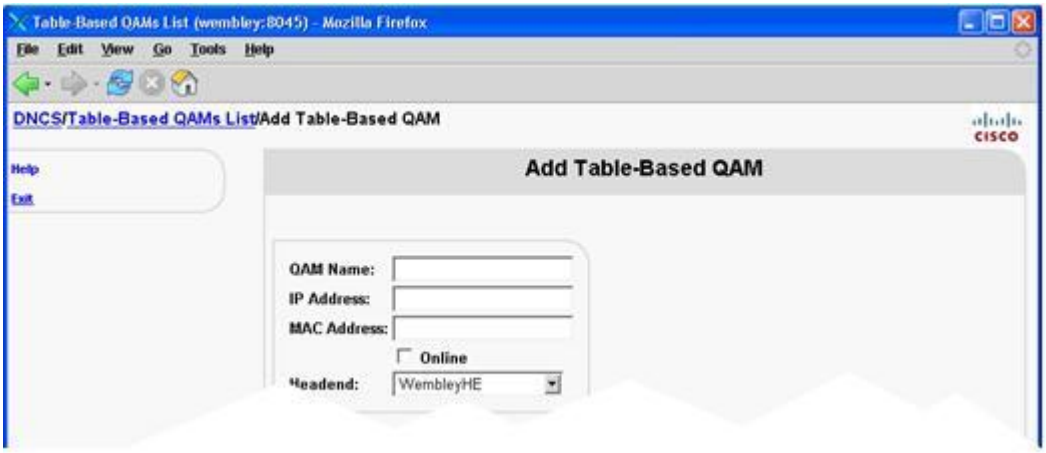
Follow these instructions to enter data in the fields of the Add Table-Based QAMs List window:

Note: Adding a TB-QAM modulator element to the DNCS does not allow the DNCS to provision or communicate with the TB-QAMs you add. Instead, the DNCS uses the information you enter to direct program streams to TB-QAM modulators when required. Each TSR has a TSR ID that uniquely identifies it throughout the system and as is passes blindly through the NOBE.

1 From the DNCS tab on the DNCS Administrative Console, click **Network Element Provisioning**. The Network Element Provisioning tab comes to the forefront.

2 Click **Table-Based QAM**. The Table-Based QAMs List window opens.

3 Click **Add**. The Add Table-Based QAM window opens.



4 Follow these instructions to enter data in the fields of the Table-Based QAMs List window:

- **QAM Name** – Enter a name for the TB-Modulator that is consistent with the naming scheme used on your network map. We recommend that you establish a naming scheme that allows you to easily identify the TB-QAM modulator and where it resides. For example, a name of **xDQA43hub1** could represent a TB-QAM modulator whose IP address ends in 43 and processes data for Hub 1.
- **IP Address** – Enter the IP address of the GbE interface for this TB-QAM modulator. (You can obtain this address from your network map or from your system administrator.)
- **MAC Address** – Enter the MAC Address of the GbE interface for this TB-QAM modulator. Make certain to separate each pair of characters in the 12-character address with a colon, for example 00:00:00:00:00:00.
- **Online** – Click the Online option to place the TB-QAM modulator online.
- **Headend** – Click the Headend arrow and select the headend where this TB-QAM modulator resides.

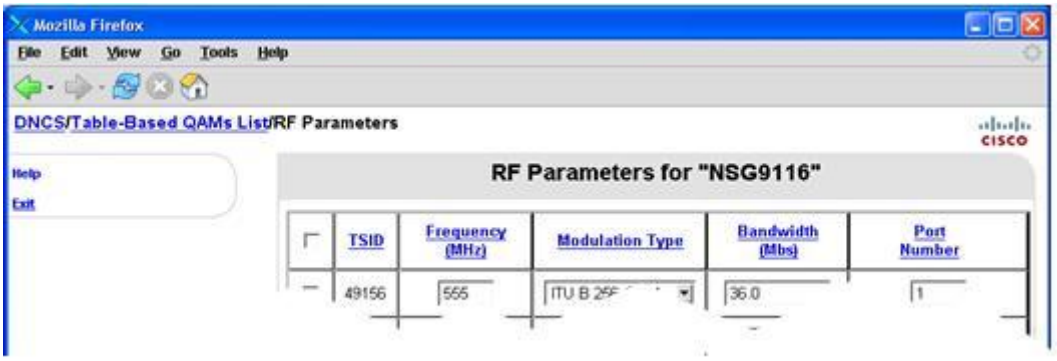
5 Click **Save**. The Add Table-Based QAM window closes and Table-Based QAMs List window updates to show the TB QAM modulator in the list.

6 Now that you have added the TB-QAM modulator to the DNCS, configure the RF parameters for the TB-QAM modulator. Go to ***Enter RF Output Information Into the DNCS*** (on page 52).

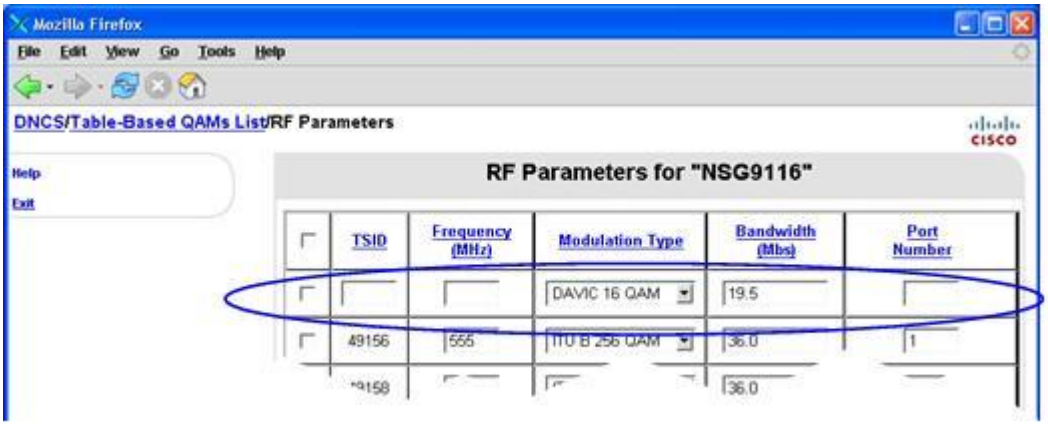
Enter RF Output Information Into the DNCS

Follow these instructions to enter the RF output configuration information for this TB-QAM modulator into the DNCS.

1 Use the Filter to display the TB-QAM that you just added, and click the Select box next to the TB QAM modulator that you just added in the Table-Based QAMs List window, and click **Configure RF Parameters**. RF Parameters window opens for this TB QAM modulator.



2 Click **Add**. New data fields appear.



3 Follow these instructions to enter data in the new data fields:

- **TSID –** Enter the TSID that has been assigned to the RF carrier to uniquely identify the output transport stream. This number is used by DHCTs to automatically identify their service groups.
- **Frequency –** Enter the frequency assigned for this port (carrier).
- **Modulation Type –** Enter the type of modulation that has been set for this port (carrier).
- **Port Number –** Enter a number for this port (carrier). For example, a TB-QAM with 16 carriers would have ports 1 thorough 16.

4 Click **Save**. The Table-Based QAM RF Parameters window updates to show the settings for this RF channel.

5 Repeat steps 2 through 4 to configure additional RF ports (carriers) for this TB-QAM modulator. When you are done, go to step 6.

6 In the path at the top of the window, click **Table-Based QAMs List**. The Table-Based QAMs List window opens.

7 Now that you have entered the RF output information for this TB-QAM, enter the mapping table for this TB-QAM into the DNCS. Go to ***Enter the Mapping Table of a TB-QAM*** (on page 54).

Enter the Mapping Table of a TB-QAM

This section provides instructions on entering mapping tables for TB-QAMs into the DNCS. Mapping tables are provided by the QAM manufacturer and are used to define static "session pipes" through a TB-QAM. They map a set of destination UDP port numbers at the input to the TB-QAM to a set of MPEG program numbers and PIDs on specific carriers at the output of the TB-QAM.

Note: The terms RF "carrier" and output "port" are used interchangeably on the DNCS when referring to the output of a QAM modulator. The DNCS is unaware of physical ports on a QAM modulator and how many carriers are present on those physical ports. However, it is important that all carriers on a physical output port of a modulator be assigned to the same service groups.

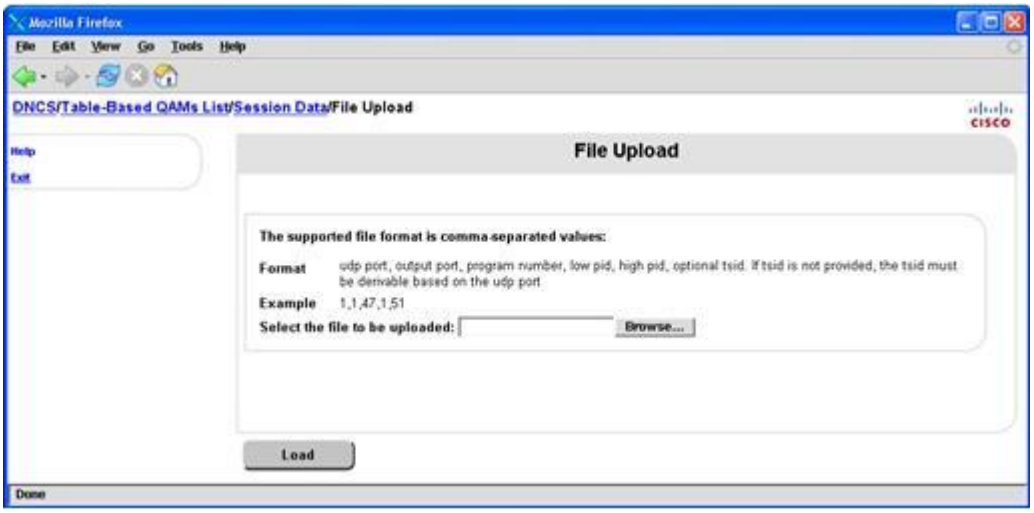
Follow these instructions to enter the mapping table for a TB-QAM modulator into the DNCS.

1. Click the **Select** button next to the TB-QAM modulator whose mapping table you want to configure, and click **Configure Session Data**. The Session Data window opens for the TB-QAM modulator you selected.
2. Do you want to use an automated method to enter the mapping table for this TB-QAM modulator?
   - If **no**, go to step 11 to enter the table manually.
   - If **yes**, go to step 3 to upload a comma separated value file (.csv) and have the DNCS map the streams for you.

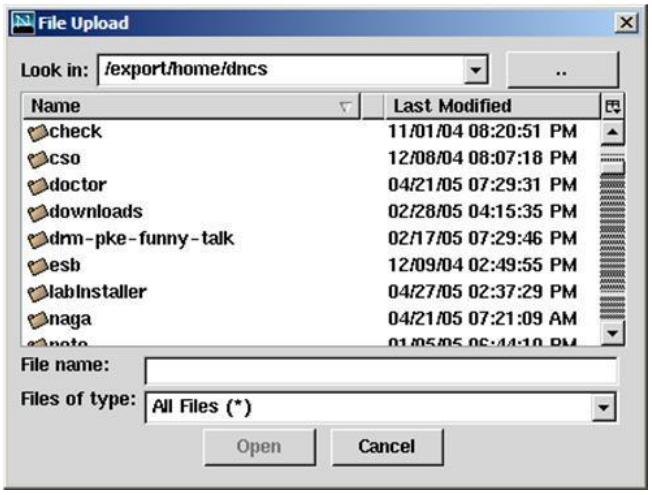
     Important: Each line of the .csv file must list values for the following parameters that the TB-QAM modulator uses to map each transport stream. The values must be listed in the following order from left to right, and each value must be separated by a comma. For example, 1, 1, 1, 1, 51, 47.
     - **UDP port number:** 1 in this example
     - **Output port carrier number:** 1 in this example
     - **Program number:** 1 in this example
     - **Low PID number:** 1 in this example
     - **High PID number:** 51 in this example
     - **QAM TSID:** 47 in this example

     Note: If not provided, the QAM TSID must be derivable based on the UDP port.

3 Click **File Upload** to set up mapping-table data. The File Upload window opens.



4 Click **Browse**. The File Upload window opens and shows the subdirectories on the DNCS, similar to the following example. Each folder icon ( ) represents a subdirectory.



5 Select the .csv file that contains the mapping table for this TB-QAM modulator. The File name field in the bottom of the File Upload window displays the file you selected.

Note: You may need to scroll through the list to find and select the file.

6 Click **Open**. The File Upload window closes and the file you selected appears in the Browse field, similar to the following example.

7 Click **Load**. An Alert window opens and prompts you to save the entries that have been uploaded.

8 Click **OK**. The Alert window closes and the Table-based Session Data now shows the data that has been uploaded.

Note: Depending on the number of transport streams to be set up, it may take a minute for the DNCS to display all of the data for the mapping table.

9 Click **Save Changes**. An Alert window opens and notifies you that sessions were saved.

10 Click **OK**, and go to step 13. The Alert window closes.

11 Click **New**. A row of fields containing zeros appears in the window.

12 Obtain the following data from the QAM manufacturer or installer, and enter data in each of the fields on the Table-based Session Data window:

- UDP port number
- Output port number
- Program number
- Low PID number
- High PID number
- QAM TSID (This number is assigned by the system.)

13 Click **Save changes**. An Alert message appears, similar to the following example, to let you know that this information was saved in the DNCS database.

14 Click **OK**. The Alert window closes and the Table-based Session Data now shows the data that you entered for this transport stream.

15 To map additional transport streams on this TB-QAM modulator, repeat steps 11 to 14 as many times as necessary.

16 Click **Exit** to close the Table-based Session Data window.

17 Now that you have entered the TB-QAM information into the DNCS, create the GbE transport networks that connect NOBEs to QAM modulators. For assistance, see ***Create GbE Transport Network Elements*** (on page 57).

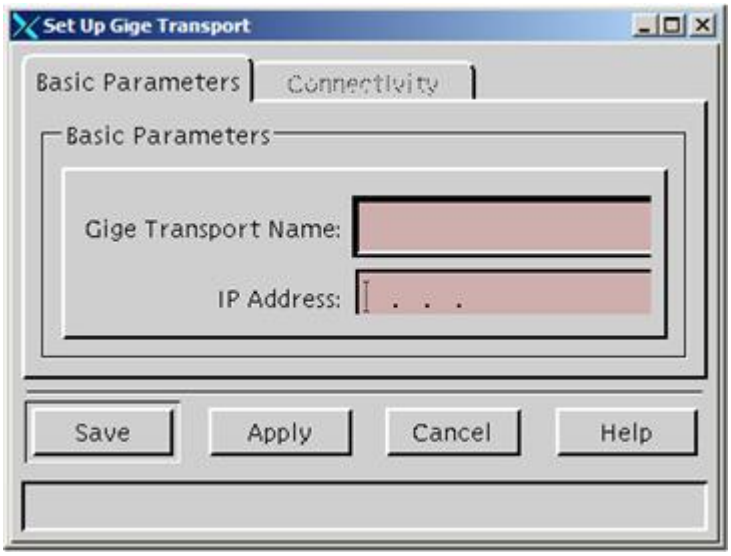
Create GbE Transport Network Elements

This section provides procedures for creating a GbE transport network on the DNCS. As discussed in ***Theory of Operation*** (on page 6), a GbE transport network is a logical concept, not a physical device. Creating a GbE transport network allows you to specify and limit connectivity between NOBEs and QAM modulators. This is done by creating GbE transport networks with arbitrary numbers of connection "ports" and indicating the NOBEs, QAM modulators, and sources that are connected to those networks using the procedures in this section.

Creating a GbE Transport Network

Follow these instructions to create a GbE Transport network on the DNCS and connect it to a Netcrypt element and appropriate edge device, such as a TB-QAM modulator.

1. On the DNCS Administrative Console, click the **DNCS** tab.
2. Click the **Element Provisioning** tab, and click **GbE Transport**. The GbE Transport List window opens and shows all GbE transport networks that have been created on the DNCS.
3. Click **File** and select **New**. The Set Up GbE Transport List opens.



4 Enter the following information in the fields of the Basic Parameters tab:

- **GbE Transport Name –** A name for the transport network

  Note: You can use up to 20 alphanumeric characters. We recommend that you establish a naming scheme that allows you to easily identify this transport network and where it resides. For example, a name of **CFhub1GTN43** could represent a GbE transport network that connects to Hub 1 and is connected to a NOBE by a device whose IP address ends in 43.

- **IP Address –** The IP address of the transport device, such as a switch or router, that is physically connected to this NOBE.

  Note: This address is not used by the DNCS and simply provides a convenient place to save and retrieve this information should you wish to ping or telnet to the router or switch for monitoring or diagnostic purposes.

5 Click **Apply**. The DNCS saves this data and makes the Connectivity tab available for you to select.

6 Click the Connectivity tab, and re-size the window to view all of the tab.

7 Click **Create Port**. The Port Number Prompt window opens.

8 Enter a number to identify the input port on the GbE transport network device that will receive data from a NOBE or other source and click **OK**. The Port Number Prompt window closes, and a box representing the port appears in the Input Port column.

9 For each additional input port on the GbE transport network device, repeat steps 7 and 8 to create these input ports.

10 Click **Create Port**. The Port Number Prompt window opens.

11 Click **Output**. The Output port type option turns on.

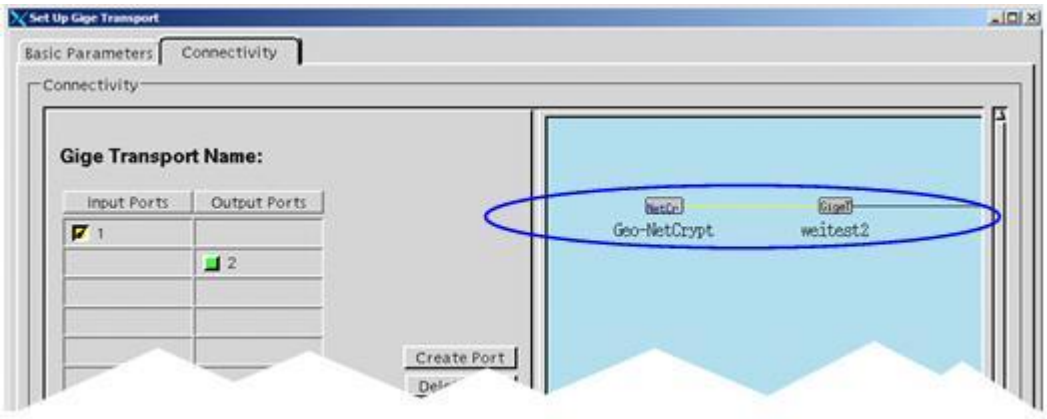
12 Enter the number to identify the output port on the GbE transport network device that will be used to forward data to other devices in the transport network, and click **OK**. The Port Number Prompt window closes, and a box representing the port appears in the Output Port column.

13 For each additional output port on the GbE transport network device, repeat steps 10 through 12 to create these output ports.

14 Click an **Input Ports** box to enable it, then define how this input port on the GbE transport network device connects to the NOBE or other source by entering the following information in each of the Connect To fields:

- **Headend Name** – Select the headend that contains the NOBE or other source that is physically connected to this input port on the GbE transport network device.
- **Device Type** – Select the NOBE, MPEG Source, or another GbE transport network as the type of device that sends data to this input port on the GbE transport network device.
- **Device Name** – Select the name of the NOBE or other source that sends data to this input port on the GbE transport network device.
- **Port Number** – Select the port number on the NOBE or other source that is connected to this input port on the GbE transport network device.

15 Click **Apply**. The DNCS saves your changes and updates the Connectivity graphic to show a connection from this port on the transport network device to the port on the NOBE.



16 If necessary, repeat steps 14 and 15 to define another input port.

17 Click an **Output Ports** box to enable it, then define how this output port on the GbE transport network device connects to the input port of the appropriate edge device, such as a TB-QAM modulator, by entering the following information in each of the Connect To fields:

- **Headend Name** – Select the headend that contains the device that is physically connected to this output port on the GbE transport network device.
- **Device Type** – Select the type of device that receives data from this output port on the GbE transport network device. This device may be, for example, a QAM modulator or another GbE transport network.
- **Device Name** – Select the name of the device that receives data from this output port on the GbE transport network device.
- **Port Number** – Select the port number on this device that is connected to this output port on the GbE transport network device.

18 Click **Apply**. The DNCS saves your changes and updates the Connectivity graphic to show a connection from this port on the GbE transport network device to the port on the appropriate edge device, such as a TB-QAM modulator, that receives data from the transport network.

19 If necessary, repeat steps 17 and 18 to define another output port.

20 Click **Save**. The DNCS saves your changes and closes the Set Up GbE Transport window.

21 Now that you have provisioned Netcrypt elements and elements for related devices, set up sessions on the Netcrypt elements. For assistance, go to ***Setting Up CF Sessions and Transport Stream Routes on a NOBE*** (on page 61).

4

Setting Up CF Sessions and Transport Stream Routes on a NOBE

This chapter first describes the types of sessions that can be set up on a NOBE and the windows, buttons and other tools used to set up Overlay sessions on the DNCS. After describing the tools used to set up Overlay sessions on the DNCS, this chapter provides instructions for setting up sessions, including TSRs on a NOBE.

Note: See Appendix A for the technical specifications of the NOBE and consult your network wiring diagram when you provision the NOBE to ensure a proper allocation of bandwidth.

In This Chapter

Overview of Sessions Carried on a NOBE

This section summarizes the types of sessions that can be established using a NOBE.

Note: For more information on sessions and stream types, see ***Theory of Operation*** (on page 6).

Types of Sessions

You can think of sessions as temporary "pipes" or network paths that define a route for content through the various network elements responsible for content delivery, such as, NOBEs and session-based QAM modulators.

A NOBE requires that you set up the following types of sessions in order to send third-party and Cisco content to set-tops in the network.

- **Overlay Transport Stream Routes (TSRs)** - An Overlay TSR is used to pass third-party pre-encrypted content through the NOBE without altering the content. In an Overlay environment, this approach is primarily used to pass third-party-encrypted content streams through the NOBE and on to simple edge devices, such as TB-QAM modulators. This approach can also be used to pass clear transport streams through the NOBE without alteration.

  An Overlay TSR is useful in situations where operators need to pass an entire statistically multiplexed MPTS, while encrypting only some of the programs within the MPTS. Sessions would only be required for the programs that need to be encrypted. All others would be passed in the clear without alteration.

  Overlay TSRs are always dejittered.

- **Overlay Sessions** - Overlay sessions are relatively static connections between a video source and destination. Overlay sessions are primarily used for broadcasting and, as such, are relatively long-lived. They are often referred to as "continuous feed" sessions or CF sessions.

  An Overlay session contains a clear and a third-party encrypted copy of a program. The resulting Overlay stream is made up of PowerKEY-encrypted and third-party-encrypted critical packets and the remaining clear packets.

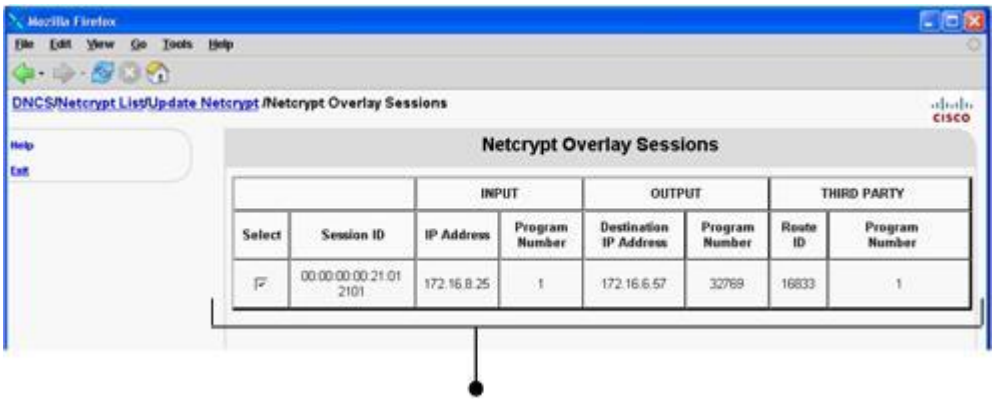
  Multiple Overlay sessions may be set up from an MPTS.

Become Familiar With DNCS Tools

This section describes the Overlay Transport Stream Route window that is available when the **DBDS Network Overlay** and **Overlay Netcrypt Bulk Encryptor** optional features have been enabled on the DNCS. Use this window to add, view, or delete TSRs carried by a NOBE.

Netcrypt Overlay Sessions Window

From the Netcrypt Overlay Sessions window, you can create new Overlay sessions. You can also modify or delete existing Overlay sessions.



The fields in the Netcrypt Overlay Sessions window define the Overlay sessions that are carried on a NOBE and map the sessions to an Overlay TSR.

To map Overlay sessions to an Overlay TSR, first create an Overlay TSR and then create an Overlay session with a Third-Party Route ID that matches the Route ID of the Overlay TSR.

Note: For more information about Overlay sessions, see Theory of Operation.

Fields on the Netcrypt Overlay Sessions Window

The fields on the Overlay Netcrypt Sessions window display the following information about each Overlay session that has been set up for a specific NOBE. The resulting Overlay stream is made up of PowerKEY-encrypted and third-party-encrypted critical packets and the remaining clear packets.

To identify the third-party-encrypted program, the Overlay session can explicitly describe the third-party-encrypted copy of the program, or it can indicate the TSR from which the NOBE can retrieve the critical packets for the Overlay stream. When indicating the TSR from which to retrieve critical packets, the session uses the TSR ID; it identifies the program within the TSR by its MPEG program number.

Session ID	A unique number that identifies the Overlay session. The first field of the session ID includes 12 zeros separated in pairs by a colon; the second field includes the Source ID for the session as listed in the Source List window. For example, an Overlay session created from a source with a Source ID of 1500, would use a Session ID of 00:00:00:00:00:00 1500.
INPUT IP Address	Varies according to the transmission method: **For unicasts,** the IP Address of the GbE port on the NOBE **For multicasts,** the IP multicast address assigned to that content
INPUT Program Number	The MPEG program number of the desired program in the transport stream. This number must match the program number of the MPEG source as defined by your content provider.
OUTPUT Destination IP Address	The IP address of the receiving device
OUTPUT Program Number	The output program number of the Overlay session
THIRD PARTY Route ID	A number that uniquely identifies the transport stream for this session **Important:** The value for this field must exactly match the value of the Overlay TSR ID that will transport the session to the set-top.
THIRD PARTY Program Number	The MPEG program number of this session. This number must match the program number of the MPEG source as defined by your content provider.

Buttons on the Overlay Netcrypt Session Definition Window

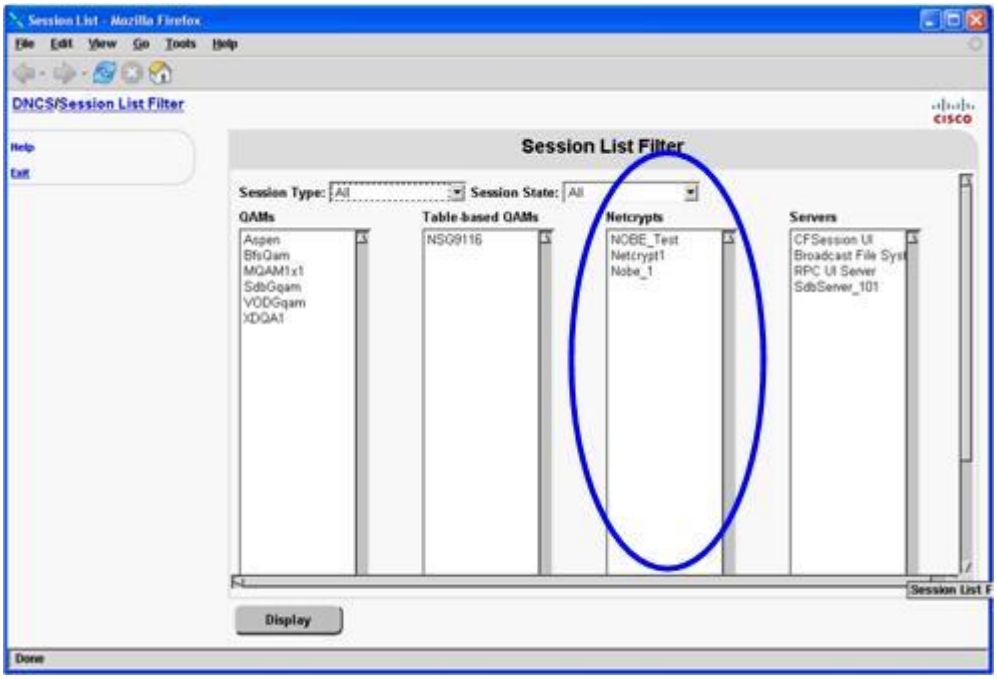
The buttons at the bottom of the Overlay Netcrypt Session Definition window allow you to perform the following tasks.

Save	Saves the parameters you have entered for this Overlay session.
Cancel	Clears any data you have entered in this window and leaves the window open so that you can enter new data.

Session List Filter Window

The Session List Filter window shows sessions that have been set up on any NOBE elements in your system.

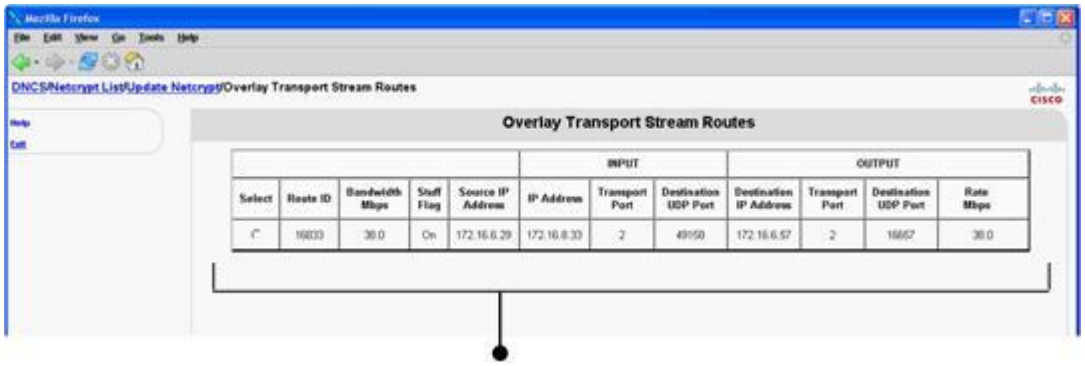
Options on the Session Filter window allow you to view Overlay sessions carried on all NOBEs or on specific NOBEs. For assistance, refer to the *Digital Network Control System Online Help for System Release 2.8/3.8/4.3*.



Overlay Transport Stream Routes Window

This section describes the new Transport Stream Routes window that is available when Netcrypt support has been enabled on your DNCS. Use this window to manage TSRs.

From the Overlay Transport Stream Routes window, you can create new Overlay TSRs. You can also modify or delete existing Overlay TSRs.



The fields in the Overlay Transport Stream Routes window show how TSRs pass through the NOBE from source to destination. **Note:** Overlay TSRs allow operators to configure a NOBE to pass, unaltered, any content that does not require encryption or another type of session. Typically, Overlay TSRs pass third-party-encrypted streams. For more information about TSRs, see ***Theory of Operation*** (on page 6).

Fields on the Overlay Transport Stream Routes Window

The fields on the Overlay Transport Stream Routes window display the following information about each Overlay TSR that has been set up for a specific NOBE. You can create up to 17 Overlay TSRs on a NOBE.

Fields labeled INPUT refer to addresses in the streams as they come into the NOBE. Fields labeled OUTPUT refer to the addresses you want to have on the streams as they exit the NOBE.

Route ID A unique number that identifies this TSR.

This number must be a 2-byte integer the in range of 1 to 65535. Although the system will allow you to enter and save a value of 0, the system will not allow you to create an Overlay sessions with a value of 0.

Note: Make a note of the number you enter. You will need this number later when you set up sessions for this TSR.

Bandwidth Mbps	The amount of bandwidth (in Mbps) that the system should allow for the service this TSR provides. Each TSR generally equates to one QAM-modulated carrier. We recommend that you enter **26.9704** Mbps; this value represents the bandwidth required for a 64-QAM carrier. **Important:** The Bandwidth value must exactly match the OUTPUT Rate value.
Stuff Flag	Indicates whether or not the NOBE stuffs the MPEG header to a full QAM rate to provide a constant bit rate output. **Important:** Always enable this option when adding an Overlay TSR to the DNCS.
Source IP Address	IP address of the device sending content to the NOBE, for example, a GbE multiplexer
INPUT IP Address	**For unicasts,** the IP address of the GbE port on the NOBE **For multicasts,** the IP multicast address assigned to that content
INPUT Transport Port	The number of the physical GbE port that will be used for this stream, as labeled on the back panel of the NOBE. We recommend that you select Port 2 for encrypted streams and Port 1 for clear streams.
INPUT Destination UDP Port	**For unicasts**, the UDP port number that uniquely identifies this stream **For multicasts**, this number is not required; however, the system may choose to assign a well-known UDP port number.
OUTPUT Destination IP Address	**For unicasts,** the IP address of the receiving device **For multicasts,** the IP multicast address of the receiving device
OUTPUT Transport Port	The number of the physical GbE port that will be used for this stream, as labeled on the back panel of the NOBE. We recommend that you select Port 2.
OUTPUT Destination UDP Port	**For unicasts,** the UDP port number of the receiving device **For multicasts,** this number is not required; however, the system may choose to assign a well-known UDP port number.
OUTPUT Rate Mbps	The rate (in Mbps) of the transport stream being sent from the NOBE. **Important:** This value must match the Bandwidth value exactly.

Buttons on the Overlay Transport Stream Routes Window

The selections in the left pane of the Overlay Transport Stream Routes window allow you to perform the following tasks.

Add	Add an Overlay TSR to the DNCS.
Open	Open the Overlay Transport Stream Route window of a specific Overlay TSR to view or modify any of the settings.
Delete	Delete an existing Overlay TSR from the DNCS. **Important:** Before you can delete a TSR from the DNCS, you must first delete any sessions associated with the TSR. Go to ***Tear Down Overlay Sessions*** (on page 79) for assistance.

Session Setup Overview

This section provides an overview of the process required to set up sessions on a NOBE so that the NOBE receives both pre-encrypted third-party content and Cisco content and passes both content securely to the set-tops in the network.

Remaining sections in this chapter provide detailed instructions for setting up sessions on a NOBE.

Overview of Setting Up Transport Stream Routes and Sessions

Follow this process to create an Overlay TSR and Overlay sessions that map to the TSR. Mapping Overlay sessions to a TSR ensures that the Overlay session retrieves critical packets from the third-party pre-encrypted stream and encrypts those packets using PowerKEY encryption. This method allows the stream to be decrypted by both third-party and Cisco set-tops.

1. If you have not already done so, provision the NOBE and its associated devices on the DNCS.

   Note: For assistance, go to ***Provisioning the NOBE and Associated Devices*** (on page 37).

2. From the Overlay Transport Stream Route window, create an Overlay TSR. You can create as many as 17 Overlay TSRs on one NOBE.

   Note: For assistance, go to ***Create an Overlay Transport Stream Route*** (on page 70).

3. From the Overlay Netcrypt Session Definition window, create an Overlay session and map it to the TSR that you have created.

   Important: To map these two elements, make certain that the session's Third-Party Route ID matches the value used for the TSR ID.

   When creating Overlay sessions, keep in mind that each TSR generally corresponds to one QAM-modulated carrier. You can map as many sessions to a TSR as will fit on a QAM carrier. For example, you could map 10 standard-definition streams or two high-definition streams to one TSR.

   Note: For assistance, go to ***Create an Overlay Session*** (on page 73).

Create an Overlay Transport Stream Route

This section describes how to create an Overlay TSR. Overlay TSRs allow third-party-encrypted streams to pass through the NOBE unaltered. You can set up to 17 Overlay TSRs on a NOBE.

Follow these steps to create an Overlay TSR.

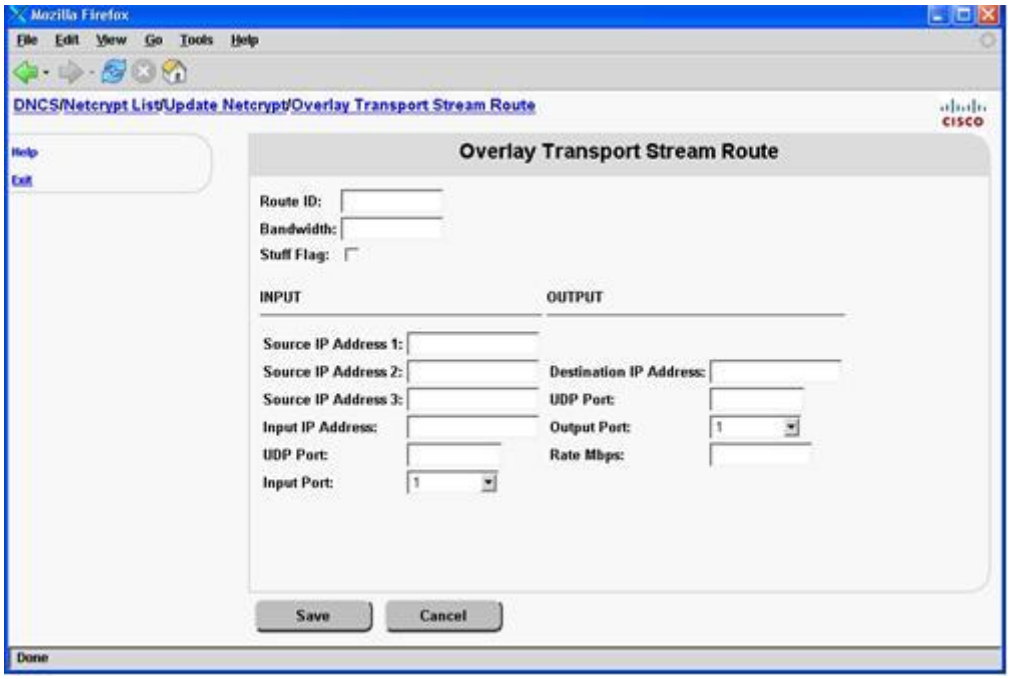
1 From the DNCS Administrative Console, click the **Network Element Provisioning** tab.

2 Click **Netcrypt**. The Netcrypt List window opens.

3 Click the **Select** button next to the NOBE that you want to carry the Overlay TSR, and then click **Edit**. The Update Netcrypt window opens for the element you selected.

4 Click **Overlay Transport Stream Routes**. The Overlay Transport Stream Routes window opens and shows any Overlay TSRs currently carried on this NOBE.

5 Click **Add**. The Overlay Transport Stream Route window opens similar to the following example.



6 Enter the following information in the top fields on the Overlay Transport Stream Route window:

- **Route ID** - A unique number that identifies this TSR. This number must be a 2-byte integer the in range of 1 to 65535. Although the system will allow you to enter and save a value of 0, the system will not allow you to create an Overlay sessions with a value of 0.

  Note: Make note of the number you use for the Route ID. You will need this number later when you set up sessions for this TSR.

- **Bandwidth** - The amount of bandwidth (in Mbps) that the system should allow for the service this TSR provides. Each TSR generally equates to one QAM-modulated carrier.

  We recommend that you enter 26.9704 Mbps; this value represents the bandwidth required for a 64-QAM carrier.

  Important: The Bandwidth value must exactly match the OUTPUT Rate value.

- **Stuff Flag** - Enable this option to indicate that the NOBE stuffs the MPEG header to a full QAM rate in order to provide a constant bit rate output.

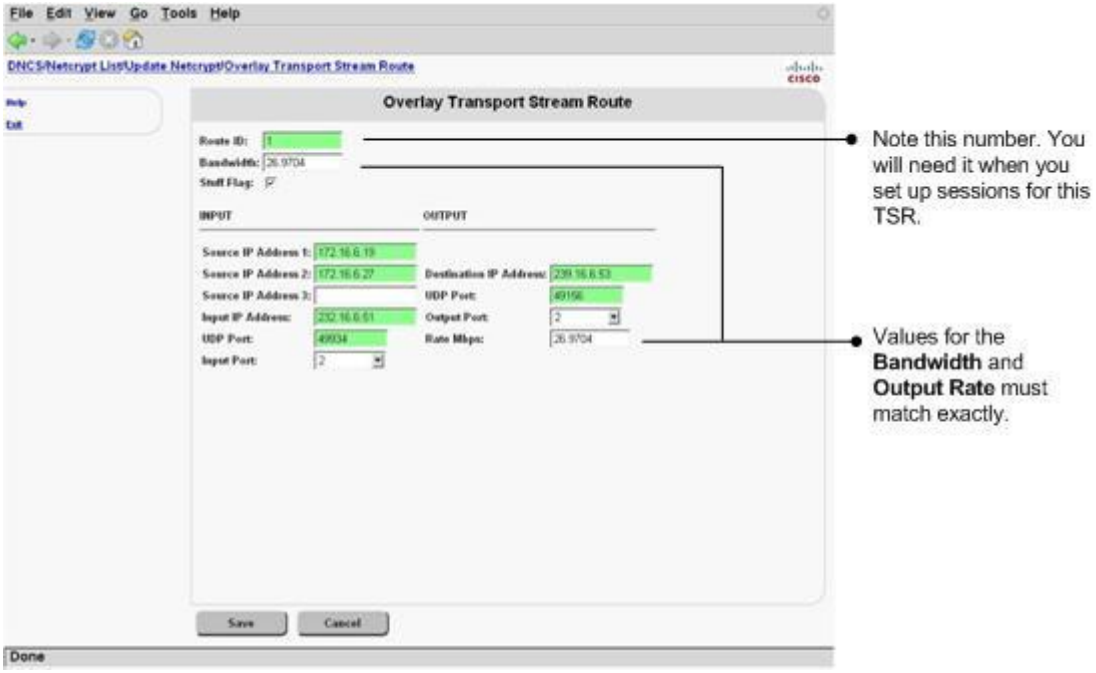
7 Enter the following information in the **INPUT** fields on the Overlay Transport Stream Route window:

- **Source IP Address 1** - The IP address of the source device, such as a GbE multiplexer.
- **Source IP Address 2** - The IP address of the backup source. For example, if the first multicast source fails, the DNCS would use this address to receive the source.
- **Source IP Address 3** - The IP address of the secondary backup source. (If Source IP Address 1 and Source IP Address 2 fail, the system uses Source IP Address 3.)
- **Input IP Address** - Varies according to the transmission method:
  - **For unicasts,** the IP Address of the GbE port on the NOBE
  - **For multicasts,** the IP multicast address assigned to that content
- **UDP Port** - Varies according to the transmission method:
  - **For unicasts,** the UDP port number that uniquely identifies this stream
  - **For multicasts,** this number is not required; however, the system may choose to assign a well-known UDP port number.
- **Input Port** - The number of the physical GbE port that will be used for this stream, as labeled on the back panel. We recommend that you select Port 2 for encrypted streams and Port 1 for clear streams.

8 Enter the following information in the **OUTPUT** fields on the Overlay Transport Stream Route window:

- **Destination IP Address** - IP address of the receiving device
- **UDP Port** - The UDP port number of the receiving device
- **Output Port** - The number of the physical GbE port that will be used for this stream, as labeled on the back panel. We recommend that you select Port 2.
- **Rate Mbps** - The rate (in Mbps) of the transport stream being sent from the NOBE

  Important: This value must match the Bandwidth value exactly.



9 Click **Save**. The system saves your changes and opens the Overlay Transport Stream Routes window, which now shows the TSR you just created. The status area of the window shows the message "NOBE Transport Stream Saved Successfully."

10 Do you need to set up another Overlay TSR on this NOBE or on another NOBE?

- If **yes**, repeat steps 2 to 9 to set up another Overlay TSR on this NOBE or on another NOBE.
- If **no**, you have successfully set up all the Overlay TSRs required.

Note: You can create as many as 17 Overlay TSRs on one NOBE.

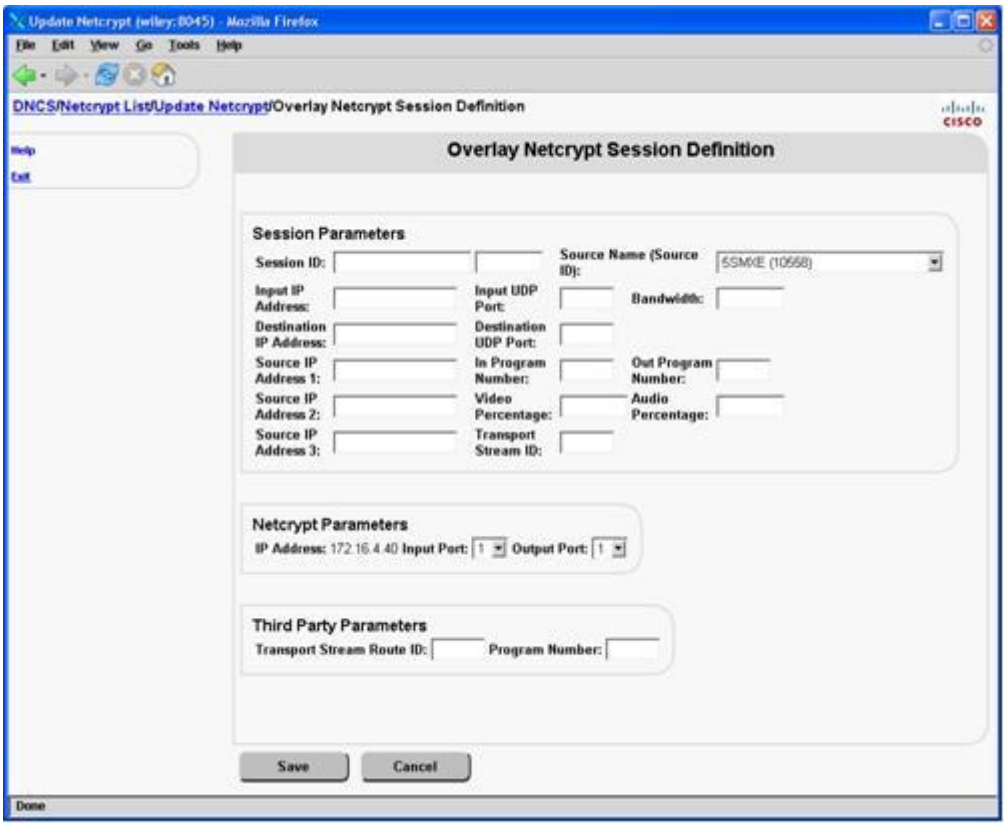
11 Set up a session for this Overlay TSR. Go to ***Create an Overlay Session*** (on page 73).

Create an Overlay Session

Follow these instructions to create an Overlay session.

Important: If the Overlay session retrieves critical packets for the stream from an Overlay TSR, create the Overlay TSR first so that you have a TSR ID to use when creating the Overlay session. For assistance, see ***Create an Overlay Transport Stream Route*** (on page 70).

1. From the DNCS Administrative Console, click the **Network Element Provisioning** tab.
2. Click **Netcrypt**. The Netcrypt List window opens.
3. Click the **Select** button next to the NOBE that you want to carry the Overlay session, and then click **Edit**. The Update Netcrypt window opens for the NOBE you selected.
4. Click **Overlay Sessions**. The Netcrypt Overlay Sessions window opens and shows all of the Overlay sessions this NOBE carries.
5. Click **Add**. The Overlay Netcrypt Session Definition window opens similar to the following example.



6 Enter or select the following information for the **Session Parameters** fields on the Overlay Session Definition window:

- **Session ID** - The identifier for the Overlay session. (The first field of the session ID includes 12 zeros separated in pairs by a colon; the second field includes the Source ID for the session as listed in the Source List window. For example, an Overlay session created from a source with a Source ID of 1500, would use a Session ID of 00:00:00:00:00:00 1500.)
- **Source Name (Source ID)** - The identifier that represents the source for this session
- **Input IP Address** - Varies according to the transmission method:
  - **For unicasts,** the IP Address of the GbE port on the NOBE
  - **For multicasts,** the IP multicast address assigned to that content
- **Input UDP Port** - The UDP port that receives the clear input program
- **Bandwidth** - The amount of bandwidth (in Mbps) that the system should reserve for the service this session provides

  Note: This value is usually defined by your content service provider, or it can be set using a re-rating or re-coding device. Typical values are:
  - Standard MPEG video streams use **3.75** Mbps
  - HDTV streams use **12** to **15** Mbps
  - Audio streams use **0.2** Mbps
- **Destination IP Address** - The IP address of the receiving device
- **Destination UDP Port** - The UDP port of the receiving device
- **Source IP Address 1** - The IP multicast address of the source device, such as a GbE multiplexer
- **In Program Number** - The MPEG program number of the desired program in the transport stream. This number must match the program number of the MPEG source as defined by your content provider.
- **Out Program Number** - The output program number of the Overlay session
- **Source IP Address 2** - The IP multicast address of the backup source. For example, if the first multicast source fails, the DNCS would use this address to receive the source.
- **Video Percentage** - Indicates that the NOBE should encrypt critical packages of the session so that the resulting Overlay stream is made up of PowerKEY encrypted and third-party encrypted critical packets.

  We recommend 4% encryption for the video portion of the stream.
- **Audio Percentage** - A value of 98 in this field indicates that the NOBE should encrypt critical packages.

  Important: Always enter 98 in this field; otherwise, sessions may not be encrypted properly.

- **Source IP Address 3** - The IP multicast address of the secondary backup source. (If Source IP Address 1 and Source IP Address 2 fail, the system uses Source IP Address 3 .)
- **Transport Stream ID** - A unique number that identifies the TSR from which the CF session will retrieve critical packets for the Overlay stream. This number must be a 2-byte integer the in range of 1 to 65535.

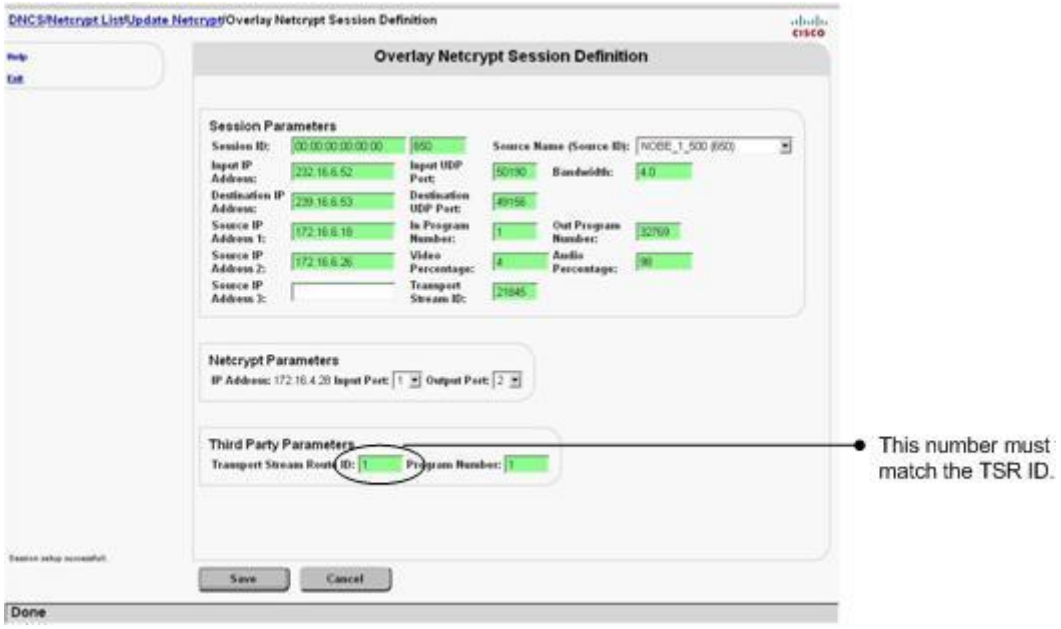
7 Enter or select the following information for the **Netcrypt Parameters** fields on the Overlay Session Definition window:

- **IP Address** - The IP address of the NOBE that will carry this session
- **Input Port** - The number of the physical GbE port that will be used for this stream, as labeled on the back panel. We recommend that you select Port 1.
- **Output Port** - The number of the physical GbE port that will be used for this stream, as labeled on the back panel. We recommend that you select Port 2.

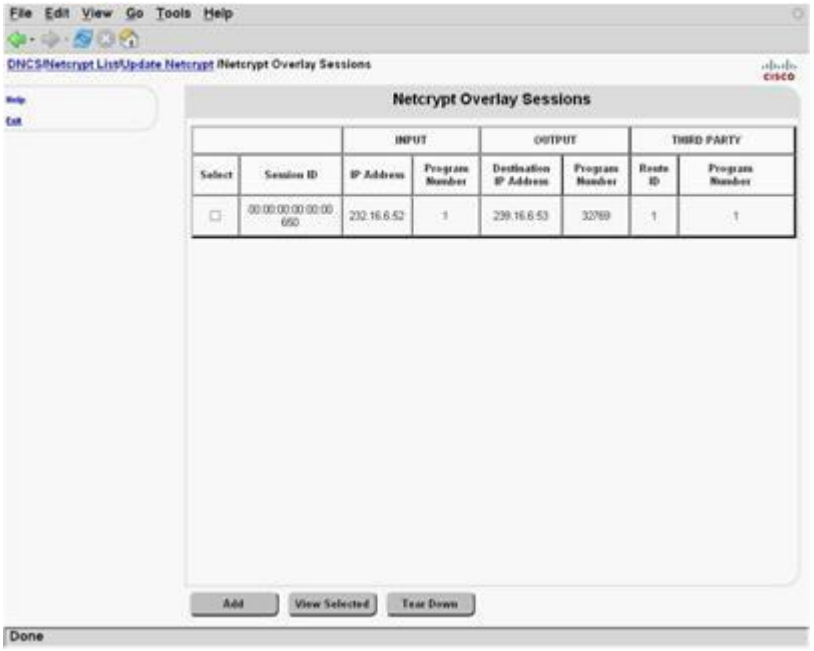
8 Enter the following information in the **Third Party Parameters** fields on the Overlay Session Definition window:

- **Transport Stream Route ID** - A number that uniquely identifies the transport stream for this session

  Important: The value for this field must exactly match the value of the Overlay TSR ID that will transport the session to the set-top.
- **Program Number** - The MPEG program number of the session. This number must match the program number of the MPEG source as defined by your content provider.



9 Click **Save**. The system saves your changes and opens the Netcrypt Overlay Sessions window, which now shows the Overlay session you just created.



10 Do you need to set up another Overlay session on this NOBE or on another NOBE?

- If **yes**, repeat steps 2 to 9 to set up another Overlay session on this NOBE or on another NOBE
- If **no**, you have successfully set up all the Overlay sessions required.

Note: When creating Overlay sessions, keep in mind that each TSR generally corresponds to one QAM-modulated carrier. You can map as many sessions to a TSR as will fit on a QAM carrier. For example, you could map 10 standard-definition streams or two high-definition streams to one TSR.

11 Now that you have created an Overlay session from this content source, define how you want to offer this session as a service to subscribers. The process for defining a service from an Overlay session is no different than defining a service from a QAM session. However, the process is summarized below for easy reference:

a Define the source that is used for the service as a **non-SA Digital source**. For assistance, refer to the *Digital Network Control System Online Help for System Release 2.8/3.8/4.3.*

Important: The number that you will enter in the MPEG Program number field on the Set Up Non-SA Source Definition window, differs according to whether or not the channel is to be encrypted. If the channel is to be encrypted, the number entered in this field must be 32768 + the actual program number of the session. For example, if the MPEG program number is 1, you would enter 32769 in this field. On the other hand, if the channel is going to be broadcast in the clear, enter the actual MPEG program number in this field.

b For a clear or encrypted service, register the service with the Service Application Manager (SAM) to define how the service operates when set-top receives it. For assistance registering a service with the SAM, refer the *Digital Network Control System Online Help for System Release 2.8/3.8/4.3*.

c For a clear or encrypted service, place the service in the IPG Service List so that information about this service appears in the on-screen IPG that is presented to subscribers. For assistance setting up IPG services, refer to *Application Server 3.5 Release Notes* (part number 4022899).

d For a clear or encrypted service, place the service on a Channel Map so subscribers can access the service by tuning to a particular channel. For assistance refer to adding a service to a channel map, refer to the *Digital Network Control System Online Help for System Release 2.8/3.8/4.3.*

View Overlay Sessions

Follow this procedure to view Overlay sessions that have been set up on a NOBE.

1. From the DNCS Administrative Console, click the **Utilities** tab.
2. Click **Session List**. The Session List Filter window opens.
3. In the Netcrypt list, select the NOBE whose sessions you want to view.
4. Click the **Display** button at the bottom of the window. The Session Summary window opens and shows all sessions that have been set up on this NOBE. The following states may be listed for a session:
   - **Active** - Indicates that the NOBE is receiving both clear and third-party encrypted PATs and PMTs.
   - **Pending** - Indicates that a session has been set up but has not yet reached its start time.
   - **Completed** - Indicates that a session has successfully completed, or has been torn down by the user.

Note: To close the Session Summary window, click **Exit**.

Tear Down Overlay Sessions

Follow this procedure to tear down an Overlay session.

1. If you have not already done so, display the sessions that you want to tear down. For assistance, go to ***View Overlay Sessions*** (on page 78).
2. With the list of sessions displayed, use one of the following methods to select the sessions you would like to tear down:
   - To tear down specific sessions, click in the Select box to the left of one or more sessions to select all of the sessions that you want to delete.
   - To tear down all sessions, click in the Select box at the top of the Session Summary table.

   Note: If you make a mistake and select a session that is carried by another modulator, click the Select box again to clear your selection.
3. Click the **Tear Down button** at the bottom of the window. The system tears down the sessions you selected and updates the status of all sessions.
4. If you need to delete a TSR associated with the session, go to ***Delete an Overlay Transport Stream Route*** (on page 80).
5. Click **Exit** to close the Session Summary window.

Delete an Overlay Transport Stream Route

This section describes how to delete an Overlay TSR in the event that you make a mistake while creating the Overlay TSR and need to delete the TSR and create it again.

Important: You cannot directly modify the parameters of an Overlay TSR from the DNCS. To change any Overlay TSR parameters, delete the Overlay TSR from the DNCS, and then add it back to the DNCS using the new parameters.

Why Tear Down Sessions?

This section describes how to tear down sessions so that you can then delete a TSR or a NOBE.

Note: Before deleting a TSR or NOBE, first tear down sessions associated with the TSR or NOBE. Deleting a TSR or NOBE without first tearing down its related sessions can degrade system performance. Performance can degrade because the DNCS uses its resources to attempt to associate sessions with an element that no longer exists. These sessions are called orphaned sessions.

Deleting an Overlay TSR

Follow these instructions to delete an Overlay TSR.

Important: Before deleting a TSR, first tear down sessions associated with the TSR. Deleting a TSR without first tearing down its related sessions can degrade system performance. Performance can degrade because the DNCS uses its resources to attempt to associate sessions with TSR that no longer exists. These sessions are called orphaned sessions. For assistance, go to ***Tear Down Overlay Sessions*** (on page 79).

1 Have you torn down all Overlay sessions associated with this TSR?

- If **yes**, go to step 2.
- If **no**, first tear down all Overlay sessions associated with this TSR and then go to step 2. For assistance tearing down an Overlay session, go to ***Tear Down Overlay Sessions*** (on page 79).

  Note: Deleting a TSR without first tearing down its related sessions can degrade system performance. Performance can degrade because the DNCS uses its resources to attempt to associate sessions with TSR that no longer exists. These sessions are called orphaned sessions.

2 From the DNCS Administrative Console, click the **Network Element Provisioning** tab.

3 Click **Netcrypt**. The Netcrypt List window opens.

4 Click the **Select** button next to the NOBE whose Overlay TSR you want to delete, and then click **Edit**. The Update Netcrypt window opens for the NOBE you selected.

5 Click **Overlay Transport Stream Routes**. The Overlay Transport Stream Route window opens and shows all of the Overlay TSRs that pass through this NOBE.

6 Click the Select button next to the Overlay TSR you want to delete, and click **Delete**. The system removes the Overlay TSR from the list of TSRs shown in the window.

7 Do you need to delete other Overlay TSRs on this NOBE?

- If **yes**, repeat step 6 to delete another Overlay TSR.
- If **no**, continue with the next step.

8 Do you need to delete an Overlay TSR on another NOBE?

- If **yes**, repeat steps 4 to 7 to delete an Overlay TSR on another NOBE.
- If **no**, continue with the next step.

9 You have successfully deleted Overlay TSRs. To close the Overlay Transport Stream Route window, click **Exit**.

5

Maintaining and Repairing the NOBE

This chapter contains procedures for maintaining a NOBE that has been installed in a DBDS. It also provides basic repair instructions and recommendations for spare parts to keep on-hand.

Note: Once installed as described, the NOBE is designed to run unattended for extended periods. However, proper maintenance is required to keep it functioning properly.

In This Chapter

Maintenance Overview

Performing routine maintenance extends the life of the NOBE and helps to reduce the need for troubleshooting.

Note: For instructions to on how to diagnose alarm conditions, see ***Troubleshooting the NOBE*** (on page 93).

Recommended Spare Parts

We recommend that you stock the following spare parts. Keeping these spare parts on hand enables you to quickly return the NOBE to operating order in the unusual event that the NOBE malfunctions:

- Two 4.0 A, SLO BLO 250 V fuses (part numbers 188106)
- One fan kit, which includes the replacement fan and instruction sheet (part number 4010291-40)

Quarterly Inspection

The NOBE can operate unattended for extended periods. However, perform a visual inspection once every three months to ensure that the unit is in good operating order.

Important: Only qualified personnel should attempt maintenance and service of the NOBE.

Check the following items during a visual inspection:

- **Cables and connectors** - Verify that all cables are mated properly and all retaining screws are tight. Inspect cables for stress and chafing.
- **Cover and rear panel** - If necessary, clean the cover and rear panel with a soft cloth dampened with a mild detergent solution.
- **Fan intakes on side panel** - Check the fan intakes on the side panel for excessive lint or dust buildup. Remove the lint and dust from the intakes using a damp cloth or a small hand vacuum.
- **Front and back panel indicators** - Check the indicators on the front and back panel of the unit to verify that they show the NOBE is operating as expected. For assistance, go to ***Front Panel Status Indicators During Normal Operation*** (on page 85) and ***Back Panel Status Indicators During Normal Operation*** (on page 85).

Front Panel Status Indicators During Normal Operation

The following table lists the status of front panel indicators when the unit is operating as expected.

Indicator	Status
POWER (green)	On
RUN/LOAD (green)	On
RESET (yellow)	Off
MINOR ALARM (yellow)	Off
MAJOR ALARM (red)	Off

Note: If the indictors show that the unit is not operating as expected, see ***Troubleshooting the NOBE*** (on page 93) for assistance.

Back Panel Status Indicators During Normal Operation

The following tables list the status of back panel indicators when the unit is operating as expected.

Indicators for GbE Connections During Normal Operation

Indicator	Status
DUP (green)	■ On when in full duplex mode ■ Off when in half duplex mode
L1000 (green)	On when a 1000 Mbps (gigabit Ethernet) link is established
L100 (green)	On when a 100 Mbps (fast Ethernet) link is established
L10 (green)	On when a 10 Mbps (Ethernet) link is established
TX (green)	On when transmitting data
RX (green)	On when receiving data

Note: If these indictors show that the unit is not operating as expected, see ***Troubleshooting the NOBE*** (on page 93) for assistance.

Indicators for Ethernet Connections During Normal Operation

Indicator	Status
TX (green)	On
L/RX (green)	On or blinking
ERROR (yellow)	Off

Note: If these indicators show that the unit is not operating as expected, see ***Troubleshooting the NOBE*** (on page 93) for assistance.

Replace the Fuses

Each NOBE contains two power fuses. This section describes how to replace the fuses with spares that you should have on hand.

Before You Begin

CAUTION:

To minimize the disruption of services, we recommend keeping two spare fuses for each NOBE in your system.

To replace the fuses, you must have the following:

- Two 4.0 A, SLO BLO 250 V fuses (part numbers 188106)
- A small, flat-blade screwdriver or similar tool to pry the fuse holder from the back panel of the NOBE

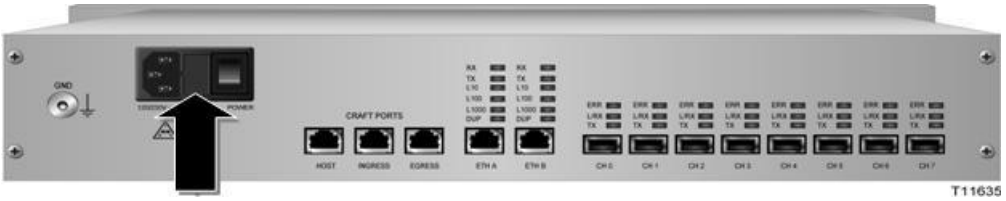
Replacing the Fuses

WARNING:

Avoid electric shock. Disconnect the power cord on this product before you remove the fuses and only use fuses that have the correct type and rating.

To replace the SLO BLO 250 V fuses, follow these steps.

1. Power down the NOBE and unplug the power cord from the back panel.
2. Locate the fuse holder on the left side of the back panel of your NOBE.



3. Use a small, flat-blade screwdriver to pry the fuse holder from the back panel of the NOBE.
4. Remove and discard both blown fuses, and replace them with new fuses.
5. Insert the fuse holder into the back panel and press firmly until it snaps in place.
6. Replace the power cord and power on the NOBE.
7. If necessary, order additional fuses to ensure that you have spares readily available. See ***Customer Information*** (on page 113) for the telephone number of a customer service center in your area.

Replace a Fan

This section provides instructions for replacing a fan unit on the NOBE by either hot swapping the fan unit or powering off, disconnecting, and removing the bulk encryptor completely from the rack. When hot swapping a fan, you do not need to power down the NOBE. As a result, you can replace a fan without disrupting service to subscribers.

Important: Do not wait for a maintenance window to replace a failed fan. Replace failed fans as soon as possible; otherwise, damage can result to the NOBE.

How to Identify a Fan Failure

Indicator lights on the front panel of the NOBE help you identify a fan failure. If a fan fails, the **MAJOR** LED on the front panel will light. In addition, if you are using Cisco's optional DBDS Alarm Management System to monitor network elements, the message **Fan <fan number> failure** is displayed for operators. The Alarm Management System numbers fans 1 to 5 from front to back.

CAUTION:

Replace a failed fan as soon as you identify it has failed; otherwise, damage can result to the NOBE. Do not wait for a maintenance window to replace a fan.

Before You Begin

WARNING:

Avoid electric shock and damage to this product. Replace a fan only with a genuine replacement fan from Cisco. Contact the representative who handles your account to order replacement fans.

In order to hot swap a fan unit, you must have the following:

- Sufficient length in all cords and cables so you can slide the bulk encryptor forward in the rack far enough to fully access the fan units on the side panel
- The ability to externally support the NOBE with a cart or table or with the assistance of another person
- A #10 Torx bit
- Either of the following replacement parts:
  - A replacement fan unit (part number 4007846)
  - A replacement fan kit, which includes the replacement fan and instruction sheet (part number 4010291-40)

Replacing a Fan

The NOBE has five fans on the side panel. The fans are designed to be hot swappable, meaning you do not need to power down the NOBE to replace a failed fan. If you allowed for sufficient cable lengths during installation, you are able to slide the NOBE forward in the rack to fully access fans and allow the unit to operate uninterrupted.

CAUTION:

Avoid damage to this product. Replace a fan unit only with a genuine replacement fan unit from Cisco. Contact your Cisco Customer Service Representative to order replacement fan units.

To replace a fan on the NOBE, complete these steps.

1. Identify the fan that failed on the NOBE.

   If you are using Cisco's optional DBDS Alarm Management System to monitor network elements, the message **Fan <fan number> failure** is displayed for operators. For example, if fan 1 has failed, the message **Fan 1 failure** is displayed. The Alarm Management System numbers fans 1 to 5 from front to back.

2. Are the cables connected to the back panel of the bulk encryptor long enough to allow you to slide the unit forward in the rack so that you can access the fan units?

   - If **yes**, remove the four screws that secure the NOBE in the rack and carefully slide the bulk encryptor forward until you can access the fan units. Go to step 5.

     CAUTION:

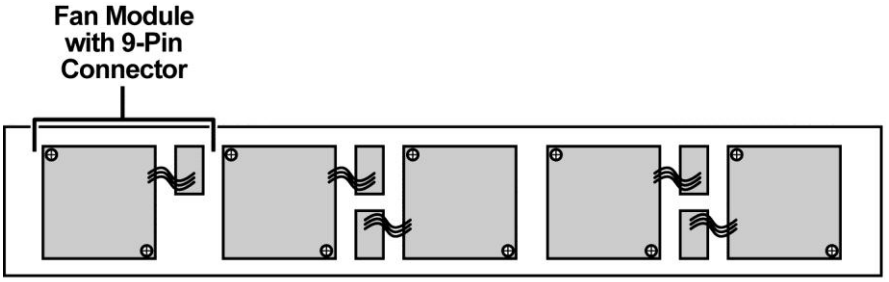
     To avoid damaging the unit, you must be able to externally support the NOBE with a cart or table or with assistance when you slide the chassis forward in the rack.

   - If **no**, power off the bulk encryptor and disconnect all cables.

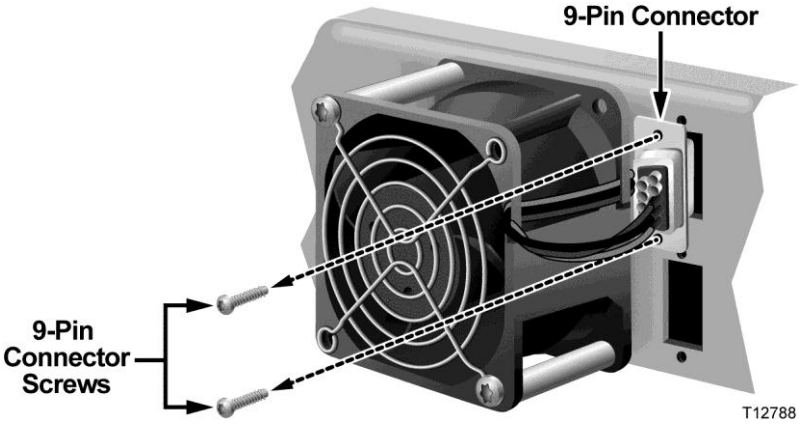
   Important: When the unit is powered off, service to customers is disrupted.

3. If you cannot slide the unit forward in the rack because any of the cables in the rack are not long enough to allow access to the fan, you must power off the unit and disconnect all cables.
4. Remove the four screws that secure the NOBE in the rack.
5. Carefully remove the NOBE completely from the rack to and place it on a sturdy, level work surface, such as a work cart.
6. Identify the fan that failed on the bulk encryptor (the one that is not spinning). If you removed power from the bulk encryptor, apply power from a temporary source to identify the fan that failed. Then, power off again before continuing.

7 Locate the 9-pin connector for the fan you want to replace. The following diagram shows the location of the 9-pin connectors on the bulk encryptor.



8 Remove the two screws that secure the 9-pin connector to the side panel and place them in a safe location nearby.

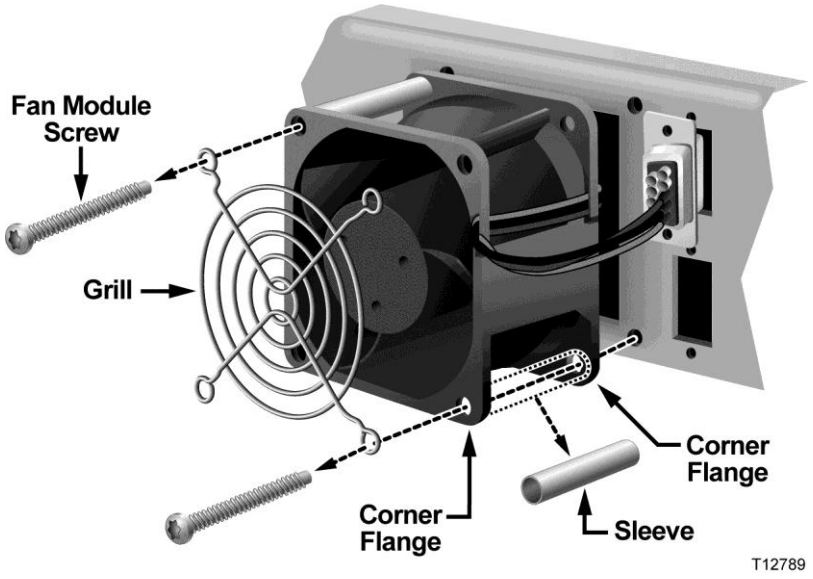


9 Disconnect the 9-pin connector.

10 Remove the following components from the unit and place them in a safe location nearby:

- Two torx screws
- Two sleeves
- The grill that protects the fan from debris

  Important: The sleeves are loosely positioned between the flanges and are not connected to the fan. Be carful not to drop them as you remove them from the unit.



11 Remove the non-functioning fan unit. Set this fan unit aside for safe disposal later.

> **WARNING:**
>
> **Avoid electric shock hazard. Hazardous voltage can be accessed inside the unit when a fan is removed.**

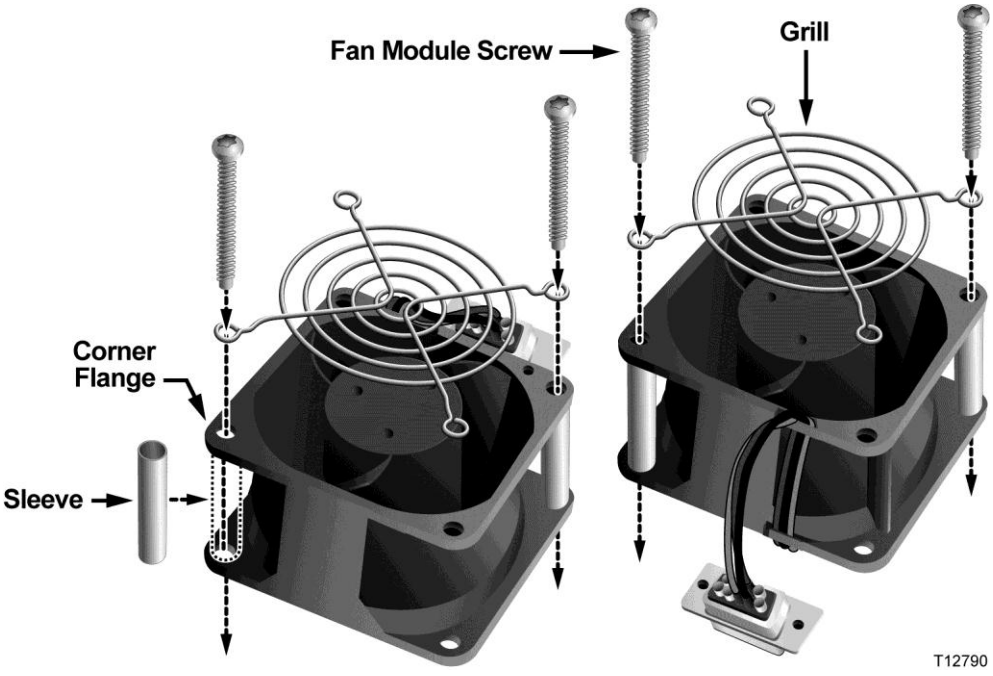
12 Place the new fan unit on a flat work surface or on top of the NOBE.

13 Place the grill in the proper location on the fan.

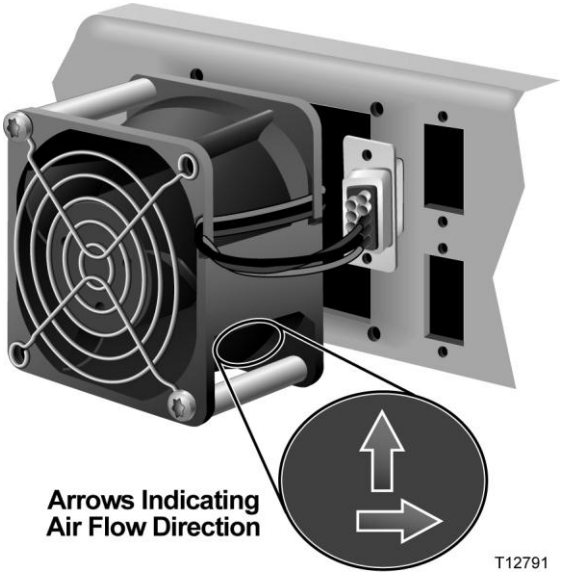
14 Insert the sleeves between the corner flanges.

15 Hold each sleeve in place while you insert the screw through the grill, sleeve, and the back of the fan unit. Repeat this step for all four screws.

Note: You may find an alternate method for reassembling the fan pieces that is more comfortable for you. Whatever method you use, be carful that you do not drop one of the fan components.



16 Hold the new fan unit in place on the side panel of the bulk encryptor so that the 9-pin connector aligns with its socket. Verify that the arrows indicating air flow direction are pointing up and into the unit (see the following diagram). Make sure the arrows are not pointing toward you. Tighten both screws to secure the fan in place.



17 Insert the 9-pin connectors into the 9-pin socket, and then replace and carefully tighten both screws that secure the 9-pin connector to the side panel. Do not over tighten or cross thread any of the screws.

18 Did you have to remove the NOBE completely from the rack?

- If **yes**, go to step 19.
- If **no**, go to step 20.

19 Replace the NOBE into its original position in the rack and secure it in the rack using the original screws. Then, go to step 20.

20 Reconnect the power cord and power on the NOBE.

21 Does the new fan unit operate properly and did the alarm(s) clear?

- If **yes**, you have completed this procedure.
- If **no**, contact Cisco Services for assistance.

6

Troubleshooting the NOBE

This chapter provides explanations of major, minor, and status alarm conditions and instructions for checking alarms.

In This Chapter

Alarm Conditions

This section describes major, minor, and status alarms. Refer to ***Troubleshooting With Alarm Manager*** (on page 96) for a list of alarms and possible solutions.

Purpose and Severity Levels of Alarm Indicators

Alarms provide system operators with an indication of an abnormal condition. Alarm indicators turn on when hardware or software conditions occur that might cause the NOBE to operate incorrectly or fail. Examples of such conditions include temperature fluctuations, power supply failure, communication problems, or the detection of bad data. All alarms are automatically enabled after powering up the NOBE.

The following table describes each of the status and alarm indicators on the front panel of the NOBE.

Status Indicators

Indicator	Description
POWER	When the POWER indicator lights, the NOBE is receiving power.
RUN/LOAD	When the RUN/LOAD indicator lights the NOBE is running under normal conditions. When the RUN/LOAD indicator blinks, the NOBE is downloading a new version of code.

Alarm Indicators

Title	Title
MINOR ALARM	When the MINOR ALARM indicator lights, a non-fatal error condition is pending. Under this condition, the NOBE may continue to operate with some loss of functionality.
MAJOR ALARM	When the MAJOR ALARM indicator lights, a fatal error condition is pending. A fatal error indicates a complete loss of functionality. Major alarms occur for hardware or software conditions that indicate a serious disruption of service or the malfunctioning or failure of important circuits. These situations require the immediate response of the technician to restore or maintain system operability.

Front Panel Alarm Indicators

The following table lists the conditions that cause MAJOR ALARM and MINOR ALARM indicators to turn on.

Note: For additional information on each of the alarm descriptions listed here, see ***Troubleshooting With Alarm Manager*** (on page 96).

Alarm Level	Alarm Description
MINOR ALARM	■ Temperature Exceeded ■ Input (1-8) MPEG continuity error ■ Input (1-8) MPEG Transport error ■ Input (1-8) errored MPEG packets ■ Input (1-8) FIFO overflow ■ Output (1-8) FIFO overflow ■ Output (1-8) packets were dumped ■ Input (1-8) ECM PID conflict ■ Power supply failure
MAJOR ALARM	■ Input (1-8) loss of input signal ■ Ethernet loss of signal ■ Hardware error ■ Runtime error (operating system) ■ Input (1-8) auto negotiate failure ■ Fan (1 - 5) failure ■ Session xxx data error, where xxx is a number from 0 to 991

Troubleshooting With Alarm Manager

If you are using our optional DBDS Alarm Management System to monitor network elements, Netcrypt alarms are monitored on the DNCS. Refer to the table in this section to find and correct the cause of these alarms. Some alarms may require you to contact Cisco. Refer to ***Customer Information*** (on page 113), for contact information.

Alarm Manager Alarms

Refer to the following table to diagnose and correct the following alarm conditions.

Note: For more details on troubleshooting alarms, refer to *DBDS Alarm Manager 1.0 Online Help* (part number 745259) .

- Threshold Exceeded alarm
- Session Capacity Exceeded alarm
- Total Outstanding Sessions alarm (This alarm will alert the operator of the need for an additional NOBE).

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Temperature Exceeded	Minor	The internal temperature of the NOBE is approaching 120ºC (248ºF) for the network processors and 120ºC (248ºF) for the FPGA (field-programmable gate array).	Remove vent obstructions. Provide more cooling and ventilation. Check power connections for the exhaust fans. Contact Cisco Services. **Important:** You should check the temperature on the NOBE daily or more frequently if possible.
Input (1-8) MPEG continuity error	Minor	MPEG continuity error counter. One or more of the MPEG packets are being dropped.	Check one or more upstream devices connected to the GbE ports. Contact Cisco Services.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Input (1-8) MPEG Transport error	Minor	MPEG transport error indicator counter. An error occurred in the header of the MPEG packet.	■ Check one or more upstream devices connected to the GbE ports. ■ Run the Doctor Report to troubleshoot network connectivity issues. ■ Contact Cisco Services.
Input (1-8) loss of input signal	Major	No signal. This indicates one or more of the following conditions: ■ An upstream device that provides input to the NOBE has failed or is offline. ■ A cable has been disconnected.	■ Check for loose or broken GbE cable connections to the NOBE. ■ Check that the GbE outputs of upstream devices are active. ■ Run the Doctor Report to troubleshoot any network connectivity issues. ■ Contact Cisco Services.
Input (1-8) errored MPEG packets	Minor	An MPEG sync byte error occurred in the header of MPEG packets as they arrived at the indicated Input port.	■ Contact Cisco Services. ■ Check one or more upstream devices connected to the GbE ports.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Input (1-8) FIFO overflow on the GigE media access controller (GMAC)	Minor	A first-in first-out (FIFO) overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the NOBE. ■ The data rate as defined from the DNCS for the Netcrypt session is too low, which also means that the data rate of the GbE input to the NOBE is too high. ■ Excessive amount of IP (non-MPEG) network traffic. ■ Hardware problem exists.	■ Reduce the data rate of input to the NOBE by doing the following: • Reducing the amount of incoming data • Reducing the amount of data added to the stream ■ Verify and correct session rate targets and threshold values. ■ Reduce flow of general IP (non-MPEG) traffic to the NOBE. ■ Contact Cisco Services.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Input (1-8) packets were dumped See also Input (1-8) FIFO overflow	Minor	A FIFO overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the NOBE. ■ The data rate as defined from the DNCS for the Netcrypt session is too low, which also means that the data rate of the GbE to the NOBE is too high. ■ Hardware problem exists. ■ Excessive IP (non-MPEG) network traffic being sent to the NOBE.	■ Reduce the data rate of input to the NOBE by doing the following: ■ Reducing the amount of incoming data ■ Reducing the amount of data added to the stream ■ Run the Doctor Report to troubleshoot network connectivity issues. ■ Reduce flow of general IP (non-MPEG) traffic to the NOBE. ■ Contact Cisco Services.
Ethernet loss of signal	Major	This indicates one or more of the following conditions: ■ An upstream device that provides input to the NOBE has failed or is offline. ■ A cable has been disconnected.	Check for loose or broken Ethernet cable connections to the NOBE ■ Check that the Ethernet outputs of upstream devices are active. ■ Run the Doctor Report to troubleshoot any network connectivity issues. ■ Contact Cisco Services.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Output (1-8) FIFO overflow See also Output (1-8) packets were dumped	Minor	A first-in first-out (FIFO) overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the NOBE. ■ The data rate as defined from the DNCS for the Netcrypt session is too low, which also means that the data rate of the GbE input to the NOBE is too high. ■ Hardware problem exists.	■ Reduce the data rate of input to the NOBE by doing the following: • Reducing the amount of incoming data • Reducing the amount of data added to the stream • Verify and correct session rate targets and threshold values. ■ Contact Cisco Services.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Output (1-8) packets were dumped See also Output (1-8) FIFO overflow	Minor	A FIFO overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the indicated port on the NOBE. ■ The data rate as defined from the DNCS for one or more Netcrypt sessions is too low for the indicated port, which also means that the data rate of the GbE to the NOBE is too high ■ Hardware problem exists.	■ Reduce the data rate of input to the NOBE by doing the following: • Reducing the amount of incoming data • Reducing the amount of data added to the stream ■ Run the Doctor Report to troubleshoot network connectivity issues. ■ Contact Cisco Services.
Reset detected	Status	The NOBE has been reset by either a power loss or a manual reset.	Session and alarm provisioning are sent to the NOBE again automatically from the DNCS. However, you should also check the following: ■ Verify that there are still broadcast services on this NOBE. ■ Verify that the reset did not adversely affect broadcast services. ■ Run the Doctor Report to troubleshoot any network connectivity issues. ■ Contact Cisco Services.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Hardware error	Major	General-purpose hardware error or hardware failure occurred.	Contact Cisco Services.
Runtime error	Major	General-purpose software error occurred.	■ Reset the NOBE by the power switch or, if possible, by DNCS control. ■ Contact Cisco Services.
Craft event change	Status	The NOBE did not receive the third-party CA provisioning message. The NOBE will not attempt to connect to external devices such as the Event Information Scheduler (EIS) and the Entitlement Control Message Generator (ECMG) devices while this alarm is active.	Check for loose connections or defective cables, tighten any loose cable connections, connect any disconnected cables, and replace any defective cables. Check the EIS Configuration and ECMG List windows on the DNCS for this NOBE and enter data in the fields on these windows if necessary. Display the DNCS Control window on the DNCS and verify that the pkeManager process on the DNCS is running. If it is not running, restart the pkeManager process.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Input (1-8) ECM PID conflict	Minor	Program Specific Information (PSI) table data changed in the input stream.	■ Check the upstream MPEG input sources connected to the NOBE. ■ If the alarm does not automatically clear, contact Cisco Services.
Input (1-8) auto negotiate failure	Major	The Ethernet auto-negotiation algorithm has failed on the indicated (1-8) GbE port. **Note:** The GMAC device attempts to auto-negotiate again and clear the alarm on its own.	■ If the alarm does not clear, try connecting the Ethernet cable for that port to another port on the GbE hub/switch. ■ Contact Cisco Services.
Input (1-8) PAT update	Status	The PAT seen at one of the inputs (1-8) on the NOBE yields a version number change indicating that the input stream has changed.	No action required.
Input (1-8) PMT update	Status	The PMT for an MPEG program on input 1-8 has changed.	No action required.
Fan (1 - 5) failure	Major	One of the ventilation fans failed. **Note:** Fans are numbered 1 to 5 from front to back.	■ Verify that the fan power cable is connected. ■ Contact Cisco Services
Power supply failure	Minor	At least one internal power	Contact Cisco Services.

Alarm Description	Alarm Level	Probable Cause	Check and Correct
Session xxxx data error where xxxx is a number from 0 to 3999	Minor	A data_overflow error indicates that the data rate for this session exceeds the threshold value. There is a potential for loss of programming content, black screens, freeze frames, and other degradations to services sent from this NOBE.	Verify and correct any session setup problems including the session rate target and threshold values. Verify the sources feeding this NOBE.
		A data_underflow error indicates that the data rate for this session drops to 0 (zero) or is a predefined percentage less than the threshold value.	Verify and correct any session setup problems including the session rate target and threshold values. If the session setup is correct, data is becoming corrupted. Verify the sources feeding this modulator. If loss of input signal is the cause, restore the input signal.
		A data_pid_enable_error indicates that a PID that should be enabled on the NOBE is not enabled. (A PID is contained in the MPEG header to link MPEG packets together.)	If this alarm occurs with this Cause Code and then quickly clears, it is not a cause for concern. **Note:** If the alarm does not quickly clear, tear down the session, verify the session parameters, and restart the session. If the alarm reoccurs, the PID is missing from the input stream. Verify the missing PID with an MPEG analyzer.

Troubleshooting With Telnet

After using telnet to connect to the NOBE, you can issue commands that can help you verify that the NOBE is functioning as expected. You can also use telnet to troubleshoot. This section describes the commands you can use once you have telnetted to a NOBE and gives instructions for using the commands.

Telnet Commands for a NOBE

After you have telnetted to the NOBE, you can use any of the following commands.

- **print_session_status** to verify that an Overlay session is active on the NOBE. For assistance, go to ***Verify an Overlay Session Is Active*** (on page 106).
- **print_tsr_status** to verify that an Overlay TSR is active on the NOBE. For assistance, go to ***Verify an Overlay TSR Is Active*** (on page 108).
- **gmacstats** to verify that data is flowing through a NOBE. For assistance, go to ***Verify Data Is Flowing Through a NOBE*** (on page 109).
- **perf_sess_info** to display diagnostic information for programs transmitted from the NOBE. For assistance, go to ***Display Diagnostic Information for Programs*** (on page 111).

Telnetting to a NOBE

Follow these instructions to telnet to a NOBE

1. From the Administrative Console, click the **DNCS** tab and then click the **Utilities** tab.
2. Click **xterm** to open an xterm window.
3. From the xterm window, type **telnet <IP address of NOBE>** and press **Enter**. For example, if the NOBE has a management IP address of 172.16.4.200, you would type **telnet 172.16.4.200**. The system prompts you to enter a user name.
4. Type **Netcrypt** and press **Enter**. The system prompts you to enter a password.
5. Type **Netcrypt** and press **Enter**. The system displays the prompt NC_HOST>.

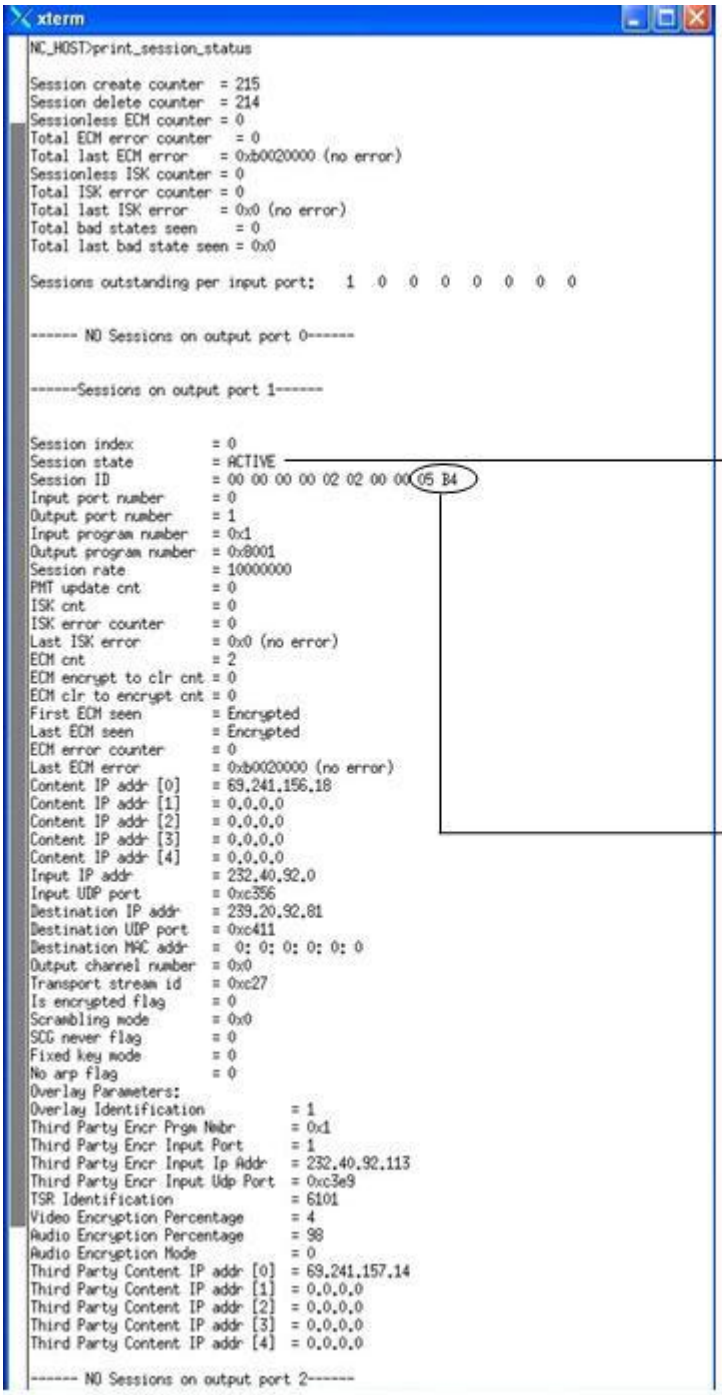
   Note: Your password will be displayed as you type it.
6. From the NC_HOST prompt, you can enter any of the following commands:
   - **print_session_status** to verify that an Overlay session is active on the NOBE. For assistance, go to ***Verify an Overlay Session Is Active*** (on page 106).
   - **print_tsr_status** to verify that an Overlay TSR is active on the NOBE. For assistance, go to ***Verify an Overlay TSR Is Active*** (on page 108).
   - **gmacstats** to verify that data is flowing through a NOBE. For assistance, go to ***Verify Data Is Flowing Through a NOBE*** (on page 109).
   - **perf_sess_info** to display diagnostic information for programs transmitted from the NOBE. For assistance, go to ***Display Diagnostic Information for Programs*** (on page 111).
7. To close the telnet connection to this NOBE, type **Ctrl-]** and press **Enter**. The system displays a telnet> prompt.
8. To exit the telnet session, type **quit** and press **Enter**. The system displays a dncs prompt.
9. To close the xterm window, type **exit** and press **Enter**.

Verify an Overlay Session Is Active

Follow these instructions to use the **print_session_status** command to verify that an Overlay session is active.

1. From the NC_HOST> prompt type **print_session_status** and press **Enter**. The system displays all sessions located on the NOBE, similar to the following example.

Note: For illustration purposes, this example contains only one session. You are likely to have many sessions. To find a specific session, copy the output of this command to a text file and use the search option to find a specific session.



2 To close the telnet connection to this NOBE, type **Ctrl-]** and press **Enter**. The system displays a telnet> prompt.

3 To exit the telnet session, type **quit** and press **Enter**. The system displays a dncs prompt.

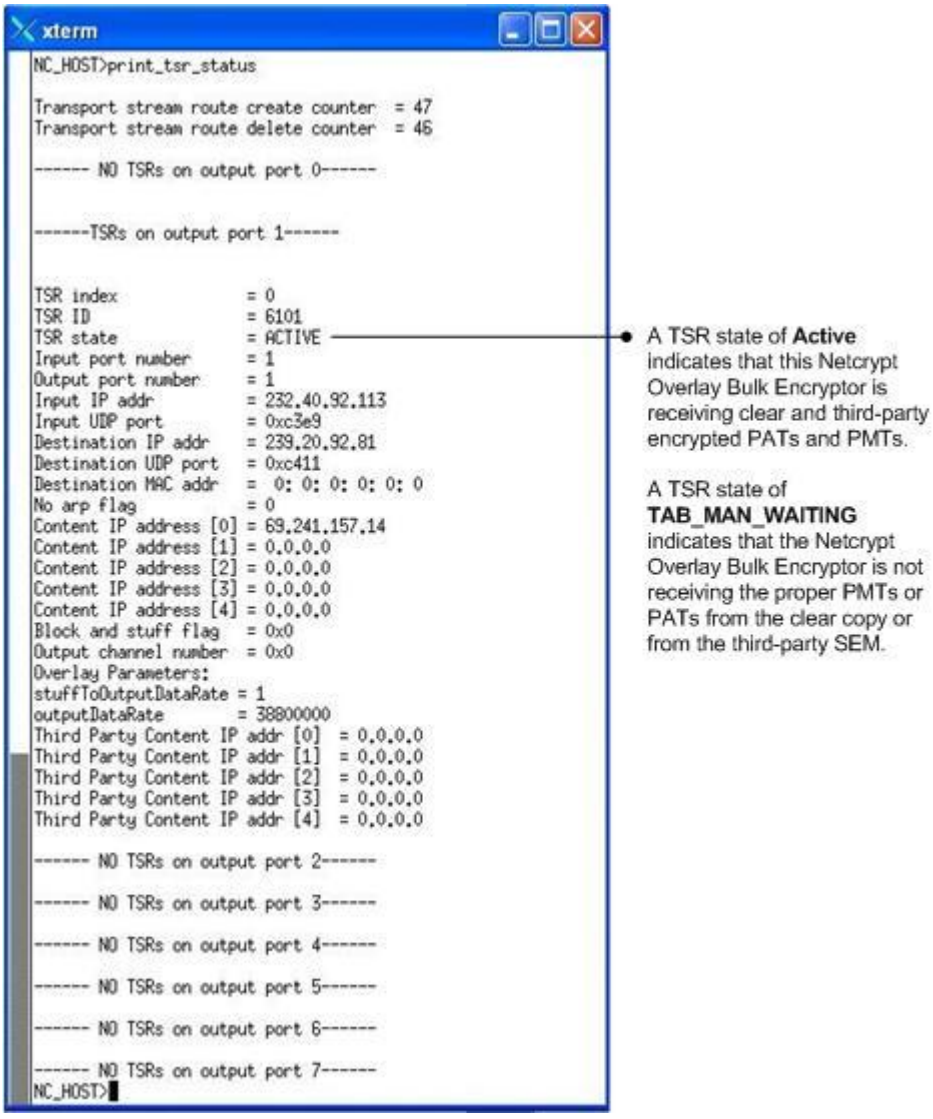
4 To close the xterm window, type **exit** and press **Enter**.

Verify an Overlay TSR Is Active

Follow these instructions to use the **print_tsr_status** command to verify that an Overlay TSR is active.

1 From the NC_HOST> prompt type **print_tsr_status** and press **Enter**. The system displays all sessions located on the NOBE, similar to the following example.

Note: For illustration purposes, this example contains only one TSR. You are likely to have many TSRs. To find a specific TSR, copy the output of this command to a text file and use the search option to find a specific TSR.



2 To close the telnet connection to this NOBE, type **Ctrl-]** and press **Enter**. The system displays a telnet> prompt.

3 To exit the telnet session, type **quit** and press **Enter**. The system displays a dncs prompt.

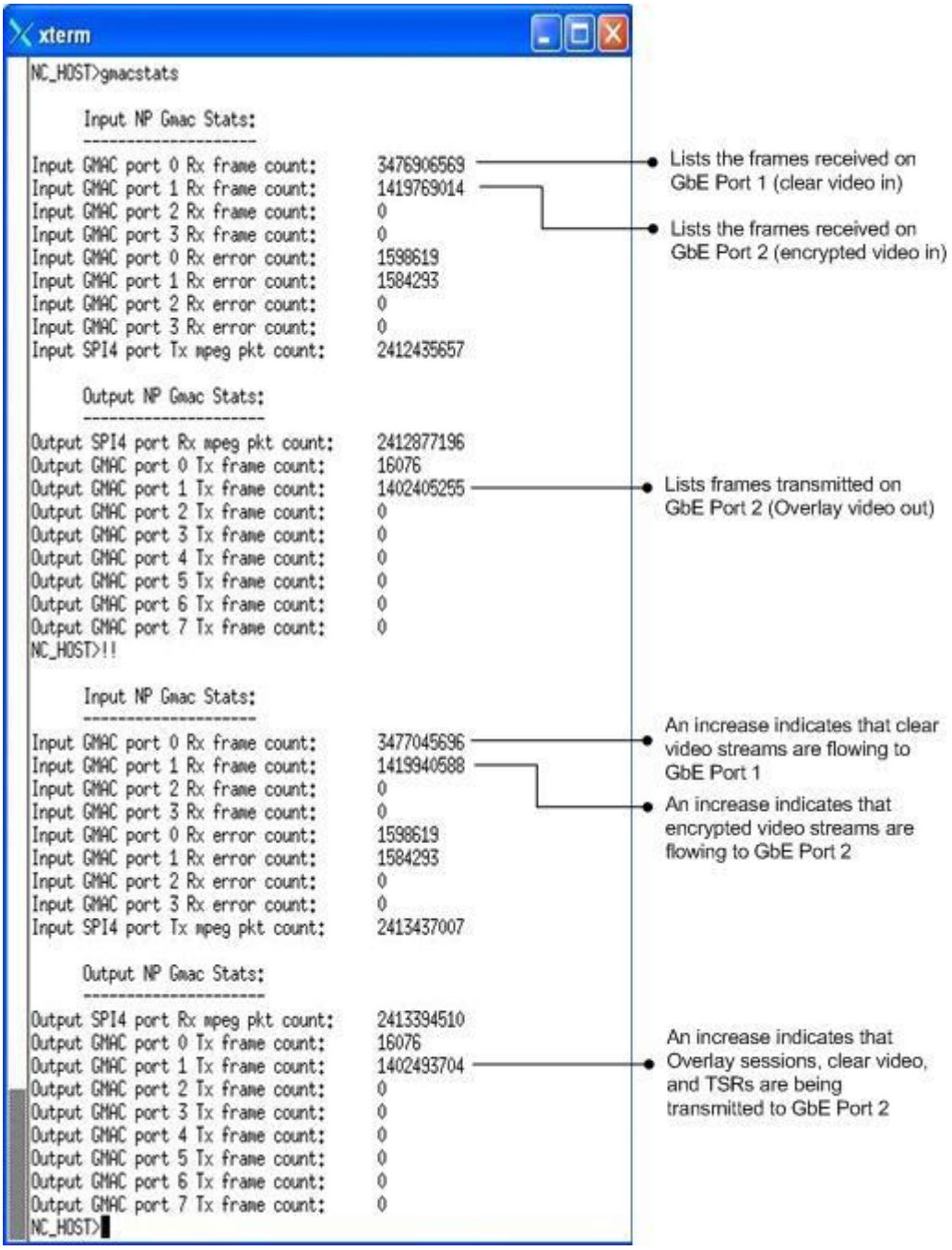
4 To close the xterm window, type **exit** and press **Enter**.

Verify Data Is Flowing Through a NOBE

Follow these instructions to use the **gmacstats** command to verify that data is flowing through the NOBE.

1. From the NC_HOST> prompt type **gmacstats** and press **Enter**. The system shows the packet counts for the GbE Ethernet media access control (GMAC) input and output NOBE ports.
2. Immediately type **!!** and press **Enter**. The system repeats the command you entered in step 1. The system displays data similar to the following example.

Note: This allows you to compare the results of the two commands that show data from different periods of time.



3 To close the telnet connection to this NOBE, type **Ctrl-]** and press **Enter**. The system displays a telnet> prompt.

4 To exit the telnet session, type **quit** and press **Enter**. The system displays a dncs prompt.

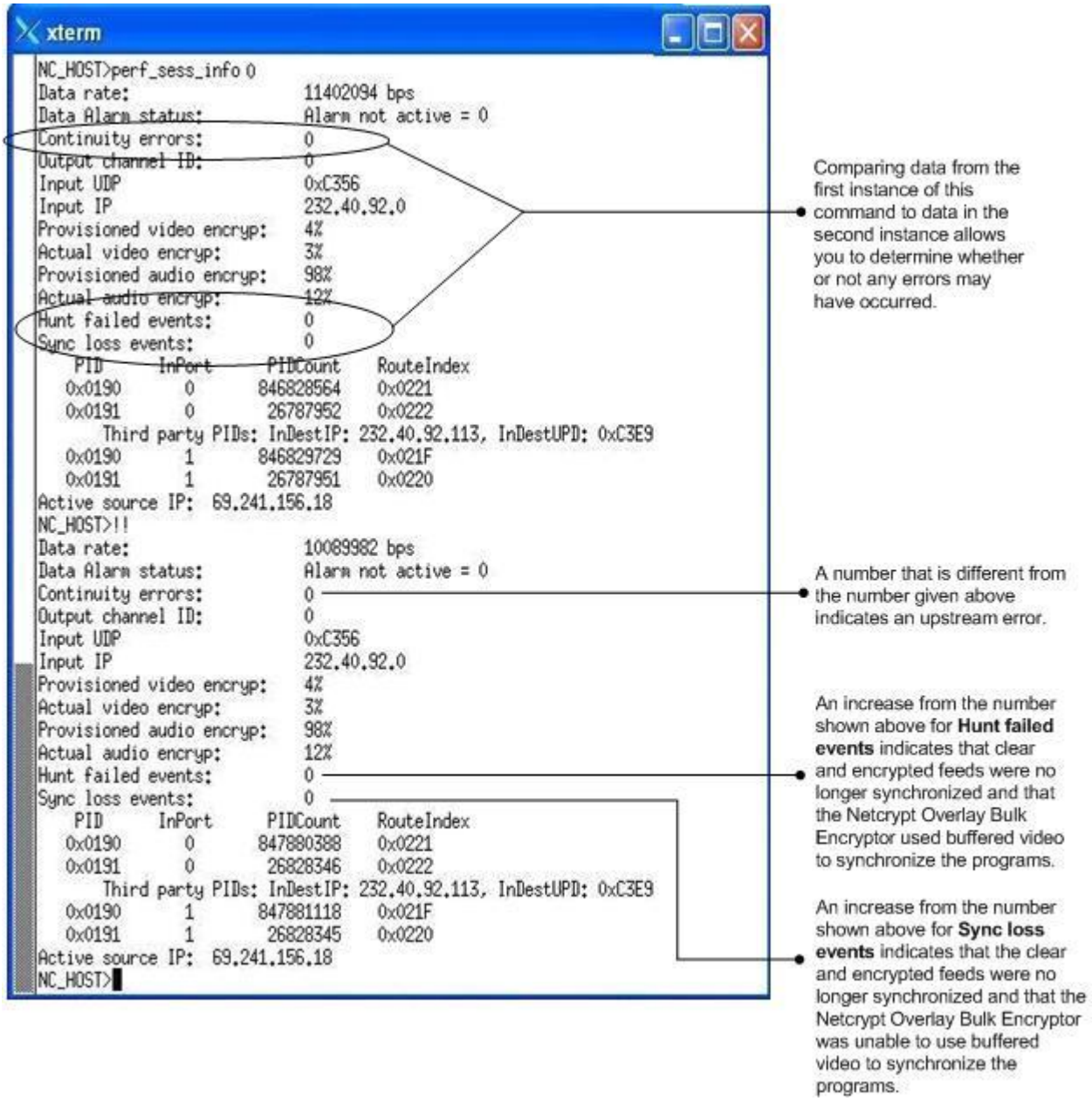
5 To close the xterm window, type **exit** and press **Enter**.

Display Diagnostic Information for Programs

Follow these instructions to use the **perf_sess_info** command to display diagnostic information for programs transmitted from a NOBE.

1. From the NC_HOST> prompt type **perf_sess_info** and press **Enter**. The system displays diagnostic information for programs transmitted from the NOBE.
2. Immediately type **!!** and press **Enter**. The system repeats the command you entered in step 1. The system displays data similar to the following example.

   Note: Comparing the results of each instance of the command allows you to examine data from different periods of time.



3 To close the telnet connection to this NOBE, type **Ctrl-]** and press **Enter**. The system displays a telnet> prompt.

4 To exit the telnet session, type **quit** and press **Enter**. The system displays a dncs prompt.

5 To close the xterm window, type **exit** and press **Enter**.

7

Customer Information

If You Have Questions

If you have technical questions, call Cisco Services for assistance. Follow the menu options to speak with a service engineer.

Access your company's extranet site to view or order additional technical publications. For accessing instructions, contact the representative who handles your account. Check your extranet site often as the information is updated frequently.

A

Technical Specifications

Introduction

This appendix lists the power, rack, and environmental requirements for installing the NOBE and provides technical specifications for the unit.

In This Appendix

Installation Requirements

This section lists the power, rack, and environmental conditions necessary for installing and operating the NOBE.

Power Requirements Table

The following table describes the power specifications for the NOBE.

Item	Specification
Supply Voltage	100–240 VAC 50/60 Hz 2.5 A
Fuse	Two 4.0 A SLO BLO 250 V fuses (Cisco part numbers 188106)
Line Frequency	47 to 63 Hz
Power Required	300 VA (maximum)
Power Dissipated	275 Watts (maximum)
In Current	■ 35 amps maximum, Vin = 100 VAC ■ 75 amps maximum, Vin = 240 VAC

Rack Requirements Table

The following table lists the rack requirements for the NOBE.

Item	Specification
Rack Mount Type	EIA RS-310
Height	3.5 in./88.9 mm
Width	19 in./482.6 mm
Depth	22.5 in./571.5 mm
Weight	24.5 lb./11.10 kg

Environmental Requirements Table

The following table lists the environmental for the NOBE.

Item	Specification
Operating Temperature	0°C (32°F) to 50°C (122°F) **CAUTION:** **void damage to this product. Your warranty is void if you operate this product above the maximum specified operating temperature.** **Do not obstruct the air vents or fan vents on the sides of the unit. Otherwise, damage can occur to the unit.** **Important:** You must use the supplied notched rack mounts (part numbers 734845 and 734846) to mount the NOBE in the rack. These rack mounts allow correct air circulation through the unit.
Storage Temperature	-10°C (14°F) to 70°C (158°F)
Operating Humidity	5% to 95%, non-condensing
Electrostatic Shock Susceptibility	No damage sustained from five discharges of 15 KV IEC electrostatic discharge model (150pF + 150 ohm) to all exposed connections

Connector Type Table

The following table lists the various types of connectors for the NOBE.

Item	Specification
Gigabit Ethernet	SFP Module. Modules are available for duplex multimode fiber and copper interface
10/100 BASE-T Ethernet (2)	RJ-45
AC Power	IEC three wire (with integrated or close proximity power switch)
Craft (serial port) I/O	RS-232 serial port using an RJ-45 jack

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