NSG9000-40G HectoQAM™
Narrowcast Services Gateway

NSG 9000-40G Software User Guide
VERSION 3.2.X
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Documentation Conventions

This manual uses some special symbols and fonts to call your attention to important information. The following symbols appear throughout this guide:

<table>
<thead>
<tr>
<th>NOTE:</th>
<th>The Note symbol calls your attention to additional information that you will benefit from heeding. It may be used to call attention to an especially important piece of information you need, or it may provide additional information that applies in only some carefully delineated circumstances.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIP:</td>
<td>The Tip symbol calls your attention to parenthetical information that is not necessary for performing a given procedure, but which, if followed, might make the procedure or its subsequent steps easier, smoother, or more efficient.</td>
</tr>
</tbody>
</table>

In addition to these symbols, this manual uses the following text conventions:

- **Data Entry**: indicates text you enter at the keyboard.
- **User Interface**: indicates a button to click, a menu item to select, or a key or key sequence to press.
- **Screen Output**: shows console output or other text that is displayed to you on a computer screen.
- **Bold**: indicates the definition of a new term.
- **Italics**: used for emphasis, cross-references, and hyperlinked cross-references in online documents.
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Chapter 1
Features and Specifications

1.1 Introduction

This guide describes the configuration and monitoring instructions for NSG (Network Services Gateway) 9000-40G using its web client.

This universal high density EdgeQAM supports multiple applications and delivers up to 432 QAM-RF output streams with full QAM placement agility. QAM channels can be placed anywhere within a pre-defined transmission window.

The number of the delivered transport streams is defined according to the device configuration and number of QAM-RF modules mounted in the slots of the device. Each QAM may serve a different application allowing a single device to concurrently support multiple applications. The supported applications are as follows:

- VOD (Video On Demand)
- Broadcast
  - Service remux
- SDV (Switched Digital Video)
  - ISA
  - NGOD (Next Generation On Demand)
- M-CMTS
  - High Speed Data
  - M-CMTS (Modular CMTS)
## 1.2 Main Firmware Related Features

The following table describes the main features supported by the narrowcast firmware:

<table>
<thead>
<tr>
<th>Category</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Max input sockets</td>
<td>1000 multicast 8000 unicast</td>
</tr>
<tr>
<td></td>
<td>Max. Input bit rate</td>
<td>Up to 40,000 Mbps per device</td>
</tr>
<tr>
<td></td>
<td>Dynamic Extraction of input</td>
<td>Video only - Dynamic detection of changes in services and PSI tables at the input.</td>
</tr>
<tr>
<td></td>
<td>Input Format</td>
<td>Video - MPEG2 transport over UDP/IP M-CMTS - L2TPv3 streams</td>
</tr>
<tr>
<td></td>
<td>VOD - In-band provisioning of IP/UDP unicast sockets</td>
<td>Programs are automatically routed to the required output QAM channel based on their UDP port number. User may select between several different UDP mapping templates. See 4.2.3 Defining UDP Mapping on page 65.</td>
</tr>
<tr>
<td>IP multicast</td>
<td>supports IGMP ver 1/2/3</td>
<td></td>
</tr>
</tbody>
</table>
| Processing                                | Multiplexing/ provision options              | Full multiplexing (any input to any output)  
Multicast of any input stream to multiple transport streams.  
Socket pass-through: NSG 9000-40G may be configured to pass input sockets in their entirety to a given output QAM channel. However, pass-through sockets may not be multicast to multiple output QAM channels. (For future use)  
Spooling of PSI/SI tables (for future use) |
|                                           | Switched Digital Video                       | Supported SDV protocols:  
ISA  
NGOD R6 and D6                                                                                                                                |
|                                           | Scrambling                                   | Motorola Privacy Mode scrambling  
DVB Scrambling                                                                                                                                 |
|                                           | Modular CMTS                                  | Serves as an EdgeQAM in WB & NB applications, supports the following DOCSIS 3.0 protocols:  
DEPI (MPT)  
DRFI  
DTI                                                                                                                                           |
## Table 1-1: Main Firmware Related Features

<table>
<thead>
<tr>
<th>Category</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Max output bit rate</td>
<td>See NSG 9000-40G Hardware and Installation User's Guide</td>
</tr>
<tr>
<td></td>
<td>QAM-RF</td>
<td>See NSG 9000-40G Hardware and Installation User’s Guide</td>
</tr>
<tr>
<td></td>
<td>ASI/GbE Monitoring</td>
<td>The unit duplicates any requested QAM channel to the ASI output port/GbE port for monitoring purposes.</td>
</tr>
</tbody>
</table>
| Management             | Management and monitoring interfaces | * Control Panel  
* Web client  
* MCT (Mass Configuration Tool)  
* NMX (Harmonic's Digital Service Manager)  
* SNMP  
* SysLog |
|                        | QAM utilization statistics  | When NMX is used for alarms and status monitoring, it may also provide statistical reports of QAM utilization. |
Harmonic offers several methods for configuring the NSG 9000-40G devices and monitoring
their status. All management interfaces listed below connect to the NSG 9000-40G over
LAN, via its ETH1 Ethernet port.

**Caution:** Harmonic strongly recommends using an Ethernet network that is isolated from
any other networks or subnets at your site for management of the NSG 9000-40G
gateways. It ensures adequate security, and prevents possible disturbances to the
normal operation of NSG 9000-40G devices due to uncontrolled network activity.

The table below lists the available management interfaces according to the management
purpose for which they are designed:

**Table 1-2: Management Interfaces**

<table>
<thead>
<tr>
<th>Tool</th>
<th>Purpose</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Panel</td>
<td>Preliminary configuration and monitoring of a single NSG 9000-40G device</td>
<td>The NSG 9000-40G control panel is located on the front panel of the NSG 9000-40G. The control panel is active once the NSG 9000-40G boots up and provides means for preliminary configuration of a single NSG 9000 device. It also allows you to monitor the NSG 9000-40G’s status, view its alarms (if present), and troubleshoot them.</td>
</tr>
<tr>
<td>Web Client</td>
<td>Configuration and monitoring of a single NSG 9000-40G device</td>
<td>The NSG 9000-40G web client is an on-board web-based user interface, that is an integral part of the NSG 9000-40G firmware. The web client is accessible through Microsoft Internet Explorer, and provides means for configuring a single NSG 9000-40G device. It also allows the user to monitor the NSG 9000-40G’s status, view its alarms (if present), and troubleshoot them. For details on Internet Explorer and accessing the web client, see 2.2.1 Logging Into the Device via IE on page 11.</td>
</tr>
</tbody>
</table>
Table 1-2: Management Interfaces

<table>
<thead>
<tr>
<th>Tool</th>
<th>Purpose</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCT (Mass Configuration Tool)</td>
<td>Configuration of multiple NSG 9000-40G devices</td>
<td>The MCT is a spreadsheet-oriented system designed to configure multiple NSG’s simultaneously. MCT is recommended for large-scale NSG deployments. Besides simultaneous configuration of large number of NSG devices, it also allows users to perform firmware upgrade for multiple devices. MCT is sold separately - contact Harmonic Customer Support for more details. Note: MCT is not automatically updated when an NSG is configured through the web client. Using the web client for configuring individual NSG in an MCT-based site is not recommended. If the web client is used, care should be taken to update MCT with the changed configuration. For details on synchronizing MCT with NSG devices, refer to the MCT online help.</td>
</tr>
<tr>
<td>Command Line Interface (CLI) future use</td>
<td>Configuration and monitoring of a single NSG 9000-40G device</td>
<td>The CLI comprises commands that are organized in a hierarchical structure of submenus branching down from the root directory. You can use the CLI on any computer that communicates with NSG 9000-40G and that has a free SSH client installed on it.</td>
</tr>
<tr>
<td>NMX - Harmonic's Digital Service Manager</td>
<td>Status and Alarm Monitoring of multiple NSG 9000-40G devices</td>
<td>NMX may be used for monitoring general status and alarms of multiple NSG 9000-40G devices. A single NMX manager may be used to monitor several hundreds NSG 9000-40G devices, located in several different sites.</td>
</tr>
<tr>
<td>3rd party SNMP monitoring</td>
<td>Status and Alarm Monitoring of multiple NSG 9000-40G devices</td>
<td>The integrated SNMP supports an extended set of SNMP MIBs. In addition, NSG 9000 may generate SNMP traps in the following SNMP versions: v1, v2c, v3.</td>
</tr>
<tr>
<td>Syslog</td>
<td>Monitoring of a single NSG 9000-40G device</td>
<td>This is a standard network protocol for logging device messages. A Syslog server that is registered with the NSG 9000-40G device will receive messages from the device whenever an alarm or warning is asserted or remitted.</td>
</tr>
</tbody>
</table>
2.1 Initial Configuration of NSG 9000-40G

The NSG 9000-40G device is configured and controlled by a remote management system. Once you have finished cabling the device (see, NSG 9K-40G Hardware and Installation User’s Guide), set NSG IP address, that is, the IP addresses of the Ethernet ports located on the back panel of the NSG 9000-40G. To set the NSG IP address, use the control panel located on the front panel of the NSG 9000-40G.

NOTE: The NSG 9000-40G requires a user name and password to log in to all management interfaces including the serial communications console, web client and SSH. See 2.2.1 Logging Into the Device via IE on page 11.

2.1.1 Configuring Ethernet Ports

NSG 9000-40G is monitored and configured by a remote management system, via the Ethernet ports located on the back panel of the NSG 9000-40G.

The Ethernet ports labeled ETH1 and ETH2 provide access to two independent networks. The NSG 9000-40G uses the Ethernet port labeled ETH1 to communicate with the management network. You may set the ETH1 IP address, subnet mask and default gateway.

NSG 9000-40G uses the Ethernet port labeled ETH2 to communicate with the CAS network. For ETH 2 you may configure only its IP address and subnet mask.

NOTE: Eth3 is for future use only.

To configure the Ethernet ports of an individual device, use the Control Panel of the device. The following sections describe how to configure individual NSG 9000-40G devices using the control panel of the unit.

When you configure the network parameters of ETH ports via the control panel, the application checks the validity of the IP address and network group parameters.

To configure ETH1 port:

Once you are in Config mode (see page 98), do the following:
1. Navigate to the Network Config screen and click <Enter>.
   The Ethernet Port 1 screen appears.
2. Click <Enter>. The ETH1 IP Address screen appears.
3. Click <Enter>. The Edit IP Address screen appears.
4. Edit the IP address and click <Enter>.
   The program checks whether you entered a valid IP address and only then applies changes. The Edit Ethernet Subnet Mask screen appears.
5. Edit the subnet mask and click <Enter>. The Edit Default GW screen appears.
6. Edit the ETH gateway and click <Enter>.
The program checks whether you entered valid network parameters and only then applies changes. The ETH1 IP Address screen appears.

If invalid network parameters are entered an error message appears.

To configure ETH2 port

NOTE: If you are using the ETH2 port, you must configure its IP address on a different subnet than that of the Ethernet 1 port.

Once you are in Config mode, do the following:

1. Navigate to the Network Configuration screen and click <Enter>.
2. Click <Down or Up> to open the Ethernet Port 2 screen.
3. Click <Enter>. The ETH2 IP Address screen appears.
4. Click <Enter>. The Edit IP Address screen appears.
5. Enter the required IP address and click <Enter>. The program checks whether you entered a valid IP address and only then applies changes. The Edit Subnet Mask screen appears.
6. Enter the required subnet mask and click <Enter>. The program checks whether the network group parameters are valid and only then applies the changes. The ETH2 IP Address screen appears.

If invalid network parameters are entered, an error message appears.

NOTE: You can re-configure the Ethernet ports using MCT or the Web client. MCT allows the configuration of a number of NSG devices and the Web client allows a remote individual configuration.

For further information about the Control Panel, see B.1 Using the Control Panel on page 96.

2.2 Full Device Configuration

The NSG 9000-40G web client allows a full configuration of the NSG 9000-40G device. It also allows the user to monitor the NSG 9000-40G’s status, view its alarms (if present), and troubleshoot them. This manual describes and instructs you on how to configure and monitor the device via the web client.

The web client is accessible through a web browser. The following web browsers are supported:

Table 2-1: Supported Web Browsers

<table>
<thead>
<tr>
<th>Microsoft Internet Explorer Supported Versions</th>
<th>Mozilla FireFox Supported Versions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>3.5</td>
</tr>
<tr>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>
2.2.1 Logging Into the Device via IE

To log into the device via IE, open a browser and login by using the required user name and password. Each user is eligible to a different mode of work with the device. The following table lists the various users and their working mode:

Table 2-2: Username and Working Mode

<table>
<thead>
<tr>
<th>Username</th>
<th>Password</th>
<th>Working Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>guest</td>
<td>nsgguest</td>
<td>Allows only to monitor the operation of the device.</td>
</tr>
<tr>
<td>config</td>
<td>nsgconfig</td>
<td>Allows to configure the device and to define the Config and Guest access level password.</td>
</tr>
<tr>
<td>admin</td>
<td>nsgadmin</td>
<td>Allows to configure the device, to define a password to all users and to export and import firewall tables. See page 31.</td>
</tr>
</tbody>
</table>

The current access level appears in the title bar of the web client.

NOTE: In this version, the user name is root

To login the device
1. Open an IE browser.
2. Type in the address of the required device.
3. Click Go or press <Enter>.
4. In the Connect To dialog type in the required username and password.
5. To save the password for the future, select Remember my password.
6. Click Ok.

The web client page appears and you may start working with the device according to the restrictions of your access level.
2.3 Guidelines for Device Configuration

Once the NSG 9000-40G is properly cabled and setup in your network, you may access it via the web client in order to configure and monitor it. The web client reads data from the NSG 9000-40G and presents it in an easy to use User Interface (UI).

2.3.1 Web Client Page

Once you have logged into the device, the web client page appears. It includes the following sections:

- **Title bar** - displays the following:

![Title bar image]
Chapter 2 Getting Started Guidelines for Device Configuration

- Device model, for example: NSG 9000-40G
- Device name - by default it is the IP address of the device. You can select it and type any name for easy identification and click Apply. For example: Rack 5-NSG 3.
- Logged-in user
- Alarm indicator - the alarm indicator is actually a link to the Alarm page and the indicator provides the following information:

Table 2-3: Alarm Indication

<table>
<thead>
<tr>
<th>Alarm Indication</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Alarm button</td>
<td>No active alarms.</td>
</tr>
<tr>
<td>Red Alarm button</td>
<td>There is at least one active alarm. Once the mouse pointer hovers on it, a hint appears displaying the alarm description. Once you click it, the Alarm page opens.</td>
</tr>
<tr>
<td>Orange Alarm button</td>
<td>There is at least one active warning. Once the mouse pointer hovers on it, a hint appears displaying the alarm description. Once you click it, the Alarm page opens.</td>
</tr>
</tbody>
</table>

N Active Alarms  
N Active Warnings  

- Help button - allows you to access information about the various options provided by the web client. The provided help is a context sensitive help. Upon clicking the help button, the help page relevant to the open web client page appears.

- Tabs bar - Links you to parameters required for NSG 9000-40G configuration. The Tabs bar is comprised of two sections:
  - Main tabs - includes the tabs listed in the following table and the Apply button
  - Sub tabs - includes tabs related to the Main tab as the following table describes.

Table 2-4: Available Tabs

<table>
<thead>
<tr>
<th>Main Tab</th>
<th>Sub Tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>General - allows to configure chassis parameters, input and output ports and QAM-RF module parameters.</td>
</tr>
<tr>
<td></td>
<td>Licensing - allows to manage the licenses. For future use</td>
</tr>
<tr>
<td></td>
<td>NGOD - allows to set general NGOD ERM parameters to enable communication with the NSG 9000-40G device.</td>
</tr>
<tr>
<td></td>
<td>ISA - allows to set general ISA parameters to enable communication with the NSG 9000-40G device</td>
</tr>
</tbody>
</table>
Table 2-4: Available Tabs

<table>
<thead>
<tr>
<th>Main Tab</th>
<th>Sub Tab</th>
</tr>
</thead>
</table>
| Application | - VOD - allows to define the VOD parameters. See page 62.  
|           | - Broadcast - allows to define service remux. See page 68.  
|           | - SDV - allows to define SDV sessions. See page 72.  
|           | - M-CMTS - allows to define M-CMTS sessions. See page 81.  
|           | - D2E - for future use only. For future use.  
|           | - CAS - allows to define the CAS parameters. See page 84.  |
| Monitoring | - Traffic - shows the traffic that flows out of the device. See page 93.  
|           | - Alarms - shows the currently raised alarms. See page 98.  
|           | - Diagnostics - allows ASI and IP forwarding for monitoring and analysis purposes.  
|           | - Logs - allows to view the GbE counters, alarm logs, NGOD RTSP messages and RPC communication messages. See page 113 - page 114.  |
| Reports   | Allows to view the RF configuration. See page 118.  |

- **Apply button** - to the right of the Tabs bar. A click on this button sends the updated configuration to the device.
- **Work area** - This section changes according to the selected tab and includes the parameters required for the configuring.

## 2.3.2 Stages of NSG 9000-40G Configuration

Configuring the NSG 9000-40G model includes the following stages:

- **Defining/viewing Platform Parameters**, a one time configuration. During this stage, define Ethernet 1&2 ports, GbE input ports and view platform parameters such as status of slots, software version, chassis serial number, and more. You can also set general device parameters such as:
  - SNMP traps
  - Time
  - Advanced network options - routing table and Access Control list
  - Device security parameters (For future use)

- **Defining QAM-RF module parameters** - during this stage define the following:
  - Global RF and QAMs parameters
  - RF port parameters
  - QAMs parameters
  - View a summary of general attributes

- **Licensing** - during this stage, view the licenses installed on the NSG device, install new licenses if needed, and assign licenses to QAM channels. (For future use)

- **Applications** - during this stage, define the parameters of the required application. The available applications are as follows:
  - VOD
  - Broadcast
  - M-CMTS
  - D2E (For future use)

- **CAS** - in case CAS is required, set the attributes of Privacy Mode as required.
2.3.2.1 Before you Begin

Before you start configuring and provisioning the device, pay attention to the following:

- Greyed out fields - fields that are for view only, or fields that are not supported in the current version.
- To change parameter values, click in the field and type the required values. Once you click away from the field, the web client interface is updated and displays the new parameters. However, the parameters are not sent to the device.
- To apply changes to fields marked with this icon ☑, you should reset the device.
- To send to the device the newly configured parameters, click Apply. Only when you click Apply, you actually submit the new parameters to the device.
- To delete rows in a table, check the Select box and then click Delete Selected.
- A web page dialog includes a Done button. When clicking this button, you save the new configuration without applying it to the device and you close the web page dialog.

2.3.2.2 Understanding GUI Tables

This section includes guidelines for understanding the following tables incorporated in the User Interface:

Table 2-5: Working with GUI Tables

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Accessing Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM table</td>
<td>Platform &gt; Slot &gt; Port # QAMs</td>
</tr>
<tr>
<td>Service Remux</td>
<td>Application &gt; Broadcast &gt; Service Remux tab</td>
</tr>
<tr>
<td>PID Remux</td>
<td>Application &gt; Broadcast &gt; PID Remux tab</td>
</tr>
<tr>
<td>VOD QAM</td>
<td>Application &gt; VOD &gt; QAMs</td>
</tr>
<tr>
<td>SDV QAM</td>
<td>Application &gt; SDV &gt; QAMs</td>
</tr>
<tr>
<td>ISA Active Sessions</td>
<td>Application &gt; SDV &gt; ISA Active Sessions tab</td>
</tr>
<tr>
<td>NGOD Active Sessions</td>
<td>Application &gt; SDV &gt; NGOD Active Sessions tab</td>
</tr>
</tbody>
</table>

In the above listed tables, you can do the following:

Resize columns by dragging the border of the table header:
Sort the column data by clicking the header. Once you click the header, the typeface becomes italicized and a small triangle indicates the sorting order:

<table>
<thead>
<tr>
<th>RF En...</th>
<th>RF O...</th>
<th>QAM...</th>
<th>TS ID</th>
<th>Serving...</th>
<th>NGOD Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1</td>
<td>1</td>
<td>1</td>
<td>QG1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.2</td>
<td>10</td>
<td>10</td>
<td>QG10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RF En...</th>
<th>RF O...</th>
<th>QAM...</th>
<th>TS ID</th>
<th>Serving...</th>
<th>NGOD Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1</td>
<td>9</td>
<td>8</td>
<td>QG8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.8</td>
<td>8</td>
<td>8</td>
<td>QG8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3
Configuring Platform Parameters

3.1 Platform Tab Overview

The Platform tab is the default tab. As soon as you link to the device it opens with the General tab selected. The Platform tab enables you to configure device parameters which are usually a one time configuration and it is recommended to configure as soon as you start working with the device. The Platform parameters are organized in the following tabs:

- Platform > General Tab - The Platform > General tab includes a graphical view of the device back panel. Focusing on each component, allows to view or configure the parameters of the component in focus. By default, Chassis is selected and the General tab is in focus. The following table lists the available components and the tabs related to each component.

Table 3–1: Platform Page – Components and Available Tabs

<table>
<thead>
<tr>
<th>Selected Component</th>
<th>Available Tabs</th>
</tr>
</thead>
</table>
| Chassis            | - General - view general chassis parameters, define device name, IGMP V2 only and device EdgeCluster (redundancy) parameters. See 3.4 Configuring General Device Parameters on page 23.  
- Global RF & QAMs - set global QAM-RF module parameters. See page 41.  
- SNMP & Syslog - set SNMP and Syslog parameters. See page 25.  
- Time - set device time and time zone parameters. See page 26.  
- Security - set access to the unit. See page 28. |
| Eth1, 2            | - General. See page 22.  
- Routing table. See page 23.  
- Virtual IPs. See page 56. |
| GbE                | - General. See page 31.  
- Routing table. See page 33.  
- Port Redundancy. See page 34.  
- Virtual IPs. See page 56. |
| DTI card           | See 3.9 Configuring/Viewing DTI Parameters on page 36. |
| Slot               | - General - view a general summary of the QAM configuration. See page 52.  
- Module - set ITU-T Annex, constellation, symbol rate and more. See page 43.  
- Ports - (default view) enable an QAM-RF port, set the number of channels and the power level of the port. See page 45.  
- Port 1 QAMs - view and set QAM parameters such as QAM manager. See page 48.  
- Port 2 QAMs - view and set QAM parameters such as QAM manager. See page 48.  
- Redundancy - enable QAM-RF module redundancy. For future use. |

- Platform > NGOD tab - define the parameters required for the NSG NGOD ERM communication. See 3.11.1 Configuring NGOD General Parameters on page 52 and 3.11.2 Configuring ERM Parameters on page 53.
3.1 Configuring Platform Parameters

3.1.1 Global Chassis Buttons

Table 3-2: Global Chassis Buttons

<table>
<thead>
<tr>
<th>Button</th>
<th>Button Name</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Identify unit]</td>
<td>Identify unit</td>
<td>See page 18.</td>
</tr>
<tr>
<td>![Export Configuration to File]</td>
<td>Export Configuration to File</td>
<td>See page 18.</td>
</tr>
<tr>
<td>![Import Configuration to Device]</td>
<td>Import Configuration to Device</td>
<td>See page 18.</td>
</tr>
<tr>
<td>![Firmware upgrade]</td>
<td>Firmware upgrade</td>
<td>See page 19.</td>
</tr>
<tr>
<td>![Factory default]</td>
<td>Factory default</td>
<td>See page 22.</td>
</tr>
<tr>
<td>![If Chassis is selected Reset Device If Slot is selected, Reset Module]</td>
<td>If Chassis is selected Reset Device If Slot is selected, Reset Module</td>
<td>See page 19.</td>
</tr>
<tr>
<td>![Validate]</td>
<td>Validate</td>
<td>Validates the QAM-RF module configuration only. See page 43.</td>
</tr>
</tbody>
</table>

To identify unit
1. Select the Platform tab.
   By default Chassis is selected.
2. Click Identify Unit.
   The LEDs of Output ports 4, 5 and 6 are blinking and the button toggles to Stop Blinking.

To Export the configuration to File
1. Select the Platform tab.
   By default chassis is selected.
2. Click Export Configuration to File.
   The Export File From Device dialog appears.
3. Click either of the following:
   - Open - to open the XML file and to view the configuration of the device.
   - Save - to save the XML file with the device configuration at the required location.

To import configuration
1. Select the Platform tab. By default chassis is selected.

2. Click Import Configuration to Device. The Import File To Device dialog appears.

3. To locate the required XML file previously exported, click Browse.

4. To import, click Import. Wait until a message notifying you of a successful import appears.

5. For the device to run with the newly imported configuration, reset the device.

To clear configuration and Revert to Factory Defaults

1. Select the Platform tab. By default chassis is selected.

2. Click Factory Default. The following message appears:
   This action will clear configuration and reset the device. Are you sure?

3. To confirm the action, click OK. The device configuration is removed and device boots up with factory defaults.

To reset the device

1. Select the Platform tab. By default chassis is selected.

2. Click Reset Unit.

3. Click Ok to confirm the action. The reset process takes place.

3.2 Firmware Upgrade

NSG 9000-40G ships with firmware and the web client installed. However, Harmonic periodically releases firmware updates. To find out if the provided firmware meets your needs or must be updated, contact Harmonic Technical Support.

To upgrade the firmware of more than one NSG 9000-40G device, use MCT. See MCT 9.6 and higher SW User Guide, or MCT Online Help.

To upgrade the firmware of a single NSG 9000-40G device, refer to the following section.

3.2.1 Upgrading the Firmware of a Single NSG 9000-40G Device

The NSG 9000-40G firmware is packaged and delivered within the installer application. The installer turns firmware upgrade into an easy and straightforward procedure. To upgrade using the NSG installer refer to the following instructions. You can still upgrade the firmware using Apache or the IIS HTTP server. For these instructions, refer to A.1 Upgrading the Firmware of a Single Device on page 119.
Before upgrading, prepare the following:

- **NSG installer** - Obtain the installer from Harmonic's FTP site. The NSG installer includes the new firmware package. The name of the NSG installer indicates the device type and the firmware version. For example: NSG9K40G-3.2.0.16-1-Installer-v1.2.1.exe, where

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Firmware Version</th>
<th>Application Name</th>
<th>Installer Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSG9K6G</td>
<td>3.2.0.16-1</td>
<td>Installer</td>
<td>v1.2.1</td>
</tr>
</tbody>
</table>

- **PC** - Download the NSG installer to a computer that meets the following requirements:
  - Access to the device. Port 22 of the computer should be open to allow communication via the SSH protocol.
  - Around 200MB of free space
  - Any kind of Windows operation system

∵ To upgrade using the NSG installer

1. Once you downloaded the NSG installer to your PC, launch the NSG installer.

The NSG installer is extracting files. This may take around 30 seconds. The following dialog appears:

The dialog indicates the firmware version packaged within the Installer you have started.
2. In **IP Address**, enter the IP address of the device you wish to upgrade.

3. In **UserName**, enter the username for logging into the device. This username should be eligible to upgrade the firmware. See 2.2.1 Logging Into the Device via IE on page 13.

4. In **Password**, enter the required password.

5. By default, **Auto-Reboot** is selected. It allows to reboot the device once the installation of the new firmware is completed. However, if you wish to reboot manually, de-select Auto-Reboot.

6. Click **Install**.
   The progress bar indicates that upgrade is taking place while denoting the current stage of the upgrade.

7. **View Log** - during the upgrade, you can click **View Log**.
   A text file appears with detailed information regarding the upgrade. This log allows you to troubleshoot the upgrade process.

   **NOTE:** **View Log** is enabled from the following upgrade stage: Running upgrade script on device

8. If **Auto-Reboot** is selected, wait until the message *Upgrade Completed Device is Rebooting* appears. Click **OK** and wait until device reboots.
   If **Auto-Reboot** is not selected, you are asked to reboot the device. Click **OK** to reboot and wait until the message *Upgrade Completed Device is Rebooting* appears. Wait until device reboots.
In the web client of the device, (Platform > Chassis > General tab) you can verify that the device reports the same version number as the required firmware.

### 3.3 Configuring Ethernet Ports

The IP address of the ETH ports or NSG 9000-40G primary IP address is configured as part of the NSG 9000-40G installation (see 2.1.1 Configuring Ethernet Ports on page 9). However, when required, you may change the IP address settings via the Platform screen, Ethernet table:

**NOTE:** The following sections are organized according to the recommended sequence of steps for device configuration.

- **To change configuration of ETH1 and ETH2**
  1. Select the Platform tab.
  2. Select the required Ethernet port.
     The ETH1 or the ETH2 Properties General tab appears.
  3. For Eth1, select the General tab.

   - To enable the port, check Enable Port.
5. In MAC Address, view the MAC Address. The MAC address is the physical address of the unit. The address is retrieved and presented in the Platform page for viewing purposes only.

6. Type the required IP address, subnet mask and default gateway of ETH1 and/or ETH2.

7. Applies to NSG9000-40G version 3.2.3 and up. In DNS Server IP, enter the IP of the Domain Name Server. This applies when the EdgeQAM is part of an NGOD system architecture. See 3.11 Configuring NGOD on page 52.

8. Click Apply to apply changes.

3.3.1 Configuring Routing Table Parameters for Ethernet Ports

The routing table allows you to define Ethernet routes to specific networks. This option is required in special network topologies that require more than the capabilities of a default gateway.

To set the Routing table parameters, do the following:
1. Select Platform > General tab.
2. In Back Panel View, select Eth 1/2/3.
3. Select Routing Table.

4. Click Add Route to add a blank row to the table.

5. Enter the required values as explained below:
   - Destination - Enter the IP address of the destination device or network.
   - Mask - Specify the subnet mask. The combination of mask and destination IP will determine the exact range of IP destinations that may be accessed through this route.
   - Gateway - Enter the IP address of the gateway through which the NSG will attempt to make a connection to a destination. For ETH1 or ETH2, the gateway must be in the same NSG subnet for either ETH1 or ETH2 ports.
   - Delete - Check this box to remove this route. The route is removed once you click Delete Route.

**NOTE:** For Virtual IPs (ISA), see 3.13 Virtual Devices on page 56

3.4 Configuring General Device Parameters

3.4.1 Configuring/Viewing Chassis Properties

The General tab allows you to configure and view the following:
• View general device parameters like software version
• Define device name
• Define to work in IGMP V2 protocol only

To view/set chassis properties
1. Select the Platform tab.
2. In Back Panel View, select Chassis > General tab.
   The Chassis Properties & Main Board Properties section appears.

3. View the following Chassis information:
   SW Version - The device’s firmware version and revision.
   Boot Version - The version of the BOOT file.
   Main Board Type - Part number of the main board.
   Main Board Serial Number - The serial number of the main board.
   Main Board FPGA Version - view the FPGA version as retrieved from the device. This is a read only parameter.
   LLC Version - indicates the embedded version of the controller.
   Chassis Serial Number - The serial number of the chassis.
   Chassis Type - The part number of the chassis.
   Front Panel - Indicates front panel type:
   • NSG-FP-01 - front panel typically used for NSG 9000-3G and NSG 9000-6G. The warning Incorrect type of Front Panel is issued.
   • NSG-FP-02 - new front panel version. This front panel has the Turbo label and it complies with the work load of the NSG 9000-40G device.
   Power Supply 1 - Indicates power supply type Table 3-3 on page 25 shows.
   Power Supply 2 - Indicates power supply type as Table 3-3 on page 25 shows.
   Force IGMP V2 - To set the GbE ports to support the IGMPv2 protocol only, select Force IGMP V2. NSG 9000-40G ignores any IGMPv3 messages and does not generate any IGMPv3 messages.
3.5 Configuring SNMP and Syslog Parameters

3.5.1 Configuring SNMP

NSG 9000-40G is capable of reporting its status via SNMP (Simple Network Management Protocol) to a third-party SNMP-based network management systems.

NSG 9000-40G status is reported to the SNMP manager in the following ways:

- **SNMP Traps** - notifications that the NSG device initiates and sends to the SNMP manager to indicate the assertion or remittance of an alarm or warning. SNMP Traps are sent only to SNMP managers that are registered with the NSG 9000-40G.

- **Alarms status queries** - the SNMP manager may query the NSG for its current alarms status. The NSG reports this information using standard and custom SNMP MIBs.

- **Configuration and Traffic queries** - the SNMP manager may query the NSG for various configuration parameters, as well as various traffic counters that indicate the rate of traffic that is flowing through the NSG’s interfaces.

In addition, NSG 9000-40G supports Syslog - a standard-based method for centralized logging of device messages. A Syslog server that is registered with the NSG 9000-40G device will receive messages from the device whenever an alarm or warning is asserted or remitted.

To set SNMP parameters
1. Select the **Platform** tab.
2. Select Chassis > **SNMP & Syslog** tab.

3. By default SNMP is enabled. Verify that it is enabled. To disable SNMP, de-select **Enable SNMP**.

4. In **SNMP Community String**, enter the required string value for the Get community:
   - Get Community - The name of the community having Read access to the network elements. The elements will respond to this community Get commands. The default string is `public`.

5. In **SNMP Trap Destination table**, enable the required table-row by selecting the **Enable** box.

6. Enter the IP Address of the computer to which you wish to forward all SNMP traps from the NSG.

7. Open the **Version** list and select the required SNMP version.

8. In **System MIB**, enter the following information:
   - Contact (SysContact) - enter contact information
   - Location (SysLocation) - enter the location of the device. In other words, the location of the host on which the SNMP agent, or server runs.

### 3.5.2 Configuring Syslog Parameters

To log NSG related events, enable this option and enter the Syslog server IP address as instructed below:

1. Select the **Platform** tab.
2. Select Chassis > **SNMP** tab and focus on the **Syslog** section.
3. If you wish to log events on the server, enable the Syslog server. To enable, select **Enable Syslog**.
4. In **Syslog Server IP address**, enter the IP address of the Syslog server.

### 3.6 Setting Device Time and Date Parameters

Set the device time according to either of the following options:

- **Automatically** - Synchronize the NSG 9000-40G time with the Universal Time Coordination (UTC) by connecting to an NTP (Network Time Protocol) server. If you enable this option, you cannot set the time of the unit manually.
- **Manually** - Use this option when NTP server is not available.
To set the time of the device according to the NTP server

1. Select the Platform tab.
2. Select Chassis > Time tab.
3. To allow to establish communication with the NTP server, select Enable NTP.
4. Enter the IP address of the NTP server in NTP Server IP Address.

To set the device time zone

1. Do either of the following:
   - Open the Time Offset list and select the required local time offset to match between the time of the device, that is UTC time, and the Greenwich Mean Time (GMT),
   - Or,
     - Select Enable Daylight Saving.
     - The Time Offset is disabled and Location and City/Province are enabled.
     - B. Select the required location.
     - C. Select the required city/province.

The daylight saving time is automatically defined according to the selected location and city/province.

To set the time of the device manually

1. Verify that Enable NTP is not selected.
2. In Date, enter, in the required format, the current date.
3. In Time, enter, in the required format, the current time.
4. Open the Time Zone list and select the required local time offset to match between the time of the device and the Greenwich Mean Time (GMT).

NOTE: When you manually set the date and time of the device, this event is logged in the unit alarm log.

3.7 Device Security

Configure the following as explained below:

Passwords, see 3.7.1 Setting a Password on page 28

Firewall IP tables, see 3.7.2 Controlling Access - Firewall IP Tables on page 29
3.7.1 Setting a Password

1. Select the Platform tab.
2. Select Chassis > Security tab.

**NOTE:** The following picture, shows the Security tab when config/guest user is logged in.

3. Focus on the Change Password section.
4. If you logged as Admin, User Name list appears. In User Name, verify that the required user name appears. If you logged as Admin, you are authorized to change your password and the password of all other users.
   If you logged as Configure, you are authorized to change your password or the password of Monitor.

5. In New Password, enter the new password. Password length should be at least six characters and at least one letter.
6. In Verify Password, re-enter the new password.
7. To apply the password change, click Change Password.
   When logging in, use the newly set password.

**NOTE:** After three unsuccessful login trials, or if you forgot the password/user name, reset your password. To reset the password, call Harmonic Customer Support.
3.7.2 Controlling Access – Firewall IP Tables

To control the access to the NSG 9000-40G device, use the firewall IP tables of Linux native firewall known as Uncomplicated Firewall. An experienced user only, should update the firewall using the NSG 9000-40G Command Line Interface (CLI). Once the firewall is updated, you can distribute the file to other NSG 9000-40G devices.

Via the Security tab you can do the following:

- Export or import firewall IP tables:
  - Export - allows to save the IP tables file.
  - Import - allows to control the access to the device. As soon as the import process is complete, the new configuration is active.

  **NOTE:** Only user *admin* is allowed to export and import firewall IP tables.

- Define the allowed protocols for accessing the device

  **NOTE:** To export firewall IP tables

  1. Select the Platform tab.
  2. Select Chassis > Security tab.
  4. To save the IP tables as a zipped file, click Export Firewall IP Tables.
  5. Click Export.
  6. In the File Download dialog, click Save.
  7. Navigate to the required location and click Save.

  **NOTE:** Verify that you are logged as user *admin*. 

- To import firewall IP tables
1. Select the Platform tab.
2. Select Chassis > Security tab.
3. To import the IP tables file, click Import Firewall IP Tables.

4. Browse to the required file and click Import.
5. In the dialog that appears, click Yes.
6. Wait until the following message appears:

7. Click Ok to close the message.

3.7.3 Controlling Access – Device Access Protocols

By default both HTTP and HTTPS protocols are enabled and you can access the web client using these protocols. However, you can disable the HTTP protocol to allow accessing the NSG 9000-40G device via HTTPS secure-mode only.

HTTPS TCP port is 443 and HTTP TCP port is 80.

NOTE: Only user admin can disable the HTTP protocol.

To change the default configuration of access protocols, do the following:
1. Select the Platform tab.
2. Select Chassis > Security tab.
4. To enable/disable the HTTP protocol, select/de-select Enable HTTP.

**NOTE:** When disabling a protocol, the device disconnects for an instant to refresh its connection.

---

### 3.8 Input GbE Ports Configuration

The GbE ports operate as eight independent ports receiving eight different feeds. The input rate of the GbE ports is as follows:
- GbE 1-4 - 1G
- GbE 5-8 - 1G/10G (configurable)

The port status is reflected in the Platform > General tab as follows:

**Table 3-4: Input GbE Port**

<table>
<thead>
<tr>
<th>Port Status</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Grey</td>
</tr>
<tr>
<td>Enabled</td>
<td>White, or blue when selected</td>
</tr>
<tr>
<td>Part of a port-redundancy pair</td>
<td>Yellow - tool tip indicates whether primary or backup</td>
</tr>
</tbody>
</table>

---

### 3.8.1 Configuring Input GbE ports

To configure GbE port properties

1. Select the Platform tab.
2. In Back Panel View, select the GbE ports.
### Chapter 3 Configuring Platform Parameters

#### Input GbE Ports Configuration

The GbE # Properties General tab appears.

<table>
<thead>
<tr>
<th>General</th>
<th>Routing Table</th>
<th>Port Multiplex</th>
<th>Virtual Link (T1E1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFP Vendor</td>
<td>PEN30AR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFP Mode</td>
<td>1000BASET</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFP Type</td>
<td>Copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed</td>
<td>1Gbps</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Auto Negotiation** - Applies to 1GbE only. The Auto Negotiation is a handshake protocol used in GbE links. Select this check box to activate the Auto Negotiation protocol only if the other end of the GbE link also uses auto negotiation.

**MAC Address** - view the physical address of the GbE as retrieved from the device. This is a read only parameter.

**Status** - reflects the current status of the relevant GbE channel. Displays OK, Link Down, SFP Not Mounted, or Disable Mode.

**NGOD Input Group Name** - Enter the name of the input group that the NSG relates to when reporting on this interface in its NGOD-D6 messages.

**ND0G Assigned Bandwidth (Mbps)** - Enter the bandwidth of the GbE port assigned for the NGOD ERM. The default is 1000MB for both 1G and 10G GbE port. If the assigned bandwidth for a 1G/10G port is 1,000MB/10,000MB, the full capacity of the port is assigned for the NGOD ERM, respectively. You can enter a value between 0-1,000/0-10,000 in increments of 100, respectively. If you enter 0, the GbE port is not available for the NGOD ERM.

---

3. To configure the GbE port parameters, do the following:

   **Enable Port** - select to enable the port.

   **SFP Vendor** - (Read only) view the vendor of the SFP module mounted in the GbE port.

   **SFP mode** - (Read only) view the mode of the SFP module mounted in the GbE. It can be multi mode, single mode or copper.

   **SFP Type** - (Read only) view the type of SFP mounted.

   - Copper - when copper SFP is mounted
   - When fiber SFP is mounted either of the following is indicated:
     - SX - indicates multi-mode SFP, typically used for short distances (up to 200 m)
     - LX - indicates single-mode SFP, typically used for long distances (10km and up).

   **NOTE:** If the SFP is not mounted, Not Mounted appears in the SFP Vendor, SFP Mode and SFP Type parameters.

   **SFP Speed** - Applies to 10GbE only (GbE5-GbE8). Open the list and select the required speed. Changes to the speed, require device reboot:

   - 1Gbps
   - 10Gbps

---

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NSG 9000-40G, Version 3.2.x, Rev H
Route Refresh - When enabled, the NSG routinely sends gratuitous ARP messages to the switch. Messages are sent approximately once per 5 seconds, thus preventing expiration of the route.

Refresh Interval (Msec) - Define, in Msec, how often to send a Ping request.

4. In the IP Addresses table, enter the following parameters:
   - IP Address1 - type in the required IP address
   - Subnet - type in the required subnet mask.

### 3.8.2 Configuring Routing Table Parameters

The routing table allows you to define Ethernet routes to specific networks. This option is required in special network topologies that require more than the capabilities of a default gateway.

**NOTE:** You cannot configure a routing table for a port that serves as a backup port with Same IP enabled. See [3.8.3 Configuring Input GbE Port Redundancy on page 34](#).

To set the Routing table parameters, do the following:

1. Select Platform > General tab.
2. In Back Panel View, select the required GbE port.
3. Select Routing Table.
4. Click Add Route to add a blank row to the table.
5. Enter the required values as explained below:
   - Destination - Enter the IP address of the destination device or network.
   - Mask - Specify the subnet mask. The combination of mask and destination IP will determine the exact range of IP destinations that may be accessed through this route.
   - Gateway - Enter the IP address of the gateway through which the NSG will attempt to make a connection to a destination. For GbE 1, 2 and 3 ports, the gateway must be in the same NSG subnet for each GbE port.
   - Delete - Check this box to remove this route. The route is removed once you click Delete Route.

**NOTE:** For Virtual IPs (ISA), see [3.13 Virtual Devices on page 56](#).
3.8.3 Configuring Input GbE Port Redundancy

3.8.3.1 Overview

NSG 9000-40G supports 1:1 and N:1 redundancy modes for its GbE input ports. Typical port redundancy configuration depends on the application in which the NSG is deployed as the following scenarios describe:

- VOD application - to allow redundancy for IP unicast VOD streams, you should use 1:1 port redundancy. Select a distinct backup port for each primary port, with the Same IP Address option checked.
- SDV application - to allow redundancy for IP multicast SDV streams, use either 1:1 or N:1 redundancy modes depending on the desired level of protection:
  - 1:1 port redundancy - define for each primary port a backup port. De-select the Same IP Address option, and set a distinct IP address for the designated backup port. This mode ensures the highest level of protection against various network failures.
  - N:1 port redundancy - allows an efficient use of the eight available input GbE ports, by utilizing a single backup port for protecting several primary ports. The typical and recommended configuration for this mode is to define two groups of 3 primary ports and one backup port. For example, port 4 backs up ports 1-3 and port 8 backs up ports 5-7. In case of a redundancy switch, the backup port starts transmitting also the streams of the failed primary port(s).

In general, the following guidelines apply for the port redundancy feature:

- To configure port redundancy, port should be enabled. (Select GbE Port > General tab)
- A primary port cannot serve as a backup port.
- If the Same IP Address option is selected, the backup port is disabled and the IP address of the port changes to the IP address of the primary port. When the primary port fails, the backup port is enabled, using the same IP address of the failed port.
- Configuring port redundancy, blocks the port configuration except for IP address in case Same IP Address is selected.

**NOTE:** Verify that the capacity of the backup port matches or exceeds the actual capacity of the primary port.

- Alarm configuration:
  - By default both Link Down and No Input Traffic alarms trigger port redundancy.
  - The alarm configuration of the primary port and backup port is the same.
  - You can configure the alarms of a primary port only.
  - When selecting a backup Port, the alarm configuration of the primary port also applies to the backup port.
  - In N:1 port redundancy, the alarm configuration applies to the backup port and to all of the primary ports it backs up. Once you configure the backup port to backup an additional primary port, the alarm configuration automatically applies to the primary port. Any changes to the alarm configuration immediately applies to the backup port and to all primary ports it backs up.

3.8.3.2 Port Redundancy Related Alarms

- Triggering redundancy - Link Down and No Input Traffic
After the redundancy switch, the following alarm is raised: Backup Port is Active

To configure GbE port redundancy
1. Open the web client of the device.
2. Select Platform > GbE 1/2/3/4/5/6/7/8 > Port Redundancy tab
3. To view the current status of the ports, click Refresh Port State. The Active Port column is updated to display the currently active port.
4. Open the Backup Port list and select the required backup port for any of the required ports.

**NOTE:** Verify that the capacity of the backup port matches or exceeds the actual input capacity of the primary port.

Active Port, Same IP Address, Trigger alarm columns and the Switch button are enabled. By default, both triggering alarms are selected.

5. In VOD application, to allow redundancy for the IP unicast VOD streams, select a distinct backup port for each primary port with the Same IP Address option checked. In this case, only the primary port is active. Once you select Same IP Address the following takes place:
   - The IP address of the backup port changes to the IP address of the primary port
   - The backup port is disabled
   - The routing tables of the primary port are copied to the backup port routing tables. Once Same IP Address is unchecked, the routing tables of the backup port are removed.

6. By default both triggering alarms are selected. Configure the triggering alarms as required.
7. To manually switch between the ports, click Switch and then Apply.
3.9 Configuring/Viewing DTI Parameters

To configure and view DTI parameters, select the DTI component and do the following:

- Configure DTI parameters:
  - Enslave NSG 9000-40G clock to the DTI clock by selecting Use DTI Clock
  - Define the DTI port redundancy mode, and select the preferred DTI port (if applicable, depending on the redundancy mode)
  - Configure the SNMP traps

- View the following:
  - DTI client properties and status - via the Client Information section
  - Port Information - via Per Port Information section

3.9.1 Configuring DTI Client Parameters

1. Select the Platform > General tab.
2. In the Back Panel View, select the DTI component.
   The General tab appears.
3. When working in M-CMTS mode, enslave the NSG clock to the DTI clock. To enslave, select Use DTI Clock.
4. To set the DTI port redundancy mode, open the Redundancy Mode list and select one of the following:
   - Manual - you need to select the DTI port. No automatic switching/activation of ports is done, regardless of the status of the DTI ports.
   - Automatic (no Auto Revert) - selecting the active port is completely automatic, without any intervention and without any preference of a specific port. If the active
port fails, the standby port is activated and assumes the role of "active" as long as it is in normal state. If the latter fails, ports will be switched again. This switching can continue any number of times, without any preference of a specific port.

- Automatic (Auto Revert) - in this mode, the selected port (as defined in Selected Port) is always preferred over the other port. In case that the selected port fails, the standby port is automatically activated. Once the selected port is fixed, the NSG automatically switches back to the selected port.

5. To select the active DTI port, open the Selected Port list and select either port 1 or 2.

**NOTE:** The Selected Port list is disabled if Automatic (no Auto Revert) is selected.

6. In Notification, define which notification to send once the status of the DTI client changes:
   - Log Status Change Events - send a notification to the alarm log upon a change in the status of the DTI client
   - Send Trap on Status Change - send an SNMP trap upon a change in the status of the DTI client

### 3.9.2 Viewing DTI Client and DTI Port Information

1. Select the Platform > General tab.
2. In the In Back Panel View, select the DTI component. The General tab appears.
3. To view DTI client information, focus on Client Information section.
   - In Overall Status, verify that the DTI status is NORMAL. The following table lists the available Status options:

<table>
<thead>
<tr>
<th>Status</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmup</td>
<td>Local oscillator has not yet stabilized</td>
</tr>
<tr>
<td>Freerun</td>
<td>DTI client is not locked to the signal of the DTI server, and is running freely using its own internal real-time clock. Freerun indicates that since its last initialization, the client was not locked to the server.</td>
</tr>
<tr>
<td>Normal</td>
<td>DTI client is locked to the DTI server, working normally</td>
</tr>
<tr>
<td>Bridging</td>
<td>This is a transient state, which may last up to 2 seconds. It indicates that the DTI client has experienced a momentary interruption in its timing signal, but is still able to maintain acceptable timing. NSG 9000 is still locked to the DTI server clock.</td>
</tr>
<tr>
<td>Holdover</td>
<td>DTI client lost its sync to the DTI server clock. Working in &quot;best effort mode&quot;, with the last known valid time correction</td>
</tr>
<tr>
<td>Fast</td>
<td>The DTI client has just acquired a valid signal, and is in the process of locking to it. If this status is displayed for a prolonged time, this indicates a problem with the received DTI signal or with the DTI client.</td>
</tr>
</tbody>
</table>

- In 10Mhz Ref., indicates whether the 10Mhz Reference signal is present.
- In Timestamp, view the last DTI timestamp
- In Active Port, view the currently active DTI port.
- In FPGA Version, view the installed FPGA version of the DTI client.
4. To view DTI client port information, focus on the Per Port Information section. For each port view the following information:
   - **DTI Signal Detected** - indicates whether a valid DTI signal is detected.
   - **Server Status** - indicates the status of the server as it is communicated to the client. Available status indications are as follows: Warmup, Freerun, Fast, Normal, or Holdover.
   - **CRC Error Count** - indicates the number of CRC error occurrences on the DTI link.
   - **Cable Advanced Valid** - indicates whether cable advance is valid. A valid, i.e. Stable, Cable Advance value is essential in order for the client to lock to the server.
   - **Frame Error Rate** - indicates the Frame Error Rate as follows: Below 2%, 2% to 5%, or Over 5%.

3.9.2.1 **DTI Client State Diagram**

![DTI Client State Diagram](image-url)
### 3.10 Configuring QAM-RF Modules

The NSG 9000-40G device has nine slots. Each slot accommodates a single QAM-RF module.

Selected slot, with QAM-RF related information

The Back Panel View section, displays the slots while indicating the following QAM-RF module related information:

- **Slot number** - a number between 1 - 9
- **Slot Status** - either of the following appears:
  - **Module OK** - indicates that the slot is occupied with the configured module and the latter is working.
  - **Module Out** - indicates that the slot is vacant.
  - **Module Fail** - indicates that the mounted module is faulty or that the applied configuration does not match the currently mounted module.

In addition, when selecting a slot, you may access the properties of the mounted module. The Module Properties are arranged in the following tabs:

- **Module** - See [3.10.3 Configuring a QAM-RF Module](#)
- **Port** - See [3.10.4 Configuring Module RF Ports](#)
- **Port # QAMs** - See [3.10.5 Configuring/Viewing QAM Channels](#)
- **General** - See [3.10.6 Viewing QAM-RF Module Information](#)

You can also perform various actions using the action buttons listed in the following table:
3.10.1 Copying Module Configuration

In case you wish to copy the configuration of a module to other modules or the configuration of a port, to the other port of the module, do the following:

1. In the Back Panel View, select a module.
2. Click Copy Module/Port Configuration.
3. In Configuration Level, select the item at stake whether module or port.
   The Copy Module Configuration and Copy Port Configuration sections are enabled according to the item at stake.
   The Copy Module Configuration allows you to select the required modules to copy to. The selected module is disabled.
   The Copy Port Configuration allows to select whether to copy port 1 to 2 or vice versa.
4. To copy a module, in Copy Module Configuration, select the module(s) to copy to the configuration of the selected module.

Table 3-6: Module Operation Buttons

<table>
<thead>
<tr>
<th>Button</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Resets the module software" /></td>
<td>Resets the module software</td>
</tr>
<tr>
<td><img src="image" alt="Resets the module hardware and reloads module FPGA." /></td>
<td>Resets the module hardware and reloads module FPGA.</td>
</tr>
<tr>
<td><img src="image" alt="Validates module configuration" /></td>
<td>Validates module configuration</td>
</tr>
<tr>
<td><img src="image" alt="Displays the Power level table." /></td>
<td>Displays the Power level table. Note: Pop-up blocker should allow pop-ups. See 3.10.3 Configuring a QAM-RF Module on page 43.</td>
</tr>
<tr>
<td><img src="image" alt="Allows to copy module configuration to other modules." /></td>
<td>Allows to copy module configuration to other modules. See 3.10.1 Copying Module Configuration on page 40.</td>
</tr>
</tbody>
</table>
5. To copy a port, in Copy Port Configuration, select whether to copy port 1 to 2 or port 2 to 1.
6. Click Copy.
7. A message appears notifying that the configuration of the destination module/port will be override. Click OK.
   A message that procedure completed appears.
8. Click OK.
9. To send to device, click Apply.

The following sections guide you on how to configure the QAM-RF modules. The QAM-RF module configuration includes the following stages:

- Configuring global parameters - the same definitions are sent to all of the QAM-RF modules/QAM channels. The Global configuration is available via the Platform > General > Chassis > Global RF & QAMs tab.

- Configuring parameters for each QAM-RF module - To allow the NSG 9000-40G device to support multiple applications, during this configuration you may override the configuration of global parameters such as module encoding mode and QAM manager. The configuration of each QAM-RF module is available via the Platform > General > Slot Module > Module/Ports/QAMs tabs.

### 3.10.2 Configuring Global RF & QAMs Parameters

**TIP:** Defining the global parameters of the RF ports & QAM channels is the first stage of the QAM-RF module configuration.

When configuring the QAM-RF module parameters, you may send definition to all of the QAM-RF modules/QAM channels as the following table shows.

**Table 3-7: Setting Global RF&QAM Parameters**

<table>
<thead>
<tr>
<th>Required Action</th>
<th>Required Buttons</th>
</tr>
</thead>
<tbody>
<tr>
<td>To send definitions to all of the QAM-RF modules, click Set All Modules and then Apply.</td>
<td>1. Set All Modules 2. Apply</td>
</tr>
<tr>
<td>To send definitions to all of the QAMs, click Set All QAMs and then Apply.</td>
<td>1. Set All QAMs 2. Apply</td>
</tr>
</tbody>
</table>

### 3.10.2.1 Defining Global RF and QAMs Settings

The available 24 QAM-RF channels of each RF port are divided into groups. The QAM channels of each group share the same configuration: ITU-T Annex, constellation, symbol rate and interleaver. Group configuration applies to both RF ports of the module. Currently the two available groups are:

**Table 3-8: Available QAM–RF Groups**

<table>
<thead>
<tr>
<th>Group</th>
<th>ITU-T Annex</th>
<th>Operation Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x4 QAM-RF channels</td>
<td>A</td>
<td>4A-4A-9A</td>
</tr>
<tr>
<td>1x9 QAM-RF channels</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To define RF Scheme and Template

1. Select Platform > General tab.
2. In Back Panel View, select Chassis.
3. Select the Global RF& QAMs tab.

4. Focus on the RF Scheme section.
5. In Operation Mode select the required group arrangement:
   - 6B-6B-1 2B for Annex B
   - 4A-4A-9A for Annex A

Once you selected the required operation mode, the ITU-T is updated accordingly as the following table shows:

**NOTE:** Currently only Annex-B and Annex A are supported.

### Table 3-9: ITU-T Annex

<table>
<thead>
<tr>
<th>Operation Mode</th>
<th>ITU-T Annex</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4A-4A-9A</td>
<td>Annex-A (DVB)</td>
<td>This mode is used mainly in European and Asian countries. Utilizes bandwidth of 8 MHz per QAM-RF channel.</td>
</tr>
<tr>
<td>6B-6B-12B</td>
<td>Annex-B</td>
<td>This is the mode used in North-American countries. Utilizes bandwidth of 6 MHz per QAM-RF channel.</td>
</tr>
<tr>
<td>Future Use</td>
<td>Annex-C (Japan)</td>
<td>As implied by its name, used mainly in Japan. Similar to Annex-A in the most part, but utilizes bandwidth of 6 MHz per QAM-RF channel.</td>
</tr>
</tbody>
</table>
6. To define the required constellation, open the Constellation list for each group. The Constellation is the type of Quadrature Amplitude Modulation (QAM) used. QAM constellation affects Data Rate and Symbol Rate, and must be set according to HFC network properties. Valid values are:

<table>
<thead>
<tr>
<th>ITU-T Annex</th>
<th>Valid Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annex-A or Annex-C</td>
<td>16, 32, 64, 128, 256</td>
</tr>
<tr>
<td>Annex-B</td>
<td>64 and 256</td>
</tr>
</tbody>
</table>

7. In Symbol Rate (Msps), view/configure the rate of QAM symbols that are encoded and transmitted per second as follows:
- Annex-B - (Read-only), symbol rate is fixed per constellation
- Annex-A - configure in the following allowed range: 5.0000 - 6.9565
- Annex-C - configure in the following allowed range: 5.0000 - 5.3131

8. In Data Rate, view the data rate. Its value depends on the selected constellation.

9. Interleaver is an advanced QAM configuration parameter. To configure the required interleaver for both interleaver 1 and 2, open the list, respectively, and select the required value for each group. For Annex-A or Annex-C, use 12-17. For Annex-B, Interleaver value depends on the constellation in use. Constellation 64: 128-1, constellation 256: 128-4, 128-1.

10. To apply the configuration to all of the QAM-RF modules, click Set All Modules.

**NOTE:** The configuration will take effect once you click Apply.

11. To set the QAM-RFs frequency, focus on the Default RF Template section.

12. open the RF Template list and select one of the following:
- Frequency - frequency is entered explicitly as numeric frequency values
- Applies to Annex B only. EIS-STD - frequency is defined using channel numbers based on the EIA-STD channel table. See *EIA SDT and HRC Standards on page 131.*
- Applies to Annex B only. EIA-HRC - RF settings are entered using channel numbers based on the EIA-HRC channel table. See *EIA SDT and HRC Standards on page 131.*

13. To apply the configuration to all of the QAM-RF modules, click Set All Modules.

**To configure a QAM Manager**

1. To select a QAM manager for all of the QAM-RF modules, open the QAM Manager list and select the required QAM Manager. See, *Table 3-10: QAM Manager on page 49.*

2. To send configuration to all of the QAMs, click Set All QAMs.

**NOTE:** The configuration will take effect once you click Apply.

Once you are done with this configuration, move on to configure each module by selecting the required module and the Module tab.

### 3.10.3 Configuring a QAM-RF Module

The Module tab allows to configure a single module. Once you apply the configuration, it overrides the global configuration as set in *3.10.2 Configuring Global RF & QAMS Parameters on page 41.*

1. Select the Platform tab.
2. In Back Panel View, select the required slot.

3. Select the Module tab.

4. Define/View the following module information:
   - RF Template - Applies to Annex B only. Open the list to select the required RF template:
     - **Frequency** - frequency is entered explicitly as numeric frequency values
     - **EIS-STD** - Frequency is defined using channel numbers based on the EIA-STD channel table. See [EIA SDT and HRC Standards on page 131](#).
     - **EIA-HRC** - RF settings are entered using channel numbers based on the EIA-HRC channel table. See [EIA SDT and HRC Standards on page 131](#).
   - Operation Mode - the default QAM-RF group is 6B-6B-12B. You can select either 6B-6B-12B, or 4A-4A-9A.
   - ITU-T ANNEX - view for each group the required encoding mode.
   - Constellation - select the required constellation. The Constellation is the type of Quadrature Amplitude Modulation (QAM) used.
     - In Annex B, QAM constellation affects Data Rate and Symbol Rate, and must be set according to HFC network properties.
     - In Annex A, constellation affects data rate only and you should configure Symbol Rate.
     - Valid values are: Annex-A or Annex-C: 16, 32, 64, 128, 256. Annex-B: 64 and 256. Changes override the constellation configured during global module configuration.
   - Symbol Rate - define/view the rate of QAM symbols that are encoded and transmitted per second. You can define the symbol rate in Annex A and C. In Annex B, you can only view its value. Changes override the symbol rate configured during global module configuration.
   - Data Rate - view the defined data rate for each QAM-RF channel in the group.
   - Interleaver 1 and 2 - Interleaver is an advanced QAM configuration parameter. To configure the required interleaver for both interleaver 1 and 2, open the list, respectively, and select the required value. For Annex-A or Annex-C, use 12-17. For Annex-B, Interleaver value depends on the constellation in use. Constellation 64: 128-1, constellation 256: 128-4, 128-1.

**NOTE:** You can configure the Sym Rate for ANNEX A and ANNEX C only.
3.10.4 Configuring Module RF Ports

Each RF Port spans across 384MHz transmission frequency of the 1GHz spectrum (to be accurate 50MHz-1GHz).

You can locate along the spectrum, for each RF port, its Span window = 384MHz divided into steps of 6MHz for Annex B, or 8MHz for Annex A. You can set the Span window with accuracy of up to 1Khz along the 1GHz spectrum. For example 228.001 - 612.001.

Once you defined the Span window, locate the available QAM channels along this span window while each QAM channel utilizes six MHz in Annex B. For example, if the Span Window = 384 MHz and Span Start = 228 MHz, you can configure QAM channels with any frequency between 228MHz - 612 MHz. However, the frequency of the QAM channels is defined according to the center frequency. In this case, the first QAM channel valid frequency is 231MHz in steps of 6MHz. For example:

231, 237, 243…

You can locate the QAMs any where along the Span window. For example, QAM #4 can be located at 255MHz.

For Annex B, QAM frequency is calculated according to the following formula:

$$f_{QAM} = \text{SpanStart} + 3MHz + n*6MHz < \text{SpanEnd}$$

$$n=0 .... 63$$

For Annex A, QAM frequency is calculated according to the following formula:

$$f_{QAM} = \text{SpanStart} + 4MHz + n*8MHz < \text{SpanEnd}$$

$$n=0 .... 47$$

When Span window moves, all the allocated QAMs move accordingly. So if e.g. the window moves by +1Mhz, all allocated QAMs shift by +1Mhz.

To configure the RF port

1. Select the Platform tab.
2. In Back Panel View, select the required slot.
3. Select the Ports tab.

4. For each RF port, define the following:
   - RF Enable - select to enable the RF port. Enable the port only after completing the output configuration.
   - Frequency Range (MHz) - to locate the span window, along the spectrum, enter the Span Start and Span End.

Once you define the frequency range, all QAM Channel frequencies are aligned with the span window. For example: If the span start is 228 MHz, the QAM frequencies are: 231, 237, 243MHz. If you change the Span Start by 1kHz, 228.001MHz, all QAM frequencies change respectively, 231.001, 237.001 etc.

   - Optimized ACP - to apply ACP (Adjacent Channel Protection) Optimization, select this option. If ACP is applied, # QAMs per Port, is disabled. The device automatically balances the RF gain chain according to the number of currently active QAMs. However, if you mute a channel, while Optimized ACP is selected, a momentary disruption to video on other channels may ensue.

   - #QAMs per Port - available if Optimized ACP is not selected. Select the number of QAM channels that can be activated, turned On/Off. For Annex B, select QAM channels from 1-24, for Annex A select between 1-17. To decrease the number of QAMs per channel, indicate specifically the QAMs you wish to mute. See 3.10.5 Configuring/Viewing QAM Channels on page 48.

   **NOTE:** Select # QAMs per port according to your future upgrade of network path. The # of power level per QAM depends on the # QAMs per port.
- Power Level Per QAM - define the QAM power level for all QAM channels within the port. View the allowed range next to the Power Level Per QAM box.

You can click the Help button to view the following dialog:

**NOTE:** To view the Power Level Per QAM dialog, disable your pop-up blocker.

These values appear in the QAM tab as a read-only value:

- Total Power Level (dBmV) - Read only. The total power level of the RF port according to the power level of each QAM channel and the number of QAMs per port.
- Enable Variable Equalizer - select Variable Equalizer to enable the Cable Attenuation option.
- Cable Attenuation (dB) - to yield the best frequency flatness at the end of the cable, open the Cable Attenuation list and select a value where the cable attenuation provides pre-emphasis to high frequencies. To flatten the residual frequency ripple/tilt, refer to User Attenuation. See page 49.
5. To view the total active QAMs, use the Total Active QAMs table:

![Total Active QAMs Table]

For each port, view the following:

- The number of currently active QAMs/total number of QAMs per port with the QAM Manager in question. For example, as per the capture above, 15/19 - in port 1 there are 19 QAMs with VOD SRM QAM Manager and 15 of them are currently active.
- The overall number of active QAMs/total number of QAMs per port.

### 3.10.5 Configuring/Viewing QAM Channels

1. Select the Platform tab.
2. In Back Panel View, select the required slot.
3. Select the Port 1/2 QAMs tab.

![Module 7 Properties]

4. Define/view the following QAM-RF attributes:
   - RF Output - Read only. It indicates the QAM-RF output channel in the following pattern x,y,z where:
     x - Module number
     y - RF port number
     z - RF channel number
     For example, 1.2.2 refers to output traffic of module 1, transmitted via RF port 2, QAM channel 2.
   - QAM Index - (Read Only). An index number to identify each QAM channel within the total available QAM-RF channels of the device.
   - TS ID - sets the ID of the transport stream carried over this QAM-RF channel.
   - Group - Read only. Indicates the group the QAM channel belongs to in the following pattern: x (X,xxx,x.xxxxxxx), where:
     x - group number
     X - ITU-T Annex
     xxx - constellation
     x.xxxxxxx - symbol rate
   - QAM Manager - The QAM manager determines the functionality of the QAM. The default QAM manager is NGOD ERM. You can select one of the following QAM...
managers:

Table 3-10: QAM Manager

<table>
<thead>
<tr>
<th>QAM-RF Manager</th>
<th>Application</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOD SRM (default)</td>
<td>VOD Service &amp; PID Remux</td>
<td>VOD - the NSG 9000-40G automatically detects the incoming streams and automatically routes them, according to the indicated UDP, to the required QAM-RF channel. The traffic routed via the QAM-RFs is controlled by the SRM (Session Resource Manager). The SRM may also route to the QAM-RFs service remux or PID remux.</td>
</tr>
<tr>
<td>NGOD ERM</td>
<td>VOD SDV Service &amp; PID Remux</td>
<td>The NGOD ERM controls the QAM-RFs for binding SDV sessions and for routing VOD sessions. The ERM may also route to the QAM-RFs service remux or PID remux. All QAM-RFs send D6 messages to the NGOD ERM if NGOD ERM server is configured and enabled by selecting Applications &gt; NGOD.</td>
</tr>
<tr>
<td>ISA SRM</td>
<td>SDV VOD Service &amp; PID Remux</td>
<td>All QAM-RFs are controlled by ISA (Interactive Service Architecture) using the RPC protocol. VOD sessions are provisioned via ISA or by autodetection. The ISA may also route to the QAM-RFs service remux or PID remux.</td>
</tr>
<tr>
<td>Pass Through</td>
<td>Pass Through</td>
<td>The incoming stream is streamed out without any changes, that is without generating new tables, services or PIDs. The traffic is locally routed (device Passthrough manager) to the QAM-RFs as indicated by the UDP port.</td>
</tr>
<tr>
<td>M-CMTS</td>
<td>M-CMTS</td>
<td>The QAM-RFs deliver M-CMTS data and are controlled by the CMTS.</td>
</tr>
<tr>
<td>D2E (Not supported)</td>
<td>D2E</td>
<td>The D2E server controls the QAMs. Future use only.</td>
</tr>
</tbody>
</table>

NOTE: To change a QAM Manager, verify that no session, service or PID are provisioned/remuxed to this QAM-RF and that the QAM is not mapped to any virtual device.

- Serving Area - Enter the ID of the area that this QAM channel serves. When working with SAT, the Serving Area value should contain up to 16 bits (range of 1-65535). See 4.2.2.3 Creating and Setting SAT on page 64.
- NGOD Group Name - enter the QAM group name that the NSG reports on via its NGOD-D6 messages.
- EIA Channel - Appears when in RF Template you select EIS-STD. It indicates the channel number based on the EIA-STD channel table.
- Frequency - The center RF frequency (Hz) of this transport stream. You can locate the QAM channel anywhere along the Span window allocated for the group.
- Power Level (dBmV) - Indicates the power level of the QAM channel as defined in the RF Port tab. See, 3.10.4 Configuring Module RF Ports on page 45.
- User Attenuation - to flatten the residual frequency ripple/tilt, open the list and select
the required value. The available range is between 0-2 dB with steps of 0.1 dB.

- Interleaver - An advanced QAM configuration parameter. Select the required values according to the interleaver settings in the Module tab (see 3.10.3 Configuring a QAM-RF Module on page 43, or 3.10.2 Configuring Global RF & QAMs Parameters on page 41).

- QAM On - select to open the a single QAM channel without affecting the other channels that flow through the port.

- Spectral Inversion - The spectral inversion is an advanced QAM configuration parameter. If checked, spectral inversion is enabled.

- CW - Select for testing purposes only. Enabled only when the QAM channel is active.

5. Review the QAM channels configuration via the provided bar graphs as explained in the following section.

### 3.10.5.1 Understanding the RF Port Graph

A bar graph, for each RF port displays the current configuration of the RF port as the following table explains:

<table>
<thead>
<tr>
<th>Applied spectral inversion</th>
<th>Licensed, CW applied</th>
<th>Licensed Mute QAM channel</th>
<th>RF port enabled - blue grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF port enabled - blue grid</td>
<td>RF port disabled - red grid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RF O...</th>
<th>QAM...</th>
<th>TS...</th>
<th>Group</th>
<th>QAM Manager</th>
<th>Serving...</th>
<th>NLC...</th>
<th>Fre...</th>
<th>Power Lev...</th>
<th>User Att...</th>
<th>Inter...</th>
<th>QAM...</th>
<th>Spectr...</th>
<th>CW...</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2.1</td>
<td>313</td>
<td>313</td>
<td>1</td>
<td>(6,256,5,3605) VOD SLM</td>
<td>251.000</td>
<td>44</td>
<td>0</td>
<td>128-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2.2</td>
<td>314</td>
<td>314</td>
<td>1</td>
<td>(6,256,5,3605) VOD SLM</td>
<td>251.000</td>
<td>44</td>
<td>0</td>
<td>128-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2.3</td>
<td>315</td>
<td>315</td>
<td>1</td>
<td>(6,256,5,3605) VOD SLM</td>
<td>251.000</td>
<td>44</td>
<td>0</td>
<td>128-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2.4</td>
<td>316</td>
<td>316</td>
<td>1</td>
<td>(6,256,5,3605) VOD SLM</td>
<td>251.000</td>
<td>44</td>
<td>0</td>
<td>128-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3-11: RF Port Legend

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Enable</td>
<td>Gray grid - RF port is enabled</td>
</tr>
<tr>
<td></td>
<td>Red grid - RF port is disabled</td>
</tr>
<tr>
<td># QAMs per Port</td>
<td>Number of bars in graph. Each QAM-RF channel is represented by a bar.</td>
</tr>
<tr>
<td>Power Level (dBmV)</td>
<td>Height of bar. Each bar represents a QAM.</td>
</tr>
<tr>
<td>Bar color</td>
<td>Blue - license is granted and QAM is active</td>
</tr>
<tr>
<td></td>
<td>Gray - no license is granted. Currently not supported.</td>
</tr>
<tr>
<td>Bar shape</td>
<td>Rectangle like - normal</td>
</tr>
<tr>
<td></td>
<td>Pointy bar - CW is activated</td>
</tr>
<tr>
<td></td>
<td>Truncated bar - channel is mute</td>
</tr>
<tr>
<td></td>
<td>Indicates that spectral inversion is applied on this QAM. The arrows appear at the top of the bar.</td>
</tr>
</tbody>
</table>

Once you hover the mouse pointer over a bar, you can read QAM channel related information as the following table explains:

Table 3-12: Hint Explanation

<table>
<thead>
<tr>
<th>Hint Parameter</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM</td>
<td>Indicates the QAM number</td>
</tr>
<tr>
<td>Frequency</td>
<td>Indicates the center frequency of the QAM-RF channel</td>
</tr>
<tr>
<td>QAM Manager</td>
<td>Indicates the QAM Manager. See Table 3-10 on page 49.</td>
</tr>
<tr>
<td>Power level</td>
<td>Indicates the power level of the QAM-RF channel</td>
</tr>
<tr>
<td>QAM On</td>
<td>Indicates whether on or mute</td>
</tr>
<tr>
<td>Spectral Inversion</td>
<td>Indicates whether spectral inversion is applied</td>
</tr>
<tr>
<td>RF Group</td>
<td>Indicates the RF group this QAM channel belongs to</td>
</tr>
</tbody>
</table>
3.10.6 Viewing QAM-RF Module Information

1. Select the Platform tab.
2. In Back Panel View, select the required slot.
3. Select the General tab.

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Serial Number</th>
<th>FPGA Version</th>
<th>RF SW Version</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSG-36R1G</td>
<td>021045418</td>
<td>0x165A</td>
<td>06.00</td>
<td>MODULE OK</td>
</tr>
</tbody>
</table>

4. View the following information:
   - **Module Type** - NSG-36R1G, up to 36 QAM-RF channels per 1 Giga RF port. Number of available QAM-RFs is firmware dependent.
   - **Serial Number** - The serial number of the mounted module.
   - **FPGA Version** - The version of the interface FPGA card.
   - **RF SW Version** - The version of the RF firmware. A version of 06.00 and higher indicates an up converter of 1G.
   - **Status** - Indicates the status of the module:
     - Module OK - the module is mounted and works properly
     - Module is Out - the module is not mounted in the slot
     - Module Failed - the mounted module is faulty or there is a mismatch between the module and the configuration.

3.11 Configuring NGOD

When the EdgeQAM is part of an NGOD system architecture, configure the following to allow the QAM-RFs of the EdgeQAM to outflow SDV/VOD sessions:

- Configure and enable an NGOD ERM server as explained below.
- Define the NGOD ERM as the QAM-RF manager of the required QAM-RFs. See 3.10.5 Configuring/Viewing QAM Channels on page 48.

Setting NGOD ERM parameters requires to set general NGOD parameters and specific ERM parameters.

3.11.1 Configuring NGOD General Parameters

To allow communication with the ERM, the NSG 9000-40G device supports the D6 and R6 NGOD protocols. When communicating using the R6 protocol, NSG is always listening on port 554(RTSP). Currently NSG900-40G communicates only with one ERM.
1. Select Platform > NGOD tab.

2. Focus on the General section.

3. In NGOD Component Name, enter the component name as defined in the D6 protocol.

4. In Bandwidth Update Threshold (kbps), define the allowed deviation from the current output bit rate of the device (60 to 2000). Whenever the bit rate deviation reaches the value defined in this field, the NSG sends the ERM the updated output bit rate.

5. In Routing Cost, enter a value as defined in the D6 protocol (0-255).

6. In R6 RTSP Port, view the port number. When communicating using the R6 protocol NSG is always listening on port 554(RTSP).

3.11.2 Configuring ERM Parameters

1. Select Platform > NGOD tab.

2. In IP Address, enter the ERM IP address. From version 3.2.3 and up, you can also enter the name of the ERM. If you entered the ERM name, NSG9000-40G obtains the IP address of the required ERM from the DNS (Domain Name Server). (See also 3.3 Configuring Ethernet Ports on page 22)

3. In Port, enter the ERM TCP port number.

4. In Version, select the supported version of the protocol. Version 2 is the default version.

5. In Streaming Zone, enter the streaming zone as defined in the D6 protocol.

6. To enable the NSG-ERM communication, select the Enable ERM box.

From version 3.2.3, enter here either the ERM IP address or the DNS name.
7. In Status, view the connection status.

<table>
<thead>
<tr>
<th>Status</th>
<th>Explanation</th>
<th>Following Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDLE</td>
<td>No connection with ERM</td>
<td>CONNECT if NSG is trying to connect to the ERM</td>
</tr>
<tr>
<td>CONNECT</td>
<td>Trying to connect to the ERM.</td>
<td>CONNECT if NSG cannot access the ERM</td>
</tr>
<tr>
<td>ACTIVE</td>
<td>Trying to establish connection with the ERM</td>
<td>ACTIVE if ERM parameters are invalid ESTABLISH</td>
</tr>
<tr>
<td>ESTABLISH</td>
<td>Established connection with the ERM over the D6 protocol</td>
<td></td>
</tr>
</tbody>
</table>

8. In ERM Keep Alive, view the period of time, in seconds, that elapses between the keepalive messages. These messages are transmitted by the NSG to the ERM. This is a read-only parameter.

9. In Connection Retry Threshold (sec), enter a period of time in seconds to indicate the duration between retrials to connect to the ERM to send D6 messages.

10. In Hold Time (sec), enter a period of time in seconds to indicate the duration between responses to successive Keep Alive and or UPDATE messages received by the NSG. If the duration time elapses and a response is not received, NSG tries to re-establish the connection with the ERM.

### 3.12 Configuring ISA

The ISA configuration includes the following:
- Defining general parameters
- Defining virtual ISA devices

#### 3.12.1 Defining ISA General Parameters

When the EdgeQAM is part of an ISA SRM (Session Resource Manager) system architecture, you need to configure the following parameters to allow the QAM-RFs of the EdgeQAM to outflow SDV/VOD sessions:

1. Select Platform > ISA tab.

2. Define the following parameters:
- SRM IP Address - enter the IP address of the SRM that controls the NSG device. The port number over which the device communicates with the SRM is 0, to allow a dynamic port assignment. The Connection type is TCP.

- Timeout Period - enter a period of time in seconds to indicate the duration between the NSG trials to connect to the SRM.

- Enable Reset Indication - check to enable this message required by the RPC protocol. Enable this option in case the SRM supports reset indication message, such as a DNCS SRM. This message is sent to the SRM who manages the device after device reset or once management communication is back in case of communication problems. By default this parameter is off.

- Enable Announce Message Indication - check to enable the announce message indication required by the ISA and the RPC interface version 1.5 protocol. Announce message indications are sent to the SRM due to the following:

Table 3-14: Announce Message

<table>
<thead>
<tr>
<th>Announce Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream Established</td>
<td>NSG sends this message upon the following:</td>
</tr>
<tr>
<td></td>
<td>■ A session is created and traffic is detected on the input</td>
</tr>
<tr>
<td></td>
<td>■ When stream state changes from stream failed or lost to stream exists.</td>
</tr>
<tr>
<td>Stream failed to acquire a multicast stream</td>
<td>NSG sends this message when no input traffic is detected for this stream</td>
</tr>
<tr>
<td>Stream lost or degraded</td>
<td>NSG sends this message when a problem occurs on the output preventing the</td>
</tr>
<tr>
<td></td>
<td>transmission of the output stream.</td>
</tr>
</tbody>
</table>

- Report PMT Section (QuerySessionInfo) - when selected, in QuerySessionInfo, the PMT packet data is sent to the SRM.

- Out of Band Mini Carousel - applies to ISA-SDV. Select, in case, the mini carousel is transmitted to the set-top-box out-of-band and not through the video network. When you enable this parameter, the device does not raise the alarm Service Missing for mini carousel sessions.

NOTE: The following parameters apply to SDV sessions that are either shell/bind sessions or create sessions with port 0 or a port higher than 8 only.

- SDV Load-Sharing Ports - Applies to SDV sessions that are either shell/bind sessions or create sessions with port 0 or a port higher than 8. The input port in the provisioning message is not indicated. The edgeQAM attempts to receive the input stream via the input port indicated in the SDV Port-Sharing Load A box. The default port is port 1. You can configure up to four ports in case the SDV traffic exceeds 1Giga. In this case, the NSG manages the traffic between the input ports for SDV session selected in the SDV Load-Sharing Ports. The NSG sends the sessions to the input port for SDV session with less traffic. If the selected ports are equally loaded with traffic, the device sends the traffic to the port with the lowest number (GbE 1-8) that is selected for SDV sessions.

NOTE: To view the actual input port, select Applications > SDV > ISA Active Sessions.
3.13 Virtual Devices

Virtual devices allow flexibility in deployment of systems with constraints of QAM-RF channels. VOD or ISA SRM systems handle a limited number of QAM-RF channels. To overcome this limitation, the virtualization feature allows these system components to view the edgeQAM as several devices and to interface and utilize the whole range of QAM-RF channels provided by the edgeQAM.

To create virtual devices, do the following:

- Create virtual IPs - requires to define the following, unless you are using the physical management port IP or the physical GbE port IP for the virtual devices:
  - Eth1 Virtual IPs - You can add virtual IPs to Eth1 only. You can add up to 18 Eth1 virtual IPs. Eth1 virtual IPs should be on a subnet other than Eth2 subnet.
  - GbE Virtual IPs - You can add GbE virtual IPs to any of the GbE ports. GbE Virtual IP can be the same as the physical GbE IP. The physical GbE port is automatically added as one of the available virtual port IPs and you cannot remove it.

- Associate virtual devices with VOD QAM manager or ISA SRM QAM Manager.

3.13.1 Creating Virtual IPs for ISA

To create Eth1 virtual IP

1. Open the web client of the device.
2. Select the Platform tab.
4. In Eth1 Properties, select the Virtual IPs tab.
5. Click Add Virtual IP.

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6. In the table enter the following:

   - Eth1 Virtual IP - enter the required Eth1 virtual IP. Virtual IP should be different than
     the physical Eth1 IP address and any other Eth1 virtual IP and on a subnet other than
     Eth2.

   **NOTE:** If you change an Eth1 virtual IP of an existing virtual device, its Reset Ind. MAC Address changes unless it was manually changed. See 3.13.2 Associating a Virtual Device with VOD/ISA SRM Device on page 58.

   - IP Mask - enter a subnet mask.

7. In Status, view the status of the Eth1 virtual IP:

   - In Use - the virtual IP is currently in use. You cannot delete a virtual Eth1 that its status is
     *In Use*.
   - Not in Use - the virtual IP is currently not in use.

8. To delete, in the Delete column, select the required virtual device and then click Delete Selected.

   **NOTE:** You cannot delete a virtual Eth1 that its status is *In Use*.

To create virtual GbE IP

1. Open the web client of the device.
2. Select the Platform tab.
3. In Back Panel View, select the required GbE port.
4. In GbE Properties, select the Virtual IPs tab.

   **NOTE:** Since the GbE virtual IP can be as the physical GbE IP, the physical GbE IP is already listed as the GbE virtual IP.

5. Click Add Virtual IP.
6. In the table, enter the following:
   - GbE Virtual IP - enter the GbE virtual IP. The GbE virtual IP can be as the physical GbE IP. GbE virtual IP should be unique across all ports.
   - Mask - enter the required IP mask.
   - Delete - select to delete the virtual IP once you click Delete Selected. You cannot delete a virtual GbE IP address that its associated Eth1 is currently in use. (See 3.13.1 Creating Virtual IPs for ISA on page 56.

3.13.2 Associating a Virtual Device with VOD/ISA SRM Device

Once you defined the virtual ISA IPs, you may associate them with the QAM-RFs as explained below:

**NOTE:** The QAM-RFs to be associated, should have an ISA SRM QAM Manager.

➢ To associate a virtual device with VOD/ISA SRM device
1. Open the web client of the device.
2. Select the **Platform > Virtual Devices** tab.
3. Click **Add Virtual Device**, to open a blank record for the new virtual device.
4. Select the required management IP. Once you click in the Eth1 Virtual IP field, it is propagated with the Eth1 virtual IPs you defined in 3.13.1 Creating Virtual IPs for ISA on page 56.
5. In VOD/ISA, open the QAM Manager list and select the required QAM manager. Select either VOD, for VOD systems and ISA for ISA SRM systems.
6. Once you click in the GbE Port: Virtual IP field, it is propagated with the GbE port IPs and GbE virtual IPs you defined in 3.13.1 Creating Virtual IPs for ISA on page 56. The GBE interface appears in the following format: `<x>:<virtual GbE IP>`, where x is the physical GbE port of the edgeQAM, an integer between 1-4. Select the required GbE interface.
7. To define the QAM channel to output the content, in QAM Mapping, click **Add**.
The following dialog appears:

8. In case of VOD QAM manager, Bitmap and Encoded options appear. Select the required UDP port scheme:
   Bitmap - each of the MSB bits represents a virtual QAM number of the NSG. The virtual QAM number is determined by the bit that is set to 1. For example, virtual QAM 8 is represented by 10000000, virtual QAM 3 by 00000100 and virtual QAM 9 by 00000001 together with the IP address.

   Encoded - the virtual QAM is determined by the numeric value of the MSB. For example, virtual QAM 8 is represented by 00001000, virtual QAM 3 by 00000011 and virtual QAM 9 by 00000101.

9. In QAM Mapping Table page you can click Add RF Port or Add QAM. The following table provides instructions for both options:

Table 3-15: QAM Mapping Table Page

<table>
<thead>
<tr>
<th>Instructions for Clicking Add RF Port</th>
<th>Instructions for Clicking Add QAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Click Add RF Port.</td>
<td>a. Click Add QAM.</td>
</tr>
<tr>
<td>b. Open the RF Port list and select an RF Port. The list is populated with ports that include at least one QAM channel with ISA SRM QAM manager</td>
<td>b. In Virtual QAM, enter the QAM number (1-255) in the provisioning message. The UDP Port Range is automatically displayed.</td>
</tr>
</tbody>
</table>
10. You can add up to four GbE ports for each VOD/ISA virtual device. To add, click the + sign. Blank records are added and you may configure the GbE:Virtual IP and Virtual Input Port as instructed above.

<table>
<thead>
<tr>
<th>Instructions for Clicking Add RF Port</th>
<th>Instructions for Clicking Add QAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. Open the QAM Start list and select the required QAM. The list is populated with QAM channels with ISA SRM QAM manager.</td>
<td>c. In Physical QAM, enter the physical QAM to output the content. Indicate the physical QAM in the following pattern: x.y.z, where x - module number, an integer between 1-9, y - port number, an integer between 1-2, z - QAM channel number, an integer between 1-24</td>
</tr>
<tr>
<td>d. Open the QAM End list and select the required QAM.</td>
<td></td>
</tr>
<tr>
<td>e. In Start Virtual QAM, enter the QAM number in the provisioning message. This is the first visual QAM to start mapping from.</td>
<td></td>
</tr>
<tr>
<td>f. Click Done to save configuration and to close the dialog.</td>
<td></td>
</tr>
</tbody>
</table>

11. Applies to ISA SRM only. In Virtual Input Port enter the required port according to the ISA provisioning.
12. **Applies to ISA SRM only.** In Enable Reset Indication, check to enable this message required by the RPC protocol. Enable this option in case the SRM supports reset indication message, such as a DNCS SRM. This message is sent to the SRM who manages the device, after device reset or after management communication is back in case of communication problems. By default this parameter is off.

13. **Applies to ISA SRM only.** Reset Ind. MAC Addr. - the MAC Address of the management port of the device/virtual device. This MAC address appears in the Reset Indication message only to identify the device. Once you click Enable Reset Indication, the Reset Ind. MAC Address is calculated as follows:

   Reset Indication MAC Address

   First two bytes = First two bytes of the Eth1 MAC address

   Four last bytes = The IP address of the Eth1/virtual Eth1 in hexadecimal.

   For example: Reset Indication is 00:90:0a:28:17:b1, where:

   00:90 = derived from the MAC address of Eth1, which is 00:90:F0:02:12:A8

   0a:28:17:b1 = the IP address of the virtual Eth1, which is 10.40.23.177. In hex = 0a:28:17:b1.

   **NOTE:** In case the calculated Reset Indication MAC Address is already in use, you can edit the Reset Indication MAC Address.

   **NOTE:** The Reset Ind. MAC Addr. changes only if you changed the Eth1 virtual device via the Eth1 Properties and if the Reset Ind. MAC Addr. is automatically generated. Once you edit it, it does not change even if you change the Eth1 virtual device via the Eth1 Properties. See [3.13.1 Creating Virtual IPs for ISA on page 56](#).
4.1 Applications Overview

NSG 9000-40G operates in the following applications:

VOD Application - The system serves as a highly integrated digital video gateway, capable of multiplexing on-demand content streamed over an IP network.

Broadcast Applications - The system serves as a digital video gateway that broadcasts remuxed services.

SDV Application - The device streams out SDV sessions provisioned by ISA.

CAS - This version supports Privacy Mode scrambling only.

**NOTE:** When provisioning static sessions through the web client or MCT, NSG 9000-40G may carry up to 500 sessions only. When dynamic sessions are provisioned through NGOD ERM, ISA SRM or VOD SRM, NSG 9000-40G may carry up to 3,000 dynamic SDV/VOD sessions.

4.2 VOD Application

The VOD application includes two tabs:

- **Settings** - allows you to set the following:
  - General parameters - session inactivity time
  - MPEG related parameters
  - Emulation mode
- **QAMs** - a read-only page to view QAMs settings

4.2.1 Defining Session Inactivity Time

Define the allowed duration for session inactivity before the session is removed from the output.

1. Select Applications > VOD > Settings tab.
2. In Session Inactivity Teardown Threshold (Sec), enter the allowed period of time in seconds for session inactivity. In case the interval is longer than the indicated time, the session is removed from the output port.

3. By default Allow Auto Detection is selected. Verify that this option is selected to allow auto detection, in the input, of the output QAM according to the indicated UDP port.

### 4.2.2 Defining MPEG Parameters

#### 4.2.2.1 PID Remapping

The PID Remapping option allows you to remap according to a specific paradigm or randomly. In either case, the NSG prevents the assignment of conflicting PIDs.

- **Paradigm** - The elementary stream PIDs are determined according to the ATSC A/53 standard, which defines the PID remapping rules that are listed in the table below:

<table>
<thead>
<tr>
<th>Formula</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service ID = 0xN</td>
<td>Service ID = 0x34</td>
</tr>
<tr>
<td>PMT PID = LeftShift(N) = 0xN0</td>
<td>PMT PID = 0x340</td>
</tr>
<tr>
<td>PCR=Video=PMT+1= 0xN1</td>
<td>Video = 0x341</td>
</tr>
<tr>
<td>Audio 1&amp;2 = PMT+4/5 = 0xN 4,0xN5</td>
<td>Audio 1&amp;2 = 0x344, 0x345</td>
</tr>
<tr>
<td>ECM=PMT+9= 0xN9</td>
<td>ECM PID= 0x349</td>
</tr>
</tbody>
</table>

**NOTE:** The Paradigm mode is not suitable for processing services with service IDs greater than 510. If you are using service ID that are greater than 510 you must use the Random mode.

- **Random** - The NSG remaps incoming PIDs to PID numbers that are randomly selected from a predefined range. Define the range in the PID Range field. The PID range is written in hex-decimal format. Range of acceptable values is 0x21 to 0x1FF0.

Changing the PID remapping mode may interrupt the streams currently flowing through the device. It is recommended to change the remapping mode only when no active streams are flowing through the device.

In addition, changing the PID remapping may affect the operation of some STB (Set-up Boxes.) Various STBs operate better with a specific mode. If you suspect such a case, call the STB vendor before changing the PID remapping.

**NOTE:** Do not change the default settings unless it is necessary. Changing the parameters may cause serious problems with elementary stream transmission.

**NOTE:** Changing the PID Remapping mode is global. It applies to the platform and to both VOD and SDV sessions.

To change PID remapping

1. Select Applications > VOD > Settings:
2. By default the remapping method is Paradigm. To change the remapping method, select Random. The PID Range (Per TS) option is enabled.

3. In PID Range (Per TS), define the PID range (in hex-decimal format) that the NSG will use for random PID assignment. The range of acceptable values is 0x21 to 0x1FF0.

   **NOTE:** Changes take affect after device reset only.

### 4.2.2.2 Setting PAT/PMT Intervals

1. In PMT Interval, define the interval in milliseconds at which PMT packets are sent over the NSG's output transport streams.

2. In PAT Interval, define the interval in milliseconds at which PAT packets are sent over the NSG's output transport streams.

   **NOTE:** Changes take affect after device reset only.

3. Select Update PMT Version to update the PMT version. This version is incremented every time the PMT's data is changed (e.g. the Video PID changes).

### 4.2.2.3 Creating and Setting SAT

Service Area Table (SAT) is a none standard table created to meet special needs of customers. SAT is like the SDT (Service Description Table) defined by the DVB standard. SAT uses the Serving Area parameter. To create SAT, the Serving Area value should contain up to 16 bits (range of 1-65535). For serving area configuration, see **Configuring/Viewing QAM Channels** on page 48.

1. Select Create SAT (Service Area Table), to create SAT at the output. Once Create SAT is selected, the following parameters are enabled:

   - Original Network ID
   - Serving Area Location in SAT

2. If Create SAT is selected, define the original network ID.

3. If Create SAT is selected, open the Serving Area Location in SAT list and select one of the following:

   - TS ID - the serving area is written to the TS ID.
   - First Service Name - the serving area is written to the first service name.
   - Both - the serving area is written to both the TS ID and the first service name.
4.2.3 Defining UDP Mapping

By default, for VOD streams, autodetected is enabled and the streams are multiplexed to the required QAM, according to the UDP port number. However, you can set the QAM mapping method as follows:

- Normal 10/6 - according to this QAM mapping the 10MSB indicate the designated QAM-RF output and the 6LSB the output service ID. Thus, the allowed ranges are: QAM-RF 0-1023, Service ID 0-63.
- NSG9000-6G - select to enable QAM mapping according to NSG9000-6G.
- Custom - you can prepare your own QAM mapping file and load it to the NSG. The streams are outflowing according to the QAM mapping defined in the customized file.
- Virtualization (8/8 bits) - according to this QAM mapping the 8MSB indicate the designated QAM-RF output and the 8LSB the output service ID. Thus, the allowed ranges are: QAM-RF 0-255, Service ID 0-63.

To define UDP mapping

1. Select Applications > VOD > Settings tab.
2. Focus on the UDP Mapping section.
3. For default QAM mapping, select 10MSB for QAM, 6LSB for Service.
4. When Normal mapping is selected, to create a range to be mapped, enter the following:
   In Service ID Base, enter the first service in the mapping range. The default is 1.
   According to Normal mapping the 10MSB indicate the designated QAM-RF output and the 6LSB the output service ID. Thus, the allowed ranges are: QAM-RF 0-1023, Service ID 0-63.
5. To enable QAM mapping according to NSG9000-6G, select NSG9000-6G.
6. For custom QAM mapping, select Custom.
   In the dialog that appears, browse to the file with the custom mapping and load it to the device.
   The NSG device is using the loaded QAM mapping.csv file to map the QAMs.

**NOTE:** Changes to QAM Mapping Range and to QAM Mapping method require device reset.
7. When working with a system with constraints regarding the QAM-RF channels, select Virtualization (8/8 bits) option. This UDP mapping allows to route services to the QAM-RFs of the NSG9000-40G without changing the existing UDP configuration that was constructed according to older types of edgeQAM devices. See Virtual Devices on page 56.

4.2.3.1 Creating and Importing the QAM Mapping File

1. In Excel, create a QAM mapping file. The following picture is an example of a custom file:

   ![Excel QAM Mapping File Example](image)

   The file includes the following fields with values in decimal format only:
   - Column A - UDP - UDP port number, an integer between 1 - 65535.
   - Column B - QAM - QAM Index, an integer between 1-648.
   - Column C - SID - Service ID, an integer between 1-63.

   In addition, heed the following:
   - Line length in the file should be up to 256 characters.
   - Empty lines are allowed.
   - Comments are allowed at column D.
   - Save the file as a CSV file.

2. Once you are done, save the file as a CSV file.

3. In the web client of the device, select Application > VOD > Settings.

4. Click Import File.

5. Click Browse, to locate the required file.

6. In the confirmation message, click OK.
The file is loaded to the device. While loading the file, the device validates the file.

7. Reset the device.

**NOTE:** If imported file is invalid, the file is imported successfully. However, after reset, device uses the default 10 MSB for QAM for QAM 6LSB for Service scheme.

### 4.2.3.2 Exporting Customized QAM Mapping Mode File

1. Select **Applications** > **VOD** > **Settings**.
2. Click **Export File**.
3. Click either **Open** or **Save** the file of the selected QAM Mapping mode.
   - If you select **Open**, the file opens and you can view it.
   - If you select **Save**, a Save As dialog opens and you may browse to the required location of the file.

### 4.2.4 Viewing VOD QAMs

The QAMs tab allows you to view the settings of all the QAMs configured to stream out VOD sessions. These QAMs are managed by the following QAM managers:

- VOD SRM
- ISA SRM

To view VOD QAMs

1. Select **Applications** > **VOD** > **QAMs**.

2. View the following read-only information:
   - **QAM Manager** - lists the defined QAM manager for this application. In VOD application, the defined QAM manager can be VOD SRM, NGOD ERM, or ISA SRM. See **Configuring/Viewing QAM Channels** on page 48.
   - **RF Output** - see **Configuring/Viewing QAM Channels** on page 48
   - **QAM Index** - An index number to identify each QAM channel within the 648 QAM-RF channels of the device. This tab displays the number of QAM channels in groups of 36 QAMs per QAM which is the maximum number of QAMs Per Port.

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Chapter 4 Configuring Applications

4.3 Broadcast Application

In Broadcast application mode, NSG 9000-40G allows to manually route various content elements to any output QAM channel. NSG 9000-40G allows to create the following types of sessions:

- Service Remux - to route specific MPEG services (programs) using the Service Remux tab
- Pass through - to route complete input MPTSs by using the Pass Through tab. For future use.
- PID Remux - to route individual PIDs using the PID Remux tab.

4.3.1 Provisioning Service Remux Sessions

NSG9000-40G supports RTSP (Real Time Streaming Protocol) sessions provisioned over RTSP protocol. NSG9000-40G supports up to 2000 NGOD sessions.

You can route a service from any input to any output. You can select whether to:

- Output the service with its input ID or to remap it.
- Remap the service PIDs.

NSG9000-40G supports RTSP provision with alternate sources. See SDV Settings on page 73.

When provisioning sessions through the web client or MCT, session ID starts at 10,000.

NOTE: You cannot remux PIDs of remuxed services.

To route a service
Chapter 4 Configuring Applications

Broadcast Application

1. Select Applications > Broadcast > Service Remux tab:

   - Click to add a session to route a service
   - Click Duplicate, to add a session with definitions exactly as the selected session
   - Click Duplicate Range, to add sessions according to the defined range

<table>
<thead>
<tr>
<th>Session ID</th>
<th>Multicast</th>
<th>GbE Port</th>
<th>IP Address</th>
<th>UDP Port</th>
<th>Source IP</th>
<th>RF Output</th>
<th>Service ID</th>
<th>No PID Remapping</th>
<th>Select</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td></td>
<td>1</td>
<td>192.168.9.4</td>
<td>0.0.0.0</td>
<td>3.1.11(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Click Add Session.

   A row is added to the table with a session ID.

   Session ID- Read only. A sequential number starting at 10000, to indicate the number of the session in the current page.

3. To define the input socket, do the following:
   - Select Multicast, in case the input stream is a multicast TS. If selected, the IP address is removed from the IP Address box.
   - Select the input GbE Port. Open the GbE Port list to select the required input port. Once you define the required GbE port, the IP Address field is updated to display the IP address of the selected port, unless Multicast is selected.
   - In IP Address, enter the required unicast/multicast IP address of the input port. By default, the IP address of the selected port appears, unless multicast is selected.
   - In UDP Port, indicate the UDP port.
   - In Source IP, view the IP address of the upstream device that streams the content to the defined GbE port and socket.

4. To define the output QAM, enter in RF Output the required QAM-RF channel in the following format: X.Y.Z (T) where:
   - X – module number (1…9)
   - Y – RF port number (1…2)
   - Z – channel number (1…24/17Annex A)
   - T – QAM index number (1…648). QAMs are arranged in groups of 36 QAMs per port

5. In Service ID enter the required output service ID. You can output the service with the same input ID number or to remap the service.

6. To output a service without remapping its PIDs, select No PID Remap.

   **NOTE:** If you disable No PID remapping, verify there is no PID conflict in the output.

   - To route a service using the Duplicate button

     Once you defined a service and need to route another service with similar configuration, do the following:
     1. In Service Remux page, check the Select box of the required service/session.
     2. Click Duplicate.

        The selected row is duplicated and appears as the last row in the table.
     3. Define the required parameters as explained in **To route a service** on page 68.
To route a service to a few output ports
1. In Service Remux page, check the Select box of the required service.
2. Click Duplicate Range.
The following page appears:

3. To define the range of the output QAM (logical port number), enter in From QAM and To QAM a number between 1-636 to indicate the beginning and the end of the range, respectively. (QAMs are arranged in groups of 36 per RF port. 1-636 indicates the number of QAMs that are currently supported.)
4. Click Done.

To delete a remuxed service
1. In Service Remux page, check the Select box of the required service.
2. Click Delete Selected.

4.3.2 Provisioning PID Remux Sessions

You can route a PID from any input to any output. You can select whether to add a PMT reference to the PID.

You can route an input PID to a few outputs and remap a PID to output it over different outputs. However, you cannot route a PID to the same output with different remapped PIDs.

The PID 0x10 is reserved for the Network Information Table (NIT). If you remux a PID and remap it to PID 0x10, the PAT points to it as a NIT table PID. NSG 9000-40G ignores any of the PID 0x10 configuration such as PMT reference and added descriptor.

NOTE: You cannot remux PIDs of remuxed services.

To route a PID
1. Select Applications > Broadcast > PID Remux tab:
2. Click Add Session.
A row is added to the table with a session ID.

   Session ID- Read only. A sequential number to indicate the number of the session in the current page.

3. To define the input socket, do the following:
   - Select Multicast, in case the input stream is a multicast TS. If selected, the IP address is removed from the IP Address box.
   - Select the input GbE Port. Open the GbE Port list to select the required input port. Once you define the required GbE port, the IP Address field is updated to display the IP address of the selected port, unless Multicast is selected.
   - In IP Address, enter the required unicast/multicast IP address of the input port. By default, the IP address of the selected port appears, unless multicast is selected.
   - In UDP Port, indicate the UDP port.
   - In Source IP, view the IP address of the upstream device that streams the content to the defined GbE port and socket.
   - In Input PID, enter the PID at the input.

4. To define the output QAM, enter in RF Output the required QAM-RF channel in the following format: X.Y.Z (T) where:
   - X – module number (1…9)
   - Y – RF port number (1…2)
   - Z – channel number (1…24/17Annex A)
   - T – QAM index number (1…648). QAMs are arranged in groups of 36 QAMs per port

5. In Output PID, enter the required ID of the ES at the output. You can output the PID with the same input ID or to remap the PID.

6. To allow PMT reference, select the PMT Ref box.
   The ES Type field is enabled. PID 0x10 is excluded. It does not support PMT reference and added descriptor.

7. If you selected the PMT Reference box, enter the ES Type to stream out the PID. This is the ES type that the PMT table points to. See, Standard ES Types and Descriptors on page 129.

8. To add a descriptor, click Descriptor...
   The Descriptor List page opens.

9. Click Add Descriptor.
10. In Descriptor Type and Descriptor Value, enter the required parameters as defined by the MPEG standard.
11. To close the dialog and save configuration, click Done.

To route a PID using the Duplicate button

Once you defined a service and need to route another service with similar configuration, do the following:
1. In PID Remux page, check the Select box of the required session.
2. Click Duplicate.
   The selected row is duplicated and appears as the last row in the table.
3. Define the required parameters as explained in To route a PID on page 70.

To route a PID to a few output ports
1. In PID Remux page, check the Select box of the required service.
2. Click Duplicate Range.
   The following page appears:
   
   ![Duplicate Range -- Webpage Dialog]

   3. To define the range of the output QAM (logical port number), enter in From QAM and To QAM a number between 1-636 to indicate the beginning and the end of the range, respectively. (QAMs are arranged in groups of 36. 1-636 indicates the number of QAMs that are currently supported.)
4. Click Done.

To delete a remuxed PID
1. In PID Remux page, check the Select box of the required service.
2. Click Delete Selected.

4.4 SDV Application

The SDV application includes the following tabs:
- Settings - allows you to set the following:
  - SDV redundancy
  - MPEG related parameters
- QAMs - a read only page to view QAMs settings
4.4.1 SDV Settings

4.4.1.1 NGOD Redundancy

NSG9000-40G supports RTSP provision with up to four alternate sources per session. NSG 9000-40G supports the RTSP protocol with various redundancy modes. Select one of the following redundancy modes:

Hot/Warm - the default option. The service has only one redundant service. NSG 9000-40G JOINs the primary service, and upon failure, JOINs the backup multicast group. As a result, the backup service is streamed from the switch to the input port of the device.

Hot/Hot - the service has one redundant service. NSG 9000-40G JOINs both the primary and backup multicast groups and both groups are steamed to the device. Upon failure, the backup service is provisioned to the device resulting in a short fail-over time.

Hot/Warm/Warm - the service has at least two redundant services. NSG 9000-40G JOINs the primary multicast group. Upon failure NSG 9000-40G JOINs the first backup service and as a result the backup service is streamed into the device. If this trial fails, NSG 9000-40G JOINs the second backup multicast group.

Hot/Hot/Hot - the service has at least two redundant services. NSG 9000-40G JOINs all three multicast groups. All three services are streamed to the input port to allow short fail-over time.

4.4.1.2 ISA Redundancy

Service redundancy - activated once the device does not detect the service at the input port. Service redundancy is supported in one of the methods described in NGOD Redundancy.

The Allow Shared Backup Source option allows a single service/socket to backup more than one primary sockets. Once this option is selected, the redundancy switch may take up to four seconds.

To define SDV socket redundancy mode

1. Select Applications > SDV > Settings.
2. To set the redundancy mode, do either of the following:

- To set the NGOD redundancy mode, open the NGOD Redundancy Mode list and select one of the modes listed in the Table 4-1: SDV Redundancy Modes table.
- To set the ISA redundancy mode, open the ISA Redundancy Mode list and select one of the modes listed in the Table 4-1: SDV Redundancy Modes table.

### Table 4-1: SDV Redundancy Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot/Warm</td>
<td>The default option. The service has only one redundant service. NSG 9000-40G JOINs the primary service, and upon failure, JOINs the backup multicast group. As a result, the backup service is streamed from the switch to the input port of the device.</td>
</tr>
<tr>
<td>Hot/Hot</td>
<td>The service has one redundant service. NSG 9000-40G JOINs both the primary and backup multicast groups and both groups are steamed to the device. Upon failure, the backup service is provisioned to the device resulting in a short fail-over time.</td>
</tr>
<tr>
<td>Hot/Warm/Warm NGOD only</td>
<td>The service has at least two redundant services. NSG 9000-40G JOINs the first backup multicast group. Upon failure NSG 9000-40G JOINs the first backup multicast group. If this trial fails, NSG 9000-40G JOINs the second backup multicast group.</td>
</tr>
<tr>
<td>Hot/Hot/Hot NGOD only</td>
<td>The service has at least two redundant services. NSG 9000-40G JOINs all three multicast groups. All three services are streamed to the input port to allow short fail-over time.</td>
</tr>
</tbody>
</table>
3. ISA Redundancy mode - check Allow Shared Backup Source to allow a single service/socket to backup more than one primary sockets. Once this option is selected, the redundancy switch may take up to four seconds.

**NOTE:** To define port redundancy in SDV application, see *Configuring Input GbE Port Redundancy* on page 34.

### 4.4.1.3 Defining MPEG Parameters

1. Select Applications > SDV > Settings.
2. Focus on the MPEG section.

![MPEG section](MPEG_section.png)

See *Defining MPEG Parameters* on page 63.

### 4.4.1.4 ISA Synchronization

1. Select Applications > SDV > Settings.
2. Focus on the ISA Synchronization section.

3. To trigger the ISA ERM to synchronize with the device regarding the provisioned SDV services, click Sync.

4.4.2 Viewing SDV QAM Parameters

The QAMs parameters allows you to view all of the SDV available QAMs.

1. Select Applications > SDV > QAMs.

2. View the following information.
   - QAM Manager - lists the defined QAM manager. In SDV the QAM manager can be NGOD ERM or ISA.
   - Eth Virtual IP - view the virtual management port of the device.
   - RF Output - see Configuring/Viewing QAM Channels on page 48
   - QAM Index - see Configuring/Viewing QAM Channels on page 48
   - TS ID - see Configuring/Viewing QAM Channels on page 48
4.4.3 Viewing NGOD Active Sessions

The NGOD Active Sessions tab lists all the NGOD sessions provisioned to the device. NSG 9000-40G supports up to 2,000 NGOD sessions.

To view NGOD active sessions
1. Select **Applications > SDV > NGOD Active Sessions**.

2. To view the currently provisioned session, click **Refresh Sessions**.

3. View the following information:
   - **On Demand Session ID** - a unique session ID generated by the NGOD system.
   - **Session ID** - a unique session ID generated by the NSG 9000-40G device.
   - **RF Output** - the output QAM-RF channel through which the service is streamed out of the device.
   - **Service ID** - the ID of the QAM-RF module mounted in the slot.
   - **Service ID** - the ID of the output service
   - **NGOD Group Name** - the QAM group name that the NSG reports on via its NGOD-D6 messages.
   - **GbE Port** - indicates the GbE input port of the incoming service.
   - **Destination IP** - the IP address (unicast or multicast) of the input session.
UDP Port - the UDP port of the input session.

Active Source IP - indicates the IP address of the current source and whether it is the primary or the backup source. For example, 1:123.123.123.100, where: 1 - primary source, 123.123.123.100 - source IP address

Bitrate - the required bitrate for this session.

4. To view further information, click Details. The following dialog appears:

5. View the following session information:
   On Demand Session ID - a unique session ID generated by the NGOD system.
   Session ID - a unique session ID generated by the NSG 9000-40G device.
   Session Group - an optional field. A value given by the ERM for managing the session list length.
   Bitrate - indicates the required bitrate for this session.
   No PID Remap - indicates whether No PID Remap is selected for this session. See Provisioning Service Remux Sessions on page 68.

6. View the following Output information:
   TS ID - the ID of the output TS that carries the output session.
   Output Service ID - the ID of the output service.

7. View the following Input Redundancy information:
   # - a sequential number to indicate the number of the listed input redundancy ports.
   GbE Port - indicates the number of the input GbE port.
   Input Service ID - indicates the ID of the input service
   Multicast IP Address - the multicast IP address of the input service
   UDP Port - the UDP port of the input service
   Source IP Address - indicates the IP address of the broadcasting device.
   Active - indicates whether this input port is currently active. The row of the active port is darker.
4.4.3.1 Exporting NGOD Active Sessions

1. Select Applications > SDV > NGOD Active Sessions.
2. Click Export Sessions.
3. Click Export.
4. Select Open or Save.
5. View the .XML file.

4.4.4 Viewing ISA Active Sessions

The ISA Active Sessions tab lists all the ISA sessions provisioned to the device.

To view ISA active sessions

1. Select Applications > SDV > ISA Active Sessions.
2. To view the currently provisioned sessions, click Refresh Sessions.
3. To export the currently ISA active sessions to an XML file, click Export Session.
4. View the following information:

NOTE: Parenthesis indicate virtual item.

- Management IP - indicates the Eth1 IP address of the NSG device. If in parenthesis, it is a virtual device.
- Session ID - a unique session ID generated by the NSG 9000-40G device.
- State - indicates the status of the session:
  - Bind - the session is provisioned
  - Alloc - the session is allocated but not yet provisioned
- RF Output - the output QAM-RF channel through which the service is streamed out of the device indicated as follows: x.y.z (#), where:
  - x - module number, (1-9)
  - y - RF port number, (1 or 2)
  - z - QAM channel, (1-648)
  - (#) - virtual QAM channel, the QAM channel in the provisioning message
- Service ID - the ID of the output service
- GbE Port - indicates the GbE input port of the incoming service indicated as follows: z (x), where
  - z - GbE physical port
  - (x) - GbE virtual port
- Destination IP Address - the IP address (multicast/unicast) that the service is sent to.
- UDP Port - the input UDP port
- Active Source IP - the IP address of the source IP. It is indicated in the following pattern: A:x, where:
  - A - number of GbE input port in the device
  - x - the IP address of the source device
- Bitrate - the bitrate of the provisioned session.

5. To view further information, click Details. The following dialog appears:

6. View the following session information:
   - Session ID - a unique session ID generated by the NSG 9000-40G device.
   - Bitrate - the bitrate of the session.
   - Time Created - the first time the session was provisioned
   - State - indicates the status of the session:
     - Bind - the session is provisioned
     - Alloc - the session is allocated but not yet provisioned

7. View the following Output information:
   - TS ID - the ID of the output TS that carries the output session.
   - Service ID - the ID of the output service.
   - No PID Remap - indicates whether PID remapping is applied.

8. View the following Input Redundancy information:
   - # - a sequential number to indicate the number of listed input redundancy ports.
GbE Port - indicates the number of the input GbE port: z (x), where
z - physical GbE port
(x) - virtual GbE port

Input Service ID - the ID of the input service
IP Address - the IP address of the input service
UDP Port - the UDP port of the input service
Source IP Address - indicates the IP address of the broadcasting device.
Active - indicates whether this input port is currently active. The row of the active port is
darker.

4.4.4.1 Exporting ISA Active Sessions

To export ISA Active Sessions to an .XML file, do the following:
1. Select Applications > SDV > ISA Active Sessions.
2. Click Export Sessions.
3. Click Export.
4. Select Open or Save.
5. View the .XML file.

4.4.5 Monitoring SDV Connections

The Connections tab lists all SDV managers together with a messages counter. The counter
monitors the connection between the SDV managers and the edge QAM.

Each time a message is received by the edge QAM, the counter registers another incidence
and updates the number of messages. You may refresh the connection when required.

To monitor SDV connections
1. Select Applications > SDV > Connections.

2. View the following:
   ♦ Manager IP - indicates the IP address of the SDV manager.
   ♦ Virtual Management IP - indicates the Eth1 virtual IP of the device
   ♦ Messages - indicates the number of messages. It is updated each time a message is
     received.
3. To refresh connection, click Refresh Connection.

4.5 M-CMTS Application

When NSG 9000-40G is integrated in an M-CMTS system, do the following:
- Create an M-CMTS session by defining the QAM Manager as M-CMTS
NOTE: If M-CMTS session is using a QAM that works in ITU-T Annex A, enable spectral inversion. See Configuring/Viewing QAM Channels on page 48

- Configure the session - When you configure an M-CMTS session, you choose to output a socket without any changes, that is without remapping and without generating tables.

่า To create an M-CMTS session

1. Select Platform > General tab.
2. Select the required slot.
3. Select the QAMS tab.
4. For the required RF Output, open the QAM Manager list and select M-CMTS.
   Once you select Applications > M-CMTS tab, the M-CMTS sessions appear and you can define their parameters.

 daß To configure an M-CMTS session

When you configure a session, select the required input port and route it to the required output as instructed below:

1. Select Applications > M-CMTS tab:

<table>
<thead>
<tr>
<th>Session ID</th>
<th>DTT Sync Restamping</th>
<th>DOCSIS Sync Compensation</th>
<th>QAM Port</th>
<th>QAM IP Address</th>
<th>UTP Session ID</th>
<th>RF Output</th>
<th>QAM Index</th>
<th>Interleave</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.1</td>
<td>1</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10001</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.2</td>
<td>2</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10002</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2.1</td>
<td>5</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10003</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.2</td>
<td>6</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10004</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2.1</td>
<td>9</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10005</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2.1</td>
<td>19</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10006</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2.1</td>
<td>13</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10007</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2.2</td>
<td>14</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10008</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2.2</td>
<td>17</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10009</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3.1</td>
<td>19</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10010</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3.1</td>
<td>19</td>
<td>226-4</td>
<td></td>
</tr>
<tr>
<td>10011</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3.1</td>
<td>21</td>
<td>226-4</td>
<td></td>
</tr>
</tbody>
</table>

Sessions appear in the table according to your QAM configuration in Platform > General > Slot > QAMS. Each session appears with a unique session ID.

Session ID- Read only. A sequential number starting at 10000, to indicate the number of the session in the current page.

NOTE: Steps 2&3 are relevant to primary DS channels only. In case of wideband sessions, move to step 4.

2. Applies to DS channels with control messages only - To synchronize with the DTT time, select DTT Sync Restamping. The EdgeQAM re-stamps the DTT sync packets.

3. Applies to DS channels with control messages only - In DOCSIS Sync Compensation, enter the sync compensation. The CMTS core router automatically inserts DOCSIS sync packets into the primary DS QAM channels. To ensure the accuracy of the DOCSIS sync packets, the EdgeQAM re-stamps them. Depending on RF network topology, it may be required to fine-tune the sync messages that flow over the various QAM channels of the EdgeQAM. The fine-tuning ensures consistent timing of CMs across all cable interfaces of the system. To fine-tune the sync offset across cable interfaces, use the DOCSIS Sync Compensation option. The sync offset units are ticks of the CMTS 10.24 MHz clock, where 1 tick=97.6 nano-sec. The typical allowed offset difference between modems is +/- 6
ticks. To define the sync compensation value, measure the average Cable Modem (CM) timing offset difference (you can view the timing offset values via the CMTS core console) and calculate the desired compensation value for the QAMs of the port. Typically, the compensation value of adjacent QAMs in the port is identical for each QAM in the port.

4. To select the input GbE Port, open the GbE Port list and select the required port. Once you defined the required GbE port, the GbE IP Address box is updated to display the IP address of the selected port.

5. GbE IP Address - updated according to the selected GbE port. To change the GbE IP address, see Configuring Input GbE ports on page 31.

6. In L2TP Session ID, enter the required session ID.

7. View the following Read-only information:
   - In RF Output, view the QAM channel to output the session where:
     - X – module number (1…9)
     - Y – RF port number (1…2)
     - Z – channel number (1…648) QAMs are listed in groups of 36 QAMs per port.
   - QAM Index - see Configuring/Viewing QAM Channels on page 48.
   - Interleaver - see Configuring/Viewing QAM Channels on page 48.

4.6 D2E Application

The Direct to Edge (D2E) application is for future use only.

When NSG 9000-40G is operating as part of a D2E system, configure it in the same manner as a regular Wideband M-CMTS application:

- Set the QAM manager for the relevant QAMs to M-CMTS
- Configure the sessions as regular Wideband M-CMTS sessions
Chapter 5
Conditional Access System (CAS)

5.1 CAS Overview

The Conditional Access System (CAS) prevents unauthorized viewing of programs by scrambling services that later on can be decrypted using the correct decrypting key.

NSG devices support the following CAS modes:

- DVB SCR scrambling - an encryption mode for the DVB protocol.
- Privacy Mode - an encryption mode developed by Motorola Inc.

5.1.1 DVB SCR Scrambling Overview

A typical CAS is comprised of a few elements. The NSG 9000 includes the SCS, CWS and scrambling modules. Following is a short description of the CAS elements.

- Event Information Scheduler (EIS) - in charge of all of the headend’s schedule information and the CAS configuration to ensure that services are encrypted correctly. It initiates the Scrambler Control Group (SCG) message, the actual request sent by the EIS to the NSG 9000 that encryption is required. The SCG message includes the service ID, time slot and the access criteria.
- SimulCrypt Synchronizer (SCS) - controls and manages the scrambling parameters to allow encryption. It receives requests for encryption and passes them on to the Control Word (CW) generator. Once a CW is initiated the SCS passes it to ECMG.
- Control Word Server (CWG) - generates the encryption key.
- Scrambling Unit - encrypts the services.
- Entitlement Control Message Generator (ECMG) - receives control words and access criteria and generates an Entitlement Control Message (ECM) stream in return.

The EIS sends the NSG 9000 an SCG message, a request to encrypt a service component. In turn, the NSG 9000 sends a message to the ECMG which contains the following:

- Control Word (CW) - the encryption key generated by the NSG 9000.
Chapter 5 Conditional Access System (CAS)

5.1.2 Privacy Mode Scrambling Overview

Privacy Mode is a real-time encryption method which was developed by Motorola and licensed to Harmonic for VOD applications. Privacy Mode requires an MCT machine which serves as the Privacy Mode ERS proxy as the following illustration shows:

When using Privacy Mode scrambling, the only additional configuration that is required within the NSG web client is to enable CAS and to set the behavior upon ECM expiration. (See page 90) However, Privacy Mode also requires an MCT machine which serves as the Privacy Mode ERS proxy. For information on how to configure Privacy Mode parameters in MCT, refer to the MCT User’s Guide.

5.2 Defining Global CAS Parameters

To set global CAS parameters, do the following:

1. Select Applications > CAS. The following tab opens.
2. In CAS Properties, open the Encryption Mode (DVB PM) list and select either of the following:
   - DVB Scrambling - an encryption mode for the DVB protocol.
   - Privacy Mode Scrambling - an encryption mode developed by Motorola Inc.
3. To enable CAS, select the CAS Enable box.
   The fields of the selected encryption mode are enabled.

### 5.3 Defining DVB Scrambling Parameters

Once you selected the DVB Scrambling mode, and enabled the CAS, move to the DVB Settings section and do the following:

1. In CP Duration (Sec), enter the required value. By default it is 15 seconds. The Crypto Period defines how often the NSG changes the control word (or "key") for encrypted services. Valid values range between 1-6554.
2. In ECMG Failover Retries, define the number of times the NSG 9000 unit tries to establish communication with the Entitlement Control Message Generator (ECMG) before issuing the alarm ECMG Connection Failure.
3. In CA Descriptor Location, select a location in the PMT for the CA descriptor. The CA descriptor may appear either in a service or elementary level or in both levels.
4. Open the DVB Scrambling Mode box and select either of the following:
   - Session based - the EIS is external and it issues an SCG for each service for which encryption is required. When selected, the DVB Session based features are enabled.
   - Tier based - all services are scrambled with the same control word and ECM and there is no external EIS. Once selected, the DVB Tier Based features are enabled.
5.3.1 Defining DVB Session Based Parameters

Once you selected this option in DVB Scrambling Mode, define the session based parameters as follows:

1. In **TS ID Provisioning**, select how to generate the TS ID to be provisioned:
   - Direct - The default option. The provisioned TS ID is the same as the output TS ID.
   - By QAM Index - The provisioned TS ID is according to the QAM number that is a number between 1-636.
2. In **EIS SCS Port Number**, define the TCP port through which NSG communicates with the EIS. Valid values range between 1-65535.
3. In **Clear to Scramble (Sec)** enter the clear time in seconds before starting to scramble the service, once the SCG is received. Valid values range between 0-9999. The default value is 0 seconds.

5.3.2 Defining DVB Tier Based Parameters

Once you selected this option in DVB Scrambling Mode, define the tier based parameters as follows:

1. Select **Block Upon Failure**, to allow the device to block the stream to protect the content. When a stream is blocked, no picture appears on the end user screen. This action takes place in case the NSG 9000 could not establish communication with the ECMG.
2. In **Failed to Scramble Timeout (Sec)**, define the period of time between outputting the service and recognizing CAS failure. When CAS failure is recognized the following takes place:
   - Scrambling with the last available ECM
   - Block the stream. Applies in case ECM is not available and Block Upon Failure is selected.
   - Outflow a clear stream. Applies in case ECM is not available and Block Upon Failure is not selected.
3. NSG 9000-40G supports SimulCrypt in DVB Tier Based mode and it allows to encrypt the content with up to 3 different Conditional Access Systems. You can define up to three ECMs each with its own Access Criteria. To configure the ECMs, enter the required values in the ECM Group table as explained below:
   - ECM PID - enter the ECM PID.
   - Super CAS ID - enter the Super CAS ID of the ECMG as provided by the vendor.
Access Criteria - enter an access criteria as provided by the vendor.

### 5.3.3 Viewing EIS Information

You can work with multiple EIS devices. The EIS tab lists all EIS connected to the device. NSG 9000-40G supports up to six EIS machines:

To view EIS log
1. Select Applications > CAS > EIS tab.
2. To update the listed information, click Refresh.
3. View the following information:
   - Date - indicates the date of connection between the NSG and the EIS.
   - Time - indicates the time of connection.
   - Channel ID - indicates the channel of communication between the NSG and the EIS.
   - Description - shortly describes the connection (setup, closed).
   - State - indicates the current status of the NSG and EIS connection.

### 5.3.4 Defining ECMGs and NSG 9000 Communication Parameters

This section instructs you on how to define the ECMG & NSG 9000 communication parameters.

To define ECMGs
1. Select Applications > CAS > ECMG. The ECMG page appears. Each row in the page represents an ECMG. You can define up to 10 ECMGs.

<table>
<thead>
<tr>
<th>Active</th>
<th>Name</th>
<th>Priority</th>
<th>SuperCasID (Hex)</th>
<th>Protocol Revision</th>
<th>IP Address</th>
<th>Port</th>
<th>Channel ID</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>DVB1</td>
<td>1</td>
<td>1043030609</td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td>CONNECTED</td>
</tr>
<tr>
<td>✔️</td>
<td>DVB2</td>
<td>2</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB3</td>
<td>3</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB4</td>
<td>4</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB5</td>
<td>5</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB6</td>
<td>6</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB7</td>
<td>7</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB8</td>
<td>8</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB9</td>
<td>9</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✔️</td>
<td>DVB10</td>
<td>10</td>
<td></td>
<td>REV2</td>
<td>192.168.187.205</td>
<td>3335</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Define the communication parameters according to the following explanation:
   - Active - Check the box in the left most column to make the current ECMG active.
   - Name - Enter the name of the ECMG brand.
Priority - to allow redundancy, set priority by indicating the primary and secondary ECMG of the same SuperCasID. In case of ECMGs with the same SuperCasID, NSG 9000 always tries to connect first to the ECMG with the highest priority. Assign priority from 1-10 with 1 as the highest priority.

SuperCasID (Hex) - A 32-bit hexadecimal number that consists of the 16-bit CA vendor ID and an additional 16-bit number that distinguishes one ECM generator from another for the same CAS vendor. The super CAS ID determines which access criteria is coupled with each ECMG. The CAS vendor provides this value.

Protocol Revision - Specifies the CAS mode of operation. Select Revision 1, 2 or 3.

IP Address - The IP address of the ECMG. The CAS vendor provides this value.

Port - The number (in decimal format) of the TCP port used to connect the ECMG. The CAS vendor provides this value.

Channel ID - indicates the channel of communication between the NSG and the ECMG.

Status - Indicates the state of the connection:
- Connected - The ECMG and NSG are communicating.
- Disconnected - No communication is taking place at the moment.

5.3.5 Viewing CAS Status

5.3.5.1 Viewing the SCG Parameters

1. Select Applications > CAS > SCGs tab. The SCG page appears.

The following information is listed:

Number of SCGs - indicates the number of listed SCGs.

SCG ID - The ID number of the SCG.

CP Number - A running counter of the number of Crypto Periods. It indicates the number of times the ECM has been changed for this stream.

TS ID/QAM Index - The stream that carries the service to be encrypted as sent by the EIS.

Service ID - The ID of the program/service being scrambled using the specific SCG.

State - Indicates the status of the service as follows:
- Scrambling - Indicates that the service is encrypted.
- Clear - Indicates that scrambling failed.

Access Criteria - the access criteria as provided by the vendor.

2. Click Refresh to update the information in the SCG table.

5.3.5.2 Viewing ECM Parameters

The Entitlement Control Message (ECM) page provides information about the ECM stream that is sent to the NSG and is added to the TS.
1. Select Applications > CAS > ECMs tab. The ECM page appears and you can view the following information:

<table>
<thead>
<tr>
<th>Stream ID</th>
<th>ECM ID</th>
<th>SuperCasID (Hex)</th>
<th>SCG ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0x3e08</td>
<td>00010000</td>
<td>1</td>
</tr>
</tbody>
</table>

Number of ECMs - indicates the number of listed ECMs.
Stream ID - The ID number of the stream.
ECM ID - The ID of the ECM as sent by the EIS.
SuperCasID - Identifies the ECMG that encrypts this program. This number is provided by the CAS vendor.
SCG ID - The ID of the SCG that requested the ECM stream.

2. Click Refresh to update the information.

5.4 Defining Privacy Mode Scrambling Parameters

1. Select Applications > CAS > Privacy Mode Settings section.

2. Open the Stream Processing on ECM Expiration list and select either of the following:
   - Scramble with Last ECM - All NSGs of the VODS should be updated with the new ECM.
   - Don’t Scramble - do not scramble the stream.

TIP: Once provisioning/multiplexing is complete, enable the RF ports. See 3.10.4 Configuring Module RF Ports on page 45.
6.1 Monitoring the NSG 9000-40G Overview

Monitoring the NSG 9000-40G comprises the following two aspects:

- Monitoring the device utilization
- Monitoring the device status

6.2 Device Utilization

The Traffic tab displays a read-only information about the output streams of the device. This information is displayed in the following views:

- Service View - default view. It displays the output services according to their QAM manager.
- Bitrate View - displays the actual bit rate of all of the services according to their QAM manager.
- Output view - displays information on the selected output content. See 6.2.4 Viewing Output Information on page 96.
- Input view - displays the number of incoming services and the current frequency. See 6.2.3 Viewing Input Information on page 95.

6.2.1 Service/Bitrate View

The Service and Bit rate view pages include the following:

- Legend - explains the available colors for the bar graphs according to the QAM manager:

<table>
<thead>
<tr>
<th>Color</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>VOD SRM QAM manager</td>
</tr>
<tr>
<td>Brown</td>
<td>ISA SRM QAM Manager</td>
</tr>
<tr>
<td>Black</td>
<td>NGOD ERM QAM manager</td>
</tr>
<tr>
<td>Green</td>
<td>Passthrough QAM manager (for future use)</td>
</tr>
<tr>
<td>Red</td>
<td>M-CMTS QAM manager</td>
</tr>
<tr>
<td>Gray</td>
<td>D2E QAM manager (for future use)</td>
</tr>
</tbody>
</table>
■ Scale - allows to arrange the bar graph scale per RF port as the following table shows:

Table 6-2: Scale in Service and Bitrate View

<table>
<thead>
<tr>
<th>Service View</th>
<th>Bitrate View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic - arranges display according to the QAM manager with highest number of services</td>
<td>Automatic - arranges display according to the QAM manager with highest bitrate</td>
</tr>
<tr>
<td>20 services</td>
<td>200Mps</td>
</tr>
<tr>
<td>50 services</td>
<td>500Mps</td>
</tr>
<tr>
<td>100 services</td>
<td>1000Mps</td>
</tr>
</tbody>
</table>

■ Nine sections - each section represents another module with both RF ports. Each one of the nine sections of the Service/Bitrate View tab represents another slot with the following indications:

- Module # - indicates the module number. Module # (Card Missing) - indicates that a module is currently not mounted.
- RF # - click this link to view service parameters. Once you click a service, you can view the RF Port Traffic dialog. See 6.2.3 Viewing Input Information on page 95.

■ Bar graph - represents a QAM manager. Each bar graph is represented by a unique color. See Table 6-1: Legend of Service/Bitrate View on page 91.

The number at the top of each bar, indicates the following:

- Service view - the amount of services per QAM manager.
- Bitrate view - the total bit rate in Mbps per QAM manager.
Hover the mouse pointer over the bar to view the type of session and in Service view the number of services and in Bitrate view the frequency.

6.2.2 Viewing Traffic

The Module Traffic page displays all the services outputted via each QAM-RF channel together with detailed information on each service.

To view the traffic streamed out of the device in a bar graph display:
2. Click RF #.
   The following page opens. It shows the traffic flowing via RF port 1 of module 1:
3. By default QAMs are sorted by QAM index. To sort by frequency, open the Sort By list and select Frequency.

4. By default the focus is the RF port you clicked on in the Service/Bitrate View tab. You can click Next, to move to the following RF port.

5. To view detailed information about a service, select the required service in the bar graph. The Service Information section appears with the following information:
NOTE: PIDs appear in Hex. and in decimal in the following pattern: Hex. (Decimal.)

- Service ID - Read Only. The ID number of the service.
- Port:IP - The number of the input port and its IP address.
- UDP Port - The UDP according to the source configuration.
- PMT Ver - The version of the PMT PID
- PMT PID - The PID over which the service’s Program Map Table (PMT) is transmitted.
- PCR PID - The PID of the service’s Program Clock Reference (PCR).
- ECM PID - The PID of the Entitlement Control Message (ECM).

6. To view detailed information regarding the output stream, hover the mouse pointer over the QAM channel and view the following:

- TS ID - the TS ID that outflows via the QAM.
- Frequency - the frequency of the output stream
- QAM Manager

### 6.2.3 Viewing Input Information

To view the number of incoming services and the input bitrate, do the following:

1. Select Monitoring > Traffic > Input View tab.
2. View the required information.

<table>
<thead>
<tr>
<th>TS</th>
<th>Service/service Remux</th>
<th>PID</th>
<th>PID Remux</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM Manager</td>
<td>Service ID</td>
<td>Orig PID</td>
<td>Orig PID</td>
</tr>
<tr>
<td>Serving Area</td>
<td>Port:IP</td>
<td>Remap PID</td>
<td>Remap PID</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>NGOD QAM Group Name</td>
<td>UDP Port</td>
<td>PID Type</td>
<td>PID Type</td>
</tr>
<tr>
<td>Input Source</td>
<td>PMT PID</td>
<td>Language</td>
<td>PMT Reference</td>
</tr>
<tr>
<td>UDP Port Range</td>
<td>PCR PID</td>
<td>ES Descriptors</td>
<td>ES Descriptors</td>
</tr>
<tr>
<td>ASI Forwarding</td>
<td>ECM PID</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PMT Ver</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Source IP</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Service Descriptors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.3 Monitoring NSG 9000-40G Status and Alarms

When ever the NSG 9000-40G detects an internal failure or problems related to the input/output streams, it asserts an alarm to indicate the specific failure. The alarms are exhibited as follows:

Table 6-3: Alarm Exhibition

<table>
<thead>
<tr>
<th>Component</th>
<th>Reaction Upon Malfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Panel</td>
<td>The Alarm LED is illuminated in red when an alarm is issued and in orange when a warning is issued.</td>
</tr>
</tbody>
</table>
| Web client   | - The alarm indicator turns red  
               - The number of active alarms is updated  
               - a message appears notifying you of the nature of the problem |
| NMX          | Alarm is issued in the NMX alarm manager                                                  |

6.3.1 Viewing Alarms Via the Web Client

The Active Alarms tab allows you the following:
- View the alarms/warnings
- Save active alarm log as an XML file
- Configuring the alarms

To view alarms in the web client:

1. Select Monitoring > Alarms > Active Alarms.

2. View the alarms. You can also save the alarm log as an XML file. The alarms are listed with the following parameters:
   - # - index number of the alarm.
   - Module - the faulty component.
   - Description - describes the fault that invoked the alarm. Red color entry - indicates an alarm, orange color entry - indicates a warning.
NOTE: You may view the alarms also by moving the mouse pointer to the Alarm indicator located in Title bar. A window opens displaying the current alarms.

To save active alarms log to file
1. Select Monitoring > Alarms > Active Alarms.
2. Click Export.
3. Browse to the required location and click Save.

### 6.3.2 Alarm List

The following table lists the alarms of NSG 9000-40G according to the module that issues the alarm. The alarms are arranged in alphabetical order with a short description and a solution to remit the alarm. Alarms with a star are NOT reflected in NMX.

<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Trigger Device Redundancy</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Platform</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan X Failure</td>
<td>No</td>
<td>Fan X (x= 1-4) is malfunctioning.</td>
<td>Replace the fan as instructed in the HW User’s Guide.</td>
</tr>
</tbody>
</table>
| Front Panel Communication Failure | No                     | Cannot establish communication with the control panel module.               | 1. Replace the front panel.  
  2. Replace the Processing module.  
  3. Call Customer Support. |
| Front Panel Missing         | No                        | Front panel is missing.                                                     | Verify that the front panel is fastened securely to its place.           |
| High Temperature Failure    | Yes                       | The unit is overheating  
  Raised when board FPGA processor temperature >= 80°C, or board CPU temperature >= 75°C. | Check front panel connection and the speed of the fans.                  |
| LCD Communication Failure   | No                        | Cannot establish communication with the LCD panel.                         | 1. Replace the front panel.  
  2. Replace the Processing module.  
  3. Call Customer Support. |
| NGOD R6 Connection Loss     | No                        | NGOD VREP0-R6 client has lost connection and there are live SDV sessions within the NSG. | Check the Ethernet connection to the R6 client.                          |
| No Input Traffic            | Yes                       | All configured and enabled GbE ports receive no input data.                 | Check source.                                                            |
| Power Supply X Failure      | Yes                       | Power supply (x= 1-2) is malfunctioning.                                   | Replace power supply unit.                                               |
| Service Missing             | No                        | There is at least one defined service without active input                 | Check source.                                                            |
| System Voltage Error        | Yes                       | Invalid voltage is detected in the device                                  | 1. Reboot the device.  
  2. If persists, call Customer Support. |
<p>| Temp/Voltage Communication Error | No                   | Cannot read the temperature or voltage.                                   | Call Customer Support.                                                   |
| ETH Port Link Down          | No                        | Problematic ETH port link                                                  | Check ETH connection                                                     |</p>
<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Trigger Device Redundancy</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsupported HW Configuration: Mixed PS Models</td>
<td>No</td>
<td>Different types of power supply units are installed on the device</td>
<td>Replace at least one power supply unit so both units are of the same type. See NSG9000-40G Hardware and Installation User Guide.</td>
</tr>
<tr>
<td><strong>Management Port</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETH Port Link Down</td>
<td>No</td>
<td>Problematic Eth link.</td>
<td>Check port.</td>
</tr>
<tr>
<td><strong>Slot</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Card Missing*                       | Yes                       | No module is mounted in the slot and the corresponding RF port is enabled.   | 1. Disable the RF port.  
2. Mount a module in the slot.  
3. Enable the corresponding RF port. |
| Card Mismatch*                      | No                        | Mismatch between the mounted module and the sent configuration.              | Check configuration or mounted module. |
| **GbE Port**                        |                           |                                                                              |          |
| CRC Error                           | No                        | At least one packet has CRC error                                            | Check the switch, fiber, and copper connections. Check source (input or output). |
| ETH Buffer Overflow                 | No                        | Management traffic on the GbE port exceeds the port's capacity.             | Check sources for excessive management traffic. |
| Invalid Input Packet                | No                        | The payload length of an input UDP packet is not divisible by 188 bytes a standard length of an MPEG packet | Check source. |
| L2TPv3 Sequence Error               | No                        | The sequence number of L2TP frames is not sequential, which means that some L2TP frames were dropped in the input. |  ■ Check input source.  
■ Check switch.  
■ Check fiber and copper connections. |
| Link Down (SFP)                     | Yes                       | Problematic link to the SFP.                                                | Verify that the fiber is connected properly to the SFP |
| SFP Missing                         | Yes                       | The SFP connector is missing from the GbE port.                             | Check that the SFP connector is fully inserted |
| **GbE Card**                        |                           |                                                                              |          |
| GbE Controller Failure              | Yes                       | PHY ID Error; instable communication with GbE module.                       | 1. Reset unit.  
2. If problem persists, call Customer Support. |
| MPEG Buffer Overflow                | No                        | Buffer is overloaded with too high bit rate                                 | Reduce bit rate. |
| MPEG Sync Loss                      | No                        | GbE traffic contains No valid MPEG data                                      | 1. Check source.  
2. Check the input cable and replace if defective. |
<p>| General HW Failure                  | No                        | GbE module fatal error.                                                     | Call Customer Support |
| <strong>TS Out</strong>                          |                           |                                                                              |          |</p>
<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Trigger Device Redundancy</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS Out Overflow</td>
<td>No</td>
<td>The actual output bit rate exceeds the configured QAM output bit rate.</td>
<td>Deprovision several services of the specific output until the alarm clears.</td>
</tr>
<tr>
<td>VOD Session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAT Corrupted*</td>
<td>No</td>
<td>Invalid PAT</td>
<td>Check source.</td>
</tr>
<tr>
<td>PAT Missing*</td>
<td>No</td>
<td>PAT is missing in input signal.</td>
<td>Check source.</td>
</tr>
<tr>
<td>PMT Corrupted*</td>
<td>No</td>
<td>Invalid PMT</td>
<td>Check source.</td>
</tr>
<tr>
<td>PMT Missing*</td>
<td>No</td>
<td>PMT is missing in input signal.</td>
<td>Check source.</td>
</tr>
<tr>
<td>PAT Disappeared</td>
<td>No</td>
<td>PAT was in input signal and disappeared.</td>
<td>Check source.</td>
</tr>
<tr>
<td>PMT Disappeared</td>
<td>No</td>
<td>PMT was in input signal and disappeared.</td>
<td>Check source.</td>
</tr>
<tr>
<td>Audio PID Missing*</td>
<td>No</td>
<td>Audio PID is missing in input signal</td>
<td>Check source.</td>
</tr>
<tr>
<td>Video PID Missing*</td>
<td>No</td>
<td>Video PID is missing in input signal</td>
<td>Check source.</td>
</tr>
<tr>
<td>VOD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invalid UDP Detected*</td>
<td>No</td>
<td>The UDP is destined to an invalid output port</td>
<td>Check source.</td>
</tr>
<tr>
<td>VOD Program Not Scrambled</td>
<td>No</td>
<td>VOD program is not scrambled while either of the following applies:</td>
<td>Check source.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Device Configured to DVB-CAS mode and CAS is enabled</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Provisioned program is VOD auto detect and service is not scrambled</td>
<td></td>
</tr>
<tr>
<td>Session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Missing*</td>
<td>No</td>
<td>Service is missing in input signal</td>
<td>Check source.</td>
</tr>
<tr>
<td>QAM-RF Module</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initialization Failure</td>
<td>No</td>
<td>Card initialization failed because the actual card is different than the</td>
<td>Replace module, or assign proper configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>assigned card.</td>
<td></td>
</tr>
<tr>
<td>Communication Failure</td>
<td>No</td>
<td>The device cannot communicate with the QAM-RF module</td>
<td>1. Check that the module is properly inserted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Assign the module</td>
</tr>
<tr>
<td>Critical Error:</td>
<td>No</td>
<td>The affected QAM-RF module has suffered repeated CIC overflow events.</td>
<td>1. Replace the affected module.</td>
</tr>
<tr>
<td>Repeated CIC Overflow</td>
<td></td>
<td>To prevent service interruption on adjacent QAM channels, both RF ports of</td>
<td>2. Contact Harmonic Customer Support.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the module has been shut-off.</td>
<td></td>
</tr>
<tr>
<td>Alarm Message</td>
<td>Trigger Device Redundancy</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Processing Error (Sync Byte)  | No                        | Internal fatal error in the QAM-RF modules. (Additional troubleshooting information for Harmonic) | 1. Re-install the module  
2. If problem persists, call Customer Support. |
| Processing Error (Tx Sync)    | No                        | Internal fatal error in the QAM-RF modules. (Additional troubleshooting information for Harmonic) | 1. Re-install the module  
2. If problem persists, call Customer Support. |
| Processing Error (MPEG Sync)  | No                        | Internal fatal error in the QAM-RF modules. (Additional troubleshooting information for Harmonic) | 1. Re-install the module  
2. If problem persists, call Customer Support. |
| Processing Error (SGMI)       | No                        | Internal fatal error in the QAM-RF modules. (Additional troubleshooting information for Harmonic) | 1. Re-install the module  
2. If problem persists, call Customer Support. |
| Processing Error (CRC)        | No                        | Internal fatal error in the QAM-RF modules. (Additional troubleshooting information for Harmonic) | 1. Re-install the module  
2. If problem persists, call Customer Support. |
| Processing Error              | No                        | Failure is detected on at least one QAM-RF channel                          | Soft reset the QAM-RF module  
If error persists, replace module |
| Processing Error - Critical Failure | No                  | QAM-RF module shuts down to prevent corruption of the RF spectrum           | Replace module |
| Temperature Out of Range      | No                        | The temperature is out of the defined range  
Module temperature $\geq 85^\circ C$.                                      | Call Customer Support |
| Voltage Out of Range          | No                        | QAM-RF module is out of order                                               | Replace the QAM-RF module. |
| DAC Failure                   | No                        | QAM-RF module is out of order                                               | Replace the QAM-RF module. |

### QAM Channel

<table>
<thead>
<tr>
<th>License Missing</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM License</td>
<td>The QAM License is either expired or is not granted.</td>
<td>Request a QAM license</td>
</tr>
<tr>
<td>PM License</td>
<td>The Privacy Mode license is either expired or is not granted.</td>
<td>Request a PM license</td>
</tr>
<tr>
<td>SCR License</td>
<td>The DVB scrambling license is either expired or is not granted.</td>
<td>Request a DVB scrambling license</td>
</tr>
<tr>
<td>DOCSIS QAM + DTI Sync License</td>
<td>This license is either expired or is not granted.</td>
<td>Request this license</td>
</tr>
<tr>
<td>DOCSIS QAM License</td>
<td>The DOCSIS QAM license is either expired or is not granted.</td>
<td>Request a DOCSIS QAM license</td>
</tr>
</tbody>
</table>

### RF port
<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Trigger Device Redundancy</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Communication Failure         | No                        | The device can not communicate with the upconverter.  | 1. Reset unit  
2. Replace the module  
3. If problem persists, call Customer Support |
| RF Level Out of Range         | No                        | The power level of the RF signal going into the upconverter is out of the allowed range. | Call Customer Support |
| PLL1 Failure                  | No                        | Indicates a HW failure                               | Replace the module                                                      |
| PLL2 Failure                  | No                        | Indicates a HW failure                               | Replace the module                                                      |
| Power Supply Failure          | No                        | Power level to the upconverter momentarily exceeded limits. | Call Customer Support |
| Software Failure              | No                        | Indicates a failure of the RF software.              | Replace the module                                                      |
| CAS Privacy Mode              |                           |                                                       |                                                                          |
| ECM Expired                   | No                        | ECM Expired                                          | Update PM ECM via MCT.                                                  |
| ECM Missing                   | No                        | ECM is missing                                        | Updated Privacy Mode ECM via MCT.                                      |
| DVB CAS                       |                           |                                                       |                                                                          |
| SCS ECMG Communication Failure| No                        | Connection between SCS and ECMG is not established   |  • Check link of Ethernet port 2  
• Check ECMG definitions in the web client. Make sure all parameters match the properties of the CAS system in use. |
| ECM Stream Error              | No                        | Cannot get ECM from ECMG                             |  • Check connectivity to ECMG  
• Check with the ECMG vendor that AC is valid                            |
| DTI Card                      |                           |                                                       |                                                                          |
| DTI Client Not Locked         | Yes                       | The status of the DTI client is not NORMAL           | Check that DTI server status is NORMAL.                                 |
| Service Remux Session         |                           |                                                       |                                                                          |
| PAT Corrupted*                | No                        | Invalid PAT                                          | Check source.                                                            |
| PAT Missing*                  | No                        | PAT is missing in input signal.                      | Check source                                                             |
| PAT Disappeared               | No                        | PAT disappeared from input signal                    | Check source                                                             |
| PMT Corrupted*                | No                        | Invalid PMT                                          | Check source                                                             |
| PMT Missing*                  | No                        | PMT is missing in input signal.                      | Check source                                                             |
| PMT Disappeared               | No                        | PMT disappeared from input signal                    | Check source                                                             |
| Service Remux Source Failure* | No                        | When Service Remux is configured and the input socket is not active. | Check source                                                            |
### 6.3.3 Warning List

The following table lists the warnings of NSG 9000-40G according to the module that issues the warning. The warnings are arranged in alphabetical order with a short description and a solution to remit the warning. Warnings with a star are NOT reflected in NMX.

<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Triggers Device Redundancy</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMTS Session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socket CMTS Source Failure*</td>
<td>No</td>
<td>When CMTS socket is configured and the input socket is not active.</td>
<td>Check source</td>
</tr>
<tr>
<td>PassThrough Session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socket Passthrough Source Failure*</td>
<td>No</td>
<td>When passthrough socket is configured and the input socket is not active.</td>
<td>Check source</td>
</tr>
<tr>
<td>PID Remux Session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID Remux Source Failure*</td>
<td>No</td>
<td>When PID Remux is configured and the input socket is not active.</td>
<td>Check source</td>
</tr>
<tr>
<td>PID Range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Source</td>
<td>No</td>
<td>Traffic is not detected on the configured input socket.</td>
<td>Check source</td>
</tr>
<tr>
<td>PID Range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backup Source</td>
<td>No</td>
<td>One of the backup sources is activated</td>
<td>Check source</td>
</tr>
<tr>
<td>License</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>License Expired</td>
<td>No</td>
<td>License expired</td>
<td>Add and request a new license.</td>
</tr>
<tr>
<td>Alarm Message</td>
<td>Triggers Device Redundancy</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Running on Temporary License*</td>
<td></td>
<td>The system is running with an active temporary license while using the non-default features granted by the license.</td>
<td>Claim the required license.</td>
</tr>
<tr>
<td>Backup RF Module Activated</td>
<td></td>
<td>The backup module was activated, due to failure of an RF module</td>
<td>Check the faulty QAM-RF module</td>
</tr>
<tr>
<td>Backup RF Module is Missing or Failed</td>
<td></td>
<td>Backup RF module is missing or failed</td>
<td>Check backup module in slot 9. If missing, mount a QAM-RF module.</td>
</tr>
<tr>
<td>Communication Error at all QAM-RF modules</td>
<td></td>
<td>There is no communication with the QAM-RF modules</td>
<td>Do the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. SW reset of each module.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. If problem persists, HW reset of each module.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. If problem persists, reset the device.</td>
</tr>
<tr>
<td>GbE Port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backup Port Active</td>
<td></td>
<td>Redundancy switch has taken place</td>
<td>Check primary port</td>
</tr>
<tr>
<td>Management Packets Reached Rate Limit</td>
<td></td>
<td>Management packets may drop because rate is reaching its limit.</td>
<td>Check non-video traffic on the GbE port</td>
</tr>
<tr>
<td>SFP Communication Error</td>
<td></td>
<td>Instable communication with the SFP module</td>
<td>1. Verify that the SFP module is mounted properly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Replace SFP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Reset unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. If problem persists, call Customer Support</td>
</tr>
<tr>
<td>GbE Card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exceeding Max Sockets</td>
<td></td>
<td>The number of incoming streams exceeds the allowed limit.</td>
<td>Check the source.</td>
</tr>
<tr>
<td>Extraction Buffer Overflow</td>
<td></td>
<td>Extraction descriptor FIFO overrun.</td>
<td>Check PSI bit rate.</td>
</tr>
<tr>
<td>GbE Management Rx Failure</td>
<td></td>
<td>Management traffic buffer overload resulting in management packets loss.</td>
<td>Check the bit rate of the management packets.</td>
</tr>
<tr>
<td>GbE Management Tx Failure</td>
<td></td>
<td>Detecting problems when trying to transmit management data</td>
<td>1. Reset unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. If problem persists, call Customer Support</td>
</tr>
<tr>
<td>TS Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic on Invalid TS*</td>
<td></td>
<td>The input traffic points to an invalid output.</td>
<td>Check source and QAM mapping.</td>
</tr>
<tr>
<td>QAM-RF Module</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm Message</td>
<td>Triggers</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Voltage Warning</td>
<td></td>
<td>The QAM-RF voltage is almost out of the allowed range. There are high chances that the QAM-RF module is out of order.</td>
<td>Replace the QAM-RF module.</td>
</tr>
<tr>
<td>Nearing Temperature Out of Range</td>
<td></td>
<td>The temperature of the QAM-RF module is almost out of the allowed temperature range</td>
<td>Check for proper operation of the cooling fans. Make sure that air inlets in the device’s front panel are clean. If problem persists, power-off the device and contact Customer Support.</td>
</tr>
<tr>
<td>RF Port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nearing Temperature Out of Range</td>
<td></td>
<td>The upconverter's temperature is almost out of the allowed temperature range (0°C to 70°C).</td>
<td>Check for proper operation of the cooling fans. Make sure that air inlets in the device’s front panel are clean. If problem persists, power-off the device and contact Customer Support.</td>
</tr>
<tr>
<td>DTI port</td>
<td>DTI Port Link Down</td>
<td>DTI port lost connection with the DTI server</td>
<td>Check DTI cable.</td>
</tr>
<tr>
<td>CAS Privacy Mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECM Nearing Expiration</td>
<td></td>
<td>ECM is about to expire.</td>
<td>Update PM ECM via MCT.</td>
</tr>
<tr>
<td>DVB CAS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCS ECMG Connection Failure</td>
<td></td>
<td>Connection to the ECMG has failed and services may not be encrypted properly</td>
<td>Check link of Ethernet port 2 Check ECMG definitions in the web client. Make sure all parameters match the properties of the CAS system in use.</td>
</tr>
<tr>
<td>License</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>License Expires in 24 hours</td>
<td></td>
<td>License will expire in the next 24 hours.</td>
<td>Add and request a new license.</td>
</tr>
<tr>
<td>License Expires in 72 hours</td>
<td></td>
<td>License will expire in the next 72 hours.</td>
<td>Add and request a new license.</td>
</tr>
<tr>
<td>Redundancy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Heartbeat on Eth1*</td>
<td></td>
<td>Standby device does not receive Heartbeat messages from Eth1 of Active device.</td>
<td>Check Ethernet connection.</td>
</tr>
<tr>
<td>No Heartbeat on Eth2*</td>
<td></td>
<td>Standby device does not receive Heartbeat messages from Eth2 of Active device.</td>
<td>Check Ethernet connection.</td>
</tr>
</tbody>
</table>
### 6.3.4 Notification List

The following table lists notifications of NSG 9000-40G. A notification is a message sent from the device to the alarm log to denote a status change without raising any alarm. However, depending on the configuration, when a notification is raised, it may trigger an SNMP trap.

**NOTE:** Notifications appear in Monitoring > Alarms > Settings page with severity 0.

<table>
<thead>
<tr>
<th>Notification Message</th>
<th>Description</th>
<th>Displayed in Alarm Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active DTI Port Is/Changed to &lt;#&gt;</td>
<td>The active port of the NSG’s DTI client has changed (from 1 to 2 or vice-versa)</td>
<td>No</td>
</tr>
<tr>
<td>DTI Client Status Changed</td>
<td>The status of DTI Client has changed to the value reflected in Platform &gt; General DTI.</td>
<td>No</td>
</tr>
<tr>
<td>Corrupt Firmware File, Booting with Previous Firmware</td>
<td>Could not load new firmware file to flash due to file corruption.</td>
<td></td>
</tr>
<tr>
<td>Cannot Find BOOTP Server, Booting with Previous IP</td>
<td>BOOTP server did not respond within the defined time out, NSG 9000-40G booted with its previous IP settings.</td>
<td></td>
</tr>
<tr>
<td>Reboot System Recovered from Watchdog Reset</td>
<td>System recovered from HW Watchdog reset</td>
<td></td>
</tr>
<tr>
<td>Reboot System Recovered from Power Reset</td>
<td>System recovered from power reset</td>
<td></td>
</tr>
<tr>
<td>Reboot Shutdown at &lt;Date&gt;</td>
<td>Shutdown at &lt;Date&gt; (Reboot)</td>
<td></td>
</tr>
<tr>
<td>Configuration Error &lt;#&gt;</td>
<td>Configuration failed in XML validation</td>
<td></td>
</tr>
<tr>
<td>SLOT &lt;#&gt; QAM-RF Module Reset by user Status=OK/ Fail</td>
<td>User initiated QAM-RF reset in slot &lt;#&gt;. The status is either OK or Fail.</td>
<td></td>
</tr>
<tr>
<td>IpInp &lt;#&gt; Manual Revert from backup port &lt;#&gt;</td>
<td>User manually reverted to the GbE input port &lt;#&gt; from backup port &lt;#&gt;</td>
<td></td>
</tr>
<tr>
<td>IpInp &lt;#&gt; Manual Switch to backup port &lt;#&gt;</td>
<td>User manually switched from GbE input port &lt;#&gt; to backup port &lt;#&gt;</td>
<td></td>
</tr>
<tr>
<td>IpInp-X Switch to Backup Port Y</td>
<td>Port redundancy - switched automatically from the Primary port to the Backup port because of no bit rate at the Primary port</td>
<td></td>
</tr>
<tr>
<td>IpInp-X Cannot Switch to Backup Port Y - Occupied</td>
<td>Port redundancy - tried to automatically switch from a primary port to a backup port but the backup port was occupied.</td>
<td></td>
</tr>
<tr>
<td>IpInp Backup Port Y switched to Primary X</td>
<td>Port redundancy - switched automatically from the Backup port to the Primary port because of no bit rate at the Backup port</td>
<td></td>
</tr>
<tr>
<td>Firmware File Download Failed</td>
<td>Failed to download new firmware file using the specified path.</td>
<td></td>
</tr>
<tr>
<td>Switched to Alternate Source</td>
<td>The NSG has switched to the alternative IP/UDP source that is configured for this session</td>
<td></td>
</tr>
<tr>
<td>GbE Card - Output Buffer Sync Byte Error</td>
<td>GbE card detected and invalid packet.</td>
<td></td>
</tr>
<tr>
<td>IPTSIN MPEG Sync Loss</td>
<td>IP input traffic contains no valid MPEG data</td>
<td></td>
</tr>
</tbody>
</table>
### 6.3.5 Setting Alarm Parameters

The Alarms > Settings page lists the alarms according to their class, that is the object that issues the alarm.

<table>
<thead>
<tr>
<th>Notification Message</th>
<th>Description</th>
<th>Displayed in Alarm Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS-Out Near Overflow</td>
<td>The actual output bit rate is nearing the configured QAM output bit rate.</td>
<td></td>
</tr>
<tr>
<td>Clock Update Started</td>
<td>RTC clock is being updated.</td>
<td></td>
</tr>
<tr>
<td>Clock Update Finished</td>
<td>The update of the RTC clock is completed</td>
<td></td>
</tr>
<tr>
<td>Application Process Restart</td>
<td>Application recovered from SW Watchdog reset</td>
<td></td>
</tr>
<tr>
<td>VOD Session - PAT Missing</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>CIC Overflow</td>
<td>The CIC module within the QAM modulator has gone through a momentary overflow, and recovered</td>
<td>No</td>
</tr>
</tbody>
</table>

The Alarms > Settings page includes the following information for each alarm:

- **Class** - the module that issues the alarm
- **Alarm Description** - the alarm text
- **Alarm ID** - the ID of the alarm
- **Severity** - defines whether the alert is an alarm or a warning

You can configure alarm parameters and define triggering alarms as explained below:

1. To define alarms settings
2. Select Monitoring > Alarms > Settings tab.
3. Set the following parameters:
NOTE: Once you have changed any of the default values and sent them to the device (Apply), the Set Defaults button appears next to the alarm its parameters were changed.

- **Assert Threshold (Msec)** - a latency period indicated in milliseconds for this alarm. When a module discovers a condition that would normally cause it to assert this alarm, it waits for the time specified in the Assert Threshold (Msec) field before asserting the alarm.
- **Remit Threshold (Msec)** - a latency period indicated in milliseconds for this alarm. When a module discovers a condition that would normally cause it to remit this alarm, it waits for the time specified in the Remit Threshold (Msec) field before remitting the alarm.
- **Scan Interval (Msec)** - defines how often the device checks for the conditions that raise the alarm. This field allows you to define a break, in milliseconds, in checking for the conditions that raise the alarm.
- **Trigger EdgeCluster** - defines whether the alarm triggers a redundancy switch. For future use.
- **Add to Log** - defines whether to write the alarm to the log of active alarms.
- **Send Trap** - defines whether to send an SNMP trap when the alarm is raised.
- **Disable Alarm** - when selected, this alarm is not issued upon correlated failure.
- **Set Default** - click to revert the alarm settings to its default settings. This option appears only once you have changed any of the alarm parameters.

NOTE: The Set Default button reverts all alarms to their default settings.

### 6.4 Diagnosing and Analyzing Traffic

#### 6.4.1 Saving Configuration

You can save the NSG 9000-40G configuration to a read-only file.

1. Select Monitoring > Diagnostics.

   ![Image of Get Information button]

2. Click Get Information.

3. In the Save HTML Document dialog, browse to the required location for saving the configuration.

4. Click Save.

   The configuration of the device is saved as an XML file on your PC.
6.4.2 Exporting Logs

You can export various device logs for debugging purposes.

1. Select Monitoring > Diagnostics.

   Click Export Logs

   1. Enable Forwarding
   2. Source Port: GBE 1
   3. Forwarding Level: Port
   4. Destination Port: GBE 2

   Sockets List

   Note: Socket forwarding must be disabled during normal operation.

   Add Socket

   Delete Selected

2. Click Export Logs.

3. In the Export File dialog, click Export.

4. In the dialog that opens, click either Open or Save.

   If you click Open, WinZip opens the Logs_Export zipped file.

   If you click Save, save the Logs_Export zipped file at the required location.

   If required, send the file to Harmonic Customer Support.

6.4.3 ASI and GbE Forwarding

NSG 9000-40G may duplicate the incoming or outgoing content to an ASI port or to any GbE port that is defined as a mirroring port. Connect the mirroring port to devices that accept ASI or/and GbE input such as an MPEG analyzer. For cabling instructions, see NSG 9000-40G Installation and Hardware guide.

NOTE: Use socket forwarding for diagnostic purposes only and not during normal operation.

⇒ To forward an Output Stream
1. Select Monitoring > Diagnostics.

2. Focus on the Output Forwarding section.

3. Open the Forwarding Port list and select the required port. If you select a GbE port, the IP Forwarding section is enabled.

4. Open the Probed QAM list to select the QAM-RF channel to be forwarded for diagnosis.

5. Open the Probe Location list and select either of the following:
   - Before Scrambler - to probe as a clear stream
   - After Scrambler - to probe as a scrambled stream

6. Applies only if a GbE port is selected in Forwarding Port. In this case define socket to be forward, by indicating the following parameters:
   - Destination IP Address - enter the destination IP address
   - UDP Port - enter the UDP port
   - Use MAC address - select to indicate destination by MAC address
   - MAC address - enter the required MAC address

7. Click Apply to send to device.

To forward a GbE Input Port

**NOTE:** Disable socket forwarding during normal operation.

1. Select Monitoring > Diagnostics and focus on the Input Forwarding section.

2. To enable mirroring, select Enable Forwarding.

3. Open the Forwarding Level list and select whether to forward a port or a socket. If you select a socket, define its parameters in the Sockets List table.
4. Open the Source Port list and select the GbE port that inputs the required content.
5. Open the Destination Port list and select the port to mirror the source port.
6. In the Sockets List table, define the following:
   - GbE/MC IP Address - the destination GbE or Multicast IP address of the socket.
   - UDP Port - enter the UDP port
   - Source IP - enter the IP address of the port that streamed the socket into the device.
   - To delete the socket, select Delete.

6.5 Generating and Viewing Logs

You can view the following logs:
- Alarms log
- GbE Counters
- NGOD logs
  - NGOD RTSP
  - NGOD VREP
- ISA logs

6.5.1 Alarms Log

The Alarms log displays the recent alarms in a chronological order. The log can display up to 100 alarms.

To view an updated log, refresh the log. You may view, refresh, clear or save the log.

To view the alarms log
1. Select Monitoring > Logs > Alarms Log.
2. To display the log, click View Log.

NOTE: The view Log button toggles to Refresh Log.

<table>
<thead>
<tr>
<th>#</th>
<th>Date</th>
<th>Time</th>
<th>Module</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>11/15/2008 14:01:01</td>
<td>Platform</td>
<td>No Input Traffic</td>
<td>Off</td>
<td></td>
</tr>
</tbody>
</table>

The log displays the alarms registered up to the time you generated the log and informs you of the following:
- # - a sequential number.
- Date - the date the alarm was issued.
- Time - the time the alarm was issued.
- Module - the module that raised the alarm.
- Description - a brief description of the alarm.
- State - indicates whether the alarm is raised.

## To refresh alarms log

Since the Alarms log displays the alarms up to the time you generated the log, refresh it to view an updated log by performing the following:

- In the Alarms Log tab, once the alarms log is displayed, click Refresh Log.
  The log is updated to display the latest alarms.

## To clear the log

1. Select Monitoring > Logs > Alarms Log.
2. To clear the log, click Clear Log.
   The currently displayed log disappears. Once you click View Log, a new log is generated.
   It includes alarms registered since the last clear log.

## To save log to file

1. Select Monitoring > Logs > Alarms Log.
2. To save the log, click Export.
3. Select a location for saving the file and click Save.
   The log is saved as an XML file in the location of your choice.

### 6.5.2 Monitoring the GbE Ports

The Counters page monitors the operation of the GbE ports.

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitted Management Packets</td>
<td>The number of legal management packets transmitted by the active GbE port.</td>
</tr>
<tr>
<td>Received Management Packets</td>
<td>The number of legal management packets received by the active GbE port.</td>
</tr>
<tr>
<td>CRC Errors</td>
<td>The number of Ethernet MAC CRC errors detected by the active GbE port.</td>
</tr>
<tr>
<td>Byte Counter</td>
<td>Counts bytes of valid packets of input traffic.</td>
</tr>
</tbody>
</table>
Each time an event occurs, the counter of the event registers another incidence and updates the number of incidence. You may reset the counter when required, and upon reboot, all counters are reset.

To monitor GbE ports

1. Select Monitoring > Logs > Counters tab. View the following information:
   - Module - indicates the GbE port
   - Description - indicates each event
   - Value - shows the number of occurrences
2. To reset a counter, click in the required row.
3. To reset all counters, click Clear All Counters.

### 6.5.3 Monitoring the ERM/ISA Communication

To monitor the communication of the NGOD ERM/ISA with NSG 9000-40G, allow tracing. Once you do that, Data Logging indication appears in the title bar of the device:

![Data Logging indication](image)

#### 6.5.3.1 Monitoring NGOD ERM Communication

NSG 9000-40G supports both R6 and D6 NGOD protocols.

To monitor NGOD communication with NSG 9000-40G using the R6 protocol

1. Select Monitoring > Logs > NGOD RTSP.
   The following page appears:

2. To start tracing the communication, click Start Tracing.

**NOTE:** Device reset does not cancel tracing. If you reset the device while tracing, when the device boots up, tracing continues and Data Logging appears in red in the title bar of the web page indicating that tracing is taking place.

3. To stop tracing, click Stop Tracing.
4. To view the communication, click Show Messages.
5. View the messages. The messages appear with the following parameters
   - # - a sequential number
   - Time - the time and date of the message
   - From/To - indicates the sender and the addressee
   - Message Type - indicates the message type. For example, Get Parameter, Connection etc.
   - Message Content - a short description of the message

To monitor NGOD communication with NSG 9000-40G using the R6 protocol
1. Select Monitoring > Logs > NGOD VREP.
   The following page appears:

2. To start tracing the communication, click Start Tracing.
3. To include in the log also Keep Alive messages, select Capture Keep Alive Messages.

**NOTE:** Device reset does not cancel tracing. If you reset the device while tracing, when the device boots up, tracing continues and Data Logging appears in red in the title bar of the web page indicating that tracing is taking place.

4. To stop tracing, click Stop Tracing.
5. To view the communication, click Show Messages (Parsed) or Show Messages (Raw Data), where,
   - Show Messages (Parsed) - the messages appear in a processed legible format
   - Show Messages (Raw Data) - the messages appear in a binary format
Chapter 6 Monitoring and Troubleshooting

Generating and Viewing Logs

6. View the messages. The messages appear with the following parameters:
   - # - a sequential number
   - Time - the time and date of the message
   - From/To - indicates the sender and the addressee
   - Type - indicates the message type in numbers
   - Function - indicates the purpose of the message
   - Message Content - a short description of the message
To monitor ISA communication with NSG 9000-40G

1. Select Monitoring > Logs > ISA RPC.

The following page appears:

2. To start tracing the communication, click Start Tracing.

**NOTE:** Device reset does not cancel tracing. If you reset the device while tracing, when the device boots up, tracing continues and Data Logging appears in red in the title bar of the web page indicating that tracing is taking place.

3. To stop tracing, click Stop Tracing.

4. To view the communication, click Show Messages.

5. View the messages. The messages appear with the following parameters:
   - # - a sequential number
   - Time - the time and date of the message
   - From/To - indicates the sender and the addressee
   - Type - indicates the communication protocol via which the message was sent
   - Function - indicates the purpose of the message
   - Message Content - a short description of the message
6. To view Result Codes parameter, click Result Code. A dialog that lists and explains the available result codes opens.

6.6 Viewing Available Reports

This version of the NSG 9000-40G web client allows you to view a report of the RF settings. To view global RF settings and RF module settings:

1. Select Reports > RF Configuration.

2. To view RF module parameters, view the following:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>See Chapter 3.10.5 Configuring/Viewing QAM Channels on page 48.</th>
<th>See Chapter 3.10.5 Configuring/Viewing QAM Channels on page 48.</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAM Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimized ACP</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of QAMs per port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power level per QAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable Attenuation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectral Inversion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix A
Firmware Upgrade Using and External Server

A.1 Upgrading the Firmware of a Single Device

Firmware upgrade of NSG 9000-40G is based on HTTP download and requires an HTTP server.

Installing and configuring an HTTP server is a one time procedure. For instructions on how to install and configure an HTTP server, see Upgrade Server Installation and Configuration on page 123.

To upgrade a single NSG 9000-40G device

New firmware packages are distributed as a self-extracting ZIP archive. When executed, this archive unzips itself to X:\HTTPROOT\Harmonic\NSG9K40G\x.y.z.bb-1 where x.y.z.bb-1 represents the version number, for instance 3.0.0.34-1.

1. Obtain the new firmware zipped file from Harmonic's FTP site.
2. Browse to the firmware file and double click it.
   Firmware file is NSG9K-40G_X.Y.Z.BB-1.exe where x.y.z.bb-1 is version number.
   Wait until Installer verification is done and the following screen appears:

3. In Destination Folder, enter the folder to copy to the firmware package. You should enter the same drive that you chose when configuring the Apache Web Server or when configuring the IIS. The destination folder is X:\HTTPROOT\Harmonic\NSG9K40G, where x stands for the selected drive. The default drive is C:.
4. Click Install.
The following dialog appears while WinZip Self-Extractor extracts the files:

5. To view details, click Show Details.
6. Once the extraction is done, Close is enabled. Click Close.
7. Open the web client of the NSG 900-40G device. See 2.2.1 Logging Into the Device via IE on page 11.
8. Select the Platform tab.
   By default Chassis is selected.
9. Click Firmware Upgrade.
   The following dialog appears:

10. In Repository Server IP Address, enter the IP address of your HTTP server.

11. In Firmware Directory, enter the name of the subdirectory that holds the extracted files. For example, 3.0.0.34-1.
12. Open the Reboot After Install list and select either of the following:
   - Automatic - to automatically reboot after installing the firmware. The device reboots of its own accord during the upgrade procedure. However, this option does not require any intervention once the upgrade procedure is initiated.
   - Manual - to reboot after install following user confirmation only. This option allows background download. While downloading the new firmware, the device is fully operational. You can reboot the device at your convenience and control the time the device is out of service for rebothing with the new firmware file.

13. To install, click Install.
   The following message appears:

   ![Browser window with installation message]

   To proceed, click OK.
   The Installation Status page appears:

   ![Installation Status page]

   This page informs you of the installation status. The installation status log is updated every 3 seconds during the installation.

   **NOTE:** During the installation of the new firmware, you cannot access the web client of the device. If you close and reopen the web client the Status Installation page appears.

   When the installation is finished, either of the following takes place:
   - If you selected Automatic reboot, the device reboots automatically.
Once reboot is done, the following message appears:

- If you selected Manual reboot, the following message appears:

15. Do either of the following:
   - **Automatic** - Click OK and move to the next step.
   - **Manual** - Click OK to complete the installation and to reboot with the new firmware version.
   
   If you click Cancel, you cancel the firmware installation and you will need to re-start the installation for the device to run with a new upgraded firmware.

16. Select Platform > Chassis > General tab and verify that the device reports the same version number as the required firmware.
Appendix B
Upgrade Server Installation and Configuration

B.1 Overview

Firmware upgrade of NSG 9000-40G is based on HTTP download and requires an HTTP server on the LAN. Use either of the following HTTP servers as the Upgrade server:

- Apache Web server - Harmonic provides a customized installation package

This appendix guides you on how to prepare the Upgrade server as follows. The configuration of the Upgrade server is a one-time procedure.

- Apache Web server - installation instructions
- IIS - configuration instructions. Instructions vary according to the operating system.

NOTE: You can use the HTTP server also for running the MCT or the NSG web client.

B.1.1 Upgrade Server Requirements

The Upgrade server PC should meet the following requirements:

Table 6-5: Upgrade Server Requirements

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Operation System</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical drive</td>
<td>One of the following:</td>
<td>HTTP server - Either of the following:</td>
</tr>
<tr>
<td></td>
<td>■ Windows2000</td>
<td>■ Apache Web Server</td>
</tr>
<tr>
<td></td>
<td>■ Windows XP</td>
<td>■ Pre-installed IIS</td>
</tr>
<tr>
<td></td>
<td>■ Windows 2003 server</td>
<td></td>
</tr>
<tr>
<td>USB interface</td>
<td></td>
<td>NSG firmware distribution package</td>
</tr>
<tr>
<td>Pentium 4 or higher</td>
<td>At least 10gbYTE free space on the hard drive</td>
<td></td>
</tr>
</tbody>
</table>

B.1.2 Upgrade Server Installation Guidelines

Use either the Apache Web Server or the IIS server. Any attempt to install the Apache server on a computer with IIS, will stop the IIS operation.

For Apache installation and configuration instructions, see B.2 Apache Server on page 124.

For IIS configuration instructions, see B.3 IIS Server on page 125.
B.2 Apache Server

This section guides you on how to install and configure the Apache server.

B.2.1 Installing the Apache Web Server

To install the Apache server, use Harmonic’s customized installation package supplied on the Upgrade CD-ROM.

Prior to installing read the following:

- Apache currently does not work under Windows Vista.
- Apache server uses port 80 which is usually used by Skype. If Skype is installed on the Upgrade server computer, a conflict may arise. Re-configure Skype prior to the Apache installation.
- If you are using a firewall, you may need to configure or disable firewall.

The installation batch script performs the following:

- Installs Apache at c:\xampplite\apache.
- Sets X:\HTTPROOT as the WWW root directory. X Represents the drive letter that you select.

The web server is configured with the following:

- Anonymous access enabled
- Directory browsing enabled

To install the Apache web server

1. On the Upgrade CD-ROM, browse to the Apache_setup_x file. (x = version number)
2. Double click the setup file to run the file.
3. In the Apache Setup dialog, click OK.
   Apache self extracts. A batch sequence window appears notifying that it installs Apache in the C:\XAMPPPLITE directory and stops IIS if it is running.
4. On your keyboard, press <Y> and then <Enter> to continue.

   Batch steps are executed:
   - Batch Step #1 stops and uninstalls the Apache service if installed.
   - Batch Step #2 stops IIS.
   - Batch Step #3 checks if port 80 is available.
   - Batch Step #4 sets up the root directory.
   - Batch Step #5 creates Start menu shortcuts under Apache for Harmonic. If your interface is not English then the links are placed in C:\xampplite\Harmonic\Links. You can manually copy them to the desktop.
   - Batch Step #6 installs and starts the Apache Web service.

B.2.2 Testing the Operation of the Apache Web Server

- Select Start > All Programs > Apache for Harmonic > Test_service.

In your default browser a window appears with the message:

Your server is running correctly!
B.3 IIS Server

This section guides you on how to configure the IIS server.

With IIS you must manually create the directories and the alias Harmonic that comprise the Harmonic virtual directory. IIS can run under a few operation systems. Each operation system requires different configuration. The following table lists the OS with the corresponding instructions:

Table 6-6: IIS - Operation System and Instructions Reference

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Instructions Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows XP</td>
<td>See B.3.2 Configuring IIS Upgrade Server with Windows XP &amp; Windows 2003 on page 127.</td>
</tr>
</tbody>
</table>

B.3.1 Configuring IIS Upgrade Server with Windows 2000

The configuration under Windows 2000 includes the following stages:

- Creating the directories: HTTPROOT\Harmonic\NSG9k40G
- Creating Harmonic alias

B.3.1.1 Creating Directories Under Windows 2000:

1. Right-click My Computer.
2. Select Explore.
3. Select a volume.
5. Type HTTPROOT for the new folder name, and press <Enter>.
6. Double-click the new HTTPROOT folder.
7. Select File > New > Folder.
8. Type Harmonic for the new folder name, and press <Enter>.
9. Double-click the new Harmonic folder.
10. Select File > New > Folder.
11. Type NSG9K40G for the new folder name, and press <Enter>.

The following picture shows the required directory structure:
B.3.1.2 Creating the Harmonic Alias under Windows 2000

1. Select Start > Settings > Control Panel.
2. Double-click Administrative Tools.
3. Double-click Internet Services Manager.

   The Internet Information Services dialog appears.
4. Expand the tree in the left panel.
5. Right-click Default Web Site.

   The Virtual Directory Creation Wizard appears.
5. Click Next.
6. In the Alias box enter Harmonic and click Next.
7. Click Browse.
8. Select the folder named Harmonic under X:\ HTTPROOT. (X represents the volume that you chose)
9. Click OK.
10. Click Next.
11. To set the access permissions for the virtual directory, select the Browse box.

12. Click Next.
13. Click Finish.

Windows creates the Harmonic virtual directory.

B.3.2 Configuring IIS Upgrade Server with Windows XP & Windows 2003

The configuration under Windows XP/Windows 2003 includes:

- Creating the Harmonic virtual directory
- Enabling the Browse feature

To configure the IIS Upgrade Server with Windows XP/Windows 2003

1. Select Start > Control Panel.
2. Double-click Administrative Tools.
3. Double-click Internet Information Services.

The Internet Information Services window displays.

4. Expand the tree in the left panel.
5. Expand Web Site.
6. Right-click Default Web Site.
7. Select New > Virtual Directory.

The Virtual Directory Creation Wizard appears.

8. Click Next.
9. In the Alias box enter Harmonic and click Next.
10. Click Browse.
11. Select a drive.
12. Click Make New Folder.
13. Type HTTPROOT for the new folder name, and press <Enter>.
14. Click Make New Folder.
15. Type Harmonic for the new folder name, and press <Enter>.
16. Click Make New Folder.
17. Type NSG9K40G for the new folder name, and press <Enter>.
18. Select the X:\HTTPROOT\Harmonic folder. (X=the drive selected in step 11)
19. Click OK.
20. Click Next.
21. To set the access permissions for the virtual directory, select the Browse box.

![Virtual Directory Creation Wizard](image)

Select Browse, to set access permission

22. Click Next.
23. Click Finish.

Windows creates the Harmonic virtual directory.
Appendix C

Standard ES Types and Descriptors

C.1 Standard Elementary Stream (ES) Types

The following standards are used to define types of elementary stream:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0</td>
<td>ITU-T</td>
</tr>
<tr>
<td>0x1</td>
<td>ISO/IEC 11172 Video</td>
</tr>
<tr>
<td>0x2</td>
<td>ITU-T Rec. H.262</td>
</tr>
<tr>
<td>0x3</td>
<td>ISO/IEC 11172 Audio</td>
</tr>
<tr>
<td>0x4</td>
<td>ISO/IEC 13818-3 Audio</td>
</tr>
<tr>
<td>0x5</td>
<td>ITU-T Rec. H.222.0</td>
</tr>
<tr>
<td>0x6</td>
<td>ITU-T Rec. H.222.0</td>
</tr>
<tr>
<td>0x7</td>
<td>ISO/IEC 13522 MHEG</td>
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<tr>
<td>0x8</td>
<td>ITU-T Rec. H.222.0</td>
</tr>
<tr>
<td>0x9</td>
<td>ITU-T Rec. H.222.1</td>
</tr>
<tr>
<td>0xA</td>
<td>ISO/IEC 13818-6 type A</td>
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<tr>
<td>0xB</td>
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</tr>
<tr>
<td>0xC</td>
<td>ISO/IEC 13818-6 type C</td>
</tr>
<tr>
<td>0xD</td>
<td>ISO/IEC 13818-6 type D</td>
</tr>
<tr>
<td>0xE</td>
<td>ISO/IEC 13818-1 auxiliary</td>
</tr>
<tr>
<td>0xF-0x7F</td>
<td>ITU-T Rec. H.222.0</td>
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<tr>
<td>0x80 - 0xFF</td>
<td>User Private</td>
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</table>

C.2 Standard ES and Program Descriptors (MPEG)

The following MPEG standards are used to extend the definitions of elementary stream and programs:

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<th>Value</th>
<th>Description</th>
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<tbody>
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<td>0x2</td>
<td>Video stream descriptor</td>
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<tr>
<td>0x3</td>
<td>audio stream descriptor</td>
</tr>
<tr>
<td>0x4</td>
<td>hierarchy descriptor</td>
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</tbody>
</table>
### C.3 Standard ES and Program Descriptors (DVB)

The following DVB standards are used to extend the definitions of elementary stream and programs:

<table>
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<tr>
<th>Value</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>0x51</td>
<td>Mosaic descriptor</td>
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<tr>
<td>0x52</td>
<td>Stream identifier descriptor</td>
</tr>
<tr>
<td>0x56</td>
<td>Teletext descriptor</td>
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<tr>
<td>0x59</td>
<td>Subtitling descriptor</td>
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<tr>
<td>0x5F</td>
<td>Private data specifier</td>
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<tr>
<td>0x60</td>
<td>Service move descriptor</td>
</tr>
<tr>
<td>0x65</td>
<td>CA system descriptor</td>
</tr>
<tr>
<td>0x66</td>
<td>Data broadcast ID descriptor</td>
</tr>
</tbody>
</table>
Appendix D
EIA SDT and HRC Standards

The EIA (Electronic Industries Association) sets internationally recognized standards for standard frequencies (EIA SDT) and for Harmonic related carriers (EIA HRC).

Table 6-7: EIA SDT and HRC

<table>
<thead>
<tr>
<th>EIA Channel Number</th>
<th>STD (Zero Offset) MHz</th>
<th>HRC MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>73.7500</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>57.0000 55.7500</td>
<td></td>
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<tr>
<td>3</td>
<td>63.0000 61.7500</td>
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<tr>
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<tr>
<td>25</td>
<td>231.0000 229.7500</td>
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<tr>
<td>26</td>
<td>237.0000 235.7500</td>
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</table>
Table 6-7: EIA SDT and HRC

<table>
<thead>
<tr>
<th>EIA Channel Number</th>
<th>STD (Zero Offset) MHz</th>
<th>HRC MHz</th>
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<td>EIA Channel Number</td>
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<tr>
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### Table 6-7: EIA SDT and HRC

<table>
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<tr>
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<th>STD (Zero Offset) MHz</th>
<th>HRC MHz</th>
</tr>
</thead>
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</tr>
<tr>
<td>112</td>
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<td>113</td>
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</tr>
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<td>735.0000</td>
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<tr>
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<td>745.7500</td>
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<td>757.7500</td>
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<tr>
<td>119</td>
<td>765.0000</td>
<td>763.7500</td>
</tr>
<tr>
<td>EIA Channel Number</td>
<td>STD (Zero Offset) MHz</td>
<td>HRC MHz</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------</td>
<td>----------</td>
</tr>
<tr>
<td>120</td>
<td>771.0000</td>
<td>769.7500</td>
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<tr>
<td>121</td>
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<td>775.7500</td>
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<td>783.0000</td>
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<td>125</td>
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<td>855.0000</td>
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<td>861.0000</td>
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<td>138</td>
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<td>139</td>
<td>885.0000</td>
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<tr>
<td>140</td>
<td>891.0000</td>
<td>889.7500</td>
</tr>
<tr>
<td>141</td>
<td>897.0000</td>
<td>895.7500</td>
</tr>
<tr>
<td>142</td>
<td>903.0000</td>
<td>901.7500</td>
</tr>
<tr>
<td>143</td>
<td>909.0000</td>
<td>907.7500</td>
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<tr>
<td>144</td>
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<td>145</td>
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</tr>
<tr>
<td>146</td>
<td>927.0000</td>
<td>925.7500</td>
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<tr>
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<td>933.0000</td>
<td>931.7500</td>
</tr>
<tr>
<td>148</td>
<td>939.0000</td>
<td>937.7500</td>
</tr>
<tr>
<td>149</td>
<td>945.0000</td>
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</tr>
<tr>
<td>150</td>
<td>951.0000</td>
<td>949.7500</td>
</tr>
</tbody>
</table>
### Table 6-7: EIA SDT and HRC

<table>
<thead>
<tr>
<th>EIA Channel Number</th>
<th>STD (Zero Offset) MHz</th>
<th>HRC MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>957.000</td>
<td>955.7500</td>
</tr>
<tr>
<td>152</td>
<td>963.000</td>
<td>961.7500</td>
</tr>
<tr>
<td>153</td>
<td>969.000</td>
<td>967.7500</td>
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<tr>
<td>154</td>
<td>975.000</td>
<td>973.7500</td>
</tr>
<tr>
<td>155</td>
<td>981.000</td>
<td>979.7500</td>
</tr>
<tr>
<td>156</td>
<td>987.000</td>
<td>985.7500</td>
</tr>
<tr>
<td>157</td>
<td>993.000</td>
<td>991.7500</td>
</tr>
<tr>
<td>158</td>
<td>999.000</td>
<td>997.7500</td>
</tr>
</tbody>
</table>
Appendix E
Control Panel

E.1 Using the Control Panel

You can set preliminary configuration and control the NSG 9000-6G unit via its front panel. The front panel includes a control panel comprised of a Liquid Crystal Display (LCD) and six buttons as the following figure shows:

E.1.1 Control Panel Display

The 2-line, 16-character control panel display shows the screens, sub-screens, sub-screen options, error messages, warnings and alarms. The control panel display is comprised of two lines:

Line 1 - displays the name of the current screen/sub-screen or selected option.

Line 2 - displays the parameter value and all editing tasks are performed in this line. In editing mode the cursor is blinking to indicate the selected character.

E.1.2 Control Panel Screen Concept

The control panel screens are organized in a hierarchical fashion to indicate that a main screen contains sub-screens and sub-screen options. You may access a sub-screen only via its main screen. The available main screens are as follows:

**Power Up screen** - A main screen that appears as soon as the NSG 9000-6G boots up and after a thirty minutes of inactivity. The screen shows the company's name, NSG 9000-6G type and IP address.

**Network Config screen** - allows to access sub-screens for ETH configuration.

**Setup screen** - allows to reset the device.

**Alarm screen** - displays the last active alarm or warning. You can browse through the alarms to view them.

**Product Information screen** - via its sub-screens you can view information about the NSG 9000-6G.
The following table lists the main screens, their browsing sequence, sub-screens and their options:

<table>
<thead>
<tr>
<th>Screen</th>
<th>Browsing Sequence</th>
<th>Sub-Sequence</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Config</td>
<td>Down - Alarms</td>
<td>ETH1 IP</td>
<td>Edit ETH1</td>
</tr>
<tr>
<td></td>
<td>Up - Product Info.</td>
<td>ETH2 IP</td>
<td>Edit ETH2</td>
</tr>
<tr>
<td>Alarms</td>
<td>Down - Setup</td>
<td>Active alarms and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Up - Network Config</td>
<td>warnings</td>
<td></td>
</tr>
<tr>
<td>Setup</td>
<td>Down - Product Info.</td>
<td>Reset</td>
<td>Reset device</td>
</tr>
<tr>
<td></td>
<td>Up - Alarms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Info.</td>
<td>Down - Network Config</td>
<td>Chassis Information</td>
<td>Chassis SN</td>
</tr>
<tr>
<td></td>
<td>Up - Setup</td>
<td>DGboard Info.</td>
<td>DGBoard SN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GbE Info.</td>
<td>DGBoard FPGA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Software Information.</td>
<td>GbE GbE FPGA Ver.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control panel hotkeys</td>
<td>Firmware Ver.</td>
</tr>
</tbody>
</table>

### E.1.2.1 Moving along the Screens

To move along the screens and sub-screens of the control panel, use the following buttons of the control panel keypad:

<table>
<thead>
<tr>
<th>Button</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up &amp; Down</td>
<td>• browse through the screens/sub-screens.</td>
</tr>
<tr>
<td></td>
<td>• browse through sub-screen options.</td>
</tr>
<tr>
<td></td>
<td>• while editing, browse through numerical characters.</td>
</tr>
<tr>
<td>Left &amp; Right</td>
<td>while editing, move the cursor along the line.</td>
</tr>
<tr>
<td>Enter</td>
<td>• executes a selection of a screen/sub screen and of its available options.</td>
</tr>
<tr>
<td></td>
<td>• quits an editing session and applies changes.</td>
</tr>
<tr>
<td>Esc</td>
<td>• moves up a menu level.</td>
</tr>
<tr>
<td></td>
<td>• quits an editing session without applying changes.</td>
</tr>
</tbody>
</table>

### E.1.2.2 Hotkeys

The hotkeys are a combination of up to three keys pressed simultaneously. The following table lists the available hotkeys and describes their functionality:

<table>
<thead>
<tr>
<th>Hotkeys</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Esc&gt; &amp;&lt; Enter&gt;</td>
<td>Moves you to the screen at the top of the sequence.</td>
</tr>
</tbody>
</table>
E.1.3 Configuring Device Parameters

Configure the NSG 9000-6G unit only after boot up. The control panel allows you to configure the following:

- IP address, subnet mask and gateway of ETH1
- IP address and subnet mask of ETH2

To configure various parameters and to apply the changes, you are required to enter a password. This limitation allows authorized users only to change the NSG 9000-6G settings. The password is the following sequence of buttons: Left-Right Left-Right Up-Down Enter.

To configure device parameters:

1. Navigate to the required parameter and click <Enter> twice.
2. Enter the password.
   The screen name changes to Edit (screen name). A blinking cursor appears on the first character of the second line of the screen.
3. Start editing.
4. Do one of the following:
   - To quit the editing session and to apply changes, click <Enter>. The screen name appears without the word “Edit”. The newly configured parameter appears in the second line of the screen.
   - To quit the editing session without applying the changes, click <Esc>. The screen name appears without the word “Edit”. Unchanged parameters appear in the second line of the screen.

E.1.4 Reset the NSG 9000-40G Unit

Via the control panel you may reset the NSG 9000-40G unit when required.

☞ To reset the NSG 9000-40G unit:
   - Do either of the following:
     Navigate to the Reset NSG 9000-40G sub-screen of the Setup main screen and click <enter>,
     Or,
     Press <Esc> & Left & Right arrow for at least 3 seconds. Confirm with Right arrow.
     Once boot up starts, the control panel displays the same messages as during power up. If BOOTP is enabled, an additional message appears indicating that the NSG 9000-6G connects to the BOOTP server.

E.1.5 Viewing NSG 9000-6G Parameters

The control panel allows to view the following NSG 9000-6G parameters:
   - Alarms and Warnings - up to 100 alarms/warnings
   - Product Information
   - Control panel hotkeys

E.1.5.1 Viewing Alarms/Warnings

You may browse through the alarms/warnings to view them. If an alarm/warning is cancelled, it disappears from the screen and the following alarm/warning is presented. If there are no alarms/warnings, the message “No alarms/Warn” appears. You can view up to 100 alarms/warnings.

☞ To monitor alarms/Warnings

1. Navigate to the Alarm screen. The screen displays the number of alarms and warnings (from left to right)
2. Click <Enter>.
3. Browse through the alarms/warnings, using the <Down or Up> keys.
When a warning is displayed, the following sign appears at the top right corner of the LCD display: (W).

E.1.5.2 Viewing ETH ports MAC Address

⇒ To monitor the ETH1 MAC Address

1. Navigate to the Network Config screen and click <Enter>. The Ethernet Port 1 screen appears.
2. Click <Enter>. The ETH1 IP Address screen appears.
3. Click <Down or Up> until the ETH1 MAC Address screen appears.

⇒ To monitor the ETH2 MAC Address

1. Navigate to the Network Config screen and click <Enter>. The Ethernet Port 1 screen appears.
2. Click <Down or Up> to open the Ethernet Port 2 screen.
3. Once the Ethernet Port 2 screen appears, click <Enter>.
4. Click <Down or Up> until the ETH2 MAC Address screen appears.

E.1.5.3 Viewing Product Information

The Product Information screen is related to the following sub-screens:

- Chassis Info - view the serial number of the chassis
- DGBoard Info - view the DGBoard serial number and DGBoard FPGA number
- GbE Info - view GbE FPGA Version
- Software Info - view firmware version
- LCD Hotkeys Help - allows to view the various available hotkeys

⇒ To view product information

1. Navigate to the Product Info. screen.
2. Click <Enter>.
3. Browse through the sub-screens and their related options using the <Down or Up> and <Enter> keys.

E.1.5.4 Viewing Hotkeys

1. Navigate to the Product Information screen.
2. Click <Enter>.
3. Click <Down or Up> until the Hotkey screen appears.
4. Click <Enter>.
5. Click <Down or Up> to view the hotkeys.