



# Narrowcast Services Gateway NSG 9116, 9112 and 9108

Hardware Installation and Startup Guide  
For NSG 9100 Ver. 3.0

P/N MAN-NSG9100-HW-3.0 Rev. B  
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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15, subpart B of the Federal Communications Commission (FCC) rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy. It may cause harmful interference to radio communications if it is not installed and used in accordance with the instructions in this manual. Operation of this equipment in a residential area is likely to cause harmful interference. If this occurs, the user will be required to correct the interference at their own expense.

Connections between the Harmonic equipment and other equipment must be made in a manner that is consistent with maintaining compliance with FCC radio frequency emission limits. Modifications to this equipment not expressly approved by Harmonic may void the authority granted to the user by the FCC to operate this equipment.

The following table lists agency approvals:

Agency	Approval
North American EMI	FCC Part 15, subpart B, Class A
North American Safety	UL, 1950, cUL 22.2 No. 950
European EMI	EN55022 Class A, EN50082-1

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## Glossary

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# Preface

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This guide describes the installation and startup instructions for the Narrowcast Services Gateway family, including the NSG 9116, 9112 and 9108. The NSG is a highly integrated digital video and data gateway between on-demand content servers and their subscribers. Designed as a 1-RU chassis, the NSG family performs PID filtering, multiplexing, scrambling, QAM modulation, and RF upconversion for either sixteen, twelve or eight transport streams simultaneously. It can supply video and other on-demand multimedia services to large numbers of subscribers.

The NSG accepts digital MPEG input through a Gigabit Ethernet (GbE) port. The NSG directs multimedia to the different QAMs and up-converters to create the outgoing transport streams as QAM-RF output signals.

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**Note:** This guide uses the term NSG to refer to the NSG 9116, 9112 and 9108.

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## Manual Organization




This guide is organized as follows:

- [Chapter 1, “Features and Specifications,”](#) introduces features of the NSG.
- [Chapter 2, “Cabling and Configuration,”](#) describes how to cable and configure the NSG.
- [Chapter 3, “Troubleshooting,”](#) describes how to resolve NSG hardware alarms.
- [Appendix A, “Fuse Replacement,”](#) contains service information that explains how to replace the fuse in the NSG.

- [Appendix B, “Wiring the –48 VDC Power Supply,”](#) describes how to connect the optional –VDC power source.
- [Appendix C, “Advanced Fiber Optic Connections,”](#) describes advanced fiber optic cabling schemes including cascading and using a DWDM in your network.
- [Appendix D, “Customer Support Information,”](#) provides Customer Support contact information.
- [“Glossary,”](#) lists commonly used industry-wide terms as well as terms used in this guide.

## Conventions

This guide uses the following notational conventions:

Convention	Description
Courier font regular	System messages, syntax statements, or command examples.
<b>Courier font bold</b>	Commands that you are instructed to enter.
<i>italic font</i>	For emphasis or command variables.
<i>italic font</i>	In syntax statements, items inside brackets are optional.
 <b>Caution:</b>	Indicates a situation that might impair data.
<b>Note:</b>	Highlights important information.
 <b>Tip:</b>	Provides time-saving or informative suggestions about using the product.
 <b>Warning:</b>	Indicates a situation that causes damage to the system or might harm a person.



## Features and Specifications

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### Introduction

#### NSG 9100

Harmonic's NSG 9100 product line includes the NSG 9116, 9112 and 9108. The NSG provides digital video remultiplexing, scrambling, QAM modulation, and RF upconversion for video on demand networks. The NSG accepts digital MPEG input through 2 x GbE ports configured to work as redundant GbE channels or as independent channels that simultaneously receive different GbE feeds. The NSG delivers up to sixteen transport streams through RF output ports implementing dual upconverter technology.

The following table provides a general description of the NSG 9100 product line:

NSG	Input	Output
9116	2 x GbE ports with two modes of operation: <ul style="list-style-type: none"> <li>■ two redundant channels</li> <li>■ two independent ports receiving different feeds</li> </ul>	8 x RF ports carrying 16 x QAM transport streams
9112	2 x GbE ports with two modes of operation: <ul style="list-style-type: none"> <li>■ two redundant channels</li> <li>■ two independent ports receiving different feeds</li> </ul>	6x RF ports carrying 12 x QAM transport streams
9108	1 x GbE port with two redundant channels	4x RF ports carrying 8 x QAM transport streams

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**Note:** The NSG comes with either an AC power supply or –48 VDC power supply. All types of NSGs are intended to be installed in restricted access locations.

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## Management Interfaces

Harmonic offers several methods for configuring NSG devices and monitoring their status. All management interfaces listed below connect to the NSG over LAN, via its ETH1 Ethernet port.




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

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

Purpose	Recommended Tool
Preliminary configuration and monitoring of a single NSG device	<p data-bbox="592 369 740 395"><i>Control Panel</i></p> <p data-bbox="592 407 1210 638">The NSG control panel is comprised of a display area and key pad located on the front panel of the NSG. The control panel is active once the NSG boots up and provides means for preliminary configuration of a single NSG device. It also allows you to monitor the NSG's status, view its alarms (if present), and troubleshoot them. For details on accessing the web client, please see the <i>NSG Web Client</i>.</p>
Configuration and monitoring of a single NSG device	<p data-bbox="592 661 1210 888">The NSG web client is an on-board web-based user interface, that is an integral part of the NSG firmware. The web client is accessible through Microsoft Internet Explorer, and provides means for configuring a single NSG device. It also allows the user to monitor the NSG's status, view its alarms (if present), and troubleshoot them. For details on accessing the web client, see <a href="#">Chapter 2, "Connecting Power,"</a> .</p>

Purpose	Recommended Tool
Configuration of multiple NSG devices	<p><i>MCT (Mass Configuration Tool).</i></p> <p>The MCT is a spreadsheet-oriented system designed to configure multiple NSGs 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 NSGs. MCT is sold separately - please contact Harmonic Customer Support for more details.</p> <p><b>Note:</b> MCT is not automatically updated when an NSG is configured through the web client. Using the web client for configuring individual NSGs 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, please refer to the MCT online help.</p>
Status and Alarm Monitoring of multiple NSG devices	<p><i>Harmonic NMX / 3rd party SNMP monitoring.</i></p> <p>NMX (Harmonic's Digital Service Manager) may be used for monitoring general status and alarms of multiple NSG devices. A single NMX manager may be used to monitor several hundreds NSG devices, located in several different sites.</p> <p>In addition, NSG may report its status and alarms via standard SNMP. Any standard-based SNMP monitoring system may be used for monitoring the status of multiple NSG devices. This includes off-the-shelf systems such as HP OpenView, or custom-made systems. For further details on implementing SNMP monitoring for NSG devices, please contact Harmonic Customer Support.</p>

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**Note:** The MCT database is not automatically updated when an NSG is configured using NMX or the web client. To update the MCT database, select the NSG and execute the following command from the MCT Actions menu: Actions > Synchronize > Get from Target.

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## GbE Channel Redundancy

The NSG family supports GbE redundancy to provide the network with fault-tolerant design. The objective of the redundant channel is to eliminate or diminish any service interruptions when an active GbE

channel fails. NSGs with the redundancy feature do not have a primary and secondary channel but rather have two symmetrical GbE channels. Therefore, when a redundant channel is activated it will continue to operate and will not revert back to the previously active channel when that channel recovers.

Redundancy for both GbE1 and GbE2 is activated by one of two NSG alarms:

- [Chapter 3, “GbE X Link down,”](#)
- [Chapter 3, “GbE X SFP not mounted,”](#)

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**Note:** Automatic GbE channel redundancy is unavailable in Switching mode. In this mode the ports are configured to work independently and to receive different GbE feeds.

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**Note:** Automatic GbE channel redundancy is unavailable when using copper SFP. The redundant channel is activated only when the alarm *SFP not mounted appears*. The SFP does not trigger the *GbE link down* alarm.

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## NSG Backup Capability

The NSG includes a Non Volatile RAM (NVRAM) that is also powered by a lithium battery. The NVRAM allows configuration backup and maintains the NSG time.



**Caution:** Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

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## Features and Specifications by NSG Model

The following table describes the features of the NSG 9100.

Feature	Description
Chassis	1-RU, mounts in Electronic Industries Association (EIA) standard rack
2 x GbE input ports	<ul style="list-style-type: none"> <li>■ Provide two redundant GbE channels, or two independent ports receiving simultaneously different feeds</li> <li>■ Max. allowed PCR jitter 10 msec (peak to peak)</li> <li>■ Payload of up to 800 Mbps (up to 256 services)</li> <li>■ Max. Ethernet traffic (payload + pass through traffic) 1000 Mbps</li> </ul>
16, 12 or 8 x QAM modulators	<ul style="list-style-type: none"> <li>■ QAM Mode: <ul style="list-style-type: none"> <li>■ DVB (Annex A): 8 MHz</li> <li>■ ITU-T (Annex B J.83): 6 MHz</li> <li>■ ITU-T (Annex-C - Japan), 6 MHz</li> </ul> </li> <li>■ QAM Constellations: <ul style="list-style-type: none"> <li>■ Annex-A: 16, 32, 64, 128, 256</li> <li>■ Annex-B: 64,256</li> <li>■ Annex-C: 16, 32, 64, 128, 256</li> </ul> </li> </ul>
Maximum output bit rate	<ul style="list-style-type: none"> <li>■ DVB: 408 Mbps (51.2 Mbps x 16)</li> <li>■ ITU-T: 310.4 Mbps (38.8 Mbps x 16)</li> </ul>
8, 6 or 4x RF outputs	<ul style="list-style-type: none"> <li>■ Each port carries two QAM channels, combined and upconverted into two adjacent RF channels</li> <li>■ Connector: F-type</li> <li>■ Recommended Cable: 75 Ohm, RG-6</li> <li>■ QAM / RF Specifications: <ul style="list-style-type: none"> <li>■ see product specifications sheet</li> </ul> </li> </ul>
1 x ASI monitoring port	ASI monitoring port can be configured to output the same data as the RF output ports. The ASI Port can be configured to monitor all transports.
Front panel LEDs	Power, alarm, 2 input status, and 16, 12 and 8 output status LEDs.

Feature	Description
Back panel LEDs	Activity and alarm LED pairs for each GbE port (four LEDs in all).
Dynamic extraction of input	<ul style="list-style-type: none"> <li>■ Dynamic detection of changes in services and PSI tables at the input</li> <li>■ Automatic reflection of input changes into the output stream within one second</li> </ul>
Filtering of GbE input services	Data arriving to the NSG input GbE ports is filtered based on routing information communicated by the video server
PID remapping	PIDs of incoming services are remapped in one of two ways (user-configurable): <ul style="list-style-type: none"> <li>■ Paradigm</li> <li>■ Random</li> </ul>
Motorola pre-encryption support	Accepts Motorola pre-encrypted content
10Base-T/100Base-T Ethernet ports	Two independent Ethernet ports, typically used for management (ETH1) and (ETH2)
SNMP support	Built-in SNMP agent communicates device status via SNMP traps
PSI generation for each output	Generation of PSI (PAT and PMT) for each individual output stream
Monitoring and control	Configuration, control, and monitoring by: <ul style="list-style-type: none"> <li>■ Harmonic NMX Digital Service Manager</li> <li>■ NSG web client accessed using Internet Explorer 5.0 to 6.0</li> <li>■ Massive Configuration Tool (MCT)</li> <li>■ Control Panel</li> </ul>

## Environmental Specifications

The following table lists the environmental specifications for the NSG.

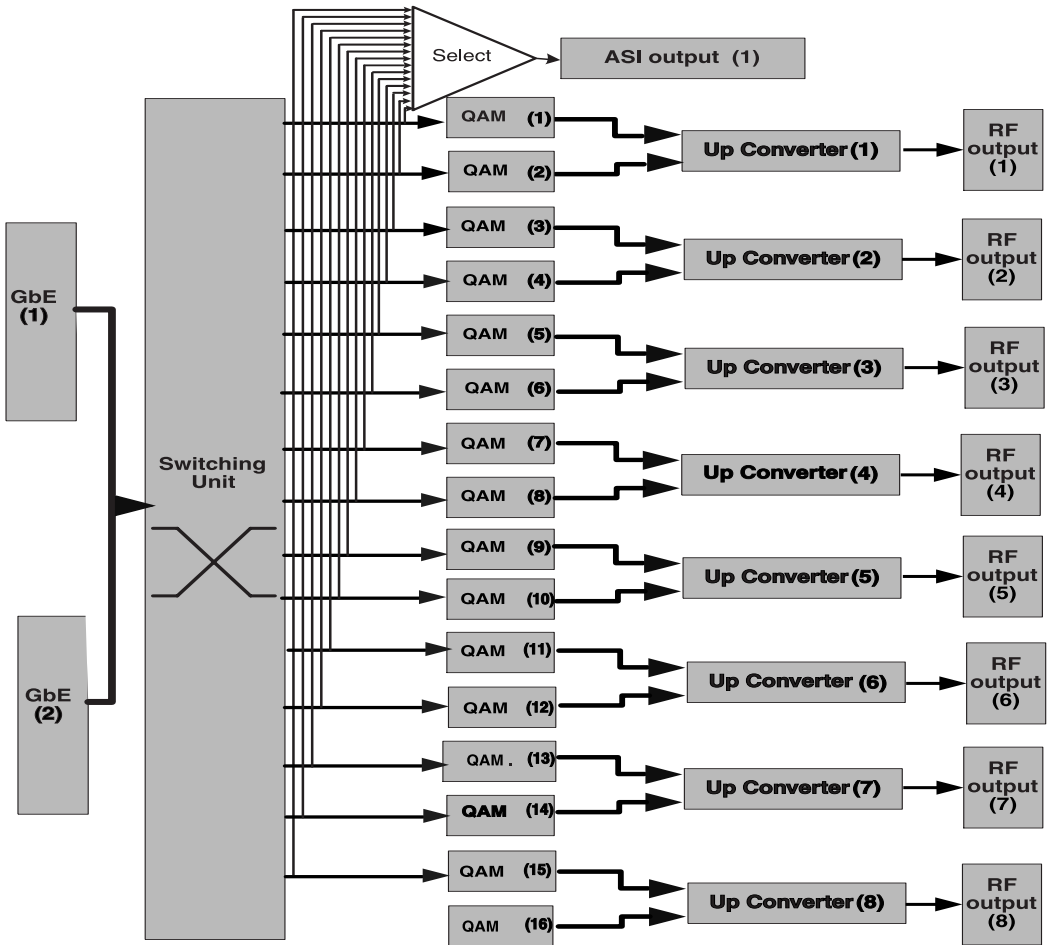
Parameter	Description
Dimensions	
Height	4.4 cm (1.73 in)
Width	44 cm (17.3 in)
Depth	62.5 cm (24.6 in)
Operating temperature	0 to 50 °C (32 to 122 °F)
Storage temperature	–40 to 70 °C (–40 to 158 °F)
Relative humidity	Maximum 85% non-condensing
Ventilation	If units are installed in a closed rack, the rack must be ventilated to ensure proper cooling of the units. Ventilation rate must be: At least 1.0 cubic meter per minute (35 cubic feet per minute) per NSG unit.



# Stream Processing Overview

The NSG accepts a GbE input, and outputs analog RF. The following diagram shows the flow of data through the GbE channel.

**Note:** The diagram shows the maximum output of 8 RF. NSG 9112 and 9108 output 6 or 4 analog RF respectively.

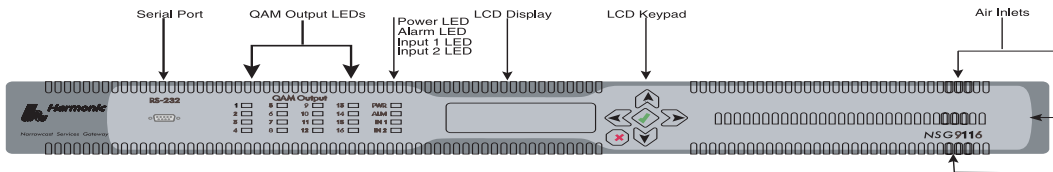


## NSG Front Panel

The front panel of the NSG contains the following:

- RS-232 connector - enables to connect the NSG to another PC.
- QAM Output LEDs - up to sixteen LEDs for monitoring QAM output ports. The number of LEDs varies according to the number of QAM output ports. In NSG 9116 there are sixteen LEDs, in 9112 twelve and in NSG 9108 there are eight LEDs.
- Power, Alarm, Input 1 and Input 2 LEDs - enables to monitor the status of the NSG power, alarm and input ports.
- Control panel- comprised of a display area and a keypad. The control panel enables preliminary configuration and monitoring of the NSG.

The following figure illustrates the front panel of the NSG 9100:



## Control Panel

The control panel allows you to monitor and configure the NSG. You can start using the control panel once the NSG boots up and the Power up screen appears in the control panel display.

## Front Panel LEDs

The following table describes the front panel LEDs, from left to right.

LED	Color	Description
Output	Green/Red/Orange	<p>ON (Green) - Indicates the output port is properly configured and has at least one service.</p> <p>ON (Red) - Indicates an output alarm has been activated.</p> <p>ON (Orange) - Indicates an output warning has been activated.</p> <p>ON (Green blinking) - Indicates the 'Identify unit' button has been selected.</p> <p>OFF - Indicates the output port has no service or is disabled.</p>
Power	Green	<p>ON - Indicates that NSG is powered on.</p> <p>OFF - Indicates that NSG is powered off.</p>
Alarm	Red/Orange	<p>ON (Red) - Indicates an alarm has been activated in the device.</p> <p>ON (Orange) - Indicates a warning has been activated in the device.</p> <p>Refer to <a href="#">Chapter 3, "Troubleshooting,"</a> for further details.</p> <p>OFF - Indicates no alarm activated.</p>
Input	Green/Red/Orange	<p>The first LED shows the status of GbE channel 1, and the second LED shows the status of GbE channel 2.</p> <p>ON (Green) - Indicates the input port is enabled and has a valid GbE signal.</p> <p>ON (Red) - Indicates an input related alarm has been activated. The activated LED indicates the specific port with the alarm.</p> <p>ON (Orange) - Indicates an input related warning has been activated. The activated LED indicates the specific port with the warning.</p> <p>ON (Green blinking) - Indicates the 'Identify unit' button has been selected.</p> <p>OFF - Indicates the input port is disabled.</p>

## EIA-232 Serial Port

The EIA-232 serial port may be used to configure the Ethernet port IP addresses. You can use the serial port for monitoring and manual maintenance operations. The EIA-232 serial port has a female DB-9 D-type connector.

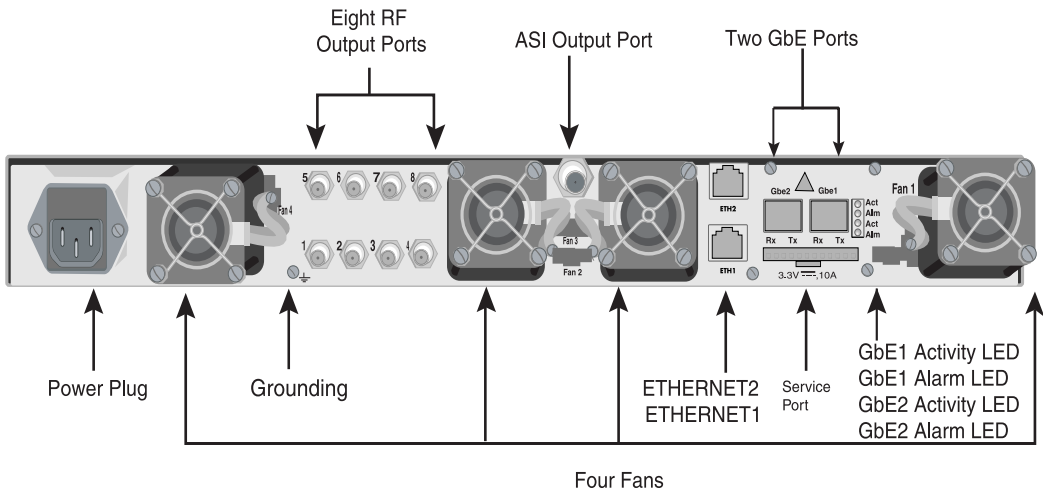
## Air Inlets

Air inlets are located along the lower, upper and right middle parts of the NSG front panel. The air inlets are designed to provide maximum air flow.

## Back Panel

This section describes the back panel of the NSG. The back panel of the NSG 9116, 9112 and 9108 differ in the number of RF output ports only. The NSG 9116 has eight RF output ports, as the following figure illustrates. NSG 9112 has six output ports and NSG 9108 has four output ports.

The NSG back panel has one ASI output port and two Gigabyte Ethernet (GbE) receptacles for Small Form Factor Pluggable (SFP) transceivers.



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**Note:** The cabling of the JTAG connector of the service port shall use min. 18AGW copper UL listed wiring.

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## Power Supply

### AC Power Supply

The power supply supports 110 and 230 VAC, and automatically senses the required voltage. A fuse is located inside the power socket and a spare is located inside the adjacent compartment. For information about replacing the fuse, see [Appendix A, “Fuse Replacement,”](#) .

See [“Connecting the AC Power Cable” on page 23](#) for instructions to connect the power supply.

The following table lists the power supply specifications.

Parameter	Specification
Input voltage	100–240 VAC
Line frequency	60–50 Hz
Typical power consumption	154 W

### –48 VDC Power Supply

If your NSG has the optional –48 VDC power supply, the standard AC power connector is replaced by a panel with a 3-pin male connector for –48 VDC. This power supply does not have a fuse.

See [“Connecting Power” on page 23](#) for instructions to wire the power supply.

The NSG’s electrical rating for the -48VDC type is as follows:

Parameter	Specification
Voltage	48/60 VDC <b>Note:</b> The device can still operate with input voltage ranging from 36 to 75 VDC.
Max. operating current	4 amps

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**Note:** Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

---

## Ethernet Ports

The NSG back panel has two Ethernet ports to allow connection to two Ethernet networks. See [“Establishing Ethernet Connection” on page 22](#) for instructions to configure IP addresses for the Ethernet ports.

Use UTP cables with an RJ-45 connector to connect the NSG to a hub or router for the management networks.

## GbE Input Port

The NSG back panel includes two SFP module receptacles labeled GbE 1 and 2 for GbE input.

The following table lists the GbE port specifications.

Parameter	Specification
Connector	Two receptacles for SFP connectors.
Maximum input bit rate	<ul style="list-style-type: none"><li>■ Line rate up to 1000 Mbps.</li><li>■ Processing up to 800 Mbps of MPEG data (up to 256 services).</li><li>■ Cascading up to 1000 Mbps of traffic.</li></ul>

The back panel of the NSG features two LEDs for each GbE port. The following table describes the LEDs:

LED	Color	Description
Activity	Green	<ul style="list-style-type: none"><li>■ Illuminates when a <i>live</i> fiber is connected to the port and a network link is detected.</li><li>■ Blinks when real traffic flows through the link.</li></ul>
Alarm	Orange	Indicates an error in the GbE port.

## SFP Module

The SFP module converts optical data into electrical data and vice versa. The following figure illustrates an SFP module:



**Warning:** Class I laser product.

You can use either of the following types of SFP depending on the cable/fiber type you are using. You can purchase SFPs separately from the NSG either from Harmonic or other sources. In this case it is strongly recommended to purchase SFP models qualified by Harmonic:

Fiber/Cable Type	Connector Type	Wave Length	Qualified SFP Make/Model
Multi-mode fiber	2xLC	850 nm	Finisar FTRJ-8519-7D
Single-mode fiber	2xLC	1310 nm	Finisar FTRJ-1310-3
UTP Cat-5 copper	1xRJ-45	N/A	_____

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**Note:** When using an SFP with a copper cable, enable the Auto Negotiate and Last in Chain options via the Web client. Cascading is unavailable and the automatic channel redundancy is activated only when the alarm *SFP not mounted* appears. The copper SFP does not trigger the *GbE link down* alarm.

---



## NSG Output Ports

### RF Ports

The NSG back panel has up to eight RF ports, numbered 1–8. Each port outputs two channels.

Use RG-6 coaxial cables cable with F-type connectors to connect the RF ports to the output devices. See [“Connecting the QAM-RF Output Cables” on page 21](#) for more information.

The following table provides the RF port specifications:

Parameter	Description
Connector	Male F connector
Cable	RG-6
Output frequency	53-868 MHz

### ASI Output Port for Monitoring

The NSG duplicates one transport stream to one ASI output port designed for monitoring purposes, applicable to both ASI and GbE data. Use this port to connect to devices that accept ASI input, such as an MPEG analyzer.

## What's Next...

The next step is to unpack and cable the NSG, as described in the following chapter.



# Cabling and Configuration

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This chapter describes how to cable and set preliminary configuration to the NSG. The various sections of this chapter are arranged according to the order of actions you need to perform in order to start using the NSG unit:

- Unpacking the NSG
- Cabling the NSG
- Connecting Power
- Setting Preliminary configuration to the NSG
- Starting the NSG Web Client

## Unpacking the NSG

The NSG comes in a specially designed shipping container that ensures its safety during shipping and handling. To avoid damaging the NSG, unpack it carefully.

## Installing the NSG

Each NSG unit consists of a 1-RU chassis installed in a standard 19-inch computer rack.

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**Note:** Mounting the NSG unit in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

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To install the NSG unit:

1. Place the 1-RU chassis on the computer rack.

2. Attach the chassis to the computer rack as follows:

Front - Fasten the front holders to the rack.

Back - Fasten the L-shaped holders to the rack.

## Cabling the NSG

Connecting cables to the NSG is straightforward. The NSG GbE input ports, QAM-RF or ASI output ports, and Ethernet ports are clearly marked on the NSG back panel. See [“Back Panel” on page 12](#) for placement.

### Connecting the GbE Port

To connect the GbE port to the Content server use either of the following:

- Multimode or single-mode optic fiber with an LC connector. The LC connector plugs into an SFP receptacle and accommodates two fibers, one for transmission and the other for reception.
- Copper cable with an RJ-45 connector. The RJ-45 connector plugs into a copper SFP receptacle.

The NSG supports two SFP modules for channel redundancy. However, when using copper SFP, automatic channel redundancy is activated only when unplugging the SFP from the current active port.

To connect the fiber/cable to the NSG:

1. Insert the SFP modules into the receptacles labeled GbE 1 and GbE 2 at the back of the NSG.
2. Insert the LC/RJ-45 plugs into the SFP module.
3. Connect the NSG to a switch or other NSG as appropriate for your network configuration.

The following figures show a basic connection between an NSG and a switch. The first figure refers to a connection with optic fibers and the second with copper cables:



The NSG also supports advanced fiber optic cabling schemes such as cascading, redundancy, IP Switching and including a DWDM in your NSG network. See [Appendix C, “Advanced Fiber Optic Connections,”](#) for instructions.



## Connecting the QAM-RF Output Cables

The NSG has up to eight RF output ports, labeled RF OUT and numbered 1– 8, which implement the dual upconverter technology. Each port delivers two RF channels.

To connect the RF Cables:

- Use RG-6 coaxial cables equipped with F-type connectors to connect the outgoing ports to your output equipment according to your network schema.

## Connecting the ASI Monitoring Port Cables

The ASI output port for the NSG provides a method to monitor the device's output data.

To connect the ASI output cable:

- ⇒ Connect the ASI cable with a BNC connector from the ASI output port on the NSG back panel to a device such as an MPEG analyzer.

## Connecting the Ethernet Cables

The Ethernet ports, labeled ETH1 and ETH2, provide access to two independent networks.

To connect the Ethernet cables:

- ⇒ Connect an Ethernet cable with RJ-45 connectors from the ETH1 port on the NSG to your management network hub or switch.

## Establishing Ethernet Connection

Because the NSG is configured and controlled by a remote management system, you must set the IP addresses of the Ethernet ports located on the back panel of the NSG. To set NSG IP address, use the control panel located on the front panel of the NSG. For further information, refer to [“Preliminary Configuration of the NSG” on page 25](#).

You may also use other management interfaces. For further information, refer to the web client online help or, in case of a number of NSG devices, use the MCT (Mass Configuration Tool) and refer to its online help.

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**Note:** The NSG requires a user name and password to log in to all management interfaces, including the serial communications console, web client and FTP. You must contact Harmonic Customer Support to obtain the user name and password before you can proceed with the following configuration. See [Appendix D, “Customer Support Information,”](#) for Customer Support contact information.

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## Connecting Power

The NSG comes with either an AC power supply or a –48 VDC power supply. Follow the instructions appropriate to your power supply.

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**Note:** Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit.

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### Connecting the AC Power Cable

If your NSG has the AC power line cord, connect the power cord to the power plug on the NSG back panel, and connect the power cord to the power outlet.

The power supply automatically senses the input voltage.

### Connecting the –48 VDC Power Supply

If your NSG has the optional –48 VDC power supply, see [Appendix B, “Wiring the –48 VDC Power Supply,”](#) for instructions to wire the power supply.

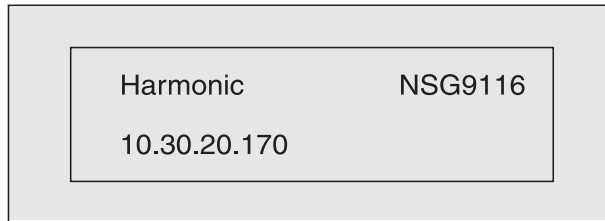
When you connect the NSG to the power supply, the boot up procedure starts. During boot up the following messages appear in the control panel display:

Power up - indicates the beginning of the procedure.

Booting... - indicates the booting stage.

Loading... - indicates that the unit loads the application.

Once boot up is complete the Power Up screen appears in the control panel display and you may start configuring the NSG. The Power Up screen shows the company's name, type of NSG and a default IP address.



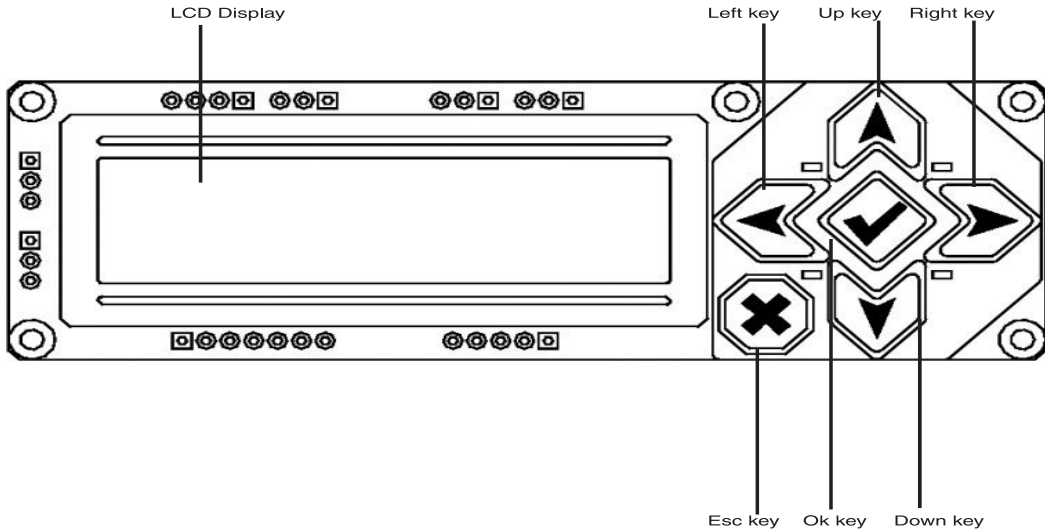
## What's Next...

The next step is to set preliminary configuration to the NSG, as described in the following section.



## Preliminary Configuration of the NSG

You can set preliminary configuration and control the NSG 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:



### 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.

## 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 boots up and after a thirty minutes of inactivity. The screen shows the company's name, NSG type and IP address.

**Network Config screen** - allows to access sub-screens for ETH configuration. To return to this screen from any other screen, use the hotkey <Esc & Enter>.

**Output screen** - via its sub-menus you can view the status of each output port.

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

**Setup screen** - via its sub-screens you can change the operation mode, edit the date and time, and reset the unit.

**Product Information screen** - via its sub-screens you can view information about the NSG.





The following table lists the main screens, their browsing sequence, sub-screens and their options:

Screen	Browsing sequence	Sub-screens	Options
Network Config	Down - Output Up - Product Info.	ETH1 IP ETH2 IP	Edit ETH1 Edit ETH2
Output	Down - Alarm Up - Network Config. screen	QAM#1 RF Freq. - QAM#16 FR Freq.	
Alarm	Down - Setup Up - Output	Active alarms and warnings	

Screen	Browsing sequence	Sub-screens	Options
Setup	Down - Product Info. Up - Alarm	Change operation mode Date and time Reset	Edit date & time Switch modes Reset unit
Product Info.	Down - Network Config. Up - Setup	Unit Information Main board Info. Interface module Info. Software Information. Control panel hotkeys help.	

## 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:

Button	Explanation
	<ul style="list-style-type: none"> <li>■ browse through the screens/sub-screens.</li> <li>■ browse through sub-screen options.</li> <li>■ while editing, browse through numerical characters.</li> </ul>
	<ul style="list-style-type: none"> <li>■ while editing, move the cursor along the line.</li> </ul>
	<ul style="list-style-type: none"> <li>■ executes a selection of a screen/sub screen and of its available options.</li> <li>■ quits an editing session and applies changes.</li> </ul>
	<ul style="list-style-type: none"> <li>■ moves up a menu level.</li> <li>■ quits an editing session without applying changes.</li> </ul>

## Using Hotkeys

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

Hotkey	Explanation
<Esc & Enter>	Moves you to the Network Config screen.
<Esc & Up & Right> Press keys for 5 seconds at least	Resets the unit.
<Esc & Up or Down>	Adjusts the contrast of the display area.
<Esc & Left & Right> Press keys for 3 seconds at least	Moves to the Change Op Mode screen.
<Esc & Left & Right>	While editing, clears the entry field and moves cursor to the bottom left.
<Esc & Left>	While editing, operates as a backspace.
<Esc & Right>	While editing, deletes entries.

## Control Panel Operation Modes

The control panel provides the user with two different access modes so as to impede unauthorized access:

**Monitor** - the default mode that allows you to only view the configuration in the NSG.

**Configure** - allows you to edit various parameters and to apply the changes. After thirty minutes of inactivity in this mode, the system switches automatically to Monitor mode. The Configure mode is controlled by a password to allow authorized users only to change the NSG settings. To obtain a password, refer to the document enclosed with the NSG unit.

To switch to Config mode:

1. Navigate to the Setup screen, using the <Up & Down> keys.
2. Click Enter. The Operation Mode screen appears.
3. Click <Enter>. You are prompted to enter a password.
4. Type in a password and click <Enter>.

The Change Op. Mode screen appears with a blinking cursor.

5. To select the Config mode, click <Down or Up> and then <Enter>.

The Operation Mode screen appears indicating the current operation mode. After thirty minutes of inactivity, the Configure mode changes automatically to the Monitor operation mode.

## Editing Tips

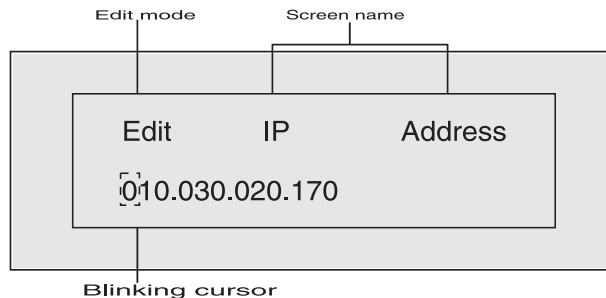
You may edit parameters only in Config mode. If you are in Monitor mode and you are trying to edit parameters, you are prompted to enter a password and switch to Config mode.

To start an editing session:

- Click Enter:

The screen name changes to Edit (screen name).

A blinking cursor appears on the first character of the second line of the screen.

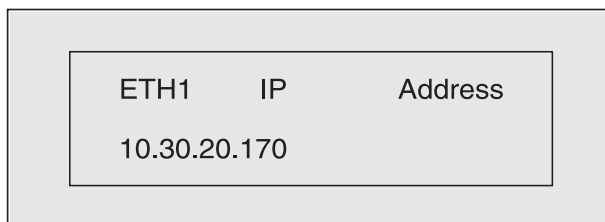


To quit an editing session and to apply changes:

- Click Enter:

The screen name appears without the word "Edit".

The newly configured parameter appears in the second line of the screen.



To quit an editing session without applying changes:

- Click <Esc>.

The screen name appears without the word "Edit".

Unchanged parameters appear in the second line of the screen.

## Configuring the NSG

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

- IP address, subnet mask and gateway of ETH1.
- PHY configuration of ETH1.
- BOOTP for ETH1
- IP address and subnet mask of ETH2.
- PHY configuration of ETH2.
- Date and time.

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**Note:** Any configuration requires a password. Call harmonic Customer Support to obtain a password. See Appendix D, “Customer Support Information”, for Customer Support contact information.

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## Configuring Ethernet Ports

Since the NSG is monitored and configured also by a remote management system, you must set the IP addresses of the Ethernet ports located on the back panel of the NSG.

The NSG uses the Ethernet port labeled ETH1 to communicate with the management network. You may set the ETH1 IP address, subnet mask and default gateway. For ETH 2 you may configure only its IP address and subnet mask.

To configure the Ethernet ports, you may use either of the following tools:

Configuration Tool	Description
MCT (Mass Configuration Tool)	Allows configuration of a number of NSG devices.
BOOTP	Allows configuration of a number of NSG devices, and requires a BOOTP setup in the network.
Web client	Allows remote individual configuration of an NSG unit.
Control Panel	Allows an individual configuration of an NSG unit as explained below.

The following sections describe how to configure individual NSG 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, 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:

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**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.

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Once you are in Config mode, do the following:

1. Navigate to the Network Config 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 check 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.

## PHY Configuration

When configuring the physical layer (PHY), select either of the following options for each ETH ports:

- Auto Neg - a handshake protocol used in Ethernet links. It must be selected if the other end of the Ethernet link also uses auto Negotiation. Selecting this protocol while communicating with a device that does not use it causes communication problems.
- 100 BT full - sets the speed to 100 BT and communication mode to full duplex.
- 10 BT full - sets the speed to 10 BT and communication mode to full duplex..
- 100 BT half - sets the speed to 100 BT and communication mode to half duplex.
- 10 BT half - sets the speed to 10 BT and communication mode to half duplex.

To set PHY configuration for ETH1:

Once you are in Config mode, 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 <Down or Up> until the ETH1 PHY Config screen appears.
4. Click <Enter>. The Edit PHY Config screen appears.
5. Using the <Down or Up> keys select the required option.
6. Click <Enter> to apply changes and to return to the ETH1 PHY Config screen.

To set PHY configuration for ETH2:

Once you are in Config mode, do the following:

1. Navigate to the Network Config screen and click <Enter>.
2. Navigate to the Ethernet Port 2 screen.
3. Click <Enter>. The ETH2 IP Address screen appears.
4. Click <Down or Up> until the ETH2 PHY Config screen appears.
5. Click <Enter>. The Edit ETH2 PHY Config screen appears.
6. Using the <Down or Up> keys select the required option.
7. Click <Enter> to apply changes and to return to the ETH2 PHY Config screen.

## Setting BOOTP

You may select either of the following options for the ETH1 port:

- Enable - select if you have BOOTP setup in your network and also enter the required timeout. The required timeout is 10 seconds. If you enter 0 the unit will continue to send BOOTP requests for an unlimited time until it receives a reply.
- Disable - the default option. Select this option if you do not have BOOTP setup in your network.

To enable/disable BOOTP:

Once you are in Config mode, do the following:

1. Navigate to the Network Config screen and click <Enter>.  
The Ethernet Port 1 screen appears.
2. Navigate to the ETH1 Port screen.
3. Click <Enter>. The ETH1 IP Address screen appears.
4. Click <Down or Up> until the ETH1 BOOTP screen appears.
5. Click <Enter>. The Edit BOOTP screen appears.
6. Using the <Up & Down> keys, select the required option.
7. Click <Enter> to apply changes and to return to the ETH1 BOOTP screen.

## Configuring Date and Time

You may set the date and time for the NSG using the control panel. The date and time are used in the generated reports.

To change date and time:

Once you are in Config mode, do the following:

1. Navigate to the Setup screen and click <Enter>.

The Config Operation Mode screen appears.

2. Click <Down or Up> to open the Unit Date/Time screen.

3. Click <Enter>. The Edit Date/Time screen appears.

4. To edit do the following:

Move the blinking cursor along the line, using the <Right & Left> keys.

When the blinking cursor is on the character to be edited, browse to the required digit/month using the <Down or Up> keys.

5. To apply and to quit the editing mode, click <Enter >.

The Unit Date/Time screen appears with the newly updated date and time.

## Reset the NSG Unit

Via the control panel you may reset the NSG unit when required.

To reset the NSG unit:

Once your are in Config mode, do the following:

1. Navigate to the Reset NSG sub-screen of the Setup main screen.

2. Click <Enter> and follow the instructions on the display area.

Once boot up starts, the control panel displays the same messages as during power up. (For further details, refer to [Connecting Power](#).) If BOOTP is enabled, an additional message appears indicating that the NSG connects to the BOOTP server.

## Monitoring the NSG

The control panel allows to monitor the following:

- Output ports: QAM port number, frequency, data rate and constellation.
- Warnings and alarms.
- NSG MAC address.
- Product Information: NSG unit, main board, interface and software information.
- Control panel hotkeys.

### Monitoring Output Ports

1. Navigate to the NSG Output screen, using the <Down or Up> keys.
2. Click <Enter>.

The QAM#1 screen appears.

3. Do either of the following:

To view data rate, click <Enter> and to view also the constellation, click <Down>.

Or

To move to any other QAM, click the <Down or Up> keys.

4. To return to the main screen, click <Esc>.

### Monitoring 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.

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).

## Monitoring 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. Click <Down or Up> until the ETH2 MAC Address screen appears.

## Monitoring Product Information

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

- Unit Information - allows to view unit type, unit version and unit S/N.
- Main Board Information - allows to view main board type, user and S/N.
- Interface Information - allows to view interface type, version and FPGA.
- Software Information - allows to view boot version, firmware version and main FPGA version.
- LCD Hotkeys Help - allows to view the various available hotkeys.

To monitor product information:

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

## Monitoring 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.

## What's Next...

Once the preliminary configuration is complete, do the following:

- Start the NSG web client to apply full configuration to the NSG unit.

## Starting the Web Client

1. Start Microsoft Internet Explorer (IE) on a PC that resides on the same LAN as the NSG.
2. In the address bar of the IE, type the NSG's IP address. The NSG Web Client opens. Through the web client you may complete the configuration of the NSG and monitor its status.

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**Note:** For instructions on how to use the web client, you may invoke its integral Online Help located on the menu tree on the left side of the web client. Select the HELP link.

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## Access Levels

The NSG 9100 family of products provides the user with two different access levels so as to impede unauthorized access. The two different access levels are *monitor* and *configure*, which can be entered using the correct Username and Password combination. The *monitor* access level allows you to only view the configuration in the NSG and the *configure* access level allows you to execute configuration parameters via the web client. Passwords for both access level may be changed through the web client. Refer to the NSG Online Help for further information on changing passwords.

### Entering the Monitor or Configure Access Level

1. Launch Internet Explorer, and connect to the URL of the NSG e.g <http://192.168.20.231>.
2. A login window pops up requesting user name and password.
3. Enter in the User Name *monitor* or *configure* as appropriate.
4. Enter in the Password *monitor* (for the monitor User Name) or *configure* (for the configure User Name) as appropriate.
5. Select OK.

You are now in the *monitor* or *configure* access level where you can view the NSG configuration only.

## Upgrading the Firmware

The NSG 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 a number of NSG devices use the MCT (NSG Mass Configuration Tool). Refer to the MCT Online Help for details.

You can also upgrade individual NSG devices manually, as described in the following section.

### Updating the Firmware

Before starting the upgrade process, verify the following:

- There is a BOOTP and TFTP setup in your network.
- You set an IP address to the NSG unit.
- You obtained the new NSG firmware provided by Harmonic Technical Support. Firmware may be provided via the NSG release CD or downloaded from the Harmonic FTP site.

To upgrade the firmware, do the following:

1. Copy the new firmware file to a directory accessible by the TFTP server.
2. Via the control panel or Web client, verify that the option BOOTP Enable is selected.
3. Via the Web client, verify that the software update option is selected.
4. Via the control panel or Web client, reset the NSG unit.
5. To determine whether upgrade is completed successfully, wait for the reboot process to complete. Via the control panel or Web client, verify that the device reports the same version number as specified in the release notes enclosed with the new firmware.



## Troubleshooting

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The NSG device has warnings and alarms. When the NSG issues a warning or alarm, the warning or alarm message is posted to NMX, the web client's alarm page and to the control panel. The number of currently-active warnings and alarms appears in yellow (warnings) and red (alarms) in the upper right-hand corner of the web client. It appears also in the Alarm screen of the control panel (alarms/warnings). Refer below to view the warning and alarm text for the appropriate device in alphabetical order, description and possible solutions.

### Warnings for the NSG Unit

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**Note:** X indicates the number for either service, input, TSout, Upconverter or QAM.

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Warning Message	Description	Solution
<b>Web client:</b> Control panel communication failure  <b>Control panel:</b> LCD comm fail	Cannot establish communication with the control panel module.	Call Customer Support.
<b>Web client:</b> Control panel LEDs board communication failure  <b>Control panel:</b> LEDs comm fail	Cannot establish communication with the LEDs board module.	Call Customer Support.
<b>Web client:</b> GbE X Channel Failed. Activating Redundant Channel  <b>Control panel:</b> Channel failed	Active GbE channel failed and triggered automatic switch to redundant channel.	Check all GbE connections.
<b>Web client:</b> GbE X UDAD Data Not Received  <b>Control panel:</b> UDAD not recv	No UDAD packets received over the GbE link.	Check if the link to the switch is alive and active. Check if the switch is configured for UDAD.
<b>Web client:</b> Missing resources  <b>Control panel:</b> Miss resources	All 256 available sockets are in use.	Re-check VOD system configuration.
<b>Web client:</b> Cannot find BOOTP server. Booting with previous IP setting  <b>Control panel:</b> BootP srvr fail	BOOTP server did not respond within the defined timeout, NSG booted with its previous IP settings.	<ul style="list-style-type: none"> <li>■ Retry BOOT.</li> <li>■ Verify that BootP server is up and that the NSG MAC is correct.</li> <li>■ Contact Customer Support.</li> </ul>

Warning Message	Description	Solution
<p><b>Web client:</b> NSG Cooling fan X failure (X=1-4)</p> <p><b>Control panel:</b> Fans-X failure</p>	<p>Fan X (X = 1-4) is malfunctioning.</p>	<ol style="list-style-type: none"> <li>1. Check fan's power connector.</li> <li>2. Replace fan. You can replace the fan while the system is on, as follows: <ul style="list-style-type: none"> <li>■ Disconnect the fan power cable. Release the fan's four screws.</li> <li>■ Replace with a new fan.</li> </ul> </li> </ol>
<p><b>Web client:</b> NSG Firmware file download failed.</p> <p><b>Control panel:</b> FW download</p>	<p>Failed to download new firmware file using the specified upgrade_server/path/filename.</p>	<p>Check to see if the path is correct.</p>
<p><b>Web client:</b> NSG Incomplete or corrupt firmware file. Load failed, booting with previous firmware.</p> <p><b>Control panel:</b> FW corrupt file.</p>	<p>Firmware download from upgrade server succeeded, but new firmware could not be loaded to Flash due to file corruption.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> TSout nearing oversubscription.</p> <p><b>Control panel:</b> Nearing Oversub</p>	<p>The QAM utilization is above the configured threshold.</p>	<p>Consider using another QAM.</p>
<p><b>Web client:</b> TSout X Number of services exceeds limit</p> <p><b>Control panel:</b> No srvcs exceed</p>	<p>The number of provisioned services exceeds the configured threshold per TSout.</p>	<ul style="list-style-type: none"> <li>■ Deprovision one or more services.</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li>■ Configure a higher threshold</li> </ul>

## Alarms for the NSG Unit

Alarm Message	Description	Solution
<b>Web client:</b> GbE X Input errors  <b>Control panel:</b> Input errors	Indicates a CRC error in the input.	Verify the input services are valid from the server.
<b>Web client:</b> GbE X Link down  <b>Control panel:</b> Link down	<p>This alarm can occur for three reasons:</p> <ul style="list-style-type: none"> <li>■ The Ethernet link of the GbE port is not functioning.</li> <li>■ The source is not sending a signal.</li> <li>■ The source is sending a signal that is too weak</li> </ul> <p>For an NSG with automatic redundancy enabled:</p> <ul style="list-style-type: none"> <li>■ If this failure occurs on the active GbE channel, a redundancy switch is triggered and the backup GbE channel becomes active.</li> <li>■ If this failure occurs on the backup GbE channel, you receive notification in the alarm list and alarm log, but the Alarm LED does not turn red.</li> </ul>	<ol style="list-style-type: none"> <li>1. Verify that the fiber is properly connected to the SFP.</li> <li>2. Verify that SFP is properly inserted.</li> <li>3. Check the fiber for physical damage.</li> <li>4. Check that the source is sending a signal.</li> <li>5. Check the source signal strength using an optical power-meter. The minimum light intensity that the SFP requires to maintain a link is:             <ul style="list-style-type: none"> <li>■ 850 nm SFP: - 17 dBm</li> <li>■ 1310 nm SFP: - 20 dBm</li> </ul> </li> </ol>

Alarm Message	Description	Solution
<p><b>Web client:</b> GbE X Management buffer overflow</p> <p><b>Control panel:</b> MNG buff ovflw</p>	<p>Management traffic on the GbE port network exceeds the port's capacity.</p>	<p>Check for sources of excessive management traffic.</p>
<p><b>Web client:</b> GbE X Management port failed</p> <p><b>Control panel:</b> MNG port fail</p>	<p>This alarm is issued by the GbE port in case it failed to initialize its management interface during NSG power-up. In this situation, the GbE port is not capable of handling any management traffic, including UDAD traffic.</p>	<ul style="list-style-type: none"> <li>■ The NSG must be power-cycled again.</li> <li>■ If the problem persists, contact Customer Support.</li> </ul>
<p><b>Web client:</b> GbE X MPEG buffer overflow</p> <p><b>Control panel:</b> MPEG buff ovflw</p>	<p>MPEG data arriving at the GbE port exceeds the port's capacity</p>	<ol style="list-style-type: none"> <li>1. If the problem is constant, the NSG is over-subscribed. Deprovision services until the error clears.</li> <li>2. If the alarm appears momentarily, the source material may be arriving in bursts and overflowing the port during transmission peaks.</li> </ol>
<p><b>Web client:</b> GbE X MPEG sync loss</p> <p><b>Control panel:</b> MPEG sync loss</p>	<p>Indicates no valid MPEG data found in the GbE traffic.</p>	<p>Check the source. Check the input cable and replace if defective.</p>

Alarm Message	Description	Solution
<p><b>Web client:</b> GbE X SFP not mounted</p> <p><b>Control panel:</b> SFP not mounted.</p>	<p>The SFP module is missing or not properly mounted.</p> <p>For an NSG with automatic redundancy enabled:</p> <ul style="list-style-type: none"> <li>■ If this failure occurs on the active GbE channel, a redundancy switch is triggered.</li> <li>■ If this failure occurs on the backup GbE channel, you receive notification in the alarm list and alarm log, but the Alarm LED does not turn red.</li> </ul>	<ul style="list-style-type: none"> <li>■ Verify that an SFP module is present and is properly mounted in GbE X (X=1 or 2).</li> </ul>
<p><b>Web client:</b> GbE X No Valid MPEG Stream in Input</p> <p><b>Control panel:</b> No Valid MPEG In</p>	<p>The data received through the GbE port is not a valid MPEG stream. Typically, the GbE stream does not contain PAT.</p>	<p>Check the GbE source for content and/or encapsulation problems.</p>
<p><b>Web client:</b> GbE X UDAD Ethernet Connection Failed</p> <p><b>Control panel:</b> UDAD conn failed</p>	<p>The NSG could not establish Ethernet connectivity with the switch.</p>	<p>Check if the switch's management IP address matches the one shown on the NSG's Input configuration page. Check if the switch is connected to the management LAN.</p>
<p><b>Web client:</b> GbE X UDAD Telnet Connection Failed</p> <p><b>Control panel:</b> UDAD conn failed</p>	<p>The NSG could not establish Ethernet session with the switch.</p>	<p>Check if Telnet is enabled on the switch.</p>

Alarm Message	Description	Solution
<p><b>Web client:</b> GbE X UDAD Configuration Failed</p> <p><b>Control panel:</b> UDAD conf failed</p>	<p>The switch has rejected the configuration sent by the NSG.</p>	<p>Check if the switch is configured correctly for UDAD.</p>
<p><b>Web client:</b> GbE X UDAD Authentication Failure</p> <p><b>Control panel:</b> UDAD auth failed</p>	<p>The switch has rejected the login information provided by the NSG.</p>	<p>Check if the switch's password matches the one configured in the NSG's Input configuration page.</p>
<p><b>Web client:</b> NSG Power failure</p> <p><b>Control panel:</b> Power failure</p>	<p>At least one of the internal voltages of the NSG is out of range.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> NSG System overall temperature alarm</p> <p><b>Control panel:</b> Sys overall temp</p>	<p>The NSG internal measured temperature exceeded the limit.</p>	<ul style="list-style-type: none"> <li>■ Check environment temperature.</li> <li>■ Check the fans operation.</li> </ul>
<p><b>Web client:</b> QAM communication failure</p> <p><b>Control panel:</b> Comm failure</p>	<p>Cannot establish communication with the QAM module.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> QAM Bitrate mismatch</p> <p><b>Control panel:</b> Bitrate mis</p>	<p>QAM modulator input data rate does not match its symbol rate configuration.</p>	<p>Reapply the QAM configuration:</p> <ul style="list-style-type: none"> <li>■ Set the output bit rate to a new value. Check for alarm clearance.</li> <li>■ Return to the original output bit rate.</li> </ul>

Alarm Message	Description	Solution
<b>Web client:</b> QAM X Sync loss <b>Control panel:</b> Loss of Sync	QAM modulator cannot lock on its input. This type of alarm may indicate a QAM modulator hardware configuration failure.	Reapply the QAM configuration: <ul style="list-style-type: none"> <li>■ Set the output QAM type to a new value. Check for alarm clearance.</li> <li>■ Return to the original output QAM type.</li> </ul>
<b>Web client:</b> TSout X Overflow <b>Control panel:</b> OverFlow	The actual output bit rate exceeds the configured QAM output bit rate.	Deprovision several services of the specific output until the alarm clears.
<b>Web client:</b> Upconverter X General alarm <b>Control panel:</b> General alarm	An upconverter internal hardware failure.	Restart the NSG: <ul style="list-style-type: none"> <li>■ Turn it off by disconnecting the power cord.</li> <li>■ Turn it back on and check for alarm clearance.</li> </ul>
<b>Web client:</b> Upconverter X Power failure <b>Control panel:</b> Power failure	Power level to the upconverter momentarily exceeded limits. Alarm clears when you restart the NSG.	Restart the NSG: <ul style="list-style-type: none"> <li>■ Turn it off by disconnecting the power cord.</li> <li>■ Turn it back on and check for alarm clearance.</li> </ul>
<b>Web client:</b> Upconverter X Communication failure <b>Control panel:</b> Comm failure	Indicates a hardware failure.	Call Customer Support.
<b>Web client:</b> Upconverter X RF level out of range <b>Control panel:</b> RF range	This type of alarm is generated when the RF output power level falls below limit.	Call Customer Support.



Alarm Message	Description	Solution
<p><b>Web client:</b> Upconverter X Temperature out of range</p> <p><b>Control panel:</b> Temp range</p>	<p>Upconverter temperature is out of the defined range.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> Upconverter X PLL1 failure</p> <p><b>Control panel:</b> PLL1 failure</p>	<p>Indicates a hardware failure.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> Upconverter X PLL2 failure</p> <p><b>Control panel:</b> PLL2 failure</p>	<p>Indicates a hardware failure.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> Upconverter software failure.</p> <p><b>Control panel:</b> Software failure.</p>	<p>Upconverter checksum test failed.</p>	<p>Call Customer Support.</p>

Alarm Message	Description	Solution
<p><b>Web client:</b> Upconverter Mismatch</p> <p><b>Control panel:</b> UC mismatch</p>	<p>The eight upconverters installed in the NSG are not the same type. The NSG checks the upconverters during boot up and sends this alarm if it detects that there are different types of upconverters. All eight upconverters must be the same type for the NSG to function properly.</p>	<p>Call Customer Support.</p>
<p><b>Web client:</b> Upconverter X Repeated failures</p> <p><b>Control panel:</b> Repeated fail</p>	<p>This alarm is sent when an upconverter sends four critical alarms within a 24-hour period. The affected upconverter is automatically shut down when this alarm occurs.</p> <p>The following alarms are considered critical alarms:</p> <ul style="list-style-type: none"> <li>■ Internal Communication Failure</li> <li>■ Power Failure</li> <li>■ PLL1 Failure</li> <li>■ PLL2 Failure</li> </ul>	<ul style="list-style-type: none"> <li>■ Call Customer Support</li> <li>■ Reboot the NSG to clear the alarm, but it is likely to occur again.</li> </ul>

## Fuse Replacement

---

This appendix contains service information that explains how to replace the fuse in the NSG.

If your NSG has an AC power supply, the NSG uses a 5A fuse that is located inside the power socket. A spare fuse is located inside the compartment adjacent to the power socket.



---

**Warning:** Always replace the fuse with a fuse of the same rating and type. Using a different fuse voids the Harmonic warranty and could result in fire or other electrical damage.

---

To replace the fuse, follow these instructions:



---

**Warning:** You must disconnect the power cord before removing the fuse.

---

1. Unplug the power cord from the chassis to disconnect the power.
2. Pull down the fuse cover on the back panel.
3. Remove the old fuse.
4. Install the new fuse.
5. Replace the fuse cover.
6. Plug in the NSG and turn it on.



## Wiring the –48 VDC Power Supply

---

If your NSG has the optional –48 VDC power supply, follow these steps to wire the power supply.

### Getting Started

Before you begin wiring the –48 VDC power supply, make sure that you provide the necessary overcurrent protection, wires, and power connector.

### Power Source Specifications

The DC power source feeding the NSG device must meet the following requirements:

- Electrically isolated from any AC power source
- Positive ground. The Positive bus of the DC power source must be reliably connected to the Ground bus.

Each feed-pair must provide a continuous supply of power that meets the following specifications:

Parameter	Specification
Voltage	36 to 75 VDC
Max. operating current	4 amps
Max. input surge current	35 amps

## Overcurrent Protection

To provide overcurrent protection:

- Provide overcurrent protection devices as part of each rack housing NSG devices.
- Locate readily accessible disconnect device between the DC power source and the NSG.
- Use a 10-amp double-pole fast trip, DC-rated disconnect device for each DC power connector.

---

**Note:** Overcurrent protection devices must meet applicable national and local electrical safety codes and be approved for the intended application.

---

## Wiring Requirements

The NSG is connected to the DC power source using three wires:

- $-V_{in}$
- GND
- $+V_{in}$

Although Harmonic provides the power input connector with the NSG device, you must supply the wires.

The wires to be used must comply with the following specifications:

Parameter	Specification
Suitable conductor material	Copper only
$-V_{in}$ and $+V_{in}$ wires	16 AWG rating
Ground cable	16 AWG rating
Cable insulation rating	Minimum 80 C, low smoke fume (LSF), flame retardant

Parameter	Specification
Cable type	Must comply with at least one of the following standards: <ul style="list-style-type: none"><li>■ UL 1581 (VW-1) - UL style 1028 or equivalent</li><li>■ EEE 383</li><li>■ EEE 1202-1991</li></ul>
Branch circuit cable insulation color	Per applicable national electrical codes
Grounding cable insulation color	Green-yellow

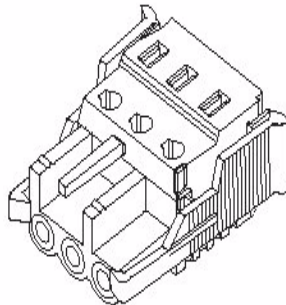
## Power Connector

The NSG is supplied with a special DC power connector plug that matches the DC power socket on the back of the NSG device.

This connector is made by WAGO, model number 231-103/037-000.

Use only the original connector for connecting the NSG to the DC power source. Contact Harmonic Technical Support if you want to use any other type of connector.

The following figure shows the connector and its strain relief housing:



## Assembling the DC Input Power Cable

To assemble the DC input power cable:

1. Prepare the power wires as specified in “Wiring Requirements” on page 54.
2. Use the disconnect device to make sure that the power supply from the DC power source to the cables is switched off.



**Caution:** Turn off the power before proceeding with these instructions.

---

3. Unplug the WAGO power connector from the power socket on the NSG back panel.
4. Identify the three wires coming from the DC power source that are used in the connection to the expansion unit:
  - -Vin
  - +Vin
  - GND

5. Strip up to 0.3 inches (8 mm) of insulation from each of the wires coming from the DC power source.

Do not strip more than this length from each wire. Stripping more leaves uninsulated wire exposed outside the DC connector after the assembly is complete.

6. Insert a small screwdriver into the rectangular hole directly above the hole in the DC connector where you want to insert the first cable and press down on the screwdriver.

This opens the cage clamp for this section of the DC plug connector.

---

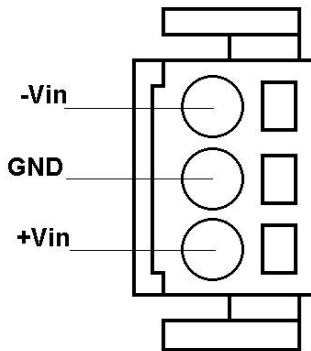
**Note:** WAGO also sells tools specifically designed to open cage clamps easily. For more information, either visit the WAGO web site at [www.wago.com](http://www.wago.com), or call WAGO at 1-800-346-7245 and request information about items 210-250 or 231-131.

---

7. Feed the exposed section of the wire into the matching hole in the DC plug connector.

See the pin-out figure below to match wires with the required holes.





8. Repeat steps 5 through 7 for the other two wires to complete the assembly of the DC input cable.

---

**Note:** If you need to remove a wire from the DC plug connector, insert a small screwdriver into the slot directly above the wire and press down on the screwdriver to free the wire from the cage clamp.

---

## Connecting the Power Cable to the NSG

For this procedure use a Protective Earthing Conductor listed as min. 16AWG, green/yellow insulation copper wire.

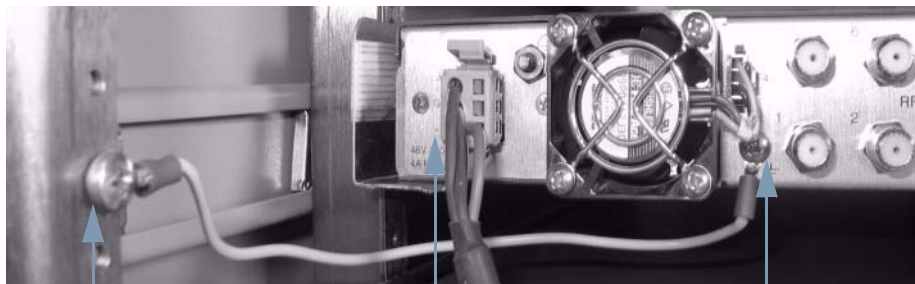
1. Ensure the NSG is securely installed in a rack and in a Restricted Access Location only.
2. Connect the 16 AWG rating green-yellow grounding cable with cable terminals to the grounding screw on the NSG back panel and to the NSG rack as illustrated in the following figure. Make sure to connect to a reliably grounded 48VDC SELV source or a reliably grounded 60 VDC source.

---

**Note:** Grounding cable with cable terminals - use the following UL listed terminal assemblies: Manufacturer: Panduit, Part No. PV18-8R-C, special crimping tool: CT-100.

---

3. Connect the DC input power cable to the DC connector on the NSG back panel, as illustrated in the following figure.



Ground connection on  
NSG rack

DC connector

Ground connection on  
NSG back panel

Your NSG is now connected to power.

4. Complete any other cabling that may still be needed, and engage the disconnect device to start using the device.

## Advanced Fiber Optic Connections

---

The NSG family supports advanced fiber optic cabling schemes, including cascading of NSG devices, cascading with IP switching, DWDM links and GbE channel redundancy.

### Cascading

The NSG family uses the cascading option to optimize the GbE bandwidth by chaining any number of NSGs together. Each NSG device draws the services intended for it and passes on all the traffic so a total of one Gigabit is used.

Cascading with IP switching allows to optimize the GbE bandwidth by using three NSG 9116 units that are fed by two GbE inputs.

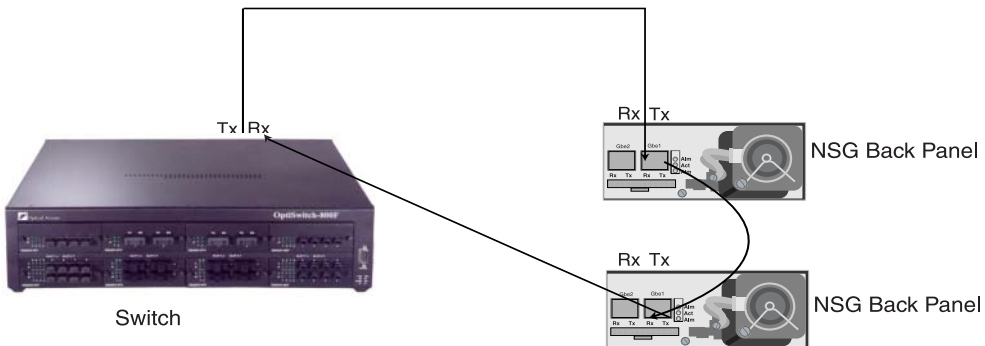
### Cascading Single Channels

Cascading single channels is recommended when using two NSG 9112 units.

To cascade NSGs using a single GbE channel (and no channel redundancy):

1. Connect the switch Tx to the GbE1 Rx connector on the first NSG in the chain.
2. Connect the NSG GbE1 Tx to the next NSG GbE1 Rx.  
Continue chaining until you reach the last NSG in the chain.
3. Connect the last NSG GbE1 Tx to the switch Rx.
4. Select the last NSG in the chain. Activate the Last in Chain option. For further information refer to the NSG Online Help.

5. In the web client configure the appropriate GbE channel.  
The following figure illustrates the cascaded connections.



## Cascading Redundant Channels

The NSG family also supports GbE channel redundancy for cascaded NSG devices. Cascading redundant channels is recommended when using three NSG 9108 units.

To add a connection for the redundant GbE channel:

1. Connect the first GbE channel as described in [“Cascading Single Channels” on page 59](#), steps one and two.
2. Connect the Switch 2 Tx of the GbE2 Rx connector on the last NSG in the chain.

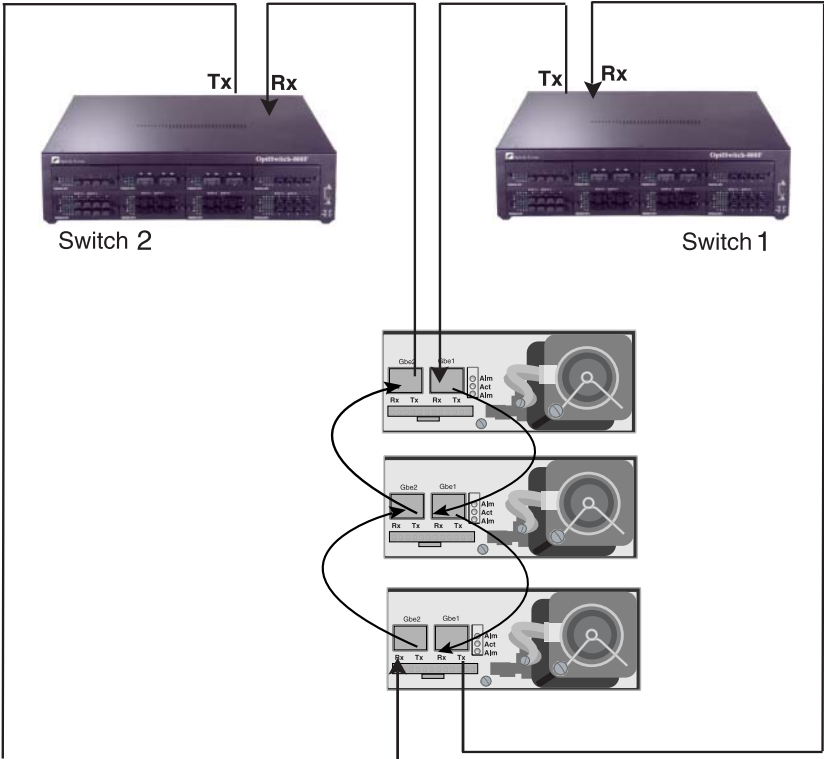
---

**Note:** The two channels run in opposite directions for maximum protection. If an NSG in the middle of the chain fails, then units downstream from the failed device can switch to the redundant channel and continue to operate.

---

3. Connect the NSG GbE2 Tx on the last NSG to the GbE2 Rx on the next-to-last NSG in the chain.
4. Continue chaining in this direction until you reach the first NSG.
5. Connect the last NSG Tx to Switch 2 Rx and select the Last in Chain option from the web client.

The following figure shows the connections for cascaded NSGs with redundancy.



## Cascading with IP Switching.

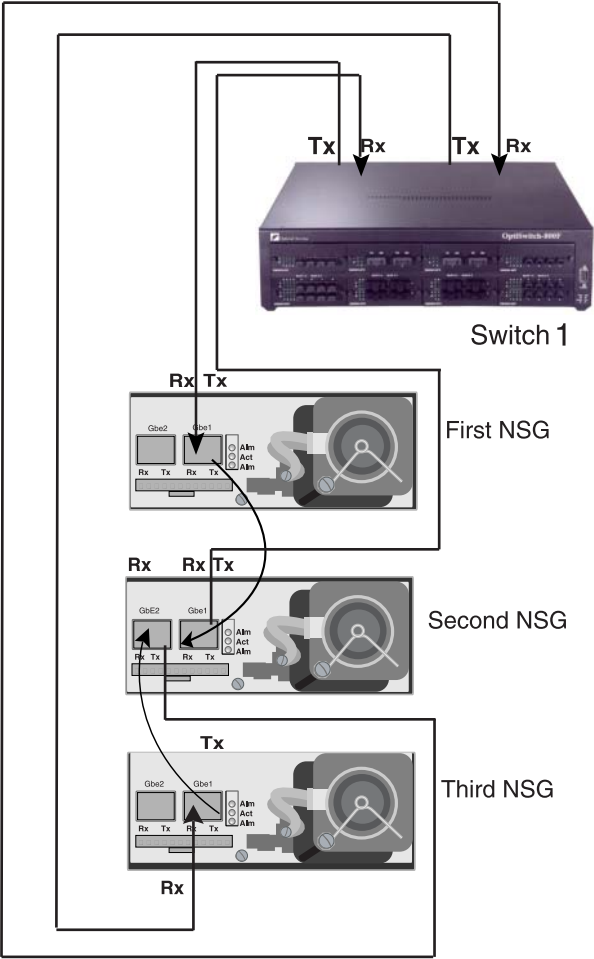
To fully utilize the GbE feed and the capacity of the NSG, it is best to use 3xNSG 9116 units cascaded with IP switching. Chain two different NSG 9116 units to another NSG 9116 unit. Each of the two units receives a different GbE input stream and draws the services intended for it. Each unit passes on the traffic to a different GbE port of a third NSG unit so a total of one GbE is used.

The IP switching option supports the cascading single channels using two different GbE channels with no channel redundancy.

To use the IP switching option:

1. Connect the Switch Tx to the GbE1 Rx connector on the first NSG.
2. Connect the first NSG GbE1 Tx to the second NSG GbE1 Rx.
3. Connect second NSG GbE1 Tx to a Rx connector of the switch.
4. Connect the Switch Tx to the GbE1 Rx connector on the third NSG.
5. Connect the third NSG GbE1 Tx to the GbE2 Rx of the second NSG.
6. Connect the second NSG GbE2 Tx to a Rx connector of the switch.
7. Using the Web client, configure the second NSG to operate in the IP Switching mode and configure its input ports to have different IP addresses. For further details, refer to the Web client online help.

The following figure illustrates the IP switching connections:



## Connecting a DWDM

If your network includes Dense Wavelength Division Multiplexing (DWDM), add the DWDM unit in between the switch and the NSG. The following example shows a cascaded DWDM setup with redundancy, but you could include a DWDM in a non-cascaded or non-redundant configuration.

To set up redundant GbE channels with a DWDM:

1. Connect the first Tx connector on the demultiplexing module of the DWDM to the GbE1 Rx connector on the first NSG in the chain.
2. Connect the NSG GbE1 Tx to the next NSG GbE1 Rx.  
Continue chaining until you reach the last NSG in the chain.
3. Connect the second Tx connector on the demultiplexing module of the DWDM to the GbE2 Rx connector on the last NSG in the chain.
4. Connect the NSG GbE2 Tx on the last NSG to the GbE2 Rx on the next-to-last NSG in the chain.
5. Continue chaining in this direction until you reach the first NSG.

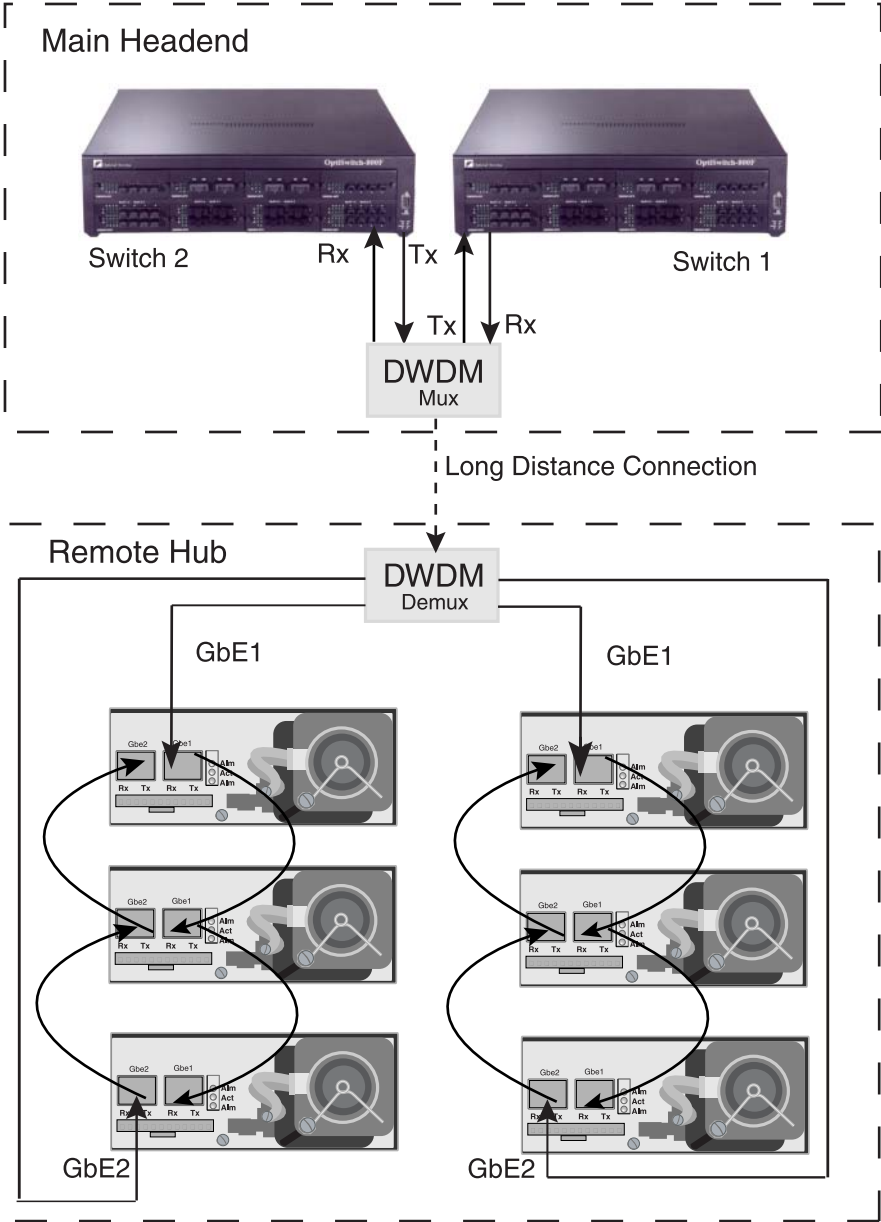
The following figure shows the connections for cascaded NSGs with a DWDM and redundant channels.

---

**Note:** The following diagram illustrates typical 9100 NSG devices cascading configuration.

---







## Customer Support Information

---

### Contacting Harmonic for Technical Support

The Harmonic Customer Support group is available to help you with any questions or problems you might have regarding Harmonic products. You can reach them at:

E-mail: [techhelp@harmonicinc.com](mailto:techhelp@harmonicinc.com)

Phone: (408) 490-6477

1-888-MPEGTWO (673-4896)

Fax: (408) 490-6770

Harmonic Inc.

549 Baltic Way

Sunnyvale, California 94089

Attn: Customer Support



# Glossary

---

## A

### ASI

asynchronous serial interface. A DVB-defined interface protocol for carrying MPEG-2 transport streams at a constant or defined transmission rate.

## B

### bandwidth

The maximum amount of data that a transmission device (cable, fiber-optics link, satellite feed, and so on) is capable of carrying.

### bandwidth allocation

The process of assigning portions of the total bandwidth on the basis of the requirements of the program material. A channel that requires a high-quality picture, for example, a live sports broadcast, should be allocated a high bandwidth. A channel that can be transmitted with a lower-quality picture, for example, a VCR-quality movie, should be assigned a lower bandwidth.

## C

### cascading

The concept that NSGs maybe chained together is to optimize the bandwidth utilization of one GbE.

## CMTS

Works as an arbitrator for IP communications over RF networks.

See also [INA](#).

### component

A Harmonic hardware product that is a single, self-contained part of the network.

## D

### data stream

The continuous flow of information from one location to another.

## DCE

data communications equipment. A device that communicates with a DTE over [EIA-232](#). For example, a modem is a DCE that sends to and accepts data from a host computer (DTE). See *also* [DTE](#).

### downstream

The direction of the communications service data flow. Broadcast services flow downstream from the service provider to the subscriber.

## DTE

data terminal equipment. A device that communicates with a DCE device over [EIA-232](#). For example, a DTE is a computer that sends to and accepts data from a modem (DCE). See *also* [DCE](#).

## E

### Ethernet

A data link (physical interface) developed for local area networks (LANs) that supports transmission rates up to 10 Mbps. Fast Ethernet supports transmission rates up to 100 Mbps.

## G

### GbE

Gigabit Ethernet. A transmission technology, based on the Ethernet frame format and protocol used in local area networks, that provides a data rate of 1 billion bits per second.

## H

### headend

The distribution point in a TV system.

### Hertz

A unit of frequency defined as one cycle per second. Abbreviated Hz.

### Hz

See [Hertz](#).

## I

### I/O

input/output. Refers to a connection that inputs and outputs data.

### INA

Works as an arbitrator for IP communications over RF networks. It is based on the DVB standard. See also [CMTS](#).

### IP address

An identifier for a computer or device on an Internet Protocol (IP) network. Networks using IP route messages based on the IP

address of the destination. An IP address is a 32-bit number written in dotted decimal notation: four 8-bit sections, separated by periods, converted from binary to decimal. Each section is a number from zero to 255.

## L

### LC

A high-density optical connector used for single-mode and multimode fiber-optic applications.

## M

### MPEG

Moving Picture Experts Group. A joint working group of the International Standards Organization and International Electrotechnical Committee.

### multimode fiber

Optical fiber designed to carry multiple light rays or modes concurrently, each at a slightly different reflection angle within the optical fiber core. Multimode fiber transmission is used for relatively short distances because the modes tend to disperse over longer lengths. For longer distances, singlemode fiber is used.

### multiplex

The ability to combine multiple signals over a single communications line or channel.

### multiplexer

A function where multiple signals are combined into a single signal. A device that merges several lower-speed transmissions into one high-speed transmission, and vice versa.

## O

### OS

operating system.

## P

### packet

A block of data used for transmission.

### PID

packet identifier. Integer values used in the MPEG-2 standard to identify an elementary stream of a program within a transport stream.

### pinouts

The description and purpose of each pin in a connector.

### port

A port is an input to or an output from a component, an adapter, or a module.

## Q

### QAM

quadrature amplitude modulation. Transmits 4 bits (16 QAM) to 8 bits (64 QAM) at the same time by varying the phase and amplitude of a signal. QAM can only be used on very quiet transmission media, such as downstream-only coaxial cable or fiber, because amplitude modulation is susceptible to interfering signals.

## R

### redundancy

A back-up system of Harmonic components that ensures uninterrupted service in the event of a component failure.

### EIA

Electronic Industries Alliance. A U.S. trade organization that is responsible for establishing hardware interface standards.

### EIA-232

An EIA standard interface for connecting serial devices (DCEs), such as modems, monitors, mice, and serial printers to a DTE. EIA-232 supports the 25-pin D-type connector (DB-25) and a 9-pin D-type connector (DB-9).

## S

### SFP

small form factor pluggable transceiver.

### singlemode fiber

Optical fiber designed for the transmission of a single ray or mode of light as a carrier and is used for long-distance signal transmission. For short distances, multimode fiber is used.

### SNMP

Simple Network Management Protocol. The protocol that Harmonic control and management systems use to configure and monitor Harmonic devices remotely over IP.

### subscriber

The end user of a broadcast system; the person who views programs for entertainment purposes.

## T

### transport stream

One or more multiplexed MPEG-2 programs.

## V

### VAM

video access manager.





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