September 2016
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CAUTION: The Caution symbol calls your attention to information that, if ignored, can adversely affect the performance of your Harmonic product, or that can make a procedure needlessly difficult.

LASER DANGER: The Laser symbol and the Danger alert call your attention to information about the lasers in this product that, if ignored, can cause physical harm to you.

NOTE: 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.

IMPORTANT: The Important symbol calls your attention to information that should stand out when you are reading product details and procedural information.

TIP: 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.

In addition to these symbols, this guide may use the following text conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typed Command</td>
<td>Indicates the text that you type in at the keyboard prompt.</td>
</tr>
<tr>
<td><code>&lt;Ctrl&gt;</code>, <code>&lt;Ctrl&gt; + &lt;Shift&gt;</code></td>
<td>A key or key sequence to press.</td>
</tr>
<tr>
<td>Links</td>
<td>The <em>italics in blue</em> text to indicate Cross-references, and hyperlinked cross-references in online documents.</td>
</tr>
<tr>
<td>Bold</td>
<td>Indicates a button to click, or a menu item to select.</td>
</tr>
<tr>
<td>ScreenOutput</td>
<td>The text that is displayed on a computer screen.</td>
</tr>
<tr>
<td>Emphasis</td>
<td>The <em>italics</em> text used for emphasis and document references.</td>
</tr>
</tbody>
</table>

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1.1 Introduction

Harmonic's NSG™ Pro is a Converged Cable Access Platform (CCAP), offering a powerful combination of ultra-dense EdgeQAM and CMTS processing capabilities in a single chassis. With its CCAP-compliant high availability design, the NSG Pro allows cable operators to converge their Video and Data services onto this single powerful device, increase their operational flexibility, and realize great savings on operating expenses - reduced rack space, power consumption and cooling.

NSG Pro is a Downstream-only CCAP device, featuring the following main capabilities:

- Carrier-grade chassis, with full hot-swap and cable-once design
- 1+1 SRE redundancy
- N+1 Line Card (LC) redundancy for DLC
- Load sharing, redundant power supply units
- Redundant NSI (Network Side Interface) modules, supporting up to 120 Gbps input rate
- Super-dense QAM Processing, with full frequency agility over a frequency span of 768 MHz
  - Up to 45 x Annex-A QAM channels per RF port
  - Up to 56 x Annex-B/C QAM channels per RF port
- Support for the full range of traditional EdgeQAM applications - VOD, SDV, Broadcast, and M-CMTS
## 1.2 Main Features

The following table describes the main features of the NSG Pro platform:

<table>
<thead>
<tr>
<th>Component</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis</td>
<td>Form factor</td>
<td>• 9 RU form factor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Front-side</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 4 x PSU compartments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2 x SRE slots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 12 x Line Card slots, capable of hosting 12 x DLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rear-side</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2 x NSI slots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 6 x PIC slots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2 x fan blocks</td>
</tr>
<tr>
<td>Hot-swap Architecture</td>
<td></td>
<td>All modules may be removed or inserted while the system is operational:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Front side</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Power supply units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DLCs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SREs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rear side</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NSIs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fan blocks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PICs</td>
</tr>
<tr>
<td>Cable-once Architecture</td>
<td></td>
<td>The architecture allows one time cabling. All cabling is performed on the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rear side of the device. LCs and PSUls plug in from the front without</td>
</tr>
<tr>
<td></td>
<td></td>
<td>requiring any cable disconnect/reconnect.</td>
</tr>
<tr>
<td>Switch and Route Engine (SRE)</td>
<td>SRE redundancy</td>
<td>Optional 1+1 redundancy. See page 21.</td>
</tr>
<tr>
<td></td>
<td>Switching capacity</td>
<td>120 Gbps</td>
</tr>
<tr>
<td></td>
<td>IP Monitoring</td>
<td>Capable of mirroring the traffic of a selected QAM channel, or a selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>input stream</td>
</tr>
</tbody>
</table>
Network Side Interface (NSI)

NSI redundancy
Optional 1+1 NSI redundancy. Each of the two NSI modules is coupled with an SRE card, and fails-over with it.

12 x 1GbE/10GbE
- 12 x 1G/10G GbE Ports, capable of hosting either SFP or SFP+ modules
- Input rate is SFP dependent:
  - SFP+ - 10 Gbps - up to 10,000 Mbps per port.
  - SFP+ modules may operate at either 1 Gbps or 10 Gbps speeds
  - SFP - 1 Gbps - up to 1000 Mbps per port

Ethernet ports
- 2 x 10/100/1000 Base-T ports
- Typically, the Eth20 port is used for management, and Eth21 is used for CAS communication.

DTI ports
2 x Redundant DTI ports, for time synchronization in M-CMTS application.

Table 1–1: NSG Pro Main Features

<table>
<thead>
<tr>
<th>Component</th>
<th>Feature</th>
<th>Description</th>
</tr>
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<tr>
<td>Network Side Interface (NSI)</td>
<td>NSI redundancy</td>
<td>Optional 1+1 NSI redundancy. Each of the two NSI modules is coupled with an SRE card, and fails-over with it.</td>
</tr>
<tr>
<td>12 x 1GbE/10GbE</td>
<td></td>
<td>12 x 1G/10G GbE Ports, capable of hosting either SFP or SFP+ modules</td>
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<tr>
<td></td>
<td></td>
<td>- SFP+ - 10 Gbps - up to 10,000 Mbps per port.</td>
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<tr>
<td></td>
<td></td>
<td>- SFP - 1 Gbps - up to 1000 Mbps per port.</td>
</tr>
<tr>
<td>Ethernet ports</td>
<td></td>
<td>2 x 10/100/1000 Base-T ports</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Typically, the Eth20 port is used for management, and Eth21 is used for CAS communication.</td>
</tr>
<tr>
<td>DTI ports</td>
<td></td>
<td>2 x Redundant DTI ports, for time synchronization in M-CMTS application.</td>
</tr>
</tbody>
</table>
## Chapter 1 Main Features and Specifications

### Main Features

<table>
<thead>
<tr>
<th>Component</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Line Card (DLC)</td>
<td>DLC Redundancy</td>
<td>DLC redundancy options:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Downstream-only chassis configuration:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ 11+1 redundancy, or 12+0 (all DLCs active)</td>
</tr>
<tr>
<td>Downstream RF Ports</td>
<td></td>
<td>■ 6 x RF ports per DLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ RF frequency range: 54-1006 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Center frequency range, Annex-A QAM: 58-1002 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Center frequency range, annex-B and Annex-C QAM: 57-1003 MHz</td>
</tr>
<tr>
<td>QAM Modulation Modes</td>
<td></td>
<td>■ ITU-T J.83 Annex-A (DVB-C, 8 MHz channel bandwidth)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ ITU-T J.83 Annex-B (North America cable, 6 MHz channel bandwidth)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ ITU-T J.83 Annex-C: (Japan cable, 6 MHz channel bandwidth)</td>
</tr>
<tr>
<td>Number of QAMs per RF Port</td>
<td></td>
<td>■ Full frequency agility over a frequency span of 768 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Up to 45 x Annex-A QAM channels per RF port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Up to 56 x QAM Annex-B/C QAM channels per RF port</td>
</tr>
<tr>
<td>QAM Channels Allocation</td>
<td></td>
<td>■ Full flexibility in allocating any QAM channel to any service type</td>
</tr>
<tr>
<td>QAM Replication</td>
<td></td>
<td>■ QAMs may be replicated across multiple RF ports spanning multiple cards.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Replication is set per service type, to allow service convergence even when Service Group/Node topology is not uniform</td>
</tr>
<tr>
<td>Physical Interface Cards (PICs)</td>
<td>DS RF Ports</td>
<td>■ 12 x MCX ports per PIC, bundled in two H-UCH block connectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ H-UCH harnesses with 6 x mini-Coax cables each, sold separately</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See page 33</td>
</tr>
<tr>
<td></td>
<td>Integrated RF Switching</td>
<td>The six PICs are directly mated to the twelve RF Line-cards, and perform in-chassis RF switching to allow N+1 redundancy of DLC</td>
</tr>
<tr>
<td>Power Supply</td>
<td>Power Supply Options</td>
<td>Two distinct types of Power Supply are available:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ AC (240 VAC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ DC (48 VDC)</td>
</tr>
<tr>
<td></td>
<td>Hot Swappable redundant power supply</td>
<td>Two pairs of hot-swappable, redundant, load-sharing PSUs</td>
</tr>
</tbody>
</table>
1.3 NSG Pro Physical and Power Specifications

1.3.1 Physical Dimensions

Table 1–2: Physical Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>15.6</td>
<td>39.5</td>
</tr>
<tr>
<td>Width</td>
<td>17.5</td>
<td>44.4</td>
</tr>
<tr>
<td>Total Length (front to back)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See 3.1 Device Dimensions on page 43</td>
<td>26.72</td>
<td>67.89</td>
</tr>
<tr>
<td>Depth (From rack mount fixture to back of device)</td>
<td>26.5</td>
<td>67.3</td>
</tr>
</tbody>
</table>

1.3.2 NSG Pro Weight

The table lists maximum values of weight for several model combinations:

Table 1–3: NSG Pro Weight

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Weight (lb.)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty chassis</td>
<td>78.7</td>
<td>35.7</td>
</tr>
<tr>
<td>PSU (AC/DC)</td>
<td>3.1</td>
<td>1.4</td>
</tr>
<tr>
<td>SRE</td>
<td>10</td>
<td>4.5</td>
</tr>
<tr>
<td>PIC (any type)</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>DLC</td>
<td>10</td>
<td>4.5</td>
</tr>
<tr>
<td>NSI</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Blank panel - SRE slot</td>
<td>6.1</td>
<td>2.75</td>
</tr>
<tr>
<td>Blank panel - Line-card slot</td>
<td>5.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Chassis assembly - with 4 x PSUs, 6 x PICs, 2 x SRE, 2 x NSI</td>
<td>139</td>
<td>62.5</td>
</tr>
<tr>
<td>Full downstream-only platform - with 4 x PSUs, 6 x PICs, 2 x SRE, 2 x NSI, 12 x DLCs</td>
<td>259</td>
<td>116.5</td>
</tr>
</tbody>
</table>
1.3.3 Power Supply Specifications

Table 1–4 lists power specifications of a fully populated unit together with the Harmonic part numbers for the qualified power supply modules. Use these part numbers for ordering your power supply modules.

**Table 1–4: Power Supply Units Specifications**

<table>
<thead>
<tr>
<th>Harmonic Part Number</th>
<th>PS Type</th>
<th>Input Voltage Range</th>
<th>Input Line Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSGPRO-PS-AC-01-01F</td>
<td>AC</td>
<td>200 to 240 VAC</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>NSGPRO-PS-DC-01-01F</td>
<td>DC</td>
<td>-40.5 to -60 VDC</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1.3.4 Power Consumption from Grid

The following table lists the power consumption from grid in a typical ambient temperature of 25°C. Use the consumption figure of a single module in order to calculate the consumption of a partly-populated chassis:

**Table 1–5: Power Consumption from Grid**

<table>
<thead>
<tr>
<th>Chassis Components</th>
<th>AC Power Consumption from Grid (Watts)</th>
<th>DC Power Consumption from Grid (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x PSUs + PICs + 1 x SRE + 1 x NSI</td>
<td>611</td>
<td>580</td>
</tr>
<tr>
<td>4 x PSUs + PICs + 2 x SRE + 2 x NSI</td>
<td>968</td>
<td>920</td>
</tr>
<tr>
<td>1 x DLC fully loaded with traffic</td>
<td>305</td>
<td>290</td>
</tr>
<tr>
<td>1 x DLC standby</td>
<td>153</td>
<td>145</td>
</tr>
<tr>
<td>4 x PSUs + PICs + 2 x SRE + 2 x NSI + 12 x DLC (11 x DLCs active and 1 x DLC standby)</td>
<td>4437</td>
<td>4215</td>
</tr>
</tbody>
</table>

For installation details, see 2.2.5.2 Overcurrent protection on page 37.
For cabling details, see 3.6 Connecting Power on page 51.
For power supply architecture, see Figure 1–7 on page 19.
1.3.5 Environmental Specifications

The following table lists the environmental specifications for the NSG Pro (NSGPRO-CHS-AC-01-01F and NSGPRO-CHS-DC-01-01F):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temp</td>
<td>0 to 50 °C (32 to 122 °F)</td>
</tr>
<tr>
<td>Storage temp</td>
<td>–20 to 80 °C (–4 to 176 °F)</td>
</tr>
<tr>
<td>Relative humid.</td>
<td>Maximum 95% non-condensing</td>
</tr>
<tr>
<td>Ventilation</td>
<td>When fans operate at full speed, air flow through the device is at least 870CFM per NSG Pro unit.</td>
</tr>
</tbody>
</table>

1.3.6 NSG Pro Architecture

The design of the NSG Pro supports a wire-once architecture. Cabling is done on the rear side only. The following sketch shows the NSG Pro architecture:

![NSG Pro Architecture Diagram]

Figure 1–1: NSG Pro Architecture
The following sketch shows the content flow in the NSG Pro:

1.4 NSG Pro Front Side

The front side of the NSG Pro contains the following:

- Front bezel
- 14 x Line Cards (LCs) slots that may accommodate the following:
  - 2 x Switch and Route Engine (SRE)
  - 12 x Downstream LCs (DLC)

The following figure illustrates the front panel of the NSG Pro platform:
The NSG Pro front side features 14 slots. The following table lists the slots and their labeling. Slots are numbered from left to right:

Table 1–7: Line Card Slots from Left to Right

<table>
<thead>
<tr>
<th>Slot</th>
<th>Line Card Type</th>
<th>Labeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>DLC</td>
<td>LC0 to LC5</td>
</tr>
<tr>
<td>6-7</td>
<td>SRE</td>
<td>LC6-SRE0, LC7-SRE1</td>
</tr>
<tr>
<td>8-13</td>
<td>DLC</td>
<td>LC8 to LC13</td>
</tr>
</tbody>
</table>

The line card configuration depends on the PICs type. See 1.5.4 Physical Interface Card (PIC) on page 33.
1.4.1 **Front Bezel**

The NSG Pro platform has a detachable front bezel. The air inlets located on the bezel enable air flow to the power supply units. See 1.4.3 *Front Side Slots* on page 20.

![Figure 1–4: Front Bezel](image)

1.4.2 **Power Supply Units**

NSG Pro is furnished with four hot swappable AC or DC power supply units.

![Figure 1–5: Power Supply Unit with Handle](image)
All four PSs are mounted on the front side behind the bezel to allow a quick and easy hot swap in case of a PS failure. The power supply cabling is performed on the rear side of the device. See 1.5 Rear Side on page 25.

Power supply units labeling is behind the bezel and is as follows from left to right:

- PS0-A
- PS1-B
- PS2-A
- PS3-B

For labeling on the rear side of the device, see 1.5.1 Power Supply Connection on page 25.

Every power supply unit is connected to an independent power bus, from either the A or B power sources. In addition, for redundancy purposes, every platform component receives power through the PSLs from both power plants. For this purpose, the power supply units are divided into pairs: PS0-A and PS1-B supply power to line cards in the left half of the platform, and PS2-A and PS3-B supply power to line cards in the right half of the platform. The following illustration depicts the module powering scheme:

![Power Supply Architecture Diagram](image)

Two power supply units mounted in slots 0 & 2 or in slots 1 & 3 accommodate the power consumption of a fully populated device. When all four power supply units are plugged in and connected to the mains, the power supply units operate in power load-sharing mode and allow full power supply and power source redundancy.

For power consumption specifications, see 1.3.3 Power Supply Specifications on page 14.
Each AC power supply unit features four LEDs. The LEDs are located on the front of the power supply unit. The following table lists and describes the power supply LEDs:

### Table 1–8: AC Power Supply LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Output Status</td>
<td>Green</td>
<td>=</td>
<td>Indicates proper operation.</td>
</tr>
<tr>
<td>AC Input Status</td>
<td>Green</td>
<td>~</td>
<td>Indicates proper operation.</td>
</tr>
<tr>
<td>Warning</td>
<td>Amber</td>
<td>✸</td>
<td>Indicates over heating, 5°C before shutdown.</td>
</tr>
<tr>
<td>Alarm</td>
<td>Red</td>
<td>!</td>
<td>Indicates one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Thermal shutdown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Voltage shutdown</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Fan defective.</td>
</tr>
</tbody>
</table>

Each DC power supply unit features a single LED. The LED is located on the front of the power supply unit. The following table lists and describes the DC power supply LED:

### Table 1–9: DC Power Supply LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Green</td>
<td>Indicates proper operation.</td>
</tr>
<tr>
<td>Off</td>
<td></td>
<td>Indicates either of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Power is off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- PSU is faulty.</td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td>Applies to PS with PN NSGPRO-PS-DC-02-01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indicates power up. Once SRE initialization process is complete and PS has no alarm, the LED turns Green.</td>
</tr>
</tbody>
</table>

### 1.4.3 Front Side Slots

The front side of the NSG Pro includes 14 line card slots. Slots labeling is at the bottom of the front bezel. See Table 1–7, “Line Card Slots from Left to Right,” on page 17 and Figure 1–7 on page 19.
1.4.4 Switch and Route Engine (SRE)

The SRE line card is the main processing module of the NSG Pro platform. It includes temporary technician control and monitoring interfaces. The SRE module manages, configures and monitors the device and its modules. It is a hot-swappable module that is easily mounted from the front side of the platform. Each platform accommodates two SRE line cards working in either of the following formats:

- Two active SRE cards
- 1+1 redundancy

The SRE cards are mounted in slots labeled LC6 and LC7. Each SRE interfaces with an NSI (Network Side Interface) module mounted at the rear side of the platform. See 1.5.2 NSI Module on page 26.
The front panel of the SRE line card includes the following components:

- SRE LEDs
- SRE on-board Ports
- Air inlets

### 1.4.4.1 SRE LEDs

Table 1–10: SRE LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Green</td>
<td>ON (Green) - SRE LC is working properly.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>On (Amber) - SRE LC is working and a warning is evoked.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>ON (Red) - SRE LC is faulty.</td>
</tr>
<tr>
<td>Active</td>
<td>Green</td>
<td>ON - SRE is Active</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF - SRE is in standby (in redundancy mode)</td>
</tr>
</tbody>
</table>

### 1.4.4.2 SRE On-board Ports

The following table lists the SRE On-board ports:

Table 1–11: SRE On–board Ports

<table>
<thead>
<tr>
<th>Port Label</th>
<th>Port Description</th>
<th>Port Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On-board Ethernet port</td>
<td>Ethernet connection to CPU, using IP address 192.168.100.123.</td>
</tr>
<tr>
<td></td>
<td>Traffic monitoring port</td>
<td>For future use</td>
</tr>
<tr>
<td></td>
<td>Serial port</td>
<td>Serial (RS232) communication port, using the serial console cable provided with the NSG.</td>
</tr>
<tr>
<td></td>
<td>USB port</td>
<td>For future use</td>
</tr>
</tbody>
</table>

**NOTE:** Cables at the front of the SRE are permanent only.
1.4.5 Downstream Line Card (DLC)

The NSG Pro platform accommodates up to 12 hot-swappable DLCs:

NOTE: Slots 6 to 7 accommodate SRE cards.

Each DLC is directly connected to all six PICs. The mounted PIC determines the type of LC in the slot. See 1.5.4 Physical Interface Card (PIC) on page 33.

Each DLC performs QAM modulation and upconversion of the QAM signal. Each DLC includes six DS ports labeled 0 to 5.
The following table provides the RF port specifications:

**Table 1–12: RF Port specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output center frequency per QAM-RF</td>
<td>ANNEX A 54 - 1002 MHz</td>
</tr>
<tr>
<td></td>
<td>ANNEX B and C 53 - 999 MHz</td>
</tr>
</tbody>
</table>

**NOTE:** For detailed specifications, see NSG Pro data sheet.

The modules are hot-swappable and are mounted and plugged from the front side of the platform. The following table lists the DLC specifications:

Each DLC includes the following:
- Air inlets - along the front of the line card
- 7 x LEDs - The following table describes the LEDs

**Table 1–13: DLC LEDs**

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLC Status</td>
<td>Green</td>
<td>Blinking green - in configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steady Green - proper operation</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Faulty</td>
</tr>
<tr>
<td>DS Port Status</td>
<td>Green</td>
<td>Blinking green - in configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steady Green - proper operation</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Faulty</td>
</tr>
</tbody>
</table>
1.5 Rear Side

This section describes the rear side of the NSG Pro platform. The unique architecture of the unit allows a one time cabling architecture that is performed at the rear of the platform. The rear side includes the following:

- 4 x power input connectors
- 2 x NSI modules
- 2 x fan blocks
- 6 x Horizontal Physical Interface Cards (PIC)
- Grounding terminal

1.5.1 Power Supply Connection

Cabling of the power supply units is done from the rear side of the device.

For instructions on how to connect the AC power supply, see 3.6 Connecting Power on page 51.

For instructions on how to connect the DC power supply, see Wiring –48 VDC Power Supply Units on page 89.
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.

1.5.2 NSI Module

The NSG PRo platform accommodates two hot-swappable redundant NSI modules. The NSI modules contain the network side interfaces.

Each NSI includes the following:

![Figure 1–11: NSI Card](image)

**Figure 1–11: NSI Card**
Table 1–14: NSI Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Labeling</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x Eth ports</td>
<td>ETH20/21</td>
<td>Two 10/100/1000 Ethernet out-of-band management ports</td>
</tr>
<tr>
<td>2 x DTI ports</td>
<td>DTI30/31</td>
<td>Two DTI ports typically used in M-CMTS deployments</td>
</tr>
<tr>
<td>12 x 10GbE ports</td>
<td>GbE0/1</td>
<td>12 10GbE ports. These ports support fiber/copper cables and use SFP/SFP+ transceivers.</td>
</tr>
<tr>
<td></td>
<td>GbE2/3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GbE4/5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GbE6/7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GbE8/9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GbE10/11</td>
<td></td>
</tr>
</tbody>
</table>

The GbE ports are arranged in groups of four. All ports in the same group should have the same speed, either 1Gbps or 10Gbps.
1.5.2.1 NSI LEDs

The NSI module is furnished with two LEDs to indicate the module status. In addition all ports of the NSI module have two LEDs to indicate their status as the following table shows:

Table 1–15: LEDs of NSI Card

<table>
<thead>
<tr>
<th>Component</th>
<th>LED</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSI</td>
<td>ST - Status</td>
<td>Green, Red</td>
<td>OK, Faulty</td>
</tr>
<tr>
<td></td>
<td>ACT - Active</td>
<td>Green</td>
<td>ON - Active, OFF - Standby</td>
</tr>
<tr>
<td>10GbE0 - 11</td>
<td>Status</td>
<td>Green, Red</td>
<td>OK, Faulty</td>
</tr>
<tr>
<td></td>
<td>Active</td>
<td>Blinking green</td>
<td>ON - Active, OFF - Standby</td>
</tr>
<tr>
<td>DTI30 - 31</td>
<td>Status</td>
<td>Green, Red</td>
<td>OK, Faulty</td>
</tr>
<tr>
<td></td>
<td>Active</td>
<td>Green</td>
<td>ON - Active, OFF - Standby</td>
</tr>
</tbody>
</table>
1.5.2.2 Ethernet Ports

The Ethernet ports allow connection to separate networks. The Ethernet ports are labeled ETH20 and ETH21. ETH20 is a management port and ETH21 is usually used for CAS. The following table lists the specifications of the Ethernet ports.

Table 1–16: Ethernet Ports Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>10/100/1000 Base-T ports</td>
</tr>
<tr>
<td>Connector</td>
<td>RJ-45</td>
</tr>
</tbody>
</table>

For LEDs of Eth port, see Table 1–15: LEDs of NSI Card on page 28.
For cabling instructions, see 3.4 Connecting the Ethernet Cables on page 51.

1.5.2.3 DTI Ports

The DTI ports, labeled DTI30 and DTI31, allow the NSG Pro to operate in an M-CMTS application. The following table lists the DTI ports specifications:

Table 1–17: DTI Ports Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input signal</td>
<td>Complies with DOCSIS 3.0 DTI</td>
</tr>
</tbody>
</table>
1.5.2.4 1GbE/10GbE Input Ports

The NSG Pro platform includes 12 10GbE ports. The ports support 10GbE SFP+ transceivers with fiber optic cables. The ports also support 1GbE SFP transceivers with fiber optics or copper cables.

The following table lists the GbE port specification:

Table 1–18: GbE Port Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
<td>• SFP+ transceiver for fiber cable only</td>
</tr>
<tr>
<td></td>
<td>• SFP transceiver for either fiber of copper cables</td>
</tr>
<tr>
<td>Maximum input bitrate</td>
<td>• SFP+</td>
</tr>
<tr>
<td></td>
<td>◆ Line rate up to 10,000Mbps</td>
</tr>
<tr>
<td></td>
<td>• SFP</td>
</tr>
<tr>
<td></td>
<td>◆ Line rate up to 1000 Mbps</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Swappable</td>
</tr>
</tbody>
</table>

1.5.2.5 SFP Module

The SFP (Small Form Factor Pluggable) module converts optical signals into electrical signals and vice versa. The SFP modules allow the NSG to receive input signals over a variety of physical interfaces:

- SFP
  - Single-mode optical interface (1000 Base-LX)
  - Multi-mode optical interface (1000 Base-SX)
  - Copper interface (1000 Base-T)
- SFP +
  - Multi-mode optical interface (1000 Base-SX 1G Ethernet, 10GBase-SR/SW 10G Ethernet)

The following figure illustrates an SFP module:
Warning: Class I laser product. (IEC/EN 60825-1; 21CFR SubChapter J (1040.10 and 1040.11)

You can use either of the following types of SFP depending on the cable/fiber type you are using.

Harmonic sells SFP/SFP+ modules that have been thoroughly qualified to operate with the NSG Pro device. These SFPs are made by Finisar, and may be purchased either directly from Harmonic, or from other sources.

Table 1–19 lists the Harmonic part numbers for the qualified SFP+ modules, as well as the matching Finisar part numbers for the same modules. Use these part numbers for ordering your SFP modules.

NOTE: To be eligible for support by Harmonic, use qualified SFPs only.

Table 1–19: 1GbE SFP Modules

<table>
<thead>
<tr>
<th>Harmonic Part Num.</th>
<th>Fiber/Cable Type</th>
<th>Connector Type</th>
<th>Wave Length</th>
<th>Max. Cable/Fiber Length</th>
<th>Qualified Finisar SFP Model Part Num.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSF9311-02</td>
<td>Multimode fiber</td>
<td>2 x LC</td>
<td>850 nm</td>
<td>550m</td>
<td>FTLF8519P2BNL</td>
</tr>
<tr>
<td>GSF9322-02</td>
<td>Singlemode fiber</td>
<td>2 x LC</td>
<td>1310 nm</td>
<td>10 km</td>
<td>FTLF1319P1BTL</td>
</tr>
<tr>
<td>GSF9132-02</td>
<td>Singlemode fiber</td>
<td>2 x LC</td>
<td>1550 nm</td>
<td>70 km</td>
<td>FTLF1621P1BCL</td>
</tr>
<tr>
<td>GSF9100-02</td>
<td>Shielded and grounded CAT-6 or CAT-7</td>
<td>1 x RJ-45</td>
<td>N/A</td>
<td>100m</td>
<td>FCLF-8521-3</td>
</tr>
</tbody>
</table>
An optical SFP has two LC sockets, Receive(Rx) and Transmit(Tx). Use Multimode or Singlemode fiber optics to connect your Gigabit Ethernet switch to the NSG Pro.

1.5.3 Cooling Fans

The NSG Pro platform uses two hot-swappable blocks of fans with four fans per block to control the temperature during operation. The fans are located in the rear side of the platform and suck air from the front, and exhaust it to the rear of the platform. The CPU of the SRE controls the speed of each fan. The CPU also applies an algorithm to maximize mean time between failure by lowering the temperature of critical components, while keeping the fan noise-level as low as possible.

In a case of a single fan failure, the system automatically compensates for that failure by operating the other seven fans at a slightly higher RPM. Similarly, a complete failure of a whole fan block is compensated for by operating the other fan block at a higher RPM. When at up to 30°C ambient temperature, the NSG Pro can operate indefinitely with a failed fan block, permitting sufficient time to obtain a new fan block replacement. Nevertheless, to reduce wear and minimize the possibility of a system shutdown due to a secondary failure, the failed fan block should be replaced as soon as possible. Note that the failed fan block should not be removed from the chassis unless it is immediately replaced with a new fan block. Removing a fan block causes a major change in the internal air flow pattern, resulting in the remaining fan block sucking air from the back of the platform through the empty fan block cavity. Operating the NSG Pro with a removed fan block for more than two minutes may result in overheating of some components. Consequently, the system will be automatically shutdown to prevent permanent damage. See 4.1.1 Removing and Replacing the Cooling Fans Unit on page 56.
1.5.4 Physical Interface Card (PIC)

The NSG Pro platform is furnished with six hot-swappable PICs which function as an RF switch and allow N+1 DLC redundancy. The PICs are horizontal RF matrix cards that connect directly to the line cards installed on the front side of the platform. Currently, a single type of PIC is offered, as described below:

Table 1–21: Types of PICs

<table>
<thead>
<tr>
<th>PIC Type</th>
<th>PIC Part No.</th>
<th>PIC Format</th>
<th>Connector Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS</td>
<td>NSGPRO-DS-PIC-M</td>
<td>1 x 6 RF port 1 x 6 RF port</td>
<td>12 x female MCX connectors arranged in 2 x H-UCH cable bundles</td>
</tr>
</tbody>
</table>

1.6 Redundancy

The architecture of the NSG Pro ensures the continuous transmission of video/data streams. The device is furnished with various protection or redundancy options. Redundancy solutions provide various levels of assurance such as internal redundant components versus device redundancy. Applying redundancy is application dependent. The following table lists the internal redundancy solutions implemented in the NSG Pro:

Table 1–22: NSG Pro Redundancy

<table>
<thead>
<tr>
<th>Component</th>
<th>No Redundancy</th>
<th>Redundancy Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRE</td>
<td>1 card is active</td>
<td>2 x SREs in 1+1 configuration or in load-sharing</td>
</tr>
<tr>
<td>DLC</td>
<td>All 12 cards are active and independently connected</td>
<td>Up to 11+1 configuration The backup DLC is LC8</td>
</tr>
<tr>
<td>Power supply</td>
<td>N/A</td>
<td>2+2 configuration The four units work in pairs where each pair is connected to an independent input feed to ensure continuous power supply in case of failure.</td>
</tr>
</tbody>
</table>
Chapter 2
Installation

This chapter instructs you on how to install the NSG Pro platform. For best results, perform the required actions according to following the order:

- Read the installation guidelines
- Unpack the NSG Pro platform and remove all the modules from the chassis
- Install the NSP Pro Rack Mounting kit
- Attach the NSI and RF Cable Management (CM) kits to the NSG Pro (if equipped)
- Install the empty NSG Pro platform in the rack
- Mount the NSG Pro rear modules
- Mount the NSG Pro front modules
- Connect rear cables

2.1 Unpacking the NSG Pro Platform

The NSG Pro platform comes in a specially designed shipping crate that ensures its safety during shipping and handling. To avoid damaging the NSG Pro platform, unpack it carefully. The crate includes the following:

- Chassis with the following accessories:
  - Serial cable with the following connectors:
    - RJ-45 connector
    - DB-9 connector
  - Cable lugs for the grounding terminal and DC power
  - 3 mm Allen key

The following items are shipped separately:
- 4 x Power supply units AC/DC. In case of AC power supply, AC power cords are also shipped. The various types of AC power supply cords are for different geographical regions as the following table lists:

Table 2–1: AC Power Supply Cords

<table>
<thead>
<tr>
<th>Harmonic Part Number</th>
<th>Region</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSGPRO-CBL-PWR-AC-NA</td>
<td>North America</td>
<td>IEC-60320-C19 connector on device side, NEMA L6-20P plug on grid side, rated 20A 250V</td>
</tr>
<tr>
<td>NSGPRO-CBL-PWR-AC-EU</td>
<td>Europe</td>
<td>IEC-60320-C19 connector on device side, CEE 7/7 plug on grid side, rated 16A 250V</td>
</tr>
<tr>
<td>NSGPRO-CBL-PWR-AC-UK</td>
<td>United Kingdom</td>
<td>IEC-60320-C19 connector on device side, BS 1363 13A plug on grid side, rated 13A 250V</td>
</tr>
<tr>
<td>NSGPRO-CBL-PWR-AC-GEN</td>
<td>Generic use</td>
<td>IEC-60320-C19 connector on device side, No plug on grid side, rated 16A 250V</td>
</tr>
</tbody>
</table>
- 1 or 2 x SREs
- 1 or 2 x NSIs
- 6 x PICs
- H-UCH RF cables
- Up to 12 x DLCs
- Blank line cards for unpopulated NSI, SRE and DLC slots

**NOTE:** In case the NSG Pro platform is not equipped with all 12x DLCs, 2x SREs, and 2x NSIs, insert blank modules in the unused slots. Otherwise, improper air flow may cause severe permanent damage to the platform modules. The NSG Pro must always be used with 4x PSU, 6x PICs, and 2x fan Blocks.

- Rack mounting kit. There are two types according to the used rack. See *NSG Pro Ordering Guide* on page 106.
- NSI and RF Cable Management (CM) kits (Optional, only if ordered). Various types of RF CM are available. See *NSG Pro Ordering Guide* on page 106.

### 2.2 Installation Guidelines

**CAUTION:** The NSG Pro platforms are used in restricted access locations.

**NOTE:** To prevent body injury when mounting or servicing this platform in a rack, you must take special precautions to ensure that the system remains stable. Read the following guidelines to assure your safety.

#### 2.2.1 Rack Specifications

Install the 9-RU chassis in the following rack:
- A standard EIA 19-inch computer rack with at least 30" (76cm) deep and 40RU high. In addition, recommended rack: 36" (91cm) or 40" (102cm) depth.
- To allow free air flow, the rack must be completely open at its front side. See *Table 2–2: Guidelines and Specifications for Mounting a Device* on page 36.
- The rack should be mounted with side walls and a back door.
- The back door should have ventilation slots either at its bottom part only or throughout the height of the door.

#### 2.2.2 Rack Ventilation

A typical rack with an open front and top and with ventilation slots at the back, should enable free flow of hot air into the air conditioning system intake. The rack should meet the following:
- NSG Pro air flow is front to back
- NSG Pro air flow, as indicated in *1.3.5 Environmental Specifications* on page 15

#### 2.2.3 Rack Positioning and Device Mounting

##### 2.2.3.1 Rack positioning

- From front - leave clearance of at least 25”(63cm) from the front to any neighboring cabinet/wall.
- From back - leave clearance of at least 20”(51cm) from the back to any neighboring cabinet/wall.
- Ensure that the front of the rack is not directly exposed to the air-outlet side of any other racks.
2.2.3.2 Device Mounting

The following table lists the guidelines and specifications for mounting the NSG Pro platform in a rack. To order kits for rack-mounting, see NSG Pro Ordering Guide on page 106.

**CAUTION:** Do not obstruct the airflow of the platform. Severe equipment damage can result when the device cannot properly intake or exhaust the airflow.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupied Space</td>
<td>9 rack unit</td>
</tr>
<tr>
<td>Mounting Order</td>
<td>Partially filled rack - load rack from the bottom to the top with the heaviest component at the bottom of the rack.</td>
</tr>
<tr>
<td>Max Number</td>
<td>According to allowed floor load. See, 2.2.4 Rack Weight on page 36. Spacing between units (1RU or more) is recommended for ease of cabling. Block the spaces between units as explained in Open space.</td>
</tr>
<tr>
<td>Mounting Method</td>
<td>Mount each platform on supporting rails provided by Harmonic in the rack-mounting kit. Install the rack-mounting rails before mounting the platform in the rack.</td>
</tr>
<tr>
<td>Open space</td>
<td>To prevent hot air circulation, all open spaces below and above the platforms should be closed with blank panels.</td>
</tr>
<tr>
<td>Cabling</td>
<td>Route all cables at the rear of the platform along the sides of the rack and then up or down, to allow pulling out the NSI modules, fan blocks and PICs.</td>
</tr>
</tbody>
</table>

2.2.4 Rack Weight

1. Check the allowed floor load of the facility.
2. Calculate the total weight and load according to the following parameters:

<table>
<thead>
<tr>
<th>Item</th>
<th>Value (US)</th>
<th>Value (metric)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single fully loaded NSG Pro unit</td>
<td>265 lbs</td>
<td>120 Kg</td>
</tr>
<tr>
<td>Footprint of a typical 23” x 30” rack</td>
<td>4.8 sq. Ft</td>
<td>0.45 m²</td>
</tr>
<tr>
<td>Footprint of a typical 19” x 36” rack</td>
<td>4.750 sq. Ft</td>
<td>0.44 m²</td>
</tr>
<tr>
<td>Footprint of a typical 19” x 40” rack</td>
<td>5.278 sq. Ft</td>
<td>0.490 m²</td>
</tr>
</tbody>
</table>

For partial NSG Pro configuration, see 1.3.2 NSG Pro Weight on page 13.
3. Limit the number of NSG Pro platforms in a rack according to the allowed floor load. Take into account also additional equipment to be mounted in the rack.
2.2.5 Power Source and Wiring Specifications

2.2.5.1 Redundant power supply

When installing NSG Pro platforms, power supply units should be fed by appropriate independent power sources:

- AC power supply - use two different phases of the AC power plant.
- DC power supply - use two distinct DC sources (A line and B line). See Figure 1–7 on page 19.

2.2.5.2 Overcurrent protection

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

To ensure adequate over-current protection, mount power feed lines with circuit breakers (CB) of the appropriate rating. Power feed to the NSG Pro should be segmented as specified below:

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Typical Power consumption for CB (Watts)</th>
<th>Typical Steady State Current (Amp)</th>
<th>Max. Power consumption for CB (Watts) Upon PS Unit Failure</th>
<th>Max. Steady State (Amp) Upon PS Unit Failure</th>
<th>In Rush Current Draw (Amp)</th>
<th>CB Rating (Amp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>208VAC</td>
<td>1125</td>
<td>5.4</td>
<td>2250</td>
<td>10.8</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>220VAC</td>
<td>1125</td>
<td>5.1</td>
<td>2250</td>
<td>10.2</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>240VAC</td>
<td>1125</td>
<td>4.7</td>
<td>2250</td>
<td>9.4</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>-48VDC</td>
<td>1100</td>
<td>23</td>
<td>2200</td>
<td>46</td>
<td>35</td>
<td>60 or 65</td>
</tr>
</tbody>
</table>

When using DC power supplies, overcurrent protection should be provided by a fuse panel, with a separate fuse for each individual NSG Pro power supply unit. This fuse is meant primarily for protecting the DC power source from damage in case of an internal power supply problem. The following table lists recommended fuse types for the external fuse panel:

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Recommended Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSGPRO-PS-AC</td>
<td>16 Amp, 250VAC, Slow Blow, (13 Amp in UK)</td>
</tr>
<tr>
<td>NSGPRO-PS-DC</td>
<td>60 or 65 Amp GMT, 60VDC/125VAC rating, Fast-acting</td>
</tr>
</tbody>
</table>

For additional details on AC/DC power source requirements, see *Wiring –48 VDC Power Supply Units* on page 89.

2.2.5.3 Grounding

- Every rack must be properly earthed, connected to the ground bus of the plant.
Each NSG Pro platform in the rack must also be connected to the main Earth line of the rack, using a 6 AWG copper wire. See 3.6.1 Grounding the Mounted Platform on page 51.

### 2.2.6 Facility Cooling Requirements

The table below specifies the NSG Pro cooling requirements for worst-case conditions (50°C).

The required cooling capacity of the facility's air conditioning system assumes 15% general leakage of a typical air conditioning system and 25% latent heat.

**Table 2–6: Facility Cooling Requirements**

<table>
<thead>
<tr>
<th>Ambient Temperature</th>
<th>Generated Heat (Watts)</th>
<th>Generated Heat (BTU/Hour)</th>
<th>Facility A/C Cooling Capacity per NSG (BTU/Hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°C</td>
<td>3,600</td>
<td>12,285</td>
<td>17,200</td>
</tr>
<tr>
<td>25°C</td>
<td>3,240</td>
<td>11,057</td>
<td>15,479</td>
</tr>
</tbody>
</table>

**NOTE:** It is assumed that the head-end air conditioning system is designed to circulate the air in a manner that ensures the same ambient temperature for all the NSG Pro devices in a rack.

Ambient temperature for a continuously operating device should be 25°C. NSG Pro can continuously operate in ambient temperature of up to 50°C. However, continuous operation in a high ambient temperature shortens the device lifetime.

### 2.3 Installing NSG Pro Platforms

#### 2.3.1 Required Tools for Installation

- Screws to secure the unit to the rack
- A screwdriver for fastening the screws
- Support-rails provided by Harmonic in a separate kit (P/N RM-4-30).

#### 2.3.2 Preparing the rack

The support-rails are comprised of two sections to allow you to adjust the support-rails to the space between the front rack posts and the back rack posts.

Section A - one side of section A should be mounted on the front post of the rack. See Figure 2–1 on page 39.

Section B - one side of section B should be mounted on the back post of the rack. Figure 2–1 on page 39.

To connect the support-rails

1. From the kit, obtain the support-rails.
2. Connect both sections of the support-rails as follows:
3. Hold section A on the rack.
4. Hold section B on the rack.
5. Adjust the required length.
6. To fasten both sections together, from the inside of the rack, insert eight screws and fasten them with nuts on the outside of the rack. Step 1 in Figure 2–2 on page 40.
7. Connect the support-rails onto the rack. See step 2 and 3 in Figure 2–2 on page 40.

Figure 2–3: Support-Rails on Rack

2.3.3 Installing the NSG Pro Platform in a Rack

**NOTE:** It is recommended to install the NSG Pro platform on the rack prior to mounting any cards or modules.

1. Install the support-rails before mounting the NSG Pro platform in the rack. See 2.3.2 Preparing the rack on page 38.

2. Verify that the brackets are mounted onto the chassis. Usually, the NSG Pro chassis is shipped with mounted brackets. If the brackets are not mounted, mount them according to the provided instructions. See 2.3.3 Installing the NSG Pro Platform in a Rack on page 41.

3. If you use the NSI Cable Management or the RF cable management, mount it on the chassis. See Mounting the NSI CM on the Chassis on page 98.
4. Place the 9-RU chassis on the mounted support-rails and slide it along the support-rails.

Figure 2–4: Mounting the Platform on the Rack with NSI CM

5. Push the chassis back until the holes of the brackets in the front of the chassis line up with the rack posts as in Figure 2–4, number 1.
6. Insert four screws through the holes of the brackets in the front of the chassis to go through the corresponding holes on the rack posts as in Figure 2–4, number 2.
7. Tighten the screws with a screwdriver.
Chapter 3
Cabling

The Cabling chapter guides you on how to connect the NSI, QAM-RF and Ethernet ports. Connecting cables to the NSG Pro platform is straightforward. The NSG Pro ports are clearly marked on the NSG Pro back panel. See 1.5 Rear Side on page 25 for placement.

The Cabling chapter also includes device dimensions to allow better planning of the rack cabling scheme:

3.1 Device Dimensions on page 43
3.2 Cabling the Input GbE Ports on page 46
3.3 Connecting the QAM-RF Output Cables on page 49
3.4 Connecting the Ethernet Cables on page 51
3.5 Cabling the DTI Ports on page 51
3.6 Connecting Power on page 51
3.6.1 Grounding the Mounted Platform on page 51
3.6.2 Connecting to the Power Outlet on page 53

CAUTION: Before cabling read all safety precautions. See specific instructions and Safety Precautions on page 107.

3.1 Device Dimensions

Dimensions are provided in millimeters.

Figure 3–1 on page 44 shows the measurements of the NSG Pro platform from the front rack-mounting brackets to the fan block handles.
Figure 3–1: NSG Pro Dimensions

Figure 3–2 on page 45 shows the following measurements:

- The distance between the three available mounting options of the CMs.
- The distance from the rear of the chassis to the edge of both NSI CM and RF CM. The latter applies to the RF CM for RG-6/59 only.
- The distance from the fan handle to the edge of both NSI CM and RF CM. The latter applies to the RF CM for RG-6/59 only.

**NOTE:** The measurement of the RF CM from the rear of the chassis to the edge of the RF CM applies to both types of the RF CM.
Figure 3–2: CM Dimensions
3.1.1 Front Side Measurements

3.2 Cabling the Input GbE Ports

To connect the NSI port, use either of the following:

- Multimode or single-mode optic fibers with LC connectors. The LC connectors plug into an SFP/SFP+ receptacle, which accommodates two fibers, one for transmission and the other for reception.
- Shielded and grounded CAT-6 or CAT-7 cable with an RJ-45 connector. The RJ-45 connector plugs into a copper SFP receptacle.

3.2.1 Cabling Without NSI CM

1. Insert the SFP/SFP+ modules into the required ports at the back of the NSG Pro.
2. Insert the LC/RJ-45 plugs into the SFP module.
3. Connect the NSG Pro to a switch/router.

3.2.2 Cabling With NSI CM

For instructions on how to mount the NSI CM, see *Using Cable Management* on page 96.

**NOTE:** When using the NSI CM, cable the bottom NSI ports first.
1. To start cabling, use the down position of the NSI CM. Hold both handles and pull them inwards to release the handle once the notch is secured in the lowest hole. See figure Figure 3–4 on page 47 and Figure 3–5 on page 47.

Figure 3–4: NSI Cable Management – Handles

Figure 3–5: NSI CM – Notches Detail
2. Insert the LC/RJ-45 plugs into the SFP module at the bottom of the NSI module.
3. Wrap the fiber around the reels and pull them out to the required side of the rack.

4. Insert the LC/RJ-45 plugs into the SFP module at the top of the NSI module.
5. Wrap the fiber around the reels and pull them out to the required side of the rack.

6. Connect the NSG Pro to a switch/router.

3.2.3 Mirroring an Input Socket/Port/Output QAM

The NSG Pro unit may duplicate the incoming content of any NSI port or any output QAM channel. IP mirroring is supported in band on the NSI ports. IP monitoring port, located in the front side of the device, is for future use only.
3.3 Connecting the QAM-RF Output Cables

The NSG Pro device accommodates up to 12 DLCs that are connected to six PICs (RF switches). Each PIC is furnished with QAM-RF ports as follows:

- Up to 12 DS QAM-RF ports
- Up to six DS QAM-RF ports and up to 12 US QAM-RF ports

The following table provides cabling details:

Table 3–1: PICs Labeling

<table>
<thead>
<tr>
<th>PIC</th>
<th>Labeling</th>
<th>Connector</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x 6xDS &amp; 2 x 6xU</td>
<td>DS8 to DS1, US0/0 to US5/0, US0/1 to US5/1</td>
<td>3 x H-UCH bundles, each with 6 x male MCX</td>
<td>Octopus cable - HEC2 59-series headend cable with H-UCH/MCX female to F-male</td>
</tr>
<tr>
<td>2 x 6DS</td>
<td>DS0 to DS5, DS8 to DS13</td>
<td>2 x H-UCH bundles, each with 6 x male MCX</td>
<td>Octopus cable - HEC2 59-series headend cable with H-UCH/MCX female to F-male</td>
</tr>
<tr>
<td>12 x DS</td>
<td>DS0 to DS5, DS8 to DS13</td>
<td>Female F-type</td>
<td>RG-6 (75 Ohm, 0-3 GHz) coaxial cable equipped with male F-type connectors only, RG-59 (75 Ohm, 0-3 GHz) coaxial cable equipped with male F-type connectors only</td>
</tr>
</tbody>
</table>

**NOTE:** The female F-type connectors are designed to accept cables with center pin diameter of 0.68-1.73 mm (0.026”- 0.068”). Cables that do not meet this requirement must be mounted with crimp-on connector of the required dimensions.

**CAUTION:** Using cables other than the cables indicated above may adversely affect the QAM-RF performance.

3.3.1 Required Tools

- A flat head screwdriver - to secure the H-UCH
The following table provides instructions for connecting the QAM-RF channels according to the PIC type.

**Table 3–2: Connecting QAM–RF Channels**

<table>
<thead>
<tr>
<th>F–Type Connector</th>
<th>H–UCH Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove the terminators that cover the RF ports.</td>
<td>1. Remove the terminators that cover the RF ports.</td>
</tr>
<tr>
<td>2. Applies to RF CM - Position the RF shelf at the down position. See Figure 4–28.</td>
<td>2. Connect the H–UCH verifying that the guide connectors plug in properly to their mating connectors. See Figure 3–8 on page 50.</td>
</tr>
<tr>
<td>3. Connect the cable to the RF port. Repeat for each port.</td>
<td>3. To secure the connector, screw the H–UCH connector to the PIC. See Figure 3–8 on page 50.</td>
</tr>
<tr>
<td>4. In case of RF CM, hook the cables in the cable holder. See Figure 4–28.</td>
<td>4. In case of RF CM, hook the cables in the cable holder. See Figure 4–25.</td>
</tr>
<tr>
<td>5. Connect the other side of the cable to your output equipment according to your network schema.</td>
<td>5. Connect the other side of the cable to your output equipment according to your network schema.</td>
</tr>
</tbody>
</table>

**CAUTION:** Failing to connect to an output equipment and having a loose edge of the RF cable, exposes the PICs to ESD and may severely damage the PICs.

**CAUTION:** Any RF port which is not connected to the RF plant must be either shut-off or terminated (or both). Failure to follow this directive, may result in RF level alarm.
3.4 Connecting the Ethernet Cables

The Ethernet ports, labeled ETH20 and ETH21, provide access to two independent networks. The required cables are shielded and grounded CAT-5E or CAT-6 cables with RJ-45 connectors.

To connect the Ethernet cables:
- Connect the Ethernet cable with RJ-45 connectors from the ETH20/21 port on the NSG Pro to your management network hub or switch.

**NOTE:** If you are using NSI CM, cable the bottom ports first while using the down position of the NSI CM. See 3.2.2 Cabling With NSI CM on page 46.

3.5 Cabling the DTI Ports

Cabling the DTI card is straightforward. See 1.5 Rear Side on page 25 for placement.

For connecting the DTI ports to the DTI server, use the following cables:
- Shielded and grounded CAT-5E or CAT-6 cables with RJ-45 connectors.

To connect the DTI cables:
- Connect one side of the DTI cable to a DTI port on the NSG Pro back panel and the other side of the DTI cable to the DTI server.

**NOTE:** If you are using NSI CM, cable the bottom ports first while using the down position of the NSI CM. See 3.2.2 Cabling With NSI CM on page 46.

3.6 Connecting Power

The NSG Pro platform comes with either of the following:
- 4 x AC power supply units
- 4 x –48 VDC power supply units

Follow the instructions appropriate to your power supply.

**CAUTION:** 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.

3.6.1 Grounding the Mounted Platform

**CAUTION:** Tighten GND lug with a 5/16” socket and 1/4” drive, max torque 35 lbf-in.

To ground the mounted platform, obtain a 5/16” socket and 1/4” drive, max torque 35 lbf-in.
Each platform should be grounded using the ground terminal on the rear side of the device. For grounding a platform, use a lug terminated 6 AWG copper wire. The lug required for connecting to the NSG Pro grounding terminal is provided with the platform.

Figure 3–9: Platform Grounding Terminal

To ground each mounted platform:
1. Connect one edge of the grounding wire to the Rack grounding terminal.
2. Connect the other edge of the grounding wire to the platform grounding terminal by fastening the nuts.
3.6.2 Connecting to the Power Outlet

3.6.2.1 Power cord rating

Harmonic ships the AC power supply of the NSG Pro with a power cord of the required rating. When using an AC power feed, be sure to use the appropriate AC power cords that Harmonic provides for the NSG Pro. Cords are available for order with various types of plugs, to accommodate the typical needs of all regions. The table below lists the part numbers of the available cords and their characteristics.

<table>
<thead>
<tr>
<th>Cord Part Number</th>
<th>Plug Type at Grid Side</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSGPRO-CBL-PWR-AC-NA</td>
<td>NEMA L6-20P</td>
<td>North America</td>
</tr>
<tr>
<td>NSGPRO-CBL-PWR-AC-EU</td>
<td>CEE 7/7</td>
<td>Europe</td>
</tr>
<tr>
<td>NSGPRO-CBL-PWR-AC-UK</td>
<td>BS 1363 13A</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>NSGPRO-CBL-PWR-AC-GEN</td>
<td>No plug</td>
<td>Other. Cord is shipped un-terminated, users should mount the plug of their choice</td>
</tr>
</tbody>
</table>

Harmonic strongly recommends to use only the Harmonic-provided AC power cords. Users who still choose to obtain cords from a source other than Harmonic should use an AC cord that meets the following specifications:

- Current rating - 16 Amp or higher, (13 Amp or higher in UK)
- Wire gauge - 12 AWG or thicker
- Connector at device side - IEC -C19, Right angle

3.6.2.2 Connecting the NSG Pro to the Power Source

- Connection the NSG to the AC power source - After verifying that a proper AC power cords are being used, connect all four power cords to the power connectors on the NSG Pro rear side, and to the power outlets of the rack.

  Make sure that each power source is protected with an appropriate circuit breaker, and that different phases are connected to the A and B PSUs.

  **CAUTION:** Use the recommended 16A/12AWG cord to ensure your own personal safety and to help protect the device and working environment from potential damage.

  The power supply automatically senses the input voltage.

- Connecting the –48 VDC Power Supply - If your NSG Pro has the optional –48 VDC power supply, see [Wiring –48 VDC Power Supply Units](#) on page 89 for instructions to wire the power supply.
3.7 Booting UP the Device

When you connect the NSG Pro to the power source, the boot up procedure starts.

**NOTE:** The integral speed-controller of the cooling fans includes a protective circuit which sets fans to maximum rotation speed if it does not sense the presence of a properly registered SRE. To minimize the duration of such condition, be sure to register an SRE immediately after powering-up the device for the first time.

Once boot up is complete the status LED on the SRE should be On in green. (See 1.4.4 Switch and Route Engine (SRE) on page 21) In case it shines in red, some alarms are on. You should check the alarm log via the EdgeMS or CLI. See the NSG Pro SW Guide.

3.8 Initial Device Setup

Because the NSG Pro is configured and controlled by a remote management system, you must set the IP address of the Ethernet port located on the NSI card.

For initial device setup, see NSG Pro SW Guide, Chapter 2, section: Initial Device Setup.
This chapter contains service information that explains how to replace the following components of the platform:
- Cooling fans unit
- Power supply

**NOTE:** To prevent body injury when servicing this unit in a rack, you must take special precautions to ensure that the system remains stable.

### 4.1 Cooling Fans Unit

The NSG Pro uses two blocks of fans, each block includes four fans to control the temperature of the platform during operation. Fan blocks are mounted on the rear side of the device to allow a quick and easy hot swap in case of a fan failure.

![Figure 4–1: Fan Unit](image)

**NOTE:** A failure of a single fan, requires the replacement of a whole fan block.
4.1.1 Removing and Replacing the Cooling Fans Unit

The design of the NSG Pro platform allows a quick hot swap of a fan block. Removing and replacing the fans does not interrupt the operation of the platform as long as the fan replacement is done while the platform is operating at or below 30°C, and the fan block is replaced within two minutes. If the procedure exceeds two minutes, the device may shutdown.

4.1.1.1 Preparation

For removing and replacing the fans, you need the following:

- Phillips screwdriver
- A new fan block

**NOTE:** If NSI CM is installed, lift it. See *NSI Cable Management (CM)* on page 97.

1. Unscrew all four screws that attach the fan block to the platform. The screws are located on the four corners of the fan block. Refer to the figure below.
2. Hold the fan block by its handles and pull to detach it from the platform.

![Figure 4–2: Detaching Fan Block](image)

3. Push the new fan block and verify that its sides slide into the guides. Push the fan block until its connector mates with the connector on the platform.
4. To fasten the fan block, attach all four screws of the fan block to the platform.
5. Verify that the alarm Fan Failure is remitted.

**CAUTION:** The fans of the NSG Pro are extremely powerful, and may still turn for a while after the fan block is disconnected from the platform. Do not attempt to stop the fans if they are still turning. Take care not to let any object pass the fan block’s inner wire guards. The fan wire guards must not be removed. Extreme care should be taken not to touch the fans blades while the fans are turning. Avoid touching the electronic circuit board to prevent risk of ESD damage.
4.2 Hot Swapping Power Supply Unit

The NSG Pro platform uses four hot swappable power supply units that are mounted onto the platform from its front side. The following procedure guides you on how to hot swap a power supply unit. See Figure 1–6 on page 19.

**NOTE:** There is no need to disconnect the power before removing the power supply.

1. Remove the front bezel of the platform by unfastening the screws on both sides of the bezel.

![Bezel screws](Image)

2. Identify the non-functioning PSU and verify the following:
   - The functioning PSUs are connected to the main
   - The Status LEDs of the PSUs are green. See Table 1–8 on page 20.

3. The PS units are secured to the chassis with a pair of screws. Unfasten the screws of the required PS.

![Power supply screws](Image)

4. While holding on to the handle of the PSU, pull it to disengage its connector. Continue pulling until the PSU comes out of the platform.

![Figure 4–3: Power Supply Unit Screws and handles](Image)
Figure 4–4: Pulling Out Power Supply

5. Hold the new unit in its handle and slide it into the slot.
6. Push the unit until its edge-connector mates securely with the connector in the slot.
7. To secure the PS to the chassis, tighten the screws that attach the PS to the chassis.
8. Verify that the unit is on and operating properly by checking its LEDs as explained in 1.5.1 Power Supply Connection on page 25.

4.3 Replacing SRE, LCs, NSI Modules and PICs

The NSG Pro supports hot-swapping of its line cards and modules. The following instructions guide you on how to replace a module/line card.

4.3.1 Guidelines for Handling Cards and Modules

CAUTION: Electrostatic Discharge (ESD) may damage the platform components. Take precautions to eliminate ESD from your body and clothes before handling the platform or module by using a wrist band and a rubber mat and read the following section.

To prevent damage caused by ESD, it is recommended to follow these instructions:

- When unpacking a module, keep it in the anti-static wrapping until you are ready to install it in the device. Unwrap the module only at an ESD workstation or when grounded.
- If for any reason you cannot insert the module, lay it in an anti-static container or packaging.
- Handle the module only at ESD workstation and use anti-static rubber mat and wrist bands.
- Handle the module with care. Do not touch components and contacts on the board and hold board by its edges.
- Take off the RF ports terminators before using the ports only. Unused ports should be terminated.
- When cabling the RF ports, connect both cable ends immediately. Do not leave the cable end to be connected to the RF network unconnected. ESD may damage the module.

4.3.1.1 Tools for Mounting/Replacing a Card/Module

Mounting cards/modules requires the following screw driver:
Phillips/slot recess No. 2 Phillips

4.3.2 Replacing SREs/DLCs

The SREs/DLCs are mounted on the front side of the device. The SRE/DLCs are attached to the chassis with two screws. Prior to pulling a card, unfasten the screws.

1. Unfasten the screws that attach the card to the chassis.

![Figure 4–5: Line Card Screws](image)

2. While following the ESD guidelines mentioned above, hold on to the ejectors of the card.
Figure 4–6: Unlocking Line Card Ejectors

3. While pressing on the grey part of the ejector, pull the ejectors to open. Pull the top ejector upwards and the bottom ejector downwards, as indicated in the picture below.

Figure 4–7: Pulling Out a Line Card
The card slides out part of the way.

Figure 4–8: Dislodged Line Card

4. Pull the card out of its slot and lay it in an anti-static container or packaging.
5. While following the ESD guidelines mentioned above, unpack the replacement card.
6. Hold the line card in the correct direction. The name of the LC should be at the top. See Figure 1–8.
7. While holding the card (one hand holds the bottom of the card and the other the front of the card), insert it into the slot according to the guides. (See picture below.) As you push the card into the chassis, the card slides along the guides positioned at the bottom of the chassis.

Figure 4–9: Line Card Guides

8. While the ejectors are fully open, push the module until it reaches a stop as in Figure 4–10 on page 62, step 1. At this point the module should be almost fully inserted into the chassis.
9. Hold on to the ejectors and push the top ejector downwards and the bottom ejector upwards until the ejectors are set in their place. See Figure 4–10 on page 62, step 2.

![Figure 4–10: Inserting line cards](image)

Once ejectors are in their place, the edge-connector mates securely with the connector in the slot.

10. Tighten the screws that attach the card to the chassis. Failure to fully tighten the screws may lead to RF performance degradation.
4.3.3 Replacing the NSI Module

Replacing an NSI module is performed at the rear side of the platform. Follow the provided instructions while following the ESD guidelines.

1. When using NSI CM, pull it down to its down position (see Figure 4–22).
2. Disconnect all cables.
3. Unfasten the screws that attach the NSI module to the chassis as in Figure 4–11, number 1.

![Figure 4–11: Removing NSI Module](image)

4. Hold on to the handles of the NSI module and pull the module out of its slot as in Figure 4–11, number 2.
5. Lay it in an anti-static container or packaging.
6. Unpack the replacement NSI module.
7. Hold the NSI module and insert it into the required slot. Make sure that the edges at the top, slide into the notch of the slot, as in Figure 4–12 on page 64, Left-Side Insertion Detail and Right-Side Insertion Detail.
8.  

Figure 4–12: IOM Module Guides and Installation

9. Push the module until its edge-connector mates securely with the connector in the slot as in Figure 4–12 on page 64, number 1.
10. Tighten the screws to securely attach the IOM to the chassis as in Figure 4–12 on page 64, number 2.
11. Connect the cables, see 3.2 Cabling the Input GbE Ports on page 46.
4.3.4 Replacing the PICs

This procedure is performed on the rear side of the device.

1. When using RF CM, pull it to its down position. (see Figure 4–27)
2. Disconnect the cables.
3. Loosen the captive screws that attach the PIC to the chassis.

![Figure 4–13: PIC – Pulling Out](image)

4. Hold onto the handles and pull outwards to release the PIC.
5. Pull the PIC all the way out and lay it in an anti-static packaging.
6. While following the ESD guidelines mentioned above, unpack the required replacement PIC.
7. While holding the card, insert it into the slot according to the guides. As you push the card into the chassis, the card slides along the guides.
8. While the handles are fully open, push the module until it reaches a stop. At this point the module should be almost fully inserted into the chassis.
9. To complete module insertion and engage its internal connectors, hold on to the handles and push them inwards until the handles are set in their place.
10. Tighten the captive screws to securely attach the PIC to the chassis. Failure to fully tighten the screws may lead to RF performance degradation.
Appendix A
Contacting the Technical Assistance Center

Harmonic Global Service and Support has many Technical Assistance Centers (TAC) located globally, but virtually co-located where our customers can obtain technical assistance or request on-site visits from the Regional Field Service Management team. The TAC operates a Follow-The-Sun support model to provide Global Technical Support anytime, anywhere, through a single case management and virtual telephone system. Depending on time of day, anywhere in the world, we will receive and address your calls or emails in one of our global support centers. The Follow-the-Sun model greatly benefits our customers by providing continuous problem resolution and escalation of issues around the clock.

Report an issue online at:
http://harmonicinc.com/webform/report-issue-online

Table A–1: Technical Support Phone Numbers and Email Addresses

<table>
<thead>
<tr>
<th>Region</th>
<th>Telephone Technical Support</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>888.673.4896 (888.MPEG.TWO)</td>
<td><a href="mailto:support@harmonicinc.com">support@harmonicinc.com</a></td>
</tr>
<tr>
<td></td>
<td>or +1.408.490.6477</td>
<td></td>
</tr>
<tr>
<td>Europe, Middle East, and Africa</td>
<td>+44.1252.555.450</td>
<td><a href="mailto:emeasupport@harmonicinc.com">emeasupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>India</td>
<td>+91.120.498.3199</td>
<td><a href="mailto:apacsupport@harmonicinc.com">apacsupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Russia</td>
<td>+7.495.926.4608</td>
<td><a href="mailto:rusupport@harmonicinc.com">rusupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Mainland China</td>
<td>+86.10.6569.5580</td>
<td><a href="mailto:chinasupport@harmonicinc.com">chinasupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Japan</td>
<td>+81.3.5565.6737</td>
<td><a href="mailto:japansupport@harmonicinc.com">japansupport@harmonicinc.com</a></td>
</tr>
<tr>
<td>Asia Pacific – Other Territories</td>
<td>+852.3184.0045 or 65.6542.0050</td>
<td><a href="mailto:apacsupport@harmonicinc.com">apacsupport@harmonicinc.com</a></td>
</tr>
</tbody>
</table>

The Harmonic Inc. support website is:
http://www.harmonicinc.com/content/technical-support

The Harmonic Inc. software download locations are:

| All Harmonic software except Cable Edge software | https://harmonic.force.com/SWAccess/SWDownloadLogin |
| Cable Edge software                             | ftp://ftp.harmonicinc.com                           |
The Harmonic Inc. corporate address is:

Harmonic Inc.
4300 North First St.
San Jose, CA 95134, U.S.A.
Attn: Customer Support

The corporate telephone numbers for Harmonic Inc. are:

Tel. 1.800.788.1330 (inside the U.S.)
Tel. +1.408.542.2500 (outside the U.S.)
Fax. +1.408.542.2511
Appendix B
Safety and Regulatory Compliance Information

Legal Disclaimer: Information in this document is provided in connection with Harmonic products. Unless otherwise agreed in writing Harmonic products are not designed nor intended for any application in which the failure of the product could cause personal injury or death.

NOTE: The information in this appendix may apply to purchased products only.

Important Safety Instructions

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions are found throughout the guide where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons. You must adhere to the guidelines in this document to ensure and maintain compliance with existing product certifications and approvals. In this document, we use “product,” “equipment,” and “unit” interchangeably.

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 his or her own expense.

In event of conflict between the information in this document and information provided with the product or on our website for a particular product, this product documentation takes precedence.

Safety Symbols & Translated Safety, Warning & Caution Instructions (English)

To avoid personal injury or property damage, before you begin installing or replacing the product, read, observe, and adhere to all the following safety instructions and information. Harmonic products and/or product packaging may be marked with the safety symbols used throughout this document, when it is necessary to alert operators, users, and service providers to pertinent safety instructions in the manuals.
<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ![Warning] | **Installing or Replacing the Product Unit Warning**  
- Only trained and qualified service personnel should be allowed to install, replace, or service this unit (refer AS/NZS 3260 Clause 1.2.14.3 Service Personnel).  
- Read the installation instructions before connecting the system to the power source.  
- When installing or replacing the unit, always make the ground connection first and disconnect it last.  
- Installation of the unit must comply with local and national electrical codes.  
- This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of special tool, lock and key or other means of security.  
- Use only specified replacement parts.  
- Do not use this unit in or near water. Disconnect all AC power before installing any options or servicing the unit unless instructed to do so by this manual. |
| ![Warning] | **Rack Mount Warning**  
- To prevent bodily injury when mounting or servicing this unit in a rack, special precautions must be taken to ensure your safety and stability of system:  
  - Conform to local occupational health and safety requirements when moving and lifting the equipment.  
  - Ensure that mounting of the unit by mechanical loading tools should not induce hazardous conditions.  
  - To avoid risk of potential electric shock, a proper safety ground must be implemented for the rack and each piece of equipment installed on it. |
| ![Warning] | **Chassis Warning**  
- Before connecting or disconnecting ground or power wires to the chassis, ensure that power is removed from the DC circuit.  
- To prevent personal injury or damage to the chassis, lift the unit only by using handles that are an integral part of the chassis, or by holding the chassis underneath its lower edge.  
- Any instructions in this guide that require opening the chassis or removing a board should be performed by qualified service personnel only.  
- Slots and openings in the chassis are provided for ventilation. Do not block them. Leave the back of the frame clear for air exhaust cooling and to allow room for cabling - a minimum of 6 inches (15.24 cm) of clearance is recommended. |
### Electric Shock Warning

- This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit.
- Before working on a chassis or working near power supplies, unplug the power cord on AC units.
- Do not work on the system or connect or disconnect cables during periods of lightning activity.
- This unit is grounded through the power cord grounding conductor. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product input or outputs.
- Route power cords and other cables so that they are not likely to be damaged. Disconnect power input to unit before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth to clean chassis.
- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on. Do not insert anything into either of the system's two power supply cavities with power connected.
- Never install an AC power module and a DC power module in the same chassis.
- Do not wear hand jewelry or watch when troubleshooting high current circuits, such as the power supplies.
- To avoid fire hazard, use only the specified correct type voltage and current ratings as referenced in the appropriate parts list for this unit. Always refer fuse replacement to qualified service personnel.
- This unit relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors).
- To avoid electrocution ensure that the rack has been correctly grounded before switching on the unit. When removing the unit remove the grounding connection only after the unit is switched off and unplugged.

### Electrostatic Discharge (ESD) Caution

- Follow static precaution at all times when handling this unit.
- Always wear an ESD-preventive wrist or ankle strap when handling electronic components. Connect one end of the strap to an ESD jack or an unpainted metal component on the system.
- Handle cards by the faceplates and edges only; avoid touching the printed circuit board and connector pins.
- Place any removed component on an antistatic surface or in a static shielding bag.
- Avoid contact between the cards and clothing.
- Periodically check the resistance value of the antistatic strap. Recommended value is between 1 and 10 mega-ohms (Mohms).
<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ![Laser Radiation Warning](image) | **Laser Radiation Warning**  
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Never operate a unit with a broken fibre or with a separated fiber connector. |
| ![Lithium Battery Handling Safety Instructions](image) | **Lithium Battery Handling Safety Instructions**  
- **CALIFORNIA PERCHLORATE ADVISORY:** Some lithium batteries may contain perchlorate material. The following advisory is provided:  
  "Perchlorate Material - special handling may apply, see: [www.dtsc.ca.gov/hazardous_waste/perchlorate/](http://www.dtsc.ca.gov/hazardous_waste/perchlorate/) for information". |
| ![Caution](image) |  
- Risk of explosion if battery is replaced incorrectly or with an incorrect type  
- Dispose of used batteries according to the manufacturer’s instructions  
- There are no user-serviceable batteries inside Harmonic products. Refer to Harmonic qualified personnel only to service the replaceable batteries |

**Symboles de sécurité et traduits de sécurité, d'avertissement et Attention Instructions (français)**

Pour éviter des blessures ou des dommages matériels, avant de commencer l'installation ou le remplacement du produit, lire, observer, et de respecter toutes les instructions et informations de sécurité suivantes. Produits harmoniques et / ou l'emballage du produit peuvent être marqués avec les symboles de sécurité utilisés dans le présent document, lorsque cela est nécessaire pour alerter les opérateurs, les utilisateurs et les fournisseurs de services de consignes de sécurité pertinentes dans les manuels.
<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ![Exclamation Mark] | **Installation ou remplacement de l'unité de produit Avertissement**  
- Il est vivement recommandé de confier l'installation, le remplacement et la maintenance de ces équipements à des personnels qualifiés et expérimentés. (voir AS / NZS 3260 article 1.2.14.3 du personnel de service).  
- Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.  
- Lors de l'installation ou le remplacement de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.  
- L'équipement doit être installé conformément aux normes électriques nationales et locales.  
- Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité.  
- Utilisez uniquement des pièces de rechange spécifiées.  
- Ne pas utiliser ce produit dans l'eau ni à proximité de l'eau. Débrancher toutes les prises d'alimentation secteur avant d'installer des options ou d'effectuer l'entretien de l'unité, à moins d'instructions contraires dans le présent manuel. |
| ![Exclamation Mark] | **Rack Monture Avertissement**  
Pour éviter les blessures corporelles lors du montage ou l'entretien de cet appareil dans un rack, des précautions particulières doivent être prises pour assurer votre sécurité et la stabilité du système:  
- Conformez-vous aux exigences de médecine du travail et de sécurité lorsque vous déplacez et soulevez le matériel.  
- Assurez-vous que le montage de l'appareil par des outils de chargement mécaniques ne doit pas induire des conditions dangereuses.  
- Pour éviter tout risque d'électrocution, le rack et chaque élément de l'équipement installé dans le rack doivent être correctement reliés à la terre. |
| ![Exclamation Mark] | **Châssis Avertissement**  
- Avant de connecter ou de déconnecter les câbles d'alimentation (pôles et terre) du châssis, vérifiez que le circuit de courant continu est hors tension.  
- Pour éviter toute blessure ou des dommages au châssis, soulevez l'unité uniquement par les poignées du châssis lui-même ou en portant celui-ci par le bord inférieur.  
- Toutes les opérations du présent guide nécessitant l'ouverture du châssis ou le retrait d'une carte doivent être uniquement effectuées par du personnel d'entretien qualifié.  
- Le châssis est muni de fentes et d'ouvertures d'aération. Ne pas les bloquer. Dégager l'arrière du cadre pour permettre le refroidissement de l'évacuation d'air et laisser de la place au câblage; un dégagement d'au moins 15.24 cm (6 po) est recommandé. |
### Avertissement

<table>
<thead>
<tr>
<th>Mark</th>
<th>Choc électrique Avertissement</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbole de sécurité" /></td>
<td>Il est possible que cette unité soit munie de plusieurs cordons d'alimentation. Pour éviter les risques d'électrocution, débrancher les deux cordons d'alimentation avant de réparer l'unité.</td>
</tr>
<tr>
<td></td>
<td>Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.</td>
</tr>
<tr>
<td></td>
<td>Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.</td>
</tr>
<tr>
<td></td>
<td>Ce unité est mis à la terre par le conducteur de protection intégré au cordon d'alimentation. Pour éviter les chocs électriques, brancher le cordon d'alimentation dans une prise correctement cable avant de raccorder les entrées ou sorties du unité.</td>
</tr>
<tr>
<td></td>
<td>Installer les cordons d'alimentation et autres cables de sorte qu'ils ne risquent pas d'être endommagés. Couper l'alimentation avant nettoyage. Ne pas utiliser de nettoyant liquide ou en aérosol; utiliser seulement un linge humide.</td>
</tr>
<tr>
<td></td>
<td>Des courants électriques dangereux circulent dans cet appareil. Afin d'éviter les lessures, ne pas toucher les connexions et composants exposés lorsque l'appareil est sous tension. Ne rien insérer dans l'une ou l'autre des cavités des prises de courant du système lorsque l'appareil est sous tension.</td>
</tr>
<tr>
<td></td>
<td>N'installez jamais un module d'alimentation AC et un module d'alimentation DC dans le même châssis.</td>
</tr>
<tr>
<td></td>
<td>Ne pas porter de bijoux aux mains ni de montre durant le dépannage des circuits à haute tension, comme les transformateurs.</td>
</tr>
<tr>
<td></td>
<td>Pour prévenir les risques d'incendie, n'utiliser que le type, la tension et le courant nominal spécifiés dans la nomenclature des pièces de ce unité. Toujours confier le remplacement des fusibles à du personnel d'entretien qualifié.</td>
</tr>
<tr>
<td></td>
<td>Pour ce qui est de la protection contre les courts-circuits (surtension), ce produit dépend de l'installation électrique du local. Vérifier qu'un fusible ou qu'un disjoncteur de 120 V alt., 15 A U.S. maximum (240 V alt., 10 A international) est utilisé sur les conducteurs de phase (conducteurs de charge).</td>
</tr>
<tr>
<td></td>
<td>Pour éviter l'électrocution, assurez-vous que le rack a bien été mis à la terre avant de mettre l'unité en marche. Lors du retrait de l'unité, retirer le raccordement de terre seulement après avoir mis l'unité à l'arrêt et l'avoir débranchée.</td>
</tr>
</tbody>
</table>
### Les décharges électrostatiques (ESD) Attention
- Respecter systématiquement les précautions relatives aux charges électrostatiques durant la manipulation de cet unité.
- Portez toujours un poignet ou la cheville bracelet antistatique préventive lors de la manipulation des composants électroniques. Branchez une extrémité de la sangle à une prise ESD ou d’un composant métallique non peinte sur le système.
- Manipulez les cartes en les faces avant et les bords seulement; éviter de toucher la carte de circuit imprimé et les broches du connecteur.
- Placer un composant retiré sur une surface antistatique ou dans un sac de protection statique.
- Éviter tout contact entre les cartes et les vêtements.
- Vérifier périodiquement la valeur de résistance de la sangle antistatique. Valeur recommandée est comprise entre 1 et 10 méga-ohms (Mohms).

### Rayonnement laser Attention
- Rayonnement laser invisible peut être émis à partir de fibres ou les connecteurs débranchés. Ne pas regarder en faisceaux ou regarder directement avec des instruments optiques. Ne jamais faire fonctionner une unité en cas de bris d’une fibre ou de séparation d’un connecteur de fibre.

### Batterie au lithium Manipulation instructions de sécurité
- Perchlorate pour la Californie Consultatif: Certaines batteries au lithium, peuvent contenir du perchlorate. le texte qui suit consultatif est prévu: "Présence de perchlorate - une manipulation spéciale peut s’appliquer, voir: www.dtsc.ca.gov/hazardous waste/perchlorate/ for information".

### Il y a danger d’explosion si la batterie est remplacée de manière incorrecte ou par une batterie de type incorrect.
- Mettre au rebut les batteries usagées conformément aux instructions du fabricant.
- Les batteries des produits Harmonic ne peuvent pas être réparées ni entretenues par l’utilisateur. Ne confier l’entretien des batteries remplaçables qu’à du personnel compétent de Harmonic.
### Installation oder den Austausch des Produkts Einheit Warnung

- Das Installieren, Ersetzen oder Bedienen dieser Ausrüstung sollte nur geschultem, qualifiziertem Personal gestattet werden (siehe AS / NZS 3260 Clause 1.2. H.3 Servicepersonal)
- Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.
- Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.
- Die Installation der Geräte muss den Sicherheitsstandards entsprechen.
- Verwenden Sie nur die angegebenen Ersatzteile.

### Rack-Montage-Warnung

Zur Vermeidung von Körperversetzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt:

- Entsprechen den lokalen Arbeitsschutzanforderungen beim Bewegen und Heben der Ausrüstung.
- Stellen Sie sicher, dass die Montage des Gerätes durch mechanische Belastung Werkzeuge sollten nicht gefährlichen Bedingungen zu induzieren.
- Um das Risiko von möglichen elektrischen Schlag zu vermeiden, muss mit einer angemessenen Erdung für Rack und jedes Gerät installiert ist implementiert werden.

### Chassis Warnung

- Gleichstrom-Unterbrechung Bevor Sie Erdungs- oder Stromkabel an das Chassis anschließen oder von ihm abtrennen, ist sicherzustellen, daß der Gleichstrom-Stromkreis unterbrochen ist.
- Um Verletzungen und Beschädigung des Chassis zu vermeiden, sollten Sie das Chassis nicht an den Henkeln auf den Elementen (wie z.B. Stromanschlüsse, Kühlungen oder Karten) heben oder kippen; oder indem Sie es unterhalb der Unterkante packen.
- Alle Hinweise in diesem Handbuch, die das Öffnen benötigen Sie das Gehäuse oder das Entfernen eines Board sollte nur von qualifiziertem Fachpersonal durchgeführt werden.
### Elektroschock-Warnung

- Diese Einheit hat möglicherweise mehr als ein Netzkabel. Zur Verringerung der Stromschlaggefahr trennen Sie beide Netzgerätekabel ab, bevor Sie die Einheit warten.
- Vor der Arbeit an einem Chassis für Arbeiten in der Nähe Stromversorgung, ziehen Sie das Netzkabel mit Netzeinheiten.
- Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.
- Dieses Gerät ist über das Netzkabel Erdungsleiter geerdet. Um einen Stromschlag zu vermeiden, stecken Sie das Netzkabel in eine Steckdose richtig verdrahtet, bevor Sie das Produkt Eingang oder Ausgänge.
- Verlegen Sie Netzkabel und andere Kabel, so dass sie wahrscheinlich nicht beschädigt werden. Trennen Eingangsleistung Einheit vor der Reinigung. Verwenden Sie keine flüssigen oder Aerosolreiniger; nur mit einem feuchten Tuch zu reinigen Chassis.
- Ein Wechselstromsmodul und ein Gleichstrommodul dürfen niemals in demselben Chassis installiert werden.
- Tragen Sie keine Hand Schmuck oder schauen Sie bei der Fehlersuche hohen Stromkreise, wie beispielsweise die Stromversorgung.
- Um die Brandgefahr zu vermeiden, verwenden Sie nur den genannten richtige Art von Spannung und Strom Ratings als in der entsprechenden Stückliste für diese Einheit verwiesen. Beziehen sich immer auf Austausch der Sicherung von qualifiziertem Fachpersonal.
- Um einen Stromschlag zu vermeiden, sicherzustellen, dass die Zahnstange wurde korrekt vor dem Einschalten des Gerätes geerdet. Beim Entfernen der Einheit entfernen Sie die Masseverbindung nur, nachdem das Gerät ausgeschaltet und der Netzstecker gezogen.
### Site Preparation Instructions

**NOTE:** Only trained and qualified service personnel (as defined in IEC 60950 and AS/NZS 3260) should install, replace, or service the equipment. Install the system in accordance with the U.S. National Electric Code if you are in the United States.

1. **Preparing & Choosing a Site for Installation**
   - To ensure normal system operation, plan your site configuration and prepare the site before installation.
   - Install the unit in a restricted access area.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ![Vorsicht] | **Elektrostatische Entladung (ESD) Vorsicht**  
- Folgen Sie statische vorsorglich zu jeder Zeit beim Umgang mit diesem Gerät.  
- Hand Karten nur durch die Faceplates und Kanten; Berühren Sie die bedruckte Leiterplatte und Steckerstifte.  
- Legen Sie alle entfernten Komponenten auf eine antistatische Oberfläche oder in einem Statik-Beutel.  
- Kontakt zwischen den Karten und Kleidung vermeiden.  
- Den Widerstandswert der gegen statische Gurt in regelmäßigen Abständen überprüfen. Empfohlener Wert ist zwischen 1 und 10 Mega-Ohm (MΩ). |
| ![Warnung] | **Laserstrahlungen Warnung.**  
| ![Warnung] | **Lithium-Batterie Handhabung Sicherheitshinweise**  
| ![Vorsicht] |  
- Bei Einsetzen einer falschen Batterie besteht Explosionsgefahr  
- Entsorgen Sie die benutzten Batterien nach den Anweisungen des Herstellers.  
- Es gibt keine zu wartenden Akkus im Harmonic Produkte. Siehe Harmonic qualifiziertes Personal, um die austauschbare Batterien Service |
Appendix B Safety and Regulatory Compliance

Information

Site Preparation Instructions

- Choose a site with a dry, clean, well-ventilated and air-conditioned area.
- Choose a site that maintains an ambient temperature of 32 to 104°F (0 to 40°C)

2. Creating a Safe Environment
- Connect AC-powered systems to grounded power outlets or as per local regulations.
- Do not move or ship equipment unless it is correctly packed in its original wrapping and shipping containers.
- Only allow Harmonic trained personnel to undertake equipment service and maintenance. Do not permit unqualified personnel to operate the unit.
- Wear ear protection when working near an NSG Pro platform for a longer period of time.

3. Rack Mounting the Unit
- Install the system in an open rack whenever possible. If installation in an enclosed rack is unavoidable, ensure that the rack has adequate ventilation.
- 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 (e.g. use of power strips). This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in the partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.
- The rack must be anchored to an immovable support to prevent it from tipping when the unit is mounted on it. The rack must be installed accoring to the rack manufacturer’s instructions.
- Disconnect all power and external cables before lifting the unit. Depending on the weight of the unit, more than one person might be required to lift it.

4. Power Considerations
   a. AC Power
      - Adding to the system a UPS (Uninterrupted Power Supply) and an AVR (Automated Voltage Regulator) is highly recommended.
      - Installing the main power supply by a qualified electrician, according to power authority regulations. Make sure all powering are wired with an earth leakage, according to local regulations.
      - It is recommended to install the encoder within 1.5m (approximately 5 feet) from an easily accessible grounded AC outlet.
      - When the encoder is rack-mounted, ensure that the rack is correctly grounded.
   b. DC Power
      - Ensure a suitable overcurrent device is in-line between the equipment and the power source.
      - Connect DC-input power supplies only to a DC power source that complies with the safety extra-low voltage (SELV) requirements in the UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, AS/NZS 60950-1, EN/IEC 60825-1, 21 CFR 1040, EN 60950-1, and IEC 60950-1 standards.
      - Ensure that power is removed from the DC circuit before installing or removing power supplies

5. Handling Fiber Channel Cables
   - Always read and comply with the handling instructions on the shipping container.
   - Follow all ESD precautions and approved fiber cleaning procedures.
The fiber is made of a very pure, expensive glass and should be treated with great care. Handle fibers only in areas that are very clean and do not contain sharp objects.

Wear finger cots or gloves as dirt and oils can damage the fiber and contaminate connectors.

Do not allow kinks or knots to develop in the fiber. If tangles occur, carefully work out the tangles avoiding pulling or bending the fibre beyond its bend radius.

Always use the correct tools for stripping and cleaving the fiber. It will save time and reduce breakage caused by scratches.

If you must secure a bundle of fiber cables together, avoid plastic and metal tie wraps; secure with velcro instead.

6. Disposing of the Unit

Dispose of the unit and its components (including batteries) as specified by all national laws and regulations.

Product End-of-Life Disassembly Instructions

For disassembly instructions, please call the technical support in order to remove components requiring selective treatment, as defined by the EU WEEE Directive (2012/19/EU). See Contacting the Technical Assistance Center.

Product Disassembly Process

1. Disassemble equipment at a dedicated area only, gather the needed tools for disassembly.
2. Remove covers, housing, etc.
3. Remove and separate sub-assemblies (i.e. cables, metals, displays, fans, etc.).
4. Separate hazardous materials from the remainder of the material.
   a. Sort hazardous materials into their different types (i.e., batteries, hazardous liquids, hazardous solids, fiberglass, etc.).
   b. Proceed with hazardous waste management processes only.
5. Identify re-usable materials/sub-assemblies and separate these from the rest of the material.
6. Identify and separate recyclable materials as per below examples:
   a. Scrap material to be sent to smelter(s).
   b. E-waste such as displays, CPU’s, cables and wires, hard drives, keyboards, etc.
   c. Metals such as steel, brass, and aluminum.
   d. Plastics such as fan casings, housings, covers, etc.
   e. Fiber optics and plastic tubing not containing electrical or data wiring.

Safety Rules (English)

Recycler personnel are to wear personal protective equipment including proper eye protection, proper hand protection, and proper breathing protection if needed.

Recycler personnel shall be experienced with using the proper tools required for disassembling equipment. Untrained personnel shall not disassemble Harmonic products. Unfamiliarity with tools can cause damage and injury.

Règles de sécurité (French)

Le personnel du recyclage doit porter de l’équipement de protection individuelle, y compris des lunettes, des gants et un masque de protection appropriés au besoin.
Le personnel du recycleur doit avoir de l'expérience des outils de démontage de l'appareil. Les produits Harmonic ne doivent pas être démontés par du personnel non qualifié. Une mauvaise connaissance des outils peut causer des dommages et des blessures.

**EU Manufacturer's Declaration of Conformity**

This equipment is in compliance with the essential requirements and other provisions of Directives 73/23/EEC and 89/336/EEC as amended by Directive 93/68/EEC.

**NOTE:** For specifics, about which standards have been applied, refer to the Declaration of Conformity of the product on Harmonic website at Product Regulatory Compliance or contact Harmonic Compliance Team at regulatory.compliance@harmonicinc.com

**Electromagnetic Compatibility Notices – Class A**

a. **FCC Verification Statement (USA)**

   This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

   This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the 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 and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case users 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 and you may be required to correct any interference to radio or television communications at your own expense.

b. **ICES–003 Statement (Canada)**

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

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

c. **CE Declaration of Conformity (European Union)**

   This product has been tested in accordance too, and complies with the Low Voltage Directive (2014/30/EU) and EMC Directive (2014/35/EU). The product has been marked with the CE Mark to illustrate its compliance.
d. VCCI Class A Warning (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されます。

English translation of the notice above:
This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI) from Information Technology Equipment. If this equipment is used in a domestic environment, it may cause radio interference. When such trouble occurs, the user may be required to take corrective actions.

e. BSMI EMC Notice (Taiwan)

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

English translation of the notice above:
This is a Class A Information Product, when used in residential environment, it may cause radio frequency interference, under such circumstances, the user may be requested to take appropriate counter measures.

f. Class A Warning (Korea)

주의 A급 기기 이 기기는 업무용으로 전자파 적합 등록을 한 기기이 오니 판매자 또는 사용자는 이 점을 주의하시기 바랍니다. 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

English translation of the notice above:
This is a Class A device and is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this was sold or purchased by mistake, it should be replaced with a residential-use type.

g. Class A Statement (China)

中华人民共和国“A类”警告声明

声明
此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，
可能需要用户采取切实可行的措施。

English translation of the notice above:
When labeled with the CCC marking, the product meets the applicable safety and EMC requirements for China. This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

**h. Class A Warning – CISPR 22 (AS/NZS)**

**Warning (English)**

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

**Attention (French)**

Il s'agit d’un produit de classe A. Dans un environnement local, ce produit peut entraîner des perturbations radioélectriques, auquel cas l’utilisateur devra éventuellement prendre des mesures adéquates.

## Product Regulatory Compliance

Harmonic products are typically tested to the latest safety and electromagnetic compatibility (EMC) specifications and test methods, and are marked with one or more of the following regulatory/certification markings. Some of the certification markings will vary depending on what certifier was used to obtain a certification.

Please visit Harmonic [Product Regulatory Compliance](#) page to view information on applied safety & EMC standards and regulatory marks on Harmonic products. You can also email us at regulatory.compliance@harmonicinc.com for assistance on regulatory compliance for Harmonic products.

## Product Regulatory Compliance Markings

**Table B–1: Regulatory Compliance Markings**

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Testing Standard/Specification</th>
<th>Certification Type</th>
<th>Regulatory Mark Name</th>
<th>Product Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA/Canada</td>
<td>FCC CFR 47 Part 15, Class A; ICES-003: Issue 5, 2012; Class A</td>
<td>EMC</td>
<td>FCC Class A Statement</td>
<td><a href="https://www.fcc.gov">FCC Class A Statement</a></td>
</tr>
</tbody>
</table>

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*
<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Testing Standard/Specification</th>
<th>Certification Type</th>
<th>Regulatory Mark Name</th>
<th>Product Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EN61000-3-2:2006+A1:2009+A2:2009; EN61000-3-3:2008; Class A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>EN 60950-1; EN60825-1 (for laser)</td>
<td>Safety</td>
<td>GS</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>NOM-019-SCFI-1998</td>
<td>Safety</td>
<td>NOM</td>
<td></td>
</tr>
<tr>
<td>Taiwan</td>
<td>CNS 14336-1:2010; CNS 13438:2006; Class A</td>
<td>Safety and EMC</td>
<td>BSMI Certification (RPC Number &amp; Class A Warning)</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>VCCI V-3/2013.04; CISPR 22:2008, Class A</td>
<td>EMC</td>
<td>VCCI</td>
<td></td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>AS/NZS CISPR22:2009+A1:2010; Class A</td>
<td>Safety</td>
<td>C-Tick</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>KN22 Class A and KN24</td>
<td>EMC</td>
<td>KC</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B Safety and Regulatory Compliance

Product Environmental Compliance

Harmonic manufactures high quality and innovative IT and telecommunications equipment, video delivery infrastructure solutions and services for its customers worldwide. Harmonic is committed to providing our customers with safe and environmentally friendly products that are compliant with all relevant regulations, customer specifications, and environmental legislation, including the directives described below.

EU RoHS

In July 2006, the European Union’s (EU) Directive (2002/95/EC) on the Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE) went into effect, and in July, 2011, the European Union’s RoHS Recast Directive (2011/65/EU) also known as RoHS II entered into force.

Harmonic understands the environmental risks associated with the substances covered by the RoHS Directive and has committed to eliminating or reducing the use of these, as well as other environmentally sensitive substances in our products. Harmonic also continues to comply with the requirements under RoHS II.

For more information, please visit EU RoHS directive page at official EU website.


Restricted Substance Statement

Harmonic products contain less than the permitted limits for the six restricted substances except where exemptions published in the RoHS2 Directive are applicable. This statement is based on vendor-supplied analysis or material certifications, and/or lab test results of the component raw materials used in the manufacture of Harmonic products.

Table B–2:Restricted Substances

<table>
<thead>
<tr>
<th>Restricted Substance</th>
<th>Permitted Limit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (Cd)</td>
<td>( \leq 0.01% )</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>( \leq 0.1% )</td>
</tr>
<tr>
<td>Chromium (VI) (Cr (VI))</td>
<td>( \leq 0.1% )</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td>( \leq 0.1% )</td>
</tr>
</tbody>
</table>
Table B–2: Restricted Substances

<table>
<thead>
<tr>
<th>Restricted Substance</th>
<th>Permitted Limit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polybrominated biphenyls (PBBs)</td>
<td>≤ 0.1%</td>
</tr>
<tr>
<td>Polybrominated diphenyl ether (PBDE)</td>
<td>≤ 0.1%</td>
</tr>
</tbody>
</table>

*Homogeneous material definition as per the EU Directive.

EU REACH


Harmonic supports the basic aim of REACH in improving the protection of human health and environment through the better and earlier identification of intrinsic properties of chemical substances. Harmonic products are considered “articles” under REACH; therefore, we are required to provide recipients of our products with information on Substance of Very High Concern (SVHC) present in concentration above 0.1% (w/w).

Substances in our products are not intended to be released under normal or reasonably foreseeable conditions of use; therefore, the registration requirement in REACH Article 7(1) does not apply to our products.

For more information, please visit REACH regulation page at official EU website.

http://ec.europa.eu/environment/chemicals/reach/reach_en.htm

China RoHS

China’s regulation on restriction of the use of certain hazardous substances commonly (China RoHS), is applicable to all Electronic and Information Products (EIPs) and parts sold in China after March 01, 2007. China RoHS regulation restricts the use of the same six substances as the European Union’s ROHS, but has requirements for product labeling and regulated substance information disclosure.

Harmonic complies with China RoHS Phase I for labeling and information disclosure requirements and continues to monitor new developments in China RoHS Phase II towards substance restriction and certification program.

For more information, please visit China RoHS regulation page at official US export website.

http://www.export.gov/china/doingbizinchina/
Appendix B Safety and Regulatory Compliance

Information

China RoHS Disclosure Report

Below table shows the presence of hazardous substances, or elements in Harmonic products, if the part is present.

This table shows those components where hazardous substances may be found in Harmonic products based on, among other things, material content information provided by third party suppliers. These components may or may not be part of the product.

The Environmental Protective Use Period for Harmonic products is 20 years unless displayed otherwise on the product. The EPLP period is valid only when the products are operated or stored as per the conditions specified in the product manual.

<table>
<thead>
<tr>
<th>部件名称 (Part name)</th>
<th>有毒有害物质或元素 (Hazardous Substance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>部件名称 (Part name)</td>
<td>铅 (Pb) 汞 (Hg) 镉 (Cd) 六价铬 (CrVI) 多溴联苯 (PBB) 多溴二苯醚 (PBDE)</td>
</tr>
<tr>
<td>印刷电路板 (Printed Circuit Assemblies)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>机械组件 (Mechanical Subassemblies)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>光学组件 (Optical Subassemblies)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>电源 (Power Supplies)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>缆线 / 线束 (Cables, harnesses)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>屏幕 / 显示器 (Screens, Monitors)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>金属零件 (Metal Parts)</td>
<td>X O O O O O</td>
</tr>
<tr>
<td>塑料 / 发泡材料 (Plastics, foams)</td>
<td>O O O O O O</td>
</tr>
<tr>
<td>电池 (Batteries)</td>
<td>O O O O O O</td>
</tr>
</tbody>
</table>

O: 表示在该部件的所有均质材料中，此类有毒有害物质的含量均小于 SJ/T11363-2006 标准所规定的限量。
X: 表示在该部件的某一均质材料中，此类有毒有害物质的含量超出 SJ/T11363-2006 标准规定的限量。
Other RoHS and REACH type Regulations

Harmonic will comply with RoHS and REACH type regulations evolving in other countries, if they become relevant to our products or in markets where we sell our products.

Waste Electrical and Electronic Equipment (WEEE)

European Parliament and the Council of the European Union’s WEEE Directive (2002/96/EC) came into force on August, 2005 and, were more recently amended in July, 2012. This directive encourages the reuse, recycling, and recovery of WEEE and to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, especially those dealing with WEEE. Harmonic ensures that all requirements for registration, reporting, design and data tracking are complied with to meet the objectives of the WEEE directive.

For more information, please visit WEEE directive page at official EU website.


Battery Directive

In September 2006, the European Union’s Directive 2006/66/EC (Battery Directive) came into force with an aim to prohibit the sale of batteries and accumulators containing hazardous substances and to set rules and promote collection, treatment, recycling and disposal of waste batteries and accumulators. This directive applies to spent batteries collected together with WEEE and requires their removal and separate collection. Once removed from WEEE, spent batteries are governed by the Battery Directive. Harmonic uses lithium batteries in its products and our responsibility under the Battery Directive is taken care of under our WEEE Take-Back program.

For more information, please visit Batteries and Accumulators directive page at official EU website.

http://ec.europa.eu/environment/waste/batteries/

Harmonic is committed to manufacturing environmentally safe products for the community, and will make reasonable efforts and required adjustments to its practices, if necessary, to comply with various environmental directives and industry initiatives on the elimination of hazardous substances, labeling, marking, certification and registration as required in markets where we sell our products.

Download Harmonic’s Environmental Compliance Statement at the following location:


WEEE Take-Back Request Program

In order to assist EU member states to preserve, protect and improve the quality of the environment, protect human health and utilize natural resources prudently and rationally, Harmonic strives to recycle in compliance with the WEEE Directive any of its products that cannot be re-used.

Harmonic’s customers should:

- Not discard equipment in household or office garbage
- Arrange proper recycling of unneeded equipment. For the take-back of Harmonic equipment, customers must:
  - Collect the information required to complete Harmonic’s WEEE Take-Back Request form
Appendix B Safety and Regulatory Compliance  

Information

- Complete and submit the online WEEE Take-Back Request form. Please note that forms must be fully completed in order to prevent process delays
- Receive instant online confirmation indicating the reference number
- Receive the End of Life (EOL) asset return authorization number and instruction for EOL asset return
  - Not ship EOL product to Harmonic without a Harmonic-provided EOL asset return authorization number

The crossed-out wheeled bin symbol on a Harmonic-branded commercial product indicates that the product should not be disposed of along with municipal waste, but invites our customers to return the product to us under Harmonic’s WEEE Take-Back program for product disposal.

Harmonic will pay for the cost of shipping and will provide a Certificate of Recycling or a Certificate of Destruction upon request. For more information on collection, reuse and recycling or to initiate the WEEE take-back process, please complete the form at [http://www.harmonicinc.com/webform/weee-takeback-request](http://www.harmonicinc.com/webform/weee-takeback-request) or contact Harmonic Technical Assistance Center (TAC) or email RMA team at rma.emea@harmonicinc.com.

Compliance with additional country specific environmental, safety, and EMC standards

In addition to above listed standards and compliance regulations, Harmonic products may also be compliant with other country specific environmental, safety and EMC requirements. Please contact Harmonic Compliance Team at regulatory.compliance@harmonicinc.com or your local sales representative for more information about compliance with particular country or standard.
Appendix C

Wiring –48 VDC Power Supply Units

If your NSG Pro uses –48 VDC PSUs, follow these steps to wire the PSUs.

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 Pro device must meet the following requirement:

- Electrically isolated from any AC power source

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

Table C–1: Feed-pair Power Supply Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>-42 to -60 VDC</td>
</tr>
<tr>
<td>Max. operating current at -48 VDC</td>
<td>46 A</td>
</tr>
</tbody>
</table>

Every power supply unit in a pair is connected to an independent power bus, A & B power buses for redundancy purposes. See Figure 1–7 on page 19.

NOTE: For information on overcurrent, see 2.2.5.2 Overcurrent protection on page 37.

Wiring Requirements

Each NSG Pro power input is connected to the DC power sources using two wires:

- -48 RTN
- -48 VDC

In addition, the NSG Pro chassis must be connected to the main Earth line of the rack, using a 6 AWG copper wire.

Although Harmonic provides the power input lugs, you must supply the wires. The wires to be used must comply with the following specifications:

Table C–2: DC Wiring Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable conductor material</td>
<td>Copper only</td>
</tr>
<tr>
<td>RTN and -48</td>
<td>6 AWG rating</td>
</tr>
</tbody>
</table>
Table C–2: DC Wiring Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal Lugs</td>
<td>Copper lugs with the following: Wire strip length - 7/8&quot;</td>
</tr>
<tr>
<td></td>
<td>Stud size - #10</td>
</tr>
<tr>
<td></td>
<td>Recommended lug - Panduit LCD6-10A-L</td>
</tr>
<tr>
<td>Cable insulation rating</td>
<td>Minimum 80 C, low smoke fume (LSF), flame retardant</td>
</tr>
<tr>
<td>Cable type</td>
<td>Must comply with at least one of the following standards:</td>
</tr>
<tr>
<td></td>
<td>■ UL 1581 (VW-1) - UL style 1028 or equivalent</td>
</tr>
<tr>
<td></td>
<td>■ EEE 383</td>
</tr>
<tr>
<td></td>
<td>■ EEE 1202-1991</td>
</tr>
<tr>
<td>Branch circuit cable</td>
<td>Per applicable national electrical codes</td>
</tr>
<tr>
<td>insulation color</td>
<td></td>
</tr>
</tbody>
</table>

For grounding instructions, see 3.6.1 Grounding the Mounted Platform on page 51.

**Power Connector**

The NSG Pro is supplied with a special DC power lugs that match the DC power socket on the power input.

This connector is made by Panduit, model number LCD6-10A-L, copper lug, two holes standard barrel.

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

The following figure shows the NSG Pro power inputs:
Assembling the DC Input Power Cable

NOTE: Prior to DC assembly, ground the device as instructed in 3.6.1 Grounding the Mounted Platform on page 51.

CAUTION: Tighten DC power lug with a 5/16" socket and 1/4" drive, max torque 35 lbf-in.

To assemble the DC input power cable:

1. Prepare the power wires by terminating them with the supplied lugs.
2. Make sure that the circuit breaker at the DC power source to the cables is switched off.

CAUTION: Turn off the power before proceeding with these instructions.

3. Identify both wires coming from the DC power source that are used in the connection to the expansion unit:
   - RTN 48V (Red)
   - -48VDC (Black)

4. To connect the RTN 48V (Red) to its terminal do the following:
   a. Identify the location of the RTN 48V (Red) according to the indication on the panel.
   b. Place the lug on the terminal.
c. Place the spring washer on each terminal pin.
d. Fasten the nuts according to the above torque criteria.

5. To connect the -48VDC (Black) to its terminal do the following:
   a. Identify the location of the -48VDC (Black) according to the indication on the panel.
   b. Place the lug on the terminal.
   c. Place the spring washer on each terminal pin.
   d. Fasten the nuts.

6. Place the Plastic terminal cover to protect the connections.

7. To connect properly to the plant power source, see Figure 1–7 on page 19. Make sure that the A and B PSLUs are connected to the appropriate DC plant sources.

8. Complete any other cabling that may still be needed, and engage the disconnected circuit breakers to start using the device.
Mounting Brackets on the Platform

1. From the kit, shipped with the platform, obtain the left and right brackets.

![Left Bracket](image1)
![Right Bracket](image2)

Figure 4–15: Platform Brackets
2. Attach the bracket on the side of the device until the bracket holes line up with the holes on the chassis as in Figure 4–16 on page 94, step 1.

![Figure 4–16: Platform with Bracket Placement Marks](image)

3. Insert screws and screw them to attach the bracket to the platform as in Figure 4–16 on page 94, step 2.
4. Repeat for the other side of the platform as in Figure 4–16 on page 94, step 3.

Figure 4–17: Platform with attached brackets
Appendix E
Using Cable Management

Overview

The NSG Pro is furnished with CM for arranging the cables of the NSI module and the PICs. You can mount the NSG Pro with the following CMs:

- NSI cable management
- RF cable management:
  - RF CM for RG-6/59 cables
  - RF CM for Octopus cables

If you wish to use a cable management, mount it on the device prior to mounting the device on the rack.

Each cable management is furnished with sets of holes that determine the distance of the cable management form the rear side. In each sketch the set of holes for positioning the CM is marked by the screws that occupy the relevant holes:

Figure 4–18: Mounting Options for Connection CMs
NSI Cable Management (CM)

The NSI CM is comprised of the following:
- Two brackets that connect the NSI cable management to the chassis
- Reels and holders to hold the fibers and cables
- Handles to move the NSI cable management

Figure 4–19: NSI Cable Management
Mounting the NSI CM on the Chassis

1. Locate the required holes on the side of the chassis.

![Holes for Attaching NSI CM to Chassis](image)

**Figure 4–20: Holes for Attaching NSI CM to Chassis**

2. Attach the brackets of the NSI CM on the sides of the chassis following the up sign on the brackets, until the bracket holes line up with the holes on the chassis.

Note that all cable managements are furnished with sets of holes that determine the distance of the cable management form the rear side. See *Figure 4–18* on page 96.

3. Insert screws and screw them to attach the bracket to the chassis.

4. Repeat for the other side of the chassis.

NSI CM has three positions to allow ease of use. The CM is secured to its position due to the notches along its inner side: See *Figure 4–21* on page 99 and figure *Figure 4–22* on page 100.
Figure 4–21: NSI CM - Notches Detail

- Up position
- Middle position
- Down position

CAUTION!
To remove all power from unit, unplug PS0-A, PS1-B, PS2-A & PS3-B.
Figure 4–22: NSI CM Positions
5. To start cabling, use the down position. Hold both handles and pull them inwards to release the handle once the notch is secured in its hole.

Figure 4–23: NSI CM Starting Cabling

For further cabling instructions, see 3.2 Cabling the Input GbE Ports on page 46.
RF Cable Management

There are two types of RF CM according to cables you use:

- RF CM for RG-6/59
- RF CM for Octopus cable

**RF CM for RG-6/59**

The RF CM is comprised of the following:

- 2 x brackets that connect the NSI cable management to the chassis
- 3 x shelves to hold the cables
- 2 x Handles per each shelf to move the RF CM shelf

**RF CM for Octopus Cable**

The RF CM is comprised of the following:

- 2 x brackets that connect to both sides of the chassis
Figure 4–25: RF CM for Octopus Cables

Mounting the RF Cable Management

NOTE: The illustrations refer to the RF CM for RG-6/59 cables. The instruction apply to both RF CM types unless else is indicated.

1. Locate the required holes on the side of the chassis, step 1 in Figure 4–26.
2. Attach the brackets of the RF CM on the sides of the chassis following the up sign on the brackets, until the bracket holes line up with the holes on the chassis. Step 2 in Figure 4–26.

Note that all cable managements are furnished with sets of holes that determine the distance of the cable management from the rear side. See Figure 4–18 on page 96.

3. Repeat for the other side of the chassis.

Applies to RF CM for RG-6/59 - Each shelf of the RF CM has three positions to allow ease of use: down, middle and up position.

Figure 4–27: RF CM Positions

4. Applies to RF CM for RG-6/59. To place the shelf at the required position, push the handles of the shelf inwards and pull the shelf along the slot to the required position and verify that the notch is secured in its hole.
5. RF CM for RG-6/59 - To start cabling, use the down position. Connect the cable and then hook it in the cable slot as the following picture shows:

![Image showing RF CM with Cables]

Figure 4–28: RF CM with Cables

RF CM for Octopus - Connect the cable and hook it through the hooks.

6. Continue connecting all cables. See 3.3 Connecting the QAM-RF Output Cables on page 49.
### Table 4–1: NSG Pro Ordering Guide

<table>
<thead>
<tr>
<th>Category</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-BZL</td>
<td>NSG-Pro Front Bezel</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-CHS-AC</td>
<td>NSG-Pro Chassis, AC Power option, 4 x AC PSU Slots</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-CHS-DC</td>
<td>NSG-Pro Chassis, DC Power option, 4 x DC PSU Slots</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-DLC</td>
<td>NSG-Pro Downstream RF Line-card, 6 x RF ports</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-DS-PIC-M</td>
<td>NSG-Pro Downstream RF Matrix Card, MCX conn.</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-FANS</td>
<td>NSG-Pro Cooling Fans Block</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-NSI1</td>
<td>NSG-Pro NSI (Interface card), 12 x 10G, ETH, DTI</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-PS-AC</td>
<td>NSG-Pro Power Supply Unit, AC</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-PS-DC</td>
<td>NSG-Pro Power Supply Unit, DC</td>
</tr>
<tr>
<td>Hardware modules</td>
<td>NSGPRO-SRE</td>
<td>NSG-Pro Switch &amp; Route Engine (Main Board)</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-ACCSRY-CBLMNG-NSI</td>
<td>NSG-Pro Cables management kit for NSI cabling</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-ACCSRY-BRKT-RF</td>
<td>NSG-Pro Accessory - Brackets kit for H-UCH RF cables management</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-ACCSRY-RACKMOUNT</td>
<td>NSG-Pro Rack-mounting kit, long option. Min/Max rack depth 64/100cm (25/39.5 inch)</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-ACCSRY-RKMNT-45</td>
<td>NSG-Pro Rack-mounting kit, Short option. Min/Max rack depth 45/66cm (17.75/26 inch)</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-BLNK-NSI</td>
<td>NSG-Pro Blank panel, for NSI slot</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-BLNK-LC</td>
<td>NSG-Pro Blank panel, for RF Line-card slot</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-BLNK-SRE</td>
<td>NSG-Pro Blank panel, for SRE slot</td>
</tr>
</tbody>
</table>
Table 4–1: NSG Pro Ordering Guide

<table>
<thead>
<tr>
<th>Category</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-HUCH6-HRNS-2S-2M</td>
<td>NSG-Pro &quot;Octopus&quot; RF Cable. Includes 6 x RF cables with MCX connectors, and H-UCH block connector, dual-shielded, 2-meters long</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-CBL-PWR-AC-NA</td>
<td>AC Power Cord for NSG-Pro, for North America. NEMA L6-20P plug on grid side, rated 20A 250V</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-CBL-PWR-AC-EU</td>
<td>AC Power Cord for NSG-Pro, for Europe. CEE 7/7 plug on grid side, rated 16A 250V</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>SGPRO-CBL-PWR-AC-UK</td>
<td>AC Power Cord for NSG-Pro, for UK. BS 1363 13A plug on grid side, rated 13A 250V</td>
</tr>
<tr>
<td>Hardware accessories</td>
<td>NSGPRO-CBL-PWR-AC-GEN</td>
<td>Generic AC Power Cord for NSG-Pro. IEC-60320-C19 connector on device side, grid side un-terminated, rated 16A 250V</td>
</tr>
<tr>
<td>Licenses</td>
<td>FW-NSGPRO-QAM</td>
<td>License for a single BASIC QAM-RF channel on NSG-Pro. Enables streaming of VOD, SDV, or Broadcast pass-through video. Also supports non-primary DS DOCSIS traffic</td>
</tr>
<tr>
<td>Licenses</td>
<td>FW-NSGPRO-NSCR-PM</td>
<td>License for a single PM- Scrambled VOD channel on NSG-Pro. Enables Privacy Mode scrambling of VOD content. Sold as an addition to BASIC QAM license</td>
</tr>
<tr>
<td>Licenses</td>
<td>FW-NSGPRO-NSCR-DVB</td>
<td>License for a single DVB-Scrambled VOD channel on NSG-Pro. Enables DVB scrambling of VOD content. Sold as an addition to BASIC QAM license</td>
</tr>
<tr>
<td>Licenses</td>
<td>FW-NSGPRO-DOCDTI</td>
<td>License for DOCSIS synch re-stamping on a single M-CMTS QAM channel on NSG-Pro. Sold as an addition to BASIC QAM license</td>
</tr>
<tr>
<td>Licenses</td>
<td>FW-NSGPRO-BMUX</td>
<td>License for a single Broadcast remux channel on NSG-Pro. Enables re-multiplexing of broadcast traffic. Sold as an addition to BASIC QAM license</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-8QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 8 x BASIC QAM Lic. per port, 48 per DLC</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-16QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 16 x BASIC QAM Lic. per port, 96 per DLC</td>
</tr>
</tbody>
</table>
### Table 4–1: NSG Pro Ordering Guide

<table>
<thead>
<tr>
<th>Category</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-24QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 24 x BASIC QAM Lic. per port, 144 per DLC</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-32QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 32 x BASIC QAM Lic. per port, 192 per DLC</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-40QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 40 x BASIC QAM Lic. per port, 240 per DLC</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-48QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 48 x BASIC QAM Lic. per port, 288 per DLC</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-56QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 56 x BASIC QAM Lic. per port, 336 per DLC</td>
</tr>
<tr>
<td>Bundles</td>
<td>NSGPRO-BNDL-DLC-64QP</td>
<td>NSG-Pro Downstream RF Line-card, bundled with 64 x BASIC QAM Lic. per port, 384 per DLC</td>
</tr>
</tbody>
</table>