# Cisco GS7000
# DOCSIS Status Monitor Transponder
## Installation and Operation Guide

# For Your Safety

## Explanation of Warning and Caution Icons

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

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

**You may find this symbol in the document that accompanies this product. This symbol indicates important operating or maintenance instructions.**

**You may find this symbol affixed to the product. This symbol indicates a live terminal where a dangerous voltage may be present; the tip of the flash points to the terminal device.**

**You may find this symbol affixed to the product. This symbol indicates a protective ground terminal.**

**You may find this symbol affixed to the product. This symbol indicates a chassis terminal (normally used for equipotential bonding).**

**You may find this symbol affixed to the product. This symbol warns of a potentially hot surface.**

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

## Important

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

# Notices

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## Copyright

# Contents

# Important Safety Instructions

## Read and Retain Instructions

Carefully read all safety and operating instructions before operating this equipment, and retain them for future reference.

## Follow Instructions and Heed Warnings

Follow all operating and use instructions. Pay attention to all warnings and cautions in the operating instructions, as well as those that are affixed to this equipment.

## Terminology

The terms defined below are used in this document. The definitions given are based on those found in safety standards.

**Service Personnel** - The term *service personnel* applies to trained and qualified individuals who are allowed to install, replace, or service electrical equipment. The service personnel are expected to use their experience and technical skills to avoid possible injury to themselves and others due to hazards that exist in service and restricted access areas.

**User and Operator** - The terms *user* and *operator* apply to persons other than service personnel.

**Ground(ing) and Earth(ing)** - The terms *ground(ing)* and *earth(ing)* are synonymous. This document uses ground(ing) for clarity, but it can be interpreted as having the same meaning as earth(ing).

## Electric Shock Hazard

This equipment meets applicable safety standards.

**WARNING:**

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

Electric shock can cause personal injury or even death. Avoid direct contact with dangerous voltages at all times.

Know the following safety warnings and guidelines:

- Only qualified service personnel are allowed to perform equipment installation or replacement.

- Only qualified service personnel are allowed to remove chassis covers and access any of the components inside the chassis.

## Equipment Placement

**WARNING:**

**Avoid personal injury and damage to this equipment. An unstable mounting surface may cause this equipment to fall.**

To protect against equipment damage or injury to personnel, comply with the following:

- Install this equipment in a restricted access location (access restricted to service personnel).
- Make sure the mounting surface or rack is stable and can support the size and weight of this equipment.

## Strand (Aerial) Installation

**CAUTION:**

**Be aware of the size and weight of strand-mounted equipment during the installation operation.**

**Ensure that the strand can safely support the equipment's weight.**

## Pedestal, Service Closet, Equipment Room or Underground Vault Installation

**WARNING:**

**Avoid the possibility of personal injury. Ensure proper handling/lifting techniques are employed when working in confined spaces with heavy equipment.**

- Ensure this equipment is securely fastened to the mounting surface or rack where necessary to protect against damage due to any disturbance and subsequent fall.
- Ensure the mounting surface or rack is appropriately anchored according to manufacturer's specifications.
- Ensure the installation site meets the ventilation requirements given in the equipment's data sheet to avoid the possibility of equipment overheating.
- Ensure the installation site and operating environment is compatible with the equipment's International Protection (IP) rating specified in the equipment's data sheet.

## Connecting to Utility AC Power

**Important:** If this equipment is a Class I equipment, it must be grounded.

- If this equipment plugs into an outlet, the outlet must be near this equipment, and must be easily accessible.
- Connect this equipment only to the power sources that are identified on the equipment-rating label, which is normally located close to the power inlet connector(s).
- This equipment may have two power sources. Be sure to disconnect all power sources before working on this equipment.
- If this equipment **does not** have a main power switch, the power cord connector serves as the disconnect device.
- Always pull on the plug or the connector to disconnect a cable. Never pull on the cable itself.

## Connection to Network Power Sources

Refer to this equipment's specific installation instructions in this manual or in companion manuals in this series for connection to network ferro-resonant AC power sources.

## AC Power Shunts

AC power shunts may be provided with this equipment.

**Important:** The power shunts (where provided) must be removed before installing modules into a powered housing. With the shunts removed, power surge to the components and RF-connectors is reduced.

**CAUTION:**

**RF connectors and housing seizure assemblies can be damaged if shunts are not removed from the equipment before installing or removing modules from the housing.**

## Grounding (Utility AC Powered Equipment in Pedestals, Service Closets, etc.)

This section provides instructions for verifying that the equipment is properly grounded.

### Safety Plugs (USA Only)

This equipment may be equipped with either a 3-terminal (grounding-type) safety plug or a 2-terminal (polarized) safety plug. The wide blade or the third terminal is provided for safety. Do not defeat the safety purpose of the grounding-type or polarized safety plug.

To properly ground this equipment, follow these safety guidelines:

- **Grounding-Type Plug** - For a 3-terminal plug (one terminal on this plug is a protective grounding pin), insert the plug into a grounded mains, 3-terminal outlet.

  **Note:** This plug fits only one way. If this plug cannot be fully inserted into the outlet, contact an electrician to replace the obsolete 3-terminal outlet.

- **Polarized Plug** - For a 2-terminal plug (a polarized plug with one wide blade and one narrow blade), insert the plug into a polarized mains, 2-terminal outlet in which one socket is wider than the other.

  **Note:** If this plug cannot be fully inserted into the outlet, try reversing the plug. If the plug still fails to fit, contact an electrician to replace the obsolete 2-terminal outlet.

### Grounding Terminal

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

### Safety Plugs (European Union)

- **Class I Mains Powered Equipment –** Provided with a 3-terminal AC inlet and requires connection to a 3-terminal mains supply outlet via a 3-terminal power cord for proper connection to the protective ground.

  **Note:** The equipotential bonding terminal provided on some equipment is not designed to function as a protective ground connection.

- **Class II Mains Powered Equipment –** Provided with a 2-terminal AC inlet that may be connected by a 2-terminal power cord to the mains supply outlet. No connection to the protective ground is required as this class of equipment is provided with double or reinforced and/or supplementary insulation in addition to the basic insulation provided in Class I equipment.

  **Note:** Class II equipment, which is subject to EN 50083-1, is provided with a chassis mounted equipotential bonding terminal. See the section titled **Equipotential Bonding** for connection instructions.

## Equipotential Bonding

If this equipment is equipped with an external chassis terminal marked with the IEC 60417-5020 chassis icon (  ), the installer should refer to CENELEC standard EN 50083-1 or IEC standard IEC 60728-11 for correct equipotential bonding connection instructions.

## General Servicing Precautions

**WARNING:**

**Avoid electric shock! Opening or removing this equipment's cover may expose you to dangerous voltages.**

**CAUTION:**

**These servicing precautions are for the guidance of qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.**

Be aware of the following general precautions and guidelines:

- **Servicing** - Servicing is required when this equipment has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into this equipment, this equipment has been exposed to rain or moisture, does not operate normally, or has been dropped.
- **Wristwatch and Jewelry** - For personal safety and to avoid damage of this equipment during service and repair, do not wear electrically conducting objects such as a wristwatch or jewelry.
- **Lightning** - Do not work on this equipment, or connect or disconnect cables, during periods of lightning.
- **Labels** - Do not remove any warning labels. Replace damaged or illegible warning labels with new ones.
- **Covers** - Do not open the cover of this equipment and attempt service unless instructed to do so in the instructions. Refer all servicing to qualified service personnel only.
- **Moisture** - Do not allow moisture to enter this equipment.
- **Cleaning** - Use a damp cloth for cleaning.
- **Safety Checks** - After service, assemble this equipment and perform safety checks to ensure it is safe to use before putting it back into operation.

## Electrostatic Discharge

Electrostatic discharge (ESD) results from the static electricity buildup on the human body and other objects. This static discharge can degrade components and cause failures.

Take the following precautions against electrostatic discharge:

- Use an anti-static bench mat and a wrist strap or ankle strap designed to safely ground ESD potentials through a resistive element.
- Keep components in their anti-static packaging until installed.

- Avoid touching electronic components when installing a module.

## Fuse Replacement

To replace a fuse, comply with the following:

- Disconnect the power before changing fuses.
- Identify and clear the condition that caused the original fuse failure.
- Always use a fuse of the correct type and rating. The correct type and rating are indicated on this equipment.

## Batteries

This product may contain batteries. Special instructions apply regarding the safe use and disposal of batteries:

Safety

- Insert batteries correctly. There may be a risk of explosion if the batteries are incorrectly inserted.
- Do not attempt to recharge 'disposable' or 'non-reusable' batteries.
- Please follow instructions provided for charging 'rechargeable' batteries.
- Replace batteries with the same or equivalent type recommended by manufacturer.
- Do not expose batteries to temperatures above 100°C (212°F).

Disposal

- The batteries may contain substances that could be harmful to the environment
- Recycle or dispose of batteries in accordance with the battery manufacturer's instructions and local/national disposal and recycling regulations.




- The batteries may contain perchlorate, a known hazardous substance, so special handling and disposal of this product might be necessary. For more information about perchlorate and best management practices for perchlorate-containing substance, see www.dtsc.ca.gov/hazardouswaste/perchlorate.

## Modifications

This equipment has been designed and tested to comply with applicable safety, laser safety, and EMC regulations, codes, and standards to ensure safe operation in its intended environment. Refer to this equipment's data sheet for details about regulatory compliance approvals.

Do not make modifications to this equipment. Any changes or modifications could void the user's authority to operate this equipment.

Modifications have the potential to degrade the level of protection built into this equipment, putting people and property at risk of injury or damage. Those persons making any modifications expose themselves to the penalties arising from proven non-compliance with regulatory requirements and to civil litigation for compensation in respect of consequential damages or injury.

## Accessories

Use only attachments or accessories specified by the manufacturer.

## Electromagnetic Compatibility Regulatory Requirements

This equipment meets applicable electromagnetic compatibility (EMC) regulatory requirements. Refer to this equipment's data sheet for details about regulatory compliance approvals. EMC performance is dependent upon the use of correctly shielded cables of good quality for all external connections, except the power source, when installing this equipment.

- Ensure compliance with cable/connector specifications and associated installation instructions where given elsewhere in this manual.

## EMC Compliance Statements

Where this equipment is subject to USA FCC and/or Industry Canada rules, the following statements apply:

### FCC Statement for Class A Equipment

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 this 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.

### Industry Canada - Industrie Canadiene Statement

This apparatus complies with Canadian ICES-003.
Cet appareil est confome à la norme NMB-003 du Canada.

### CENELEC/CISPR Statement with Respect to Class A Information Technology Equipment

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

# 1

# Introduction

This manual describes the installation and operation of the Cisco GS7000 DOCSIS Status Monitor Transponder module.

## In This Chapter

# Model GS7000 Node Description

## Overview

This section contains a brief physical and functional description of the Model GS7000 Node.

For complete information about the Model GS7000 Node, refer to *Model GS7000 GainMaker Scaleable 4-Port Node Installation and Operation Guide*, part number 4013584.

## Physical Description

The Model GS7000 Node is the latest generation 1 GHz optical node platform which uses a completely new housing designed for optimal heat dissipation. The housing has a hinged lid to allow access to the internal electrical and optical components. The housing also has provisions for strand, pedestal, or wall mounting.

The base of the housing contains:

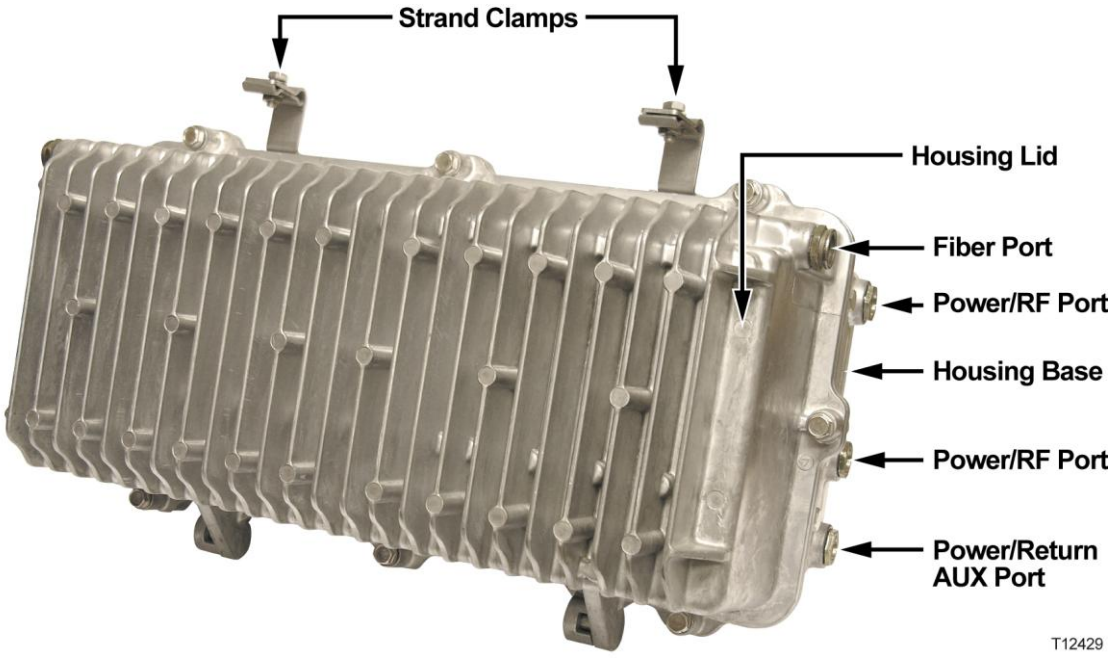
- an RF amplifier module
- AC power routing
- forward and reverse configuration modules (configuration will vary)

The lid of the housing contains:

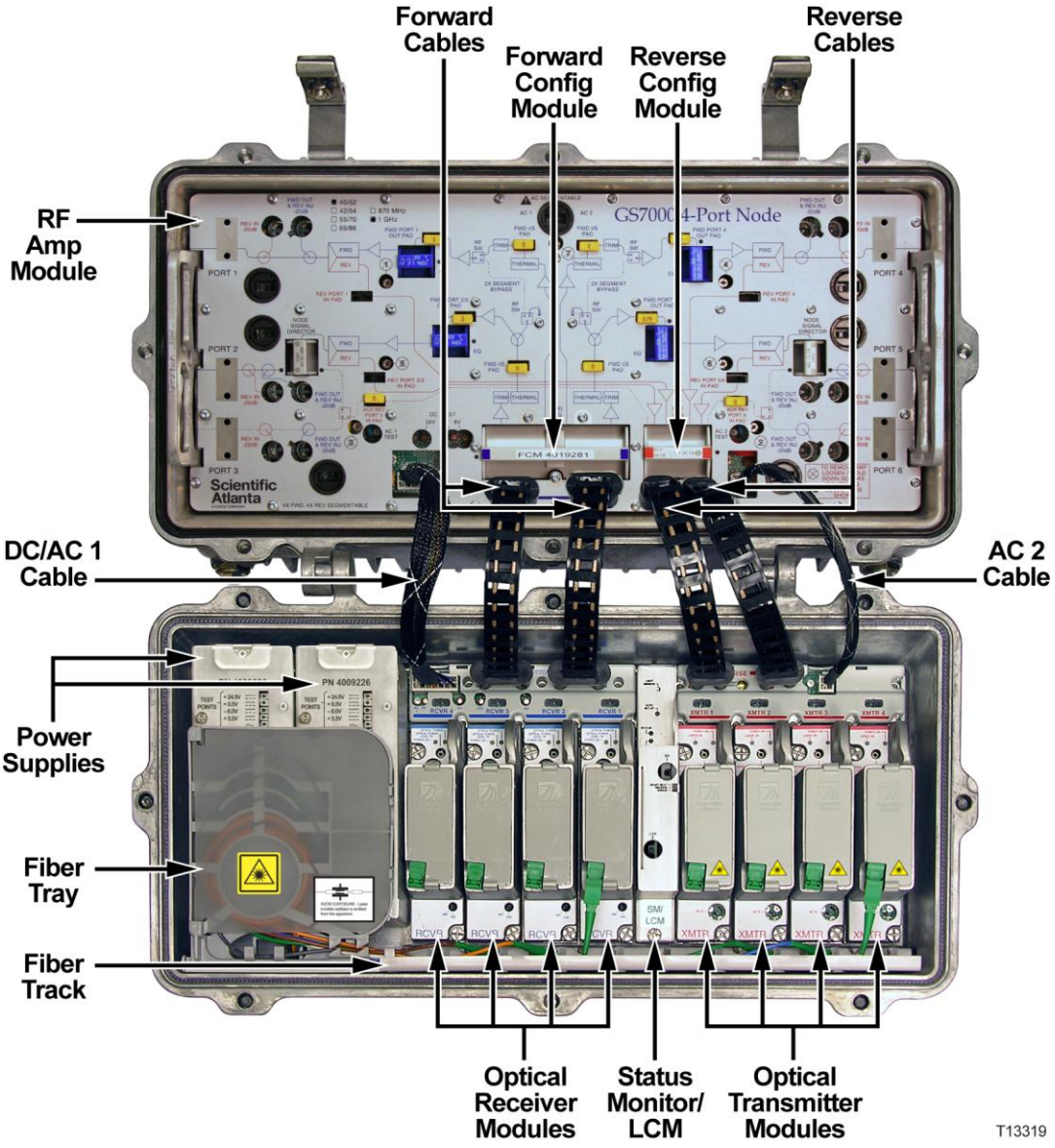
- a fiber management tray and track (included in all nodes)
- optical receiver and transmitter modules (configuration will vary)
- EDFA (erbium-doped fiber amplifier) modules and optical switch modules (for hub node application)
- power supplies (one or two)
- a status monitor/local control module (optional)

Not every Model GS7000 Node will contain all of these modules. The Model GS7000 Node is a versatile node that can be configured to meet network requirements.

The following illustration shows the external housing of the Model GS7000 Node.


Strand Clamps
Housing Lid
Fiber Port
Power/RF Port
Housing Base
Power/RF Port
Power/Return
AUX Port
T12429

The following illustration shows the Model GS7000 Node internal modules and components. This model is the 4-way forward segmentable node. The 2-way forward segmentable node has a different RF amplifier module.



# Transponder Description

The Cisco GS7000 DOCSIS Status Monitor Transponder module provides the ability to manage fiber nodes and optical hubs through an existing DOCSIS cable modem infrastructure. Please see your Cisco representative for a complete listing of supported fiber nodes.


## Overview

The transponder transmits data to a management system over the existing network DOCSIS infrastructure using standard SNMP (Simple Network Management Protocol). Status monitoring information is compatible with ANSI SCTE HMS standards.

The transponder:

- Uses ANSI/SCTE HMS standards.
- Measures analog or receives digital SCTE/HMS data from fiber nodes.
- Can be network managed through your existing CMTS.

To the cable network infrastructure, the transponder appears as a DOCSIS 2.0 cable modem. The transponder is assigned an IP address like any other DOCSIS device on the DOCSIS network. The assigned IP address is used to access the HMS status monitoring data via SNMP and the HMS MIBs.

For complete DOCSIS specifications, see the *Cisco GS7000 DOCSIS Status Monitor* data sheet, part number 7020300.

## Parts List

The following table lists the transponder and any other items that are available as an option. For damage or discrepancies, contact your Cisco representative.

| Description | Part Number | Qty |
|---|---|---|
| ASSY, MOD, 4X DOCSIS Status Monitor, GS7000. Includes GS7000 Cable Kit | 4036793 | 1 |
| Spare GS7000 RF Cable Kit (required for cable modem downstream frequencies above 140 MHz)<br>**Note:** This cable kit is not required for optical hub integrations. | 4038028 | 1 |
| 0 dB Pad | 574475 | 1 |
| 10 dB Pad | 574485 | 1 |

## Technical Support Contact Information

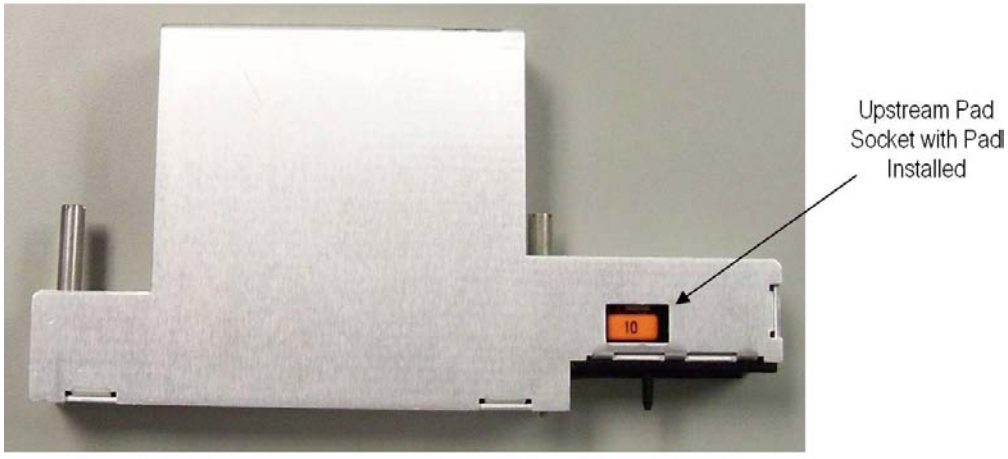
For technical issues, contact your Cisco representative. See ***Customer Support Information*** (on page 79) contact information.

## Connectors

The transponder includes:

- A node interface connector through which the transponder receives its power and performs all communications
- A label containing the transponder serial number
- Downstream RF cable connectors
- Six status LEDs
- The Craft port, a standard RJ-45 Ethernet connector that provides local access to the transponder
- An optical tamper sensor
- A pad socket to attenuate the upstream signal from the transponder so that the transponder can be configured for different implementations

The locations of these items are shown in the following illustrations.

## Connector Summary

| Connector | Description |
|---|---|
| DS RF1 CABLE | The Forward (Downstream) RF1 cable is the physical connection to the forward RF -20dB test point of optical receiver 1 (OPTRX1). |
| DS RF2 CABLE | The Forward (Downstream) RF2 cable is the physical connection to the forward RF -20dB test point of optical receiver 2 (OPTRX2). |
| CRAFT | The Craft port provides a local, physical connection to the transponder. In addition, the Craft port is a fully functional standard Ethernet port capable of providing all the functionality of any standard Ethernet connection. |
| INTERFACE CONNECTOR | The Interface Connector is the physical connection point at which the transponder attaches to the node or optical hub. |
| TAMPER SENSOR | The Tamper Sensor provides an indication of physical tampering (opening of the node enclosure). |
| LED Indicators | The transponder includes six green LEDs:<br>■ PWR<br>■ DS<br>■ US<br>■ Online<br>■ Elink<br>■ Stat<br>These indicate transponder status. For details on the LEDs and their indications, see the section titled ***Checking the LEDs*** (on page 26). |
| Downstream Pad Socket | The Pad socket is to attenuate the upstream signal from the transponder. The locations of these items are shown in the preceding illustrations.<br>If the transponder is to be used in a GS7000 node, use the 10 dB pad. If the transponder is to be used in a GS7000 Optical Hub, use the 0 dB pad.<br>**Note:** If a pad with a value less than 10 dB is used and the transponder is used in a GS7000, there is a risk the output power of the transponder may be too high for the node transmitter. |

# 2

# Installation

Cable modem infrastructures are likely to have unique characteristics. For this reason, we strongly recommend that you completely install one transponder and make it operational before deploying the entire system throughout your network.

Installing the transponders and making them operational consists of the following steps, which are explained in detail in this chapter:

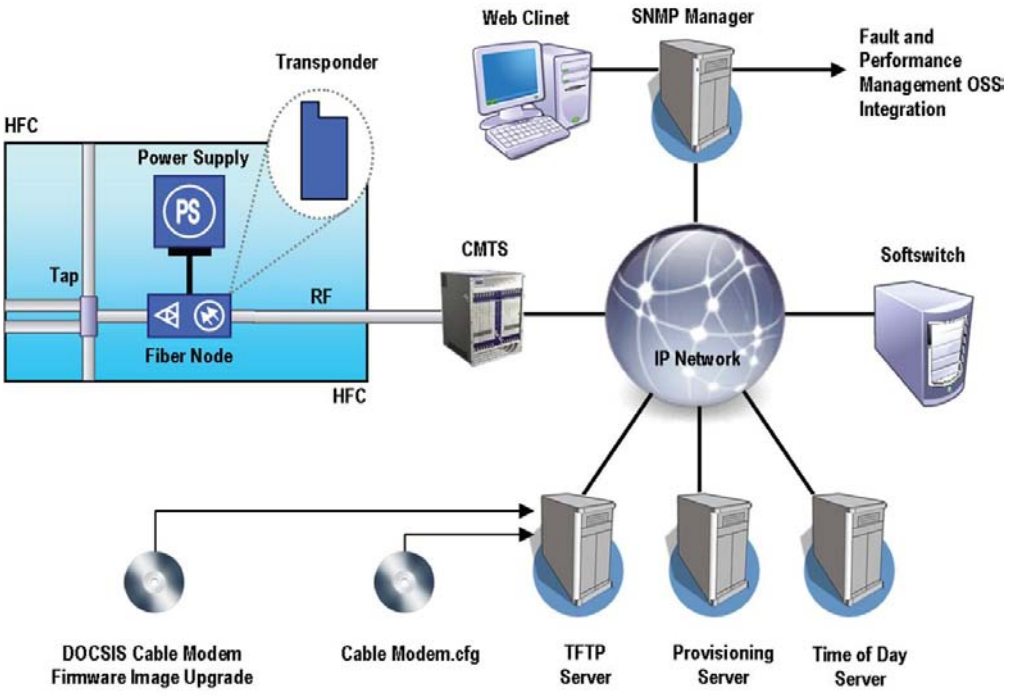
- Provisioning the transponders in the network
- Adding configuration data to the cable modem configuration file
- Installing the transponder
- Powering the transponder and checking the LEDs for status

## In This Chapter

# Provisioning the Transponders in the Network

Before installing the transponder, it must be provisioned in the network for the network to recognize, discover, and communicate with the transponder when it is powered up.

The following graphic shows a typical network.




**Note:** Some provisioning systems require that the transponder MAC address be added to the CMTS prior to installing the transponder to achieve full functionality.

# Your Network Information

Use the following table as an aid in gathering the network information you will need as you move through the deployment process.

| Network Item | Value |
|---|---|
| Cable Modem MAC Address | |
| Cable Modem IP Address | |
| TFTP Server IP Address | |
| Provisioning Server IP Address | |
| Time of Day Server IP Address | |
| DHCP Server IP Address | |

Deployment of Cisco DOCSIS-based transponders is similar to provisioning standard subscriber cable modems and MTAs. However, there are certain exceptions owing to the transponder being a test device. For example, take care when provisioning that the transponder is not invoiced in the billing system or mistakenly blocked. Cable operators will want to adapt the deployment strategy to fit their unique operational landscape. The introduction of a new device type in the DOCSIS network touches several OSS systems and disciplines whose participation is needed for successful and timely deployment.

## Security

Different security methods are used to ensure network integrity. Some common issues are:

- Subscriber account (where the transponder is the subscriber) may be required for each transponder
- The transponder MAC address may have to be pre-loaded into the CMTS
- MAC filtering may have to be modified to allow MAC addresses starting with 00:10:3F:xx:xx:xx to be registered and 00:26:97:xx:xx:xx to be registered
- For SNMP access, UDP ports 161 and 162 must not be blocked
- Firewalls must allow communication between the cable modem and the various servers

# Cable Modem Configuration File

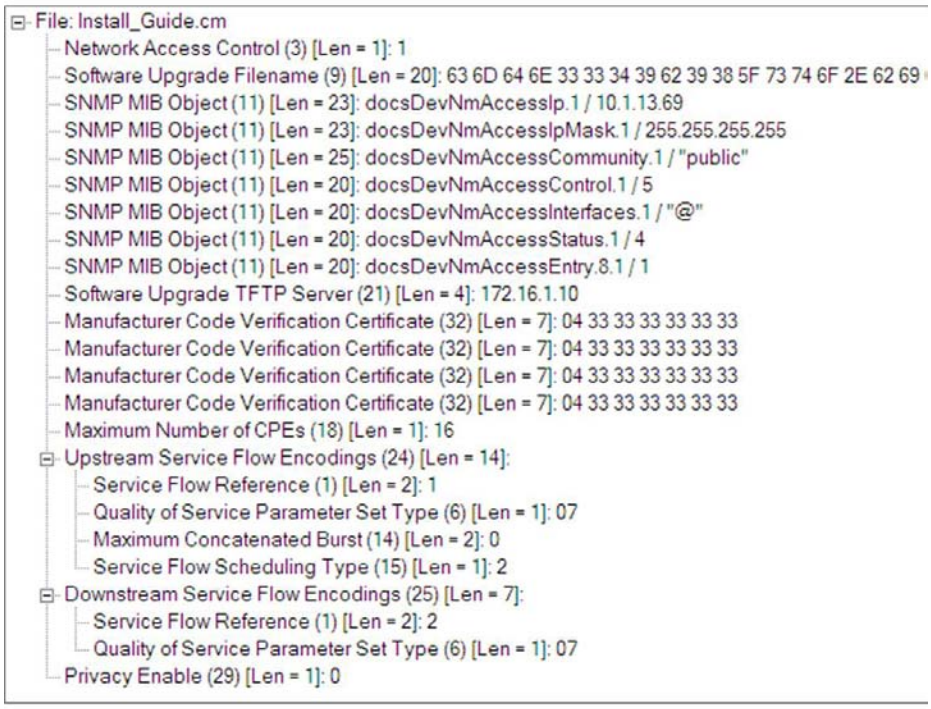
Confirm that the cable modem configuration file has been successfully modified and tested prior to deploying transponders into the system in quantity.

The transponder manages SNMP filters and trap destinations via the docsDevNmAccessTable. To ensure proper management of SNMP access, such as limiting access to certain SNMP managers or allowing the transponder to send SNMP/HMS traps, the docsDevNmAccessTable must be populated via the cable modem configuration file.

Additional object identifiers (OIDs) may be added to further configure other options such as the transponder HTTP port, its username and password configuration information, and support for Telnet server access. See ***Using the Craft Port*** (on page 35) and ***Using the Web Interface*** (on page 43) for details.

## Sample Configuration File

The following is a sample cable modem configuration file. Include only those OIDs that will provide the desired features and functionality.




**Note:** The configuration file entries shown above starting with "docsDevNmAccess" all end with ".1." The ".1" is a row index indicating row 1 in the docsDevNmAccess table. Additional rows can be added to this table by adding additional sets of docsDevNmAccess entries with different row indexes. A given row index may be used only once.

# Installing the Transponder

This section provides information for installing the transponder in the following devices:

- GS7000 Node
- GS7000 Optical Hub

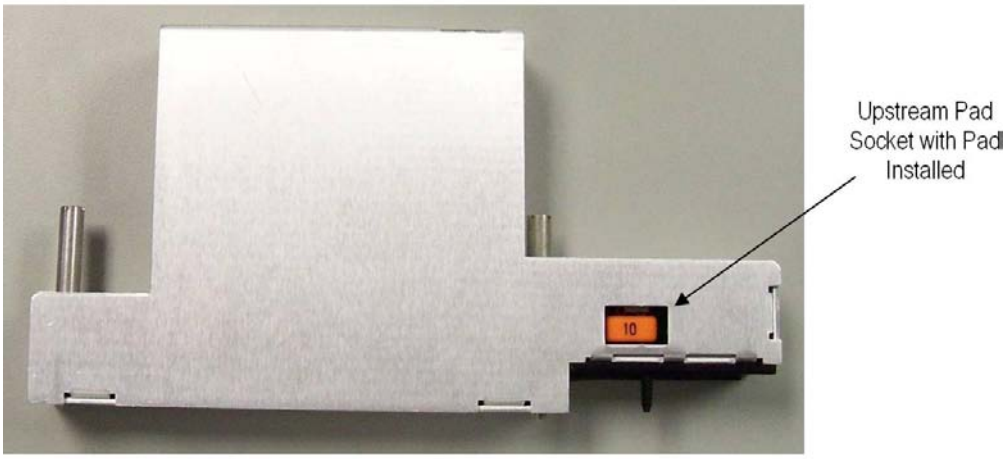
Refer to the appropriate section for installing the transponder in your particular hardware.

## GS7000 Node Installation

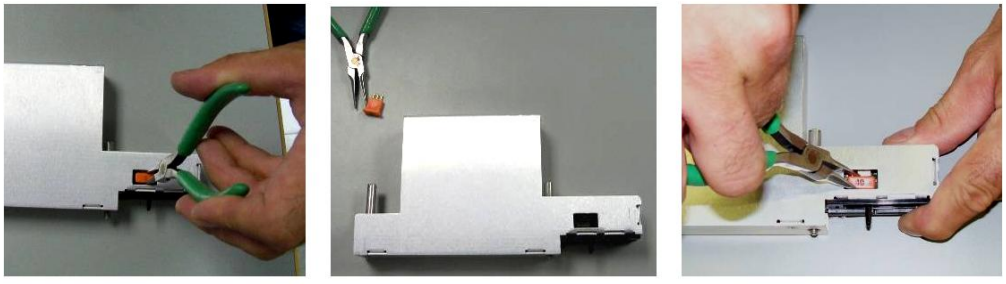
Complete the following steps to install the transponder in the GS7000 Node.

1 Remove the transponder from the shipping package.

2 Ensure that the correct pad for the desired application is installed in the pad socket. For GS7000 Node applications, verify the use of the 0 dB pad in the transponder pad socket, as shown below.



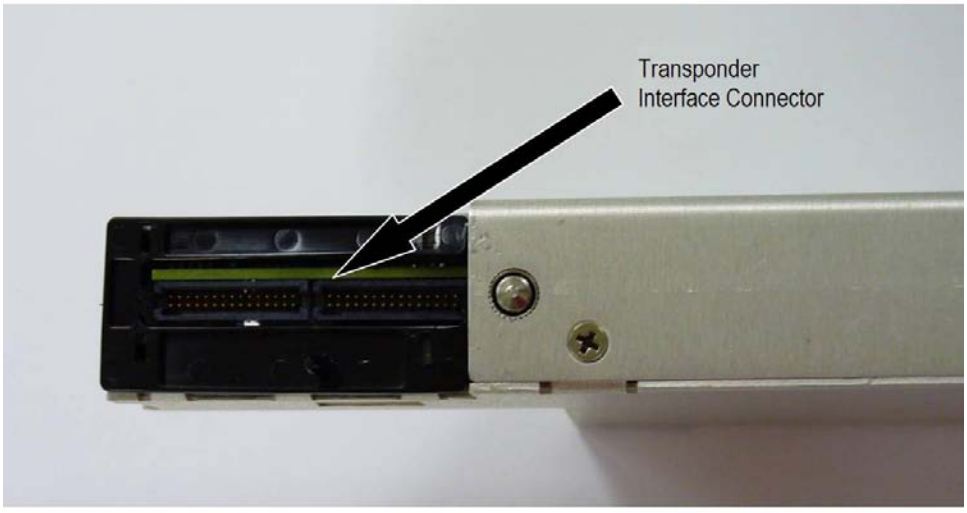

3 If any other pad value is in place (a 10 dB pad, for example), replace it with the 0 dB pad as shown below.



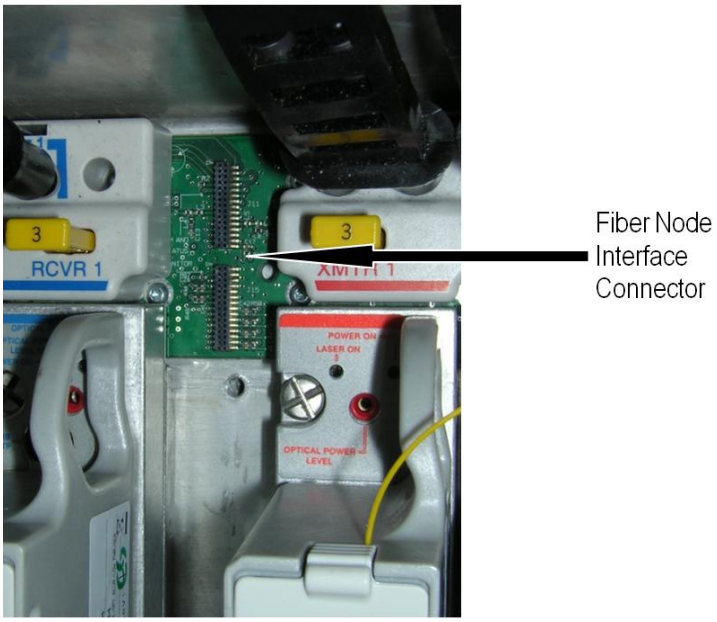
**CAUTION:**

**If a pad with a value less than 10 dB is used and the transponder is used in a GS7000 Node, there is a risk the output power of the transponder may be too high for the node transmitter.**

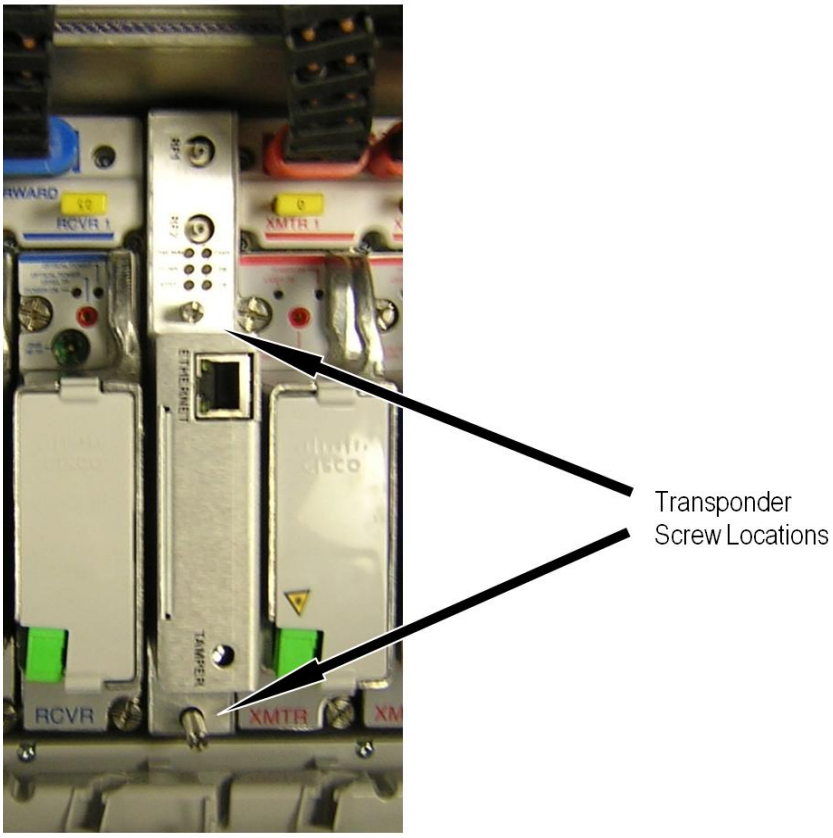
4 Position the transponder so that the interface connector shown below aligns with the node interface connector.




5 The node interface connector is shown below. This connector is located on the optical interface board (OIB) in the lid of the node.

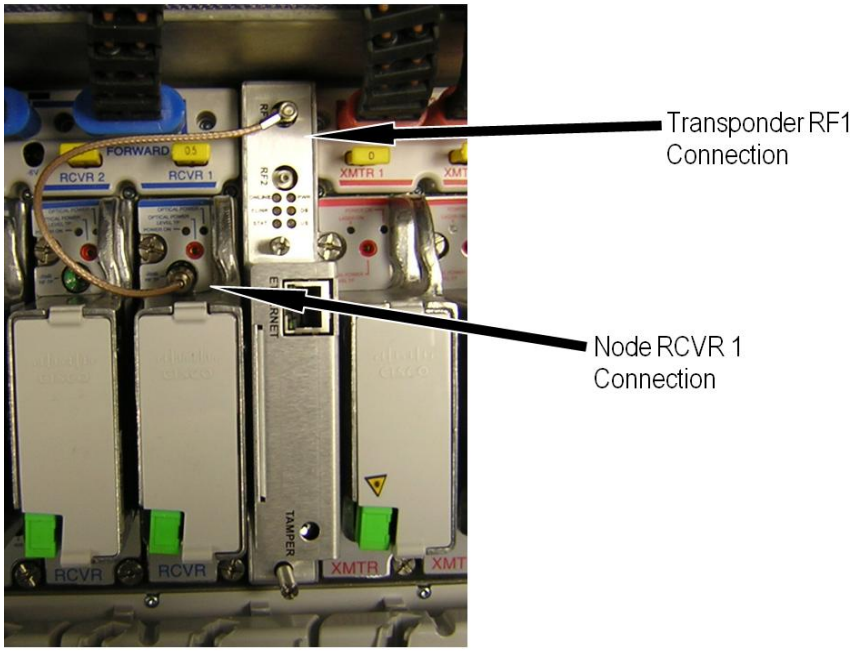


6 Push the transponder down firmly onto the OIB until the transponder seats into position. Use the screws provided with the transponder to secure the transponder to the board. The screw locations are shown in the following illustration. Tighten screws to 25-30 in-lbs (2.8-3.4 Nm).

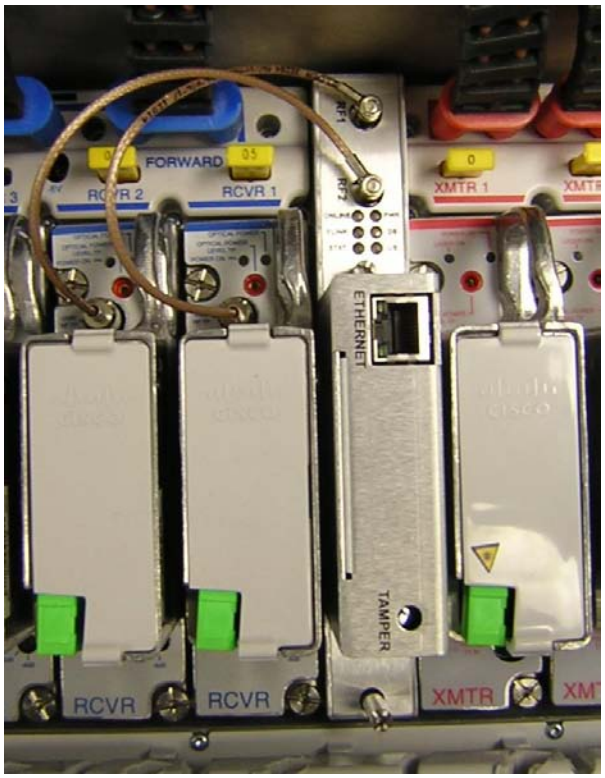



7 If the downstream cable modem frequency is above 140 MHz, install one or both Forward RF cables (supplied with the transponder) as follows:

- If you are running RCVR 1 as a single (non-redundant) receiver, attach the RF1 cable to the Optical Receiver 1 "-20 dB test point." Route the cable appropriately within the node, as shown in the following illustration.



- If you are running RCVR 1 and RCVR 2 as a redundant pair, attach the RF1 cable to the Optical Receiver 1 "-20 dB test point" AND attach the RF2 cable to the Optical Receiver 2 "-20 dB test point." Route the cables appropriately as shown in the following illustration.

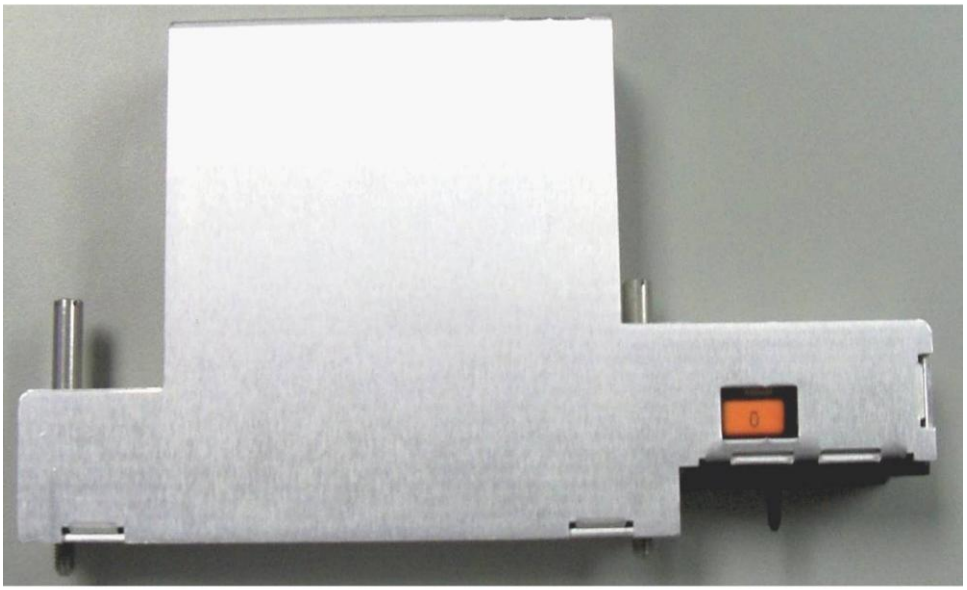


## GS7000 Optical Hub Installation

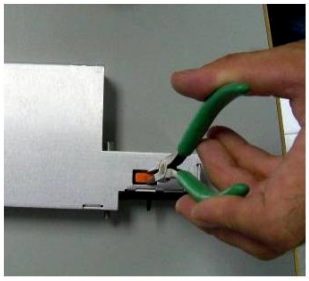
Complete the following steps to install the transponder in the GS7000 Optical Hub.

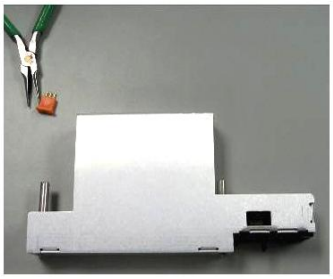
1 Remove the transponder from the shipping package.

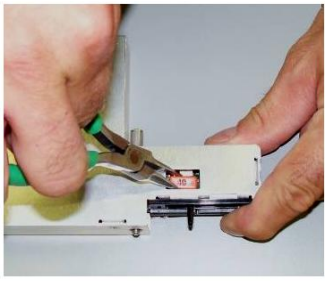
2 Ensure that the correct pad for the desired application is installed in the pad socket. For GS7000 Optical Hub applications, verify the use of the 10 dB pad in the transponder pad socket, as shown below.



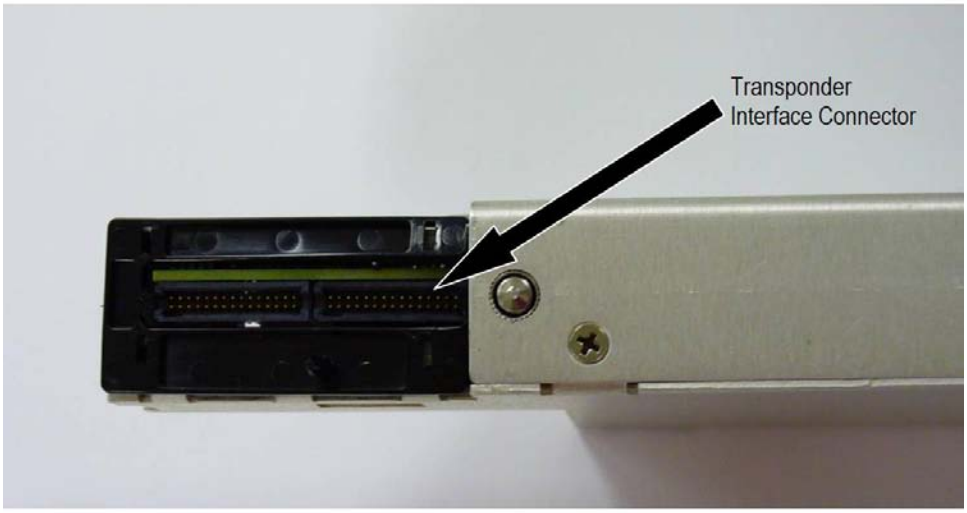
3 If any other size pad is in place (a 0 dB pad, for example), replace it with the 10 dB pad as shown.



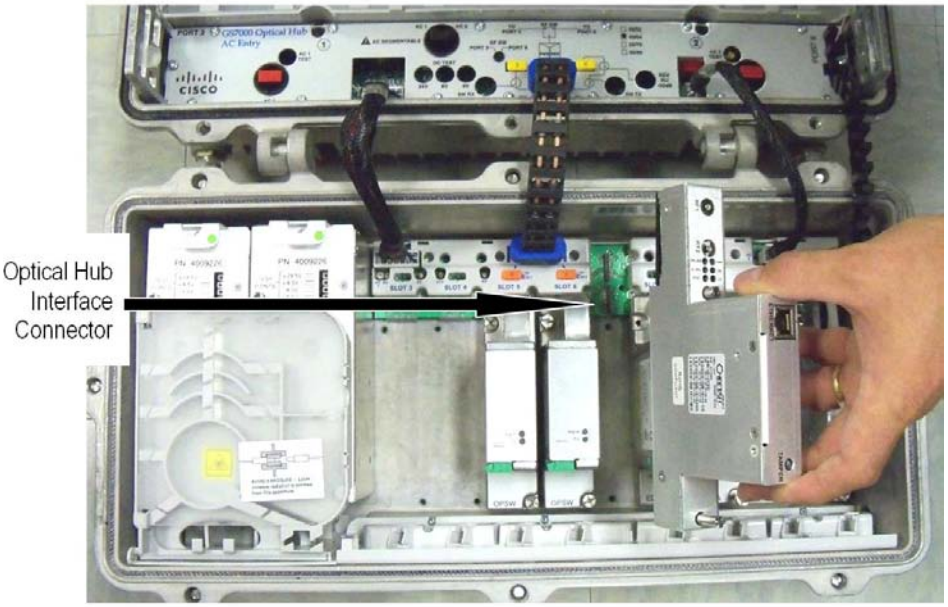




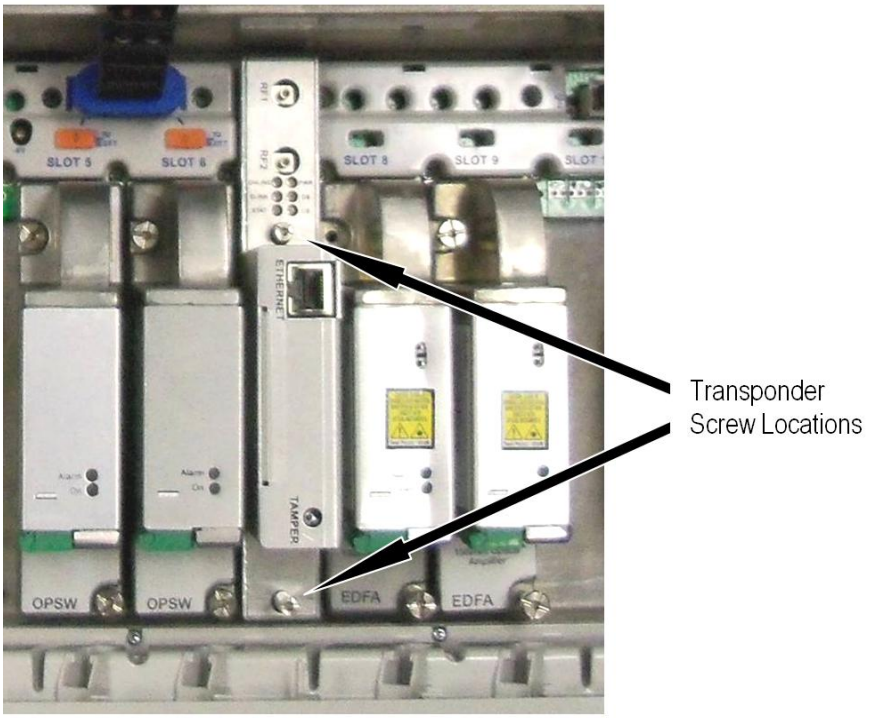
4 Position the transponder so that the interface connector shown below aligns with the node interface connector. This connector is located on the optical interface board (OIB) in the lid of the node.




5 The optical hub interface connector is shown below.



6 Push the transponder down firmly onto the OIB until the transponder seats into position. Use the screws provided with the transponder to secure the transponder to the board. The screw locations are shown in the following illustration. Tighten screws to 25-30 in-lbs (2.8-3.4 Nm).



# Configuring the Transponder Using the SA-HMS-FIBERNODEGS7000 MIB

Before the transponder can monitor the node, it will need to be set up for how the node is configured. For the GS7000 Node, this can be accomplished by using either the SA-HMS-FIBERNODEGS7000-MIB or through the GS7000 Configuration Data page. For the GS7000 Optical Hub, this can only be accomplished through the GS7000 Configuration Data page.

This section describes how to configure the transponder using the SA-HMS-FIBERNODEGS7000-MIB. For information on how to configure the transponder by using the GS7000 Configuration Data page, see ***Configuration Pages*** (on page 46).

The OIDs used to configure the node are listed in the following table:

| Component | Description |
|---|---|
| saFnForwardConfig<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.5) | Sets the forward configuration of the node.<br>■ oneX/twoXFwdSeg(1) - Forward RF signal for all ports comes from one or two optical receivers.<br>■ fourXFwdSeg(2) - Forward RF signal for each port comes from separate optical receivers.<br>■ threeXRx1-2-4FwdSeg(3) - Forward RF signal for each port comes from one of three separate optical receivers. The three receivers are Rx1, 2 and 4; Rx3 is not powered on.<br>■ threeXRx1-3-4FwdSeg(4) - Forward RF signal for each port comes from one of three separate optical receivers. The three receivers are Rx1, 3 and 4; Rx2 is not powered on. |
| saFnPowerSupplySlot<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.9.1.2) | Configures the power supply slots to indicate whether a power supply is installed or not installed. Set the installed power supplies to **Mount** and the power supply, if any, that is not installed to **Unmount**. |
| saFnRestoreTime<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.8) | Sets the time in seconds the A/B switch setting will be restored after power has been restored to the primary receiver. The default is 9 and the range is 0-255. |
| saFnOpticalReceiverSlot<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.2) | Configures the receiver slots to indicate if a receiver is installed or not installed. Set the active slots to **Mount** and the slots, if any, that do not have an installed receiver to **Unmount**. |

| Component | Description |
|---|---|
| saFnOpticalReceiverLoPwrLimit<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.4) | Sets the minimum threshold level for the input signal to the A/B switch in mW. The default is 0.50 and the range is 0.25-2.40.<br>**Notes:**<br>■ When the saFnOpticalReceiverLoPwrLimit (OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.4) is set, the LOLO alarm limits for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2) is also set.<br>■ When the LOLO alarm limit is set for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2), the LOLO alarm limit for the fnOpticalReceiverPowerLoPwrLimit (OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.4) is also set.<br>■ Because the precision of the saFnOpticalReceiverLoPwrLimit is in hundredths and that of the fnOpticalReceiverPower is in tenths, when the value is set for the saFnOpticalReceiverLoPwrLimit, the LOLO alarm limit for the fnOpticalReceiverPower will be rounded to the nearest tenth. |

| Component | Description |
|---|---|
| saFnOpticalReceiverHiPwrLimit<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.3) | Sets the maximum threshold level for input signal to the A/B switch in mW. The default is 2.00 and the range is 0.25-2.40.<br>**Notes:**<br>■ This parameter is not implemented within the transponder in versions earlier than 4.1.0.<br>■ When the saFnOpticalReceiverHiPwrLimit (OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.3) is set, the HIHI alarm limit for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2) is also set.<br>■ When the HIHI alarm limit is set for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2), the saFnOpticalReceiverHiPwrLimit (OID 1.3.6.1.4.1.1.429.1.6.5.2.4.1.3) is also set.<br>■ Although the saFnOpticalReceiverHiPwrLimit displayed precision is to the hundredths, the actual precision is only to the tenth.<br>■ The precision of the fnOpticalReceiverPower is in tenths, so when the value is set for the saFnOpticalReceiverHiPwrLimit, the HIHI alarm limit for the fnOpticalReceiverPower will be truncated to display tenths. |
| saFnReturnLaserSlot<br>(OID 1.3.6.1.4.1.1429.1.6.5.2.2.1.2) | Configures the transmitter slots to indicate if a transmitter is installed or not installed. Set the active slots to **Mount** and the slots, if any, that do not have an installed transmitter to **Unmoun**t. |

# Downloading Module Firmware Using the CTLP-DOWNLOAD-MIB

With firmware version 4.1.0 and greater, the transponder has the ability to download firmware to Optical Amps and Optical Switches by using the CTLP-Download MIB (OID 1.3.6.1.4.1.2082.5.10.1).

**Note:** While downloading firmware to the Optical Amps and Optical Switches, there will be no communication between the transponder and any Optical Amps or Optical Switches in the Hub or Node during the entire firmware download process, although they will continue to function correctly. The transponder will still be able to monitor the Optical Transmitters and Receivers.

A firmware download to the modules can be accomplished in one of two ways: management style download or provisioning style download.

- To start a management initiated download, set the downloadModuleType, downloadServer, and downloadFilename to the correct values. Then set the downloadAdminStatus to either startDownload(1) or forceDownload(2).
- To set up a provisioning style download so that the transponder will use the module download information supplied by the provisioning server during boot up or reboot, in the CM config file set the downloadModuleType to 2, downloadServer, and downloadFilename to the correct values, and the downloadAdminStatus to startDownload(1).

**Note:** When using the provisioning style download, we strongly recommend that you set the downloadAdminStatus to startDownload(1) in the CM config file. If the downloadAdminStatus is set to forceDownload(2) in the CM config file, the transponder will download the firmware to all modules on every reboot, even if they are at the current version.

## OIDs Used for Module Firmware Download

The following OIDs are used for the Module Download Feature.

- downloadServer (OID 1.3.6.1.4.1.2082.5.10.1.1.1) – The IP address of the TFTP server where the module firmware file is located. If the TFTP server is unknown and the OID is read, the returned value will be 0.0.0.0.
- downloadModuleType (OID 1.3.6.1.4.1.2082.5.10.1.1.2) – The type of download to be executed. Must be set to other(2). Type cm(1) is used for other integrations and is not applicable in this instance.
- downloadFilename (OID 1.3.6.1.4.1.2082.5.10.1.1.3) – The file name of the software image to be loaded into the device. If the file is unknown and the OID is read, the returned value will be (unknown).

- downloadAdminStatus (OID 1.3.6.1.4.1.2082.5.10.1.1.4) – Begins the download to the module(s).
  - startDownload(1) – Begins the download to the modules with version checking enabled. If a module is running the same version of firmware that is being downloaded, it will not receive the firmware download. While in the process of downloading in this fashion, the downloadAdminStatus will report startDownload if read.
  - forceDownload(2) – Begins the download to the modules regardless of the current version of firmware running or any other factors that may cause a download not to be performed. While in the process of downloading in this fashion, the downloadAdminStatus will report forceDownload if read.
  - allowProvisioning(3) – Not supported in this application. Although this is not supported for application and does not affect anything if set. It is also the default state of downloadAdminStatus.
  - ignoreProvisioning(4) – When set, firmware upgrade information is disregarded. After a download is completed, the downloadAdminStatus will report ignoreProvisioning.
- downloadOperStatus (OID 1.3.6.1.4.1.2082.5.10.1.1.5) – Reflects the operational status of the firmware download. The following are the possible states.
  - Downloading(1) – Downloading the file to the transponder.
  - Programming(2) – Programming of the module in progress.
  - completeProvisioning(3) – Not supported in this application. Indicates the provisioning upgrade has completed.
  - completeManagement(4) – startDownload or forceDownload completed successfully.
  - completeWithExceptions(5) – Indicates that the firmware download has completed, but one or more modules failed to download the firmware successfully.
  - failedTftp(6) – Transfer of the file failed.
  - failedCrc(7) – Firmware file CRC error.
  - failed Timeout(8) – Device did not respond when firmware download attempted.
  - Failed Other(9) – An unknown error occurred when attempting the firmware download.
- downloadMessage (OID 1.3.6.1.4.1.2082.5.10.1.1.6) – A text message providing the latest download status information.

# Checking the LEDs

The GS7000 DOCSIS Status Monitor transponder includes 6 green LEDs:

- Pwr
- DS
- US
- Online
- Elink
- Stat

On initial power up, the LEDs will remain off for several seconds after which time the DS, US, and Online LEDs will blink in unison six times. After this sequence completes, the LEDs indicate the status.

The Pwr, DS, US, Online, and Elink LEDs conform to the DOCSIS OSSI specification.

## LED Status Summary

The following table summarizes the meaning of the status LEDs.

| LED | Function | State | Meaning |
|---|---|---|---|
| Pwr | Power LED<br>(Note: this LED is not tied directly to line power) | Off | The transponder is switched off or is not functioning. |
| | | On | The transponder is on. |
| DS | Downstream LED: Indicates status with respect to downstream scanning and synchronization. | Blinking | The transponder is scanning for a downstream DOCSIS channel. |
| | | On | The transponder has locked onto and synchronized with a downstream DOCSIS channel. |
| US | Upstream LED: Indicates status with respect to acquisition of upstream parameters and initial ranging. | Blinking | The transponder is obtaining upstream parameters and is performing initial ranging. |
| | | On | The transponder has completed a successful initial ranging sequence. |
| Online | Online LED: Indicates status with respect to the completion of the IP initialization process and when the unit is operational. | Blinking | The transponder is currently involved in the IP initialization process. |
| | | On | The transponder has completed the IP initialization process and is operational. |
| Elink | CPE Link LED: Indicates status with respect to the bridging of data to and from a CPE device connected to the transponder's Ethernet port. | Off | A CPE device is not connected to the transponder's Ethernet port. |
| | | Blinking | The transponder is bridging data to/from a CPE device. |
| Stat | Status LED: Indicates the presence or absence of data transference between the transponder's two processors. | Off | Data is not being transferred between the two processors. |
| | | Blinking | Data is being transferred between the two processors. |

# 3

# Provisioning the SNMP Manager

This chapter explains how to provision the SNMP Manager for the Cisco GS7000 DOCSIS Status Monitor Transponder module.

## In This Chapter

# MIB Files

This section lists the Management Information Base (MIB) files required for the SNMP Manager to collect data from the transponder.

## Management Information Base (MIB) Files

**Note:** The files in this table can be found on the Society of Cable Telecommunications (SCTE) website www.scte.org.

| ANSI/SCTE # | Former HMS # | Title |
|---|---|---|
| ANSI/SCTE 36 2002 | HMS 028 | SCTE-ROOT Management Information Base (MIB) Definitions |
| ANSI/SCTE 37 2002 | HMS 072 | Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-ROOTS Management Information Base (MIB) Definition |
| ANSI/SCTE 38-1 2002 | HMS 026 | Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-PROPERTY-MIB Management Information Base (MIB) Definition |
| ANSI/SCTE 38-2 2002 | HMS 023 | Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-ALARMS-MIB Management Information Base (MIB) Definition |
| ANSI/SCTE 38-3 2002 | HMS 024 | Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-COMMON-MIB Management Information Base (MIB) Definition |
| ANSI/SCTE 38-5 2002 | HMS 025 | Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-FIBERNODE-MIB Management Information Base (MIB) Definition |
| ANSI/SCTE 38-7 2002 | HMS 050 | Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-Transponder-Interface-Bus(TIB)-MIB Management Information Base (MIB) Definition |
| ANSI/SCTE 131 2007 | | SCTE-HMS VOIP MIB |
| | | HMS VoIP Test Management Information Base (MIB) Definition SCTE-HMS-VOIP-MIB |
| ANSI/SCTE 85-3 | HMS 118 | SCTE-HMS-HE-OPTICAL-AMPLIFIER-MIB |
| ANSI/SCTE 85-4 | HMS 119 | SCTE-HMS-HE-OPTICAL-SWITCH-MIB |

## Management Information Base (MIB) Files

**Note:** The files in this table are provided by Cheetah Technologies or by Cisco. There are dependencies between MIB files, so be sure to compile them in the order listed below.

| Provider | Title |
|---|---|
| Cheetah Technologies | Lighthouse HMS Extensions MIB |
| Cheetah Technologies | CTLP-DOWNLOAD-MIB |
| Cisco | SA-HMS-FIBERNODEGS7000-MIB |

## Additional Supported Management Information Base (MIB) Files

**Note:** The files in this table are provided by Cheetah Technologies or by Cisco. There are dependencies between MIB files, so be sure to compile them in the order listed below.

| Title | Title |
|---|---|
| BRCM-BFC-MGMT-MIB | EtherLike-MIB |
| BRCM-CM-MGMT-MIB | IF-MIB |
| BRCM-EMTA-MGMT-MIB | IGMP-STD-MIB |
| BRCM-HTTP-MGMT-MIB | IP-MIB |
| BRCM-SNMP-MGMT-MIB | RFC-1213-MIB |
| BRCM-SSH-MTMT-MIB | SLED-MIB |
| BRCM-TELNET-MEMT-MIB | SNMPv2-MIB |
| BRIDGE-MIB | TOLLGRADE-HTTP-MGMT-MIB |
| IDSMAN-PING-MIB | TOLLGRADE-VOIP-ALERT-THRESHOLDS-MIB |
| DOCS-BP12-MIB | TOLLGRADE-VOIP-CONFIG-MIB |
| DOCS-CABLE-DEVICE-DRAFT-MIB | TOLLGRADE-VOIP-LOG-MIB |
| DOCS-CABLE-DEVICE-MIB | TOLLGRADE-VOIP-MIB |
| DOCS-CABLE-DEVICE-TRAP-MIB | TOLLGRADE-VOIP-ONDEMAND-MIB |
| DOCS-IF-MIB | TOLLGRADE-VOIP-OPTIONS-MIB |
| DOCS-QOS-MIB | TOLLGRADE-VOIP-REPORTS-MIB |
| DOCS-TEST-MIB | TOLLGRADE-VOIP-TRAPS-MIB |

| Title | Title |
|---|---|
| ENTITY-MIB | UDP-MIB |
| eSAFE-MIB | USB-MIB |

# Acquiring the Transponders by the SNMP Manager

The transponder must first complete its initialization and registration from the Cable Modem configuration file. The transponder will then send a warm start trap to the SNMP Manager as specified in the cable modem configuration file. This trap provides the SNMP Manager with the MAC and IP addresses of the transponder and should, depending on the configuration of the manager software, initiate monitoring the fiber node.

# 4

# Using the Craft Port

This chapter provides instructions for using the Craft (Ethernet) port on the GS7000 DOCSIS Status Monitor transponder.

## In This Chapter

# Overview

The Craft port on the transponder is typically used as a local connection point, allowing the user to connect directly to the unit. However, the Craft port is a fully functional, standard Ethernet port, so it can also provide all of the functionality of any standard Ethernet connection.

When using a local, direct connection to the transponder, the technician has the option of communicating with the transponder either via a web browser interface or using a Telnet console session. Both connection processes are discussed in the sections that follow. See ***Using the Web Interface*** (on page 43) for more detailed information on using the transponder web interface.

**Important:** Console access is intended for use by factory trained technicians. It is not recommended for use by technicians in the field.

# Web Page Access

To access the transponder locally utilizing a web browser, follow the procedure outlined below.

1. Connect a standard CAT5 Ethernet cable between the transponder and a laptop or similar device.
2. Open the web browser.
3. Enter the address value **192.168.100.1** into the browser address field, and then press **Enter** (or the appropriate button) to commence communications with the transponder. The transponder home page appears.

See ***Using the Web Interface*** (on page 43) for more detailed information on using the transponder web interface.

# Console Access

**Important:**

- Console access is intended for use by factory trained technicians. It is not recommended for use by technicians in the field.
- By default, Telnet access to the Ethernet port is enabled and the CM interface is disabled. If the use of the CM interface is desired, the operator must first enable the interface by setting the telnetIpStackInterfaces OID to the appropriate value, as shown in **TelnetIpStackInterfaces OID Values and Descriptions** below.

In addition, the default username and password may be altered if desired.

## OIDs for Usernames, Passwords, Telnet Access for Console Access

The following table contains a list of the OIDs in the telnetMgmt MIB that are used to change the username or password for the interfaces, enable or disable the interfaces, and enable or disable Telnet server access.

| Parameter | OID | Default |
|---|---|---|
| telnetIpStackInterfaces | 1.3.6.1.4.1.4413.2.2.2.1.1.1.1.0 | 0x40 (hex)<br>(CM interface is disabled and the Ethernet port interface is enabled) |
| telnetUserName | 1.3.6.1.4.1.4413.2.2.2.1.1.1.2.0 | cheetah |
| telnetPassword | 1.3.6.1.4.1.4413.2.2.2.1.1.1.3.0 | cheetah |
| telnetServerControl | 1.3.6.1.4.1.4413.2.2.2.1.1.1.4.0 | 1 (enabled) |

## TelnetIpStackInterfaces OID Values and Descriptions

The following table contains a list of the values for the telnetIpStackInterfaces OID along with the definition of each value.

| Value | Setting |
|---|---|
| 0xC0 | CM interface enabled and Craft port interface enabled |
| 0x80 | CM interface enabled and Craft port interface disabled |
| 0x40 | CM interface disabled and Craft port interface enabled |
| 0x00 | CM interface disabled and Craft port interface disabled |

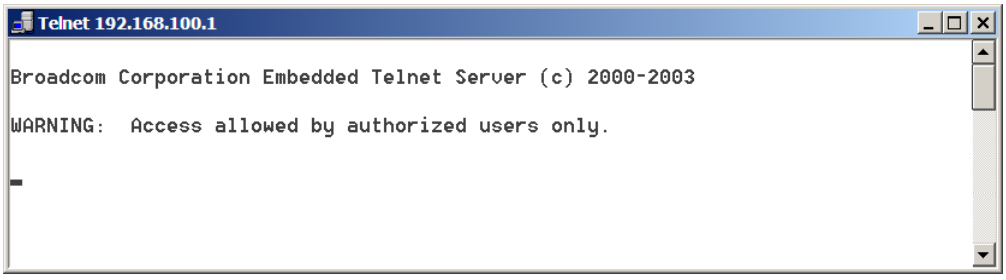
## Telnet Access Matrix

The following table provides a matrix describing the settings of the different access options. Change these values as deemed necessary.

| telnetServerControl OID Value | telnetIpStackInterfaces OID Value | Result |
|---|---|---|
| 0 | 0x00 | Telnet access is disabled and both interfaces are disabled. |
| 1 | 0x00 | Telnet access is enabled and both interfaces are disabled. |
| 1 | 0x40 | Telnet access is enabled, the CM interface is disabled, and the Craft port interface is enabled. |
| 1 | 0x80 | Telnet access is enabled, the CM interface is enabled, and the Craft port interface is disabled. |
| 1 | 0xC0 | Telnet access is enabled, the CM interface is enabled, and the Craft port interface is enabled. |

Complete the following steps to access the transponder locally using the console via a Telnet connection.

1. Be certain that Telnet access to the server has been enabled by making the appropriate MIB changes. Refer to the information presented earlier in this section for details on enabling Telnet access to the server.
2. Verify that software capable of supporting a standard Telnet communications session is present and operational on the laptop or similar device being used to communicate with the transponder.
3. Connect a standard CAT5 Ethernet cable between the transponder and a laptop or similar device.
4. Using your Telnet client software and IP address 192.168.100.1, establish a Telnet session to the transponder. The console main page appears as shown in the following example.



**Note:** If you have difficulty establishing communications with the transponder, try changing the laptop IP address value to 192.168.100.2 and its subnet mask value to 255.255.255.0.

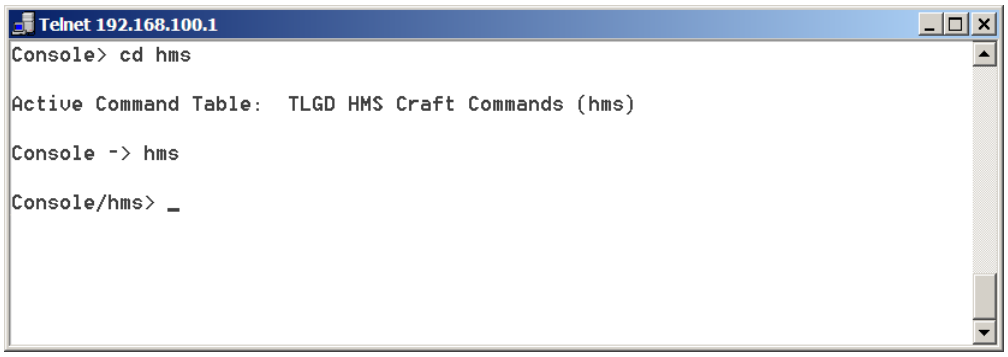
5 Press the **Enter** key. At the login prompt, enter the appropriate user name (the default is cheetah) and press the **Enter** key. Next, enter the appropriate password (the default is cheetah) and press the **Enter** key. The console prompt page appears as shown in the following example.


6 Console mode supports a number of commands that are used for troubleshooting and debugging purposes. Providing a list and description of all of the available commands would exceed the scope of this manual. Therefore, the commands described in this section will be those found in the hms directory. For additional information about the use of the console commands, contact Technical Support using the contact information provided in ***Customer Support Information*** (on page 79).

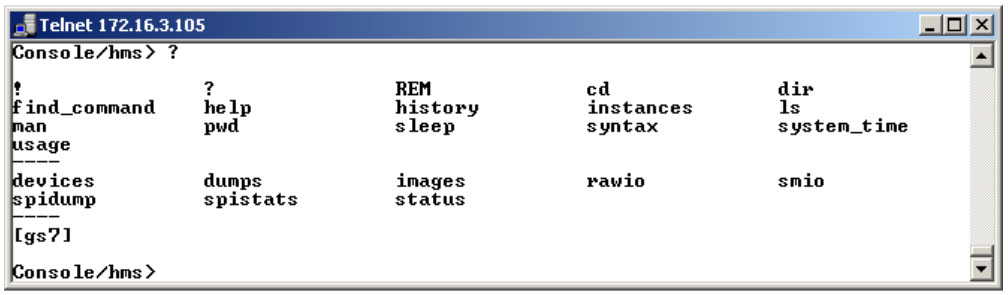
The following table provides a list of the commands in the hms section available via console mode along with a brief description of each command.

| Command | Description |
|---|---|
| devices | Displays the modules that have been discovered in the Fiber Node. |
| dumps | Toggles the serial dump feature on and off. |
| images | Displays the firmware image information. |
| rawio | Displays the raw input and output values from the transponder's two processors. |
| smio | Displays the status monitoring IO values. |
| spidump | Toggles the spidump feature on and off. |
| spistats | Displays the SPI statistics. |
| status | Displays general transponder information, i.e., firmware version, IP addresses, etc. |

To switch to the hms section, type **cd hms** at the prompt, and then press **Enter**. The following screen appears.




To display a listing of all of the available commands, type **?** and then press **Enter**. The following screen appears.




To display the proper syntax for a particular command, type the command followed by **?**, and then press **Enter**.

When the session is complete, type **exit** to terminate the Telnet session, and then close the Telnet dialog box.

# 5

# Using the Web Interface

This chapter provides instructions for using the web interface for the GS7000 DOCSIS Status Monitor transponder.

## In This Chapter

# Overview

A web interface is available on the GS7000 DOCSIS Status Monitor transponder. The default port for HTTP traffic is port 80, but can be configured to use other ports via the Cheetah httpMgmt MIB. HTTP port configuration is available for the cable modem interface (via the cable modem IP address) and the CPE interface (via the Craft connection). Setting the value to zero (0) shuts down access to the HTTP server for the given interface.

The following table lists the specific OIDs and their default values. The port must be open to use all of the features described here.

| Parameter | OID | Default |
|---|---|---|
| httpCMMgmtPort | 1.3.6.1.4.1.2082.5.5.1.1.1.0 | 80 |
| httpCPEMgmtPort | 1.3.6.1.4.1.2082.5.5.1.1.2.0 | 80 |
| httpCPU2MgmtPort * | 1.3.6.1.4.1.2082.5.5.1.1.3.0 | 8008 |

* This parameter is not applicable to this transponder.

To access the interface, type the cable modem IP address of the transponder into your web browser. The interface includes status data for the cable modem, the HMS transponder, High Speed Internet Access (HSIA) diagnostics, and the MTA (Media Terminal Adapter) in VoIP systems.

**Note:** These pages do not automatically refresh, so you must reload each one manually to view the most current data.

# Configuring the Sysname and Syslocation OIDs

It is also possible to configure the sysName (1.3.6.1.2.1.1.5.0) and sysLocation (1.3.6.1.2.1.1.6.0) OIDs from the web interface. This feature is password protected. There are both Admin and User user names and passwords. Both user names (Admin and User) have the authority to set sysName and sysLocation. The passwords can be changed via the Broadcom httpMgmt MIB.

The following table lists the specific OIDs and default values.

| Parameter | OID | Default |
|---|---|---|
| httpAdminId | 1.3.6.1.4.1.4413.2.2.2.1.1.3.1.0 | admin |
| httpAdminPassword | 1.3.6.1.4.1.4413.2.2.2.1.1.3.2.0 | cheetah |
| httpUserId | 1.3.6.1.4.1.4413.2.2.2.1.1.3.3.0 | cheetah |
| httpUserPassword | 1.3.6.1.4.1.4413.2.2.2.1.1.3.4.0 | cheetah |

# Configuration Pages

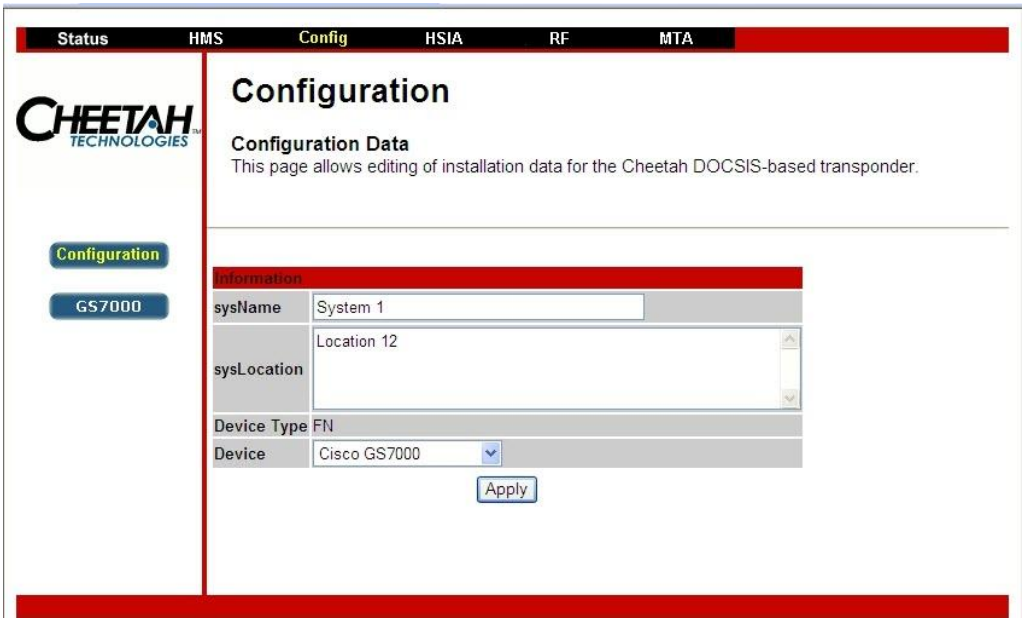
The web interface includes two configuration pages:

- Configuration Data page
- GS7000 Configuration Data page

To access either configuration page, click the **Config** link at the top of the page.

## Configuration Data Page

If the Configuration Data page is not the active page, click the **Configuration** button in the left pane. The Configuration Data page appears, as shown in the following example.




To download a sysName and/or sysLocation to the transponder:

1. Enter a sysName and/or a sysLocation in the appropriate fields, and then click the **Apply** button. A login dialog appears if the login process had not been performed previously during the current session.
2. In the login dialog, enter the correct user name and password, and then click **OK**.

The Device Type displays the type of device the transponder is configured. FN is displayed for Fiber Node.

The Device combo box displays the different devices and network configurations the transponder can be configured to operate within. The device that is displayed without the box extended is the device the transponder is configured for. Choosing the appropriate device type is necessary to ensure the device is properly controlled and monitored. The available options are the following:

- Cisco GS7000
- Cisco GS7000 Dual IP

To change the device:

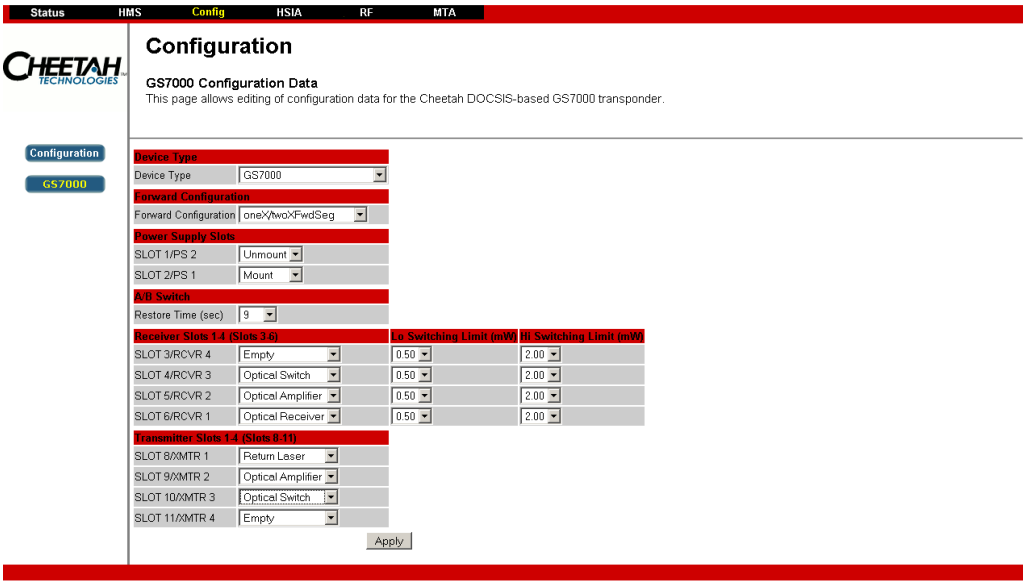
1. Select the appropriate device type, and then click the **Apply** button. A login dialog appears if the login process had not been performed previously during the current session.
2. In the login dialog, enter the correct user name and password, and then click **OK**.

## GS7000 Configuration Data Page

Before the transponder can monitor the node it will need to be set up for how the node is configured. For the GS7000 Node, this can be accomplished by using either the SA-HMS-FIBERNODEGS7000-MIB or through the GS7000 Configuration Data page. For the GS7000 Optical Hub, this can only be accomplished through the GS7000 Configuration Data page.

This section describes how to configure the transponder through the GS7000 Configuration Data page. For information on how to configure the transponder by using the SA-HMS-FIBERNODEGS7000-MIB, see ***Configuring the Transponder Using the SA-HMS-FIBERNODEGS7000 MIB*** (on page 21).

1 If the GS7000 Configuration Data page is not the active page, click the **GS7000** button in the left pane. The GS7000 Configuration Data page appears as shown in the following example.




2 Set the appropriate configuration options (see table below), and then click the **Apply** button. A login dialog appears if the login process had not been performed previously during the current session.

3 In the login dialog, enter the correct user name and password, and then click **OK**.

The following table lists the configuration options available on the GS7000 Configuration Data page.

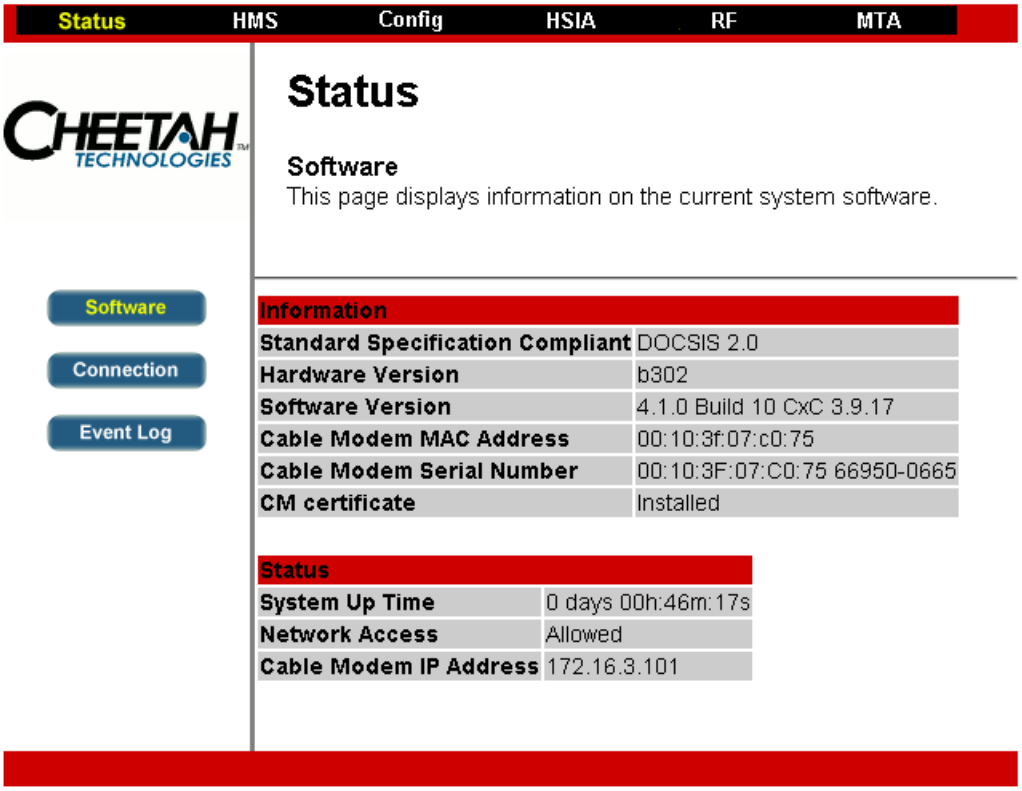
| Component | Description |
|---|---|
| Node Type | Sets the GS7000 device type to one of the following:<br>■ deviceGS7000<br>■ deviceGS7000opticalHubNode |
| Forward Configuration | The forward configuration of the node.<br>■ oneX/twoXFwdSeg - Forward RF signal for all ports comes from one or two optical receivers.<br>■ fourXFwdSeg - Forward RF signal for each port comes from separate optical receivers.<br>■ threeXRx1-2-4FwdSeg - Forward RF signal for each port comes from one of three separate optical receivers. The three receivers are Rx1, 2 and 4; Rx3 is not powered on.<br>■ threeXRx1-3-4FwdSeg - Forward RF signal for each port comes from one of three separate optical receivers. The three receivers are Rx1, 3 and 4; Rx2 is not powered on. |

| Component | Description |
|---|---|
| Power Supply Slots | The maximum number of power supplies that can be installed in the node. Set the installed power supplies to **Mount** and the power supply, if any, that is not installed to **Unmount**. |
| A/B Switch | The Restore Time is the time in Seconds the A/B switch setting will be restored after power has been restored to the primary receiver. The default is 9 and the range is 0-255. |
| Receiver Slots 1-4 (Slots 3-6) | The maximum number of receiver slots or slots to the left of the transponder in the node or optical hub. Set the active slots to **Optical Receiver**, **Optical Amplifier,** or **Optical Switch** as appropriate. Set any slots that do not have a module installed to **Empty**. |
| Lo Switching Limit (mW) | The minimum threshold level for the input signal to the A/B switch. The default is 0.50 and the range is 0.25-2.40.<br>**Notes:**<br>■ When the Lo Switching Limit is set, the LOLO alarm limit for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2) is also set.<br>■ When the LOLO alarm limit is set for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2), the Lo Switching Limit is also set.<br>■ Because the precision of the Lo Switching Limit is in hundredths and the precision of the fnOpticalReceiverPower is in tenths, when the value is set for the saFnOpticalReceiverLoPwrLimit, the LOLO alarm limit for the fnOpticalReceiverPower will be rounded to the nearest tenth. |
| Hi Switching Limit (mW) | The minimum threshold level for the input signal to the A/B switch. The default is 2.00 and the range is 0.25-2.40.<br>**Notes:**<br>■ This parameter is not implemented within the transponder in versions less than 4.1.0.<br>■ When the Hi Switching Limit is set, the HIHI alarm limit for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2) is also set.<br>■ When the HIHI alarm limit is set for the fnOpticalReceiverPower (OID 1.3.6.1.4.1.5591.1.5.5.1.2), the Hi Switching Limit is also set.<br>■ The precision of both the Hi Switching Limit and the fnOpticalReceiverPower is tenths. |

| Component | Description |
|---|---|
| Transmitter Slots 1-4 (Slots 8-11) | The maximum number of transmitter slots or slots to the right of the transponder in the node or optical hub. Set the active slots to **Return Laser**, **Optical Amplifier**, or **Optical Switch** as appropriate. Set any slots that do not have a module installed to **Empty**. |

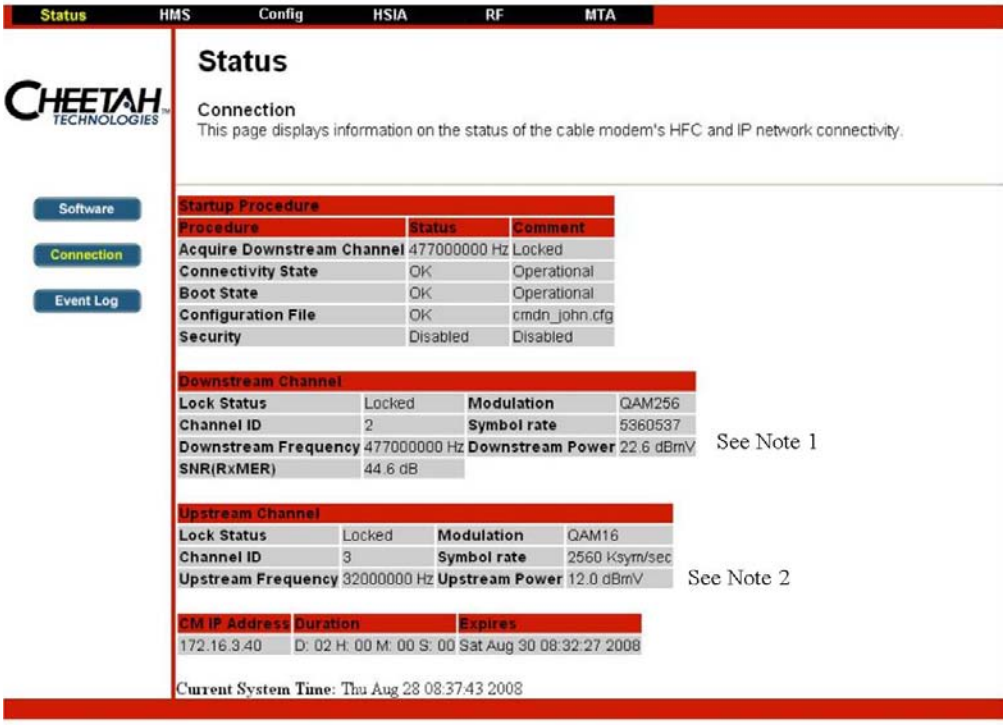
# Status Page for Software Information

Select the **Status** tab to view details on the software running in the cable modem. The Status page for software information appears as shown in the following example.



# Status Page for Connection Information

Click the **Connection** button to see detailed status information related to the current connection to the CMTS. The Status page for connection information appears as shown in the following example.




**Notes:**

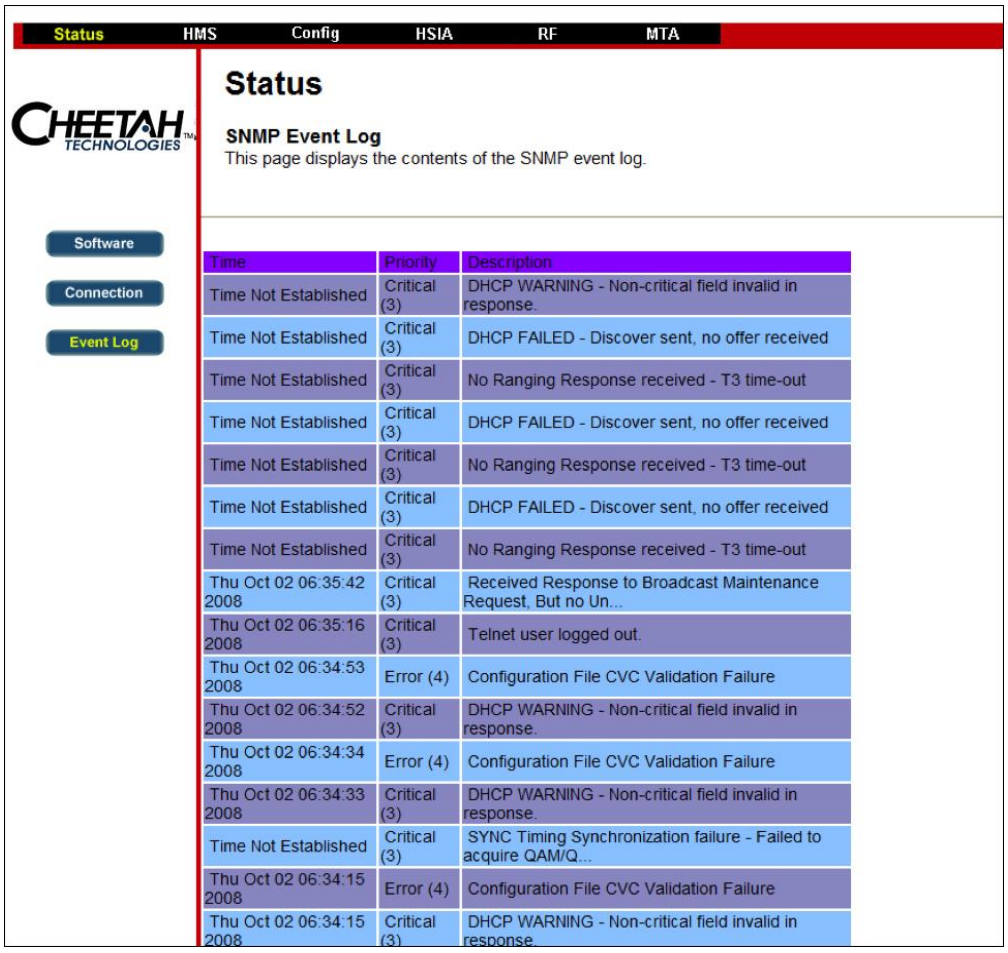
1. Downstream Power has 18 dB internal padding.
2. The transponder output is limited to a maximum of 40 dBmV at the transponder RF connector so as to not exceed manufacturer specifications. This is accomplished through a 15 dB pad in the upstream RF path within the transponder.

   It is possible for the transmit power reading on the web page to exceed 40 dBmV by a significant margin if the transponder cannot reach the CMTS requested transmit level. This high reading on the web page has no adverse impact on operation of either the transponder or the node.

   As the CMTS requests the transponder to transmit at a level beyond its capacity, the web page display can show a slowly increasing power level up to the maximum DOCSIS level for that particular transmit mode and modulation type. Even though the level reading on the web page is high, the transponder output is still limited to 40 dBmV. This condition can occur where the upstream attenuation between the node and CMTS is significant. Under normal conditions, the web page display and actual RF output level are the same.

# Status Page for the SNMP Event Log

Click the **Event** Log button to view recent event log entries. The Status page for the SNMP event log appears as shown in the following example.

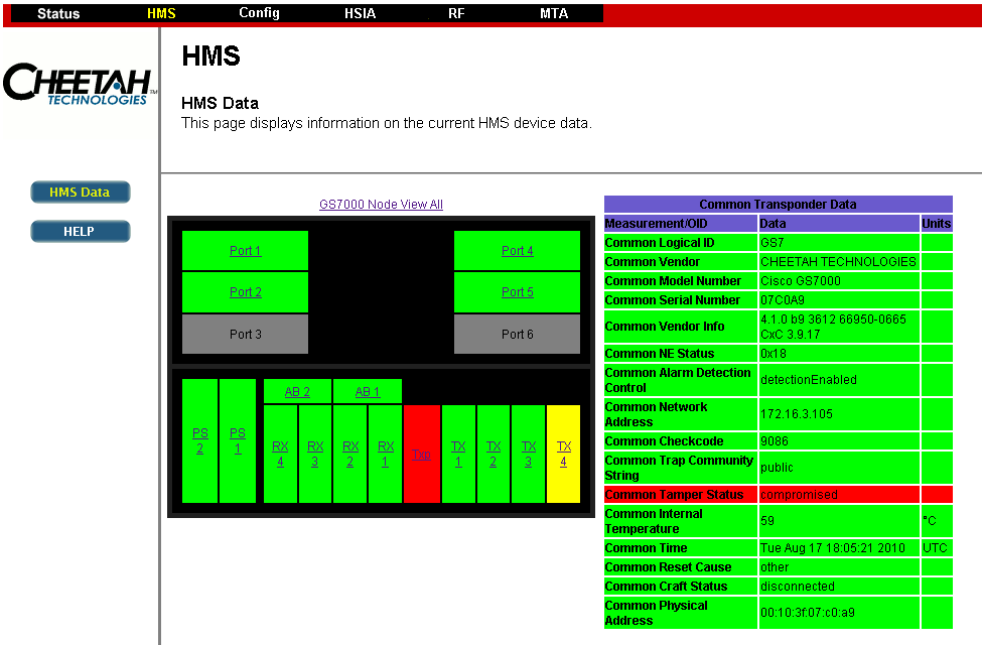



| Time | Priority | Description |
|---|---|---|
| Time Not Established | Critical (3) | DHCP WARNING - Non-critical field invalid in response. |
| Time Not Established | Critical (3) | DHCP FAILED - Discover sent, no offer received |
| Time Not Established | Critical (3) | No Ranging Response received - T3 time-out |
| Time Not Established | Critical (3) | DHCP FAILED - Discover sent, no offer received |
| Time Not Established | Critical (3) | No Ranging Response received - T3 time-out |
| Time Not Established | Critical (3) | DHCP FAILED - Discover sent, no offer received |
| Time Not Established | Critical (3) | No Ranging Response received - T3 time-out |
| Thu Oct 02 06:35:42 2008 | Critical (3) | Received Response to Broadcast Maintenance Request, But no Un... |
| Thu Oct 02 06:35:16 2008 | Critical (3) | Telnet user logged out. |
| Thu Oct 02 06:34:53 2008 | Error (4) | Configuration File CVC Validation Failure |
| Thu Oct 02 06:34:52 2008 | Critical (3) | DHCP WARNING - Non-critical field invalid in response. |
| Thu Oct 02 06:34:34 2008 | Error (4) | Configuration File CVC Validation Failure |
| Thu Oct 02 06:34:33 2008 | Critical (3) | DHCP WARNING - Non-critical field invalid in response. |
| Time Not Established | Critical (3) | SYNC Timing Synchronization failure - Failed to acquire QAM/Q... |
| Thu Oct 02 06:34:15 2008 | Error (4) | Configuration File CVC Validation Failure |
| Thu Oct 02 06:34:15 2008 | Critical (3) | DHCP WARNING - Non-critical field invalid in response. |

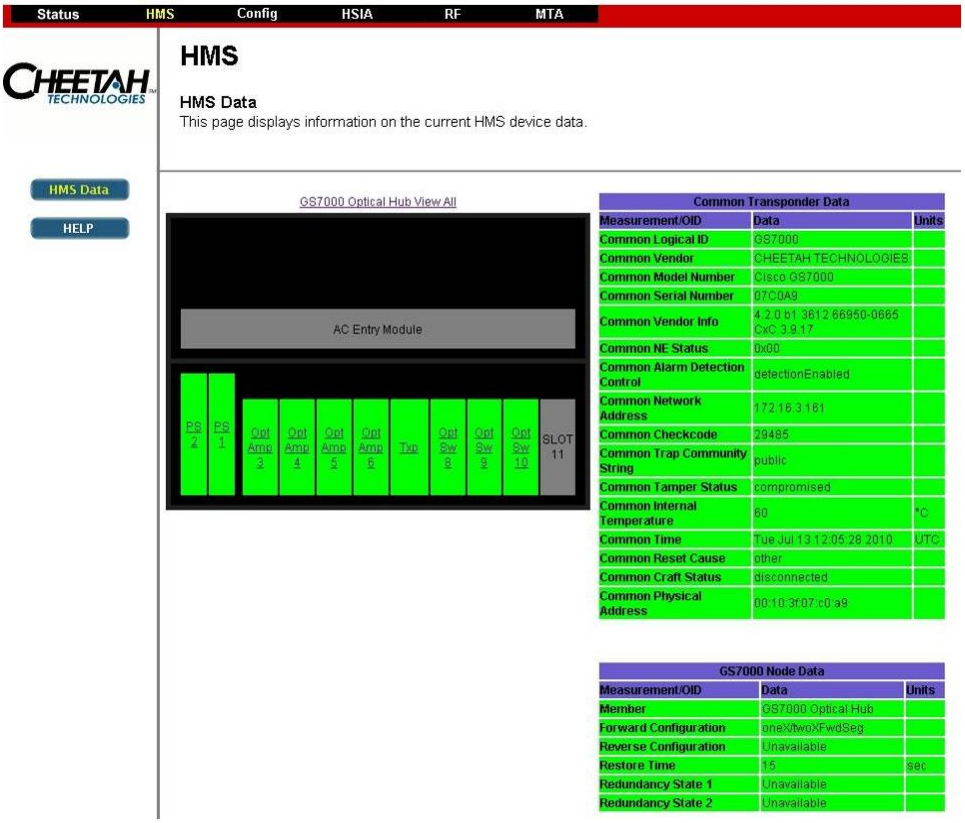
# HMS Fiber Node Data Page

Select the **HMS** tab to view HMS fiber node or optical hub data. The help button refers to a web page at the Cheetah Technologies Corporate website.

The HMS Fiber Node Data page appears as shown in the following example.



The HMS Optical Hub Data page appears as shown in the following example.



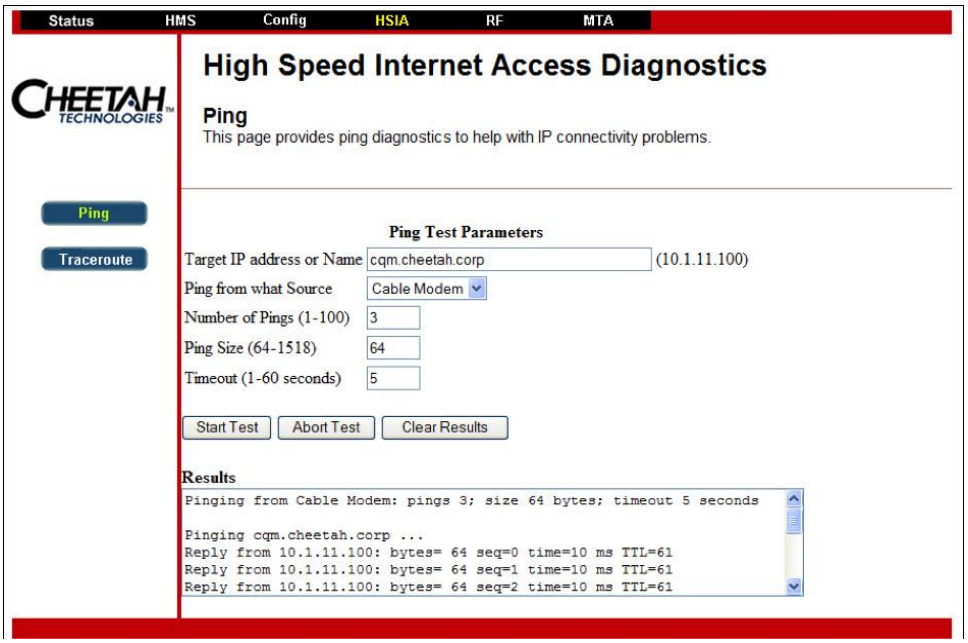

Click on a link to view the parameters associated with that particular module, or click the **View All** link to view all of the parameters at once.

The color of each module indicates the highest level of alarm present in that module at the time. Clicking on the module displays the parameter(s) responsible for the alarm(s). The following is a list of the module colors and their meanings.

- Dark Gray: The module is not present in the node or has not been configured to be monitored.
- Green: The module has no alarms.
- Yellow: The module has at least one parameter in the minor alarm state.
- Red: The module has at least one parameter in the major alarm state.

# HSIA Diagnostics Page: Ping Command

Select the HSIA tab to view high speed Internet access diagnostics. The HSIA Diagnostics page appears as shown in the following example.




The HSIA-Ping Web Interface is accessed from the Connection form that is first displayed when the transponder is accessed.

## Input Parameters

| Input Parameters | Description |
|---|---|
| Target IP address or name | Either a standard IPv4 dotted-quad address or a host name is entered. The address entered will be unconditionally given to the DNS resolver; a dotted-quad will be resolved the same value, and a name will be resolved to its IPv4 address. The final IPv4 address to be pinged is shown in parenthesis beside the host field. |
| Ping from what source | There are up to three choices, depending on what is available in the unit:<br>■ Cable Modem: always available<br>■ CPE: available if the CPE stack is activated<br>■ EMTA: available if the VoIP stack is licensed and activated |
| Number of Pings | Range is 1 to 100. |
| Ping size | Range is 64 to 1518. 64 is the standard size. |

| Input Parameters | Description |
|---|---|
| Timeout | Range 1 to 60 seconds. Standard value is 5 seconds. |

## Controlling the Ping Test

The Ping Test is controlled by the following buttons.

| Button | Description |
|---|---|
| Start Test | Starts the ping test. Each of the values provided in the input fields is evaluated for validity.<br>■ If the host name field is blank, the test will not proceed. (The exception is leaving it blank when a previous name had been entered. In that case, that name will be used.)<br>■ Range checking on the parameters. Any parameter out of range will be ignored, and the default value used.<br>Any issues with the parameters will be displayed at the top of the results box. When the test is started, the web page will begin to automatically refresh. Also, a message will be displayed:<br>**Ping in use from <source>; pkings xxx; size yyy; timeout zzz seconds**<br>indicating the parameters actually in use. This message is also in the text box. |
| Abort Test | Stops any ping test currently in progress. |
| Test Results | Clears the results window. |

## Test Results

Below the test control buttons is a text area that displays the results of the ping test. Any issues with the parameters will be displayed at the top of the results box. During a test, the web page will automatically refresh to show the current results. This refresh stops once the test is completed.

The results area permits the user to select results and copy them for pasting into another program. This is accessed using one of the standard web browser methods:

- Left-click the box and press **Ctrl-A** (select all)
- Right-click the box and click **Select all**
- Use the mouse cursor to select those lines of interest

Copy is done via standard commands used on the system in question (e.g., under Windows, use Ctrl-C to copy.)

The following example shows a typical set of Ping results.

```
Pinging from Cable Modem: pings 25; size 64 bytes; timeout 5 seconds

Pinging cms-pit.tollgrade.com ...
Reply from 172.16.0.11: bytes= 64 seq=0 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=1 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=2 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=3 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=4 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=5 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=6 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=7 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=8 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=9 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=10 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=11 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=12 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=13 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=14 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=15 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=16 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=17 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=18 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=19 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=20 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=21 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=22 time=10 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=23 time=0 ms TTL=62
Reply from 172.16.0.11: bytes= 64 seq=24 time=0 ms TTL=62

Ping statistics:
  Pings sent:  25 (1 per second); Replies received:  25 (1 per second)
  Bytes sent:  1600 (66 per second); Bytes received:  1600 (66 per second)
  25 replies passed verification (0 failed)
  Min time:  0 ms; Max time:  10 ms; Avg time:  6 ms; Total time:  24230 ms
```

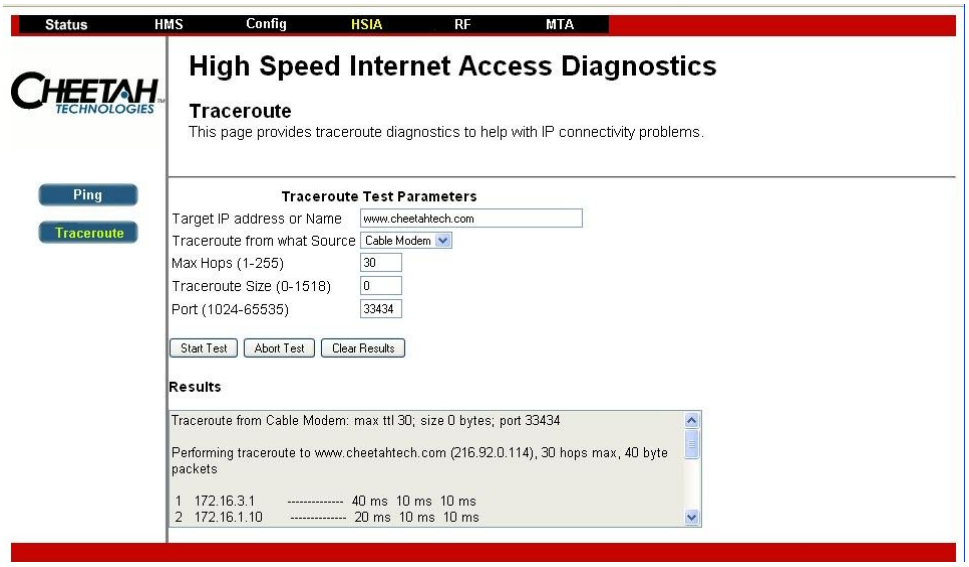
## Simultaneous Access

Access by more than one user is possible; however, only a single test can be run at a time. When the “Ping in use” message appears (see **Controlling the Ping Test** above), no other test can be started. Through the use of a temporary cookie, only the original user can abort an active test.

# HSIA Diagnostics Page: Traceroute Command

The HSIA-Traceroute Web Interface is accessed from the Connection form that is first displayed when the transponder is accessed.

Click the **Traceroute** button to view the traceroute diagnostics page. The page appears as shown in the following example.




## Input Parameters

| Input Parameters | Description |
|---|---|
| Target IP address or name | Either a standard IPv4 dotted-quad address or a host name is entered. The address entered will be unconditionally given to the DNS resolver; a dotted-quad will be resolved the same value, and a name will be resolved to its IPv4 address. The final IPv4 address to be Tracerouted is shown in parenthesis beside the host field. |
| Traceroute from what source | There are up to three choices, depending on what is available in the unit:<br>■ Cable Modem: always available<br>■ CPE: available if the CPE stack is activated<br>■ EMTA: available if the VoIP stack is licensed and activated |
| Max hops | Range is 1 to 255; default is 30. Also known as Max TTL, which is Maximum Time-to-Live. |

| Input Parameters | Description |
|---|---|
| Traceroute size | Range is 0 to 1518. 0 is the standard size, resulting in packets of 40 bytes inclusive of all overhead. |
| Port | Port to use. Standard is 33434 as the initial port. |

## Controlling the Traceroute Test

The Traceroute Test is controlled by the following buttons.

| Button | Description |
|---|---|
| Start Test | Starts the Traceroute test. Each of the values provided in the input fields is evaluated for validity.<br>■ If the host name field is blank, the test will not proceed. (The exception is leaving it blank when a previous name had been entered. In that case that name will be used.)<br>■ Range checking on the parameters. Any parameter out of range will be ignored, and the default value used.<br>Any issues with the parameters will be displayed at the top of the results box. When the test is started, the web page will begin to automatically refresh. This message also appears, indicating the parameters actually in use:<br>**Traceroute in use from <source>; max TTL xxx; size yyy; port nnnnn**<br>This message is also in the text box. |
| Abort Test | Stops any traceroute test currently in progress. |
| Clear Results | Clears the results window. |

## Test Results

Below the test control buttons is a text area that displays the results of the Traceroute test. Any issues with the parameters will be displayed at the top of the results box. During a test, the web page will automatically refresh to show the current results. This refresh stops once the test is completed.

The results area permits the user to select results and copy them for pasting into another program. You access this feature using one of the standard web browser methods:

- Left-click the box and press Ctrl-A (select all)
- Right-clicking in the box and click Select all

- Use the mouse cursor to select the lines of interest

Copy is done via standard commands used on the system in question (e.g., under Windows, use Ctrl-C to copy).

The following example shows a typical set of Traceroute results.

```
Traceroute from Cable Modem: max ttl 30; size 0 bytes; port 33434

Performing traceroute to cqm.cheetah.corp (10.1.11.100), 30 hops max, 40 byte
packets
 1   172.16.3.1        --------------  60 ms  10 ms  10 ms
 2   172.16.1.10       --------------  20 ms  10 ms  20 ms
 3   172.16.0.1        --------------  10 ms  10 ms  10 ms
 4   10.1.11.100       --------------  10 ms  20 ms  20 ms
Operation complete
```

## Simultaneous Access

Access by more than one user is possible; however, only a single test can be run at a time. When the "Traceroute in use" message is displayed (see **Controlling the Traceroute Test** above), no other test can be started. Through the use of a temporary cookie, only the original user can abort an active test.

## Traceroute Legal Agreement

The code in use to implement Traceroute originates from a third party. It had been modified slightly by Broadcom, and subsequently modified by Cheetah Technologies. The header of the file is included here for reference.

```
 * Copyright (c) 1990, 1993

 *     The Regents of the University of California.  All rights reserved.

 *

 * This code is derived from software contributed to Berkeley by

 * Van Jacobson.

 *

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*    may be used to endorse or promote products derived from this software
*    without specific prior written permission.
```
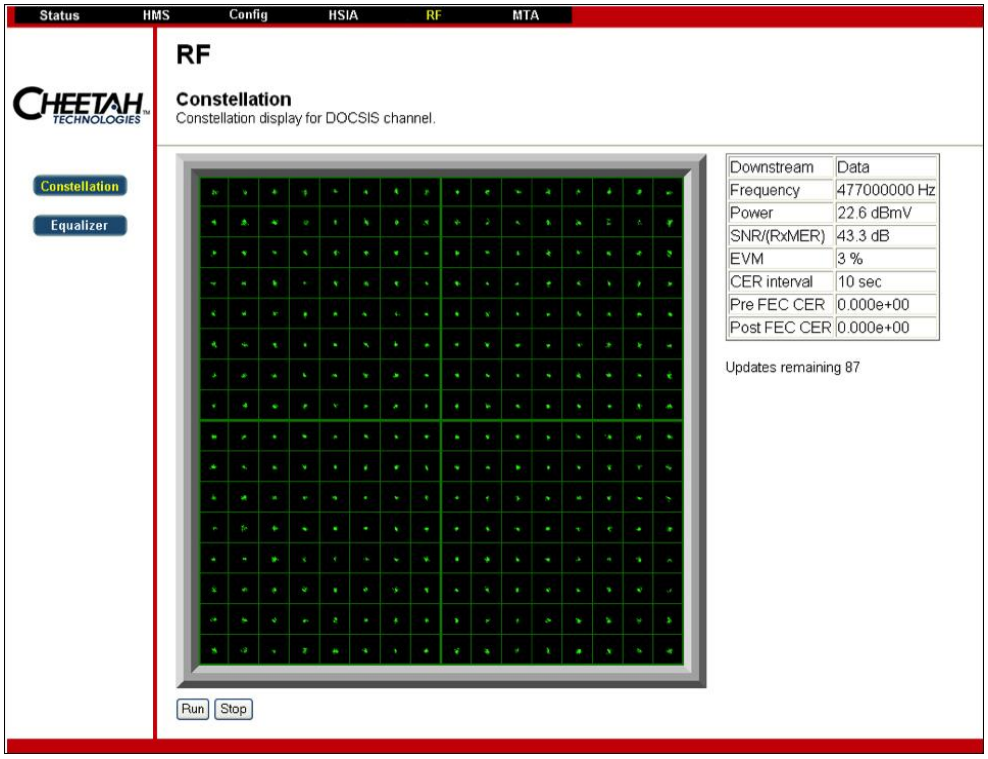

# RF Constellation Page

Select the **RF** tab to access the RF Constellation page. The RF Constellation page appears as shown in the following example.




The QAM constellation map is useful in diagnosing line problems that might otherwise go undiagnosed. This section provides useful information on how to interpret the information presented in the QAM map.

The interface consists of a panel of variables and the constellation map itself. At the device level, the QAM functionality is only supported by Cheetah Technologies products that are based on the ECMM technology.

## Controls

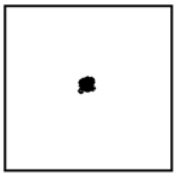
- Run — Start the sampling of data by pushing the Run button. The unit will acquire 100 samples and then stop.
- Stop — Use the Stop button to end the sampling.

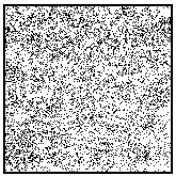
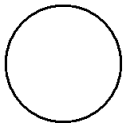
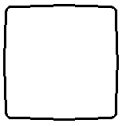
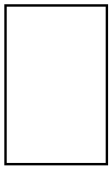
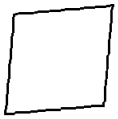
## Downstream Data

- Frequency — is the downstream frequency given in Hz.
- Power — is the downstream power given in dBmV.
- SNR / (RxMER) — this is the downstream signal quality. Modulation Error Ratio (SNR).
- EVM —Error Vector Magnitude calculated from MER.
- CER Interval — Codeword Error Rate (CER) refresh rate.
- Pre FEC CER — Codeword error rate (CER) BEFORE forward error correction is applied.
- Post FEC CER — Codeword error rate (CER) AFTER forward error correction is applied.
- Updates Remaining — this is the number of sample updates remaining for this session.

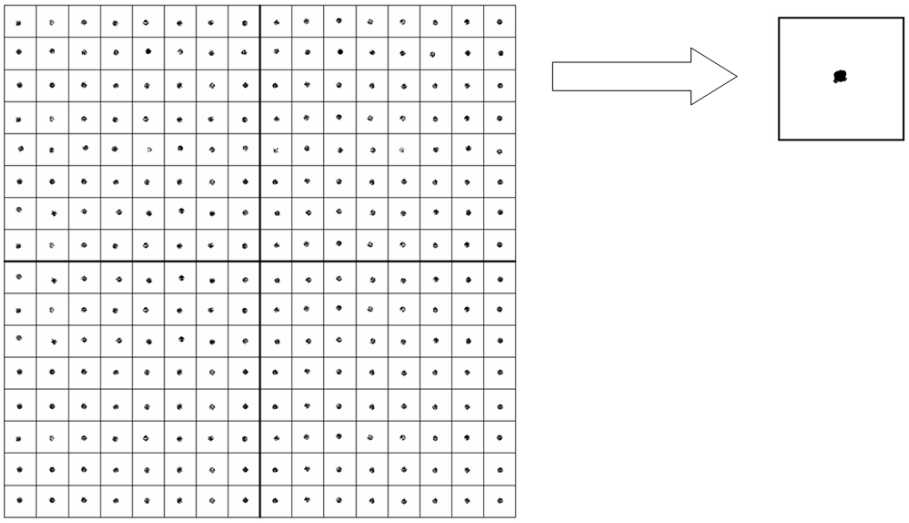
## Interpreting QAM Constellation Data by Visual Inspection

The usefulness of the QAM constellation comes in the ability to recognize common shapes and configurations within the map. The following table summarizes the shapes commonly visible in the RF Constellation page. Examples of these shapes are illustrated in the figures that follow.

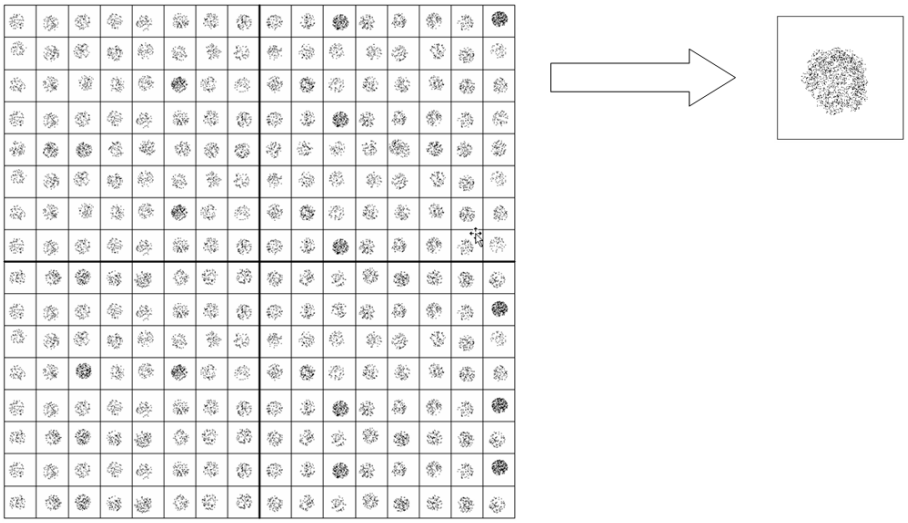
| Shape | Focus | Impairment | Description |
|---|---|---|---|
|  | Individual cells and entire QAM constellation | Normal | Dots are centered in the individual QAM quadrants. The QAM constellation has a uniform square shape. |
|  | Individual cells | Low CNR and/or Low MER | Individual cells of QAM constellation contain a fuzzy and diffused pattern. |

| Shape | Focus | Impairment | Description |
|---|---|---|---|
|  | Individual cells | Coherent Interference | Individual cells of QAM constellation contain diffused hollow circles or "doughnuts". This indicates an interfering carrier and shows the effect of not allowing the carrier to ever reach the proper point in the target range. |
|  | Individual cells | Gaussian Noise | Individual cells contain a complete and fairly uniform smear up to all decision boundaries, and is usually caused by improper system setup, too many amplifiers in a cascade, damaged/ overheated hardware, and/or low power. |
|  | Entire QAM constellation | Phase Noise | QAM constellation consists of smeared, concentric, circular patterns. |
|  | Entire QAM constellation | Gain Compression | QAM constellation looks uniformly square, but the outside corners appear to be "smashed" toward center of grid (compression in the RF plant). |
|  | Entire QAM constellation | I-Q Imbalance in the Modulator | Overall appearance of QAM constellation is rectangular rather than the desired square shape (square inequality). |
|  | Entire QAM constellation | Quadrature Distortion | Overall appearance of QAM constellation has a twisted or skewed parallelogram shape. |

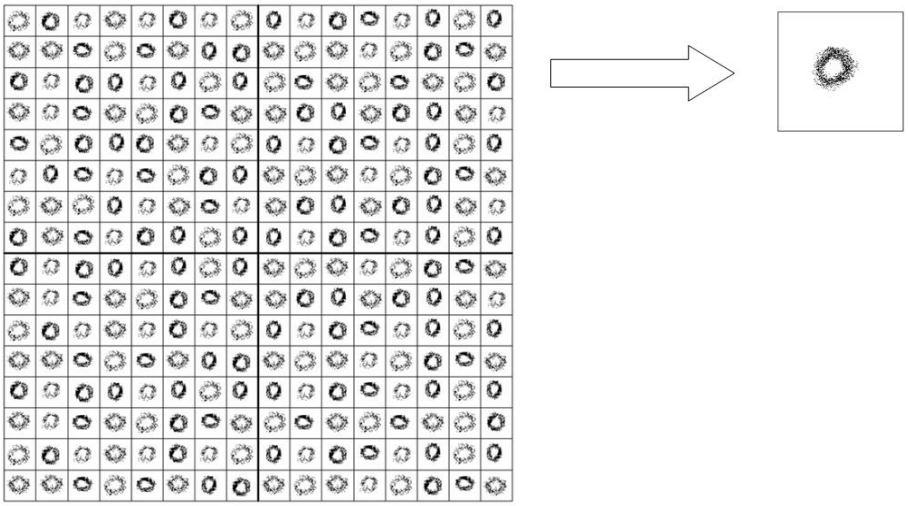
### Sample QAM Constellation—Normal Centered Dots (Good Sound Quality)



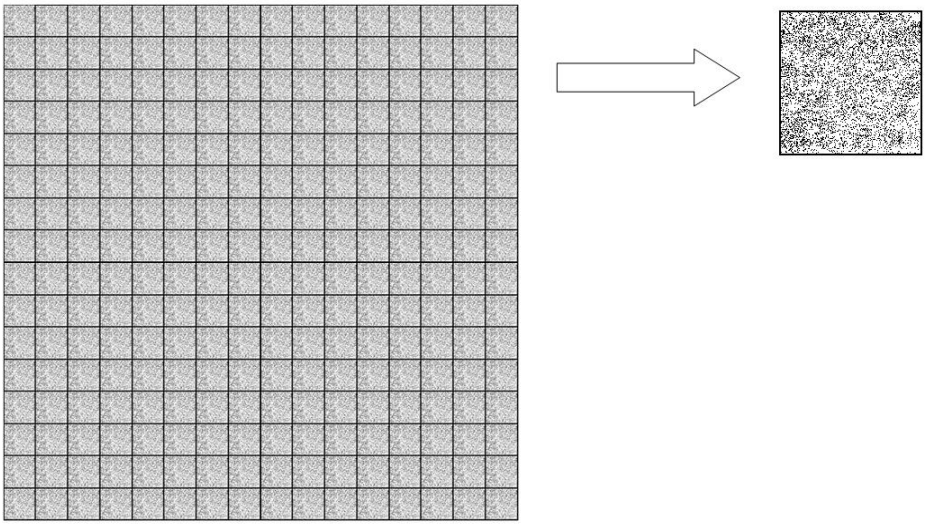
### Sample QAM Constellation—Fuzzy (Low CNR and/or Low MER)



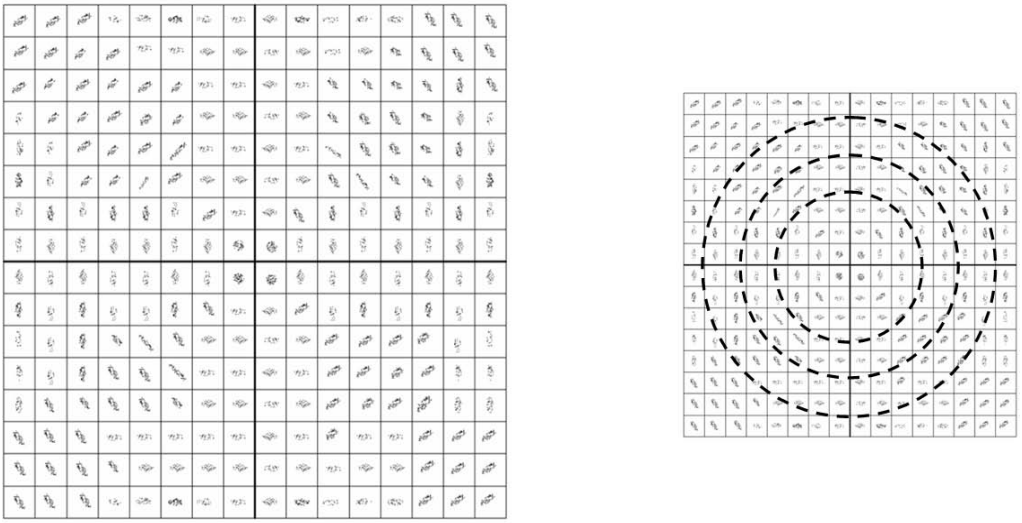
### Sample QAM Constellation—"Doughnuts" (Coherent Interference)



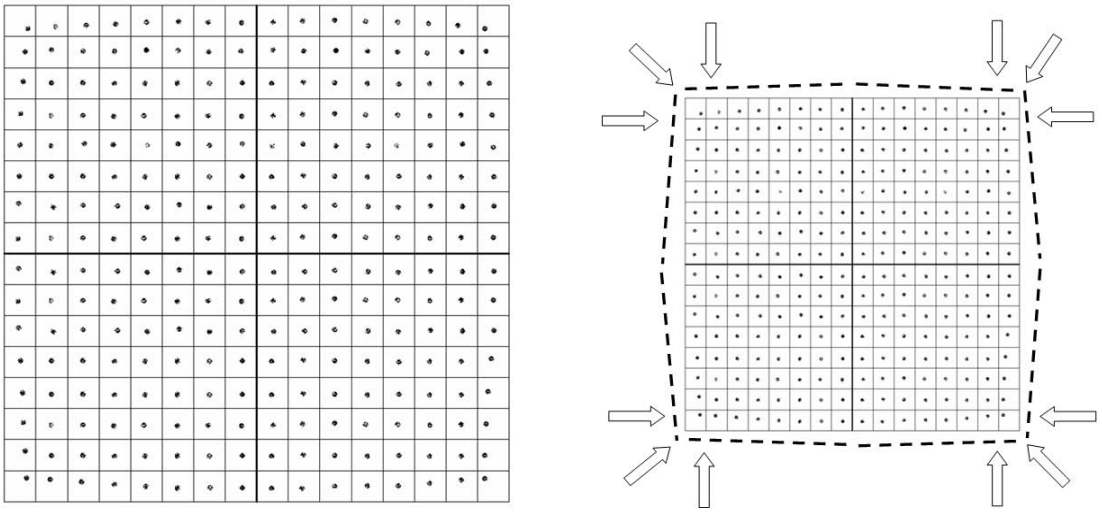
### Sample QAM Constellation—Gaussian Noise



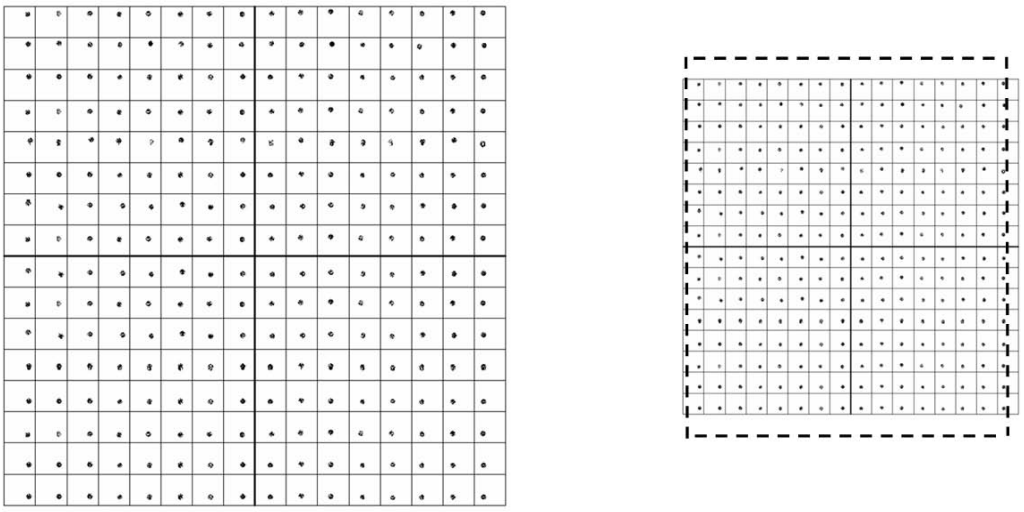
### Sample QAM Constellation—Circular Smear (Phase Noise)



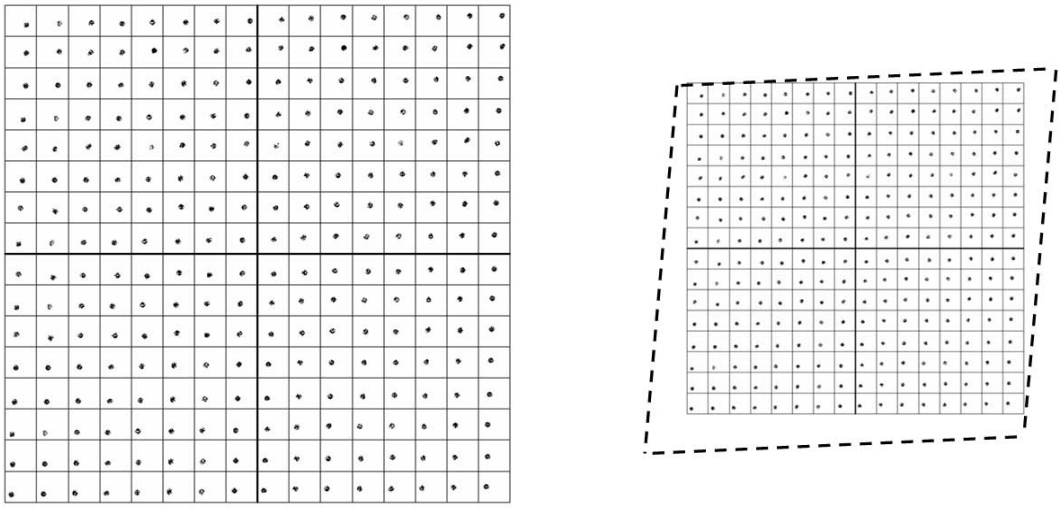
### Sample QAM Constellation—Corners Squeezed to Center (Gain Compression)



### Sample QAM Constellation—Rectangular vs. Square (I-Q Imbalance)

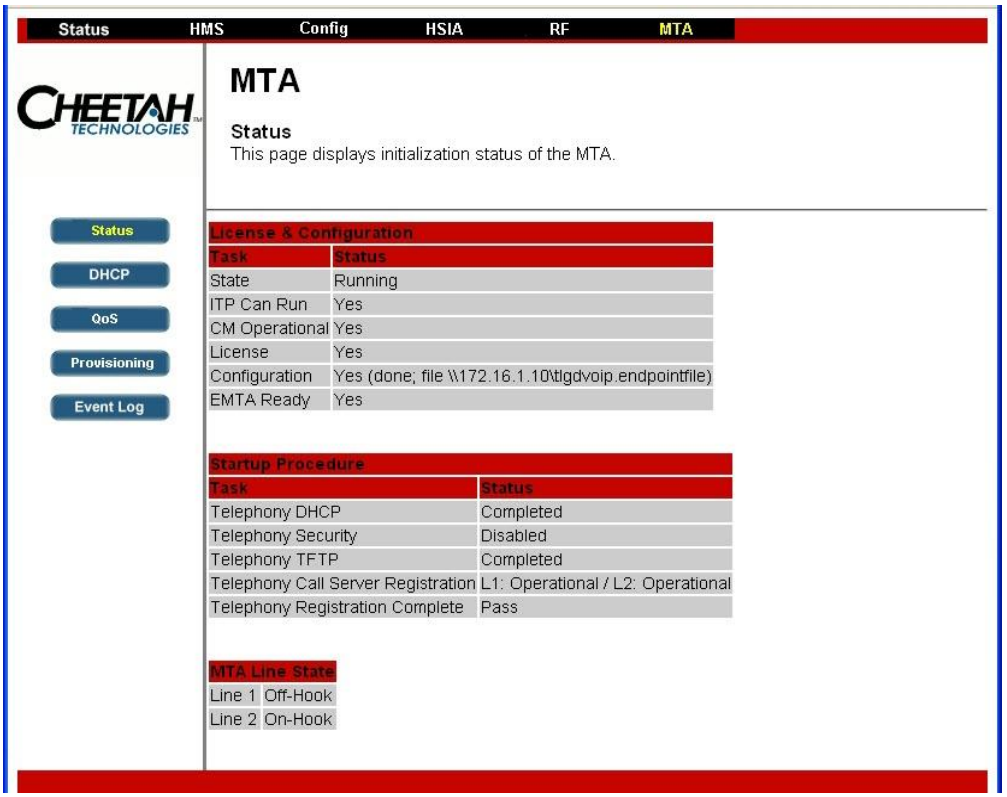


### Sample QAM Constellation—Twisted or Skewed (Quadrature Distortion)



# MTA Status Page

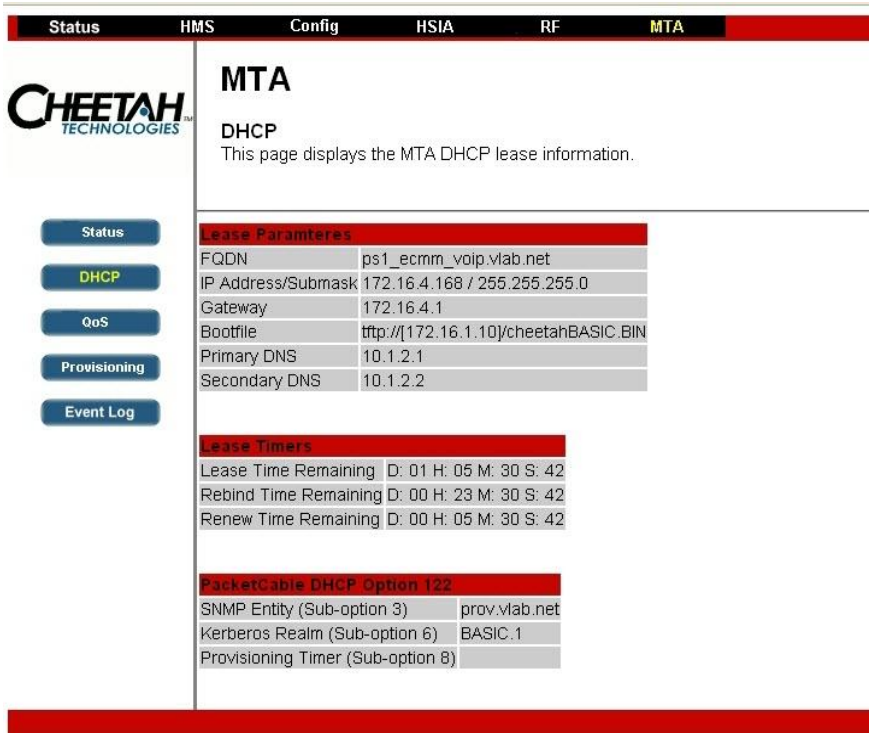
The MTA Status page provides information related to the initialization status of the MTA.




Select the **MTA** tab to view the MTA Status page via the Status, DHCP, QoS, Provisioning, and Event Log buttons.

# MTA DHCP Page

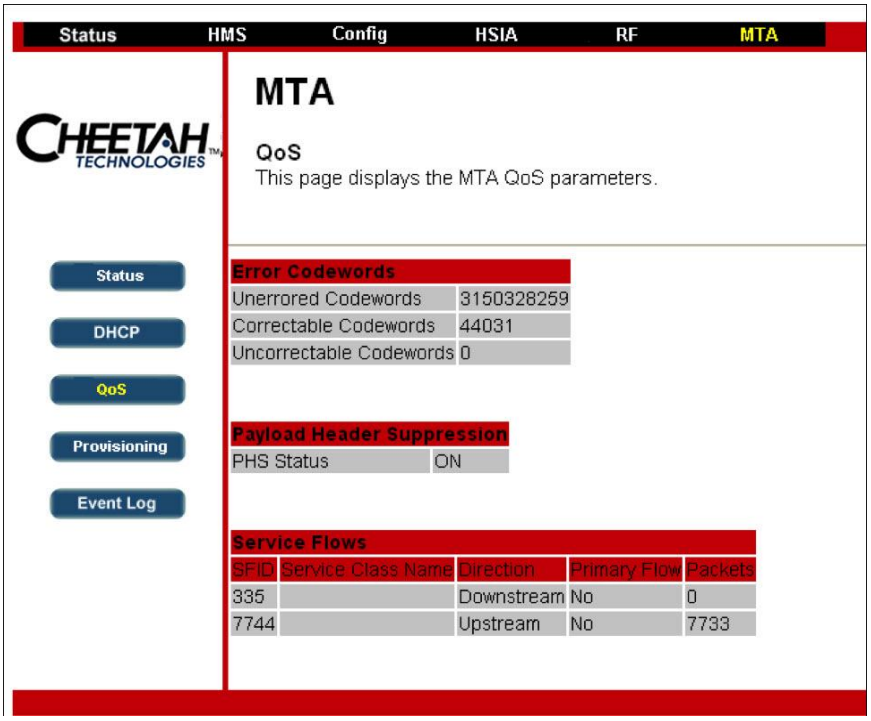
This page displays information about the MTA Dynamic Host Communications Protocol (DHCP) lease.




Click the **DHCP** button to view the DHCP information.

# MTA Quality of Service (QoS) Page

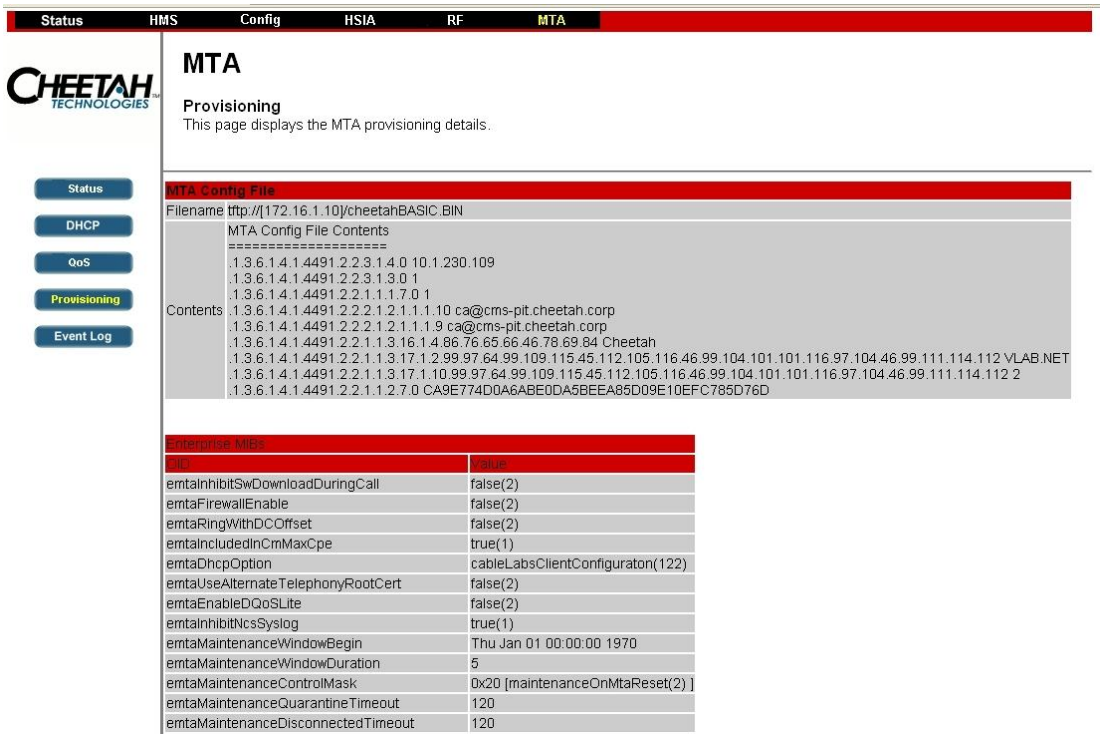
This page displays the MTA Quality of Service (QoS) parameters.




Click the **QoS** button to view the MTA QoS parameters.

# MTA Provisioning Page

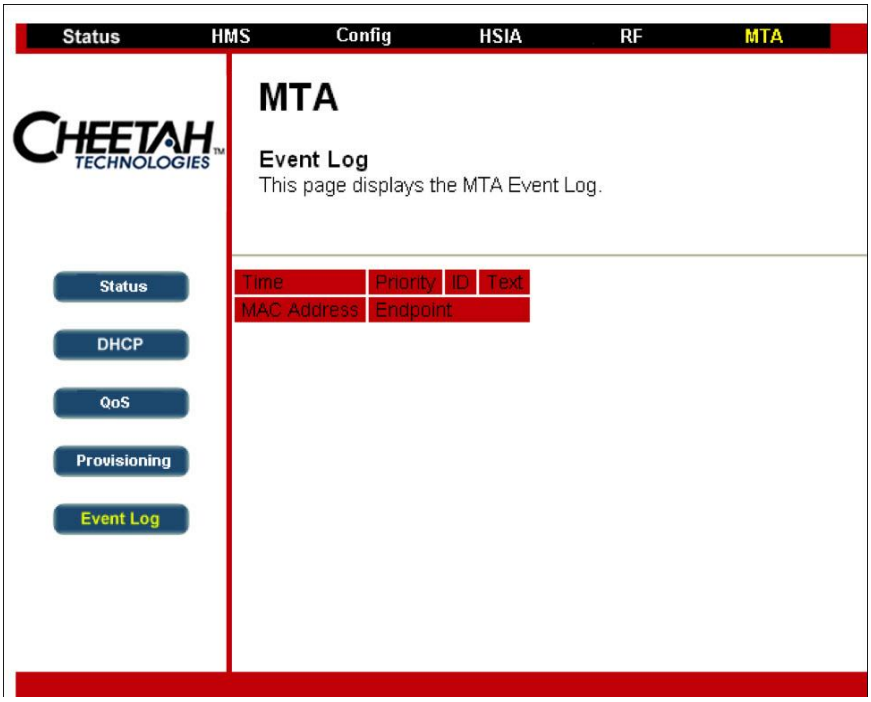
This page displays the MTA provisioning details.




Click the **Provisioning** button to view MTA provisioning details.

# MTA Event Log Page

This page displays the MTA Event Log.




Click the **Event Log** button to view the MTA Event Log information.

# A

# Technical Information

## Introduction

This appendix contains tilt, forward and reverse equalizer charts and pad values and part numbers.

## In This Appendix

# Cable Pinout Details

## Ethernet Cable

Following is the pin number configuration chart for the Ethernet cable.

| Pin | Name |
|---|---|
| 1 | Transmit + |
| 2 | Transmit - |
| 3 | Receive + |
| 4 | Unused |
| 5 | Unused |
| 6 | Receive - |
| 7 | Unused |
| 8 | Unused |

# Upgrading the Transponder Firmware

The firmware in the GS7000 DOCSIS Status Monitor transponder can be upgraded in the same fashion as any other DOCSIS-compliant cable modem. Refer to the Cable Labs CM-SP-OSSIv2.0 and SP-BPI+ specifications for details on secure software download.

# 6

# Customer Support Information

## Introduction

This chapter contains information on obtaining product support.

## Obtaining Product Support

| IF… | THEN… |
|---|---|
| you have general questions about this product | contact your distributor or sales agent for product information or refer to product data sheets on www.cisco.com. |
| you have technical questions about this product | call the nearest Technical Support center. |
| you have customer service questions about this product | call the nearest Customer Service center. |

## In This Chapter

# Support Telephone Numbers

This table lists the Technical Support and Customer Service numbers for your area.

| Region | Centers | Telephone and Fax Numbers |
|---|---|---|
| North America | Cisco Services<br>Atlanta, Georgia<br>United States | For *Technical Support*, call:<br>■ Toll-free: 1-800-722-2009<br>■ Local: 678-277-1120 (Press **2** at the prompt)<br>For *Customer Service*, call:<br>■ Toll-free: 1-800-722-2009<br>■ Local: 678-277-1120 (Press **3** at the prompt)<br>■ Fax: 770-236-5477<br>■ Email: customer-service@cisco.com |
| Europe, Middle East, Africa | Belgium | For *Technical Support*, call:<br>■ Telephone: 32-56-445-197 or 32-56-445-155<br>■ Fax: 32-56-445-061<br>For *Customer Service*, call:<br>■ Telephone: 32-56-445-444<br>■ Fax: 32-56-445-051<br>■ Email: service-elc@cisco.com |
| Japan | Japan | ■ Telephone: 81-3-5908-2153 or +81-3-5908-2154<br>■ Fax: 81-3-5908-2155 |
| Korea | Korea | ■ Telephone: 82-2-3429-8800<br>■ Fax: 82-2-3452-9748<br>■ Email: songk@cisco.com |
| China (mainland) | China | ■ Telephone: 86-21-2401-4433<br>■ Fax: 86-21-2401-4455<br>■ Email: xishan@cisco.com |
| All other Asia Pacific countries & Australia | Hong Kong | ■ Telephone: 852-2588-4746<br>■ Fax: 852-2588-3139<br>■ Email: saapac-support@cisco.com |
| Brazil | Brazil | ■ Telephone: 11-55-08-9999<br>■ Fax: 11-55-08-9998<br>■ Email: fattinl@cisco.com or ecavalhe@cisco.com |
| Mexico, Central America, Caribbean | Mexico | For *Technical Support*, call:<br>■ Telephone: 52-3515152599<br>■ Fax: 52-3515152599<br>For *Customer Service*, call:<br>■ Telephone: 52-55-50-81-8425<br>■ Fax: 52-55-52-61-0893<br>■ Email: sa-latam-cs@cisco.com |
| All other Latin America countries | Argentina | For *Technical Support*, call:<br>■ Telephone: 54-23-20-403340 ext 109<br>■ Fax: 54-23-20-403340 ext 103<br>For *Customer Service*, call:<br>■ Telephone: 770-236-5662<br>■ Fax: 770-236-5888<br>■ Email: keillov@cisco.com |

# Glossary

A

ampere. A unit of measure for electrical current.

ac, AC

alternating current. An electric current that reverses its direction at regularly recurring intervals.

AC/RF

alternating current radio frequency.

AFC

automatic frequency control. An arrangement whereby the tuning of a circuit is automatically maintained within specified limits with respect to a reference frequency.

AGC

automatic gain control. A process or means by which gain is automatically adjusted in a specified manner as a function of input level or other specified parameters.

AMPL

amplitude.

amplifier cascade

two or more amplifiers in a series, the output of one feeding the input of another.

attenuation

The difference between transmitted and received signal strength due to loss through equipment, lines, or other transmission medium. Usually expressed in decibels.

attenuator

A passive device designed to reduce signal strength without distorting the waveform. Usually specified in dB.

AUX

auxiliary.

baseband

The original band of frequencies occupied by the signal before it modulates the carrier frequency to form the transmitted signal. Characteristic of any network technology that uses a single carrier frequency and requires all stations attached to the network to participate in every transmission.

baud (Bd)

A measure of signaling rate based on the number of signaling events per unit of time.

beamwidth

The included angle between two rays (usually the half-power points) on the radiation pattern, which includes the maximum lobe, of an antenna.

BIOS

basic input/output system.

blanking level

The amplitude of the front and back porches of the composite video signal. The blanking level separates the range containing picture information from the range containing synchronization information.

BNC

A coaxial connector that uses two bayonet lugs on the side of the female connector. BNC stands for Bayonet Neill Concelman and is named after Amphenol engineer Carl Concelman.

BPF

bandpass filter.

BW

bandwidth. A measure of the information-carrying capacity of a communications channel, for example the range of usable frequencies that can be carried by a CATV system. The bandwidth corresponds to the difference between the lowest and highest frequency that can be carried by the channel.

C/N or CNR

carrier-to-noise ratio. The ratio, in decibels, of the carrier to that of the noise in a receiver's IF bandwidth after specified band limiting and before any nonlinear process such as amplitude

limiting and detection takes place.

C/T

carrier-to-noise temperature ratio.

CISC

Complex Instruction Set Computer. A computer that uses many different types of instructions to conduct its operations, i.e., IBM PCs, Apple Macintosh's, IBM 370 mainframes.

compression

The non-linear change of gain at one level of a signal with respect to the change of gain at another level for the same signal. Also, the elimination of redundant information from an audio, data, or video signal to reduce transmission requirements.

CW

continuous wave.

CWDM

coarse wave-division multiplexing. CWDM allows a modest number of channels, typically eight or less, to be stacked in the 1550 nm region of the fiber called the C-Band. This capacity is greater than WDM (wave-division multiplexing) and lesser than DWDM (dense wave-division multiplexing).

dB

decibel. One tenth of a bel, the number of decibels denoting the ratio of two amounts of power being ten times the common logarithm of this ratio.

dBc

decibels relative to a reference carrier.

dBi

decibels of gain relative to an isotropic radiator.

dBm

decibels relative to 1 milliwatt.

dBmV

decibels relative to 1 millivolt.

dBuV

decibels relative to 1 microvolt.

dBW

decibels relative to 1 watt.

DC

directional coupler.

dc, DC

direct current. An electric current flowing in one direction only and substantially constant in value.

deviation

The peak difference between the instantaneous frequency of the modulated wave and the carrier frequency, in an FM system.

differential gain

The difference in amplification of a signal (superimposed on a carrier) between two different levels of carrier.

diplex filter

A filter which divides the frequency spectrum into a high frequency segment and a low frequency segment so that two different signals can be sent down the same transmission path.

distribution

The activities associated with the movement of material, usually finished products or service parts, from the manufacturer to the customer.

distribution system

The part of a CATV system consisting of the transmission medium (coaxial cables, fiber optic cables, etc.) used to carry signals from the headend system to subscriber terminals.

DSP

digital signal processor.

duplexer

A device which permits the connection of both a receiver and a transmitter to a common antenna.

DVM

digital voltmeter.

DWDM

dense wave-division multiplexing. A method of placing multiple wavelengths of light into a single fiber that yields higher bandwidth capacity. Dense WDM indicates close spacing and more than 4 to 8 wavelengths.

EC

European Community.

EEPROM

electrically erasable programmable read-only memory.

EMC

electromagnetic compatibility. A measure of equipment tolerance to external electromagnetic fields.

emission designer

An FCC or CCIR code that defines the format of radiation from a transmitter.

EPROM

erasable programmable read-only memory.

EQ

equalizer.

equalization

The process of compensating for an undesired result. For example, equalizing tilt in a distribution system.

ERP

effective radiated power.

ESD

electrostatic discharge. Discharge of stored static electricity that can damage electronic equipment and impair electrical circuitry, resulting in complete or intermittent failures.

FCM

forward configuration module.

FET

field-effect transistor. A transistor in which the conduction is due entirely to the flow of majority carriers through a conduction channel controlled by an electric field arising from a voltage applied between the gate and source electrodes.

FM

frequency modulation. A transmission technique in which the frequency of the carrier varies in accordance with the modulating signal.

frequency

The number of similar shapes in a communications or electrical path in a unit of time. For example, the number of sine waves moving past a fixed point in a second.

frequency agile

The ability to change from one frequency to another without changing components.

frequency response

The effect that changing the frequency has on the magnitude of a signal.

ft-lb

foot-pound. A measure of torque defined by the application of one pound of force on a lever at a point on the lever that is one foot from the pivot point.

gain

A measure of the increase in signal level, relative to a reference, in an amplifier. Usually expressed in decibels.

Hertz

A unit of frequency equal to one cycle per second.

HFC

hybrid fiber/coaxial. A network that uses a combination of fiber optics and coaxial cable to transport signals from one place to another. A broadband network using standard cable television transmission components, such as optical transmitters and receivers, coaxial cable, amplifiers, and power supplies. The broadband output stream is transmitted as an optical signal, over the high-speed, fiber optic transmission lines to local service areas where it is split, converted to electrical RF signals, and distributed to set-tops over coaxial cable.

I/O

input/output.

IC

integrated circuit.

IEC

International Electro-technical Commission.

IF

intermediate frequency. The common frequency which is mixed with the frequency of a local oscillator to produce the outgoing radio frequency (RF) signal.

in-lb

inch-pound. A measure of torque defined by the application of one pound of force on a lever at a point on the lever that is one inch from the pivot point.

ITU

International Telecommunications Union.

LE

line extender.

LED

light-emitting diode. An electronic device that lights up when electricity passes through it.

LNC

low-noise converter.

Mbps

megabits per second. A unit of measure representing a rate of one million bits (megabits) per second.

multipath, multipath transmission

The phenomenon which results from a signal traveling from point to point by more than one path so that several copies of the signal arrive at the destination at different times or at different angles.

Nm

Newton meter. A measure of torque defined by the application of one Newton of force on a lever at a point on the lever that is one meter from the pivot point. (1 Nm = 0.737561 ft-lb)

OIB

optical interface board.

PCB

printed circuit board.

PROM

programmable read-only memory. A memory chip on which data can be written only once. Once data has been written onto a PROM, it cannot be written to again.

PWB

printed wiring board.

QAM

quadrature amplitude modulation. An amplitude and phase modulation technique for representing digital information and transmitting that data with minimal bandwidth. Both phase and amplitude of carrier waves are altered to represent the binary code. By manipulating two factors, more discrete digital states are possible and therefore larger binary schemes can be represented.

QPSK

quadrature phase-shift keying. A phase modulation technique for representing digital information. QPSK produces four discrete states, each state representing two bits of information.

RCM

reverse configuration module.

RCVR

receiver.

reverse path

Signal flow direction toward the headend.

RF

radio frequency. The frequency in the portion of the electromagnetic spectrum that is above the audio frequencies and below the infrared frequencies, used in radio transmission systems.

RFI

radio frequency interference.

RMA

return material authorization. A form used to return products.

RX

receive or receiver.

S/N or SNR

signal-to-noise ratio. The ratio, in decibels, of the maximum peak-to-peak voltage of the video signal, including synchronizing pulse, to the root-mean-square voltage of the noise. Provides a measure and indication of signal quality.

SA

system amplifier.

SM

status monitor.

SMC

status monitoring and control. The process by which the operation, configuration, and performance of individual elements in a network or system are monitored and controlled from a central location.

SMIU

status monitor interface unit.

SNMP

simple network management protocol. A protocol that governs network management and the monitoring of network devices and their functions.

synchronous transmission

A transmission mode in which the sending and receiving terminal equipment are operating continuously at the same rate and are maintained in a desired phase relationship.

torque

A force that produces rotation or torsion. Usually expressed in lb-ft (pound-feet) or N-m (Newton-meters). The application of one pound of force on a lever at a point on the lever that is one foot from the pivot point would produce 1 lb-ft of torque.

TX

transmit or transmitter.

UPS

un-interruptible power supply.

uV

microvolt. One millionth of a volt.

V

volt.

W

watt. A measure of electrical power required to do work at the rate of one joule per second. In a purely resistive load, 1 Watt = 1 Volt x 1 Amp.

# Index

## G



## H



## I



## L



## M



## N



## O



## P



## Q



## R



## S



## T



## U



## V



## W

## Y

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