Model GS7000 Hub/Node Status Monitor/Local Control Module

Installation and Configuration 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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Important Safety Instructions

Read these instructions. Keep these instructions. Heed all warnings. Follow all instructions. Only use attachments/accessories specified by the manufacturer.

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

Overview

Introduction

This manual describes the installation, configuration, operation, and troubleshooting of the Status Monitor/Local Control Module (SM/LCM) for the Model GS7000 Hub/Node.

In This Chapter

- Model GS7000 Hub/Node Description 2
- Status Monitor/Local Control Module Description 8

Model GS7000 Hub/Node Description

Overview

This section contains a brief physical and functional description of the Model GS7000 GainMaker® Node and Model GS7000 Optical Hub.

For complete information about the Model GS7000 Node, refer to *Model GS7000 GainMaker Scaleable 4-Port Node Installation and Operation Guide*, part number 78-4013584-01.

For complete information about the Model GS7000 Optical Hub, refer to *Model GS7000 Optical Hub Installation and Configuration Guide*, part number OL-29936-01.

Physical Description

The Model GS7000 Hub/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:

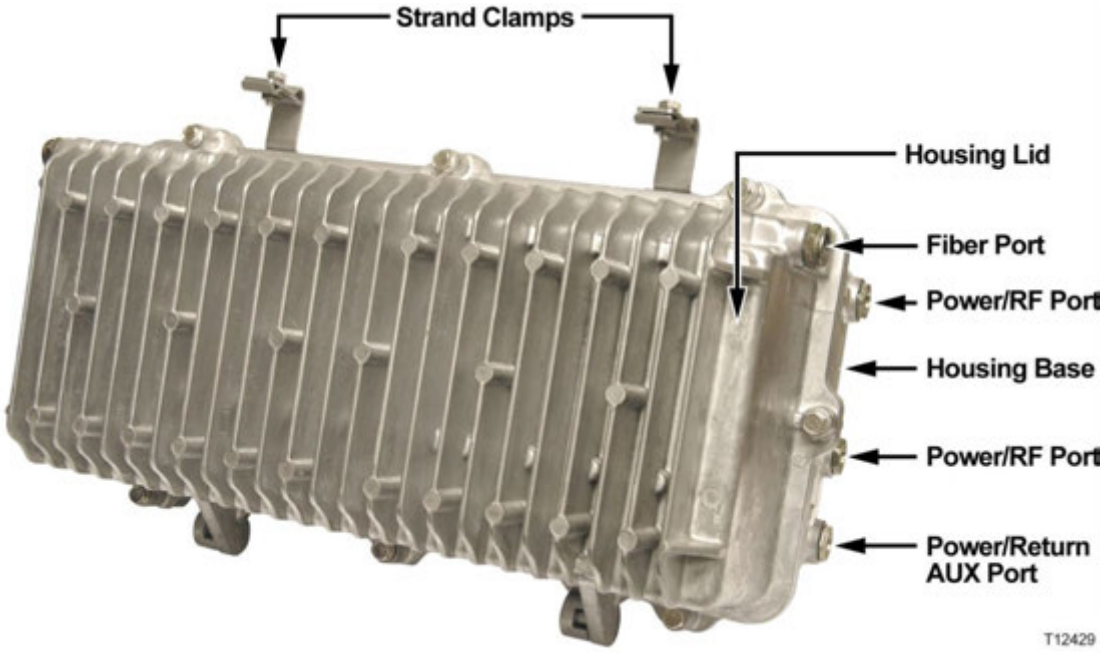
- an RF amplifier module (node or hub node only)
- AC power routing
- forward and reverse configuration modules (node or hub node only - configuration will vary)
- optical passive device tray (optical hub only - for installing multiplexers, demultiplexers, splitters, combiners, etc.)

The lid of the housing contains:

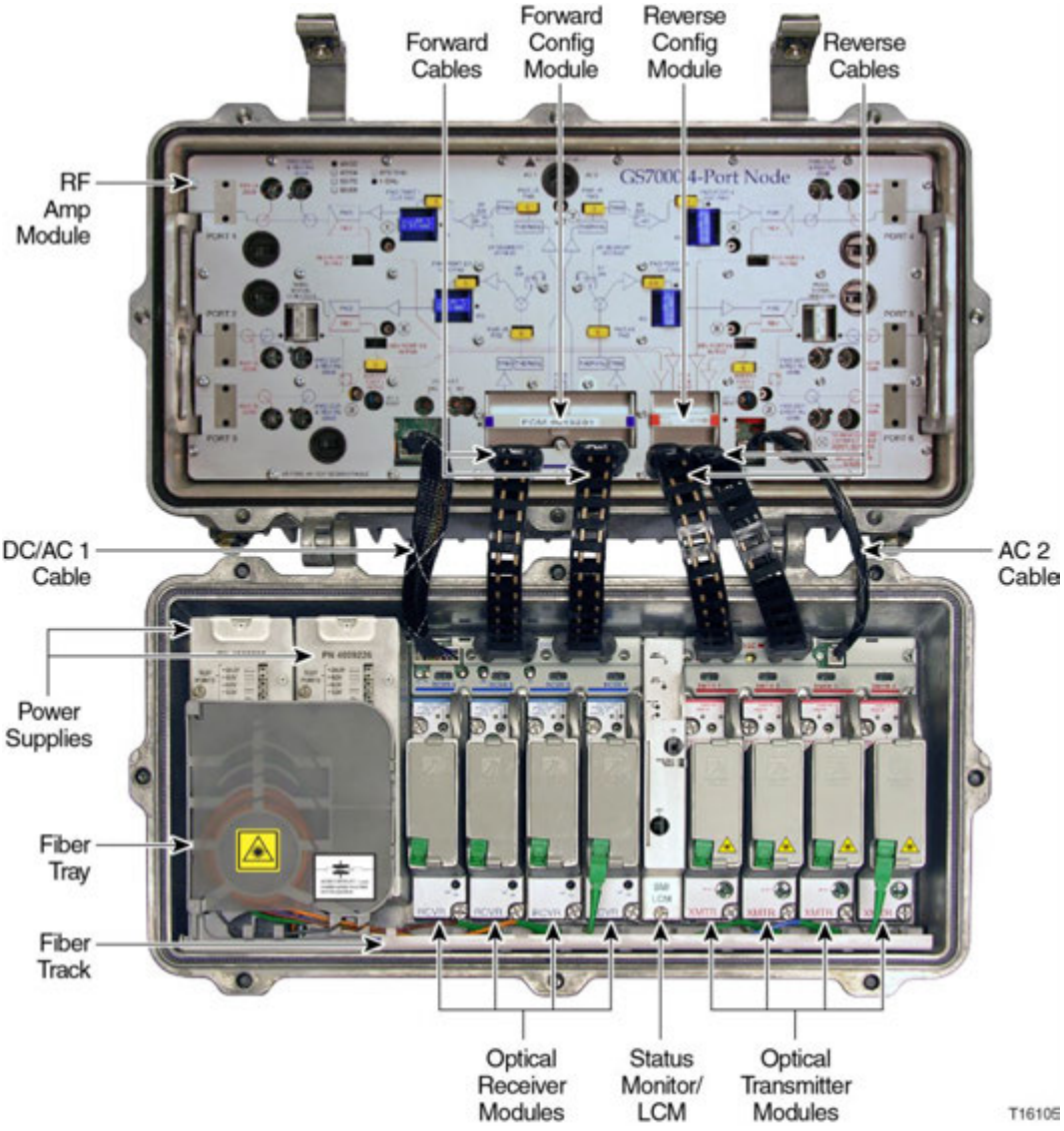
- a fiber management tray and track (included in all models)
- optical interface board (OIB) for mounting and interconnecting modules in the lid.
- optical receiver and transmitter modules (node or hub node only - configuration will vary)
- Erbium-Doped Fiber Amplifier (EDFA) modules for signal amplification (hub node or optical hub only)
- optical switch (OPSW) modules for redundancy (hub node or optical hub only)
- power supplies (one is included; second is optional)
- a status monitor/local control module (optional)

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

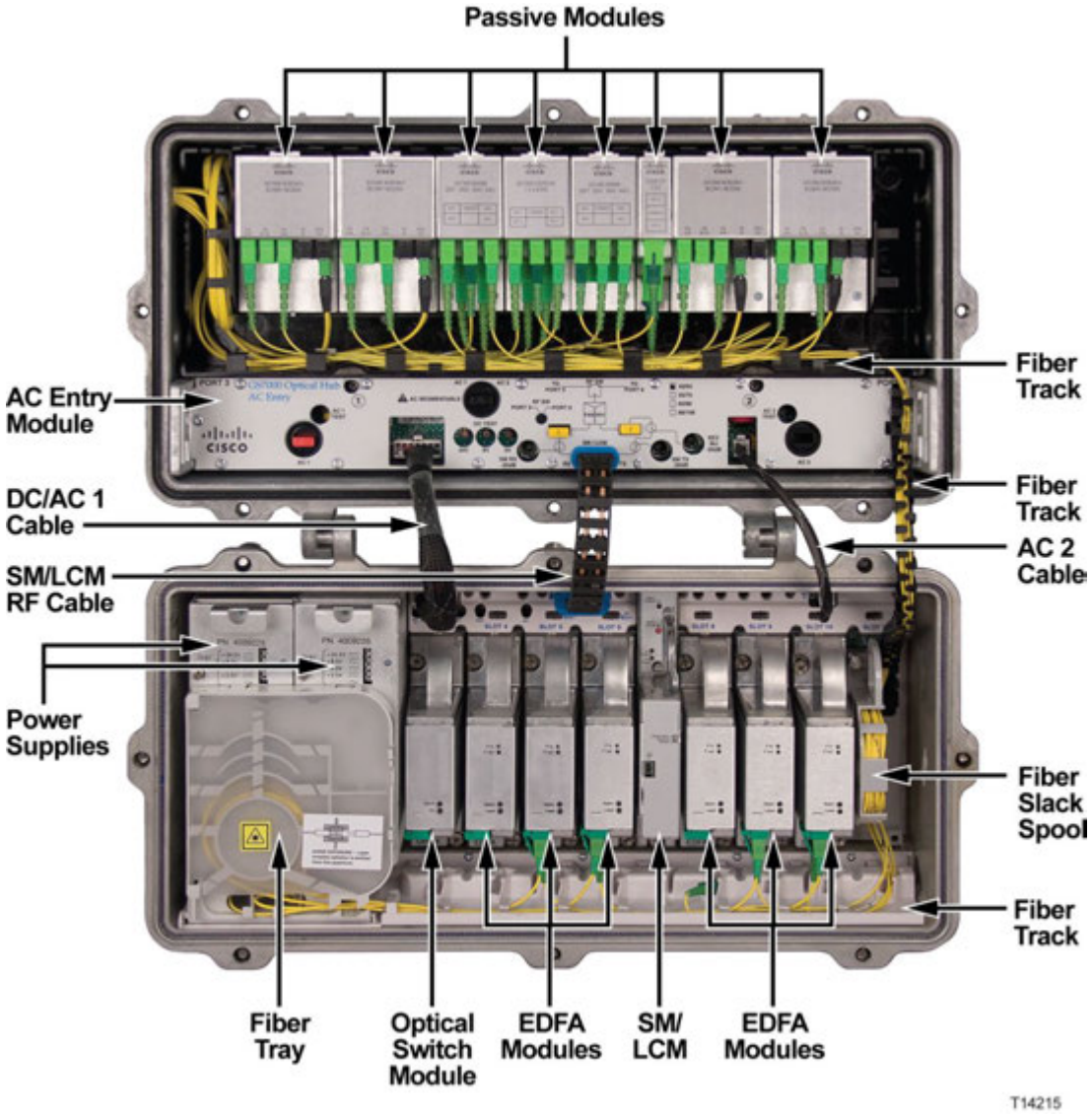
The following illustration shows the external housing of the Model GS7000 Hub/Node.



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.



The following illustration shows the Model GS7000 Optical Hub internal modules and components.



Functional Description

Node

The Model GS7000 Node is used in broadband hybrid fiber/coax (HFC) networks. It is configured with the receivers, transmitters, configuration modules, and other modules to meet your unique network requirements. This platform allows independent segmentation and redundancy for both the forward and reverse paths in a reliable, cost-effective package.

The Model GS7000 Node receives forward optical inputs, converts the input to an electrical RF signal, and outputs the RF signals at up to six ports. The forward bandwidth is from 52 MHz (or 54, or 70, or 86 MHz) to 1002 MHz. The lower edge of the passband is determined by the diplex filter and the reverse amplifier assembly. Diplex filter choices are 52 MHz, 54 MHz, 70 MHz, or 86 MHz.

The forward path of the Model GS7000 Node can be deployed with a broadcast 1310/1550 nm optical receiver with common services distributed to either four output ports (all high level) or six output ports (two high level and four lower level). The forward path can also be segmented by using one optical receiver that feeds all output ports, two independent optical receivers that each feed half of the node's output ports (left/right segmentation) or four independent optical receivers that feed four independent forward paths. Forward optical path redundancy is supported via the use of an optional local control module. The type of forward segmentation and/or redundancy is determined by the type of RF amplifier assembly and Forward Configuration Module installed in the node.

The Model GS7000 Node's reverse path is equally flexible. Reverse traffic can be segmented or combined and routed to up to four FP or DFB reverse optical transmitters, or to two advanced Baseband Digital Reverse (BDR) optical transmitters as part of our BDR system. Redundant (back-up) transmitters may be utilized. In addition, an auxiliary input path is provided for reverse signal injection (5 - 210 MHz). Reverse segmentation and/or redundancy is determined by the type of Reverse Configuration Module installed in the node.

The Model GS7000 Node accepts Optical Transmitter Modules based on the existing 694x/GainMaker optical transmitters. Reverse optical transmitters can be installed to transmit data, video, or both. Reverse bandwidth is determined by the diplex filter and the reverse amplifier assembly. Diplex filter choices are 40 MHz, 42 MHz, 55 MHz, or 65 MHz.

A new low-power receiver has been developed for the Model GS7000 Node, and is compatible with existing 694X and GainMaker Nodes. The Model GS7000 Node utilizes new transmitter and receiver module covers that have been designed to allow fiber pigtails storage within them, providing improved fiber management within the node.

Up to four optical receivers and up to four analog or two digital transmitters can be installed in the Model GS7000 Node.

45 - 90 V AC input power is converted to +24.5, +8.5, -6.0, and +5.5 V DC by an internal power supply to power the Model GS7000 Node.

Hub Node

The Model GS7000 Hub Node performs the same functions as the Model GS7000 Node with the added benefit of also providing optical gain and optical switching capability. The hub node allows you to push fiber deeper into your network while taking advantage of the RF plant that is already in place.

The Model GS7000 Node can be upgraded to a Model GS7000 Hub Node in the field. This is accomplished by installing EDFA modules, optical switching modules, and the SM/LCM in the node lid. The Model GS7000 Hub Node can then serve as a traditional node feeding the local HFC plant and as an optical hub with the optical amplifiers. The hub node with the amplifiers can service up to 32 nodes at a distance of 50 km with only three fibers.

EDFAs are available in 17 dBm, 20 dBm, and 22 dBm for broadcasting. A 17 dBm or 21 dBm gain flattened constant gain EDFA version is available to fit any architecture for requirements like DWDM narrowcasting.

The optical switch module is used for switching the input of an EDFA module from a primary signal to a backup or secondary signal. The switch is monitored and controlled by the SM/LCM in the node.

A specific model of the SM/LCM is required for use in the hub node. This SM/LCM model monitors and controls several EDFA and optical switch parameters and functions while continuing to monitor the standard node components.

Optical Hub

The Model GS7000 Hub Node can migrate to a full optical hub by replacing the RF amplifier section with an optical passive device tray that can accommodate various optical passive devices. The optical passive device tray has the capacity of housing four 1x8 narrowcast/broadcast overlay combiners with integrated multiplexers and demultiplexers. A four-band mux/demux, a 1x4 splitter, and a 1x2 splitter are also available. These modular passive devices provide effortless installation and removal, simple troubleshooting, and the capability to use off-the-shelf fiber jumpers to interconnect active and passive modules. A fully deployed Model GS7000 Optical Hub can be used to combine narrowcast/ broadcast up to 64 wavelengths feeding 32 nodes.

Status Monitor/Local Control Module Description

Overview

A local control module and a status monitor are available for the Model GS7000 Hub/Node. A status monitor consists of a local control module with a transponder core module installed in the housing. The same housing is used for both units.

The units perform the following functions:

- Local Control Module - controls redundancy and forward segmentation, and configures the modules
- Status Monitor - adds remote status monitoring capability to the local control module

Note: An existing local control module can be field upgraded to a status monitor through adding a transponder core module. Refer to *Model GS7000 Hub/Node Local Control Module to Status Monitor Upgrade Instructions*, part number 4031341, for complete instructions.

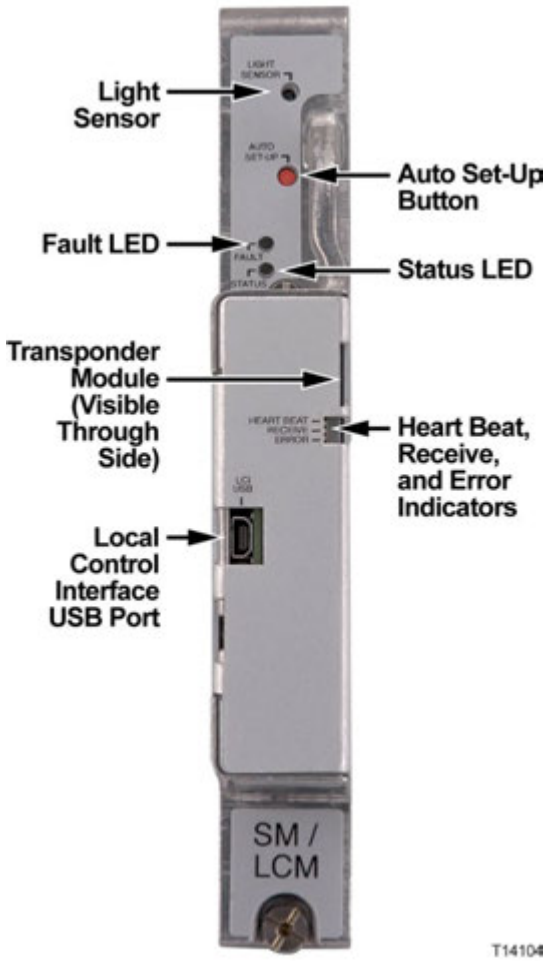
Status Monitor Description

The status monitor is HMS compliant and provides node monitoring and control capability at the cable plant's headend. The following node voltages and signals are monitored and their status reported to the headend by the status monitor.

- Receiver optical input level (all receivers)
- Transmitter optical output level (all transmitters)
- AC power presence and peak voltage (for split AC powering cases, AC power from both sides of node housing is monitored)
- DC voltages from both primary and redundant power supplies
- Optical amplifier operating parameters
- Optical switch operating parameters

Commands are sent from the headend to the status monitor. The status monitor communicates serially with the RF amplifier module to control the optional forward band redundancy switches on the forward configuration module, the reverse band 6 dB (wink) attenuators on the reverse amplifier PWB, and the reverse band on/off switches on the reverse amplifier PWB.

Note: Configuration parameters for the transponder core module, such as IP address, can be changed using the PC-based GS7000 ViewPort software.



Note: The transponder core module can be seen through the Heart Beat/Receive/Error indicator cutout in the cover.

Local Control Module Description

The local control module locally monitors the following node voltages and signals:

- Receiver optical input level (all receivers)
- Transmitter optical output level (all transmitters)
- AC power presence and peak voltage (for split AC powering cases, AC power from both sides of node housing is monitored)
- DC voltages from both primary and redundant power supplies
- Optical amplifier operating parameters
- Optical switch operating parameters

The local control module communicates serially with the RF amplifier module to control the optional forward band redundancy switches on the forward configuration module. It is a low-cost module that plugs into the status monitor connectors on the OIB.

The local control module is equipped with a USB port to allow local control of the optional forward band redundancy switches, the reverse band 6 dB (wink) attenuators, the reverse band on/off switches, the optical switch, and optical amplifiers through the PC-based GS7000 ViewPort software. All parameters monitored by the local control module can be displayed and reviewed using ViewPort.



Note: The local control module can be upgraded to a status monitor through by adding a transponder core module. The transponder core module plugs directly onto the local control module's PWB. The mechanical housing for the status monitor and the local control module are the same. The Heart Beat, Receive, and Error indicator LEDs are only present if the transponder core module is installed.

2

Installation

This chapter describes the physical installation of the SM/LCM into the housing lid of a Model GS7000 Node, Hub Node, or Optical Hub.

In This Chapter

- Installing the SM/LCM..... 12

Installing the SM/LCM

Overview

You must perform the following steps to install the SM/LCM in a Model GS7000 Node, Hub Node, or Optical Hub.

1. Open the housing.
2. Install the SM/LCM in its correct position in the housing lid.
3. Press and hold the Auto Set-Up button until the Status and Fault LEDs stay on (solid light) to start the discovery process.
4. Close the housing.

The following sections describe each of these steps in detail.

Opening the Housing

Open the housing as follows.

1. Remove the bolts securing the lid to the base.
2. Carefully open the lid to allow access to the inside of the housing.
3. Inspect gaskets on the cover flange and on the test port plugs.
4. Replace any gaskets showing signs of wear (cracked, twisted, pinched, or dry) with new, silicon-lubricated gaskets.

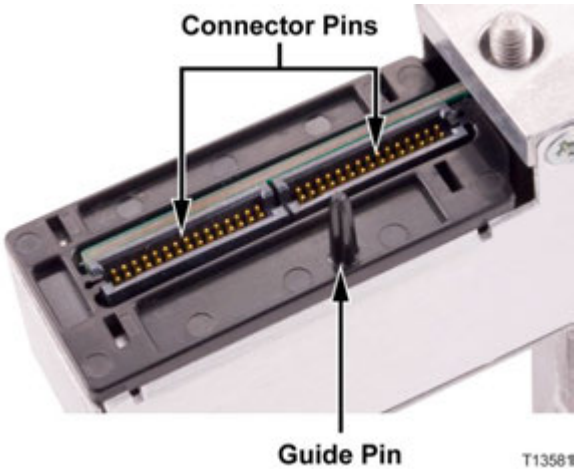
Installing the Module

Complete the following steps to install the SM/LCM.

1. Inspect the pins on the electrical connector on the rear panel of the SM/LCM module prior to inserting the module in the node.

> **CAUTION:**
>
> **Make sure that all pins on the connector are straight and also level, i.e., they are all at the same height. If not, damage may result to the connector pins upon installation, installation may be impeded, or the module may not function properly.**

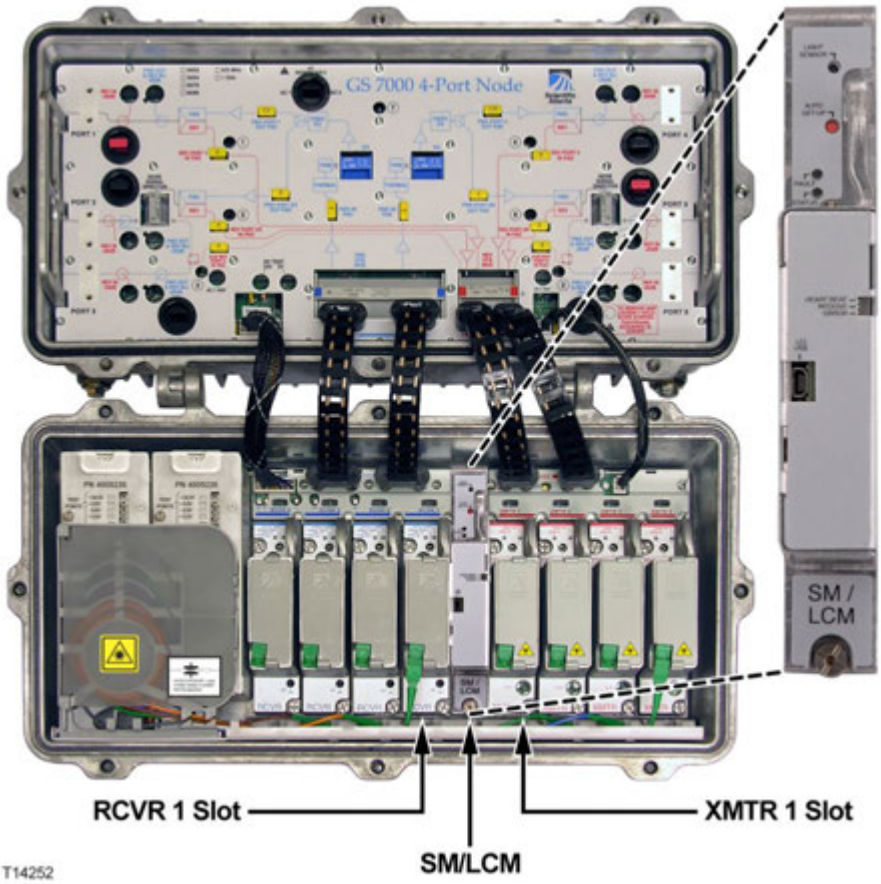
Note: If the pins are not straight and level, the module should be returned to the factory. Refer to *Chapter 6, Customer Support Information*, for information on obtaining support and returning products.



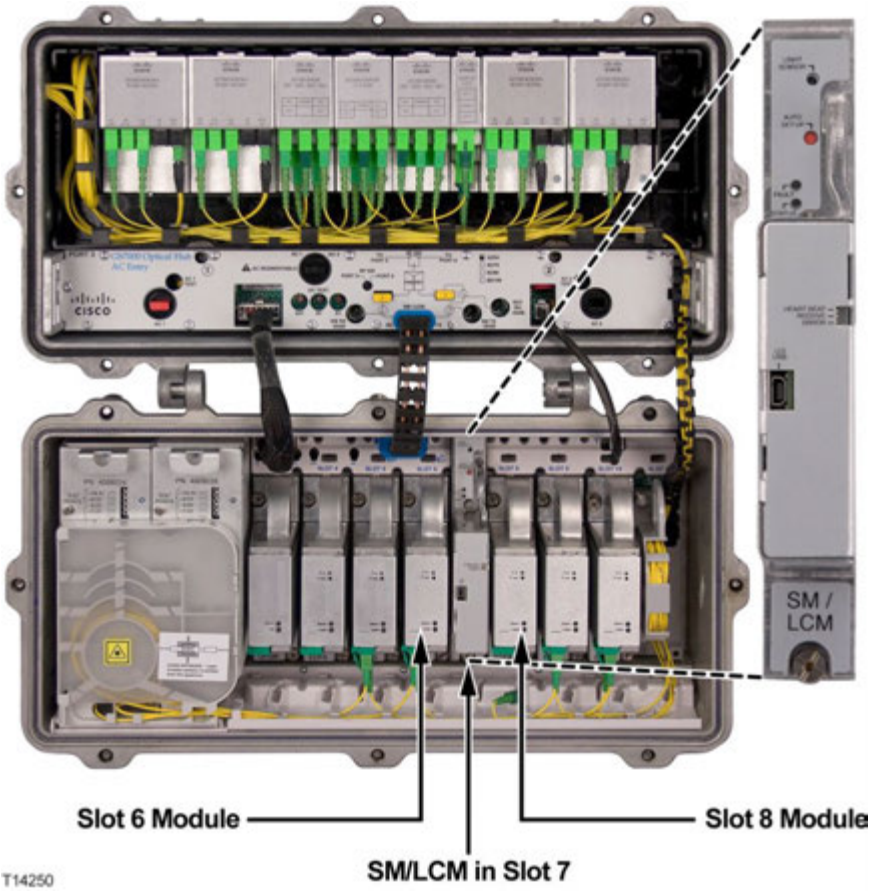
2 Carefully insert the SM/LCM into the housing lid in the position shown in the following illustrations.

> ⚠ **CAUTION:**
>
> **Do not use too much force when seating the module in the node. If too much resistance is felt, remove the module and inspect the module electrical connector pins. Make sure that the pins are straight and level before re-attempting installation.**

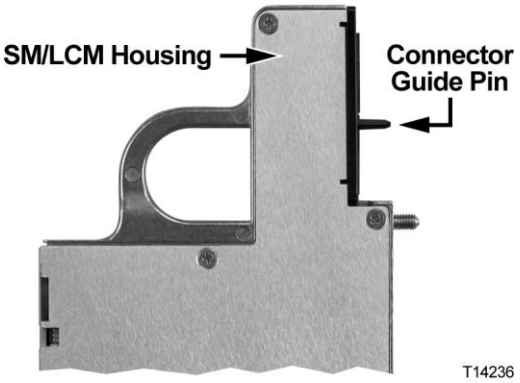
SM/LCM mounting position for a Model GS7000 Node or Hub Node



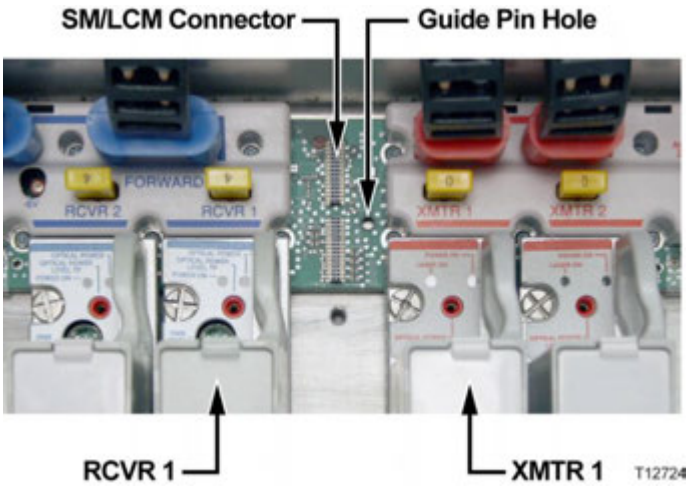
SM/LCM mounting position for a Model GS7000 Optical Hub



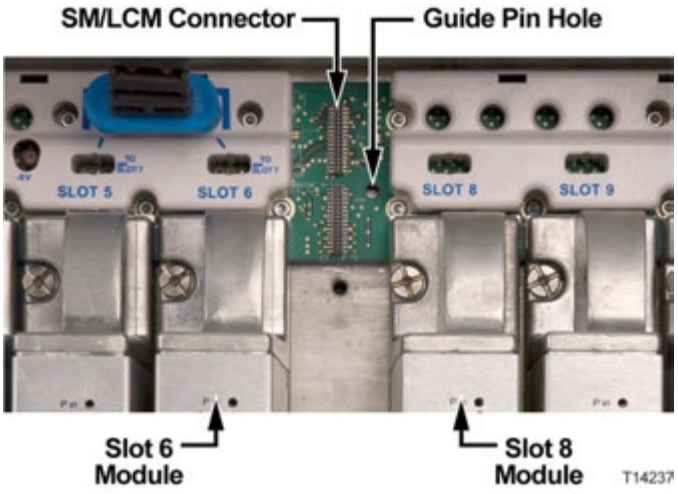
Important: To ensure proper connector alignment and fit, make sure that the connector guide pin on the back of the SM/LCM module inserts into the alignment hole on the optical interface board (OIB) as shown below.



OIB SM/LCM connector for a Model GS7000 Node or Hub Node



OIB SM/LCM connector for a Model GS7000 Optical Hub



3 Tighten the SM/LCM module hold-down screws to secure the module in the lid. Torque the screws from 25 to 30 in-lbs (2.8 to 3.4 Nm).

4 If other modules are added or removed, verify that power limits are not exceeded. Refer to ***Node Power Limitations*** (on page 17) for a list of module power consumption figures.

5 Before closing the housing, press and hold the Auto-Setup button until the Status and Fault LEDs stay on solid to start the discovery process.

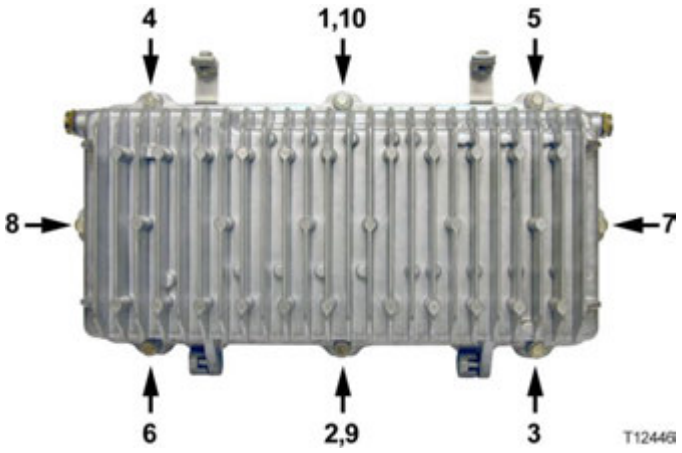
Closing the Housing

Close the housing as follows.

1. Ensure any worn gaskets are replaced, and the gaskets are clean and in the correct position.
2. Carefully close the lid.

> **CAUTION:**
>
> **Use caution when closing the housing. Improper closing may result in the unit not being sealed from the environment.**

3. For strand-mounted housings, pull the lid away from the base and remove the slack from the hinge before rotating the lid up toward the base.
4. Ensure no cables are pinched between lid and base.
5. Secure lid to base with bolts. Tighten from 5 to 12 ft-lbs (6.8 to 16.3 Nm) in the sequence shown in the following illustration. Repeat the sequence twice, ending with the final torque specification.



Node Power Limitations

Nodes and hub nodes must be configured in a manner that prevents potential thermal overloads. Heat generated by the node can reduce the life of the equipment.

> **CAUTION:**
>
> **The life of the equipment may be reduced if configured to draw more than the recommended level of power from the power supplies.**

Two power supplies can provide a maximum power level of 100 watts to the node or hub node. The RF amplifier uses the majority of the available power. Maintain the total power consumption of all modules in the housing within these guidelines to minimize the heat generated. Find the optimal configuration by summing the power consumption of the RF amplifier plus the other individual modules in the housing using the following table.

Important: Do not populate the housing with any combination of modules that would draw more than the available power of 100 watts.

The following table lists the modules and their respective power consumption.

Equipment	**Type**	**Maximum Power Draw (Watts)**	**Typical Power Draw (Watts)**
Transmitter	1310 nm dfb, analog CWDM	4.1	3.4
Transmitter	analog DWDM	5.4	4.8
Transmitter	BDR (baseband digital reverse) **Note:** Occupies two slots	12	9
Receiver	operating	3.4	2.5
Receiver	standby	0.8	0.3
EDFA	17 dBm	4.5	4
EDFA	20 dBm	7	5
EDFA	21 dBm	9	7
EDFA	22 dBm	9	7
Optical Switch		2	1.5
Status Monitor/ Local Control Module		2.6	0.9
RF Amplifier	4-way forward segmentable	72.8	69.9
RF Amplifier	2-way forward segmentable	69.6	67.1

3

Configuration

This chapter describes configuration procedures for the SM/LCM.

In This Chapter

- Local Control Module Configuration Procedure 20
- Status Monitor Configuration Procedure 27

Local Control Module Configuration Procedure

Introduction

The LCM needs to know the hub/node's hardware configuration (number of EDFAs, optical switches, receivers, transmitters, power supplies, and AC lines mounted or connected) so that it can control the node's behavior correctly. If an LCM was mounted in the node at the manufacturer, it should be configured correctly as shipped. The configuration data is stored in an EEPROM residing on the LCM main board.

Configuring the LCM

When necessary, the LCM can be configured using two different methods, as follows:

- Automatically using the Auto-Setup button
- Manually using the PC-based ViewPort software

The following sections describe these procedures in detail.

Configuring the LCM Using the Auto-Setup Button

The LCM can determine the modules installed in the hub/node by using a discovery method that is initiated by pressing the Auto-Setup button on the LCM front panel.

Important: In order for a module to be detected and counted as "installed", it must be functioning properly at the time the Auto-Setup button is pressed. This includes proper optical levels being fed to the receivers, optical switches, and EDFAs.

Perform the following steps to initiate module discovery through the LCM using the Auto-Setup button.

1. Connect power to the node.
2. Connect optical fibers to all installed receivers.
3. Press and release the Auto-Setup button on the LCM.

Note: Use a small diameter screwdriver, or other small round tool that fits the hole in the housing, to press the Auto-Setup button. Do not press hard. The button only depresses about 1/64 inch (0.4 mm). You can feel the button depress, but likely not hear it in a noisy environment.

Results: When the Auto-Setup button is pressed, the LCM checks for installed modules and discovers the type of each module.

The Auto-Setup process typically takes up to five seconds.

Note: During the module check, the LCM micro-controller samples the inputs from the optical transmitters (up to 4), optical receivers (up to 4), power supplies (up to 2), and AC lines (up to 2), to determine which of these items are installed in the node. The LCM also attempts to contact optical switches and EDFAs that may be present in the hub/node. If such modules respond to the LCM commands, the LCM determines that an optical switch or an EDFA is installed in a specific slot.

Configuring the LCM Using the PC-based ViewPort Software

The LCM can also be configured using the PC-based ViewPort software. ViewPort provides an easy-to-use graphical user interface with the LCM via a USB port on the LCI of the module. ViewPort provides for direct manual configuration and troubleshooting of the hub/node.

Installing the ViewPort Software

The system requirements for ViewPort are:

- Computer with a 600 MHz or faster processor
- Microsoft Windows XP SP2 or SP3, Windows Vista, or Windows 7
- 256 MB of RAM or more
- 100 MB available hard disk space
- Microsoft .NET Framework 2.0 or greater
- CD-ROM drive
- USB 2.0 communications port
- 1024x768 or higher-resolution display with 256 colors
- Keyboard and Microsoft mouse or compatible pointing device

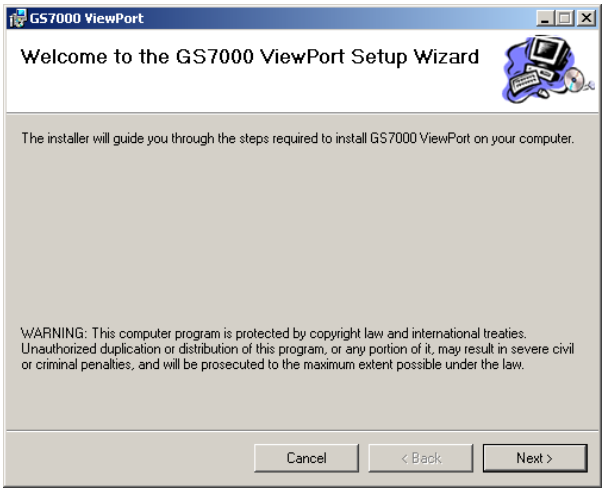
Perform the following steps to install the ViewPort software.

Important: If you receive an error message during installation regarding .NET Framework not being present on your computer or being an old version, use Windows Update to download and install the latest version of .NET Framework and then retry the installation.

1. Copy the ViewPort installer file, GS7000ViewPort.msi, to the hard drive of your computer.

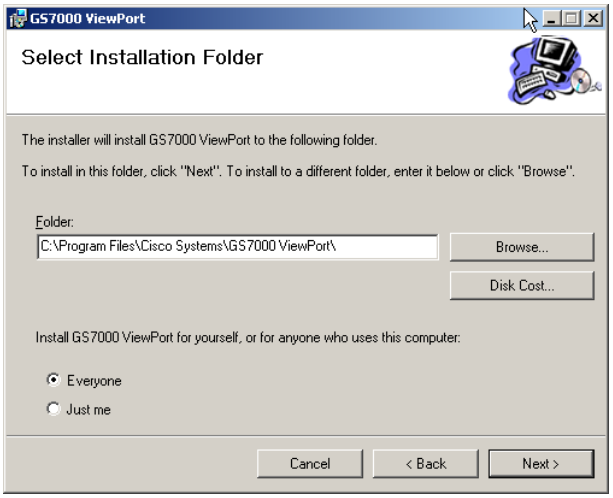
2 Double-click the installer file to start the ViewPort installation.

Result: The ViewPort setup wizard screen displays.



3 Click **Next**.

Result: The Select Installation Folder screen displays.

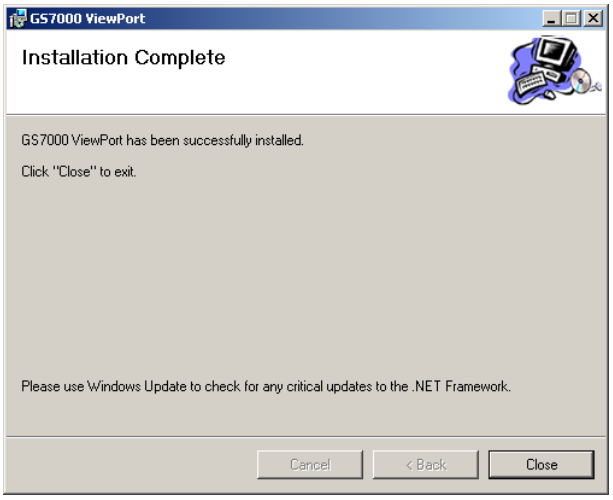


4 Accept the default installation folder or change to a different folder if desired.

5 Select **Everyone** under "Install GS7000 ViewPort for..." and click **Next**.

6 Follow the remaining screen prompts to complete the installation.

Result: When complete, the following screen displays.



7 Click **Close**.

Result: ViewPort is installed in the chosen directory, a USB driver file is added to the system, and a ViewPort icon is added to your desktop.

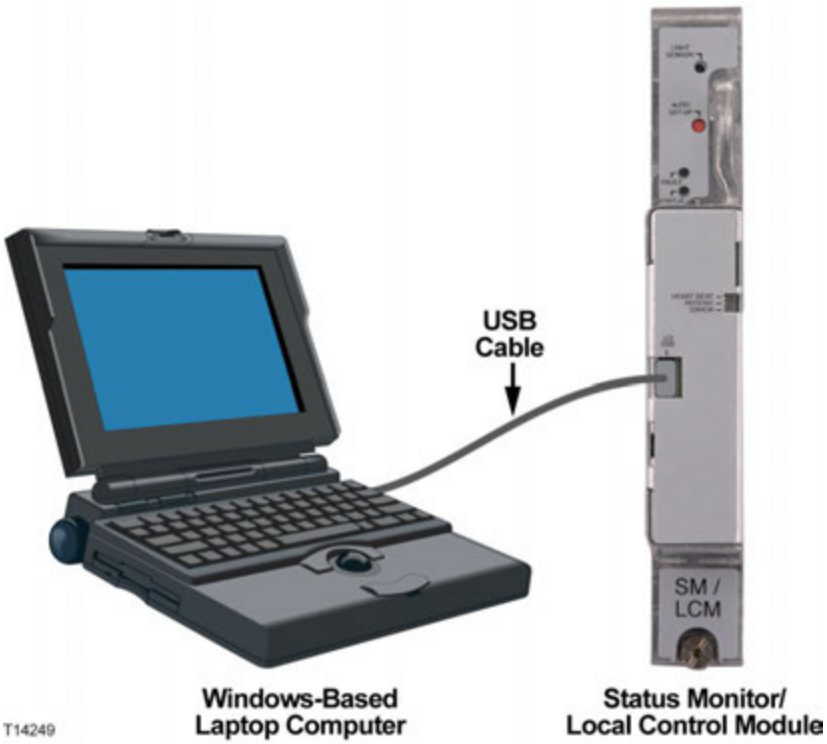
8 Double-click the ViewPort icon on your desktop to run the program.

Configuring the LCM with ViewPort

Perform the following steps to configure the LCM using ViewPort.

1 Make sure the latest ViewPort software is installed on your desktop or laptop computer.

2 Connect a USB port on the computer to the LCI USB connector on the LCM as shown in the following illustration.



3 Configure the hub/node and its internal modules using ViewPort.

Note: For complete instructions on using ViewPort, please access and read the ViewPort software's online help file.

ViewPort Help Topics

Complete instructions for using ViewPort are contained in the ViewPort software's online help file. Help file topics include:

- Getting Started
  - Functional Overview
- Connection States
  - Unconnected State
  - Connected State
- Configuration Files
  - Creating a New Configuration File
  - Saving a Configuration File
  - Opening a Saved Configuration File
  - Downloading a Configuration File

- Configuring the Chassis
  - Selecting Chassis Type
  - Selecting Forward Configuration Module Type (FCM)
  - Selecting Reverse Configuration Module Type (RCM)
  - Adding Modules to the Chassis
  - Removing Modules from the Chassis
  - Duplicating a Module's Settings
  - Moving a Module to Another Slot
  - Saving a Configuration File
- Configuring the Modules
  - Configuring the Power Supply Module (PS)
  - Configuring the Receiver Module (RCVR)
  - Configuring the Transmitter Module (XMTR)
  - Configuring the Local Control Module (LCM)
  - Configuring the Forward Configuration Module (FCM)
  - Configuring the Reverse Configuration Module (RCM)
  - Configuring the Status Monitor (SM)
  - Configuring the Optical Switch Module (OPSW)
  - Configuring the Erbium-Doped Fiber Amplifier Module (EDFA)
- Monitoring Module Status
  - Monitoring the Power Supply Module (PS)
  - Monitoring the Receiver Module (RCVR)
  - Monitoring the Transmitter Module (XMTR)
  - Monitoring the Local Control Module (LCM)
  - Monitoring the Forward Configuration Module (FCM)
  - Monitoring the Reverse Configuration Module (RCM)
  - Monitoring the Status Monitor (SM)
  - Monitoring the Optical Switch Module (OPSW)
  - Monitoring the Erbium-Doped Fiber Amplifier Module (EDFA)

- Tutorials
  - Resolving an Optical Receiver Issue
  - Adding Modules and Saving the Configuration

Status Monitor Configuration Procedure

Introduction

The SM needs to know the node's hardware configuration (number of receivers, transmitters, EDFAs, optical switches, power supplies, and AC lines mounted or connected) so that it can monitor and control the node's behavior correctly. This configuration data is stored in an EEPROM residing on the SM main board.

The SM includes an HMS compliant transponder module that plugs into the LCM main board. Once powered up in a network, the transponder will go through an auto-registering process. Once the SM/LCM has gone through the discovery process, the transponder will work without manual configuration. The transponder can be manually configured using the PC-based ViewPort software.

Notes:

- You must still use the Auto-Setup button to start the discovery process once the hub/node is configured.
- You may have to manually configure parameters for the transponder using ViewPort.
- You can use remote configuration capabilities to configure the LCM and the hub/node if your headend is properly equipped.

SM Configuration Parameters

The following table describes the available SM configuration parameters when using the PC-based ViewPort software.

Configuration Parameter	Description/Values
Firmware Version	The transponder software number.
MAC Address	MAC address of the transponder module.
IP Address	IP address of the Status Monitor.

Configuration Parameter	Description/Values
RX Frequency	The downstream frequency on which the transponder receives commands from the headend. Valid range is 45 MHz to 174 MHz.
TX Frequency	The upstream frequency on which the transponder transmits to the headend. Valid range is 5 MHz to 65 MHz. **Note:** This menu item does not display following discovery by the headend modem termination system (HMTS).
Frequency Scan	Set transponder to auto-scan for communications frequency with the headend. Check Box Values: checked = YES unchecked = NO **Note:** This menu item does not display following discovery by the HMTS.
TX Level	The transponder's transmitting output power level. Valid range is 24 dBmV to 50 dBmV
RX Level	The transponder's receive power level. Operational range is -20 dBmV to +20 dBmV. (Anything over +30 dBmV can cause equipment damage.)

Configuration Parameter	Description/Values
Channel Status	Transponder module status. Possible values are No Freq Found, Registered, Ch Description.

Configuring the SM

The SM can be configured using two different methods, as follows:

- Auto-registering at power up
- Manually assisted configuration/registering

The following sections describe these procedures in detail.

Configuring the SM Using the Auto-registering Feature

The SM transponder module is designed to work without manual configuration. Once powered up in a network, the transponder scans for a downstream transmission, locks in, receives commands, and then transmits its replies back to the headend.

This "auto-registering" process can take up to 24 hours via HMS standards, though one-half to two hours is more common. Once registered, the transponder does not have to go through the process again should power be lost and then restored.

Manually Assisting SM Configuration/Registration

The transponder registration process can be greatly accelerated by telling the transponder what the downstream frequency is.

Note: This method is recommended when the transponder is installed in a system that is not fully HMS compliant.

Perform the following steps to inform the transponder what the downstream frequency is.

1. Connect a laptop computer running the ViewPort software to the local control interface USB port on the LCM. Refer to ***Configuring the LCM Using the PC-based ViewPort Software*** (on page 21) for instructions.
2. In ViewPort, select the SM/LCM to display its configuration parameters.
3. Under XP Communications, set the RX Frequency to the frequency on which the transponder will receive commands from the headend.
4. Set the TX Frequency to the frequency on which the headend will receive transmissions from the transponder.

5 Set the TX Level to the desired output power level for the transponder.

6 Wait for communication to be established.

Note: Once the transponder is registered, the Receive LED on the SM remains solid green, while the Heart Beat LED blinks slowly. Also, the Channel Status field for the SM/LCM displays "Registered".

7 Configure the LCM/node using one of the following methods.

a Using the Auto-Setup button. See ***Configuring the LCM Using the Auto-Setup Button*** (on page 20).

b Using remote configuration capabilities. See *Using Remote Configuration Capabilities* below.

Using Remote Configuration Capabilities

A Model GS7000 Hub/Node can be configured from the headend ONLY if certain pieces of software are loaded at the headend, as follows.

- If a MIB browser is used: GS7000 Proprietary MIB (part number 7014169) is required. This MIB has some of the configuration elements. However, EDFA and optical switch settings, as well as those related to other modules, can be found in the HMS MIB.
- If the element management tool RosaEM is used, be sure to have version ATL RosaEM 3.3.40 or higher.

Application Software Remote Download and Upgrade

The Status Monitor module supports upgrading the application software image through remote download to the transponder core, Local Control Module, GS7000 EDFA, and GS7000 Optical Switch modules. Remote software download and upgrade is accomplished using the industry-approved standard ANSI/SCTE HMS Download MIB.

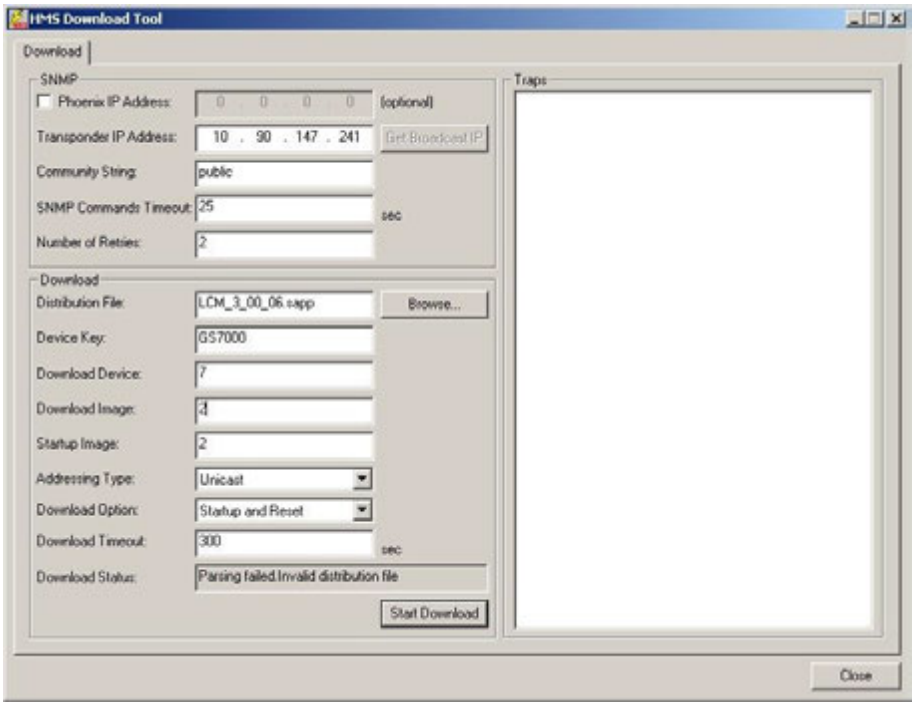
Details on the use of this MIB are provided in ***SCTE-HMS-DOWNLOAD-MIB*** (on page 47). For additional information, see the industry-approved reference specification for the ANSI/SCTE HMS Download MIB, *ANSI/SCTE 38-8 2009 Hybrid Fiber/Coax Outside Plant Status Monitoring SCTE-HMS-DOWNLOAD-MIB Management Information Base (MIB) Definition*, available from the Society of Cable Television Engineers (SCTE).

You can use any element management system (EMS) that supports this MIB to remotely download and upgrade application images to the Hub Node or Optical Hub. If a compatible EMS is not available, use the **HmsDownloadTool.exe** software utility provided with the Cisco Phoenix RF Modem and included on the software distribution CD. This modem is required for IP communications with the transponder. To establish communication with the transponder, the utility must be installed and running on a PC, and the Phoenix RF Modem must be configured in gateway mode.

To Remotely Upgrade the Software

Complete the following steps to remotely download and upgrade the application software image in the Hub Node or Optical Hub.

1 Launch the HMS Download Tool. The main screen appears as shown below.



Note: The field settings shown above are typical values for the LCM.

2 Click the **Browse** button to select the new software image.

3 Change the Device Key to **GS7000**.

4 Set the Address Type to **Unicast**.

5 Enter the Transponder IP address.

6 Enter the Phoenix IP address (optional).

7 Set the SNMP Commands Timeout to **25** (seconds).

8 Choose **Startup and Reset** from the Download Option drop-down menu.

9 Enter the appropriate Download Device number based on the corresponding physical slot number of the download device. Use 1 for Transponder, 7 for LCM, or 3 to 11 for each EDFA or OPSW physical slot number.

10 Set the Download Image to **2** for LCM, EDFA, and OPSW. The Transponder is set by the tool after the correct transponder image file, APP1 or APP2, is selected via the Browse button.

Notes:

- If available, refer to the MIB-Browser attribute dlActiveImageVersion in transponderImage or transponderTable for currently active Transponder image numbers.
- Always download to inactive images. See additional notes below.

11 Set Startup Image to **1** or **2** as specified in step 10 above. (Startup Image is typically the same value as Download Image.)

12 Set Download Timeout to **300** (seconds).

Note: Always use a download timeout value of at least 300 seconds to allow sufficient time for the download to complete.

13 Click the **Start Download** button.

Notes on Transponder Core Downloads

- There must be two valid images on the transponder core prior to the download. If there is only one image on the transponder core, change Download Option to **No Action**, and then download the other image without resetting and running the new image.

  Check the dlImageTable again to confirm that there are two valid images for the transponder core on the table. After both images appear on the table, change the Download Option to **Startup and Reset** and download the new image again. After the transponder reboots, the new image will be running.

- If the download fails before it completes, wait until the timeout period has passed before retrying or restarting the download. If Download Timeout is set to 300 seconds or more as recommended, allow additional time after the download timeout period has passed to be sure that the transponder core has reinitialized all of the download settings.

4

Management Via SNMP

This chapter provides information about using Simple Network Management Protocol (SNMP) commands for remote system monitoring and control. The transponder core in the Status Monitor recognizes SNMP v1 commands and sends SNMP v1 traps.

In This Chapter

- Introduction 34
- MIBs Used in the Optical Hub/Node 35
- MIB-2 Specifications 36
- Cisco Proprietary MIB Specifications 39
- HMS MIB Specifications 43

Introduction

SNMP is an ISO standard communication protocol often used by network and element management systems to monitor network devices for both alarms and other significant conditions.

SNMP accesses information about network devices through management information base (MIB) objects. MIBs are hierarchical tree-structured descriptions used to define database elements. SNMP is used to manage individual data elements and the values assigned to MIB objects.

SNMP addresses a single MIB object using a numeric string called an object identifier (OID). The OID defines a branching path through the hierarchy to the location of the object. In addition to the OID, a MIB object is known by its object descriptor. Both are unique to each MIB object.

Also defined for each MIB object is the access that SNMP can afford to the object data value. For example, if a MIB object has read-write access, SNMP can be used to both get (retrieve) and set (define or change) the value of the object. If an object is read-only, SNMP can be used to get the object value, but not to change it.

MIBs Used in the Optical Hub/Node

MIBs used in the GS7000 Optical Hub Node and Optical Hub are listed in the following table. A number of standard MIBs are added to the transponder core to support the addition of the EDFA and OPSW modules.

Document Number	Description
RFC 1213	MIB-2 System MIB
RFC 2737	MIB-2 Entity MIB
Proprietary MIB	SA-HMS-GS7000-FIBERNODE-MIB
	SCTE-ROOT
ANSI/SCTE 38-1 2002	SCTE-HMS-ROOTS
ANSI/SCTE 38 2002	SCTE-HMS-PROPERTY-MIB
ANSI/SCTE 38-2 2002	SCTE-HMS-ALARMS-MIB
ANSI/SCTE 38-3 2002	SCTE-HMS-COMMON-MIB
ANSI/SCTE 38-5 2002	SCTE-HMS-FIBERNODE-MIB
ANSI/SCTE 38-8 2002	SCTE-HMS-DOWNLOAD-MIB
ANSI/SCTE 38-11 2003	SCTE-HMS-HEADENDIDENT-MIB
ANSI/SCTE 83-1 2006	SCTE-HMS-HE-OPTICS-MIB
ANSI/SCTE 84-1	SCTE-HMS-HE-COMMON-MIB
ANSI/SCTE 85-3 2004	SCTE-HMS-HE-OPTICAL-AMPLIFIER
ANSI/SCTE 85-4 2003	SCTE-HMS-HE-OPTICAL-SWITCH-MIB

The following access codes **(Code)** are used in the MIB tables in this chapter.

Code	Description
RO - Read Only	Data is displayed for reading.
RW - Read-Write	Data can be read and changed.
na - Not Applicable	Data is not applicable to the equipment.

MIB-2 Specifications

This section explains the following MIBs:

- MIB-2 System MIB
- MIB-2 Entity MIB

MIB-2 System MIB

The System MIB gives an overview for the transponder core. By default, sysContact, sysName, and sysLocation can be changed. All three are saved in nonvolatile memory.

Note: The transponder core does not have a Real Time Clock (RTC). Therefore, sysUpTime is only a time estimate.

MIB-2 Entity MIB

The Entity MIB gives a configuration overview for the node or hub. Occupied slots are represented in the entPhysicalTable. The index into the entPhysicalTable for the Model GS7000 Node, GS7000 Optical Hub Node, and GS7000 Optical Hub is the slot number, starting with slot 1 and continuing through slot 11, inclusive. Since there is no slot 12 in the node or hub, entPhysicalIndex 12 represents the actual hub/node in which all the modules are contained. In this section, only pertinent OIDs are detailed.

The following table shows sample data from the entPhysicalTable.

ent-Physical-Index	Possible Slot Numbers	entPhysicalDescr	entPhysical-ModelName	entPhysical-SoftwareRev
1	1	Power Supply (Redundant)	101	na
2	2	Power Supply (Primary)	101	na
6	3 through 6	Receiver	102	na
7	7	SM/LCM	2100	3.00.03
8	8 through 11	Transmitter	103	na
10	3 through 6 8 through 11	GS7000 EDFA Broadcast 17.0 dBm	3100	1.01.02
11	3 through 6 8 through 11	GS7000 OPSW	4100	1.01.00

ent-Physical-Index	Possible Slot Numbers	entPhysicalDescr	entPhysical-ModelName	entPhysical-SoftwareRev
12	na	GS7000 Optical Hub Node	na	na

entPhysicalDescr

The previous table lists valid equipment entries for **entPhysicalDescr**. However, "GS7000 EDFA Broadcast 17.0 dBm" is just one of several possible entries for an EDFA. All valid EDFA entries are listed in the following table.

entPhysicalDescr entries for the EDFA
GS7000 EDFA Broadcast 17.0 dBm
GS7000 EDFA Broadcast 20.0 dBm
GS7000 EDFA Broadcast 22.0 dBm
GS7000 EDFA GF 17.0dBm Low Gain
GS7000 EDFA GF 21.0dBm Low Gain
GS7000 EDFA GF 17.0dBm High Gain
GS7000 EDFA GF 21.0dBm High Gain

Modules, power supplies, and the SM/LCM all have a value of 12 for **entPhysicalContainedIn**. The GS7000 Node, GS7000 Hub Node, and GS7000 Optical Hub have a value of 0, since the hub/node is not contained in anything else.

entPhysicalClass is based on type. Power Supplies are **powersupply(6)**. All other equipment are **module(9)**. The Hub/Node is **stack(11)**.

entPhysicalParentRelPos is the same as the **entPhysicalIndex**, except for the Hub/Node which has the value of 0.

entPhysicalName indicates the slot number for all modules, such as **Slot 10**, except the Hub/Node, which holds a value of Hub or Node.

entPhysicalHardwareRev shows **CCB** for the EDFA and Optical Switch, **LCM** for the Status Monitor/LCM, and **na** for all other modules, power supplies, and the Hub/Node.

Both **entPhysicalSoftwareRev** and **entPhysicalFirmwareRev** display the active software image from the module or **na** if the module does not have an image, such as a power supply.

entPhysicalSerialNum comes directly from the module or LCM. If a serial number is not available then **na** displays. Although this OID is Read-Write in the MIB, you cannot change the serial number. It is assigned in the factory.

entModelName is the device type or module type assigned the module. The Hub/Node displays **na**.

Module or Device	Device Type or Model Type
GS7000 EDFA	3100
Hub or Node	na
GS7000 Optical Switch	4100
Power Supply	101
Receiver	102
Transmitter	103
Status Monitor/LCM	2100

entPhysiccalAlias and **entPhysicalAssetID** are Read-Write. However, changes are saved in RAM only.

All units are field replaceable, and thus, **entPhysicallsFRU** is always **true(1)**.

Cisco Proprietary MIB Specifications

SA-HMS-GS7000-FIBERNODE-MIB is a proprietary MIB. The MIB supports the following values for the Optical Hub Node and Optical Hub in **saFn7000Member**, which has read-only access.

saFn7000Member	Description and Enumeration	Device Name
	deviceGS7000(2)	GS7000 Node
	deviceGS7000opticalHubNode(8)	Hub Node
	deviceGS7000opticalHub(9)	Optical Hub

saFn7000Member OID 1.3.6.1.4.1.1429.1.6.5.2.1

Optical Transmitter Table

saFnReturnLaserTable consists of an index, **saFnReturnLaserIndex**, and **saFnReturnLaserSlot**. **saFnReturnLaserIndex** uses legacy numbering conventions for transmitters. The following table shows GS7000 Node numbering conventions and slot numbers side-by-side.

Also, in previous versions of the GS7000 transponder core module, "mount" and "unmount" could be set. With transponder core module image revision OHN_3.00.03 or greater, "mount" means that a transmitter is present and "unmount" means that a transmitter is not installed. An attempt to change the value of this OID from "mount" or "unmount" or vice-versa has no effect on the module.

saFnReturnLaserIndex	Slot Number	Transmitter Installed	Transmitter Not Installed
1	8	mount(2)	unmount(1)
2	9	mount(2)	unmount(1)
3	10	mount(2)	unmount(1)
4	11	mount(2)	unmount(1)

saFnReturnLaserIndex OID 1.3.6.1.4.1.1429.1.6.5.2.2.1.1

saFnReturnLaserSlot OID 1.3.6.1.4.1.1429.1.6.5.2.2.1.2

Optical Receiver Table

saFnOpticalReceiverTable consists of four elements: the index **saFnOpticalReceiverIndex**, **saFnOpticalReceiverSlot**, **saFnOpticalReceiverHiPwrLimit** and **saFnOpticalReceiverLoPwrLimit**. As mentioned, this table uses GS7000 Node numbering conventions for the receivers. The following table shows legacy numbering conventions and slot numbers side-by-side.

saFnOpticalReceiverIndex	Slot Number	Receiver Installed	Receiver Not Installed
1	6	mount(2)	unmount(1)
2	5	mount(2)	unmount(1)
3	4	mount(2)	unmount(1)
4	3	mount(2)	unmount(1)

Also, in previous versions of the GS7000, transponder core "mount" and "unmount" could be set. With transponder core image revision OHN_3.00.03 or greater, "mount" means that a receiver is present and "unmount" means that a receiver is not installed. An attempt to change the value of this OID from "mount" or "unmount" or vice-versa has no effect on the module.

Switching thresholds for receivers can be changed by editing the **saFnOpticalReceiverHiPwrLimit** or **saFnOpticalReceiverLoPwrLimit**. The default maximum value is 1.7 milliwatts, entered as 170 for saFnOpticalReceiverHiPwrLimit. Therefore, values lower than this maximum value can be entered. The default minimum value is 0.5 milliwatts entered as 50 for saFnOpticalReceiverLoPwrLimit. Therefore, values higher than this minimum value can be entered. These limits also may be changed through the analog properties table found in SCTE-HMS-PROPERTY-MIB.

saFnOpticalReceiverIndex	OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.1
saFnOpticalReceiverSlot	OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.2
saFnOpticalReceiverHiPwrLimit	OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.3
saFnOpticalReceiverLoPwrLimit	OID 1.3.6.1.4.1.1429.1.6.5.2.4.1.4

saFnForwardConfig

The forward segmentation mode matches the configured Forward Configuration Module (FCM) type. Refer to the ViewPort software application for more information about configuring the FCM.

saFnForwardConfig	Description	FCM Type
oneX/twoXFwdSeg(1)	Forward RF signal for 2 ports comes from 1 optical receiver	1 x 2
oneX/twoXFwdSeg(1)	Forward RF signal for 2 ports comes from 1 optical receiver or the redundant receiver	1 x 2 redundant
oneX/twoXFwdSeg(1)	Forward RF signal for 2 ports comes from 1 optical receiver	1 x 2 with RF Injection
oneX/twoXFwdSeg(1)	Forward RF signal for 2 ports comes from 1 optical receiver or the redundant receiver	1 x 2 redundant with RF Injection
oneX/twoXFwdSeg(1)	Forward RF signal for 4 ports comes from 1 optical receiver	1 x 4
oneX/twoXFwdSeg(1)	Forward RF signal for 4 ports comes from 1 optical receiver or the redundant receiver	1 x 4 redundant
oneX/twoXFwdSeg(1)	Forward RF signal for 4 ports comes from 1 optical receiver	1 x 4 with RF Injection
oneX/twoXFwdSeg(1)	Forward RF signal for 4 ports comes from 1 optical receiver or the redundant receiver	1 x 4 redundant with RF Injection
oneX/twoXFwdSeg(1)	Forward RF signal for 2 ports comes from 2 optical receivers	2 x 2 redundant
oneX/twoXFwdSeg(1)	Forward RF signal for 2 ports comes from 2 optical receivers	2 x 4
oneX/twoXFwdSeg(1)	Forward RF signal for 4 ports comes from 2 optical receivers or the redundant receivers	2 x 4 redundant
fourXFwdSeg(2)	Forward RF signal for 4 ports comes from 4 optical receivers	4 x 4
threeXRx1-2-4FwdSeg(3)	Forward RF signal for 4 ports comes from 3 optical receivers (Rx1, Rx2, Rx4)	3 x 4
threeXRx1-3-4FwdSeg(4)	Forward RF signal for 4 ports comes from 3 optical receivers (Rx1, Rx3, Rx4)	3 x 4

saFnForwardConfig OID 1.3.6.1.4.1.1429.1.6.5.2.5

Redundancy Control Table

The **saFnRedundancyControlTable** consists of two elements: the index, **saFnRedundancyControlIndex**, and **saFnRedundancyState**.

saFnRedundancyControlIndex displays 1 and 2. The first pair of receivers (Rx1 and Rx2 in slot 6 and 5) are represented by 1. The second pair of receivers (Rx3 and Rx4 in slot 4 and 3) are represented by 2.

OID 1.3.6.1.4.1.1429.1.6.5.2.7.1.1

saFnRedundancyState displays the state of the redundant pair as: RedundancyUnavailable(1), RedundancyOff(2), RedundancyOn(3), RedundancyFail(4).

OID 1.3.6.1.4.1.1429.1.6.5.2.7.1.2

saFnRestoreTime indicates the time in seconds before the AB switch setting is restored following the return of satisfactory optical power to the primary receiver.

OID 1.3.6.1.4.1.1429.1.6.5.2.8

Power Supply Table

The **saFnPowerSupplyTable** consists of two elements: **saFnPowerSupplyIndex** indicates which power supply is mounted or not. The primary power supply represented by **saFnPowerSupplyIndex 1** and appears in the node in slot 2. The redundant power supply is indicated by **saFnPowerSupplyIndex 2** and appears in the node in slot 1.

OID 1.3.6.1.4.1.1429.1.6.5.2.9.1.1

saFnPowerSupplySlot indicates whether a particular power supply is "mounted" or "unmounted". In this case "mounted" means installed and receiving power, and "unmounted" indicates that the power supply is not installed or not powered. Although **saFnPowerSupplySlot** is read-write in the MIB, changing the value to a different state has no effect on the actual power supply.

OID 1.3.6.1.4.1.1429.1.6.5.2.9.1.2

saFnLCMSoftwareVersion displays the active software version number for the local control module, for example, 3.00.03.

OID 1.3.6.1.4.1.1429.1.6.5.2.10

saFnXPONSoftwareVersion displays the active software version number for the transponder core module, for example, OHN_3.00.03.

OID 1.3.6.1.4.1.1429.1.6.5.2.11

HMS MIB Specifications

SCTE-HMS-PROPERTY-MIB

The Property MIB consists of the following tables:

- analog properties table
- discrete alarms table
- current alarms table

Note: Information contained in the current alarms table can be determined by studying the other Property MIB tables.

Analog Property Table

The analog property table allows you to adjust certain alarm thresholds, hysteresis values, and settings with respect to alarm and trap generation. The thresholds displayed by the property MIB fall into three categories.

1. Thresholds that cannot be changed (na and RO in the following table). These parameters are informational and cannot be changed. Since the MIB itself has read-write access, you can edit the table. However, if an edited value has read-only access in the module, information coming from the module on the next polling cycle will overwrite your edits for that particular setting.
2. Threshold values that represent alarm thresholds (Alarm). These are used to generate a trap if the monitored value crosses one of these thresholds.
3. Thresholds that change the module settings. By editing the threshold on the property MIB, you actually change switching or other thresholds set in the module (Module threshold or Switching threshold).

Equipment	Parameter OID	Thresholds Changed	Code
LinePowerVoltage	fnLinePowerVoltage	na	RO
Transponder Core	commonInternalTemperature	Alarm	RW
RF Receive Level	commonForwardPathReceiveLevel	Alarm	RW
Transmitter	fnReturnLaserOpticalPower	Module threshold	RW
Receiver	fnOpticalReceiverPower	Switching threshold	RW
Power Supply	fnDCPowerVoltage	na	RO
EDFA	heOpAmpInputPower	Module threshold	RW
EDFA	heOpAmpLaserTemp	na	RO
EDFA	heOpAmpLaserBiasCurrent	Module threshold	RW
EDFA	heOpAmpLaserOutputPower	Module threshold	RW

Equipment	Parameter OID	Thresholds Changed	Code
EDFA	heOpAmpLaserTECCurrent	Alarm	RW
Optical Switch	heOpSwitchInputOpticalLevel	Alarm	RW
Module in slot	heCommonTemperature	Alarm	RW

The following table indicates the default values for the analog properties table.

Note: In the case of an EDFA, the specific module installed in the Hub/Node will govern the actual ranges for particular thresholds.

Name	Major Hi	Minor Hi	Minor Lo	Major Lo	Dead band	Units
fnLinePowerVoltage	80	74	40	36	2	VAC
commonInternalTemperature	80	50	-38	-40	2	degC
commonForwardPathReceiveLevel	260	240	-200	-250	5	0.1 dBmV
fnReturnLaserOpticalPower	23	23	5	5	1	mW
fnOpticalReceiverPower	17	17	5	5	0	mW
fnDCPowerVoltage (-6Vb)	-51	-52	-67	-68	1	0.1 VDC
fnDCPowerVoltage (5Vb)	64	64	52	51	1	0.1 VDC
fnDCPowerVoltage (8Vb)	96	95	77	75	1	0.1 VDC
fnDCPowerVoltage (24Vb)	274	269	229	224	2	0.1 VDC
Overall Limits – specific limits depend on the EDFA module installed						
heOpAmpInputPower	450	250	-10	-160	10	0.1 dBm
heOpAmpLaserTemp	450	250	-10	-200	10	0.1 degC
heOpAmpLaserBiasCurrent (relative)	-1	-10	na	na	1	mA
heOpAmpLaserOutputPower	220	200	-31	-200	1	0.1 dBm
heOpAmpLaserTECCurrent	3000	2000	-2000	-3000	10	mA
heOpSwitchInputOpticalLevel	140	130	-90	-100	50	0.1 dBm
heCommonTemperature	750	650	-400	-500	50	degC

Discrete Property Table

The discrete property table alerts you when a specific monitored value changes state. The alarms are set up to send a trap when a value changes from a nominal state to alarm state. Some are also set up to signal other states. The following table provides an overview of discrete property parameters and the values that may cause trap generation.

Equipment	Parameter OID	discreteAlarmValue
TamperSwitch	commonTamperStatus	1 and 2
Craftport	commonCraftStatus	1 and 2
Receiver	fnOpticalReceiverABSwitchState	1 and 2
Receiver	snFnRedundancyState	1, 2, 3, and 4
EDFA	heOpAmpUnitOutputStatus	1
Optical Switch	heOpSwitchFailoverStatus	2
Optical Switch	heOpSwitchBothInputStatus	2
Optical Switch	heOpSwitchInputStatus	2

SCTE-HMS-ALARMS-MIB

The alarm MIB keeps a copy of the last 50 alarms generated when a monitored value crosses an alarm threshold. The alarmLogTable contains the **alarmLogInformation** OID with values defined in the properties of the OID. Significant is the fifth octet that describes the Alarm Type as an enumeration representing one of the following:

1 Nominal

2 HiHi

3 Hi

4 Lo

5 LoLo

6 Discrete Major

7 Discrete Minor

Starting with octet seven until the value at the end, the OID of the monitored value causing the alarm state displays. Finally, the actual value shows in the last few octets. Traps are similar to the logged alarms. A few samples follow.

Current Alarm Table Sample

Instance	currentAlarmOID	currentAlarmAlarmState	currentAlarmVal
18.1.3.6.1.4.1.5591.1.11.1.3.1.1.2.1.2.9.1	heOpAmpInputPower.9.1	caasLOLO(5)	-242

Alarm Log Table Sample

Ins	alarmLogIndex	alarmLogInformation
11	11	34.AE.CC.90.05.19.12.2B.06.01.04.01.AB.57.01.0B.01.03.01.01.02.01.02.09.01.02.02.FF.0E

In the preceding sample, the heOpAmpInputPower, with a numeric OID of 1.3.6.1.4.1.5591.1.11.1.3.1.1.2.1.2.9.1 or hexadecimal 2B.06.01.04.01.AB.57.01.0B.01.03.01.01.02.01.02.09.01, is in an alarm state of 5 (LoLo) with a value of -242 or FF.0E in hexadecimal. The 18 (or hex 12) at the start of the OID in the current alarm table instance is the number of octets in the OID that follows. The 9 near the end of the instance stands for slot number 9, in which the EDFA is installed.

Alarm Log Example Shown With Decimal and OID Equivalents

	Alarm Type	OID	Value	Value
Octet	5	7-m	n-z	decimal
Hex	05	06.01.04.01.AB.57.01.0B.01.03.01.01.02.01.02.09.01	FF.0E	-242
Decimal	5	1.3.6.1.4.1.5591.1.11.1.3.1.1.2.1.2.9.1		
OID		heOpAmpInputPower.9.1		

SCTE-HMS-COMMON-MIB

The Common MIB is self-explanatory. A few significant OIDs are highlighted here. The transponder core's serial number is found in **commonSerialNumber**, while the MAC address is found in **commonPhysAddress**.

Information regarding the RF settings can be found in the commonRFGroup. This includes the **commonReturnPathFrequency**, the **commonForwardPathFrequency**, and the forward and return power levels.

SCTE-HMS-FIBERNODE-MIB

The fibernode MIB displays data related to the transmitters, receivers, redundancy, and power supplies. The **fnABSwitchTable** only displays when there is at least one redundant receiver pair in the node.

SCTE-HMS-DOWNLOAD-MIB

The SM module supports remote downloading application images to the transponder core, LCM module, and GS7000 EDFA and GS7000 OPSW modules by using the HMS Download MIB.

Two download tables are helpful in determining which image to download. In the HMS Download MIB, the **transponderTable** has a list of all the slots on the Hub/Node, the active image number, the active image version, and the module description, as well as other information. Downloading to an active image is not allowed. Check this table to determine which image is active and download to the other image.

Another very useful table is the **dlImageTable**. This table has a list of both the active and inactive images for each module. It is especially important to check this table prior to downloading an image to the transponder core module. It specifies the version of each image and indicates which image is read-write and which is read-only.

Downloads to the Transponder Core Module

There must be two valid images on the transponder core module prior to attempting a download. If there is only one image on the transponder core module, change **dlDownloadOption** to "noAction(2)". Then, download the other image, without resetting and running the new image.

Again, check the dlImageTable to be sure that there are two valid images for the transponder core module on the table. After the two images appear on the table, download the new image again with the dlDownloadOption "setStartupAndReset(1)" selected. After the transponder reboots, the new image will be running.

Downloads to the Local Control Module

The LCM is always in slot number 7, which is device 7 for the download. Before beginning the LCM download:

- Check the transponder table to determine which image is active.
- If the utility for the download supports an SNMP time out, set that to 25 seconds.
- Set dlDownloadTimeout to 300 seconds.

Now proceed with the download.

Note: The transponder table will always indicate that image 1 is active in the LCM, even after a download of image 2. Since there is only one download image file available that contains two application images, the transponder table is not updated to show the precise image that is running.

Downloads to the EDFA and OPSW

An EDFA or OPSW module can occupy any of the following slots: 3, 4, 5, 6, 8, 9, 10 or 11, which are also the device numbers for the download. A Power Supply is in slot 2, and the SM/LCM is in slot 7.

Before beginning a download to an EDFA or OPSW:

- Check the transponder table to determine which image is active.
- If the utility for the download supports an SNMP time out, set that to 25 seconds.
- Set the dlDownloadTimeout to 300 seconds.

Now proceed with the download.

Notes:

- The transponder table will always indicate that image 1 is active in the EDFA or OPSW, even after a download of image 2. Since there is only one download image file available that contains two application images, the transponder table is not updated to show the precise image that is running.
- If the download fails before it completes, wait until the timeout period has passed before retrying or restarting the download. The transponder core module does not have a Real Time Clock and is running on a time estimate. If you have set the dlDownloadTimeout to 300 seconds, wait 8 minutes just to be sure that the transponder core module has re-initialized all of the download settings.
- Scalar elements in the download are generally set by the remote download utility.

transponderTable and dlImageTable

Useful values in the **transponderTable** and **dlImageTable** are highlighted below.

dlTransponderDevice - Valid values for devices are 1 through 11, with the exception of two that is not used for downloads. The transponder is always device 1, and the LCM is always device 7. Other modules take on the device number that corresponds to the slot in which they are installed, 3 to 6 and 8 to 11.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.1

dlNumberImages - All of our downloadable modules are capable of holding two images.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.2

dlActiveImage - This is the image number which is currently running in the unit. The possibilities for the value are 1 or 2. Generally, the LCM, EDFA and OPSW will report image 1.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.3

dlActiveImageVersion - This value contains the active image version number, such as "OHN_3.00.03" for the transponder core module.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.4

dlActiveImageDescription - The description of the module is the value for this OID, such as "SM/LCM" for the local control module.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.5

dlActiveImageAccess - Access to the active image is always "overwriteNotAllowed(2)."

OID 1.3.6.1.4.1.5591.1.8.2.1.1.6

dlStartupImage - This OID has read-write access. Therefore, the value can be set to indicate which value should be active following a download, 1 or 2.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.7

dlDownloadOption - This OID has read-write access. Therefore, the value of dlDownloadOption can be set to setStartupAndReset(1) or noAction(2).

OID 1.3.6.1.4.1.5591.1.8.2.1.1.9

dlDownloadTimeout - This OID has read-write access. The value of this OID can be set to increase the time needed before the download times out. Valid values are 60 to 300 seconds. However, the transponder core module does not have a Real Time Clock so the time may vary when compared to actual seconds.

OID 1.3.6.1.4.1.5591.1.8.2.1.1.10

dlImageTable - This OID has read-only access. It is useful for getting data regarding the inactive image on a module.

dlImageStatus - This OID reports the validity of an image with validApplication(2) or invalid(1). An image may be invalid if the module in that slot does not run software, only one image is present, the slot is empty, or the image is corrupt.

OID 1.3.6.1.4.1.5591.1.8.2.2.1.3

dlImageAccess - This OID reports imageAccessReadWrite(1) if the inactive image and a new image may be downloaded to it. The active image is indicated by imageAccessReadOnly(2). This value also applies if the module does not run an image.

OID 1.3.6.1.4.1.5591.1.8.2.2.1.4

SCTE-HMS-HE-COMMON-MIB

The **heOpticalAmplifier** and **heOpticalSwitch** MIBs require that entries are made in the **heCommonTable**. This table is found in the heCommon MIB. Because we are only using the headend MIBs to support the Optical Switch and EDFA modules, our implementation uses the heCommonTable to monitor module temperatures.

Our modules do not support software resets. Thus, a write to the heCommonSoftwareReset does nothing. Similarly, there is no Real Time Clock on the transponder core module. Setting the heCommonTime results in no action. SysUpTime at the time that the temperature was initially polled or at the time of a temperature change by more than 0.5 degrees Celsius displays as a value in this OID.

To enable detection of a module's temperature and an entry in the properties MIB, select heCommonAlarmDetectionControl and enter detectionEnabledAndRegenerate(3). The particular module's temperature parameters will be entered into the analog properties MIB. To disable the feature described, enter detectionDisabled(1).

SCTE-HMS-HE-OPTICAL-AMPLIFIER-MIB

The HMS optical amplifier MIB allows the user to monitor and control the GS7000 EDFA. Four tables are provided through this MIB:

- **heOpAmpUnitTable**
- **heOpAmpInputTable**
- **heOpAmpLaserTable**
- **heOPAmpOutputTable**

heOpAmpUnitTable

The value of **heOpAmpUnitOutputStatus** shows the state of the EDFA with respect to whether the laser output is off(1) or on(2). The control for turning the EDFA output off or on is **heOpAmpUnitOnOffControl**.

heOpAmpUnitOutputStat us OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.1.1.1

heOpAmpUnitOnOffCont rol OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.1.1.2

heOpAmpInputTable

The input power level for the EDFA displays in the table **heOpAmpInputTable** under **heOpAmpInputPower** in units of 0.1 dBm. The instance for the table represents the slot number in which the EDFA is installed and the index. The index is always 1 because there is only one laser input to the GS7000 EDFA.

heOpAmpLaserTable

The **heOpAmpLaserTable** has read-only access. Various elements are explained below.

This instance represents the slot number in which the EDFA is installed as well as the **heOpAmpLaserIndex**.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.3.1.1

heOpAmpLaserTemp - The value of this OID gives the temperature of the amplifier laser in 0.1 degrees Celsius.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.3.1.2

heOpAmpLaserBiasCurrent - The value of this OID represents the amplifier laser bias current in 1.0 mA units.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.3.1.3

heOpAmpLaserOutputPower - The value of the laser output power, in 0.1 dBm units, displays in this OID. This element contains the same value as **heOpAmpOutputPower** for the same EDFA on the **heOPAmpOutputTable**.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.3.1.4

heOpAmpLaserTECCurrent - The value of this OID gives the laser thermo electric cooler current in 1.0 mA units.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.3.1.5

heOpAmpLaserType - This OID gives a description of the installed EDFA. The various descriptions are listed below.

heOpAmpLaserType entries for the EDFA
Broadcast 17.0 dBm
Broadcast 20.0 dBm
Broadcast 22.0 dBm
GF17.0dBm Low gain
GF21.0dBm Low gain
GF17.0dBm High gain
GF21.0dBm High gain

OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.3.1.6

heOpAmpOutputTable

The elements of **heOPAmpOutputTable**, used for controlling output power and constant gain, are explained below.

This instance contains the slot in which the EDFA is installed as well as the **heOpAmpOutputIndex**.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.4.1.1

heOpAmpSetOpticalOutputPower -In order for a value in this OID to affect the EDFA, **heOpAmpOutputGainType** must be set to **constantPower(1)**. The units of this value are 0.1 dBm. The EDFA accepts a value set by **heOPAmpSetOpticalOutputPower**, but will not act on it until **heOpAmpOutputGainType** is changed to the correct setting.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.4.1.2

heOpAmpGainPerWavelength -In order for a value in this OID to affect the EDFA, **heOpAmpOutputGainType** must be set to **constantGain (2)**. The units of this value are 0.1 dBm. The EDFA accepts a value set by **heOPAmpGainPerWavelength**, but will not act on it until **heOpAmpOutputGainType** is changed to the correct setting.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.4.1.3

heOpAmpOutputPower - The value of the laser output power, in 0.1 dBm units, displays in this OID. This element contains the same value as **heOpAmpLaserOutputPowe**r for the same EDFA on the **heOpAmpLaserTable**.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.4.1.4

heOpAmpOutputGainType - Valid values for this OID are constantPower(1) or constantGain(2). Depending on which is chosen, configurations selected for **heOpAmpSetOpticalOutputPower** or **heOpAmpGainPerWavelength** is implemented by the EDFA.
OID 1.3.6.1.4.1.5591.1.11.1.3.1.1.4.1.5

SCTE-HMS-HE-OPTICAL-SWITCH-MIB

The HMS optical switch MIB has the following three tables under heOpticalSwitchMIBObjects:

- **heOpSwitchUnitTable**
- **heOpSwitchInputTable**
- **heOPSwitchOutputTable**

heOpSwitchUnitTable

This section explains the implementation of the **heOpSwitchUnitTable**.

heOpSwitchMode - This OID can be set to automatic(1) or manual(2). In automatic mode, **heOpSwitchRevertEnable** can be set to on(2), which allows the switch to revert to the primary path if the optical power returns to a valid level following a power loss on the primary path. In manual mode, setting the **heOpSwitchRevertEnable** to on(2) has no affect on the module.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.1

heOpSwitchControl - Although there are several values shown in the HMS MIB, only PathA(1) or PathB(2) are valid for this optical switch.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.2

heOpSwitchRevertEnable - This OID can be set to off(1), on(2), or meaningless(3). When **heOpSwitchMode** is in automatic(1) this allows the switch to revert to the primary path if the optical power returns to a valid level following a power loss on the primary path. In manual mode, setting the **heOpSwitchRevertEnable** has no effect on the module.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.3

heOpSwitchState - Although there are several values shown in the HMS MIB, only PathA(1) or PathB(2) are valid for this optical switch.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.4

heOpSwitchFailoverStatus - According to the HMS MIB this value is based on "The integral status of both inputs. A value is fault (2), if current switch state heOpSwitchState is different than the preferred setting heOpSwitchControl; otherwise, it is normal." In this implementation, the value of heOpSwitchFailoverStatus is the same as "No Switch" on the ViewPort software.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.5

heOpSwitchBothInputStatus - The HMS MIB states that this is "The integral status of both inputs. A value is fault (2), if both input levels are below the nominal value. Otherwise, it is normal."
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.6

heOpSwitchSelectWavelength - The wavelength in the GS7000 optical switch is always 155000 (1550 nm). Although this field has read-write access in the HMS MIB, the value will not change from 155000.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.7

heOpSwitchHysteresis - This OID contains the value in (0.1 dB units) above which the input optical power must rise for the switch to begin the **heOpSwitchWaitToRestoreTime** prior to restoring the primary switch position. The hysteresis must be changed in 0.1 dB increments. This only applies if **heOpSwitchRevertEnable** is set to on(2) and **heOpSwitchMode** is set to automatic(1).
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.8

heOpSwitchWaitToRestoreTime - This element controls the hysteresis time in seconds. The valid range is 0 to 600 seconds. The HMS MIB states, "If in automatic switching mode and revert mode is enabled, a switch back to the original side will be delayed for the time specified by this object."
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.1.1.9

heOpSwitchInputTable

This section explains the implementation of the **heOpSwitchInputTable**.

heOpSwitchInputIndex - Index one indicates PathA. Index two indicates PathB. The instance displays the slot number and the index. Therefore, if an optical switch is in slot 10, then 10.1 indicates information for PathA and 10.2 gives the data for PathB.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.2.1.1

heOpSwitchInputOpticalLevel - The value of this OID is the measured optical input power for the optical switch in 0.1 dBm units.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.2.1.2

heOpSwitchSetInputPowerThreshold - The value of this OID is the input power switchover point for this input in 0.1 dBm units.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.2.1.3

heOpSwitchInputStatus - This OID gives the integral status of the input. The value is fault (2), if the input levels are not in the nominal range. Otherwise, it is normal (1).
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.2.1.4

heOpSwitchInputDescription - The value of this OID for the GS7000 optical switch is either PathA or PathB.
OID 1.3.6.1.4.1.5591.1.11.1.4.1.1.2.1.5

heOpSwitchOutputTable

This section explains the implementation of the **heOpSwitchOutputTable**.

heOpSwitchOutputDescription - This OID is read-only and is always set to Output.

5

Troubleshooting

This chapter contains instructions for troubleshooting SM/LCM operation.

In This Chapter

- SM/LCM Sensors and Indicators 56
- Local Control Module Troubleshooting 57
- Status Monitor Troubleshooting 60

SM/LCM Sensors and Indicators

The SM/LCM housing contains a sensor and two indicators which provide the same indications whether the module is a local control module or a full status monitor.

Note: See ***Status Monitor/Local Control Module Description*** (on page 8) for an illustration of the housing and indicators.

The functions of the sensor and indicators are described in the following table.

LED	Indication
LIGHT SENSOR	This ambient light sensor sends a trap to the status monitoring and control software indicating that the node housing is open.
STATUS (Green LED)	**BLINK (slow)** - Blinks approximately once a second if the module receives the correct input power voltage. **On (solid)** -The Auto Set-Up button is being pressed.
FAULT (Red LED)	**OFF** - Normal operation. **BLINK (slow)** - Minor alarm. One or more of the measured parameters is over threshold limit. Blinks approximately once per second. **FLASH (fast)** - Redundancy is ON. One or both of the primary optical receivers has failed and the secondary receivers are now operating. Flashes approximately two/three times per second. **ON (solid)** - 1x/2x Fwd Seg: Redundancy has failed. One or both of the primary optical receivers has failed and the secondary receivers are also not operating. 3x and 4x Fwd Seg: A receiver has failed. Either mode: The Auto Set-Up button is being pressed.

Local Control Module Troubleshooting

Introduction

The LCM indicates its status through the FAULT and STATUS LEDs on the front of the module housing. More detailed status information can be obtained using the PC-based GS7000 ViewPort software.

The following sections provide troubleshooting procedures based on the FAULT and STATUS LED indications.



WARNING:

Model GS7000 Node or Hub Node forward segmentation is set at the factory to match the installed Forward Configuration Module (FCM). A mismatch between the forward segmentation and the FCM may cause isolation or loss of service.

Green STATUS LED not Blinking

If the green STATUS LED is not blinking, complete the following steps to troubleshoot.

1. Make sure the LCM is mating correctly with the connectors on the OIB in the node. See ***Installing the SM/LCM*** (on page 12) for instructions on proper installation.
2. If the STATUS LED is still not blinking, remove the LCM from the node and examine the pins of the LCM connectors. If any are bent or broken, replace the LCM.
3. If the STATUS LED is still not blinking, input power is not being supplied to the LCM through the OIB. Check and replace the OIB if necessary. Refer to *Model GS7000 Optical Hub Installation and Configuration Guide*, part number OL-29936-01, or *Model GS7000 GainMaker Scaleable 4-Port Node Installation and Operation Guide*, part number 78-4013584-01, for more information.

Red FAULT LED Blinking Slowly

If the FAULT LED is blinking slowly, there is at least one alarm condition. This indication could be caused by:

- Improper configuration of the LCM
- Real operating condition problems

The following sections explain how to troubleshoot each of these possibilities.

Improper Configuration of the LCM

An improperly configured LCM can be the cause of this indication. Improperly configured, for example, can mean that the LCM's configuration does not match the actual receivers/transmitters mounted in the node. This could happen if the LCM you are using was previously used in another node.

Complete the following steps to troubleshoot.

1. Verify the LCM configuration. See ***Configuring the LCM*** (on page 20) for instructions on properly configuring the LCM.
2. If the LCM configuration is correct, then follow the procedures in the next section to check for an operating condition that could cause the alarm.

> **WARNING:**
>
> **Model GS7000 Node and Hub Node forward segmentation is set at the factory to match the installed FCM. A mismatch between the forward segmentation and the FCM may cause isolation or loss of service.**

Real Operating Condition Problems

Use the PC-based ViewPort software to determine what operating condition alarms exist. ViewPort's displays will lead you to any alarm conditions.

Alarm conditions are indicated in ViewPort by colored boxes around installed modules and by colored module parameter fields. The color codes are:

- Green = Normal
- Yellow = Minor Alarm
- Red = Major Alarm

If ViewPort shows a module with a yellow or red colored box around it, that module's status and configuration should be investigated and corrected.

Some typical causes for problems that should be checked include the following:

- For a node or hub node, check which receivers and transmitters are shown as installed in your configuration. The configuration settings must match what is physically installed and operating.
- Check the RX and TX threshold levels. Are they correct? If not, reset the values.
- Check the operating power levels against set threshold levels for any alarms.
- For a hub node or optical hub, check which EDFA and OPSW modules are shown as installed in your configuration. The configuration settings must match what is physically installed and operating.
- Check the EDFA and OPSW configuration parameters. Are they correct? If not, reset the values.

- Check which AC lines and PS modules are shown as installed in your configuration. The configuration settings must match what is physically installed.
- Check the power supply measurements for out-of-range values.

Red FAULT LED Flashing Fast

If the FAULT LED is flashing fast, one or both of the secondary receivers is being turned on, i.e., redundancy is in use.

Complete the following steps to verify that the redundancy switching is correct in 1x/2x Fwd Seg forward segmentation mode.

1. Connect a laptop computer running the ViewPort software to the local control interface USB port on the LCM. See ***Configuring the LCM Using the PC-based ViewPort Software*** (on page 21) for instructions.
2. Check the settings of the AB switches (Preferred A, Preferred B, Forced A, or Forced B). If not set correctly, reset as required.
3. Check the optical power levels of the receivers against their set thresholds. This allows you to see which primary receivers have failed and had their corresponding secondary receivers turned on. Verify the status of the corresponding receivers.

Red FAULT LED On Solid

If the FAULT LED is on (solid RED), redundancy has failed. One or both of the secondary receivers could not be turned on and operated when their corresponding primary receiver failed.

To troubleshoot this condition, use the same procedure as in **Red FAULT LED Flashing Fast**, but look for the failure of both primary and secondary receivers.



WARNING:

Be sure that your node supports the forward segmentation of your status monitor.

Status Monitor Troubleshooting

Introduction

Like the LCM, the SM also indicates its status through the FAULT and STATUS LEDs on the front of the module housing. In addition, the SM transponder module has three more indicator LEDs that provide additional information about the remote connection, i.e., the transponder status.

Verifying SM Operating State

If communication with the headend controller cannot be established, check the state of the SM by observing the Heart Beat, Receive, and Error indicator LEDs on the transponder module. See the next section, **SM Transponder Module Indicators**, for a description.

Further troubleshooting, based in LED indications, requires the use of the ViewPort software.

Complete the following steps to verify the operating state of the SM.

1. Connect a laptop computer running the ViewPort software to the local control interface USB port on the LCM. See ***Configuring the LCM Using the PC-based ViewPort Software*** (on page 21) for instructions.
2. Verify the current operating state of the SM. Select the SM/LCM module to display its status parameters. The operating state is indicated under XP Communications in the Channel Status field.

   Note: The possible operating state indications are: "No Frequency Found", "Ch Description", or "Registered".
3. Follow the troubleshooting procedures in the next sections based on the indicated operating state.

SM Transponder Module Indicators

The transponder module in the status monitor contains three LED indicators, which are visible through the front of the status monitor's housing.

Note: See ***Status Monitor Description*** (on page 8) for an illustration showing the LED indicators.

These LEDs are used to indicate the transponder's operating state as described in the following table.

STATE	ERROR LED (RED)	RECEIVE LED (GREEN)	HEART BEAT LED (GREEN)
Power-Up	ON	ON	ON
No Freq Found	OFF	OFF	Constant Fast Flash (approx. 2 or 3 times/second)
Ch Description	OFF	ON	Double Flash/Pause Sequence (2 flashes/second, then 1 second pause, repeat)
Registered	OFF	ON	Constant Slow Flash (approx. once/second)
Error	ON	OFF	ON

No Frequency Found State

If the SM is in the "No Freq Found" state, it is not receiving a downstream carrier from the headend controller. This is probably because the SM is in the frequency scanning mode and has not found a downstream carrier.

Complete the following steps to troubleshoot this condition.

1. Connect a laptop computer running the ViewPort software to the local control interface USB port on the LCM. See ***Configuring the LCM Using the PC-based ViewPort Software*** (on page 21) for instructions.
2. Use ViewPort to set the **RX FREQUENCY** (the downstream frequency) on which the transponder receives commands from the headend. The SM should lock on the carrier within 30 seconds.

   OR

   Wait for the SM to find the carrier. This can take up to 24 hours, but commonly takes only one to two hours.
3. Use a spectrum analyzer and check for a downstream carrier at the receiver test point. If no carrier is found, check the output of the headend controller. Verify the cabling from the headend controller to the SM.

Ch Description (Channel Description) State

If the SM is in the "Channel Description" state then:

- It is receiving a downstream carrier and is decoding the message.
- If the correct messages were received, it knows what reverse frequency it should use to transmit data back to the headend controller.

Note: The SM could receive messages not intended for it. In this case, the SM discards the messages and stays in this state.

This state indicates that the headend controller is not receiving data and is not registering the SM. The most common cause of this problem is that the reverse plant levels are incorrect.

Complete the following steps to troubleshoot this condition.

1. Verify that the MAC address and/or IP address of the SM is correctly recorded on the headend controller.
2. Verify the SM is transmitting on the reverse frequency by using a spectrum analyzer to check the transmitter test point for a reverse carrier on the correct frequency.

   Note: This is a short burst and it may be necessary to use the "Max Hold" function of the spectrum analyzer.
3. If the reverse carrier is present, check the cabling at the headend controller. Since the Status Monitor is receiving the channel descriptor but not receiving registration commands, the downstream and upstream cables may not be connected properly.
4. After verifying the SM is transmitting a carrier on the reverse plant, verify that the carrier is present at the headend controller and that the levels are correct.

   Note: An HMS compliant headend controller has a -20 dBmV to +20 dBmV input range. Some non-HMS headend controllers have a very limited input range, therefore the reverse plant and transponder's transmit power level may need to be tuned to accommodate them.

Registered State

If the SM is in the "Registered" state, then it is communicating successfully with the headend controller.

Notes:

- In some cases, the SM may be communicating MIB data with the headend controller but not showing "Registered" on the HPT status screen. The full registration can take up to one hour when registering with certain Non-HMS headend controllers.
- If the SM is in the "Registered" state, but MIB data is not being transferred, then the EMS software is not configured correctly.

Error State

If the SM is in the "Error" state, then the transponder core module in the SM is defective. Replace the transponder core module or the entire SM as necessary.

WARNING:

Be sure that the LCM software and transponder core module software match. Software versions prior to 3.00.03 are not compatible with software versions 3.00.03 and above.

6

Customer Information

If You Have Questions

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

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

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.

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.

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.

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.

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.

Bps

bits per second. The total number of bits sent in a second of time.

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.

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.

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, DC

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

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.

duplexer

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

EDFA

erbium doped fiber amplifier. Optical fibers doped with the rare earth element, erbium, which can amplify light in the 1550 nm region when pumped by an external light source.

EEPROM

electrically erasable programmable read-only memory.

EMC

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

EMS

Element Management System. A system that controls a single element, or many elements of a single type. Usually works up into a full network management system (NMS).

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.

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.

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.

frequency stability

A measure of the departure from nominal frequency value of a signal, with respect to time, temperature, or other influence.

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.

HMS

hybrid management sublayer. A set of ANSI/SCTE standards specifying an element management system for hybrid fiber/coaxial networks. The standards establish key protocols for the communication of status monitoring information between elements in the network.

I/O

input/output.

IC

integrated circuit.

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.

LCI

local craft interface.

LCM

local control module.

LED

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

Mbps

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

MIB

management information base. SNMP collects management information from devices on the network and records the information in a management information base. The MIB information includes device features, data throughput statistics, traffic overloads, and errors.

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.

OID

object identifier.

OPSW

optical switch.

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.

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.

router

A data communications device which examines a packet and routes the packet to an output port appropriate to the packet destination. On the Internet, a router is a device or, in some cases, software in a computer that determines the next network point to which a packet should be forwarded toward its destination. The router is connected to at least two networks and decides which way to send each information packet based on the router's current understanding of the state of the networks it is connected to. A router creates or maintains a table of the available routes and their conditions and uses this information along with distance and cost algorithms to determine the best route for a given packet.

RTC

real time clock.

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.

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.

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.

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