Gigabit QAM Modulator Model D9479

Hardware Installation and Operation Guide

Please Read

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.

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Contents

Safety Precautions

Read, Retain, and Follow These Instructions

Carefully read all safety and operating instructions before operating this product. Follow all operating instructions that accompany this product. Retain the instructions for future use. Give particular attention to all safety precautions.

Warning and Caution Icons

WARNING:

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

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

You will find this icon in the literature that accompanies this product. This icon indicates important operating or maintenance instructions.

You may find this icon affixed to this product and in this document to alert you of electrical safety hazards. On this product, this icon indicates a live terminal; the arrowhead points to the terminal device.

You may find this icon affixed to this product. This icon indicates a protective earth terminal.

You may find this icon affixed to this product. This icon indicates excessive or dangerous heat.

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

Heed All Warnings

Adhere to all warnings on the product and in the operating instructions.

Avoid Electric Shock

Follow the instructions in this warning.

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.

Servicing

WARNING:

Avoid electric shock! Opening or removing the cover may expose you to dangerous voltages.

Do not open the cover of this product and attempt service unless instructed to do so in the operating instructions. Refer all servicing to qualified personnel only.

Cleaning, Water, Moisture, Open Flame

To protect this product against damage from moisture and open flames, do the following:

- Before cleaning, unplug this product from the AC outlet. Do *not* use liquid or aerosol cleaners. Use a dry cloth for cleaning.
- Do not expose this product to moisture.
- Do not place this product on a wet surface or spill liquids on or near this product.
- Do not place or use candles or other open flames near or on this product.

Ventilation

To protect this product against damage from overheating, do the following:

- This product has openings for ventilation to protect it from overheating. To ensure product reliability, do not block or cover these openings.
- Do not open this product unless otherwise instructed to do so.
- Do not push objects through openings in the product or enclosure.

Placement

To protect this product against damage from breakage, do the following:

- Place this product close enough to a mains AC outlet to accommodate the length of the product power cord.
- Route all power supply cords so that people cannot walk on, or place objects on, or lean objects against them. This can pinch or damage the cords. Pay particular attention to cords at plugs, outlets, and the points where the cords exit the product.
- Make sure the mounting surface or rack is stable and can support the size and weight of this product.

WARNING:

Avoid personal injury and damage to this product! An unstable surface may cause this product to fall.

When moving a cart that contains this product, check for any of the following possible hazards:

- Move the cart slowly and carefully. If the cart does not move easily, this condition may indicate obstructions or cables that you may need to disconnect before moving this cart to another location.
- Avoid quick stops and starts when moving the cart.
- Check for uneven floor surfaces such as cracks or cables and cords.

WARNING:

Avoid personal injury and damage to this product! Move any appliance and cart combination with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart to overturn.

Fuse

When replacing a fuse, heed the following warnings.

WARNING:

Avoid electric shock! Always disconnect all power cables before you change a fuse.

WARNING:

Avoid product damage! Always use a fuse that has the correct type and rating. The correct type and rating are indicated on this product.

Grounding This Product (U.S.A. and Canada Only)

Safety Plugs

If this product is equipped with either a three-prong (grounding pin) safety plug or a two-prong (polarized) safety plug, do not defeat the safety purpose of the polarized or grounding-type plug. Follow these safety guidelines to properly ground this product:

- For a 3-prong plug (consists of two blades and a third grounding prong), insert the plug into a grounded mains, 3-prong outlet.

  Note: This plug fits only one way. The grounding prong is provided for your safety. If you are unable to insert this plug fully into the outlet, contact your electrician to replace your obsolete outlet.

- For a 2-prong plug (consists of one wide blade and one narrow blade), insert the plug into a polarized mains, 2-prong outlet in which one socket is wider than the other.

Note: If you are unable to insert this plug fully into the outlet, try reversing the plug. The wide blade is provided for your safety. If the plug still fails to fit, contact an electrician to replace your obsolete outlet.

Grounding Terminal

If this product 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 an earth ground, such as an equipment rack that is grounded.

20050727 Headend/Rack

FCC Compliance

Where this equipment is subject to U.S.A. FCC and/or Industry Canada rules, the following statements apply.

United States FCC Compliance

This device 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 such 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.

Canada EMI Regulation

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

Cet appareil numérique de la class A est conforme à la norme NMB-003 du Canada.

20061110 FCC HE

About This Guide

Introduction

This guide describes the Model D9479-1 120/230 VAC Gigabit QAM Modulator (GQAM) and the Model D9479-2 48 VDC GQAM. This guide provides installation, provisioning, operation, and troubleshooting procedures, as well as technical specifications.

Note: In this guide, the Gigabit QAM modulator is referred to as the GQAM.

Purpose

This guide provides detailed specifications and component descriptions for the GQAM. This guide also includes all of the procedures that enable you to install, provision, and operate the GQAM within your DBDS. Call center personnel can use this guide to assist them with common troubleshooting procedures.

Scope

This guide includes the following topics:

- Descriptions of GQAM functions
- Descriptions of GQAM components
- Installation procedures
- Operation procedures
- Troubleshooting guidelines
- Customer support information
- GQAM technical specifications

Audience

This guide is written for cable network system administrators and engineers, DNCS operators, call center personnel, and system operators who are responsible for installing, operating, maintaining, and troubleshooting the GQAM.

Related Publications

You may find the following publications useful as resources when you implement the procedures in this document.

- *DNCS Online Help (PC) 4.2.0.3* (part number 4012121)
- *GQAM Software Version 4.0.6 Release Notes and Installation Instructions* (part number 4011046)
- *RNCS Installation and Upgrade Instructions For SR 2.7/3.7 or SR 4.2* (part number 4012763)
- *UniPack Upgrade Installation Instructions For SR 2.7 /3.7 or SR 4.2* (part number 4012120)

Document Version

This is the fifth formal release of this document. In addition to minor text and graphic changes, the following table provides the technical changes to this document.

Description	See Topics
Added documentation to support the updated rear panel, which now has two fuse holders for the DC input. The DC input and fuse holders have been repositioned also.	***Back Panel Diagram*** (on page 9) ***Connecting a DC Power Source*** (on page 25) ***Replacing the Fuse*** (on page 86)

1

Introduction

The GQAM represents one of the most up-to-date innovations in video transmission technology. The GQAM contains five input ports and can provide up to sixteen QAM outputs for video data. The input ports include four Digital Video Broadcasting (DVB) standard asynchronous serial interface (ASI) inputs and a Gigabit Ethernet port. Data can be sent simultaneously on all five inputs and programs can be multiplexed to any of the sixteen outputs. The GQAM only requires one unit of rack space while replacing the core functionality and the RF output capabilities of four Model D9477 Multi Quadrature Amplitude Modulation (MQAM) Modulators.

The GQAM provides up to sixteen 6 MHz outputs while only occupying 1 rack unit (RU) in the equipment rack. For example, compared with the MQAM modulator, one GQAM frees up a total of seven additional RU openings, thereby making the GQAM the ideal product for mass deployment of video-on-demand (VOD), anything-On-Demand (xOD), and other interactive broadcast services.

The GQAM enables a smooth transition to headend/hub architectures that can utilize the benefits of video networking using standard data network switches or routers. This is especially beneficial for on-demand applications, whether from storage or from broadcast sources. Switching (or routing) frees the architecture from the constraints of dedicated point-to-point source to edge asynchronous serial interface (ASI) interconnections, and permits independent optimization of source bandwidth, transport bandwidth, and edge or distribution bandwidth.

This chapter describes how the GQAM functions within the Digital Broadband Delivery System (DBDS), explains how the GQAM processes and outputs data, and provides illustrations and descriptions of the GQAM front and back panel components for both the 120/230 VAC model and the 48 VDC model.

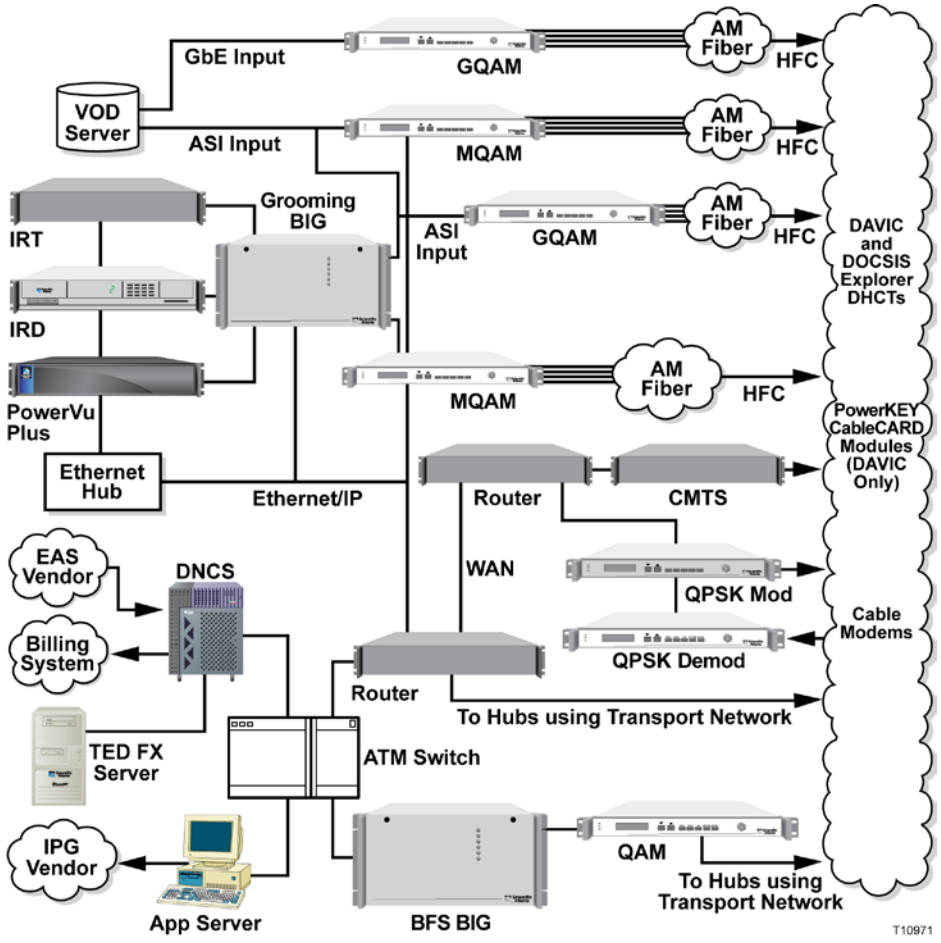
Important: You must be operating DNCS System Release (SR) 2.1.1 or later to install and provision (configure) a GQAM on your system.

In This Chapter

System Overview

Diagram of Major DBDS Components

Depending on the system architecture, the GQAM can be used in either headends or hubs. The following illustration provides an example of where the GQAM can be used with the major components of the DBDS.



Features

The GQAM provides many new digital broadcast features and innovations for your system which are described in the following table.

Feature	Function
DVB ASI Input (4)	■ Supports a maximum ASI data rate of 216 Mbps (MPEG packet rate) at all four inputs ■ Provides the capability to direct all programs from any ASI input, such as VOD servers, *x*OD servers, encoders, Synchronous Optical Network (SONET) to ASI converters, BitMizers, Multiple Decryption Receivers (MDRs), Grooming Broadband Integrated Gateways (BIGs), integrated receiver-decoders (IRDs), and other digital video sources at the headend, to any RF output
Gigabit Ethernet Interface	■ Uses Gigabit Interface Converter (GBIC) modules that provide one input and one output for data in order to implement 1000Base-LX and conform to the GbE specification 902.3z **Note:** GBIC modules support single mode fiber, multi-mode fiber, and CAT 5 copper Ethernet connections to the GQAM. ■ Supports dejitter ■ Supports MPEG transport in UDP over the GbE interface ■ Supports multiplexing to any of 16 output carriers
Statistical multiplexed (stat mux) group dejitter (SMGD) control	■ Processes the variable bit rate (VBR) stream as a group of programs ■ Ensures optimum dejitter by using one buffer that is dedicated to only one transport stream ■ Produces an output stream closer to the received jitter
10/100 BASE T Ethernet Interface	■ Provides an interface to the DNCS
Multiplexing Functionality	■ Provides program and packet identifier (PID) remapping and filtering ■ Allows individual PIDs to be dropped from programs ■ Allows full routing of MPEG programs from any of the five inputs to any combination of the sixteen QAM-modulated output channels for a total of 16 separate MPEG transport streams
MPEG Stream Management	■ Provides program clock reference (PCR) timestamp correction ■ Provides program specific information (PSI) reconstruction ■ Provides transport stream monitoring ■ Allows adaptive insertion rate control

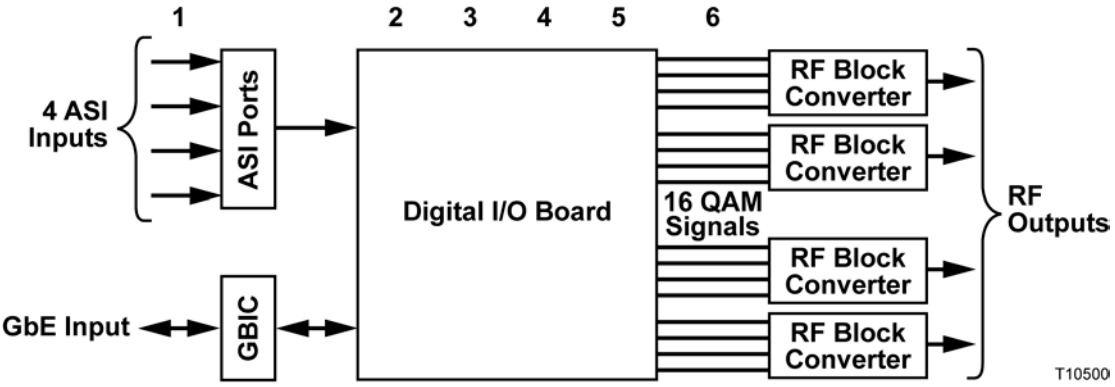
Feature	Function
Stream Encryption, Conditional Access, and Management	■ Stream encryption modes: PowerKEY® Native and the DVB Common Scrambling algorithm ■ Allows PowerKEY Book One ECM Handling ■ Provides MPEG packet insertion and entitlement control messages (ECMs) ■ Supports broadcast clear-to-air and interactive encrypted PowerKEY modes
64/256 QAM RF Output (4)	■ Provides four independently agile blocks of 6 MHz carriers for a total usable RF bandwidth of 24 MHz per output channel ■ Provides a separate physical connector for each block upconverter output ■ Allows independent level control for each QAM signal with limited frequency offset adjustment of individual carriers within a 24 MHz block ■ Allows an adjustable output center frequency range of 91 to 869 MHz ■ Allows an adjustable RF output signal level of 54 dBmV max per carrier, measured at the output F connector (+60 dBmV "equivalent" for 4 carriers) ■ Provides +/- 3 dB power adjustment between adjacent carriers, and 10 dB level range adjustment at each output ■ Provides a switched filter bank for superior broadband combined noise performance ■ Supports International Telecommunications Union (ITU) J.83 Annex-A, and Annex-B, and Annex-C standards
User Interface Features	Allows local setting of RF power levels and display of diagnostic and debug information through the front panel and user interface

Input/Output Process

This section describes how the GQAMs modulate, encrypt, and transmit the signals they receive from external sources.

Input/Output Diagram

The following diagram illustrates the stages of the input/output (I/O) process.



Note: The numbers shown in the diagram correspond to the stages within the Input/Output Stage/Description Table.

Input/Output Stage/Description Table

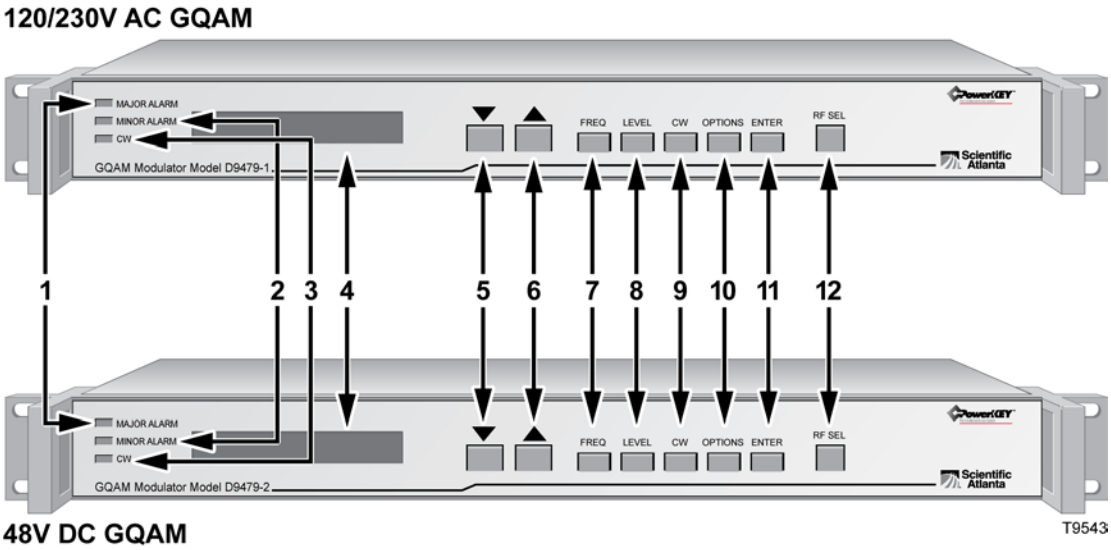
The following table describes the stages of the I/O process. The numbers correspond to the above I/O diagram.

Stage	Description
1	The ASI input ports or the GbE port receives MPEG transport stream packet data from different physical layer sources and extracts MPEG-2 transport stream packets.
2	The digital I/O board timestamps the packets, then filters and routes them according to their PID values.
3	The I/O board implements the dejitter function on packets from all inputs, for all encapsulations.
4	The digital I/O board implements PowerKEY Conditional Access. **Note:** ECMs and entitlement management messages (EMMs) are inserted into the MPEG-2 transport packet stream.
5	The output stream is modulated at 64 QAM or 256 QAM.
6	The I/O board directs the MPEG transport stream to one of 16 RF outputs and sends the signal through the RF network to DHCTs.

Front Panel Overview

Front Panel Diagram

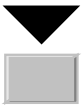
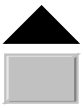
This illustration shows the front panel components of each type of GQAM.



Front Panel Components

The following table provides front panel alarm and component descriptions that correspond to each number in the preceding labeled diagram of each type of GQAM.

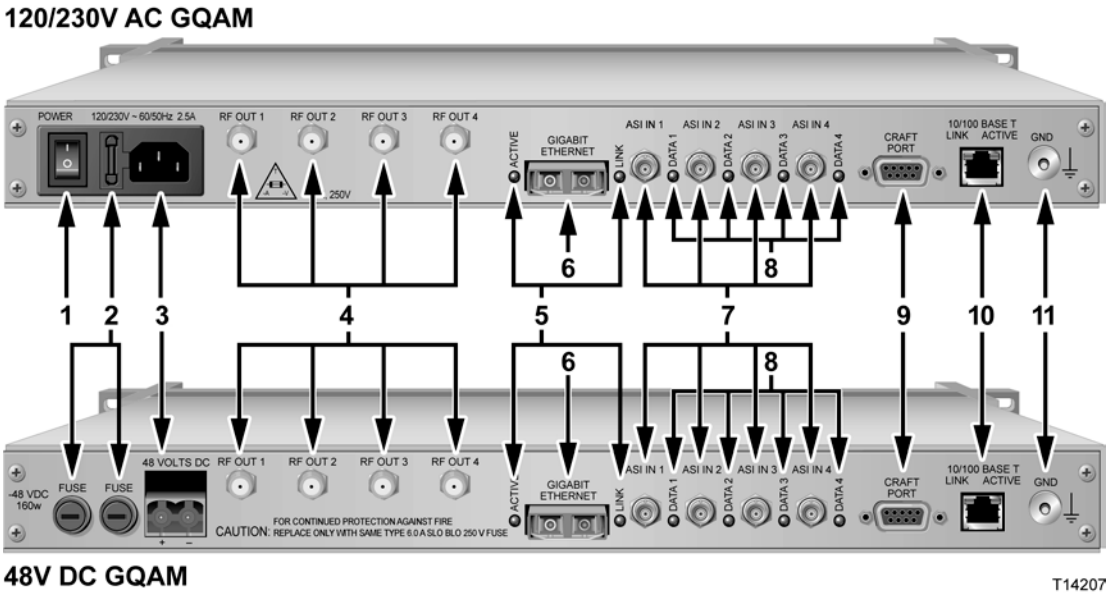
Item	Component	Description
1	MAJOR ALARM indicator	This LED is red and lights for a major alarm condition. Major alarms occur for hardware or software conditions that indicate a serious disruption of service or the malfunctioning or failure of important circuits. The LED goes off when all major alarms have cleared.
2	MINOR ALARM indicator	This LED is yellow and lights for a minor alarm condition. Minor alarms indicate a less critical error condition. The GQAM may continue to operate with some loss of functionality. The LED goes off when all minor alarms have cleared.
3	CW indicator	This LED is yellow and lights when any one of the RF carriers is set to continuous wave (CW) mode.
4	LCD alphanumeric display screen	This screen displays status and operating screens controlled by the front panel keys.

Item	Component	Description
5		The Down Arrow key decrements a displayed value or navigates through a set of displayed values. This key is only active when the display has a flashing value, which indicates that the value can be changed. This key is primarily used for decreasing a displayed value such as frequency or level.
6		The Up Arrow key increments a displayed value or navigates through a set of values. This key is only active when the display has a flashing value, which indicates that the value can be changed. This key is primarily used for incrementing a displayed value such as frequency or level.
7		The Frequency key selects the frequency display screen on which you can adjust the RF output frequency for each of the RF carriers.
8		The Level key selects the RF Output Level screen on which you can adjust the RF output power level and mute the RF output (42 to 56 dBmV).
9		The Continuous Wave (CW) key selects the Continuous Wave Screen on which you can set the GQAM modulator to output either a modulated carrier or a continuous carrier for each of the RF carriers. **Note:** CW mode is used for testing and not for normal operation.
10		The Options key scrolls through status information and setup options.
11		The Enter key saves configuration changes to nonvolatile memory.
12		The RF Port Selection (RF SEL) key selects one of the 16 RF outputs.

Back Panel Overview

Back Panel Diagram

This illustration shows the back panel components for each type of GQAM.



Back Panel Components

The following table describes the back panel components.

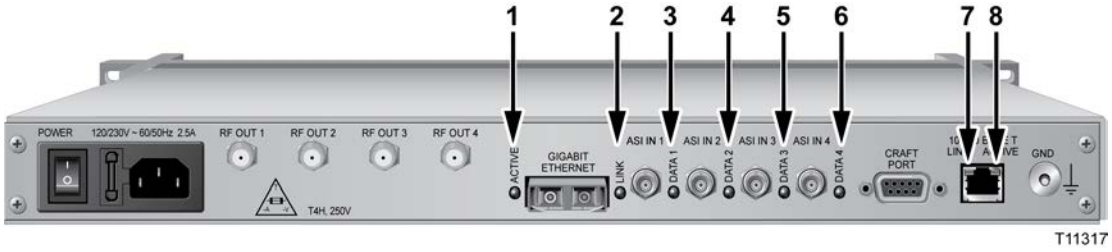
Important: The three cooling fans for the GQAM are mounted on the side panel.

Item	Component	Description
1	**AC Unit:** Power Switch	On/off rocker-type power switch
2	Fuse Holder	■ (AC Unit) 4.0 A SLO BLO 250 V fuse (part number 188106) ■ (DC Unit) 6.3 A SLO BLO 250 V fuse (part number 180522)
3	**AC Unit:** AC Power Inlet	IEC 320-conductor grounded outlet
	DC Unit: DC Power Inlet	Two-post terminal block DC power input connections
4	RF OUT Ports 1 - 4	F-connectors for RF, 75 Ω

Item	Component	Description
1	**AC Unit:** Power Switch	On/off rocker-type power switch
5	Gigabit Ethernet Port LEDs	LINK and ACT (Active) LEDs light when the Main or Backup GbE port is active
6	Gigabit Ethernet port	GBIC GbE port allows for receipt of MPEG transport stream data in UDP over the GbE interface
7	DVB ASI INPUTS 1-4	Female BNC, 75 Ω connector. Allows for the input of MPEG-2 transport stream data at a maximum rate of 216 Mbps
8	DVB ASI LEDs	Data LEDs 1 through 4 light when the DVB ASI Input ports are receiving valid MPEG-2 transport stream packets
9	CRAFT PORT	For Cisco diagnostic use only
10	10/100BASE T port	Ethernet port shares data with DNCS Ethernet hub
11	GND	Ground screw for grounding the modulator

Back Panel Indicator Lights

The following illustration and table show the back panel indicator lights.



Item	Indicator Light	Description
1	ACTIVE (green)	Lights when data traffic is on the 10/100BASE-T GbE link
2	LINK (green)	Lights when a valid GbE 10/100BASE-T link connection exists
3	DATA 1 (green)	Lights when the DVB ASI Input 1 port is receiving valid MPEG-2 transport stream (TS) packets
4	DATA 2 (green)	Lights when the DVB ASI Input 2 port is receiving valid MPEG-2 TS packets
5	DATA 3 (green)	Lights when the DVB ASI Input 3 port is receiving valid MPEG-2 TS packets

Item	Indicator Light	Description
6	DATA 4 (green)	Lights when the DVB ASI Input 4 port is receiving valid MPEG-2 TS packets
7	LINK (yellow)	Lights when a valid 10/100BASE-T Ethernet link connection exists
8	ACTIVE (green)	Lights when data traffic is on the 10/100BASE-T Ethernet link

2

Installing the Dual SFP GQAM

Introduction

This chapter describes how to install the GQAM into a rack and where to connect it to the other components within the DBDS. The connections shown in this chapter may vary according to its use in your system.

Note: Refer to ***Technical Specifications*** (on page 109) for additional data and requirements to help you install and configure the GQAM in your system.

In This Chapter

Installation Process Summary

This section provides the installation process and lists the detailed procedures in this guide that correspond with each process step.

Important: To ensure proper installation, read this entire guide *before* starting installation and then follow these processes in the order shown.

Before You Begin

This process assumes that you have already installed the GQAM software on the DNCS. Refer to the *GQAM Software Version 4.0.6 Release Notes and Installation Instructions* (part number 4011046), for detailed instructions. Also be sure that you have access to the *Digital Network Control System Online Help* before starting installation.

Installation Processes

The following process summary provides the recommendations for installation.

Stage	Process	See Procedure
1	Review system requirements and technical specifications.	***Installation Requirements*** (on page 22) ***Installation and Operation Requirements*** (on page 110)
2	Consult your Bandwidth Management Plan and the input/output specifications to allocate your bandwidth resources properly.	***Installation Requirements*** (on page 22) ***Installation and Operation Requirements*** (on page 110)
3	Unpack and inspect the Dual SFP GQAM	***Unpack and Inspect the GQAM*** (on page 16)
4	Record the MAC address from the label located on the underside of the modulator.	***Record the MAC Address*** (on page 17)
5	Install the Dual SFP GQAM into a rack.	■ ***Stacking Guidelines*** (on page 18) ■ ***Install the Modulator Into a Rack*** (on page 22)
6	Connect the Dual SFP GQAM to an earth ground and then a power source. ■ From the 120/230 VAC port, connect the power cord. ■ From the 48 VDC port, connect the power wires to the DC power inlet.	***Connect Power Sources*** (on page 25)

Stage	Process	See Procedure
7	Connect other network devices to the Dual SFP GQAM, except the RF out ports.	■ ***Connect the DVB ASI Input Ports*** (on page 27) ■ ***Connect the 10/100BASE-T Ethernet Port*** (on page 29) ■ Insert the SFP modules into the GbE ports on the back panel and then connect the GbE ports – ***Connecting the Gigabit Ethernet Ports Using Fiber Optic Cables*** (on page 31) – ***Connecting the Gigabit Ethernet Ports Using CAT-5 Ethernet Cables*** (on page 32)
8	Define the MPEG sources, add service groups (if using VOD or xOD), and provision the modulator using DNCS Element Provisioning according to your network wiring diagram.	■ ***Provision GQAMs on the DNCS*** (on page 52) ■ *DNCS Online Help (PC) 4.2.0.3* (part number 4012121)
9	Power on the modulator	N/A
10	Ensure that the modulator boots correctly and check for alarms from the front panel.	■ ***Understand the Boot Process*** (on page 62) ■ ***Troubleshooting Alarm Messages*** (on page 96) ■ ***Troubleshooting Boot Screen Error Messages*** (on page 104)
11	Connect the RF output ports.	***Connecting the RF OUT Ports*** (on page 35)
12	Set the power output level in accordance with your network wiring diagram and spectrum analyzer measurements.	***Adjust the RF Output Level of a Selected Carrier*** (on page 73)
13	If sessions have been defined, verify the correct session count by pressing the OPTIONS button.	***Viewing the Session Count*** (on page 77)
14	If encrypted, check the program count.	***Viewing the Program Count*** (on page 78)
15	Verify video and audio from a local DHCT.	See the post-upgrade procedures for your current System Release contained in the upgrade installation instructions.

Unpack and Inspect the GQAM

Carrier's Responsibility

We thoroughly inspect and carefully pack all products before shipment. The carrier is responsible for safe shipping and delivery.

- If there are any missing parts or if there is damage to the product, contact Cisco Services.
- Retain all boxes for future equipment shipping needs. The boxes are specifically designed for shipping the GQAM.

Unpacking and Inspecting Procedure

Complete the following steps to unpack and inspect the modulator.

1. Review the Safety Precautions.
2. Inspect the shipping carton for visible damage.
3. Open the shipping carton.
4. Remove all packing material.
5. Inspect the product for visible damage.
6. Inspect for loose items that may indicate concealed damage.
7. Inspect for missing parts using the packing slip as a guide.
8. Go to ***Record the MAC Address*** (on page 17).

Record the MAC Address

This section contains instructions for recording the MAC address as part of the installation process.

Recording the MAC Address

1 Unpack and inspect the modulator.

Note: Refer to ***Unpack and Inspect the GQAM*** (on page 16).

2 Locate the label containing the MAC addresses on the underside of the chassis.

Important: The GbE MAC addresses are typically the MAC address of the modulator plus 1 (one).

Examples:

- **GQAM MAC Address:** 00:02:de:41:51:03
- **GbE MAC Address:** 00:02:de:41:51:04

3 Record the MAC addresses here:

- **GQAM MAC Address:** _____
- **GbE MAC Address:** _____

Important: You will need these MAC addresses for provisioning (configuring) the DNCS.

4 Go to ***Stacking Guidelines*** (on page 18).

Stacking Guidelines

The GQAM is a high-density, high performance device for digital broadband data delivery. One GQAM performs the services of 16 QAM modulators. This space-saving feature makes the GQAM the device of choice for contemporary digital broadband delivery systems.

Providing proper ventilation and cooling for the modulator is mandatory. You can stack up to 32 GQAM devices in a standard 40-rack unit (RU) equipment rack if you read and carefully follow the guidelines provided in this section and later in this chapter.

Each GQAM contains three dual fan packs that provide forced air cooling. These fan packs, located on the side of the unit, pull air across the internal circuitry to remove heat.

Important: In order for the fans to operate correctly, you *must* install each GQAM using the rack mount brackets included with the unit. These brackets contain notched cutout sections to allow for clearance so that air can enter and leave the unit without restriction.

When you install the GQAM in the rack using the rack mounts provided, you can install them directly above and below each other with no requirements for vented spacers. Using these rack mounts also provides support for the modulator. The GQAM is *not* intended to be suspended or "hung" in the rack by only mounting the front bezel support.

Controlling Operating Temperature

CAUTION:

Headend equipment is designed to operate in a maximum 122°F (50°C) environment. Specifically, this means that the air temperature at the air inlet of any GQAM must never exceed 122°F (50°C).

Each GQAM draws up to 151 W of input power and a total of 515 BTU/hr. For a full rack with 32 units, the sum total is 4832 W per rack, or 16,480 BTU/hr. You should make your HVAC considerations based on these calculations.

Controlling Exhaust Air

Exhaust air management is the key to cooling multiple modulators in a custom rack configuration. Inlet air temperature should be as cool as possible and should never exceed 122°F (50°C). Exhaust air should have little or no restrictions. Obstructions such as cabling or other devices that block airflow to the side or top of the rack should be avoided.

Considerations When Using Side by Side Equipment Racks

Often, side-by-side equipment racks will not include an internal wall between them. You should take extreme care when installing modulators in these types of systems. There is approximately an 18°F (10°C) rise from inlet air temperature to exhaust air temperature on a GQAM. This rise in temperature could have a cumulative effect on temperature from one rack to the adjacent one. You must take extreme care not to exceed the 122°F (50°C) maximum inlet air temperature requirement in these situations.

Considerations When Using Racks with a Wall on One Side

Rack installations that have the outer wall or side of the rack in place on the exhaust side of the GQAM should note that without sufficient airflow through the rack, the heated exhaust air may re-circulate back to the input side of the GQAM. Depending on the situation, this re-circulation air could eventually exceed the specified 122°F (50°C) maximum.

Measuring the Inlet Air Temperature

If you are concerned about inlet air temperature, you should measure the temperature of the inlet air in the actual rack as you plan to use it. You should have all cabling in place and all adjacent units installed and running.

Important: Opening the door on the back panel of the rack can have an *adverse* effect on the managed airflow. If access to the door on the back panel is not controlled, you should take the inlet air temperature with the back panel door open since, in most instances, opening the door will re-direct the airflow in an adverse manner.

Stacking Considerations

You have two main options for stacking GQAMs in a rack. The option you choose depends on your system requirements. One option is to stack the GQAMs in a rack containing a top-mounted exhaust fan with vented panels on the front and back. The second option is to place a top-vented rack over a floor plenum forced air vent. The requirements for these two stacking options are described next in this section.

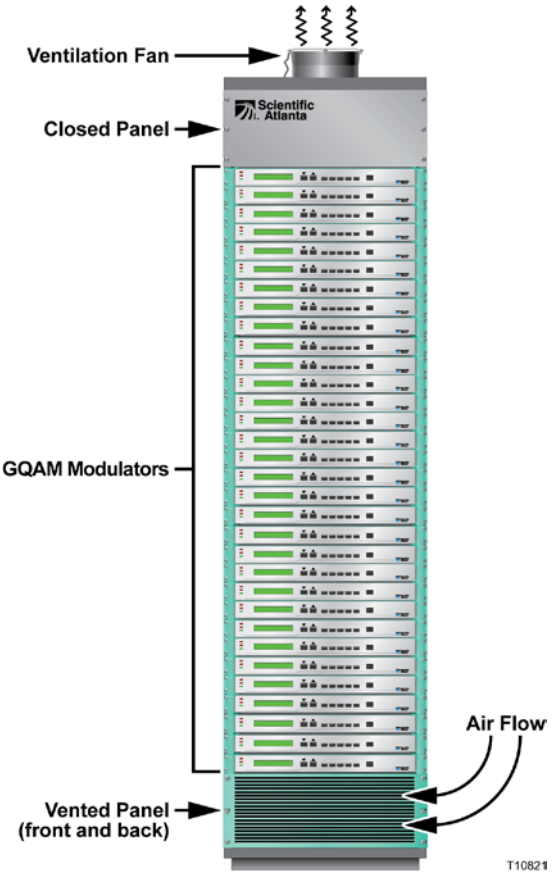
Option 1 – Using a Rack With a Top-Mounted Exhaust Fan

This stacking option uses a 40 RU configuration containing up to 32 GQAMs. The remaining 8 RUs are configured with 4 RUs at the bottom and 4 RUs at the top.

The 4 RU space at the bottom is covered with a vented panel on both the front and the back. This panel allows air to freely enter the rack to cool the modulators.

The 4 RU space at the top is covered with a closed panel. This option uses an exhaust fan located on top of the rack to draw the heated air upward and out of the rack. The 4 RU space at the top allows the ventilation space needed for the exhaust fan to operate efficiently. The exhaust fan should be chosen so that a minimum of 600 cubic feet per minute (cfm) flows through the rack with 2000 cfm being the ideal amount.

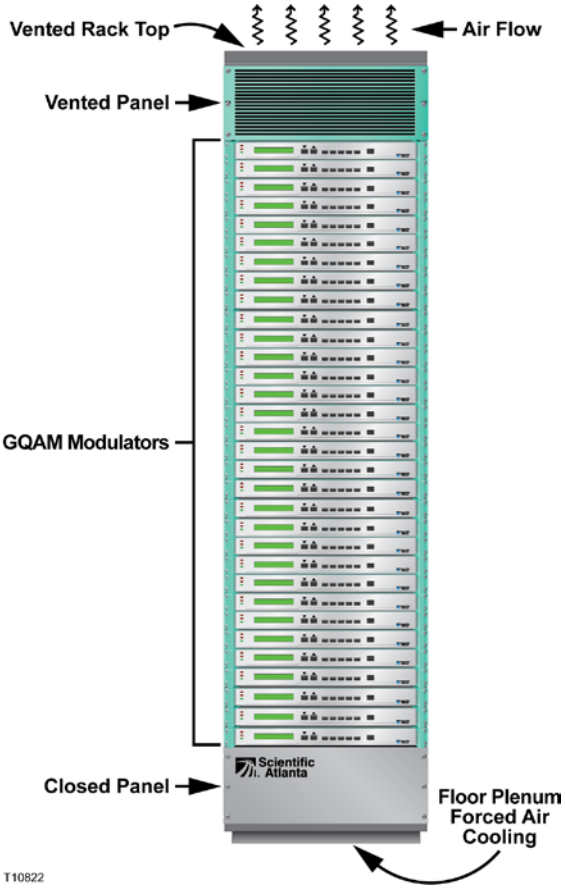
Example:



Option 2 – Using a Rack With Floor Plenum Forced Air Cooling

This stacking option also uses a 40 RU configuration containing up to 32 GQAMs. In Option 2, however, the lower 4 RU space is covered with a solid panel instead of a vented one. The upper 4 RU space is vented along with the entire top of the rack. The floor plenum forced airflow must also be a minimum of 600 cfm with 2000 cfm being the ideal amount.

Example:



Install the Modulator Into a Rack

The front bezel of the GQAM mounts to the front of the equipment rack. The GQAM fits into an EIA RS-310 rack mount.

Important: You *must* read the preceding section, ***Stacking Guidelines*** (on page 18), before installing the modulators into the rack.

Installation Requirements

Installation Requirements

This section lists the power, rack, and environmental conditions necessary for installation.

Power Requirements Table

Item	Specification
Supply Voltage	■ 90 to 130 VAC @ 47 to 63 Hz (AC unit) ■ 180 to 264 VAC @ 47 to 63 Hz (AC unit) ■ -42 to -57 VDC (DC unit)
Fuses	■ 4.0 A SLO BLO 250 V (AC unit) ■ 6.3 A SLO BLO 250 V (DC unit)
Line Frequency	■ 47 to 63 Hz (AC unit only)
Power Required	155 VA (typical)
Power Dissipated	151 Watts (typical)
In Rush Current	■ 35 amps maximum, Vin = 130 VAC (AC unit) ■ 75 amps maximum, Vin = 264 VAC (AC unit) ■ 15 amps maximum, Vin = -57 VDC (DC unit)

Rack Requirements Table

Item	Specification
Rack Mount Type	EIA RS-310
Height	1.75 in./44.45 mm
Width	19 in./482.6 mm
Depth	22.5 in./571.5 mm
Weight	13.5 lb./5.4 kg

Environmental Requirements Table

Item	Specification
Operating Temperature	0° to 50°C (32° to 122°F) **CAUTION:** **Avoid damage to this product! Your warranty is void if you operate this product above the maximum specified operating temperature.** **Use caution when installing wiring and racks to avoid obstruction of air flow into the side air vents of the GQAM, or out of the vent fans at the GQAM side panel**. **Important:** You must use the supplied notched rack mounts (part numbers 734845 and 734846) to mount the GQAM in the rack. These rack mounts allow correct air circulation through the unit.
Storage Temperature Range	–10° to 70°C (14° to 158°F)
Operating Humidity	5 to 95%, non-condensing
Vibration Susceptibility	No data errors with a chassis vibration of 0.5 Gs. No data errors with a vibration frequency of 10 to 400 Hz
Electrostatic Shock Susceptibility	No damage sustained from five discharges of 15 KV IEC electrostatic discharge model (150pF + 150 Ω) to all exposed connections

Installing the Modulator into a Rack

CAUTION:

Do not tangle or strain interconnecting cables.

Use caution when installing wiring and racks to avoid obstruction of airflow into the side air vents of the GQAM or out of the vent fans on the side of the GQAM.

IMPORTANT: You must use the supplied notched rack mounts to provide additional support and to allow correct air circulation through the unit.

1 Install the rack mounts.

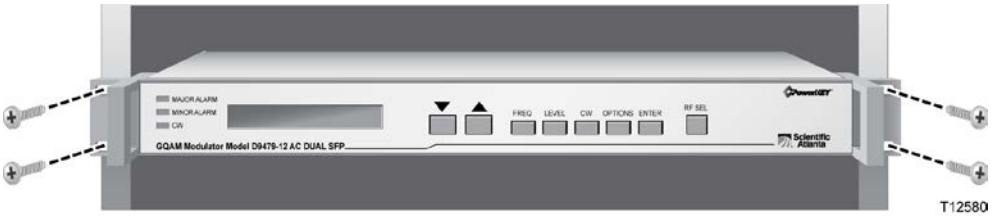
Important: The supplied rack mounts (part numbers 734845 and 734846) *must* be used. When you use the supplied rack mounts, you can install these modulators above or below each other in the rack with no space required. These rack mounts provide additional support along with the following features:

- Attaches directly to the rack

- Allows you to slide modulators partially out of the rack for service
- Allows appropriate air circulation throughout the unit

2 Place the modulator in the rack.

3 Insert a mounting screw through each of the four-bezel mounting holes on the front panel of the GQAM and then into the rack.



4 Firmly tighten each mounting screw.

5 Go to ***Connect Power Sources*** (on page 25).

Connect Power Sources

This section contains instructions for connecting the DC and AC power sources to the modulator.

Connecting an Earth Ground

Complete the following steps to connect an earth ground to either the DC or AC versions of the GQAM.

CAUTION:

The 48 VDC GQAM must be connected to an earth ground.

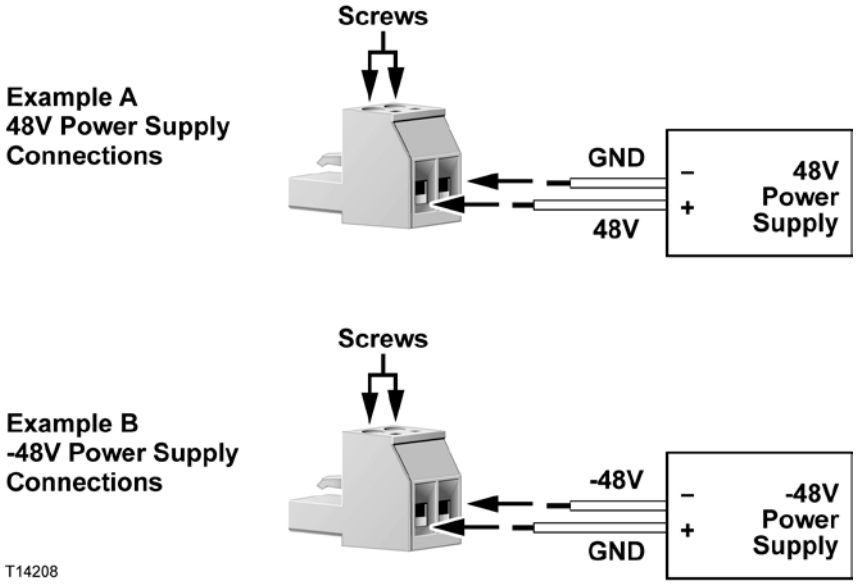
1. Place a ground wire onto the ground lug (marked **GND**) on back of the GQAM; then, use your fingers to tighten the ground lug to secure the ground wire.
2. Connect the other end of the ground wire to the rack or earth ground.

Connecting a DC Power Source

Complete the following steps to connect a DC power source to the 48 VDC GQAM.

1. Verify that the DC power source is set to the **Off** position.
2. Connect the wires from the DC power source into the terminal block connector. If you have a 48 VDC power source, refer to Example A. If you have a -48 VDC power source, refer to Example B. Use a flat-blade screwdriver to tighten the terminal block screws that secure the wires.

   Warning: Failure to connect the power source with the correct polarity will result in a blown fuse. Use caution when making connections.



3 Insert the terminal block connector into the terminal block on the back panel of the 48 VDC GQAM.

Note: The terminal block connector is keyed so that it can only be installed with the screws facing up.

4 Keep the DC power source set to the **Off** position until you are ready to power on the device.

5 Go to ***Connect the DVB ASI Input Ports*** (on page 27).

Connecting an AC Power Source

Complete the following steps to connect an AC power source to the 120/230 VAC GQAM.

1 Verify that the power switch on the back panel is placed in the **Off** position.

2 Connect the power cord to the AC power inlet on the back panel of the 120/230 VAC GQAM.

3 Connect the other end of the power cord to an AC electrical outlet.

4 Keep the power switch in the **Off** position until you are ready to power on the device.

5 Go to ***Connect the DVB ASI Input Ports*** (on page 27).

Connect the DVB ASI Input Ports

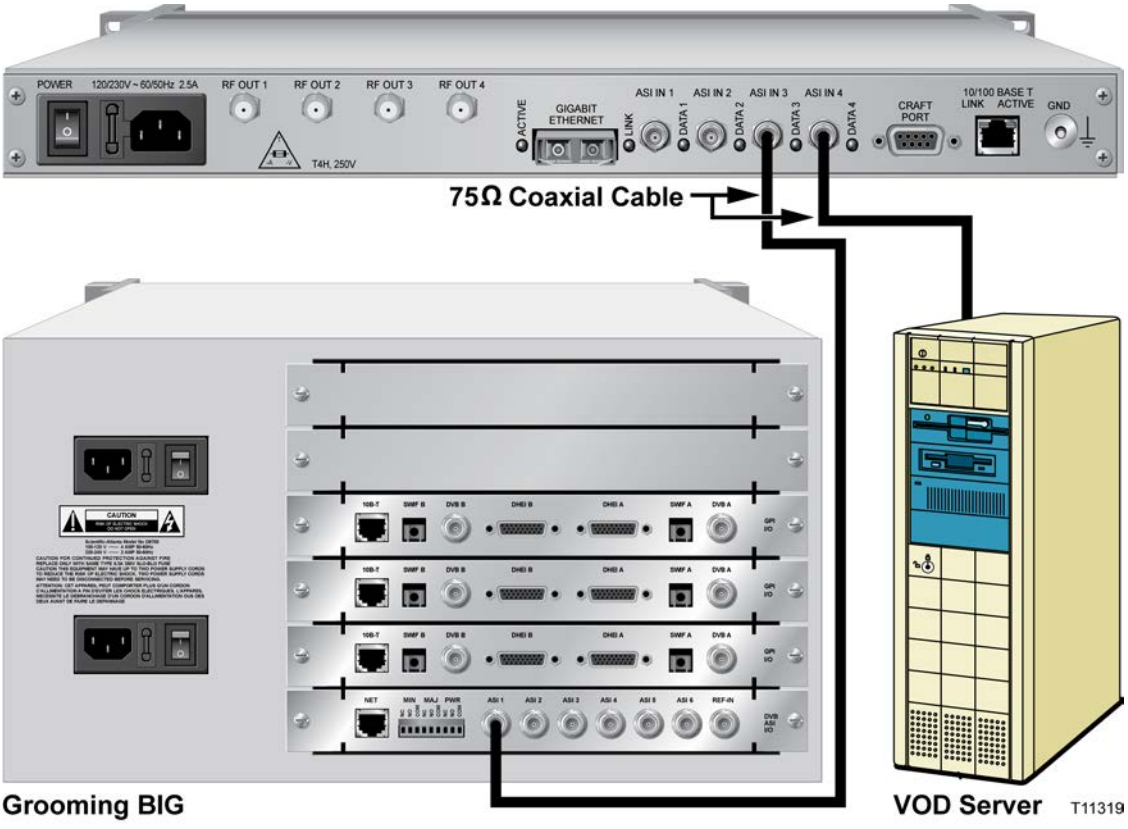
Description

Using ASI input pairs allows the device to receive data from ASI-compliant transmitting devices such as VOD servers, grooming BIGs, and MPEG multiplexers. These ASI inputs conform to the DVB document A010.

The DVB ASI input ports are BNC-type connectors and connect to 75 Ω coaxial cables. Each DVB ASI Input port allows for the input of MPEG-2 transport stream (TS) data at a maximum rate of 216 Mbps.

Location of DVB ASI Input Ports

The following illustration shows an example of a GQAM connected to DVB ASI sources.



Connecting the DVB ASI Ports

Important: Refer to your network wiring diagram to cable the GQAM in accordance with your bandwidth allocation plan.

1. Locate the output on the back of an output device.
2. Connect one end of a 75 ohm coaxial cable to a DVB ASI source.

   Note: The maximum recommended length for the cable is 100 meters.
3. Connect the other end of the cable to one of the four DVB ASI IN ports on the GQAM.
4. Repeat steps 2 and 3 for all DVB ASI inputs according to the specifications and requirements for your system.
5. Go to ***Connect the 10/100BASE-T Ethernet Port*** (on page 29).

Connect the 10/100BASE-T Ethernet Port

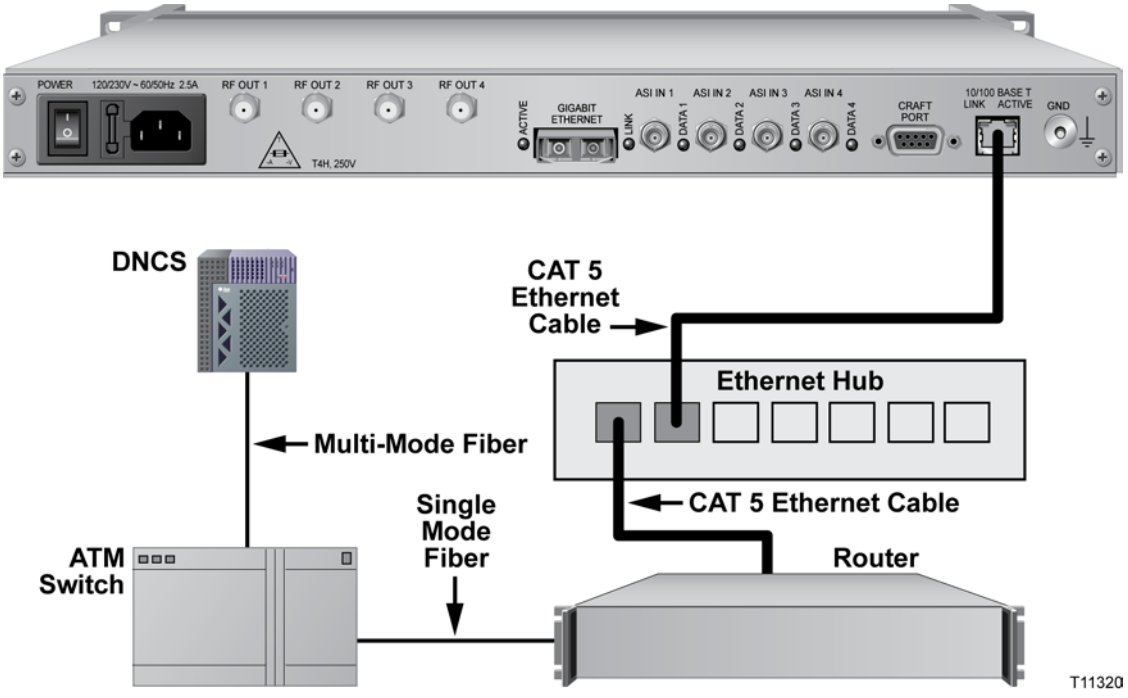
Description

The GQAM shares data with the DNCS through an ATM switch, a router, an Ethernet hub, and an Ethernet port. An Ethernet connection enables the DNCS to perform software downloads, provision the GQAM, set up broadcast sessions, monitor alarms, and check system performance.

Note: Connect the 10/100BASE-T Ethernet port on the GQAM to an Ethernet hub as part of an Ethernet connection. Do not connect it directly to a DNCS workstation or another PC.

Location of 10/100BASE-T Ethernet Port

The following illustration shows an example of a 10/100BASE-T Ethernet connection.



Connecting the 10/100BASE-T Ethernet Port

1. Connect the DNCS to the ATM switch using multi-mode fiber.
2. Connect the ATM switch to the router using single mode fiber.
3. Connect the router to the 10/100BASE-T Ethernet hub using CAT-5 Ethernet 10/100BASE-T wiring with RJ-45 connectors.

4 Connect the 10/100BASE-T port on the Ethernet hub to the 10/100 BASE T port on the GQAM using CAT-5 Ethernet 10/100BASE-T wiring with RJ-45 connectors.

Note: Use a screened or shielded cable for this connection.

5 Go to ***Connect the Gigabit Ethernet Ports*** (on page 31).

Connect the Gigabit Ethernet Ports

Description

The GQAM shares data with the DNCS and VOD, xOD, and SDV servers, or other devices at the main and backup GbE ports in one of the following two connection methods:

- Using two single mode or multi-mode fiber type SC connectors, one for input and one for output of data
- Using 8-conductor CAT-5 Ethernet 10/100BASE-T wiring with RJ-45 connectors

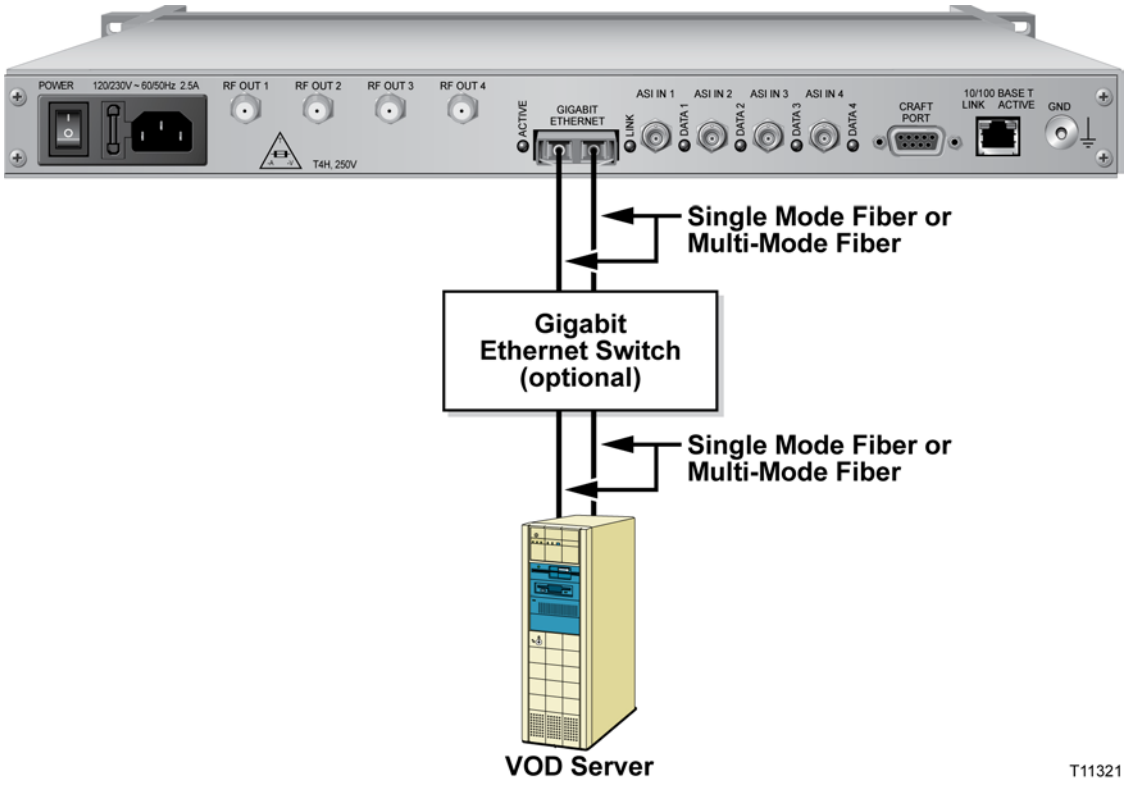
The GbE ports also allow the GQAM to support MPEG over IP transport on the GbE interface.

Connecting the Gigabit Ethernet Ports Using Fiber Optic Cables

The following illustration shows an example of the GbE connections when using single mode or multi-mode fiber optic cables.

Important: You must first insert the GBIC into the Gigabit Ethernet port before connecting the cables.

Note: When you have connected the GbE port, go to ***Connect the RF OUT Ports*** (on page 34).

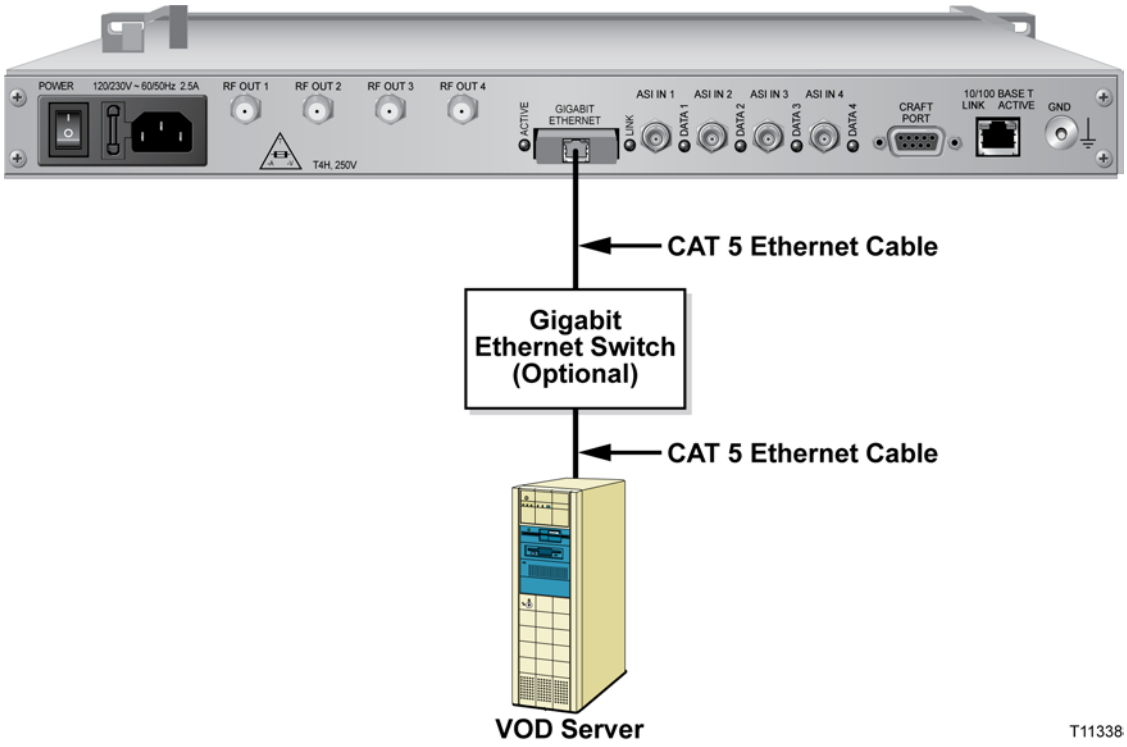


Connecting the Gigabit Ethernet Ports Using CAT-5 Ethernet Cables

The following illustration shows an example of a GbE connection when using CAT-5 Ethernet cables.

Important: You must first insert the GBIC module into the GbE port before connecting the cable.

Note: When you have connected the GbE port, go to ***Connect the RF OUT Ports*** (on page 34).



Connect the RF OUT Ports

Introduction

The RF OUT ports should be connected to a system of combiners, through the cable system, and eventually to subscribers' DHCTs. Each RF port provides for the transport of MPEG-2 transport stream (TS) data. The ports use F-connectors and 75 Ω coaxial cable interfaces.

CAUTION:

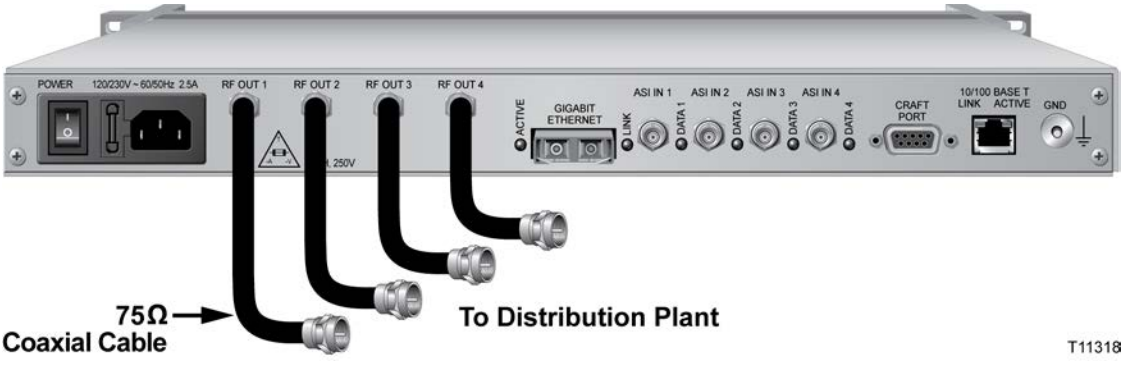
Set the RF output frequency and RF output level *before* you connect any RF OUT ports to the network to avoid possible RF interference with the services of other units connected to the network.

Important: We *strongly* recommend that you configure and adjust frequencies from the Set Up GQAM window on the DNCS. See Provision GQAMs on the DNCS (on page 52) for details.

You can also see the Adjust the Frequencies of a Selected RF Channel or CH Carrier (on page 71) and the Adjust the RF Output Level of a Selected Carrier (on page 73) sections for additional instructions for setting the RF output frequency and RF output level.

Location of RF OUT Ports

The following illustration shows an example of the four RF OUT ports connected to the distribution plant.



Connecting the RF OUT Ports

CAUTION:

Establish the RF output level before you connect the RF OUT ports to the distribution plant.

Important: We *strongly* recommend that you configure and adjust frequencies from the Set Up GQAM window on the DNCS. See Provision GQAMs on the DNCS (on page 52).

You can also see the Mute the RF Output of a Selected CH Carrier (on page 74) and the Adjust the RF Output Level of a Selected Carrier (on page 73) sections for additional instructions for instructions on enabling the RF muting and setting the RF output level from the front panel of the GQAM.

1. Refer to your Network Wiring Diagram to connect the GQAM properly.
2. Locate the RF OUT ports on the back panel of the modulator.
3. Connect one end of a 75 Ω coaxial cable to each RF OUT port to be used for the GQAM.
4. Verify that you have established the correct output level for the RF OUT port by completing the following steps:
   a. Connect one of the RF OUT ports on the GQAM to a spectrum analyzer to monitor one of the four frequencies on that port.
   b. Monitor the RF level for the selected frequency.
   c. Adjust the RF output level from the front panel of the modulator.

      Important: RF plant balancing is normally done at the set-top.
   d. Provision the GQAM from the DNCS.

      Note: Refer to ***Adjust the RF Output Level of a Selected Carrier*** (on page 73) and to ***Provision GQAMs on the DNCS*** (on page 52) for more information.
   e. Connect the other end of each 75 Ω coaxial cable to the distribution plant.

3

Provisioning the GQAM

Introduction

This chapter provides examples and descriptions of the DNCS graphical user interfaces (GUIs) used for provisioning (configuring) the GQAM as a DBDS network element from the DNCS. Provisioning the modulator allows the DNCS to recognize it and enables the modulator to operate properly. This chapter also provides procedures for adding service groups.

Note: See ***Technical Specifications*** **(on page 109)** and consult your network wiring diagram to ensure a proper allocation of bandwidth.

For more information about the DNCS and operating the DNCS software, refer to the *Digital Network Control System Online Help*.

In This Chapter

Understand the GUIs

Introduction

This section provides examples and descriptions of the GUIs used for provisioning the GQAM as a DBDS network element from the DNCS.

Important: Actual GUIs may differ slightly from the GUIs presented in this guide.

Understanding the GUIs

Use the DNCS GUIs to provision the GQAM on the DNCS. The main GUI is the Set Up GQAM window which contains the following fields:

- Basic Parameters
- Advanced Parameters
- Connectivity

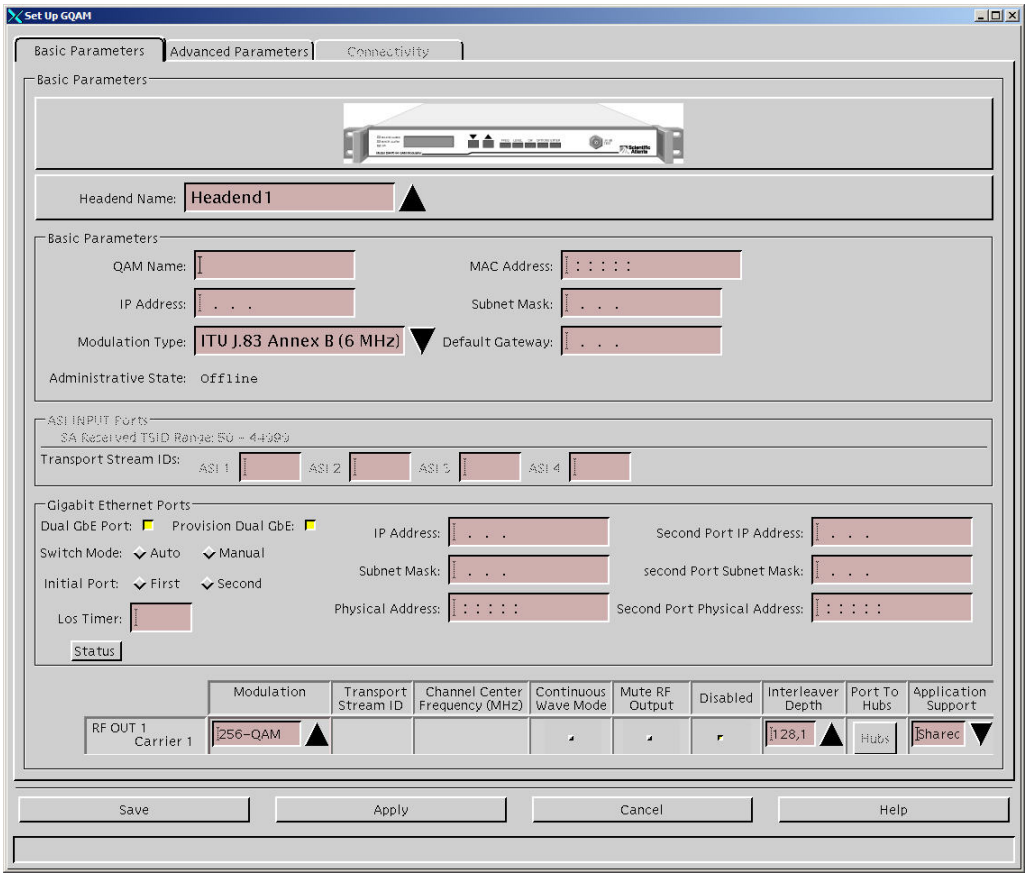
Note: This section includes examples and descriptions of all of the areas within these fields.

Understanding Basic Parameters

The Basic Parameters fields allow you to identify the modulator, assign it to a headend, and specify the modulation type for each RF OUT port. If you want to view the Basic Parameters fields while reading this section, follow these steps to examine the Set Up GQAM window.

1 On the DNCS Administrative Console, select the **DNCS** tab, choose the **Network Element Provisioning** tab, and then click **QAM**. The QAM List window opens.

2 From the File menu, choose **New** and select **GQAM**. The Set Up GQAM window opens with the Basic Parameters tab to the forefront and displays the Basic Parameters fields as shown in the following example.



Basic Parameters

The following table lists the Basic Parameters fields and their descriptions.

Field	Description
Headend Name	Displays the name of the headend with which the modulator is associated
QAM Name	Displays the name used for the modulator
IP Address	Displays the IP address of the Ethernet interface through which the DNCS manages and controls the modulator
Modulation Type	Allows you to specify one of the following modulation types for each of the carriers: ■ ITU J.83 Annex B (6 MHz) ■ ITU J.83 Annex C DAVIC/DVB (6 MHz) **Note:** The default value is ITU J.83 Annex B (6 MHz).

Field	Description
Administrative State	Specifies whether the modulator is active within the system. The values are: ■ **Offline:** Default ■ **Online:** Active
MAC Address	Displays the MAC address of the GQAM
Subnet Mask	Displays the IP subnet mask assigned by the system administrator
Default Gateway	Displays the network default gateway assigned by the system administrator

ASI Input Ports

The following table lists the ASI Input Ports fields and their descriptions.

Field	Description
ASI 1 Transport Stream ID	Displays the identifier of the MPEG transport stream generated upstream of the modulator. A unique value is assigned to the ASI IN 1 port. **Note:** These modulators only accept DVB-ASI input, except at the GbE interfaces.
ASI 2 Transport Stream ID	Displays the identifier of the MPEG transport stream generated upstream of the modulator. A unique value is assigned to the ASI IN 2. **Note:** These modulators only accept DVB-ASI input, except at the GbE interfaces.
ASI 3 Transport Stream ID	Displays the identifier for the MPEG transport stream generated upstream of the modulator. A unique value is assigned to the ASI IN 3 port. **Note:** These modulators only accept DVB-ASI input, except at the GbE interfaces.
ASI 4 Transport Stream ID	Displays the identifier for the MPEG transport stream generated upstream of the modulator. A unique value is assigned to the ASI IN 4 port. **Note:** These modulators only accept DVB-ASI input, except at the GbE interfaces.

Gigabit Ethernet Ports

The following table lists the available Gigabit Ethernet Ports fields and their descriptions.

Field	Description
Dual GbE Port	Allows you to enable the dual GbE port feature for Dual SFP GQAMs. Make sure that this box is not selected for standard GQAMs.
IP Address	Displays the IP address for the main GbE port
Subnet Mask	Displays the subnet mask for the main GbE port
Physical Address	Displays the MAC address of the GbE port

RF OUT Parameters

The following table lists the RF OUT module (1–4) fields and their descriptions.

Field	Description
Modulation	Displays the modulation format of the individual carriers. The default is 256-QAM for ITU J.83 Annex B.
Transport Stream ID	Displays the identifier of the transport stream ID for each RF OUT module
Channel Center Frequency (MHz)	Displays the frequency assigned to each carrier (range is 91 to 869 MHz). Valid frequencies use the following format, with XXX representing a number from 91 to 869. ■ XXX.000 ■ XXX.25 ■ XXX.75
Continuous Wave Mode	Provides an unmodulated RF carrier **Note:** Continuous wave mode may be selected for each carrier.
Mute RF Output	Disables the RF output. May be selected for each carrier.
Disabled	Prevents the DNCS from setting up any additional sessions on this RF output if the DNCS is choosing QAM resources. Existing sessions are not affected and continue to function as expected. May be selected for each RF output.
Interleaver Depth	Allows you to select the Interleave setting based on the type of set-top you are using on your system. Interleaving is a technique to overcome correlated channel noise. Interleaving spreads out bursts of errors to remain within the error-correcting ability of a device.
Port to Hubs	Allows you to define which hubs will receive program or service data from the RF output carrier

Field	Description
Application Support	Allows you to define one of the following applications that each RF output carrier provides: ■ **Shared:** Select when the RF carrier is used for VOD, SDV, and broadcast sessions ■ **VOD only:** Select when the RF carrier is used only for VOD sessions ■ **SDV only:** Select when the RF carrier is used only for SDV sessions ■ **Broadcast only:** Select when the RF carrier is used only for broadcast sessions

Function Keys

The following function keys appear on the Set Up GQAM window.

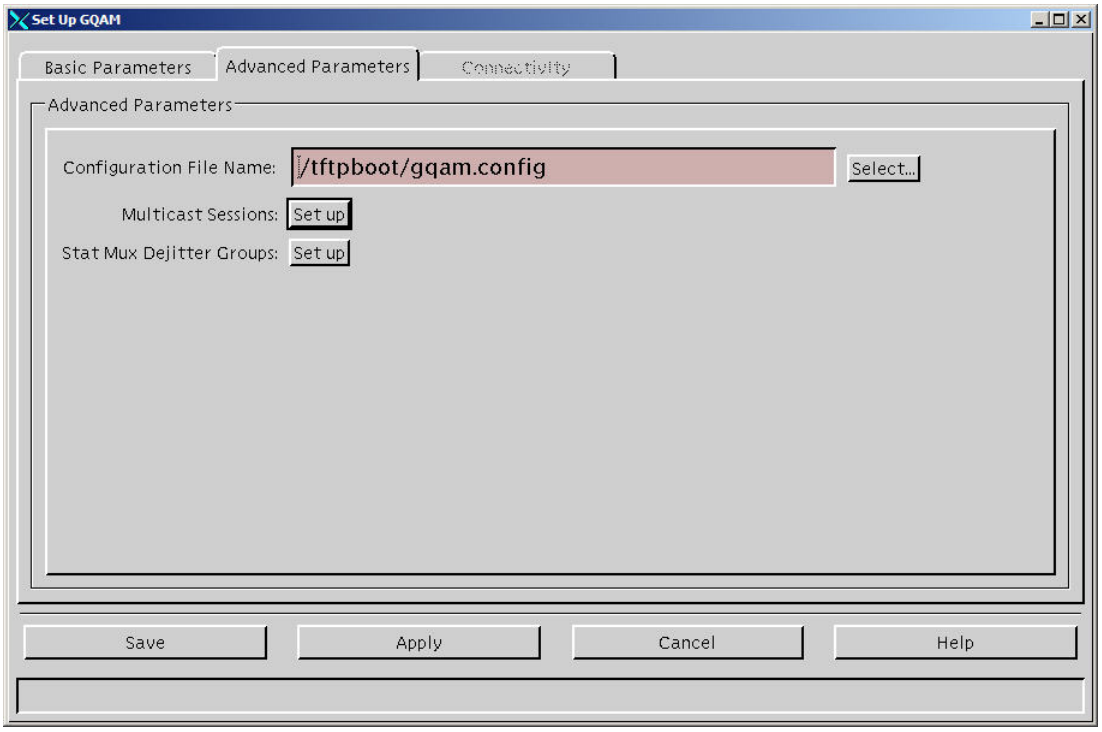
Key	Function
Save	Saves changes to settings and closes the Set Up GQAM window
Apply	Makes changes to settings without closing the Set Up GQAM window
Cancel	Closes the Set Up GQAM window without saving changes that have not been previously applied to settings
Help	Opens the DNCS Online Help

Understanding Advanced Features

The Advanced Parameters fields allow you to select the configuration file and to set up a multicast session or stat mux dejitter groups (SMDGs). To view the Advanced Parameters fields, click the **Advanced Parameters** tab in the Set Up GQAM window.

The following diagram shows an example of the Advanced Parameters fields.

Important: You should not need to access the Advanced Parameters tab unless you are setting up a multicast session or setting up an SMDG on this modulator, or you need to change the configuration file name. The configuration file controls the GQAM modulator software versions. Changes to the configuration file name should be made carefully. Please contact Cisco Services if you have any questions about setting up a multicast session, setting up an SMDG or making changes to the GQAM configuration file name.



Advanced Parameters

The following table lists Advanced Parameters field descriptions.

Field	Description
Configuration File Name	Displays the name of the configuration file used by the GQAM to determine whether it is running the correct version of application code
Multicast Sessions	Allows you to setup multicast sessions on a GQAM modulator and on any SMDG that has been set up for a GQAM modulator
Stat Mux Dejitter Groups	Allows you to set up SMDGs on modulators that receive multiplexed sources. You can set up a maximum of 16 SMDGs

Function Keys

The following additional function keys appear in the Advanced Parameters window.

Key	Function
Select	Opens the File Selection Dialog window so that you can specify the configuration file for the selected modulator. Refer to ***Understanding the File Selection Dialog Screen*** (on page 44) for more details.
Set up	Opens the **Multiple Digital Session Definition for GQAM** window or the **Stat Mux Dejitter Groups For GQAM** window, respectively.

Understanding the File Selection Dialog Screen

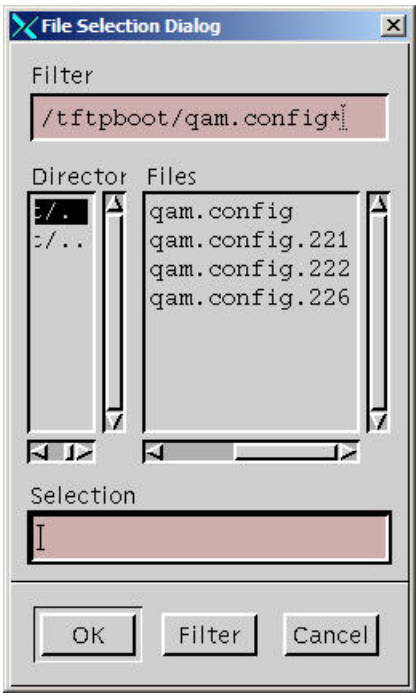
The File Selection Dialog Screen allows you to specify the configuration file for the modulator. To view the File Selection Dialog screen, click the **Select** button on the Advanced Parameters tab on the DNCS GUI.

Understanding the Bootp/Tftp Process

When a modulator boots, it sends a bootp request to get an IP address. The bootp/tftp process allows the GQAM, after power on or reset, to request and receive configuration parameters, application downloads, and provisioning from the network bootp server. The DNCS, which is a bootp server, uses a bootp reply to assign an IP address to the GQAM, provided the device is provisioned in the DNCS database. The configuration file selected in the File Selection Dialog window is included in the bootp reply.

The GQAM uses the information in the configuration file to determine whether it is running the correct version of application code. If it is not running the correct version of application code, it requests the correct image file(s) from the DNCS.

The following diagram shows an example of the File Selection Dialog screen.



File Selection Dialog Window

The following table lists field descriptions from the File Selection Dialog window.

Field	Description
Filter	Displays the path and filename wildcard used by the system to search for files. Enter the UNIX path, ending with /*. Click Filter to display the contents of the directory in the Directories and Files areas of the window.
Directories	Displays a list of available directories at the current path specified in the Filter field
Files	Displays a list of files within the current path specified in the Filter field
Selection	Displays the selected file

Function Keys

The following function keys appear in the File Selection Dialog screen.

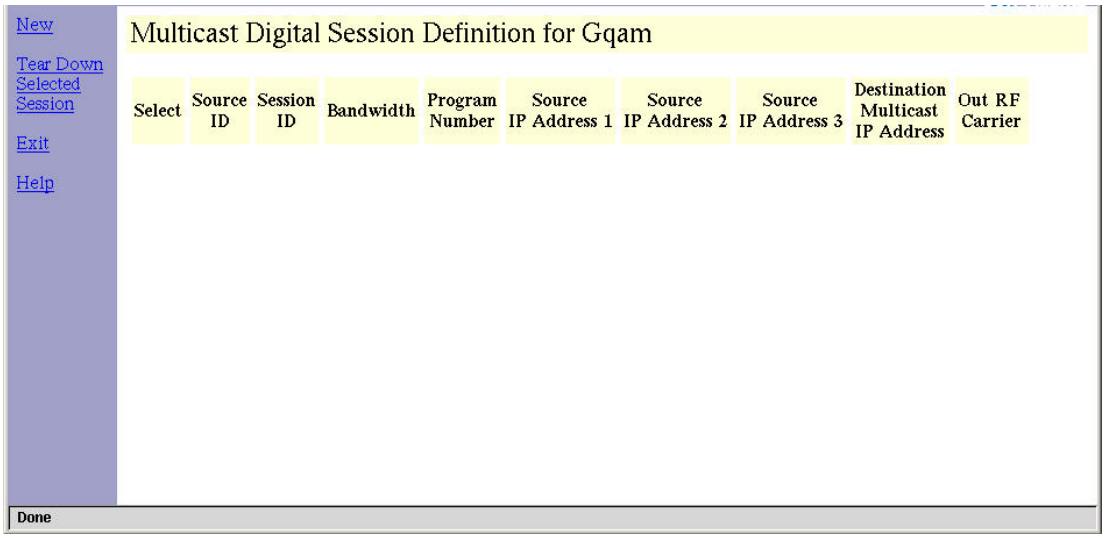
Key	Function
OK	Places the selected file name into the Configuration File Name field and closes the File Selection Dialog window

Key	Function
Filter	Enables the contents of the directory to display in the Directories and Files areas
Cancel	Closes the File Selection Dialog window without changing the original settings

Understanding the Multicast Digital Session Definition for GQAM Window

The Multicast Digital Session Definition window allows you to set up multicast sessions on a GQAM modulator and on any SMDGs that have been set up for the modulator. To view this window while reading this section, click the **Set up** button next to Multicast Sessions on the Advanced Parameters tab.

The following diagram shows an example of the Multicast Digital Session Definition for Gqam window.



Notes:

- If you are using a GQAM modulator to send multicast sessions to the network and you have already added it to the DNCS and have created a source for the session, you can set up multicast sessions.
- If you are using a GQAM modulator that receives input from a statistical multiplexor (stat mux) to send multicast sessions to the network, have already added SMDGs to the DNCS, and have created a source for the session, you can set up multicast sessions on the GQAM SMDGs. You can set up a maximum of 60 sessions on an SMDG.

Multicast Digital Session Definition for GQAM Window

The following table lists field descriptions on the Multicast Digital Session Definition for GQAM window.

Field	Description
Select	Displays whether or not a session is selected in the current window
Source ID	Displays the source ID that this session is using
Session ID	Displays the session ID that this session is using
Bandwidth	Displays the amount of bandwidth (in Mbps) that the system should allow for this service
Program Number	Displays the MPEG program number being fed into the transport stream
Source IP Address 1	Displays the IP address of the first source device
Source IP Address 2	Displays the IP address of the second source device (if used)
Source IP Address 3	Displays the IP address of the third source device (if used)
Destination Multicast IP Address	Displays the multicast IP address on the modulators where sources are input
Out RF Carrier	Displays the output destination of the source

Function Keys

The following function keys appear in the Multicast Digital Session Definition for GQAM window.

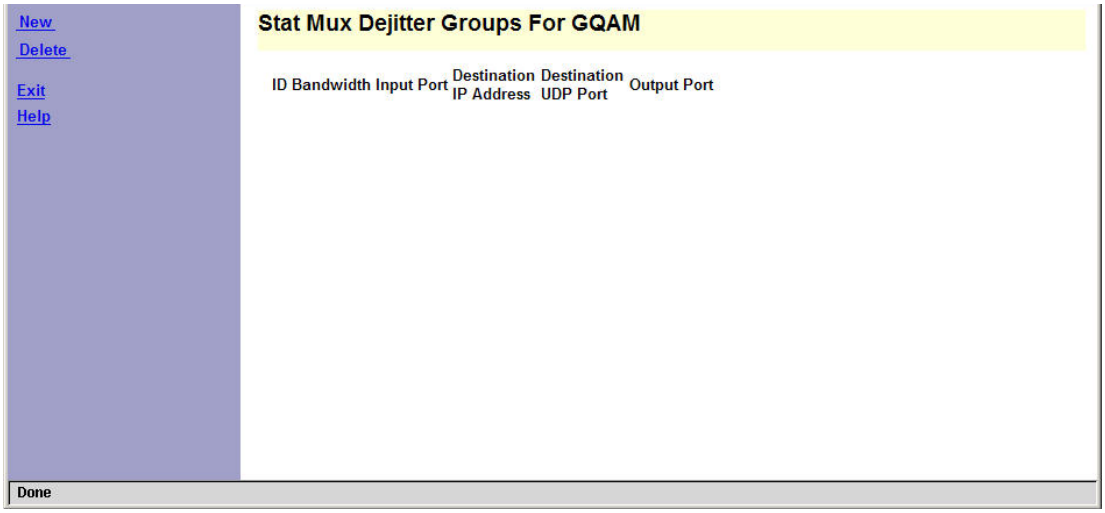
Key	Function
New	Allows you to define a new multicast session
Tear Down Selected Session	Allows you to tear down or delete a selected multicast session
Exit	Closes the Multicast Digital Session Definition for GQAM window
Help	Accesses context-sensitive help

Understanding the Stat Mux Dejitter Groups For GQAM Window

The Stat Mux Dejitter Groups For GQAM window allows you to set up stat mux dejitter groups (SMDGs) on GQAM modulators that receive multiplexed sources. SMDGs identify each GQAM input and output that will carry the multiplexed source and they also allow the modulator to appropriately process the multiplexed sources. After setting up SMDGs, you can set up sessions for groups to carry. To view this window while reading this section, click the **Select** button next to the Stat Mux Dejitter Groups button on the Advanced Parameters tab.

Important: Setting up an SMDG enables the modulator to appropriately process multiplexed sources. Failing to set up SMDGs on GQAM modulators that receive multiplexed sources may result in tiling of the video on DHCTs.

The following diagram shows an example of the Stat Mux Dejitter Groups For GQAM window.



Stat Mux Dejitter Groups For GQAM Window

The following table lists field descriptions on the Stat Mux Dejitter Groups For GQAM window.

Field	Description
ID	Displays an identifier (numerical value between 1 and 65535) to indicate the SMDG
Bandwidth	Displays the bandwidth that the modulator will use
Input Port	Displays the input port that the SMDG uses
Destination IP Address	Displays the IP address for the GQAM modulator that receives the multiplexed source **Note:** If an ASI port receives the source, this field will be empty.
Destination UDP Port	Displays the UDP port on the GQAM modulator that receives the multiplexed source **Note:** If an ASI port receives the source, this field will be empty.
Output Port	Displays the output port that the SMDG is using

Function Keys

The following function keys appear in the Stat Mux Dejitter Groups For GQAM window.

Key	Function
New	Allows you to define a new SMDG
Delete	Allows you to delete a selected SMDG session
Exit	Closes the Stat Mux Dejitter For GQAM window
Help	Accesses context-sensitive help

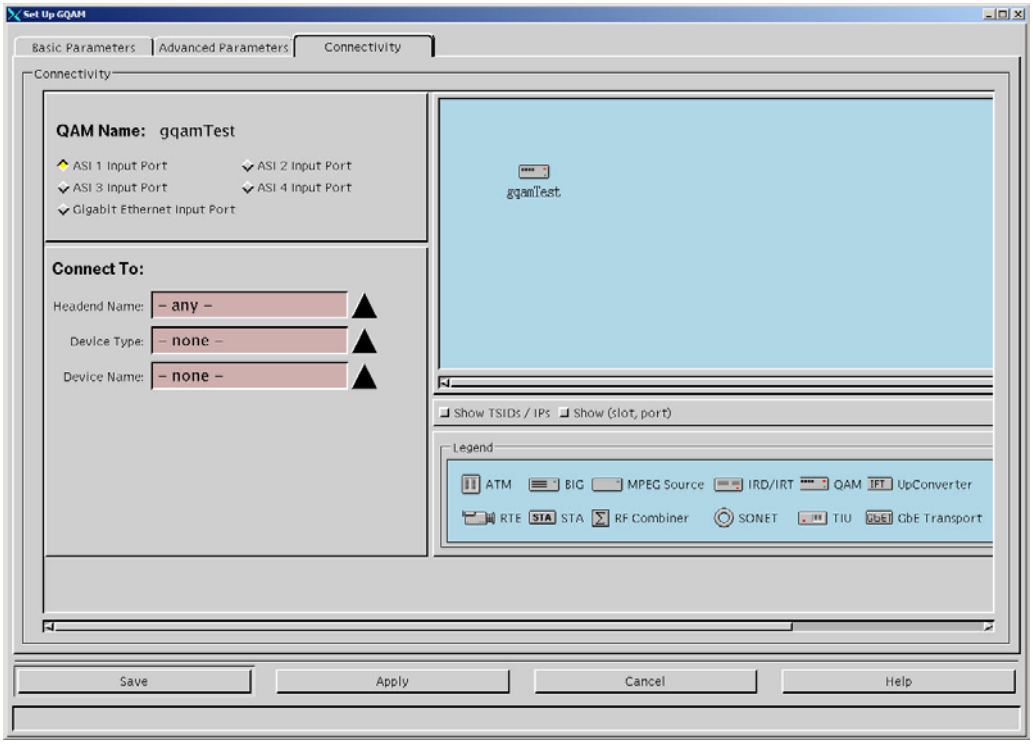
Understanding Connectivity

The Connectivity fields of the Set Up GQAM window allow you to specify the input device connected to each of the input ports on the GQAM.

Note: When you first provision the GQAM, the Connectivity fields are accessible only after you click **Apply** or **Save** from the Set Up GQAM window.

To view the Connectivity fields while reading this section, click the **Connectivity** tab in the Set Up GQAM window.

The following diagram shows an example of the Connectivity fields within the window.



Connectivity

The following table lists the Connectivity field descriptions.

Field	Description
QAM Name	Identifies the name of the selected modulator and allows you to specify the ASI input port (1 through 4), or the GbE Input
Headend Name	Identifies the headend where the input device exists
Device Type	Identifies the type of input device, such as an SDV server, VOD server, xOD server, SONET to ASI converter, or BIG to which the modulator is connected

Device Name	Identifies the name of the input device to which the modulator is connected
Port Number	Identifies the port number of the device that is connected to the GQAM. The server should be entered as the DNCS as a generic MPEG source. Create as many ports as are available for the server and connect to the modulator
Show TSIDs/IPs	Displays the Transport Stream (TS) IDs and Internet Protocol addresses (IPs)
Show (slot, port)	Displays the slot and port of the card connected to the modulator
Legend	Displays a group of icons that represent network elements that may be displayed in the graphical drawing area

Provision GQAMs on the DNCS

Introduction

In order for the GQAM to operate properly as a network element within the DBDS, you must provision it on the DNCS. This section provides procedures for provisioning a GQAM on the DNCS.

Provisioning the Modulator on the DNCS

1 Verify that you have provisioned the GQAM in accordance with your network wiring diagram, along with the ***Technical Specifications*** (on page 109) and other network devices.

To provision the GQAM on the DNCS, the system administrator must do the following.

a Enter the IP and physical (MAC) addresses of the GQAM.

b Assign a name to the GQAM.

c Associate the GQAM with a headend.

d Set the RF frequencies for each output port.

e Associate ports to hubs.

f Select a modulation type.

g Select transport stream IDs.

h Configure continuous wave mode.

i Configure the Mute RF settings.

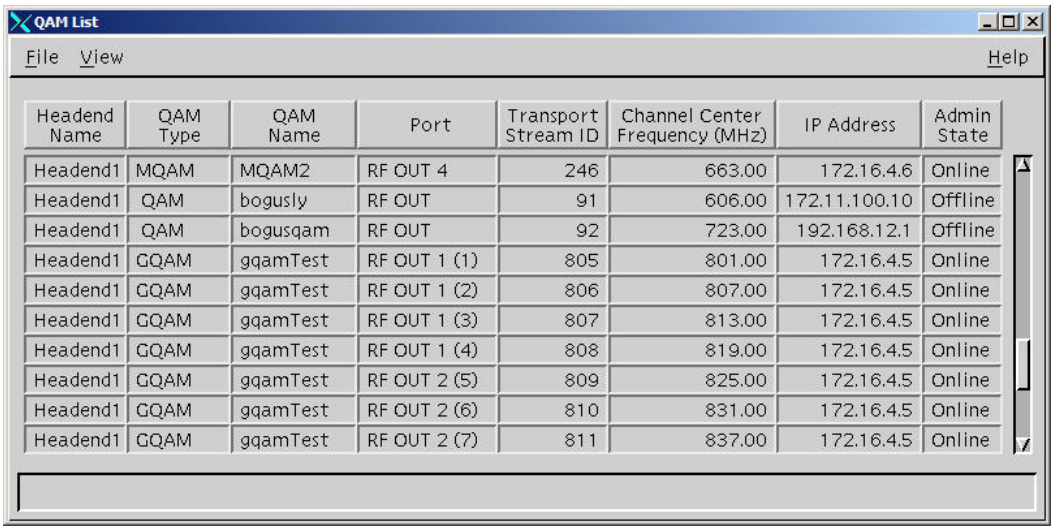
j Define MPEG sources.

k Add Service Groups, as needed.

l Assign the GbE ports.

Note: Refer to the *Digital Network Control System Online Help* for more information about provisioning network elements.

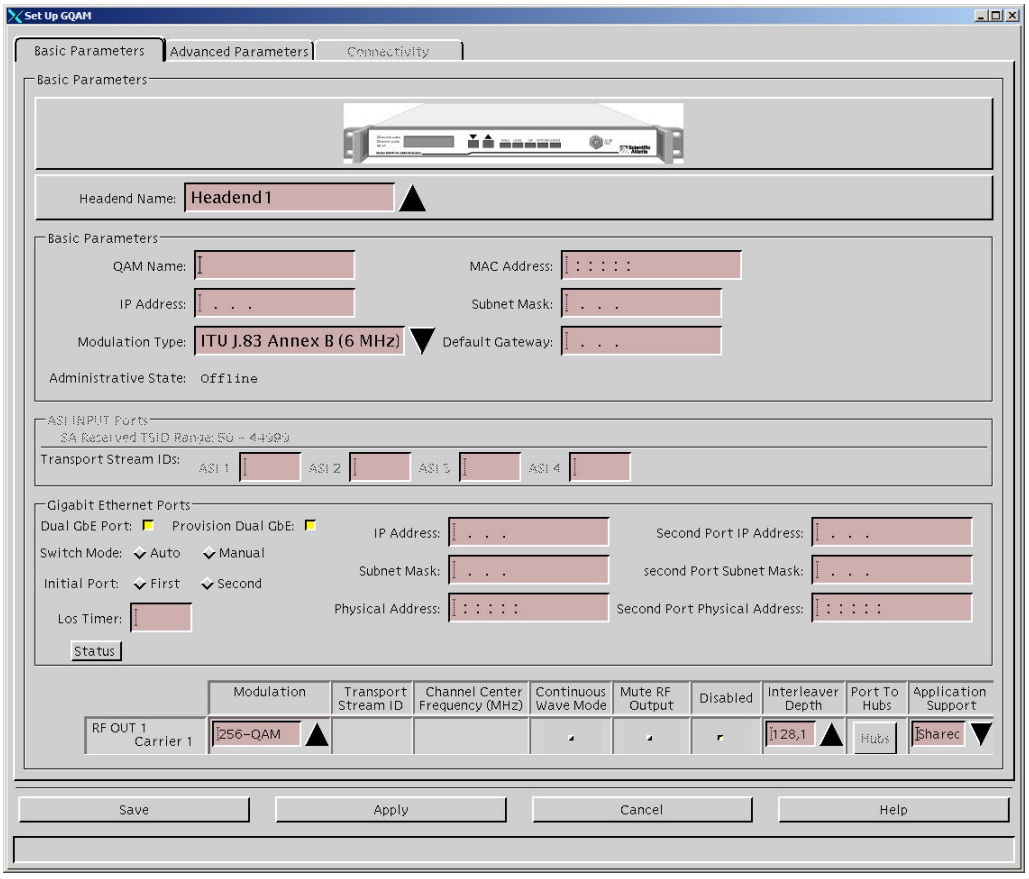
2 From the DNCS Administrative Console, select the **DNCS** tab, click the **Network Element Provisioning** tab, and then click **QAM**. The QAM List window opens.



3 Choose one of the following options:

- To provision a *new* modulator, go to step 4.
- To change the settings for an *existing* modulator, go to step 6.

4 From the File menu, click **New** and select **GQAM**. The Set Up GQAM window opens.



5 Enter the required configuration information into the blank fields on the Basic Parameters window, then go to step 8.

Important: Be sure to associate the port with a hub by clicking the **Port to Hubs** button to open the RF Output Port window.

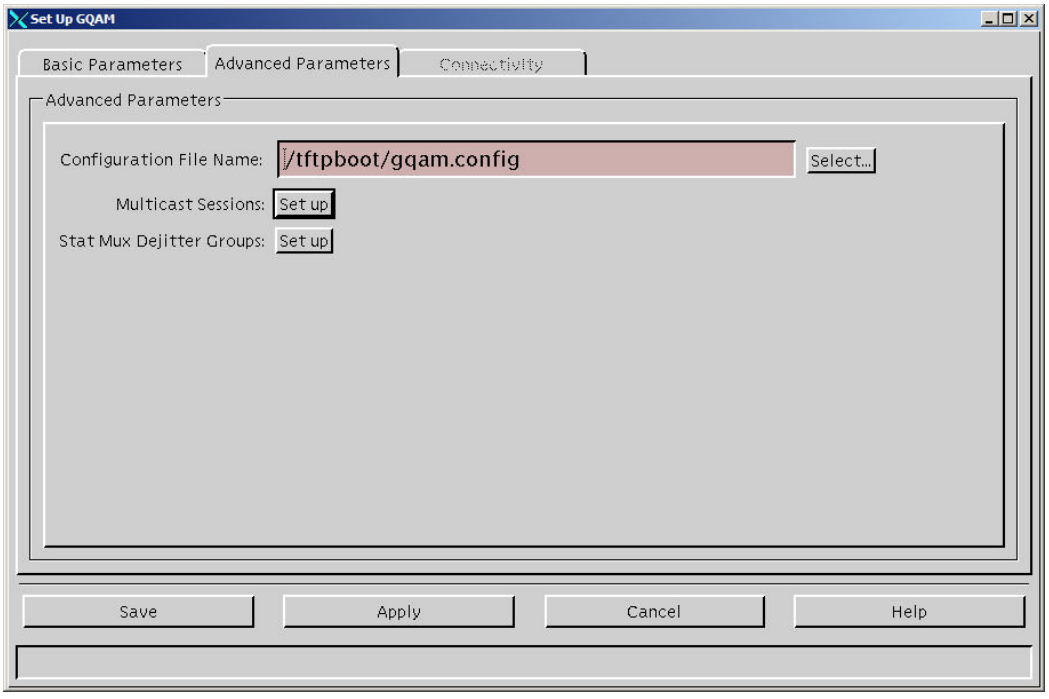
6 From the QAM List, highlight a GQAM, select **File**, and select **Open**. The Set Up GQAM window opens.

7 Enter or change the desired information in the Basic Parameters fields and then go to step 8.

Important: Be sure to associate the port with a hub by clicking the **Hubs** button in the Port to Hubs column of the table at the bottom of the window.

Notes: Refer to the *Digital Network Control System Online Help* for more details about required DNCS procedures.

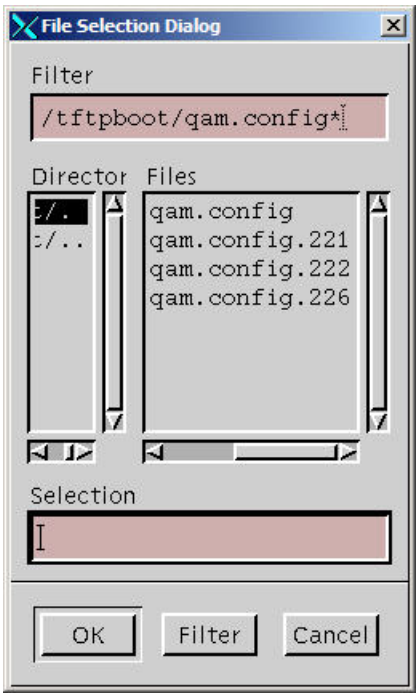
8 Click the **Advanced Parameters** tab. The window opens and includes the Advanced Parameters configuration fields.



9 Enter or change the desired information in the Advanced Parameters fields.

Notes: Refer to the *Digital Network Control System Online Help* for more details about required DNCS procedures.

10 To define the Configuration File Name, click **Select**. The File Selection Dialog window opens.



11 Enter the configuration file in the Selection field and click **OK**. The File Selection Dialog window closes.

12 Choose one of the following options:

- To adjust the connectivity settings for an *existing* modulator, go to step 13.
- To provision the connectivity settings for a *new* modulator, click **Apply**.

  Note: When you first provision a modulator, the Connectivity tab is accessible *only* after you click **Apply** or **Save**.

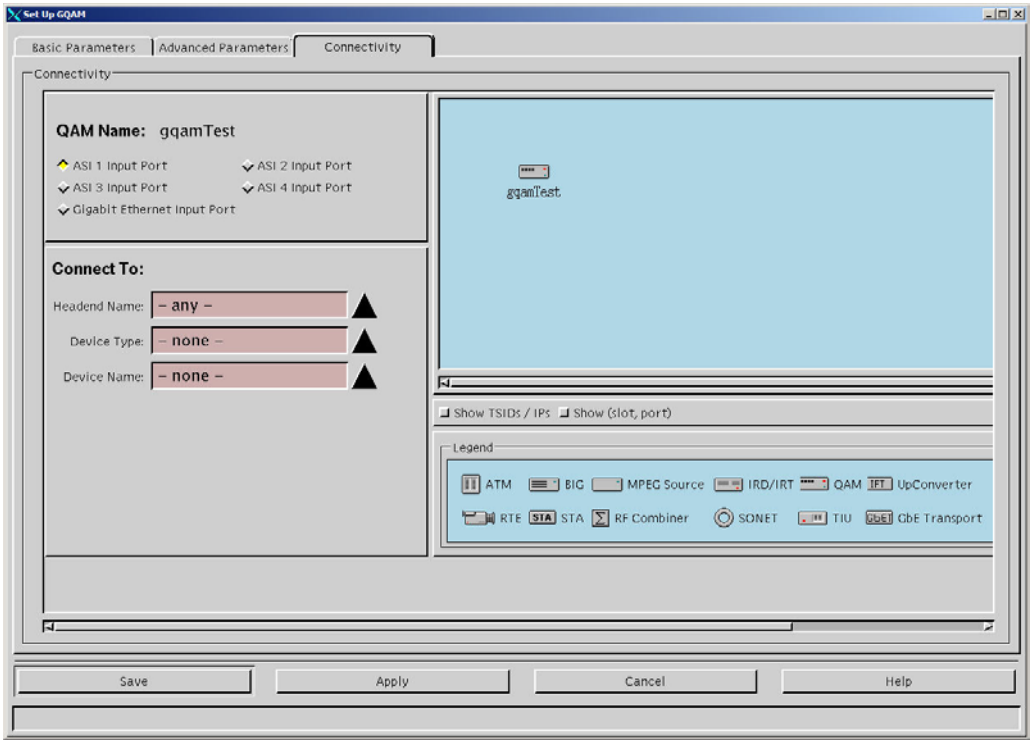
13 Are you setting up multicast sessions?

- If **yes**, click the **Setup** appropriate button and create a new Multicast Digital Session definition. Then refer to the *Digital Network Control System Online Help* for a step-by-step procedure.
- If **no**, go to step 14.

14 Are you setting up Stat Mux Dejitter Groups?

- If **yes**, click the appropriate **Set up** button and create a new stat mux dejitter group definition. Then refer to the *Digital Network Control System Online Help* for a step-by-step procedure.
- If **no**, go to step 15.

15 Click the **Connectivity** tab. The window opens and includes the Connectivity configuration fields.



16 Select the port you want to connect to the network.

17 Select the appropriate device you want to connect to in the **Connect To** area and then click **Save**. The QAM List is updated.

Notes:

- The fields available in the Connect To panel of the Connectivity tab vary according to which device is selected.
- Refer to the *Digital Network Control System Online Help* for more details about required DNCS procedures.

18 Go to ***Add a Service Group*** (on page 57).

Add a Service Group

Introduction

If you are going to provide VOD, xOD, or SDV services, you must add a service group for each VOD, xOD, or SDV server in your network, along with the associated GQAMs. A service group is a set of GQAM modulator channels that have been combined to provide narrowcast services (VOD, xOD, or SDV) to a unique group of DHCTs. Service groups enable DHCTs to distinguish which GQAM is providing which service.

You can create the following types of service groups:

- **Parent service groups**: service groups which contain one or more child service groups
- **Child service groups**: service groups which belong to a parent service group
- **Standalone service groups**: service groups which are independent; they contain no child service groups nor do they belong to a parent service group

Note: Allowing one service group to belong to another enables you to more effectively manage the different types of content that a server provides.

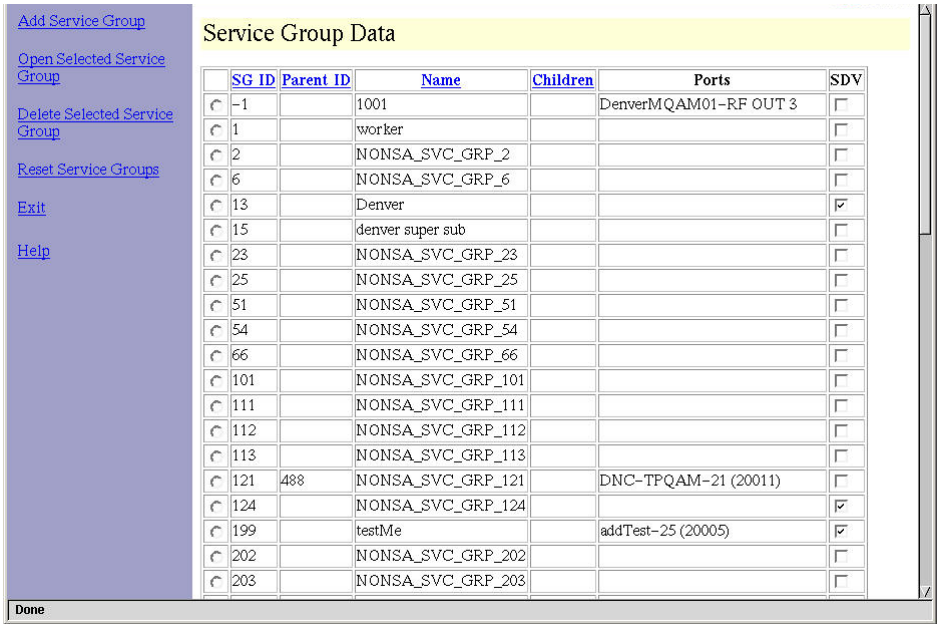
Before You Begin

Before you begin, you must have your network map. If you cannot locate your network map, contact Cisco Services. You must also know which GQAM will be providing data for each VOD, xOD, or SDV service.

Adding a Service Group

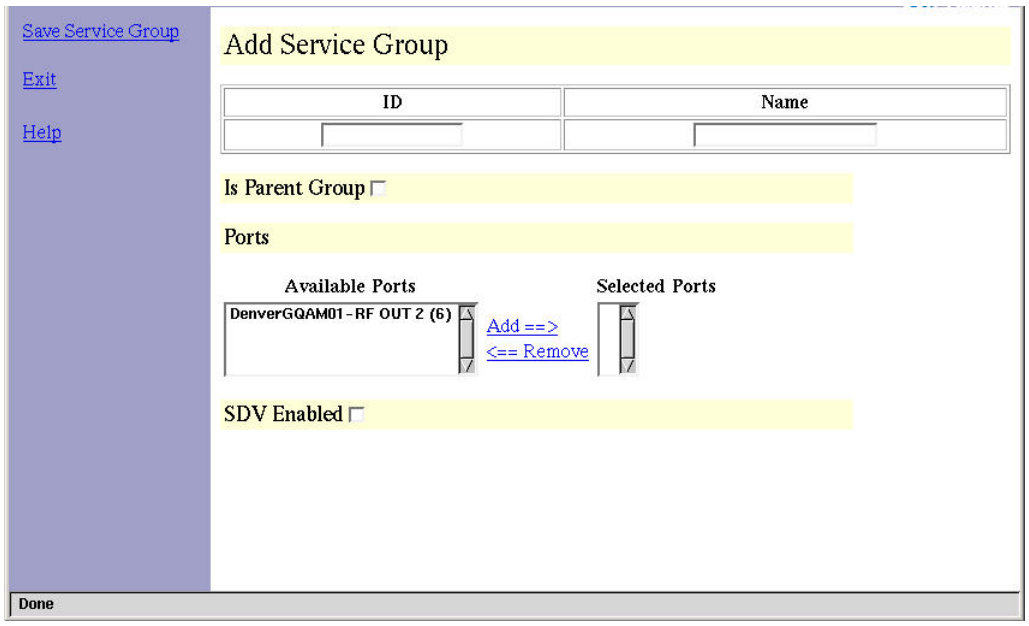
1 From the DNCS Administrative Console, click the **DNCS** tab.

2 Click the **Network Element Provisioning** tab and then click **Service Group**. The Service Group Data window opens.



Note: The SDV column only displays if SDV services are enabled for your system.

3 Click **Add Service Group**. The Add Service Group table opens.



4 Click in the **ID** field and enter a unique number to identify the service group.

Important: Make certain that this field contains only numerical characters and that the field contains no leading spaces. Entering alphabetical characters or a leading space in this field can cause the service group and associated resources assigned to the service group to become non-editable or non-viewable.

5 Click in the **Name** field and enter a name for the service group.

Note: You can use numbers and letters. We recommend that you establish a naming scheme that allows you to easily identify the service or modulator providing it, and which hub they serve.

Example: A name of VOD_SG_Hub1_GQ43 could represent a VOD service group associated with an GQAM modulator, whose IP address ends in 43, and that processes VOD data for Hub 1.

6 What kind of service group are you creating?

- If a **parent service group**, select the **Is Parent Group** check box. Then go to step 7.
- If a **standalone** or a **child service group**, go to step 9.

  Note: You must create a parent group *before* you are create a child service group.

7 In the Available Group list, click to select a group that will be a child to this parent group and then click **Add**. The selected group moves from the Available Group list into the Selected Child list.

Note: You can also remove child groups by selecting the name of the group you want to remove in the Selected Child list and clicking **Remove**.

8 Repeat step 7 for each group that will be a child to this service group.

9 In the Available Ports list, click to select the port of the modulator that will be providing data for this service group and then click **Add**. The selected port moves from the Available Ports list into the Selected Ports list.

Note: You can remove ports by selecting the name of the port you want to remove in the Selected Ports list and clicking **Remove**.

10 Is the service group for SDV services?

- If **yes**, select the **SDV Enabled** check box and then refer to *Provisioning the DNCS to Support SDV Services User Guide* (part number 4012948) for details on creating a service group for SDV services.
- If **no**, go to step 11.

Note: The SDV Enabled option only displays if SDV services are enabled for your system.

11 Click **Save Service Group**. The system closes the Add Service Group table and displays the Service Group Data window, which now lists the service group that you just added.

12 Add the new service group to your network map as specified in the Client Configuration Management (CCM) process.

Note: The CCM Process helps keep us informed of network changes as you make them. This allows us to help troubleshoot your system more effectively and efficiently should the need arise. If you are not familiar with the CCM process, contact Cisco Services immediately for further assistance.

13 Do you need to add another service group?

- If **yes**, repeat steps 3 through 12.

- If **no**, click **Exit** to close the Service Group Data window and return to the DNCS Administrative Console.

14 Are you setting up your network for the first time?

- If **yes**, go to step 15.
- If **no**, continue making any other changes that you need to make to your network. When finished, send us a copy of your updated network map as specified in the CCM process. Then go to step 17.

15 Are you using SONET interfaces in your network?

- If **yes**, go to *Setting Up SONET* topic in the DNCS help. Then return to this procedure and continue with step 16.
- If **no**, go to step 16.

16 Does your network comply with OpenCable™ standards?

- If **yes**, go to *Setting up OpenCable Compliance* topic in the DNCS help. Then return to this procedure and continue with step
- If **no**, continue making any other changes that you need to make to your network. When finished, send us a copy of your updated network map as specified in the CCM process. Then go to step 17.

17 When provisioning is complete, power on the GQAM.

18 After the modulator boots, click **Element Provisioning** on the DNCS Administrative Console.

19 Click **QAM** and select the modulator you just added.

20 From the File menu, click **Open**. The Set Up GQAM window opens.

21 From the Basic Parameters area, verify that the Administrative State for the new GQAM is set to **Online**.

22 Click **Save** to save your changes.

4

Operating the Modulator

Introduction

This chapter contains procedures for viewing and changing GQAM settings, descriptions of screens and messages, and instructions for performing routine maintenance.

Note: Actual screen settings may differ slightly from the examples presented in this guide.

In This Chapter

Understand the Boot Process

This section describes the boot process and lists examples of the screens that appear during a normal boot process. The Bootstrap (BOOTP) protocol is used to initialize and to acquire the following configuration information:

- IP address
- Address mask
- Location of default gateway
- Addresses of important servers
- Name and location of software download file(s) from the network BOOTP server

Note: The GQAM downloads software using Trivial File Transfer Protocol (TFTP), which is a simplified version of FTP.

See ***Change the Boot Mode*** (on page 65) for a description of the boot modes available and instructions for changing the boot mode.

See ***Troubleshooting Boot Screen Error Messages*** (on page 104) for troubleshooting booting conditions.

Boot Process

1. The GQAM sends a BOOTP request to the DNCS.
2. The DNCS responds to the BOOTP request, sending the IP address for the GQAM.
3. The GQAM sends a TFTP request for the configuration file.

   Note: The configuration file (gqam.config) contains environment variables, download files, and server addresses.
4. The DNCS sends the TFTP gqam.config file.
5. If the files in the gqam.config file are different from those stored in the GQAM, then the GQAM requests the download files, which consist of the following:
   - Boot code for Host, NP1, NP2, and NP3
   - Application code for Host, NP1, NP2, and NP3
   - RF module code for RF Modules 1, 2, 3, and 4

   Note: The messages that appear on the front panel of the GQAM during the boot process are described in ***Initial Boot Screens*** (on page 62) and ***Code Download Screens*** (on page 63).

Initial Boot Screens

The following illustrations show examples of the initial boot screens.

Note: Actual screen settings may differ from the examples presented in this guide.

When the GQAM boots, the boot code version and release date appear.

```
        GQAM Boot
vv.vv.vv        MM/DD/YY
```

If BOOTP completes successfully, the IP address boot screen appears.

```
        GQAM Boot
     XXX.XXX.XXX.XXX
```

Note: Although it is not a typical setting, if the GQAM is set to run in a Standalone mode (boot mode 0), the following Standalone mode boot screen appears instead of the "Starting GQAM" boot screen.

```
        GQAM Boot
     Standalone Mode
```

The IP address boot screen remains visible for approximately 2 seconds. If no errors occur and no downloads are attempted, the boot code starts the application code and the following screen appears.

```
      Starting GQAM
      Please Wait...
```

Next, a screen similar to the following appears.

```
        D9479 GQAM
4.0.5           10/28/06
```

Then, the default status screen appears.

```
 CH1 285.00 MHz    50.0dBmV
ITUB  256QAM        ALARM 0
```

Code Download Screens

The boot code, application code, and RF module code messages appear on the front panel LCD screen during code download or during a download attempt. The following table represents the sequence of events that occur during a complete boot code, application code, and RF module code upgrade.

Code Type	**Front Panel Screen Message**
Initial Boot	GQAM Boot vv.vv.vv MM/DD/YY
	GQAM Boot xxx.xxx.xxx.xxx

Code Type	**Front Panel Screen Message**
Host Processor Boot Code	Downloading Host Code !!! Do Not Power Off !!!
	GQAM Boot vv.vv.vv MM/DD/YY
	GQAM Boot xxx.xxx.xxx.xxx
Host Processor Application Code	Downloading Host Code Please Wait ….
	Writing App Code Flash Please Wait ….
RF Code	Downloading RF # Code Please Wait …. (where # = 1-4)
Input Processor Boot Code	Downloading NP1 Code Please Wait ….
Output Processor 1 & 2 Boot Code	Downloading NP2&3 Code Please Wait ….
	GQAM Boot vv.vv.vv MM/DD/YY
	GQAM Boot xxx.xxx.xxx.xxx
Input Processor Application Code	Downloading NP1 Code Please Wait ….
Output Processor 1 & 2 Application Code	Downloading NP2&3 Code Please Wait ….
	Starting GQAM Please Wait….
	(a blank screen appears momentarily)
	D9479 GQAM vv.vv.vv MM/DD/YY
When the code download is complete, the default status screen appears.	CH 1 300.00 MHz 50.0 dBmV ITUB 256QAM Alarm 0

Change the Boot Mode

This section describes the available boot modes available and contains instructions for changing the boot mode from the craft port using a diagnostic PC.

Boot Modes

Three boot modes (0 through 2) exist and are described in the following list:

- **0 - Skip BootP** (Standalone mode) – This mode bypasses the boot mode when you power on the GQAM. Use the Skip BootP mode when operating in Standalone mode, when provisioning and monitoring the GQAM from the front panel or the craft port, or when operating without the control of the DNCS. This mode skips the BOOTP and TFTP processes and jumps directly to the application code.
- **1 - Attempt BootP One Time** (Attempt Bootp Once mode) – This mode is not normally used in network operation. If used when the GQAM is connected to the network and the network connection is lost or reset, the GQAM must be rebooted. This mode attempts each BOOTP and TFTP step only once. If a failure occurs during any step, the step is skipped; the GQAM attempts the remaining steps and eventually attempts to start the application. If the BOOTP and/or configuration file TFTP steps are aborted due to errors, the GQAM may not communicate with the DNCS.
- **2 - Bootp Until Successful** (Boot Until Successful mode) – This is the default mode. This mode continues to boot until the GQAM receives an IP address and all download images. This setting is useful when upgrading the software. Booting until successful ensures that the GQAM completes all startup procedures successfully. Use the standard mode (boot forever until successful) when a network controller such as the DNCS monitors and provisions the GQAM through the Ethernet port. This mode attempts to boot and to TFTP the configuration file and any requested boot and/or application code files until the entire process is successful. If an error occurs at any step, the GQAM restarts until a successful boot occurs.

  Important: Do not select this setting when operating the GQAM outside a DNCS environment.

Changing the Boot Mode

1. Connect a diagnostic PC to the **CRAFT PORT** on the back panel of the GQAM.
2. Power on the diagnostic PC and activate a Procomm or Hyperterminal window using the following modem connection settings:
   - 9600 baud
   - 1 stop bit

- No parity
- 8 data bits
- No flow control

3 Power on the GQAM; then, during the boot sequence, watch for the following message on the PC monitor screen:
Type any key within 2 seconds to get shell prompt

Note: See the ***Connect Power Sources*** (on page 25) section for more details about powering on the GQAM.

4 Press any key on the PC to display the boot prompt. The following boot prompt appears: **boot>**

Note: If you do not press a key in time to get the boot prompt, do one of the following:

- Cycle power to the GQAM, and repeat this step. See ***Resetting the Modulator*** (on page 84) for more details.
- At the **GQAM>** prompt, type **boot**; then, after the **Type any key** message appears, press any key to display the boot prompt.

5 At the boot prompt, type **setbootmode** and press **Enter**. The current boot mode setting appears.

6 Type one of the following numbers to select the boot mode:

- **0** - Skip BootP
- **1** - Attempt BootP One Time
- **2** - Bootp Until Successful

Result: The system saves the new boot mode to nonvolatile memory (NVRAM) with the new setting.

7 Type **exit** and press **Enter**. The GQAM reboots using the new boot mode.

8 Disconnect the diagnostic PC.

Read the Default Status Screen

The Default Status screen provides status information such as the channel frequency setting, RF level settings, modulation type, and the number of active alarms. The default status screen displays after one of the following occurs:

- The reset process is complete.
- You press **ENTER** to complete a command.

The following is an example of the Default Status screen.

```
 CH1 285.00 MHz    50.0dBmV
ITUB  256QAM         ALARM 0
```

Reading the Default Status Screen

The following table describes the information displayed on the default status screen.

Display	Function
CH1	Current RF Channel output selected. The CH number corresponds to the channel number **Note:** There are 16 channels (carriers) available, four for each RF Output Module.
285.00 MHz	Established RF frequency setting for the selected RF modulator (91 to 869 MHz)
50.0 dBmV	Configured RF level setting (42 to 56 dBmV)
ITUB 256QAM	Selected modulation type. Values are: ■ ITUB 64 QAM ■ ITUB 256 QAM ■ DAVIC 16 QAM ■ DAVIC 64 QAM ■ DAVIC 256 QAM
ALARM 0	Current number of active alarms

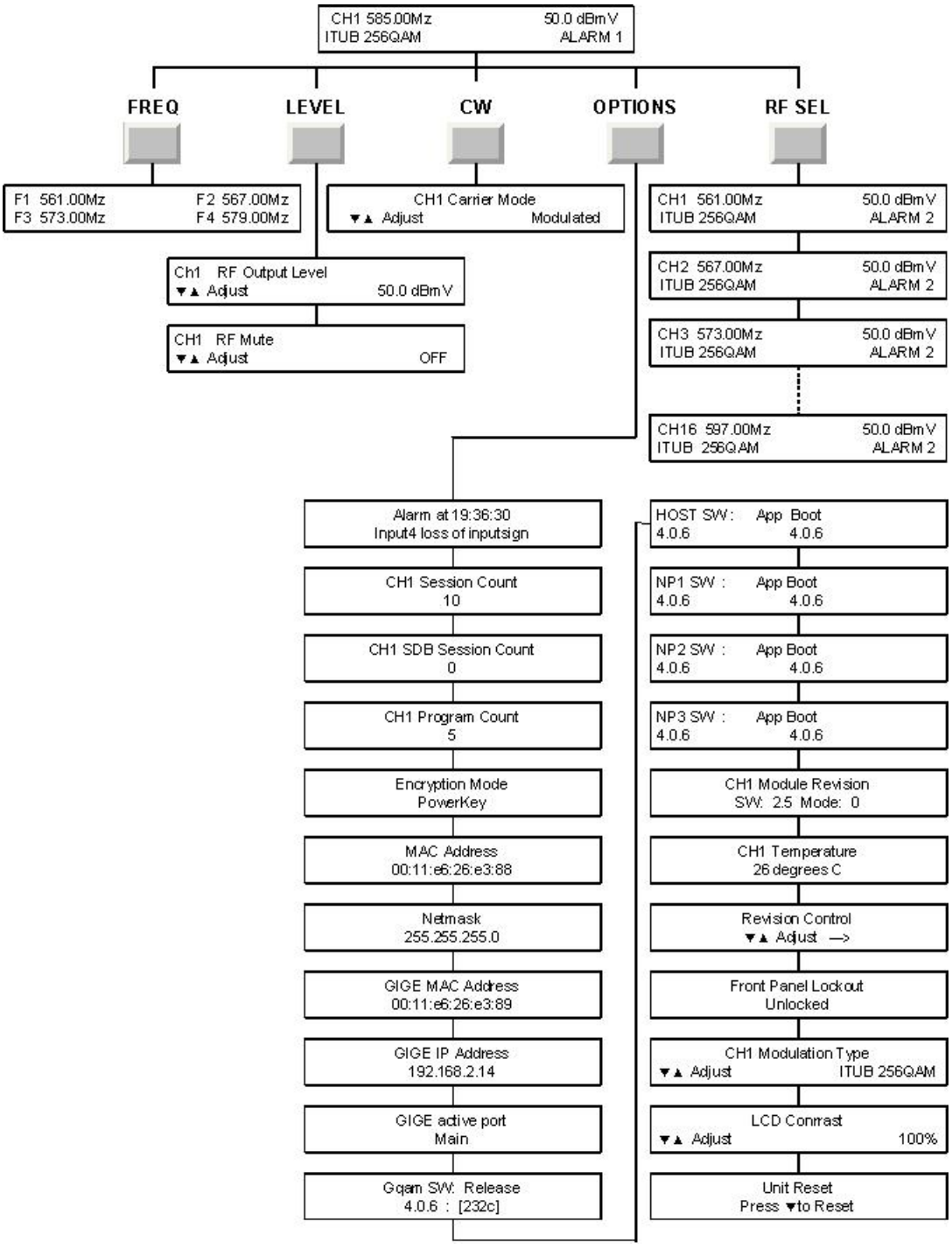
Use the Front Panel Keys to Change Configuration Settings

The front panel of the GQAM contains an alphanumeric LCD screen and three alarm indicators. There are also several keys on the front panel to allow you to change parameters. See the ***Front Panel Overview*** (on page 7) section for more information on the front panel components.

Diagram of the Menu Structure

The following diagram illustrates the menu structure in sequential order.

Note: The settings on this menu are examples, not recommended settings.



Accessing the Menus on the Modulator

You can access the menus and screens by pressing the FREQ, LEVEL, CW, and OPTIONS keys on the front panel of the modulator. Pressing these keys repeatedly scrolls through their respective sequential menus.

The following sections in this chapter describe the functions associated with each key:

- FREQ – ***Adjust the Frequencies of a Selected RF Channel or CH Carrier*** (on page 71)
- LEVEL
  - ***Adjust the RF Output Level of a Selected Carrier*** (on page 73)
  - ***Mute the RF Output of a Selected CH Carrier*** (on page 74)
- CW – ***Change the Carrier Mode of a Selected CH Carrier*** (on page 75)
- OPTIONS – ***Monitor Setup Options*** (on page 76)
- RF SEL – ***Adjust the Frequencies of a Selected RF Channel or CH Carrier*** (on page 71)

Note: See ***Front Panel Overview*** (on page 7) for detailed descriptions of these keys.

Navigating Within a Menu or Changing a Screen Value

The Up and Down arrow keys are used in conjunction with the other front panel keys to increment or decrement the values of a selected parameter within a screen or to scroll up and down through a set of selections.

Saving Changes to Configuration Settings

Pressing the **Enter** key saves changes to the configuration settings. You must also press the **Enter** key to return to the default status screen. Changes to any settings are saved into NVRAM. This memory is located on the digital board and is used to restore settings in the event of a power reset of the device.

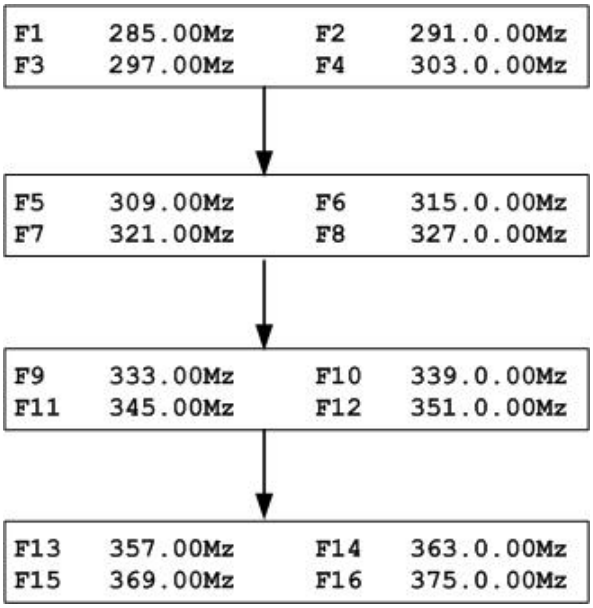
Adjust the Frequencies of a Selected RF Channel or CH Carrier

Introduction

Pressing the FREQ key allows you to access the output frequency screen, from which you can select an RF output group and adjust the individual carrier (CH) output frequency.

Important: Frequencies set from the front panel of the GQAM are not recorded by the DNCS. At the next modulator restart, the frequencies are reset to the values stored in the DNCS.

Example: A frequency setting of 285.00 Mz for F1 in the following illustration means that carrier channel 1 (CH1) has a frequency of 285.00 MHz. Each frequency setting also applies to a corresponding carrier channel.



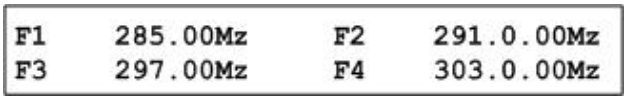
Important: The frequencies within an RF output module group must be contiguous in 6 MHz increments, but the frequencies between groups do not have to be contiguous.

Example: RF2 can contain frequencies 309 MHz, 315 MHz, 321 MHz, and 327 MHz, and RF3 can begin at 381 MHz.

Adjusting the Output Frequency

Important: Frequencies set from the front panel of the GQAM are not recorded by the DNCS. At the next modulator restart, the frequencies are reset to the values stored in the DNCS.

1 From the front panel of the modulator, press **FREQ**. A group of four output frequency settings appear with one of the frequency settings blinking. The setting that is blinking denotes the frequency of the selected channel.



Note: Each frequency setting (F1 through F4) reflects the channel number.

2 Press **RF SEL** to select a channel frequency setting.

Note: Press the **RF SEL** key repeatedly to view the RF output frequencies (F1 or F4).

3 Press the Up or Down Arrow keys to increase or decrease the output frequency value of a selected RF channel.

Notes:

- The output frequency can be changed in 0.25 MHz increments from 91 to 869 MHz. To increment or decrement the frequency value in 6 MHz steps, press and hold the Up or Down Arrow keys for about 2 seconds.
- As a frequency value is incremented or decremented, the other frequencies within the RF Module are also adjusted. This is performed automatically to maintain the 6 MHz bandwidth between frequencies residing on the same RF output module.

4 Press **ENTER**. The system saves the output frequency changes to NVRAM and the default screen appears.

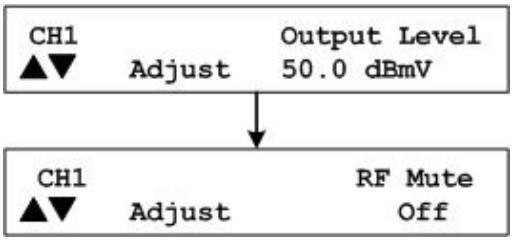
Adjust the RF Output Level of a Selected Carrier

Pressing the **LEVEL** key displays screens that allow you to perform the following functions:

- Set the RF output level of a selected RF carrier (channel)
- Enable or disable a muting option for the selected RF carrier (channel)

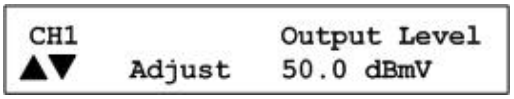
LEVEL Button Menu Flow

The following diagram shows the sequence of screens that appear when the LEVEL button is repeatedly pressed.



Adjusting the RF Output Level

1. Press **LEVEL**. The RF Output Level screen appears.



2. Press **RF SEL** to choose a channel.
3. Press and hold the Up or Down Arrow keys to increase or decrease the output level.

   Notes:

   - The level changes in 0.1 dB increments from 42 to 56 dBmV. The output level is valid in the range between 44 and 54 dBmV. The range on the front panel extends 2 dB above and below this range to compensate for variations between the displayed level and the actual level due to temperature fluctuations and the tuning range.
   - The system automatically saves the output level changes to NVRAM.
4. Press **OPTIONS** to return to the default screen.

Mute the RF Output of a Selected CH Carrier

This section contains instructions for enabling the RF mute option. During installation, for example, use this procedure to mute the RF output before you connect the RF OUT ports to the distribution plant.

Enabling or Disabling a Muting Option

Important: The RF output state established from the front panel of the GQAM is not recorded by the DNCS. At the next modulator restart, the RF output state reverts to the value stored in the DNCS.

1 On a GQAM that has power connected and has finished booting, press the **LEVEL** key twice. The Output Mute screen appears.

2 Press **RF SEL** to choose a channel.

3 Press the Up and Down Arrow keys to toggle the selected RF Mute between **Off** and **Mute**.

Note: When the selected output is set to **Mute**, the modulator displays **RF Mute** on the default screen.

4 Press **ENTER**. The system saves the RF output muting changes to NVRAM and the default screen appears.

Note: RF Mute appears on the default status screen for the selected channel.

Change the Carrier Mode of a Selected CH Carrier

This function allows you to toggle RF output to either a modulated (normal) carrier mode or a continuous wave (CW) carrier mode.

Important: The carrier mode established from the front panel of the GQAM is not recorded by the DNCS. At the next GQAM restart, the carrier mode for the GQAM reverts to the value stored in the DNCS.

Selecting Modulated or Continuous Wave Carrier Mode

1 Press **CW**. The Carrier Mode screen appears.

2 Press **RF SEL** to choose a channel.

3 Press the Up and Down Arrow keys to toggle the carrier mode between Modulated (normal) and CW (not modulated or continuous wave).

Note: The factory default for the carrier mode setting is Modulated.

4 Press **ENTER**. The system saves the carrier mode setting changes to NVRAM and the default screen appears.

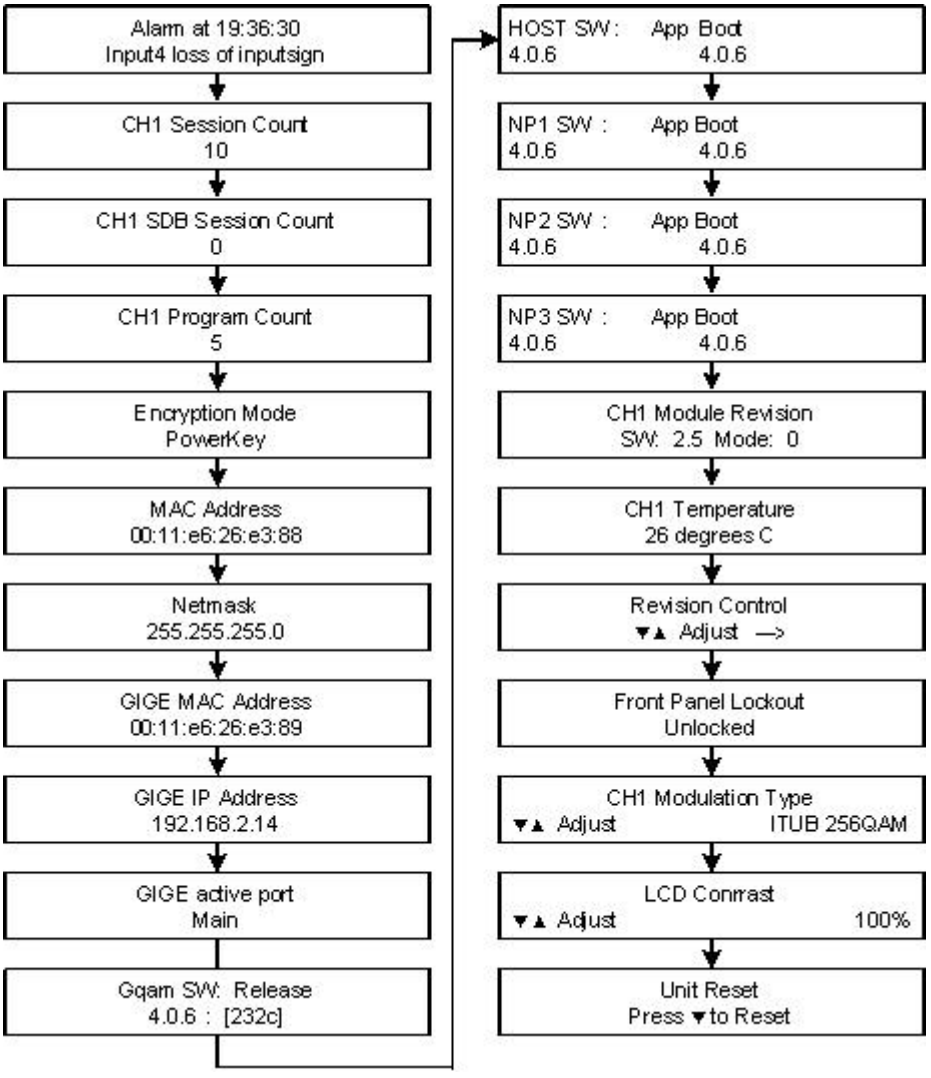
Note: When choosing CW mode, the CW LED on the front panel of the GQAM lights and CW appears on the default screen.

Monitor Setup Options

OPTIONS Menu

The following setup screens appear, in sequential order, when you press the OPTIONS key repeatedly on the GQAM. These screens allow you to monitor alarms, as well as the session and program count. This section provides instructions for viewing each setting and provides explanations of screen information.

Important: The screens in the following diagram are examples, not recommended settings.



Displaying Alarm Status

1 Press **OPTIONS**. The Alarm Status screen appears.

```
Alarm at 19:36:30
Input5 loss of inputsign
```

Notes:

- Each alarm description appears for approximately 1 second before displaying the next alarm. If no alarms are active, a **No Active Alarms** message appears.
- See ***Troubleshooting the GQAM*** (on page 93) for detailed descriptions of alarms.

2 Press **ENTER**. The default screen appears.

Viewing the Session Count

The Session Count screen displays the count of all active sessions for the selected RF output. Complete the following steps to view the total number of active sessions.

1 Press **OPTIONS** until the Session Count screen appears.

```
CH2 Session Count
        1
```

Note: The session count for the GQAM will differ from the session count on the DNCS if the GQAM does not find needed MPEG programs within MPEG Program Specific Information (PSI). By design, the GQAM responds positively to a session setup request even if the requested MPEG program is not present on the input transport stream.

2 Press **RF SEL** to view the session count for each channel.

3 Press **ENTER** to return to the default screen.

Viewing the SDB Session Count

The SDB Session Count screen displays the count of all active Switched Digital Video (SDV) sessions for the selected RF output. Complete the following steps to view the total number of active SDV sessions.

Note: SDB (Switched Digital Broadcast) and SDV are used interchangeably throughout this procedure.

1 Press **OPTIONS** until the SDB Session Count appears.

```
Ch2 SDB Session Count
        0
```

Note: If Switch Digital Video (SDV) is not configured on your system, the SDB session count will always be zero.

2 Press **RF SEL** to view the session count for each channel (CH1 or CH16).

3 Press **ENTER** to return to the default screen.

Viewing the Program Count

The Program Count screen displays the encrypted programs currently running on the selected RF output. Complete the following steps to view the program count for an RF module.

1 Press **OPTIONS** until the Program Count screen appears.

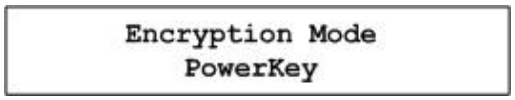
2 Press **RF SEL** to view the program count for each channel.

3 Press **ENTER** to return to the default screen.

Viewing the Encryption Mode

The Encryption Mode screen displays the current encryption mode setting. The mode is saved in the NVRAM and is selected during the boot process. To display the current encryption mode, complete the following steps.

1 Press **OPTIONS** until the Encryption Mode screen appears.

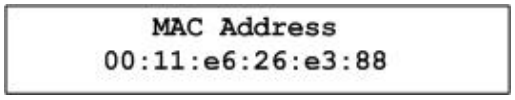


2 Press **ENTER** to return to the default screen.

Viewing the MAC Address

To view the MAC address used for GQAM Ethernet communication, complete the following steps.

1 Press **OPTIONS** until the MAC Address screen appears.

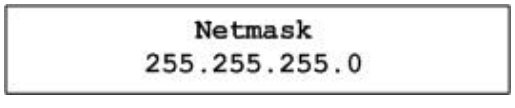


2 Press **ENTER** to return to the default screen.

Viewing the Netmask Screen

To display the currently assigned Netmask for all Ethernet communications, complete the following steps.

1 Press **OPTIONS** until the Netmask screen appears.

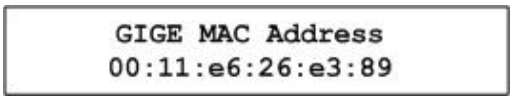


2 Press **ENTER** to return to the default screen.

Viewing the Gigabit MAC Address

To display the currently assigned Gigabit MAC address for the main port, complete the following steps.

1 Press **OPTIONS** until the Gigabit MAC address appears

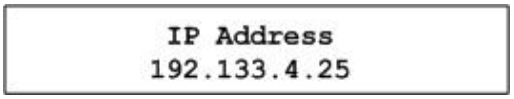


2 Press **Enter** to return to the default screen.

Viewing the IP Address

To display the currently assigned IP address for all Ethernet communications, complete the following steps.

1 Press **OPTIONS** until the IP Address screen appears.



2 Press **ENTER** to return to the default screen.

Viewing the GIGE Active Port

To display the currently active GbE port, complete the following steps.

1 Press **OPTIONS** until the GIGE active port appears.

2 Press **Enter** to return to the default screen.

Viewing the GQAM Software Release

To display the current software release for the GQAM device, complete the following steps.

1 Press **OPTIONS** until the Gqam software release address appears:

2 Press **Enter** to return to the default screen.

Viewing the Host Software Revision Level

The Host Software Revision screen displays the revision level for the host processor in the GQAM. To display the Host Software Revision screen, complete the following steps.

1 Press **OPTIONS** until the Host Software Revision screen appears.

Notes:

- In the above example, **App** is the application code and **Boot** is the boot code.
- This revision number for the application code (4.0.5) and the boot code (4.0.5), represented in the above example, contains the major release number, minor release number, and the point release number.

Important: If an asterisk (*) appears after one of the code version numbers, this indicates that the code version is a mismatch to the GQAM software package version.

2 Press **ENTER** to return to the default screen.

Viewing the NP1 Software Revision Level

The NP1 software revision screen displays the revision level for the input processor in the GQAM. To display the NP1 software revision screen, complete the following steps.

1 Press **OPTIONS** until the NP1 Software Revision screen appears.

Notes:

- In the above example, **App** is the application code and **Boot** is the boot code.
- This revision number for the application code (4.0.5) and the boot code (4.0.5), represented in the above example, contains the major release number, minor release number, and the point release number.

Important: If an asterisk (*) appears after one of the code version numbers, this indicates that the code version is a mismatch to the GQAM software package version.

2 Press **ENTER** to return to the default screen.

Viewing the NP2 Software Revision Level

The NP2 software revision screen displays the revision level for the Output 1 processor in the GQAM. To display the NP2 software revision screen, complete the following steps.

1 Press **OPTIONS** until the NP2 Software Revision screen appears.

Notes:

- In the above example, **App** is the application code and **Boot** is the boot code.
- This revision number for the application code (4.0.5) and the boot code (4.0.5), represented in the above example, contains the major release number, minor release number, and the point release number.

Important: If an asterisk (*) appears after one of the code version numbers, this indicates that the code version is a mismatch to the GQAM software package version.

2 Press **ENTER** to return to the default screen.

Viewing the NP3 Software Revision Level

The NP3 software revision screen displays the revision level for the Output 2 processor in the GQAM. To display the NP3 software revision screen, complete the following steps.

1 Press **OPTIONS** until the NP3 Software Revision screen appears.

Notes:

- In the above example, **App** is the application code and **Boot** is the boot code.
- This revision number for the application code (4.0.5) and the boot code (4.0.5), represented in the above example, contains the major release number, minor release number, and the point release number.

Important: If an asterisk (*) appears after one of the code version numbers, this indicates that the code version is a mismatch to the GQAM software package version.

2 Press **ENTER** to return to the default screen.

Viewing the Module Revision Numbers

The Module Revision screen displays the revision numbers for the hardware and software of the selected RF channel. To display the Module Revision screen, complete the following steps.

1 Press **OPTIONS** until the Module Revision screen appears.

```
CH2 Module Revision
SW: 2.5 Mode: 1
```

Notes:

- SW shows the RF board microprocessor firmware revision displayed as major release and minor release.
- If an asterisk (*) appears after one of the code version numbers, this indicates that the code version is a mismatch to the GQAM software package version.
- Mode is the PWB assembly of configuration. The 0 indicates a Standard/Domestic Mode (Baseband to RF Output) PWB assembly.

2 Press **RF SEL** to display Module Revision information for each channel.

3 Press **ENTER** to return to the default screen.

Checking the Temperature of an RF Module

1 Press **OPTIONS** until the Temperature screen appears.

```
Ch2 Temperature
28 degrees C
```

2 Press **RF SEL** to display information for each RF channel.

Note: Each channel displays the temperature of its RF output group.

3 Press **ENTER** to return to the default screen.

Viewing the Hardware Revision String

The Revision Control screen displays the hardware revision string of the GQAM. This string is 31 bytes long and is stored in non-volatile memory (NVM). Only eight characters of the string can be viewed at a time.

1 Press **OPTIONS** until the Revision Control screen appears.

```
Revision Control
      - >
```

2 Press the Up or Down Arrow keys to display the next or previous eight characters of the hardware revision string.

Note: The " ->" indicates that more characters are available.

3 Press **ENTER** to return to the default screen.

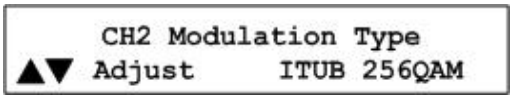
Setting the Modulation Type

The Modulation Type screen allows you to set the modulation type for each of the RF channels.

Important: The modulation type established from the front panel of the GQAM is not recorded by the DNCS. At the next GQAM restart, the modulation type reverts to the value stored in the DNCS.

To set the modulation type, complete the following steps.

1 Press **OPTIONS** until the Modulation Type screen appears.



2 Press the **RF SEL** key to display information for each channel.

3 Press the Up or Down Arrow keys to scroll through the following available modulation types:

- DAVIC 16QAM
- DAVIC 64QAM
- DAVIC 256QAM
- ITUB 64QAM
- ITUB 256QAM

4 Press **ENTER**. The system saves the selected modulation type in NVRAM memory and the default screen appears.

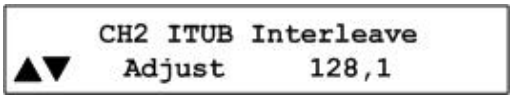
Setting the ITUB Interleave Screen

The ITUB Interleave screen displays the interleave depth factor for all ITU-B modulation settings. The interleave depth factor specifies the spacing for the forward error correction (FEC) code within the MPEG transport data. Interleaving evenly disperses the data to transport it reliably over the cable channel.

Important: The recommended setting for this screen is **128,1**. Only Cisco Services personnel should modify this setting.

Note: The interleave value established from the front panel of the GQAM is not recorded by the DNCS. At the next GQAM reset, the interleave value reverts to the value stored in the DNCS.

1 Press **OPTIONS** until the ITUB Interleave screen appears.



2 Press **RF SEL** to choose a channel.

3 Press **ENTER** to return to the default screen.

Adjusting the LCD Contrast

1. Press **OPTIONS** until the LCD Contrast screen appears.

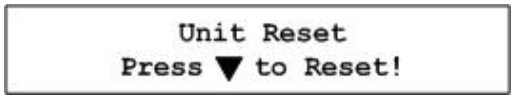
2. Press the Up or Down Arrow keys to decrease or increase the contrast from 0% to 100% in 5% increments.

   Note: The default contrast setting is 80%.

3. Press **ENTER** to save the changes to NVRAM and return to the default screen.

Resetting the Modulator

1. Press **OPTIONS** until the Unit Reset screen appears.



2. Press the Down Arrow key. The GQAM reboots.

Inspect the Modulator

Introduction

Performing routine maintenance helps prevent the need for troubleshooting. See ***Troubleshooting the GQAM*** (on page 93) for instructions to troubleshoot your modulator and to address alarm conditions that may occur.

Although, the modulator can operate unattended for extended periods, we recommend that you perform a visual inspection once every 3 months.

Important: Only qualified personnel should maintain and service the GQAM.

Check the following items during a visual inspection:

- **Cables and connectors**—Verify that all cables are mated properly and all retaining screws are tight. Inspect cables for stress and chafing.
- **Cover and rear panel**—If necessary, clean the cover and rear panel with a soft cloth dampened with a mild detergent solution.
- **Fan intakes on side panel**—Check the fan intakes on the side panel for excessive lint or dust buildup. Remove the lint and dust from the intakes using a damp cloth or a small hand vacuum.

Replace the Fuse

Each GQAM contains a power fuse. We recommend keeping spare 4.0 A, SLO BLO 250V fuses (part number 188106) for the 120/230 VAC model GQAM and spare 6.3 A, SLO BLO 250V fuses (part number 180522) for the 48 VDC model GQAM.

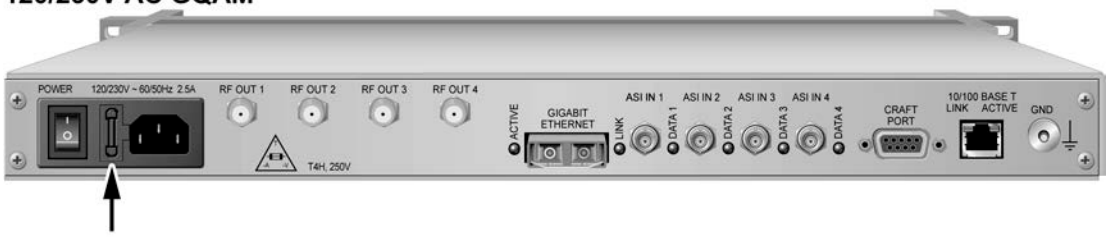
Replacing the Fuse

WARNING:

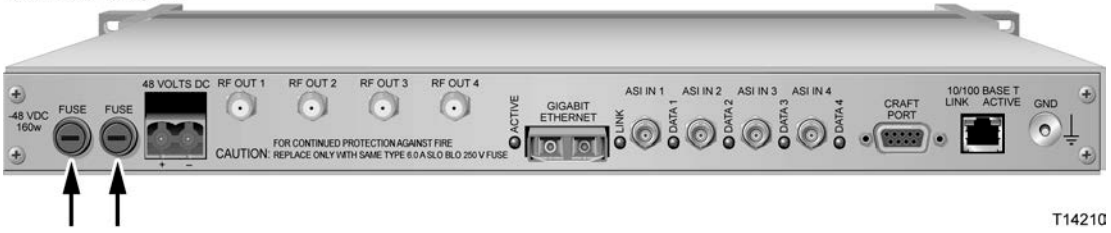
Avoid electric shock! Disconnect the power cord on this product before you remove the fuse and only use a fuse that has the correct type and rating.

1. Power down the GQAM and remove the power cord.
2. Locate the fuse holder on the left side of the back panel.

120/230V AC GQAM



48V DC GQAM



T14210

3. Choose one of the following options:
   - For the 120/230 VAC model, use a small flat-blade screwdriver to pry out the fuse holder, then go to step 7.
   - For the 48 VDC model, go to step 4.
4. Loosen either fuse holder by using a small flat-blade screwdriver to turn the fuse holder counter-clockwise.

   Note: A fuse is required for both fuse holders. Replace either or both fuses as needed with identical fuses.
5. Remove the fuse.
6. Insert a new fuse into the fuse holder, then go to step 10.
7. Locate and remove the spare fuse from the hidden compartment on the fuse holder.

8 Remove and discard the blown fuse, and then replace the blown fuse with the spare fuse.

9 Place a new fuse in the hidden compartment where you removed the spare. This fuse will now be your spare fuse.

10 Insert the fuse holder into the back panel.

11 Choose one of the following options:

- For the 120/230 VAC model, snap the fuse holder in place.
- For the 48 VDC model, tighten the fuse holder by using a small flat-blade screwdriver to turn the fuse holder clockwise.

12 Replace the power cord and power on the GQAM.

Diagnose the Fan

If a fan fails or is failing, either the **MAJOR** LED or the **MINOR** LED on the front panel will light and you will see *either* a fan failure alarm message or an excessive temperature alarm message on the front panel LCD screen, or perhaps both.

WARNING:

Avoid electric shock and damage to this product! Replace the fan only with a genuine replacement fan from Cisco. Contact your Customer Service Representative to order replacement fans.

Diagnosing the Fan

The following illustrations are examples of the alarm displays you will see on the front panel LCD screen.

Fan Failure Alarm

```
Alarm at 16:20:32
Fan Failure #1
```

Notes:

- The fan failure alarm is a Major alarm.
- The fan failure alarm can display for fan number 1 through fan number 6.

Excessive Temperature Alarm

```
Alarm at 16:20:48
RF1 Exceeded max temp
```

Notes:

- The excessive temperature alarm is a Minor alarm.
- The excessive temperature alarm can display for RF module 1 through RF module 4.

Replacing the Fan

Go to ***Replace the Fan*** (on page 90) for detailed procedures on replacing a fan unit.

Important: If a fan fails or is failing, contact your Customer Service Representative to obtain a replacement fan.

Notes:

- The part number for the replacement fan unit is **4003088**.
- The part number for the kit that includes the replacement fan and instruction sheet is **4007620-40**.

Replace the Fan

The GQAM modulator has three dual fan units on the side panel. Each of these units contains two fan rotors. You must replace the *entire* dual fan unit if one of the fan rotors should fail. The fan units are designed to be "hot swappable," meaning that you do not necessarily have to power down the GQAM to replace a fan unit that has failed.

Important: In order to hot swap a dual fan unit, you must have the following:

- Sufficient length in all cords and cables so you can slide the device forward in the rack far enough to fully access the dual fan units on the side panel.
- The ability to externally support the GQAM with a cart or table or with the assistance of another person.

Notes:

- The part number for the replacement fan unit is **4003088**.
- The part number for the kit that includes the replacement fan and instruction sheet is **4007620-40**.
- If you do *not* have sufficient length in all cords and cables, you will have to power off the unit, disconnect all cords and cables, and completely remove the GQAM from the rack to replace a dual fan unit that has failed.

This section provides the procedure for replacing a dual fan unit on the GQAM by either hot swapping the fan unit, or by powering off, disconnecting, and removing the GQAM completely from the rack.

When Can I Perform This Procedure?

If you cannot hot swap the dual fan unit, you need to replace the fan unit during a maintenance window. This is necessary because you will have to power off and disconnect the GQAM to replace the fan unit, thereby temporarily disrupting all broadcast services configured and provisioned on this GQAM.

Important: Schedule the maintenance window to replace the fan as soon as possible to avoid damage to the GQAM.

Location of Fans

The fans are located on the GQAM side panel as follows:

- Fans 1 and 2 are located nearest to the back panel.
- Fans 3 and 4 are the middle fans.
- Fans 5 and 6 are located nearest to the front panel.

Replacing the Fan

WARNING:

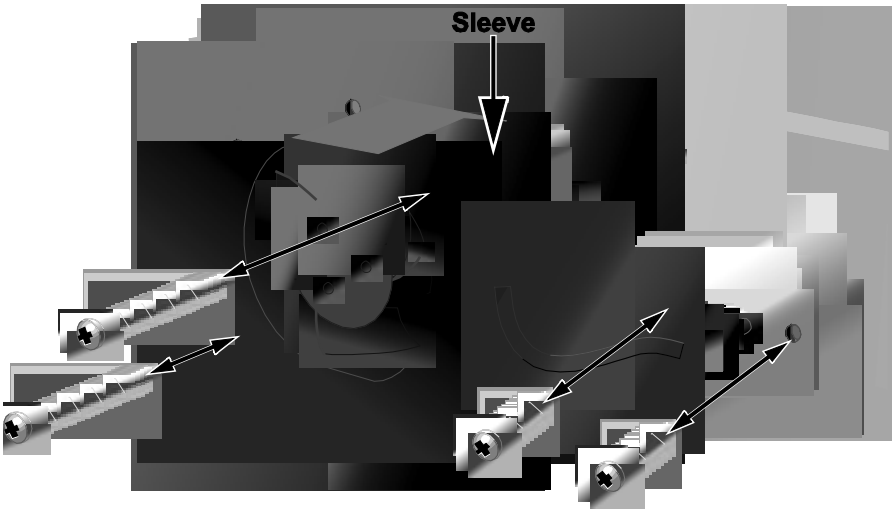
Avoid damage to this product! Replace the dual fan unit only with a genuine replacement fan unit from Cisco. Contact your Customer Service Representative to order replacement fan units.

1. Are the cables connected to the back panel long enough to allow you to slide the GQAM forward into the rack to sufficiently access the side panel where the fan units are located?
   - If **yes**, carefully remove the screws that secure the GQAM in the rack, and carefully slide the GQAM forward in the rack until you can access the fan units. Then, go to step 5.

     CAUTION:

     You must be able to externally support the GQAM with a cart or table or with the assistance of another person when you slide the chassis forward in the rack.
   - If **no**, go to step 2.
2. If you cannot slide the GQAM forward in the rack because some or all of the cables in the rack are not long enough to access the fan, wait to replace the fan until you have a maintenance window. Then, choose one of the following options:
   - If *some* of the cables are not long enough, you must power off the GQAM and disconnect any cables that are not long enough.
   - If *all* of your cables are too short, you must power off the GQAM and disconnect all the cables, including the power cable.
3. Remove the screws that secure the GQAM in the rack. Then, remove the GQAM completely from the rack to replace the fan unit.
4. After removing the GQAM, place it carefully on a sturdy flat surface.
5. Carefully remove the screws that secure the 9-pin connector to the side panel and place them in a safe location nearby.
6. Carefully remove the screws and sleeves that secure the fan unit to the side panel and place them in a safe location nearby.

Important: The sleeves are loose and are not connected to the fan. Be careful not to drop them.



7 Remove the non-functioning fan unit and carefully disconnect the 9-pin connector. Set this fan unit aside for safe disposal later.

8 Hold the new fan unit in place on the side panel of the GQAM so that the rotor with three fan blades is visible.

9 Place the sleeves in the proper location on the fan (as shown in the diagram), insert the screws through the sleeves, and then carefully tighten the screws that secure the fan to the side panel.

Important: Do not over tighten or cross thread the screws.

10 Carefully insert the 9-pin connector into the 9-pin socket, and then replace and carefully tighten the screws that secure the 9-pin connector to the side panel.

Important: Do not over tighten or cross thread the screws.

11 Did you have to remove the GQAM completely from the rack?

- If **yes**, go to step 13.
- If **no**, go to step 12.

12 Replace the GQAM into its original position in the rack and secure it in the rack using the original screws. Then, go to step 14.

13 Replace the GQAM into its original position in the rack, secure it in the rack using the original screws, reconnect all cables, reconnect the power cord, and then power on the GQAM.

14 Does the new fan unit operate properly?

- If **yes**, you have completed this procedure.
- If **no**, contact Cisco Services for assistance.

5

Troubleshooting the GQAM

Introduction

This chapter provides explanations of major, minor, and status alarm conditions and instructions for checking alarms. This chapter also includes an alarm troubleshooting table, arranged alphabetically according to the front panel LCD message, with additional information for resolving alarm conditions. In addition, this chapter provides examples of boot screen error messages that identify boot and software loading errors or failures.

In This Chapter

Alarm Conditions

This section describes major, minor, and status alarms and explains how to access and read the alarms displayed on the front panel LCD of the GQAM. Refer to ***Troubleshooting Alarm Messages*** (on page 96) for a list of alarm messages that appear on the LCD screen, their level of severity, and possible solutions.

Purpose and Severity Levels of GQAM Alarms

Alarms provide system operators with an indication of an abnormal condition. Alarm messages appear on the Alarm Status screen when hardware or software conditions occur that might cause the GQAM to operate incorrectly or fail. Examples of such conditions include temperature fluctuations, power supply failure, communication problems, or the detection of bad data. All alarms are automatically enabled after powering up the GQAM.

Alarm levels are classified as major, minor, and status alarms. Each level is described as follows:

- **Major Alarms –** A major alarm indicates a fatal error, that is, a complete loss of functionality. Major alarms occur for hardware or software conditions that indicate a serious disruption of service or the malfunctioning or failure of important circuits. These situations require the immediate response of the technician to restore or maintain system operability. The front panel of the GQAM contains a MAJOR LED to alert the operator that a major alarm is pending.
- **Minor Alarms –** A minor alarm indicates a non-fatal error condition. The GQAM may continue to operate with some loss of functionality. The front panel of the GQAM contains a MINOR LED to alert the operator that a minor alarm is pending.
- **Status Alarms –** The status alarm indicates that some state in the GQAM has changed. Status alarms are provided to alert the DNCS operator that possible changes are occurring at the GQAM site by someone pressing the front panel keys or by someone using the craft port. These are generally one-time events, such as a front panel event change. In this case, the alarm is issued with the level "status" each time you press the **ENTER** key on the front panel of the GQAM. Status alarms might not affect GQAM functionality.

LCD Alarm Display

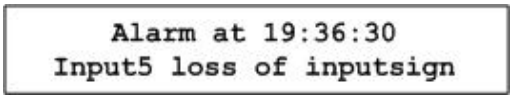
The front panel of the GQAM displays alarm messages in the following standard display.

```
Alarm at 19:36:30
Input5 loss of inputsign
```

The alarm message appears on the second line of the display. In this example, the message indicates a loss of signal to the ASI Input, which is a major alarm condition.

Reading the Display

1 Press **OPTIONS**. The Alarm Status Level screen appears.



Note: Each alarm description appears for approximately 1 second before displaying the next alarm. If no alarms are active, a **NO Active Alarms** message appears.

2 Press **ENTER**. The default screen appears.

Troubleshooting Alarm Messages

Introduction

If the front panel LCD displays an alarm condition, fails a self-test, or does not work properly, refer to the table in this section to find and correct the cause. Some alarm conditions may require you to contact us.

See ***Troubleshooting Boot Screen Error Messages*** (on page 104) for resolving problems encountered during the start-up process.

Front Panel LCD Alarm Messages

The following table lists Alarm Messages displayed on the front panel LCD, the default level of severity, a probable cause for the alarm, and suggestions for correcting the alarm condition.

Notes:

- The LCD descriptions for each alarm are arranged in alphabetical order.
- Alarm messages that occur for the 16 RF outputs or the four ASI input ports are listed only once. The numbers in parentheses indicate the range of port numbers that might be affected by the alarm.

Example: The "Input (1-5) errored MPEG packet" description corresponds to the Input port that is affected.

LCD Description	Alarm Level	Probable Cause	Check and Correct
Craft event change	Status	GQAM settings were viewed or changed from the craft port	Verify that all services are still functioning correctly
Fans failure (1-6)	Major	Ventilation fan failure	Contact Cisco Services
Front panel event change	Status	GQAM settings were changed from the craft port	Verify that all services are still functioning correctly
Hardware error	Major	General-purpose hardware error or failure	Contact Cisco Services
Input (1-5) errored MPEG packets	Minor	Error occurred in the header of MPEG packets as they arrived at the indicated Input port	Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
Input (1-5) FIFO overflow See also Input (1-5) packets were dumped	Minor	First-in first-out (FIFO) overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the GQAM ■ The data rate as defined from the DNCS for the GQAM session is too low, which also means that the data rate of the ASI input to the GQAM is too high ■ Hardware problem ■ Incorrect modulation mode	■ Reduce the data rate of input to the GQAM by doing the following: – Reducing amount of incoming data – Reducing amount of data added to the stream – Increasing the modulation mode ■ Verify and correct session rate targets and threshold values ■ Contact Cisco Services
Input (1-5) loss of input signal	Major	No signal. This indicates one or more of the following conditions: ■ An upstream device that provides input to the GQAM has failed or is offline ■ A cable has been disconnected	■ Check for loose or broken DVB ASI or GbE cable connections ■ Check that DVB ASI and GbE outputs of upstream devices are active ■ Run the Doctor Report to troubleshoot network connectivity issues ■ Contact Cisco Services
Input (1-5) MPEG continuity error	Minor	MPEG continuity error counter; one or more MPEG packets have been dropped	■ Check one or more upstream devices connected to the GbE ports or the DVB ASI input ports ■ Contact Cisco Services
Input (1-5) MPEG Transport Error	Minor	MPEG transport error indicator counter; error occurred in the header of the MPEG packet	■ Check one or more upstream devices connected to the GbE ports or the DVB ASI input ports ■ Run the Doctor Report to troubleshoot network connectivity issues ■ Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
Input (1-5) packets were dumped See also Input (1-5) FIFO overflow.	Minor	FIFO overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the GQAM ■ The data rate as defined form the DNCS for the GQAM session is too low, which also means that the data rate of the ASI input to the GQAM is too high ■ Hardware problem ■ Incorrect modulation mode	■ Reduce the data rate of input to the GQAM by doing the following: – Reducing amount of incoming data – Reducing amount of data added to stream – Increasing modulation mode ■ Run the Doctor Report to troubleshoot connectivity issues ■ Contact Cisco Services
OUT (1-16) FIFO overflow	Minor	FIFO overflow occurred and packet data has been lost. This indicates one or more of the following conditions: ■ Too many sessions defined from the DNCS for the GQAM ■ The data rate as defined from the DNCS for the GQAM session is too low, which also means that the data rate of the ASI input to the for the GQAM session is too high ■ Hardware problem ■ Incorrect modulation mode	■ Reduce the data rate of input to the GQAM by doing the following: – Reducing amount of incoming data – Reducing amount of data added to stream – Increasing modulation mode ■ Verify and correct session rate targets and threshold values ■ Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
OUT (1-16) Packets dropped See also Input (1-5) FIFO overflow	Minor	Low priority packets are being dropped. The number of packets at the identified RF output carrier exceeds its capacity. This indicates one or more of the following conditions: ■ Too may sessions defined from the DNCS for the for the GQAM session ■ The data rate as defined from the DNCS for the for the GQAM session is too low, which also means that the data rate of the ASI input for the for the GQAM session is too high ■ Hardware problem ■ Incorrect modulation mode	■ Reduce the data rate of input to the GQAM by doing the following: – Reducing amount of incoming data – Reducing amount of data added to stream – Increasing modulation mode ■ Verify and correct session rate targets and threshold values ■ Reduce total number of MPEG programs by deleting sessions ■ Use a TV to verify program availability ■ Contact Cisco Services
Reset Detected	Status	GQAM has been reset by either a power loss or a manual reset	Session and alarm provisioning are sent to the GQAM automatically from the DNCS. However, you should also check the following: ■ Verify that there are still no broadcast services on this GQAM ■ Verify that the reset did not adversely affect broadcast services ■ Run the Doctor Report to troubleshoot any network connectivity issues ■ Contact Cisco Services
RF (1-4) Comm Failure	Major	Digital I/O board is not communicating with the modulator RF board MCU at the specified RF OUT module (1-4). This problem could be caused by a loose or broken cable or by the modulator MCU not being programmed correctly	■ Reset the GQAM ■ Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
RF (1-4) DC Lock detect error See also RF (1-4) UC Lock detect error	Major	■ Downconverter (DC) lock detect signal not functioning correctly. During Modulator MCU Power On Self Test (POST), the lock detect signal from the downconverter phase-locked loop (PLL) did not indicate an unlocked condition when one existed **Note:** Since the MCU cannot correctly detect locked or unlocked status, the RF Output field displays "MUTED" when this condition occurred ■ The output converter synthesizer lock detect circuitry has malfunctioned	Contact Cisco Services
RF (1-4) DC PLL unlocked	Major	Downconverter (DC) PLL synthesizer cannot lock. The output frequency may not be correct. The RF Output field displays "MUTED" when this condition exists	Contact Cisco Services
RF (1-4) EEPROM failure	Minor	Modulator EEPROM failure. The EEPROM on the modulator board is not present or is not operational. If this alarm is set, RF calibration data is not available and the "RF (1-4) Level not calibrated" alarm is also active	Contact Cisco Services
RF (1-4) Exceeded max temp	Minor	The internal temperature of the GQAM is more than 70°C (158°F)	■ Remove vent obstructions ■ Provide more cooling and ventilation ■ Check the exhaust fans ■ Contact Cisco Services **Important:** You should check the temperature on the GQAM daily or more frequently if possible.
RF (1-4) level not calibrated	Minor	One of the RF Level settings is not calibrated to the correct frequency or the EEPROM that stores the calibration data is not operational	Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
RF (1-4) Power Supply failure	Minor	At least one internal power regulator failed. The RF Output field displays "MUTED" when this condition exists	Contact Cisco Services
RF (1-4) UC Lock detect error	Major	Upconverter (UC) PLL lock detect signal is functioning incorrectly. The RF Output field displays "MUTED" when this condition exists	Contact Cisco Services
RF (1-4) UC PLL unlocked	Major	Modulator UC PLL is unlocked. The output frequency may not be correct. The RF Output field displays "MUTED" when this condition exists	Contact Cisco Services
Runtime error (Operating System)	Major	General purpose software error	■ Reset the GQAM by the power switch or, if possible, by DNCS Control ■ Contact Cisco Services
"Session *xxx* ca error" where *xxx* is a number from 0-991	Minor	An error in the conditional access (CA) encryption for a session has been detected. This could mean that an unencrypted signal is being transmitted	■ Delete the failed session and then restart the session ■ Check and correct the package setup and encryption settings on the DNCS ■ Check the VOD sessions for bad interactive session key (ISK) messages ■ Check all hardware settings ■ Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
"Session *xxx* data error" where *xxx* is a number from 0-991	Minor	The data flow for the session is lesser or greater than what has been defined by the DNCS for the session indicating one of the following underflow or overflow conditions: ■ **Cause Code 1 - Underflow –** This session data rate for the session drops to 0 (zero) or is less than expected **Important:** The session rate dropping to 0 (zero) triggers an underflow alarm, but is not the result of a loss of signal condition. When a loss of signal occurs, the underflow alarm is not reported. This prevents the system from being overwhelmed with a large number of session data alarms. Alarms that occur as a result of higher level alarms are not reported. ■ **Cause Code 2-Overflow –** The data rate for this session exceeds the provisioned data rate	■ Verify and correct any session setup problems including the session rate target value. If session data is correct, data may be corrupted because of hardware problems. **Note:** Select data rates that you believe the program should not exceed. ■ For the overflow condition, teardown, rebuild, and then restart the session using a higher bandwidth ■ Run the Doctor Report on the DNCS and examine the report for any network connectivity issues or indications of loss of services ■ Contact Cisco Services
		Cause Code 3 - PID enable error –- A PID that should be enabled is not enabled on the GQAM	■ If this alarm occurs with this Cause Code and then quickly clears, it is not a cause for concern ■ Check the content of the input stream using an MPEG analyzer
		Cause Code 6 - Continuity error – This alarm identifies the specific session on which the Input Port (1-5) continuity error alarm occurred	Contact Cisco Services
		Cause Code 7 - PLL unlocked – The phase lock loop is unlocked for the given session	Contact Cisco Services

LCD Description	Alarm Level	Probable Cause	Check and Correct
		Cause Code 8 - Excess glue frame events – Glue frames prevent macroblocking. Excess glue frame events indicate that the associated output port is receiving too much data. When the MPEG engine in the GQAM nears full output capacity, it begins to selectively choose video PIDs on which it will issue a "freeze frame" code in the MPEG video stream for that program and will drop the video packets for that session momentarily. This will happen only for sessions in which blue framing was enabled when the sessions was created. If this alarm occurs frequently, it is a signal that the output QAM carrying that session contains to much data	Reallocate the session from the QAM that appears to contain too much data to another QAM on the same GQAM modulator or to another GQAM modulator
"Session xxx program error" where xxx is a number from 0 to 991	Minor	**Cause Code 1 –** A cyclic redundancy check (CRC) error was detected on a PMT	Delete the session
		Cause Code 2 – A new program map table (PMT) was detected	This is for information only. No action is required
		Cause Code 3 – An attempt to create a session failed	Teardown and rebuild the session
		Program Specific Information (PSI) Table data for the session contains errors	■ Check the upstream MPEG input sources connected to the GQAM ■ Contact Cisco Services

Troubleshooting Boot Screen Error Messages

This section contains examples of warning screens associated with booting error conditions. Some booting error conditions may require you to contact us.

Booting Error Messages

The following table lists booting error conditions sorted alphabetically by error type, and provides suggestions for correcting the error condition.

Error Condition	LCD Messages	Check and Correct

Application Code Download Failure Screens	■ Bad TFTP Checksum
	The following message appears if the GQAM is unable to download application code execution files from the TFTP server due to a bad checksum.
	`Bad TFTP App Checksum`
	`Restarting...`
	The GQAM automatically reboots.
	■ Unable to TFTP App Code (Boot Mode=2)
	The following message appears if the GQAM is unable to download application code execution files from the TFTP server during boot mode 2.
	`Unable to TFTP App Code`
	`Restarting...`
	The GQAM automatically reboots.
	Unable to TFTP App Code (Boot Mode=1)
	The following message appears if the GQAM is unable to download the application code execution files from the TFTP server during boot mode 1.
	`Unable to TFTP App Code`
	`Continuing Startup...`
	The GQAM then starts the application program.
		■ A corrupted application file may cause this condition.
		■ Reinstall the GQAM package on the DNCS if all GQAMs have this error condition.
		■ Check IP connectivity.
		■ Contact Cisco Services.
		Note: Refer to ***Understand the Boot Process*** (on page 62) for detailed descriptions of the boot process.

Error Condition	LCD Messages	Check and Correct

Boot Download Failure Screens	■ Unable to TFTP Boot Code (Boot Mode=1)
	The following message appears if the GQAM is unable to download the boot code execution file from the TFTP server during boot mode 1.
	`Unable to TFTP Boot Code`
	`Continuing Startup...`
	The GQAM then starts the application program.
	■ Unable to TFTP Boot Code (Boot Mode=2)
	The following message appears if the GQAM is unable to download the boot code execution file from the TFTP server during boot mode 2.
	`Unable to TFTP Boot Code`
	`Restarting...`
	The GQAM then automatically reboots.
		■ An incorrect DNCS configuration may also cause this condition.
		■ Reinstall the GQAM package on the DNCS if all GQAMs have this error condition.
		■ Check IP connectivity.
		■ Contact Cisco Services.

Default Status Screen	If an RF carrier channel cannot be accessed or is missing, the following message appears:
	`CH1`
	`Info Not Available`
		■ A possible RF hardware problem occurred.
		■ Contact Cisco Services.

Incorrect Configuration File Screens	■ Invalid Config File (Boot Mode 1)
	The following message appears when in boot mode 1 and the configuration file type is incorrect for the GQAM. The first line of the configuration file contains GqamBootpFileType=1.0.
	`Invalid File format`
	`Continuing Startup...`
	The GQAM then starts the application program.
	■ Invalid Config File (Boot Mode 2)
	The following message appears when in boot mode 2 and the configuration file type is incorrect for the GQAM. The first line of the configuration file contains GqamBootpFileType=2.0.
	`Invalid File format`
	`Restarting...`
	The GQAM then automatically reboots.
		■ Correct the configuration file.
		■ Contact Cisco Services.

Error Condition	LCD Messages	Check and Correct

RF Module Code Download Failure Screen	■ Unable to TFTP RF Code
	The following message appears if the GQAM is unable to download the RF module code execution files for boot mode 1 or boot mode 2 from the TFTP server.
	`Unable to TFTP RF Code`
	`Restarting...`
	The GQAM then automatically reboots.
		■ Check the configuration file.
		■ Check for an incorrect IP address, boot mode, or DNCS address.
		■ Reinstall the GQAM package on the DNCS if all GQAMs have this error condition.
		■ Check IP connectivity.
		■ Contact Cisco Services.

Unable to Boot Successfully	■ Unable to perform BootP (Boot Mode 1)
	The following message appears if the GQAM is in boot mode 1 while unable to perform a successful boot process (BootP).
	`Unable to perform BootP`
	`Continuing Startup...`
	The GQAM then starts the application program.
	■ Unable to perform Bootp (Boot Mode 2)
	The following message appears if the GQAM is in boot mode 2 while unable to obtain a successful BootP.
	`Unable to perform BootP`
	`Restarting...`
	The GQAM then automatically reboots.
		■ Verify that the Ethernet port is connected and that the MAC address for the unit matches the MAC address listing on the DNCS.
		■ Contact Cisco Services.

Error Condition	LCD Messages	Check and Correct

Unable to Download Configuration File from TFTP Server	■ Unable to TFTP Config File (Boot Mode 1)
	The following message appears when in boot mode 1 and the GQAM is unable to download the configuration file from the TFTP server.
	`Problem with Config File`
	`Continuing Startup...`
	The GQAM then starts the application program.
	■ Unable to TFTP Config File (Boot Mode 2)
	The following message appears when in boot mode 2 and the GQAM is unable to download the configuration file from the TFTP server.
	`Problem with Config File`
	`Restarting...`
	The GQAM then automatically reboots.
		■ Verify that the configuration file provisioned on the DNCS is present in the DNCS File system.
		■ An incorrect DNCS configuration may cause this error condition.
		■ Contact Cisco Services.

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.

A

Technical Specifications

Introduction

This appendix lists the power, rack, and environmental requirements for installing the GQAM and provides technical specifications.

In This Appendix

Installation and Operation Requirements

This section contains tables that define specifications specific to installing and operating the GQAM.

Power Requirements Table

Item	Specification
Supply Voltage	■ 90 to 130 VAC @ 47 to 63 Hz (AC unit) ■ 180 to 264 VAC @ 47 to 63 Hz (AC unit) ■ -42 to -57 VDC (DC unit)
Fuses	■ 4.0 A SLO BLO 250 V (AC unit) ■ 6.3 A SLO BLO 250 V (DC unit)
Line Frequency	47 to 63 Hz (AC unit only)
Power Required	155 VA (typical)
Power Dissipated	151 Watts (typical)
In Rush Current	■ 35 amps maximum, Vin = 130 VAC (AC unit) ■ 75 amps maximum, Vin = 264 VAC (AC unit) ■ 15 amps maximum, Vin = -57 VDC (DC unit)

Rack Requirements Table

Item	Specification
Rack Mount Type	EIA RS-310
Height	1.75 in./44.45 mm
Width	19 in./482.6 mm
Depth	22.5 in./571.5 mm
Weight	13.5 lb./5.4 kg

Environmental Requirements Table

Item	Specification
Operating Temperature	0° to 50°C (32° to 122°F) **CAUTION:** **Avoid damage to this product! Your warranty is void if you operate this product above the maximum specified operating temperature.** **Use caution when installing wiring and racks to avoid obstruction of air flow into the side air vents of the GQAM, or out of the vent fans at the GQAM side panel**. **Important:** You must use the supplied notched rack mounts (part numbers 734845 and 734846) to mount the GQAM in the rack. These rack mounts allow correct air circulation through the unit.
Storage Temperature Range	–10° to 70°C (14° to 158°F)
Operating Humidity	5 to 95%, non-condensing
Vibration Susceptibility	No data errors with a chassis vibration of 0.5 Gs. No data errors with a vibration frequency of 10 to 400 Hz
Electrostatic Shock Susceptibility	No damage sustained from five discharges of 15 KV IEC electrostatic discharge model (150pF + 150 Ω) to all exposed connections

RF Specifications

Specification	Range
Frequency Range (center frequency)	91 to 869 MHz
Minimum Tuning Step Size	250 kHz
RF Output Power Level	+42 to +54 dBmV minimum range
RF Output Impedance	75 Ω
RF Output Return Loss (carrier on)	> 12 dB (within output channel)
Spurious Outputs (50 MHz to 1.1 GHz) single frequency modulated output related	< -60 dB (relative to the average power of the QAM channel with the highest power level)
Noise Floor (out of band)	< -136 dBc/Hz > 40 MHz from center frequency
Phase Noise	-84 dBc/Hz 10 kHz from carrier -86 dBc/Hz 10 kHz from carrier (typical)
Output Power Level Change Over Tuning Range	± 2.0 dB
Output Frequency Error (over temperature)	< 3 ppm

ASI Input Specifications

Specification	Value
Minimum Sensitivity	200 mV (p-p)
Maximum Input Voltage	880 mV (p-p)
Input Impedance	75 Ω
Input Return Loss	> 17 dB (27 to 270 MHz)

Modulation Specifications

6 MHz Spec	Type	Alpha	Interleaver	Symbol Rate (Msymbols/sec)	Data Rate (megabits/sec)	Bandwidth
ITU-A	DAVIC/ DVB 64	12%	I=12, J=17	5.304	29.328	6 MHz
ITU-A	DAVIC 256	12%	I=204, J=1	5.304	39.104	6 MHz
ITU-B	QAM 64	18%	I=128, J=1	5.056941	26.971 Mb/s	6 MHz
ITU-B	QAM 256	12%	I=128, J=1	5.360537	38.811 Mb/s	6 MHz
ITU-C	DAVIC/ DVB 64	13%	I=12, J=17	5.274	29.162 Mb/s	6 MHz

Digital I/O Performance Specifications

The following table provides digital input and output performance specifications.

Specification	Value
Maximum Input Rate	1.804 Gbps - 213 Mbps for each of the four ASI input ports, plus 952 Mbps (GbE payload rate)
Gigabit Ethernet Input Rate	952 Mbps (max)
Maximum Aggregate Output Rate (including data insertion)	620 Mbps
Maximum Total Sessions	992
Maximum Number of Sessions per Output	61 sessions per channel
Maximum Number of PIDs per Session	16
Maximum Number of PIDs per Input Transport	8192, per MPEG spec
Maximum Number of PIDs for all Input Transports	32K
Maximum Packet Insertion Rate (for externally sourced packets)	500 Kbps maximum; 1 Kbps minimum

Connector Type

Item	Connector
Gigabit Ethernet	SFP module connectors. Modules are available for single mode fiber, multi- mode fiber, and copper interfaces
10/100 Base-T Ethernet	RJ-45
AC Power	IEC 320 connector
DC Power	2 Termi-Blok 90 degree header
ASI Inputs (4)	BNC, 75 Ω
Craft (serial port) I/O	DB-9 female
RF Output (only 2 are used)	Type F connectors, 75 Ω

Factory Default Settings

Value	Factory Setting
Boot Mode	2
Carrier Mode	Modulated
Encryption	PowerKEY
ITUB Interleave	128, 1
LCD Contrast	80%
Modulation Type	ITUB 256
RF Frequency	Highest Center Frequency Setting (867 MHz)
RF Mute	Off (the output is *not* muted)
RF Output Level	Midrange setting (50 dBmV)

Standard Output Frequencies

The following table provides an example of channel center frequency settings listed in 6 MHz increments between 93 and 867 MHz.

Important: This modulator also supports all Standard, Harmonically Related Carrier (HRC), and Incremental Related Carrier (IRC) frequency lineups. This table is for reference purposes only.

93	99	105	111	117	123	129	135	141	147
153	159	165	171	177	183	189	195	201	207
213	219	225	231	237	243	249	255	261	267
273	279	285	291	297	303	309	315	321	327
333	339	345	351	357	363	369	375	381	387
393	399	405	411	417	423	429	435	441	447
453	459	465	471	477	483	489	495	501	507
513	519	525	531	537	543	549	555	561	567
573	579	585	591	597	603	609	615	621	627
633	639	645	651	657	663	669	675	681	687
693	699	705	711	717	723	729	735	741	747
753	759	765	771	777	783	789	795	801	807
813	819	825	831	837	843	849	855	861	867

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