Configuring the Cisco uMG9850 QAM Module

This document describes how to configure the Cisco uMG9850 QAM Module. The Cisco uMG9850 supports the ITU-T J.83 Annex B standard for the delivery of digital video and audio signals.

This module, designed for Cisco Catalyst 4500 series switches, supports the delivery of digital broadcast and video-on-demand (VoD) services on a hybrid fiber coax (HFC) cable network. It accepts Moving Pictures Expert Group-2 (MPEG-2) digital video from an IP network, and outputs the video as a quadrature amplitude modulated (QAM) RF stream that can be received by digital set-top boxes (STBs) over the cable network.

Feature History for the Cisco uMG9850 QAM Module

Release	Modification
Release 12.1(20)EU	This feature was introduced on the Cisco uMG9850.
Release 12.1(20)EU1	Support was added on the Cisco uMG9850 for UDP port mapping in emulation mode and program data delivery (PDD).
Release 12.2(20)EU	Support was added on the Cisco uMG9850 for MPEG-2 digital broadcast services, enhanced video routing, and an enhanced Simple Network Management Protocol (SNMP) Management Information Base (MIB).

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Contents

Information About the Cisco uMG9850 QAM Module

This section introduces the following concepts that are important in understanding how this product works:

Basic Concepts

To configure and use the Cisco uMG9850 series, note the following concepts.

Digital Video

- Video on demand (VoD)—VoD service provides the cable subscriber with VCR-like control over a video program. The service can be offered as a transactional (pay per view), subscription (flat fee), or free service. The digital video content is stored on a VoD server in the local cable system, and streamed in real time to the set-top box (STB) upon request. The VoD server and STB client applications communicate through an out-of-band network to initiate a VoD session and control the stream playout. The VoD server provides tuning information (for example, RF frequency, MPEG program number) to enable the STB client to tune to the VoD program. The VoD program is typically output by the VoD server in a single program transport stream (SPTS) encapsulated in UDP/IP for transmission to the Cisco uMG9850, which multiplexes several SPTS into a multiple program transport stream (MPTS) for delivery on a QAM channel to the STB. Each VoD stream is unicast to a single cable subscriber.

- Stream—A stream is the output from an MPEG audio or video encoder. The output of a single encoder is an elementary stream (ES). One video stream and one or more audio streams can be combined by means of a shared clock reference into a program, which is the basic unit of a digital video service.

  For digital video services on a cable network, video and audio streams are transmitted in a transport stream, which uses fixed-size packets for digital transmission. One or more programs can be combined in a transport stream. An SPTS contains only one program, and an MPTS contains multiple programs. The Cisco uMG9850 accepts both an SPTS and an MPTS as input, and outputs an MPTS for transmission to an STB. A program clock reference (PCR) is included for each program in the transport stream. Transport streams also contain information for the STB to locate a selected program.

- Session—A session is a stream of video programming being received over an IP network. Sessions can be unicast or multicast. A unicast session is identified by its UDP port number. A multicast session is identified by its multicast group address. A session can be mapped to one or more QAM channels on a Cisco uMG9850.

- Program—A program is the audio and video content being delivered to customers.

- Packet identifier—Each elementary stream in a program is identified by a unique packet identifier (PID). The PID of each elementary stream in an MPTS output by the Cisco uMG9850 must be unique, so the STB can locate a selected program. The Cisco uMG9850 may change the PID of one or more elementary streams in an incoming SPTS, to ensure the uniqueness of PIDs in an outgoing MPTS.

✎
Note   PIDs can range from 0 to 8191, but PIDs 0 and 1 are preassigned, and PIDs 2 through 15 are reserved for system use.

- Program-specific information (PSI)—Each transport stream includes a program association table (PAT) that lists every program in the stream. Each program's entry in the PAT points to a program map table (PMT), which lists the PID for each elementary stream that makes up each program in the transport stream.

- Service information (SI)—Service information provides the data necessary for navigation among digital service offerings. SI may be carried within a program (with audio/video streams) or as a separate data stream. SI is typically conveyed in accordance with a standard protocol such as the Advanced Television Systems Committee (ATSC) Program and System Information Protocol (PSIP) and Digital Video Broadcasting Service Information (DVB-SI).

- UDP port map—For unicast sessions, a User Datagram Protocol (UDP) port map describes the relationship between (1) the UDP port number of a session and (2) the QAM channel and program number to be assigned to that session. The Cisco uMG9850 uses the UDP port map to route each incoming program to the correct QAM channel or channels. The Cisco uMG9850 includes a default port map, which may be overwritten with a user-defined UDP port map. The video source (VoD server or statistical multiplexer) and the Cisco uMG9850 must be configured with the same UDP port map.

- Program Data Delivery (PDD)—STB client applications such as an electronic program guide (EPG), which enables the cable subscriber to browse and select content for viewing, require program data to be delivered from the respective server application in the headend. (For more information about this feature on the Cisco uMG9850, see Program Data Delivery, page 11.)

- Service group—A service group is a group of STBs that have access to a common set of broadcast and narrowcast QAM channels. The STBs in a service group share the narrowcast QAM channels.

- Stream cloning—Certain video and program data streams are delivered to multiple STBs. Because STBs are divided into service groups, these streams have to be delivered on at least one QAM channel in each service group. To utilize the IP network most efficiently, a single copy of each stream is transmitted to the Cisco uMG9850, which then "clones" (makes multiple copies of) the stream for output on multiple QAM channels. Stream cloning instructions are predetermined by user commands on the Cisco uMG9850.

  Cloning is useful for digital broadcast services when the QAM channels are not electrically split for delivery to all service groups. Multicast streams can be cloned to QAM channels on multiple Cisco uMG9850 modules, while unicast streams can be cloned to QAM channels on a single Cisco uMG9850.

Digital Broadcast

Digital broadcast service provides the cable subscriber with a large selection of programs and a high-quality picture. The digital video content is typically received from a satellite broadcasting to a receiver at the headend, from where it is delivered in real time to all subscribers in the cable system. A

statistical multiplexer is often used in the headend to combine broadcast programs from multiple sources and generate an MPTS for delivery to the STBs. Program information is also sent to the STB client application, to enable the cable subscriber to browse and select a broadcast program for viewing.

The Cisco uMG9850 supports the following key features for delivering digital broadcast services:

- Multicast sessions—Each digital broadcast program is typically delivered to all STBs in a cable system. Multiple QAM channels are allocated for digital broadcast programs, and each QAM channel is electrically split for delivery to each service group. To utilize the IP network most efficiently, digital broadcast programs are multicast by the statistical multiplexer (or other video source) to the Cisco uMG9850. The Cisco uMG9850 uses the multicast group address and source address of each multicast session to route each incoming program to the correct QAM channel or channels. The relationship between the multicast group address and the QAM channels is predetermined by user commands on the Cisco uMG9850.

- MPTS pass-through—Digital broadcast services are typically delivered in an MPTS from a statistical multiplexer (or other video source) to the Cisco uMG9850. The Cisco uMG9850 passes the MPTS through to the STBs without remultiplexing the video streams. The Cisco uMG9850 may update the PCR or TSID information in the MPTS as necessary to output a valid transport stream. The Cisco uMG9850 outputs the MPTS on one or more QAM channels based on the UDP port map (for unicast sessions) or multicast group address (for multicast sessions) of the incoming stream.

Video Configuration Modes

It is helpful to understand the various command modes that are used to configure and monitor video services. The following command modes are illustrated in this document:

- Privileged EXEC Mode
- Global Configuration Mode
- Interface Configuration Mode
- Subinterface Configuration Mode

Privileged EXEC Mode

Use this configuration mode to execute **show** and **debug** commands that are specific to video, as well as to other functions on the switch. The following prompt illustrates privileged EXEC mode:

```
Switch#
```

Global Configuration Mode

Use this configuration mode to enter interface and subinterface provisioning modes (through the **configure terminal** command), to execute commands that support video on the entire switch. The following shows how to enter global provisioning mode:

```
Switch# config terminal
Switch(config)#
```

Interface Configuration Mode

There are 12 QAM ports or interfaces (F-connectors) on the Cisco uMG9850, in three RF modulator circuit packages with four F-connectors each. Each package performs QAM modulation and RF upconversion.

The four QAM ports in each modulator circuit package are split into two modulator groups. Thus, each modulator group consists of two QAM ports. Ports 1 and 2 form the first modulator group, ports 3 and 4 form the second modulator group, and so on. There are a total of six modulator groups on the Cisco uMG9850. Both QAM ports in a modulator group share the same video format and interleave settings.

Each QAM port supports two QAM channels, and is addressed as a upconverter group. When both QAM channels are enabled, the output of a QAM port occupies 12 MHz of contiguous bandwidth. Thus, the center frequencies of the two QAM channels in an upconverter group are offset by 6 MHz. Both QAM channels in an upconverter group operate at the same output power.

Video and asynchronous serial interface (ASI) interfaces are addressed, respectively, by the **interface qam** *interface* command and the **interface asi** *interface* command, as follows:

interface—Slot and port number in *slot*/*port* format, where *slot* is the physical slot in which the Cisco uMG9850 module resides in the switch, and *port* is the port on the module. The valid range for *slot* varies with the type of switch (see Determining the Location of a Cisco uMG9850 in the Switch, page 12). The valid range for a video (QAM) port is 1 to 12, with no default.

Address a video interface as in the following example for a module in slot 6:

```
Switch(config)# interface qam 6/1
Switch(config-if)#
```

The ASI port is always port 15. Address an ASI interface as in the following example for a module in slot 6:

```
Switch(config)# interface asi 6/15
Switch(config-if)#
```

Subinterface Configuration Mode

QAM channels are addressed as *interface.qam*, where *interface* is *slot*/*port* (discussed above), and *qam* is the QAM channel of interest. The options for *qam* are 1 or 2, with no default.

Address a QAM channel as in the following examples for a module in slot 6:

```
Switch(config)# interface qam 6/1.1
Switch(config-subif)#
```

   or

```
Switch(config)# interface qam 6/1.2
Switch(config-subif)#
```

Tip For convenience in entering QAM channel provisioning mode, simply address *slot/port*.**1**

UDP Port Mappings: Default, Manual, and Emulation Mode

This section discusses the binary mapping scheme for user datagram protocol (UDP) port numbers (also referred to as session numbers) as used by the Cisco uMG9850 for default mappings, as well as issues related to remapping UDP ports manually when default configurations are not used. An emulation mode feature facilitates the redirection of video streams destined for third-party QAM gateways to a Cisco uMG9850.

The following topics are presented:

• Default Cisco uMG9850 Binary Mapping Scheme for UDP Port Numbers

- Manual Mapping
- Emulation Mode

Default Cisco uMG9850 Binary Mapping Scheme for UDP Port Numbers

Table 1 on page 7 illustrates the default binary mapping scheme used by the Cisco uMG9850 to map a UDP port number to a slot, QAM channel, and program number (from most-significant to least-significant bit, respectively). These default mappings are used for preconfigured UDP port mappings.

Note To accommodate additional shelves in future Cisco switches, the default mapping has been changed from that in the previous release. One extra bit has been allocated for the slot number in default UDP port mapping.

Normally, UDP port mappings are preconfigured in a file that resides on the VoD server and *must conform* to the mapping scheme in Table 1. Otherwise, new UDP port mappings must be entered manually. See Manual Mapping, page 8.

Table 1   Default Cisco uMG9850 Binary Mapping Scheme for UDP Port Numbers

1	Slot				QAM channel						Program number				
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

- There are 16 bits in the UDP port number, from bit 15 to bit 0.
- Bit 15 is set to 1.
- Bits 14 through 11 define the slot number. Range is 3 to 9.
- Bits 10 through 5 define the QAM number. Range is 1 to 24.
- Bits 4 through 0 define the program (or session) number. Range is 1 to 25.

  Example: UDP port number 38946 (0x9822) renders in binary as 1 0011 000001 00010. Following the fixed bit (1), this represents slot 3 (0011), QAM 1 (000001), and program 2 (00010).

Note A Cisco uMG9850 can accept a maximum of 600 maps: 24 QAM channels times 25 programs.

Table 2 on page 7 shows the default mapping of QAM subinterfaces and channels to UDP ports.

Table 2   Default Mapping of QAM Subinterfaces and Channels to UDP Ports

QAM Subinterface (slot/port.qam)	QAM Channel	UDP Port Range					
		Slot 2[1]	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7[2]
slot/1.1	1	36897–36921	38945–38969	40993–41017	43041–43065	45089–45113	47137–47161
slot/1.2	2	36929–36953	38977–39001	41025–41049	43073–43097	45121–45145	47169–47193
slot/2.1	3	36961–36985	39009–39033	41057–41081	43105–43129	45153–45177	47201–47225
slot/2.2	4	36993–37017	39041–39065	41089–41113	43137–43161	45185–45209	47233–47257

Table 2   Default Mapping of QAM Subinterfaces and Channels to UDP Ports (continued)

QAM Subinterface (slot/port.qam)	QAM Channel	UDP Port Range					
		Slot 2[1]	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7[2]
slot/3.1	5	37025–37049	39073–39097	41121–41145	43169–43193	45217–45241	47265–47289
slot/3.2	6	37057–37081	39105–39129	41153–41177	43201–43225	45249–45273	47297–47321
slot/4.1	7	37089–37113	39137–39161	41185–41209	43233–43257	45281–45305	47329–47353
slot/4.2	8	37121–37145	39169–39193	41217–41241	43265–43289	45313–45337	47361–47385
slot/5.1	9	37153–37177	39201–39225	41249–41273	43297–43321	45345–45369	47393–47417
slot/5.2	10	37185–37209	39233–39257	41281–41305	43329–43353	45377–45401	47425–47449
slot/6.1	11	37217–37241	39265–39289	41313–41337	43361–43385	45409–45433	47457–47481
slot/6.2	12	37249–37273	39297–39321	41345–41369	43393–43417	45441–45465	47489–47513
slot/7.1	13	37281–37305	39329–39353	41377–41401	43425–43449	45473–45497	47521–47545
slot/7.2	14	37313–37337	39361–39385	41409–41433	43457–43481	45505–45529	47553–47577
slot/8.1	15	37345–37369	39393–39417	41441–41465	43489–43513	45537–45561	47585–47609
slot/8.2	16	37377–37401	39425–39449	41473–41497	43521–43545	45569–45593	47617–47641
slot/9.1	17	37409–37433	39457–39481	41505–41529	43553–43577	45601–45625	47649–47673
slot/9.2	18	37441–37465	39489–39513	41537–41561	43585–43609	45633–45657	47681–47705
slot/10.1	19	37473–37497	39521–39545	41569–41593	43617–43641	45665–45689	47713–47737
slot/10.2	20	37505–37529	39553–39577	41601–41625	43649–43673	45697–45721	47745–47769
slot/11.1	21	37537–37561	39585–39609	41633–41657	43681–43705	45729–45753	47777–47801
slot/11.2	22	37569–37593	39617–39641	41665–41689	43713–43737	45761–45785	47809–47833
slot/12.1	23	37601–37625	39649–39673	41697–41721	43745–43769	45793–45817	47841–47865
slot/12.2	24	37633–37657	39681–39705	41729–41753	43777–43801	45825–45849	47873–47897

1. Cisco Catalyst 4506 only

2. Cisco Catalyst 4507R only

> **Note**   To change UDP portmapping from the default, use the command video <slot> route vlan, page 124. See also Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14.

Manual Mapping

To create a nondefault mapping manually, use a number starting with decimal 49152 (or hexadecimal 0xc000) to configure a UDP port mapping for one session or a range of sessions at a time. (Numbers can be entered in either format. The system automatically identifies a hexadecimal input by its "0x" prefix). Table 3 on page 9 shows nondefault UDP port ranges in decimal and hexadecimal formats.

> **Note**   All user-configured UDP port mappings must begin with decimal 49152 (or hexadecimal 0xc000).

Table 3   Nondefault UDP Port Ranges

From		To	
Decimal	**Hexadecimal**	**Decimal**	**Hexadecimal**
49152	0xc000	65535	0xffff

Tip   To enter a UDP port mapping manually, any number in the above range is sufficient. The number 49152 is used in the examples in this document.

Emulation Mode

The Cisco uMG9850 is able to emulate the UDP port mapping of third-party QAM gateways that accommodate fixed QAM-channel groups of eight or 24 channels each. Up to three eight-channel gateways or one 24-channel gateway can be emulated. The user's mappings are converted to the scheme used by the Cisco uMG9850, and then are reconverted to the user's mapping scheme. IP addresses are assigned automatically. Mapping schemes for some third-party gateways are presented below.

Third-Party Bitwise 8-QAM Mapping Scheme

Table 4 presents an example bitwise mapping scheme for a third-party QAM gateway.

Table 4   Third-Party Mapping Scheme for UDP Port Numbers

QAM channel								Session number							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

- For bits 15 to 8, one bit represents one QAM channel. QAM channels range from 1 to 8.
- Session (program) numbers range from 1 to 25.
- *Example*: UDP port number 0x1007 represents the following:

  QAM channel 5, program 7

Note   If fewer than three IP addresses are chosen, the QAM channels that would be associated with the unchosen addresses are unused. For the following, see Table 1 on page 7.

- *Example*: Cisco uMG9850 in slot 3. The first IP address is mapped to QAM channels 1 through 8 on the module. An incoming stream sent to the first IP address and UDP port 0x1007 (program 7 on QAM channel 5) is mapped to UDP port 0x98a7 (1 0011 000101 00111) and is output as program 7 on subinterface 3/3.1 (QAM channel 5).
- *Example*: Cisco uMG9850 in slot 3. The second IP address is mapped to QAM channels 9 through 16 on the module. An incoming stream sent to the second IP address and UDP port 0x1007 (program 7 on QAM channel 5) is mapped to UDP port 0x99a7 (1 0011 001101 00111) and is output as program 7 on subinterface 3/7.1 (QAM channel 13).

Third-Party Bytewise 8-QAM Mapping Scheme

The QAM channels and session numbers are partitioned as follows:

- In this scheme the QAM channels are represented by whole one-byte values. QAM channels range from 1 to 8.

- Session (program) numbers range from 1 to 25.

- *Example*: UDP port number 0x1607 represents the following:

  QAM channel 22, program number 7

> ✎
>
> **Note**   If fewer than three IP addresses are chosen, the QAM channels that would be associated with the unchosen addresses are unused. For the following, see Table 1 on page 7.

- *Example*: Cisco uMG9850 in slot 4. The second IP address is mapped to QAM channels 9 through 16 on the module. An incoming stream sent to the second IP address and UDP port 0x0307 (program 7 on QAM channel 3) is mapped to UDP port 0xa167 (1 0100 001011 00111) and is output as program 7 on subinterface 4/6.1 (QAM channel 11).

Third-Party Bytewise 24-QAM Mapping Scheme

The QAM channels and session numbers are partitioned as follows:

- In this scheme the QAM channels are represented by whole one-byte values. QAM channels range from 1 to 24. IP packets can be mapped to any of the 24 QAM channels

- Session (program) numbers range from 1 to 25.

- *Example*: UDP port number 0x1607 represents the following:

  QAM channel 22, program number 7

- *Example*: Cisco uMG9850 in slot 4. The IP address is mapped to QAM channels 1 through 24 on the module. An incoming stream sent to the IP address and UDP port 0x1307 (program 7 on QAM channel 19) is mapped to UDP port 0xa267 (1 0100 010011 00111) and is output as program 7 on port subinterface 4/10.1 (QAM channel 19).

To accommodate the UDP port mapping schemes used by third-party QAM gateways that may already be installed in a VoD network, it is possible to use the **video** *slot* **emulation-mode** command (see video <slot> emulation-mode, page 114). For example, where a third-party QAM gateway supports fixed groups of eight QAM channels, the emulation feature accommodates up to three sequential IP addresses—one for each eight-channel group, as shown in Table 5. The user enters only one IP address when the VLAN is configured (see Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14). The other addresses are configured automatically.

Table 5   IP Addresses and QAM Assignments for Gateways with Eight-QAM Groups

Number of 8-QAM Gateways	IP Address	QAM Assignment
1	1	1–8
2	2	9–16
3	3	17–24

For more information and provisioning examples, see Setting Emulation Modes for UDP Port Mapping (Optional), page 17.

Program Data Delivery

The Program Data Delivery (PDD) support provided by the Cisco uMG9850 makes possible the delivery of electronic program guide (EPG) data, other client data, and navigation data to a client application running on the set-top box, enabling the subscriber to browse and select content for viewing. (PDD applies to both broadcast video and video on demand.) Program data can be delivered to the STB either in-band (on a shared QAM channel with digital video services) or out-of-band (on a DOCSIS or QPSK channel). When delivered in-band, the program data is typically delivered as private data in a low-bitrate MPEG program with multiple PIDs. Most cable systems deliver such data through one or more in-band carousels to which the client tunes at startup, as well as during program navigation, as needed.

Program-related information is streamed from a server, and can be delivered to subscribers in-band through the Cisco uMG9850. The data are encapsulated as SPTS MPEG-2 streams delivered by means of UDP/IP, as regular sessions are. Program data can be unicast or multicast from the server to the Cisco uMG9850.

To maximize the efficiency of the IP network, a single copy of a program data stream is sent to a Cisco uMG9850 QAM channel, where the stream can be cloned to one, several, or all QAM channels. Also, the program data stream may contain program clock references (PCRs), or may be a pure data stream without timing information. To support PDD and similar functionality, the Cisco uMG9850 remaps the PID, either by using the default map or a user-specified configuration.

PDD functionality on the Cisco uMG9850 supports the following:

- Multicast
- Cloning
- Programs having up to 31 elementary streams

Note For example procedures, including conditions and restrictions, see Configuring Program Data Delivery (PDD) Features, page 38.

How to Configure the Cisco uMG9850 QAM Module

This section presents a variety of tasks for configuring the Cisco uMG9850. Table 6 lists these tasks by category. A variety of configurations are possible, depending upon the network design. Most likely, video input is on one switch, and the Cisco uMG9850 modules reside on one or more switches in different subnets. A video stream may or may not use the same VLAN as the modules, and can enter the switch through any Gigabit Ethernet (GE) port that is available.

Table 6   Module Configuration Tasks by Category

Category	Task
Configuring Gigabit Ethernet Input and Output Ports into a VLAN	Determining the Location of a Cisco uMG9850 in the Switch, page 12
	Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14

Table 6   Module Configuration Tasks by Category (continued)

Category	Task
Configuring Video Routing	Configuring Video Routing, page 16
Configuring Video Features on the Cisco uMG9850	Setting Emulation Modes for UDP Port Mapping (Optional), page 17
	Setting the Frequency and Output Power of the QAM Module Channels, page 20
	Setting Up, Editing, and Routing a Video Stream to a QAM Channel, page 22
	Setting Up PSI Parameters, page 32
	Configuring Program Data Delivery (PDD) Features, page 38
	Configuring Digital Broadcast Services, page 44
Monitoring and Troubleshooting	Configuring the ASI Port for QAM Channel Routing (Optional), page 35
	Setting the Video Statistics Interval for All Cisco uMG9850 Modules in the Switch, page 45
	Using show Commands for Troubleshooting, page 46

Determining the Location of a Cisco uMG9850 in the Switch

To provision one or more Cisco uMG9850 modules, you need to know where they reside in the Cisco Catalyst switch. Table 7 shows where the supervisor engines (SEs) and Cisco uMG9850 modules reside in the Cisco Catalyst switch models that support the Cisco uMG9850.

Table 7   Slot Use in Cisco Catalyst Switch Models That Support the Cisco uMG9850

Slot	Cisco Catalyst Switch Model		
	4503	**4506**	**4507**
	Function		
1	Supervisor engine	Supervisor engine	Supervisor engine
2	Cisco uMG9850	Cisco uMG9850	Supervisor engine
3	Cisco uMG9850	Cisco uMG9850	Cisco uMG9850
4	Not used	Cisco uMG9850	Cisco uMG9850
5	Not used	Cisco uMG9850	Cisco uMG9850
6	Not used	Cisco uMG9850	Cisco uMG9850
7	Not used	Not used	Cisco uMG9850

If you do not know where the Cisco uMG9850 modules reside, do the following to determine their locations in the switch.

Tip	You can do this in either user mode (illustrated below) or privileged EXEC mode.

Prerequisites

None

Restrictions

- Generally, you cannot configure a Cisco uMG9850 unless it is physically installed. The exception is the **video** *slot* **route vlan** command, which can be applied to nonsupervisory slots even if they are empty.

- You must wait at least 15 seconds after removing a module before you reinsert it. If you are removing more than one module, you must wait at least 15 seconds before removing the next. If you are inserting more than one module, you must wait at least 15 seconds before inserting the next. Otherwise, an assertion error is raised and you must reboot the switch.

SUMMARY STEPS

1. **show module**

DETAILED STEPS

Step 1
```
Switch> show module

Chassis Type : WS-C4507R

Power consumed by backplane : 40 Watts

Mod Ports Card Type                              Model              Serial No.
---+-----+------------------------------------+------------------+-----------
 1    2  1000BaseX (GBIC) Supervisor(active)     WS-X4515          JAB071306BH
 6   17  24QAM 1SFP 1RJ45(10/100/1000)           WS-X4712-UMG9850  CSJ0726210F

 M MAC addresses                     Hw  Fw          Sw               Status
--+------------------------------+---+-----------+----------------+---------
 1 000c.8572.0000 to 000c.8572.0001 1.2 12.1(12r)EW  12.1(20031007:11 Ok
 6 000c.0c07.abef to 000c.0c07.abff 2.3                              Offline
```

Step 2 Note the location of the QAM modules, under the Model column.

Note	Module names may vary, but the "Card Type" or "Model" is identified by "QAM." This example shows a single Cisco uMG9850 module, in slot 6.

What to Do Next

Proceed to .

Configuring Gigabit Ethernet Input Ports into a VLAN (Optional)

Video streams on inbound GE interfaces are included in single VLANs to use network addresses more efficiently. The IP addresses and subnet masks configured for each VLAN interface populate the IP switching table on the switch with the forwarding information needed to forward the video packets to their destination. The number and use of VLANs varies according to the programming and management needs of the system operator.

Note Though optional, the use of VLANs for dedicated video traffic is recommended. For a detailed discussion, refer to video <slot> route vlan, page 124. Beginning with Release 12.2(20)EU, that command has been enhanced significantly.

Do the following to create a VLAN interface, assign an IP address to the incoming (video source) interface, and assign input GE ports to the VLAN.

Note It is the responsibility of the multiple system operator (MSO) to plan subnets and VLANS and assign addresses carefully.

Prerequisites

None

Restrictions

None

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **vlan** *vlan-id*

4. **state active**

5. **exit**

6. **interface vlan** *vlan-id*

7. **ip address** *ip-address mask*

8. **no shut**

9. **interface gigabitethernet** *interface*

10. **switchport**

11. **switchport access vlan** *vlan-id*

12. **no shut**

13. **exit**

14. Repeat Step 3 through Step 13 for additional VLAN and GE interfaces, as required.

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password when prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`vlan` *vlan-id* **Example:** `Switch(config-vlan)# vlan 20`	(Optional) Enters VLAN configuration mode and creates a Layer 3 switch virtual interface (SVI) for video service if one has not been created yet. Range is 1 to 4096. If a VLAN for video service has been created and made active, proceed to Step 6.

Step 4	`state active`
	
	Example:
	`Switch(config-vlan)# state active`
		Makes the VLAN active.
		
		Tip To confirm which VLANs are active or suspended, use the **show vlan** command and note the Status column.

Step 5	`exit`
	
	Example:
	`Switch(config-vlan)# exit`
		Exits VLAN configuration mode.

Step 6	`interface vlan` *vlan-id* **Example:** `Switch(config)# interface vlan 20`	Enters interface configuration mode for the VLAN created in Step 3.
Step 7	`ip address` *ip-address mask* **Example:** `Switch(config-if)# ip address 192.168.20.4 255.255.255.0`	Assigns an IP interface and subnet mask to the VLAN.

Step 8	`no shut`
	
	Example:
	`Switch(config-if)# no shut`
		Enables the VLAN interface.

Step 9	`interface gigabitethernet` *slot/port* **Example:** `Switch(config-if)# interface gigabitethernet 6/13`	Assigns a GE interface to be included in the VLAN. (See Interface Configuration Mode, page 5.) This is the interface of an incoming video stream. **Tip** If you are unsure of the location of modules you want to configure, see Determining the Location of a Cisco uMG9850 in the Switch, page 12.

	Command or Action	Purpose
Step 10	**switchport** **Example:** Switch(config-if)# switchport	Configures the GE interface as a Layer 2 interface. You must enter this command without any arguments before you can enter the **switchport access vlan** command, below. The **switchport** command is required only if it has not already been entered for the interface.
Step 11	**switchport access vlan** *vlan-id* **Example:** Switch(config-if)# switchport access vlan 20	Configures the GE interface as a static-access port that is a member of the VLAN for video service.
Step 12	**no shut** **Example:** Switch(config-if)# no shut	Enables the GE interface.
Step 13	**exit**	Exits interface configuration mode.
Step 14	Repeat Step 3 through Step 13 for additional VLAN and GE interfaces, as required.	

What to Do Next

Proceed to Configuring Video Routing, page 16.

Configuring Video Routing

The configuration of video routing changed considerably with Cisco IOS Release 12.2(20)EU. For a detailed discussion, see video <slot> route vlan, page 124. A VLAN must be specified, but a default UDP port range is provided. (A UDP port range can be specified if so desired.)

Do the following to route video packets to an explicit range of UDP ports, or use the default UDP port mapping scheme (see Default Cisco uMG9850 Binary Mapping Scheme for UDP Port Numbers, page 7).

Prerequisites

None

Restrictions

None

Note A Cisco uMG9850 module need not be present in the switch chassis to configure video routing. If no module is present, the video streams are dropped as long as video routing is configured correctly.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **video** *slot* **route vlan** *vlan-number* **udp** *x y*
4. **no video** *slot* **route**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password when prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	**video** *slot* **route vlan** *vlan-number* **udp** *x y* **Example:** `Switch(config)# video 3 route vlan 20 udp 49152 65535`	Configures the routing of video packets on a specific VLAN to a specified range of UDP ports. The parameters *x* and *y* set the lower and upper bounds of the range, respectively. In this case, UDP packets sent to the IP address on VLAN 20, with destination ports from 49152 to 65535, are routed explicitly to the Cisco uMG9850 in slot 3. If no UDP port ranges had been given in the command, then the default range from Table 2 on page 7 would be used.
Step 4	**no video** *slot* **route** **Example:** `Switch(config)# no video 4 route vlan`	(Optional) Removes the routing configuration for the module. **Note** For the syntax of this command, see video <slot> route vlan, page 124.

What to Do Next

Proceed to Setting Emulation Modes for UDP Port Mapping (Optional), page 17.

Setting Emulation Modes for UDP Port Mapping (Optional)

As discussed in Emulation Mode, page 9, you can configure the Cisco uMG9850 to emulate the UDP port mapping schemes used by third-party bitwise and bytewise QAM gateways. This task illustrates how to emulate each type of gateway.

Note the following conditions and constraints:

• You must first establish a VLAN, using the **vlan** *vlan-id* command. See Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14.

• You need to establish only one IP address. The additional second or third IP address is added automatically, based on the address established in the previous step.

- Additional IP addresses apply only to bitwise and bytewise eight-channel QAM gateways.

- If any user-defined port map has been configured (see UDP Port Mappings: Default, Manual, and Emulation Mode, page 6), the emulation mode command is denied, with a warning to remove the map first.

- If emulation mode is active, note the following:

  - The **no video** *slot* **route** command is not allowed. (See video <slot> route vlan, page 124). To disable emulation mode, use the **no video** *slot* **emulation-mode** command (see video <slot> emulation-mode, page 114).

  - User-defined mappings are not allowed, through the **video session** command or the **video udp** command.

  - If the UDP range required by the chosen emulation mode is not included in the UDP range used for video routing (see video <slot> route vlan, page 124), the command is rejected with the following message:

    ```
    Cannot support emulation mode if video routing is not configured to include the
    range of UDP ports x to y required for this emulation mode.
    ```

The following shows how to emulate the UDP port mapping of each of the following QAM gateways:

- A third-party 8-channel QAM gateway that uses bitwise mapping

- A third-party 8-channel QAM gateway that uses bytewise mapping

- A third-party 24-channel QAM gateway that uses bytewise mapping

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **video** *slot* **route vlan** *vlan-number*

4. **video** *slot* **emulation-mode bitwise number** *number-ip-address*

5. **video** *slot* **emulation-mode bitwise**

6. **video** *slot* **emulation-mode 8-qam-number**

7. **video** *slot* **emulation-mode 8-qam-number** *number-ip-address*

8. **no video** *slot* **emulation-mode**

9. **video** *slot* **emulation-mode 24-qam-number**

10. **no video** *slot* **emulation-mode**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode. See Global Configuration Mode, page 5.

Step 3	`video` *slot* `route vlan` *vlan-number* **Example:** `Switch(config)# video 6 route vlan 20`	Configures switching of video packets from the input GE port to the QAM channels on the Cisco uMG9850 in the specified slot. The **vlan** keyword is required, to select a Cisco Catalyst VLAN in which to route the packets. See Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14, and video <slot> route vlan, page 124.
Step 4	`video` *slot* `emulation-mode bitwise number` *number-IP-address* **Example:** `Switch(config)# video 6 emulation-mode bitwise number 1`	Sets bitwise emulation mode (explicit IP addresses). This example sets a single IP address. **Note** For the syntax of this command, see video <slot> emulation-mode, page 114.

Step 5	`video` *slot* `emulation-mode bitwise`
	
	Example:
	`Switch(config)# video 6 emulation-mode bitwise`
		Sets bitwise emulation mode (default IP addresses). This example sets three IP addresses automatically.

Step 6	`video` *slot* `emulation-mode 8-qam-number`
	
	Example:
	`Switch(config)# video 6 emulation-mode 8-qam-number`
		Sets bytewise 8-QAM-channel emulation mode with three IP addresses (default).

Step 7	`video` *slot* `emulation-mode 8-qam-number` *number-IP-address* **Example:** `Switch(config)# video 6 emulation-mode 8-qam-number 2`	Sets bytewise 8-QAM-channel emulation mode. This example sets two IP addresses.

Step 8	`no video` *slot* `emulation-mode`
	
	Example:
	`Switch(config)# no video 6 emulation-mode`
		Disables emulation mode and enables default and manual UDP port mapping. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
		
		Step 8 and Step 10 are identical but achieve different objectives.

	Command or Action	Purpose

Step 9	`video` *slot* `emulation-mode 24-qam-number`
	
	Example:
	`Switch(config)# video 6 emulation-mode`
	`24-qam-number`
		Sets bytewise 24-QAM-channel emulation mode with one IP address. (Only one address is supported in this mode.)

Step 10	`no video` *slot* `emulation-mode`
	
	Example:
	`Switch(config)# no video 6 emulation-mode`
		Disables emulation mode.
		
		Note This is required before the **no video** *slot* **route** command can be used.
		
		Step 8 and Step 10 are identical but achieve different objectives.

What to Do Next

Proceed to Setting the Frequency and Output Power of the QAM Module Channels, page 20.

Setting the Frequency and Output Power of the QAM Module Channels

Each F-connector (QAM port) provides two QAM channels, and the output power and frequency are configured for both channels simultaneously. Setting frequency and power for one QAM channel automatically sets the appropriate values for the other channel in the same interface.

For background, see Interface Configuration Mode, page 5. QAM channels are provisioned in subinterface mode (see Subinterface Configuration Mode, page 6), which provides logical access to the subinterface command set for a given slot and port. Generally speaking, consider the provisioning of such basic functions as frequency and power, modulation format (see Setting the Modulation Format, page 23), and forward error correction (FEC) interleave level and mode (see Configuring the FEC Interleave Level and Mode, page 24) as taking place on both *slot*/*port* QAM channels simultaneously and automatically. Setting the power for one channel automatically sets the same power level on both channels. Configuring the frequency for one QAM channel automatically configures the correct frequency for the other QAM channel in its upconverter group. The frequency bandwidth of each QAM upconverter block is 12 MHz. Consequently, if *slot*/*port*.1 is set to frequency f1, then *slot*/*port*.2 is automatically set to frequency f1 + 6 MHz. Similarly, if *slot*/*port*.2 is set to frequency f2, then *slot*/*port*.1 is automatically set to frequency f2 – 6 MHz.

Do the following to set the frequency and output power of both QAM channels on a port in a Cisco uMG9850.

Prerequisites

None

Restrictions

None

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface qam** *interface.qam*

4. **video frequency** *frequency*

5. **video power** *power*

6. Monitor video frequency and power.

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`interface qam` *interface.qam*
	
	Example:
	`Switch(config)# interface qam 6/1.1`
	`Switch(config-subif)#`
		Enables subinterface configuration mode. See Subinterface Configuration Mode, page 6.
		
		Note For the syntax of this command, see interface qam, page 85.

Step 4	`video frequency` *frequency* **Example:** `Switch(config-subif)# video freq 800`	The frequency range for QAM *slot*/*port*.1 is 50 through 854 MHz, and for QAM *slot*/*port*.2 is 56 through 860 MHz. **Note** For the syntax of this command, see video frequency, page 139. **Tip** Frequency conflicts can result in undesirable results, depending on how QAM channels are cabled. To configure the software either to allow frequency conflicts or to check for them and block conflicting assignments, use the command video \<slot\> frequency allow-any, page 117.

	Command or Action	Purpose
Step 5	**video power** *power* **Example:** `Switch(config-subif)# video power 50`	When both QAM channels in an RF port are enabled, the allowed power range is 42 to 55 dBmV (102 to 115 dBmicroV). If only one QAM channel is enabled, the allowed range is 45 to 58 dBmV (105 to 118 dBmicroV). **Tip** Power values must be entered in dBmV. To convert dBmV to dBmicroV, add 60 to the power in dBmV. **Note** If both QAM channels are up, RF port power is configured to *power* + 3 dBmV. If only one channel is up, RF port power is configured to *power*. If no channel is up, RF port power is not configured. Frequency and power must be entered on separate command lines. **Note** For the syntax of this command, see video power, page 149.
Step 6	Monitor video frequency and power.	(According to local practice.) We recommend that you use appropriate test equipment to monitor video frequency and power before proceeding.

What to Do Next

Proceed to Setting Up, Editing, and Routing a Video Stream to a QAM Channel, page 22.

Proceed through the topics in Video Configuration Tasks by Category, page 22, as appropriate. Both basic and advanced tasks are presented.

Setting Up, Editing, and Routing a Video Stream to a QAM Channel

This section discusses how to set up, edit, and route a video stream (session, program, PID) to a desired output QAM channel.

Table 8 lists video configuration tasks by category: basic and advanced.

Table 8   Video Configuration Tasks by Category

Category	Task
Basic	Setting the Modulation Format, page 23
	Configuring the FEC Interleave Level and Mode, page 24
	Statically Setting Session Timeouts, page 25
	Statically Routing a Range of Program Sessions to a QAM Channel, page 27
	Statically Routing a Single Program Session to a QAM Channel, page 28
	Setting PMT and PAT Intervals for the Switch, page 32

Table 8   Video Configuration Tasks by Category

Category	Task
Advanced	Setting Emulation Modes for UDP Port Mapping (Optional), page 17
	Configuring Maximum Jitter for a Session, page 29
	Statically Filtering PIDs, page 30
	Remapping Input PIDs to Output PIDs, page 31
	Setting TSID and NIT-PID Values, page 34
	Configuring Program Data Delivery (PDD) Features, page 38
	Configuring Digital Broadcast Services, page 44

Note   To monitor the output of a QAM channel, see Configuring the ASI Port for QAM Channel Routing (Optional), page 35.

Setting the Modulation Format

Setting the modulation format on one QAM channel applies the same format to all four QAM channels in a modulator group. (For background, see Interface Configuration Mode, page 5.)

To set the modulation format for all four channels in a QAM modulation group, perform the following procedure:

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface qam** *interface.qam*

4. **video format** *format*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

	Command or Action	Purpose

Step 3	`interface qam` *interface.qam*
	
	Example:
	`Switch(config)# interface qam 5/2.1`
	`Switch(config-subif)#`
		Enables QAM configuration mode. See Subinterface Configuration Mode, page 6.
		
		Note For the syntax of this command, see interface qam, page 85.

Step 4	`video format` *format* **Example:** `Switch(config-subif)# video format 64`	Sets the modulation format for all four channels in the QAM modulator group—that is, QAM channels 5/1.1, 5/1.2, 5/2.1, and 5/2.2, where • *format* = QAM modulation format (64 or 256) The default format is 256. **Tip** If the FEC interleave level is set to 1, the option "256" (256QAM) is not available and does not appear. See Configuring the FEC Interleave Level and Mode, page 24. **Note** For the syntax of this command, see video format, page 138.

Configuring the FEC Interleave Level and Mode

Forward error correction (FEC) reduces bit error rate (BER) in data transmission by correcting recovered bit errors in the demodulator. Interleaving is a technique that reorders (in time) individual code-word bits with other code-word bits to spread error bursts over many different code words. The technique used is compliant with ITU J.83, Annex B.

Setting the interleave level and mode on any QAM channel sets the interleave level and mode for that modulator group. (For background, see Interface Configuration Mode, page 5.) If the interleave level and mode is set on one QAM channel, the same value is applied to all four QAM channels in the modulator group.

To set the FEC interleave level and mode for all four QAM channels in the modulator group, perform the following procedure:

⚠

Caution The default settings should be satisfactory. Realize that varying the settings can result in an increase in packet latency. Always monitor new settings to ensure that resulting bit error rates (BERs) are acceptable.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface qam** *interface.qam*

4. **video interleave level** *level*

5. **video interleave mode** *mode*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`interface qam` *interface.qam* **Example:** `Switch(config)# interface qam 6/2.1`	Enables QAM configuration mode. See Subinterface Configuration Mode, page 6. **Note** For the syntax of this command, see interface qam, page 85.
Step 4	`video interleave level` *level* **Example:** `Switch(config-subif)# video interleave level 2`	Sets the FEC interleave level, which can be 1 or 2. The default is 2. **Tip** If the FEC interleave level is set to 1, the option "256" (256QAM) is not available and does not appear. See Setting the Modulation Format, page 23. **Note** For the syntax of this command, see video interleave, page 141.
Step 5	`video interleave mode` *mode* **Example:** `Switch(config-subif)# video interleave mode 2`	Sets the FEC interleave mode, which can be any value from 1 to 14, except 11 and 13. The default is 6. **Note** The **mode** option can be used only when the interleave level is 2 (default). Each mode determines a set of I and J values as defined in ITU J.83, Annex B. (Level and mode must be set on separate command lines.) **Note** For the syntax of this command, see video interleave, page 141.

Statically Setting Session Timeouts

You can statically set a session timeout for the entire Cisco uMG9850 module, or for the entire switch, to determine when the session is closed when packets no longer come into the session. You can also set the time, following the absence of packets, at which a loss of signal is reported. Use the **video** *slot* **timeout** command to address an entire module in a given slot, and the **video timeout** command to address the entire switch. The options and parameters are the same in both cases.

When a session is closed, this means that the Cisco uMG9850 has not received any video packets for the given session's UDP port for the period determined by the **video** *slot* **timeout session-close** command or the **video timeout session-close** command. The session no longer exists, and is not listed following a **show** command. The range is 1 to 1440 minutes. The default is 10 minutes.

When a session is inactive, this means that the Cisco uMG9850 has not received any video packets for the given session's UDP port for the period determined by the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command. The session still exists and is listed following a **show** command. If packets start arriving before the timer set by the **video** *slot* **timeout session-close** command or the **video timeout session-close** command counts down, the session becomes active. The range is 200 to 10000 milliseconds. The default is 5000 milliseconds.

The value for the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command should always be larger than the value configured for jitter.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **video** *slot* **timeout session-close** *timeout-in-minutes*
4. **video** *slot* **timeout signal-loss** *timeout-in-milliseconds*
5. **video timeout session-close** *timeout-in-minutes*
6. **video timeout signal-loss** *timeout-in-milliseconds*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`video ` *slot* ` timeout session-close`
	timeout-in-minutes
	
	Example:
	`Switch(config)# video 6 timeout session-close`
	`25`
		Configures session-close timeout for an entire module, and sets the number of minutes, following the absence of packets, at which the session closes. The slot is where the Cisco uMG9850 resides. (Table 7 on page 12 shows where the Cisco uMG9850 modules can reside in the supporting Cisco Catalyst switch models.)
		
		Note For the syntax of this command, see video <slot> timeout, page 127.

	Command or Action	Purpose
Step 4	**video** *slot* **timeout signal-loss** *timeout-in-milliseconds* **Example:** Switch(config)# video 6 timeout signal-loss 500	Configures signal-loss timeout for an entire module, and and sets the number of milliseconds, following the loss of signal, at which the session becomes inactive. The slot is where the Cisco uMG9850 resides.(Table 7 on page 12 shows where the Cisco uMG9850 modules can reside in the supporting Cisco Catalyst switch models.) **Note** For the syntax of this command, see video <slot> timeout, page 127. **Tip** To see inactive sessions, use the **show video** *slot* **session** command (see show video <slot> session, page 103).
Step 5	**video timeout session-close** *timeout-in-minutes* **Example:** Switch(config)# video timeout session-close 25	Enables configuration mode for the entire switch, and sets the number of minutes, following the absence of packets, at which the session closes. **Note** For the syntax of this command, see video timeout, page 156.
Step 6	**video timeout signal-loss** *timeout-in-milliseconds* **Example:** Switch(config)# video timeout signal-loss 500	Enables configuration mode for the entire switch, and sets the number of milliseconds, following the loss of signal, at which the sessions become inactive. **Note** For the syntax of this command, see video timeout, page 156.

Statically Routing a Range of Program Sessions to a QAM Channel

The UDP port number of each program session allows each session to be routed to a designated QAM channel by default. You can overwrite the default routing (which is signaled by the port number) and route a range of program sessions to a QAM channel.

Note You can also use this command to route a range of program sessions to the ASI port (port 15) for monitoring. See Configuring the ASI Port for QAM Channel Routing (Optional), page 35.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface qam** *interface.qam*

4. **video sessions** *number-of-sessions* **udp** *first-UDP-port-num* **program** *first-program-number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`interface qam` *interface.qam*
	
	Example:
	`Switch(config)# interface qam 5/2.1`
	`Switch(config-subif)#`
		Enables QAM configuration mode. See Subinterface Configuration Mode, page 6.
		
		Note For the syntax of this command, see interface qam, page 85.

Step 4	`video sessions` *number-of-sessions* `udp` *first-UDP-port-num* `program` *first-program-number* **Example:** `Switch(config-subif)# video sessions 8 udp 49153 prog 28`	Enables video configuration mode and routes a range of program sessions to the previously selected QAM channel. **Tip** To verify that UDP portmaps are configured properly, use the **show interface qam** *interface.qam* **video portmap** command (see show interface qam <interface.qam> video portmap, page 94). To verify that a session is active, use the **show interface qam** *interface* **video** command (see show interface qam <interface> video, page 90). **Note** For the syntax of this command, see video sessions, page 154.

Statically Routing a Single Program Session to a QAM Channel

The UDP port number of each program session allows each session to be routed to a designated QAM channel by default. If necessary, you can overwrite the default routing (which is signaled by the port number) and route a single program session to a QAM channel.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface qam** *interface.qam*

4. **video udp** *UDP-port-number* **program** *out-program-number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`interface qam` *interface.qam*
	
	Example:
	`Switch(config)# interface qam 5/2.1`
	`Switch(config-subif)#`
		Enables QAM configuration mode. See Subinterface Configuration Mode, page 6.
		
		Note For the syntax of this command, see interface qam, page 85.

Step 4	`video udp` *UDP-port-number* `program` *out-program-number* **Example:** `Switch(config-subif)# video udp 49152 program 10`	Remaps a UDP port to an output program number on a QAM channel, where *UDP-port-number* is a UDP port number (see UDP Port Mappings: Default, Manual, and Emulation Mode, page 6), and *out-program-number* ranges from 1 through 255. **Note** For the syntax of this command, see video udp, page 160.

Configuring Maximum Jitter for a Session

You can set the maximum allowable network jitter (packet latency variation) for a specified UDP port session. This global video setting affects the overall packet latency (at the buffer level) within an entire Cisco uMG9850.

Note The **jitter** option sets the size of a dejittering buffer that absorbs the input jitter. This buffer introduces system delay (the time for a packet to enter and leave the Cisco uMG9850). The greater the value of **jitter**, the greater the delay introduced to the output stream. You can change the size of the dejitter buffer at either the slot or the session level. (The default level is 100 milliseconds.) Changing it at the slot level changes the default value for jitter. Consequently, for all sessions having the default value for jitter, the jitter value is changed to the new value. For sessions that have nondefault jitter values (as configured by the **video** *slot* **udp** *UDP-port-number* **jitter** command; see video <slot> udp <UDP-port-number> jitter, page 133), their current jitter value is maintained.

Tip When setting the jitter value (the size of the dejitter buffer), take into consideration the network jitter (the inherent jitter introduced at the input of the Cisco uMG9850), and allow for clock tracking. Leave approximately 50 milliseconds for clock tracking. For example, if peak-to-peak network jitter is 100 milliseconds, set the jitter value to 150 milliseconds.

The value for the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command should always be larger than the value configured for jitter.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **video** *slot* **udp** *UDP-port-number* **jitter** *level*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`video` *slot* `udp` *UDP-port-number* `jitter` *level* **Example:** `Switch(config)# video 6 udp 49152 jitter 250`	Sets the UDP port and maximum network jitter level, in milliseconds. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6. The default for the **jitter** keyword is 100 milliseconds, and the range is 0 to 300 milliseconds. Note For the syntax of this command, see video <slot> udp <UDP-port-number> jitter, page 133. Jitter can also be configured at the slot level (see video <slot> jitter, page 119).

Statically Filtering PIDs

If necessary, you can set up a filter that causes a packet with a given packet identifier (PID) to be dropped for a given UDP session on a selected Cisco uMG9850. If the session does not contain packets with that PID, the filter is ignored.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **video** *slot* **udp** *UDP-port-number* **filter-pid** *in-pid*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`video` *slot* `udp` *UDP-port-number* `filter-pid` *in-pid* **Example:** `Switch(config)# video6 udp 49152 filter-pid 30`	Sets a PID filter for all packets on a Cisco uMG9850 in the selected slot, where *UDP-port-number* is a UDP port number (see UDP Port Mappings: Default, Manual, and Emulation Mode, page 6), and *in-pid* is an input PID from 0 through 8191. **Note** For the syntax of this command, see video <slot> udp <UDP-port-number> filter-pid, page 131.

Remapping Input PIDs to Output PIDs

You can remap input PIDs to output PIDs on a QAM channel.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface qam** *interface.qam*
4. **video udp** *UDP-port-number* **in** *in-pid* **out** *out-pid*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

	Command or Action	Purpose

Step 3	`interface qam` *interface.qam*
	
	Example:
	`Switch(config)# interface qam 5/2.1`
	`Switch(config-subif)#`
		Enables subinterface configuration mode. See Subinterface Configuration Mode, page 6.

Step 4	`video udp` *UDP-port-number* `in` *in-pid* `out` *out-pid* **Example:** `Switch(config-subif)# video udp 49152 in 16 out 8000`	Remaps an input PID to an output PID on a QAM channel, where *UDP-port-number* is a UDP port number (see UDP Port Mappings: Default, Manual, and Emulation Mode, page 6), and *in-pid* and *out-pid* range from 16 to 8191. **Note** For the syntax of this command, see video udp, page 160.

Setting Up PSI Parameters

You can set up various program-specific information (PSI) parameters, either globally (for the entire switch) or on an individual QAM channel.

Note If any sessions are active in the switch, global program association table (PAT) and program map table (PMT) commands are rejected.

The range of the PAT and PMT intervals is 50 to 450 milliseconds. The default rate is the default rate for the switch, 100 milliseconds. If the QAM rates are different from the original switch rate, they are left unchanged. If they are the same as the original switch rate, the rate is changed on both the QAM channel and the switch.

Changing the default rates in global configuration mode changes the rates for the entire switch. Changing the default rates in subinterface configuration mode changes the rates for the selected QAM channel only.

This section presents the following procedures:

Setting PMT and PAT Intervals for the Switch

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **video interval pat** *milliseconds*
4. **video interval pmt** *milliseconds*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`video interval pat` *milliseconds* **Example:** `Switch(config)# video interval pat 100`	Sets the interval at which the program association table (PAT) is distributed for all Cisco uMG9850 modules in the switch. Changing the default rate in this configuration mode overwrites the rate for the switch. (See Note at beginning of this section, Setting Up PSI Parameters, page 32.) ⚠ **Caution** The syntax for a switch is different from the syntax for a QAM channel. **Note** For the syntax of this command, see video interval pat, page 143.
Step 4	`video interval pmt` *milliseconds* **Example:** `Switch(config)# video interval pat 100`	Sets the interval at which the program map table (PMT) is distributed for all Cisco uMG9850 modules in the switch. Changing the default rate in this configuration mode overwrites the rate for the switch. (See Note at beginning of this section, Setting Up PSI Parameters, page 32.) ⚠ **Caution** The syntax for a switch is different from the syntax for a QAM channel. **Note** For the syntax of this command, see video interval pmt, page 145.

Setting PMT and PAT Intervals on a QAM Channel

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface qam** *interface.qam*

4. **video interval pat** *milliseconds*

5. **video interval pmt** *milliseconds*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Switch> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Switch# configure terminal	Enables global configuration mode.
Step 3	**interface qam** *interface.qam* **Example:** Switch(config)# interface qam 5/2.1 Switch(config-subif)#	Enables subinterface configuration mode. See Subinterface Configuration Mode, page 6.
Step 4	**video interval pat** *milliseconds* **Example:** Switch(config-subif)# video pat interval 100	Sets PAT intervals for the QAM channel. Changing the default rate in this configuration mode overwrites the rate for the QAM channel only. (See Note at beginning of this section, Setting Up PSI Parameters, page 32.) **Note** For the syntax of this command, see video interval pat, page 143.
Step 5	**video interval pmt** *milliseconds* **Example:** Switch(config-subif)# video pmt interval 100	Sets PMT intervals for the QAM channel. Changing the default rate in this configuration mode overwrites the rate for the QAM channel only. (See Note at beginning of this section, Setting Up PSI Parameters, page 32.) **Note** For the syntax of this command, see video interval pmt, page 145.

Setting TSID and NIT-PID Values

At each hub, each QAM channel must have a unique transport stream ID (TSID). The software checks for and guarantees the uniqueness of a TSID within a chassis only.

⚠️
Caution It is the responsibility of the operator to avoid TSID conflicts among switches. To see all the TSIDs within a switch, use the **show video** *slot* command (see show video <slot>, page 96), and address each Cisco uMG9850 in the switch.

The PID for the network information table, or NIT-PID, can be configured from the QAM interface. If the NIT-PID is already used as a video, audio, or data PID, the configuration is rejected.

For the transport stream that is to be transmitted over a QAM channel, you must configure the TSID and NIT-PID values for that channel.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface qam** *interface.qam*
4. **video tsid**
5. **video nitpid**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode. See Global Configuration Mode, page 5.

Step 3	`interface qam` *interface.qam*
	
	Example:
	`Switch(config)# interface qam 5/2.1`
	`Switch(config-subif)#`
		Enables QAM configuration mode. See Subinterface Configuration Mode, page 6.
		
		Note For the syntax of this command, see interface qam, page 85.

Step 4	`video tsid` *tsid* **Example:** `Switch(config)# video tsid 444`	Sets the value of the transport stream ID (TSID) for the QAM channel. The range is 1 to 65535. **Note** For the syntax of this command, see video tsid, page 158.
Step 5	`video nitpid` *nitpid* **Example:** `Switch(config)# video nitpid 555`	Sets the value of the network information table packet ID (NIT-PID) for the QAM channel. The range is 16 to 8191. **Note** For the syntax of this command, see video nitpid, page 148.

Configuring the ASI Port for QAM Channel Routing (Optional)

You can route the output of a single QAM channel to the asynchronous serial interface (ASI) port to monitor the channel. This section discusses how to configure the ASI port, and route the output of a QAM channel to the ASI port.

Note Routing the output of a QAM channel to the ASI port does not disrupt the RF output.

This section presents the following procedures:

- Setting the Byte-Gap Value (S-rate) of the ASI Port, page 36
- Routing the Output of a QAM Channel to the ASI Port, page 36

Setting the Byte-Gap Value (S-rate) of the ASI Port

You can change the gap spacing of the data bytes in the output of the ASI port. The S-rate is the spacing of data bytes (the number of ASI transport null bytes between the data bytes) within the output transport stream. If there is not a sufficient number of data bytes in the stream, padding the stream with null bytes maintains the signal voltage and integrity.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface asi** *slot*/**15**
4. **video byte-gap** *value*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`interface asi` *slot*/`15`
	
	Example:
	`Switch(config)# interface asi 5/15`
	`Switch(config-if)#`
		Enables ASI configuration mode. See Interface Configuration Mode, page 5.
		
		Note For the syntax of this command, see interface asi, page 83.

Step 4	`video byte-gap` *value* **Example:** `Switch(config-if)# video byte-gap 4`	Changes the byte gap from the default. **Note** For the syntax of this command, see video byte-gap, page 137.

Routing the Output of a QAM Channel to the ASI Port

You can route the output of a QAM channel (all programs in the MPTS) to the asynchronous serial interface (ASI) port (in ASI signaling format), to monitor the output of the channel. Use a video decoder to view the selected program. The ASI port is always addressed as *slot*/**15**. See Interface Configuration Mode, page 5.

Note Routing the output of a QAM channel to the ASI port does not disrupt the RF output.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **interface asi** *slot*/**15**

4. **video route qam** *interface.qam*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`interface asi` *slot*/`15`
	
	Example:
	`Switch(config)# interface asi 5/15`
		Enables ASI interface configuration mode. See Interface Configuration Mode, page 5.
		
		Note For the syntax of this command, see interface asi, page 83.

Step 4	`video route qam` *interface.qam* **Example:** `Switch(config-subif)# video route qam 5/2.1`	Routes the output of the selected QAM port to the ASI interface previously assigned. See Subinterface Configuration Mode, page 6. **Note** For the syntax of this command, see video route, page 153.

Configuring Program Data Delivery (PDD) Features

The procedures in this section show you how to do the following in support of PDD (see Program Data Delivery, page 11):

- Clone a unicast UDP session to one, several, or all QAM channels on a Cisco uMG9850 with a specified output-program number.

- Clone a single copy of a PDD stream, or a multicast session, to one, several, or all QAM channels on a Cisco uMG9850.

- Use emulation mode to clone a stream or session. In emulation mode, the destination UDP port number determines the output QAM channel and program number.

PDD Conditions and Restrictions

Note the following conditions and restrictions:

- A UDP port map can be either clonable or not.

   - Configure nonclonable UDP port maps in QAM subinterface configuration mode. See Subinterface Configuration Mode, page 6. Any UDP port map configured at the QAM subinterface level cannot be cloned.

   - Configure clonable UDP port maps in global configuration mode. See Global Configuration Mode, page 5.

   - A UDP port map outside the range specified by the **video** *slot* **route vlan** command (see video <slot> route vlan, page 124) cannot be cloned, even if it is a default map.

- Multicast sessions are clonable by default. They can be configured only in global configuration mode.

- There can be only one copy of an input session per QAM channel. If the user enters a conflicting number, an error message appears, as in the following example:

```
uMG9850(config)# video 4 udp 257 q4/1.1 prog 35

Udp port 257 already mapped to QAM4/1/1
```

- For a unicast or multicast session to be mapped to all QAM channels, it must not have been configured previously. Also, the selected output-program number must not have been used previously.

⚠️
Caution   Keep in mind that the Cisco uMG9850 remaps the PIDs of incoming sessions to ensure uniqueness in the outgoing MPTS (except for pass-through sessions, where PID remapping is not necessary). When PIDs are remapped, any references to PID values in PDD streams become invalid.

This section presents the following procedures:

- Cloning a Unicast UDP Session to One, Several, or All QAM Channels on a Module

- Cloning a PDD Stream or Multicast UDP Session to One, Several, or All QAM Channels on a Module

- Using Emulation Mode to Clone a Session

Cloning a Unicast UDP Session to One, Several, or All QAM Channels on a Module

You can map a unicast input UDP session to one, several, or all QAM channels on a Cisco uMG9850 with a specified output-program number. Program numbers can vary.

The following example illustrates the cloning of user-defined UDP ports. To clone default UDP ports, you must use program 26 and above.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **video** *slot* **udp** *UDP-port-number* **qam** *interface.qam* **program** *program-number*

4. **video** *slot* **udp** *UDP-port-number* **all program** *program-number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.
		
		Note The two steps that follow are mutually exclusive.

	Command or Action	Purpose

Step 3	**video** *slot* **udp** *UDP-port-number* **qam** *interface.qam* **program** *program-number*
	
	Example:
	`Switch(config)# video 3 udp 60000 qam 3/1.1 program 1`
	`Switch(config)# video 3 udp 60000 qam 3/3.1 program 3`
	`Switch(config)# video 3 udp 60000 qam 3/5.1 program 5`
	`Switch(config)# video 3 udp 60000 qam 3/7.1 program 7`
		Maps an input UDP session to a particular QAM channel with a specified output program number.
		
		Note For the syntax of this command, see video <slot> udp <UDP-port-number> qam, page 135.
		
		Repeat the command for each session and program to be mapped, one mapping per line. Each output can have a different program number. The slot can also vary.
		
		This example clones UDP session 60000 on QAM channels 1, 5, 9, and 13 on a Cisco uMG9850 in slot 3.
		
		⚠
		Caution If you perform this step, do not perform the following step. For a unicast or multicast session to be mapped to all QAM channels, it must not have been configured previously. Also, the selected output-program number must not have been used previously.

Step 4	**video** *slot* **udp** *UDP-port-number* **all program** *program-number* **Example:** `Switch(config)# video 3 udp 60000 all program 1`	Maps a UDP session to all 24 QAM channels with a specified output program number. **Note** For the syntax of this command, see video <slot> udp <UDP-port-number> all, page 129. If you perform this step after performing the previous step, you receive an error message to the effect that UDP 60000 has already been used. See Caution above.

Cloning a PDD Stream or Multicast UDP Session to One, Several, or All QAM Channels on a Module

You can map a PDD stream or multicast session to one, several, or all QAM channels on a Cisco uMG9850. It is assumed that the multicast source is on one VLAN, and the Cisco uMG9850 is on another VLAN. It is also assumed that the necessary VLANs have been created and are active. (See Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14.)

✎
Note Many of the following commands are switch-only commands. See "Understanding and Configuring IP Multicast" in *Switch Documentation, Cisco IOS Software Release 12.1(20)EW* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/lan/cat4000/12_1_20/config/index.htm

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **ip multicast-routing**

4. **no ip igmp snooping vlan** *Cisco uMG9850-VLAN-number*

5. **interface vlan** *source-VLAN-number*

6. **ip pim dense-mode**

7. **exit**

8. **interface vlan** *Cisco uMG9850-VLAN-number*

9. **ip pim dense-mode**

10. **ip igmp static-group** *group-ip-address* **source-address** *ip-address*

11. **exit**

12. **video** *slot* **route vlan** *VLAN-number*

13. **video** *slot* **multicast source-address** *source-ip-address* **dest-address** *dest-ip-address* **qam** *interface.qam* **program** *program-number*

14. **video** *slot* **multicast source-address** *source-ip-address* **dest-address** *dest-ip-address* **all program** *program-number*

> **Note** In the following example, the Cisco uMG9850 is in slot 3, on VLAN 5, and the multicast source is on VLAN 4.

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`ip multicast-routing`
	
	Example:
	`Switch(config)# ip multicast-routing`
		Enables multicast routing, allowing the switch to forward multicast packets.
		
		Note For the details of this and other switch commands, see Note at beginning of this procedure.

Step 4	`no ip igmp snooping vlan`
	Cisco uMG9850-VLAN-number
	
	Example:
	`Switch(config)# no ip igmp snooping vlan 5`
		Disables Internet Group Management Protocol (IGMP) snooping. When IGMP snooping is disabled on an input VLAN interface, multicast packets related to that interface are sent to all forwarding switchports in the VLAN.

Step 5	`interface vlan` *source-VLAN-number* **Example:** `Switch(config)# interface vlan 5`	Enters interface configuration mode and establishes the VLAN for the multicast source.

	Command or Action	Purpose

Step 6	`ip pim dense-mode`
	
	Example:
	`Switch(config-if)# ip pim dense-mode`
		Enables Protocol Independent Multicast (PIM) dense mode on the interface.

Step 7	`exit`	Exits the configuration of the first VLAN.
Step 8	`interface vlan` *Cisco-uMG9850-VLAN-number* **Example:** `Switch(config)# interface vlan 4`	Enters interface configuration mode and establishes the VLAN for the Cisco uMG9850.

Step 9	`ip pim dense-mode`
	
	Example:
	`Switch(config-if)# ip pim dense-mode`
		Enables PIM dense mode on the interface.

Step 10	`ip igmp static-group` *group-ip-address* `source-address` *ip-address* **Example:** `Switch(config-if)# ip igmp static-group 224.2.129.116 source-address 192.168.4.10`	Configures the switch as a statically connected member of a group.
Step 11	`exit`	Exits the configuration of the second VLAN.
Step 12	`video` *slot* `route vlan` *VLAN-number* **Example:** `Switch(config)# video 3 route vlan 3`	Switches video packets from the input GE port to the output GE port. See Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14. **Note** The two steps that follow are mutually exclusive.

	Command or Action	Purpose
Step 13	`video slot multicast source-address` `source-ip-address` **dest-address** `dest-ip-address` **qam** `interface.qam` **program** `program-number`	Enables multicast sessions, mapping an input multicast session to one or more QAM channels in a Cisco uMG9850 with a specified output program number. All programs must have the same number. The multicast addresses for *dest-ip-address* are in the range 224.0.0.0 through 239.255.255.255.

	Example:
	`Switch(config)# video 3 multicast`
	`source-address 192.168.4.10 dest-address`
	`224.2.129.116 qam 3/1.1 program 1`
	
	`Switch(config)# video 3 multicast`
	`source-address 192.168.4.10 dest-address`
	`224.2.129.116 qam 3/3.1 program 1`
	
	`Switch(config)# video 3 multicast`
	`source-address 192.168.4.10 dest-address`
	`224.2.129.116 qam 3/5.1 program 1`
	
	`Switch(config)# video 3 multicast`
	`source-address 192.168.4.10 dest-address`
	`224.2.129.116 qam 3/7.1 program 1`
		Note For the syntax of this command, see video <slot> multicast, page 121.
		
		This example maps an input multicast session to QAM channels 1, 5, 9, and 13 on a Cisco uMG9850 in slot 3, specifying output program 1.
		
		⚠
		Caution If you perform this step, do not perform the following step. For a unicast or multicast session to be mapped to all QAM channels, it must not have been configured previously. Also, the selected output-program number must not have been used previously.

Step 14	`video slot multicast source-address` `source-ip-address` **dest-address** `dest-ip-address` **all program** `program-number`	Enables multicast sessions, mapping an input multicast session to all QAM channels in a Cisco uMG9850 with a specified output program number. If you perform this step after performing the previous step, you receive an error message. See Caution above.

	Example:
	`Switch(config)# video 3 multicast`
	`source-address 192.168.4.10 dest-address`
	`224.2.129.116 all program 1`	

Using Emulation Mode to Clone a Session

You can configure the Cisco uMG9850 to operate in a variety of emulation modes. (See Setting Emulation Modes for UDP Port Mapping (Optional), page 17.) Emulation mode supports cloning and multicast. In these cases, the value of the destination UDP port determines the output QAM and program number.

⚠

Caution   When ports are cloned, conflicts among output-program numbers can occur. The user is responsible for avoiding such conflicts. Also, you cannot clone to program numbers 1–25. Use numbers 26 and above.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **video** *slot* **emulation-mode** {**bitwise** | **8-qam-number** | **24-qam-number**} [**number** *number-ip-address*]

4. **video** *slot* **udp** *UDP-port-number* **qam** *interface.qam* **program** *program-number*

> **Note** In the following example, 24-QAM emulation mode is used. UDP port 0x011a maps to QAM channel 2, program 3. The configuration clones this to QAM channel 4, program 26.

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`video` *slot* `emulation-mode 24-qam-number`
	
	Example:
	`Switch(config)# video 3 emulation-mode`
	`24-qam-number`
		Configures the Cisco uMG9850 for 24-QAM emulation mode.
		
		Note For the syntax of this command, see video <slot> emulation-mode, page 114.

Step 4	`video` *slot* `udp` *UDP-port-number* `qam`
	interface.qam `program` *program-number*
	
	Example:
	`Switch(config)# video 3 udp 0x011a qam 3/2.2`
	`program 26`
		Clones the preceding to QAM channel 4, program 26.
		
		⚠ **Caution** This can conflict with another UDP port 0x011a (decimal 282, binary 100011010). Ensure that you do not assign a UDP port used for another stream.

Configuring Digital Broadcast Services

The procedures in this section show you how to do the following in support of digital broadcast services (see Digital Broadcast, page 4):

• Receive prepackaged digital broadcast services in the form of an MPTS by means of unicast or multicast, and output the MPTS without remultiplexing the video streams. The Cisco uMG9850 may update the program clock reference (PCR) or TSID information in the MPTS as necessary to output a valid transport stream.

• Receive SI data PIDs in a unicast or multicast UDP session that may or may not include PSI tables, and multiplex the SI data packets into an outgoing MPTS without remapping the SI PIDs or updating the PSI data of the MPTS.

This section presents the following procedures:

Note See also Configuring Program Data Delivery (PDD) Features, page 38, for information about cloning an incoming MPTS and SI data to multiple QAM channels.

Configuring MPTS Pass-through

Multiple program transport stream (MPTS) pass-through is enabled by means of the **pass-through** keyword. For examples, see the following:

- video <slot> multicast, page 121
- video <slot> udp <UDP-port-number> qam, page 135

Configuring SI Pass-through

Service information (SI) pass-through is enabled by means of the **no-snoop** keyword. For examples, see the following:

- video <slot> udp <UDP-port-number> qam, page 135

Monitoring and Troubleshooting

The **show** commands in this section can be of help in monitoring and troubleshooting video delivery. A variety of standard **show** commands that are part of the Cisco Catalyst switch environment are also useful in video environments.

This section presents the following procedures:

- Setting the Video Statistics Interval for All Cisco uMG9850 Modules in the Switch, page 45
- Using show Commands for Troubleshooting, page 46

Setting the Video Statistics Interval for All Cisco uMG9850 Modules in the Switch

You can globally set the interval at which video statistics are retrieved from all Cisco uMG9850 modules in the switch. These statistics are useful in monitoring and troubleshooting.

SUMMARY STEPS

1. **enable**

2. **configure terminal**

3. **video interval stats** *interval*

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Switch> enable`
		Enables privileged EXEC mode.
		
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Switch# configure terminal`
		Enables global configuration mode.

Step 3	`video interval stats`
	
	Example:
	`Switch(config)# video interval stats 30`
		Sets the interval at which video statistics are reported for all Cisco uMG9850 modules in the switch.
		
		Note For the syntax of this command, see video interval stats, page 147.

Using show Commands for Troubleshooting

This section presents a variety of **show** commands that are useful in troubleshooting the Cisco uMG9850. Table 9 on page 46 lists these commands by category. These commands are executed at the following prompt (see Privileged EXEC Mode, page 5):

`Switch#`

Table 9   Categories of Information Viewable Through show Commands

Category	Reference
Gigabit Ethernet	Gigabit Ethernet Interface: Status, page 47
Cisco uMG9850 module	Cisco uMG9850 Module: Showing Diagnostics, page 47
	Cisco uMG9850 Module: Showing IDPROM, page 48
Video	clear video <slot> statistics, page 82
	show interface qam <interface> video, page 90
	show interface qam <interface.qam> video, page 92
	show interface qam <interface.qam> video portmap, page 94
	show video <slot>, page 96
	show video <slot> psi session, page 98
	show video <slot> psi session multicast, page 100
	show video <slot> route, page 102
	show video <slot> session, page 103
	show video <slot> session multicast, page 105
	show video <slot> ts_table, page 107
	show video <slot> version, page 109
QAM/ASI	show interface asi <interface> video, page 88

Gigabit Ethernet Interface: Status

You can view standard information related to the status of a Gigabit Ethernet interface on the switch. Use the **show gigabitethernet** *interface* command (see).

✎
Note   This **show** command is a Cisco Catalyst switch command.

Examples

```
Switch# show interface gig 4/14

GigabitEthernet1/1 is down, line protocol is down (notconnect)
  Hardware is Gigabit Ethernet Port, address is 000b.fd42.eac0 (bia 000b.fd42.eac0)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Auto-duplex, Auto-speed
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/2000/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Cisco uMG9850 Module: Showing Diagnostics

You can view information related to the installed hardware EEPROM, as well as standard diagnostic information related to the switch. Use the **show diag online module** *slot* command, where *slot* is the number of the slot in which the Cisco uMG9850 resides.

✎
Note   This **show** command is a Cisco Catalyst switch command.

Examples

```
Switch# show diag online module 3

Slot Ports Card Type                              Diag Status     Diag Details
---- ----- ------------------------------------- ---------------- ------------
 2    14   video card (more info)                Passed          None

Detailed Status
```

```
                         ---------------
                         . = Pass              U = Unknown
                         L = Loopback failure  S = Stub failure
                         I = Ilc failure       P = Port failure
                         E = SEEPROM failure   G = GBIC integrity check failure


                         Ports 1   2   3   4   5   6   7   8   9   10  11  12  13  14
                               .   .   .   .   .   .   .   .   .   .   .   .   .   .
```

Cisco uMG9850 Module: Showing IDPROM

The **show idprom module** command is useful to see whether the Cisco uMG9850 module has been programmed correctly. If not, the result of issuing the command is garbled text. If the module has been programmed correctly, you can see information related to the installed IDPROM, as well as standard diagnostic information related to the switch. Use the **show idprom module** *slot* command, where *slot* is the number of the slot in which the Cisco uMG9850 resides.

✎
Note   This **show** command is a Cisco Catalyst switch command.

Example

```
Switch# show idprom module 2

Module 2 Idprom :
 Common Block Signature = 0xABAB
 Common Block Version = 1
 Common Block Length = 144
 Common Block Checksum = 4464
 Idprom Size = 256
 Block Count = 2
 FRU Major Type = 0x4201
 FRU Minor Type = 321
 OEM String = Cisco Systems, Inc.
 Product Number = WS-X4412-2GB-T
 Serial Number = JAE064002EP
 Part Number = 73-4838-02
 Part Revision = A0
 Manufacturing Deviation String =
 Hardware Revision = 1.1
 Manufacturing Bits = 0x0000
 Engineering Bits = 0x0000
 Snmp OID = 0.0.0.0.0.0.0.0
 Power Consumption = 0
 RMA Failure Code = 0 0 0 0
 Linecard Block Signature = 0x4201
 Linecard Block Version = 1
 Linecard Block Length = 24
 Linecard Block Checksum = 850
 Feature Bits = 0x0000000000000000
 Card Feature Index = 82
 MAC Base = 0008.e3cf.dc00
 MAC Count = 14
```

Configuration Examples for the Cisco uMG9850 QAM Module

This section presents the following configurations on the QAM switch, the Cisco Catalyst 4507 that hosts the modules:

- QAM Switch Configuration with Different VLANs: Example, page 49
- QAM Switch Configuration with the Same VLAN: Example, page 66

Third-party VoD servers or other video sources provide video streams that are forwarded to a headend switch. The headend switch and Dhub switch, not illustrated or discussed below, must also be configured.

Note For a thorough discussion of video distribution architectures and related issues, refer to *Cisco Gigabit-Ethernet Optimized VoD Solutions*, at the following URL:

http://www.cisco.com/univercd/cc/td/doc/solution/vodsols/index.htm

QAM Switch Configuration with Different VLANs: Example

Figure 1 illustrates Cisco uMG9850 modules in a QAM switch supporting different VLANs.

Figure 1   QAM Switch with Different VLANs
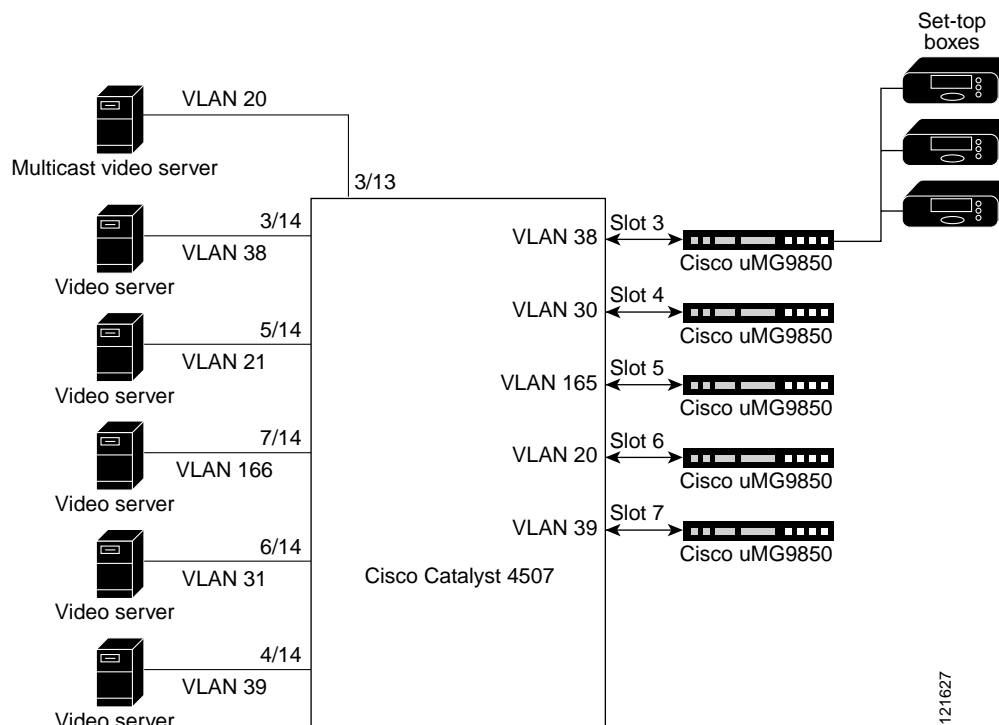
- VLAN 20 supports ingress multicast video traffic.
- VLANs 20, 31, 38, 39, and 166 support ingress unicast video traffic.

- VLAN 38 supports the Cisco uMG9850 in slot 3.

- VLAN 30 supports the Cisco uMG9850 in slot 4.

- VLAN 165 supports the Cisco uMG9850 in slot 5.

- VLAN 20 supports the Cisco uMG9850 in slot 6.

- VLAN 39 supports the Cisco uMG9850 in slot 7.

- The Cisco uMG9850 in slot 3 forwards selected video streams (from QAM channels 3/1.1 to 3/12.2) to set-top boxes.

- The ASI port of the Cisco uMG9850 in slot 3 is configured to route the output of QAM channel 3/1.1 to an MPEG analyzer (not shown).

```
Headend# show running-config

Current configuration : 19319 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
service compress-config
!
hostname Dhub
!
boot system bootflash:cat4000-i5su3-mz.tornado.609
boot system flash slot0:tornado.608
!
vtp mode transparent
ip subnet-zero
!
ip multicast-routing
no ip igmp snooping
video timeout session-close 1
video 3 route Vlan38 udp 49152 49500
video 3 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam3/12.2
 pass-through
video 4 route Vlan30 udp 257 6154
video 4 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam4/12.2
 pass-through
video 5 route Vlan165 udp 49152 49400
video 5 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam5/12.2
 pass-through
video 6 route Vlan20 udp 49152 49500
video 6 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam6/12.2
 pass-through
video 7 route Vlan39 udp 257 6154
video 7 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam7/12.2
 pass-through
no cluster run
!
no file verify auto
spanning-tree mode pvst
spanning-tree extend system-id
power redundancy-mode redundant
!
redundancy
 main-cpu
  auto-sync standard
 mode rpr
```

```
!
!
!
vlan internal allocation policy ascending
!
vlan 20-21,30-31,38-39,151,164-167
!
interface GigabitEthernet1/1
 switchport access vlan 21
 speed nonegotiate
 unidirectional receive-only
!
interface GigabitEthernet1/2
 switchport access vlan 166
 load-interval 30
 speed nonegotiate
!
interface GigabitEthernet2/1
!
interface GigabitEthernet2/2
!
interface QAM3/1
 no ip address
!
interface QAM3/1.1
 video interleave mode 1
 video power 53
 video freq 717000000
 video sessions 10 udp 49152 program 1
!
interface QAM3/1.2
 video interleave mode 1
 video power 53
 video freq 723000000
 video sessions 10 udp 49162 program 1
!
interface QAM3/2
 no ip address
!
interface QAM3/2.1
 video interleave mode 1
 video freq 729000000
 video sessions 10 udp 49172 program 1
!
interface QAM3/2.2
 video interleave mode 1
 video freq 735000000
 video sessions 10 udp 49182 program 1
!
interface QAM3/3
 no ip address
!
interface QAM3/3.1
 video freq 741000000
 video sessions 10 udp 49192 program 1
!
interface QAM3/3.2
 video freq 747000000
 video sessions 10 udp 49202 program 1
!
interface QAM3/4
 no ip address
!
interface QAM3/4.1
```

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```
 video freq 753000000
 video sessions 10 udp 49212 program 1
!
interface QAM3/4.2
 video freq 759000000
 video sessions 10 udp 49222 program 1
!
interface QAM3/5
 no ip address
!
interface QAM3/5.1
 video freq 765000000
 video sessions 10 udp 49232 program 1
!
interface QAM3/5.2
 video freq 771000000
 video sessions 10 udp 49242 program 1
!
interface QAM3/6
 no ip address
!
interface QAM3/6.1
 video freq 777000000
 video sessions 10 udp 49252 program 1
!
interface QAM3/6.2
 video freq 783000000
 video sessions 10 udp 49262 program 1
!
interface QAM3/7
 no ip address
!
interface QAM3/7.1
 video freq 789000000
 video sessions 10 udp 49272 program 1
!
interface QAM3/7.2
 video freq 795000000
 video sessions 10 udp 49282 program 1
!
interface QAM3/8
 no ip address
!
interface QAM3/8.1
 video freq 801000000
 video sessions 10 udp 49292 program 1
!
interface QAM3/8.2
 video freq 807000000
 video sessions 10 udp 49302 program 1
!
interface QAM3/9
 no ip address
!
interface QAM3/9.1
 video freq 813000000
 video sessions 10 udp 49312 program 1
!
interface QAM3/9.2
 video freq 819000000
 video sessions 10 udp 49322 program 1
!
interface QAM3/10
 no ip address
```

```
!
interface QAM3/10.1
 video freq 825000000
 video sessions 10 udp 49332 program 1
!
interface QAM3/10.2
 video freq 831000000
 video sessions 10 udp 49342 program 1
!
interface QAM3/11
 no ip address
!
interface QAM3/11.1
 video freq 837000000
 video sessions 10 udp 49352 program 1
!
interface QAM3/11.2
 video freq 843000000
 video sessions 10 udp 49362 program 1
!
interface QAM3/12
 no ip address
!
interface QAM3/12.1
 video freq 849000000
 video sessions 10 udp 49372 program 1
!
interface QAM3/12.2
 video freq 855000000
!
interface GigabitEthernet3/13
 switchport access vlan 20
!
interface GigabitEthernet3/14
 switchport access vlan 38
!
interface ASI3/15
 no ip address
 keepalive 5
 video route qam 3/1.1
!
interface QAM4/1
 no ip address
!
interface QAM4/1.1
 video power 45
 video freq 717000000
 video sessions 10 udp 257 program 1
!
interface QAM4/1.2
 video power 45
 video freq 723000000
 video nitpid 16
 video sessions 10 udp 513 program 1
!
interface QAM4/2
 no ip address
!
interface QAM4/2.1
 video freq 729000000
 video nitpid 16
 video sessions 10 udp 769 program 1
!
interface QAM4/2.2
```

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```
 video freq 735000000
 video nitpid 16
 video sessions 10 udp 1025 program 1
!
interface QAM4/3
 no ip address
!
interface QAM4/3.1
 video freq 741000000
 video nitpid 16
 video sessions 10 udp 1281 program 1
!
interface QAM4/3.2
 shutdown
 video freq 747000000
 video nitpid 16
 video sessions 10 udp 1537 program 1
!
interface QAM4/4
 no ip address
!
interface QAM4/4.1
 shutdown
 video freq 753000000
 video nitpid 16
 video sessions 10 udp 2049 program 1
!
interface QAM4/4.2
 video freq 759000000
 video nitpid 16
 video sessions 10 udp 2305 program 1
!
interface QAM4/5
 no ip address
!
interface QAM4/5.1
 video freq 765000000
 video nitpid 16
 video sessions 10 udp 2561 program 1
!
interface QAM4/5.2
 video freq 771000000
 video nitpid 16
 video sessions 10 udp 2817 program 1
!
interface QAM4/6
 no ip address
!
interface QAM4/6.1
 video freq 777000000
 video nitpid 16
 video sessions 10 udp 3073 program 1
!
interface QAM4/6.2
 video freq 783000000
 video nitpid 16
 video sessions 10 udp 3329 program 1
!
interface QAM4/7
 no ip address
!
interface QAM4/7.1
 video freq 789000000
 video nitpid 16
```

```
     video sessions 10 udp 3585 program 1
!
interface QAM4/7.2
 video freq 795000000
 video nitpid 16
 video sessions 10 udp 3841 program 1
!
interface QAM4/8
 no ip address
!
interface QAM4/8.1
 video freq 801000000
 video nitpid 16
 video sessions 10 udp 4097 program 1
!
interface QAM4/8.2
 video freq 807000000
 video nitpid 16
 video sessions 10 udp 4353 program 1
!
interface QAM4/9
 no ip address
!
interface QAM4/9.1
 video freq 813000000
 video nitpid 16
 video sessions 10 udp 4609 program 1
!
interface QAM4/9.2
 video freq 819000000
 video nitpid 16
 video sessions 10 udp 4865 program 1
!
interface QAM4/10
 no ip address
!
interface QAM4/10.1
 video freq 825000000
 video nitpid 16
 video sessions 10 udp 5121 program 1
!
interface QAM4/10.2
 video freq 831000000
 video nitpid 16
 video sessions 10 udp 5377 program 1
!
interface QAM4/11
 no ip address
!
interface QAM4/11.1
 video freq 837000000
 video nitpid 16
 video sessions 10 udp 5633 program 1
!
interface QAM4/11.2
 video freq 843000000
 video nitpid 16
 video sessions 10 udp 5889 program 1
!
interface QAM4/12
 no ip address
!
interface QAM4/12.1
 video freq 849000000
```

```
 video nitpid 16
 video sessions 10 udp 6145 program 1
!
interface QAM4/12.2
 video freq 855000000
 video nitpid 16
!
interface GigabitEthernet4/13
!
interface GigabitEthernet4/14
 switchport access vlan 39
!
interface ASI4/15
 no ip address
 keepalive 5
 video route qam 4/1.1
!
interface QAM5/1
 no ip address
!
interface QAM5/1.1
 video freq 717000000
 video nitpid 16
 video sessions 10 udp 49152 program 1
!
interface QAM5/1.2
 video freq 723000000
 video nitpid 16
 video sessions 10 udp 49162 program 1
!
interface QAM5/2
 no ip address
!
interface QAM5/2.1
 video freq 729000000
 video nitpid 16
 video sessions 10 udp 49172 program 1
!
interface QAM5/2.2
 video freq 735000000
 video nitpid 16
 video sessions 10 udp 49182 program 1
!
interface QAM5/3
 no ip address
!
interface QAM5/3.1
 video freq 741000000
 video nitpid 16
 video sessions 10 udp 49192 program 1
!
interface QAM5/3.2
 shutdown
 video freq 747000000
 video nitpid 16
 video sessions 10 udp 49202 program 1
!
interface QAM5/4
 no ip address
!
interface QAM5/4.1
 shutdown
 video freq 753000000
 video nitpid 16
```

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```
 video sessions 10 udp 49212 program 1
!
interface QAM5/4.2
 video freq 759000000
 video nitpid 16
 video sessions 10 udp 49222 program 1
!
interface QAM5/5
 no ip address
!
interface QAM5/5.1
 video freq 765000000
 video nitpid 16
 video sessions 10 udp 49232 program 1
!
interface QAM5/5.2
 video freq 771000000
 video nitpid 16
 video sessions 10 udp 49242 program 1
!
interface QAM5/6
 no ip address
!
interface QAM5/6.1
 video freq 777000000
 video nitpid 16
 video sessions 10 udp 49252 program 1
!
interface QAM5/6.2
 video freq 783000000
 video nitpid 16
 video sessions 10 udp 49262 program 1
!
interface QAM5/7
 no ip address
!
interface QAM5/7.1
 video freq 789000000
 video nitpid 16
 video sessions 10 udp 49272 program 1
!
interface QAM5/7.2
 video freq 795000000
 video nitpid 16
 video sessions 10 udp 49282 program 1
!
interface QAM5/8
 no ip address
!
interface QAM5/8.1
 video freq 801000000
 video nitpid 16
 video sessions 10 udp 49292 program 1
!
interface QAM5/8.2
 video freq 807000000
 video nitpid 16
 video sessions 10 udp 49302 program 1
!
interface QAM5/9
 no ip address
!
interface QAM5/9.1
 video freq 813000000
```

```
 video nitpid 16
 video sessions 10 udp 49312 program 1
!
interface QAM5/9.2
 video freq 819000000
 video nitpid 16
 video sessions 10 udp 49322 program 1
!
interface QAM5/10
 no ip address
!
interface QAM5/10.1
 video freq 825000000
 video nitpid 16
 video sessions 10 udp 49332 program 1
!
interface QAM5/10.2
 video freq 831000000
 video nitpid 16
 video sessions 10 udp 49342 program 1
!
interface QAM5/11
 no ip address
!
interface QAM5/11.1
 video freq 837000000
 video nitpid 16
 video sessions 10 udp 49352 program 1
!
interface QAM5/11.2
 video freq 843000000
 video nitpid 16
 video sessions 10 udp 49362 program 1
!
interface QAM5/12
 no ip address
!
interface QAM5/12.1
 video freq 849000000
 video nitpid 16
 video sessions 10 udp 49372 program 1
!
interface QAM5/12.2
 video freq 855000000
 video nitpid 16
!
interface GigabitEthernet5/13
!
interface GigabitEthernet5/14
 switchport access vlan 21
 load-interval 30
 speed nonegotiate
!
interface ASI5/15
 no ip address
 keepalive 5
 video route qam 5/1.1
!
interface QAM6/1
 no ip address
!
interface QAM6/1.1
 video power 45
 video freq 717000000
```

```
 video nitpid 16
 video sessions 10 udp 49152 program 1
!
interface QAM6/1.2
 video power 45
 video freq 723000000
 video nitpid 16
 video sessions 10 udp 49162 program 1
!
interface QAM6/2
 no ip address
!
interface QAM6/2.1
 video freq 729000000
 video nitpid 16
 video sessions 10 udp 49172 program 1
!
interface QAM6/2.2
 video freq 735000000
 video nitpid 16
 video sessions 10 udp 49182 program 1
!
interface QAM6/3
 no ip address
!
interface QAM6/3.1
 video freq 741000000
 video nitpid 16
 video sessions 10 udp 49192 program 1
!
interface QAM6/3.2
 shutdown
 video freq 747000000
 video nitpid 16
 video sessions 10 udp 49202 program 1
!
interface QAM6/4
 no ip address
!
interface QAM6/4.1
 shutdown
 video freq 753000000
 video nitpid 16
 video sessions 10 udp 49212 program 1
!
interface QAM6/4.2
 video freq 759000000
 video nitpid 16
 video sessions 10 udp 49222 program 1
!
interface QAM6/5
 no ip address
!
interface QAM6/5.1
 video freq 765000000
 video nitpid 16
 video sessions 10 udp 49232 program 1
!
interface QAM6/5.2
 video freq 771000000
 video nitpid 16
 video sessions 10 udp 49242 program 1
!
interface QAM6/6
```

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```
 no ip address
!
interface QAM6/6.1
 video freq 777000000
 video nitpid 16
 video sessions 10 udp 49252 program 1
!
interface QAM6/6.2
 video freq 783000000
 video nitpid 16
 video sessions 10 udp 49262 program 1
!
interface QAM6/7
 no ip address
!
interface QAM6/7.1
 video freq 789000000
 video nitpid 16
 video sessions 10 udp 49272 program 1
!
interface QAM6/7.2
 video freq 795000000
 video nitpid 16
 video sessions 10 udp 49282 program 1
!
interface QAM6/8
 no ip address
!
interface QAM6/8.1
 video freq 801000000
 video nitpid 16
 video sessions 10 udp 49292 program 1
!
interface QAM6/8.2
 video freq 807000000
 video nitpid 16
 video sessions 10 udp 49302 program 1
!
interface QAM6/9
 no ip address
!
interface QAM6/9.1
 video freq 813000000
 video nitpid 16
 video sessions 10 udp 49312 program 1
!
interface QAM6/9.2
 video freq 819000000
 video nitpid 16
 video sessions 10 udp 49322 program 1
!
interface QAM6/10
 no ip address
!
interface QAM6/10.1
 video freq 825000000
 video nitpid 16
 video sessions 10 udp 49332 program 1
!
interface QAM6/10.2
 video freq 831000000
 video nitpid 16
 video sessions 10 udp 49342 program 1
!
```

```
interface QAM6/11
 no ip address
!
interface QAM6/11.1
 video freq 837000000
 video nitpid 16
 video sessions 10 udp 49352 program 1
!
interface QAM6/11.2
 video freq 843000000
 video nitpid 16
 video sessions 10 udp 49362 program 1
!
interface QAM6/12
 no ip address
!
interface QAM6/12.1
 video freq 849000000
 video nitpid 16
 video sessions 10 udp 49372 program 1
!
interface QAM6/12.2
 video freq 855000000
 video nitpid 16
!
interface GigabitEthernet6/13
!
interface GigabitEthernet6/14
 switchport access vlan 31
 speed nonegotiate
 unidirectional receive-only
!
interface ASI6/15
 no ip address
 keepalive 5
 shutdown
!
interface QAM7/1
 no ip address
!
interface QAM7/1.1
 video freq 717000000
 video nitpid 16
 video sessions 5 udp 257 program 1
!
interface QAM7/1.2
 video freq 723000000
 video nitpid 16
 video sessions 10 udp 513 program 1
!
interface QAM7/2
 no ip address
!
interface QAM7/2.1
 video freq 729000000
 video nitpid 16
 video sessions 10 udp 769 program 1
!
interface QAM7/2.2
 video freq 735000000
 video nitpid 16
 video sessions 10 udp 1025 program 1
!
interface QAM7/3
```

```
 no ip address
!
interface QAM7/3.1
 video freq 741000000
 video nitpid 16
 video sessions 10 udp 1281 program 1
!
interface QAM7/3.2
 video freq 747000000
 video nitpid 16
 video sessions 10 udp 1537 program 1
!
interface QAM7/4
 no ip address
!
interface QAM7/4.1
 video freq 753000000
 video nitpid 16
 video sessions 10 udp 2049 program 1
!
interface QAM7/4.2
 video freq 759000000
 video nitpid 16
 video sessions 10 udp 2305 program 1
!
interface QAM7/5
 no ip address
!
interface QAM7/5.1
 video freq 765000000
 video nitpid 16
 video sessions 10 udp 2561 program 1
!
interface QAM7/5.2
 video freq 771000000
 video nitpid 16
 video sessions 10 udp 2817 program 1
!
interface QAM7/6
 no ip address
!
interface QAM7/6.1
 video freq 777000000
 video nitpid 16
 video sessions 10 udp 3073 program 1
!
interface QAM7/6.2
 video freq 783000000
 video nitpid 16
 video sessions 10 udp 3329 program 1
!
interface QAM7/7
 no ip address
!
interface QAM7/7.1
 video freq 789000000
 video nitpid 16
 video sessions 10 udp 3585 program 1
!
interface QAM7/7.2
 video freq 795000000
 video nitpid 16
 video sessions 10 udp 3841 program 1
!
```

```
interface QAM7/8
 no ip address
!
interface QAM7/8.1
 video freq 801000000
 video nitpid 16
 video sessions 10 udp 4097 program 1
!
interface QAM7/8.2
 video freq 807000000
 video nitpid 16
 video sessions 10 udp 4353 program 1
!
interface QAM7/9
 no ip address
!
interface QAM7/9.1
 video freq 813000000
 video nitpid 16
 video sessions 10 udp 4609 program 1
!
interface QAM7/9.2
 video freq 819000000
 video nitpid 16
 video sessions 10 udp 4865 program 1
!
interface QAM7/10
 no ip address
!
interface QAM7/10.1
 video freq 825000000
 video nitpid 16
 video sessions 10 udp 5121 program 1
!
interface QAM7/10.2
 video freq 831000000
 video nitpid 16
 video sessions 10 udp 5377 program 1
!
interface QAM7/11
 no ip address
!
interface QAM7/11.1
 video freq 837000000
 video nitpid 16
 video sessions 10 udp 5633 program 1
!
interface QAM7/11.2
 video freq 843000000
 video nitpid 16
 video sessions 10 udp 5889 program 1
!
interface QAM7/12
 no ip address
!
interface QAM7/12.1
 video freq 849000000
 video nitpid 16
 video sessions 10 udp 6145 program 1
!
interface QAM7/12.2
 video freq 855000000
 video nitpid 16
!
```

```
interface GigabitEthernet7/13
!
interface GigabitEthernet7/14
 switchport access vlan 166
!
interface ASI7/15
 no ip address
 keepalive 5
 shutdown
!
interface Vlan1
 no ip address
!
interface Vlan20
 ip address 192.168.20.6 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan21
 ip address 192.168.21.2 255.255.255.0
 standby ip 192.168.21.3
!
interface Vlan30
 ip address 192.168.30.6 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan31
 ip address 192.168.31.2 255.255.255.0
 load-interval 30
 standby 31 ip 192.168.31.3
!
interface Vlan38
 ip address 192.168.38.2 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan39
 ip address 192.168.39.2 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
 load-interval 30
!
interface Vlan161
 no ip address
 shutdown
!
interface Vlan164
 ip address 192.168.164.2 255.255.255.0
 load-interval 30
!
interface Vlan165
 ip address 192.168.165.2 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan166
 ip address 192.168.166.3 255.255.255.0 secondary
 ip address 192.168.166.4 255.255.255.0 secondary
 ip address 192.168.166.2 255.255.255.0
 no ip redirects
 load-interval 30
!
interface Vlan167
```

```
  ip address 192.168.167.2 255.255.255.0
  load-interval 30
!
interface Vlan222
 no ip address
 shutdown
!
router ospf 1
 log-adjacency-changes
 passive-interface QAM3/1
 passive-interface QAM3/2
 passive-interface QAM3/3
 passive-interface QAM3/4
 passive-interface QAM3/5
 passive-interface QAM3/6
 passive-interface QAM3/7
 passive-interface QAM3/8
 passive-interface QAM3/9
 passive-interface QAM3/10
 passive-interface QAM3/11
 passive-interface QAM3/12
 passive-interface ASI3/15
 passive-interface QAM4/1
 passive-interface QAM4/2
 passive-interface QAM4/3
 passive-interface QAM4/4
 passive-interface QAM4/5
 passive-interface QAM4/6
 passive-interface QAM4/7
 passive-interface QAM4/8
 passive-interface QAM4/9
 passive-interface QAM4/10
 passive-interface QAM4/11
 passive-interface QAM4/12
 passive-interface ASI4/15
 passive-interface QAM5/1
 passive-interface QAM5/2
 passive-interface QAM5/3
 passive-interface QAM5/4
 passive-interface QAM5/5
 passive-interface QAM5/6
 passive-interface QAM5/7
 passive-interface QAM5/8
 passive-interface QAM5/9
 passive-interface QAM5/10
 passive-interface QAM5/11
 passive-interface QAM5/12
 passive-interface ASI5/15
 passive-interface QAM6/1
 passive-interface QAM6/2
 passive-interface QAM6/3
 passive-interface QAM6/4
 passive-interface QAM6/5
 passive-interface QAM6/6
 passive-interface QAM6/7
 passive-interface QAM6/8
 passive-interface QAM6/9
 passive-interface QAM6/10
 passive-interface QAM6/11
 passive-interface QAM6/12
 passive-interface ASI6/15
 passive-interface QAM7/1
 passive-interface QAM7/2
 passive-interface QAM7/3
```

```
        passive-interface QAM7/4
        passive-interface QAM7/5
        passive-interface QAM7/6
        passive-interface QAM7/7
        passive-interface QAM7/8
        passive-interface QAM7/9
        passive-interface QAM7/10
        passive-interface QAM7/11
        passive-interface QAM7/12
        passive-interface ASI7/15
        network 192.168.164.0 0.0.0.255 area 0
        network 192.168.165.0 0.0.0.255 area 0
        network 192.168.166.0 0.0.0.255 area 0
        network 192.168.167.0 0.0.0.255 area 0
       !
       no ip http server
       !
       line con 0
        stopbits 1
       line vty 0 4
        login
       !
       end
```

QAM Switch Configuration with the Same VLAN: Example

Figure 2 illustrates Cisco uMG9850 modules in a QAM switch with a single VLAN supporting ports to route video streams to different boards.

Figure 2   QAM Switch with Different VLANs
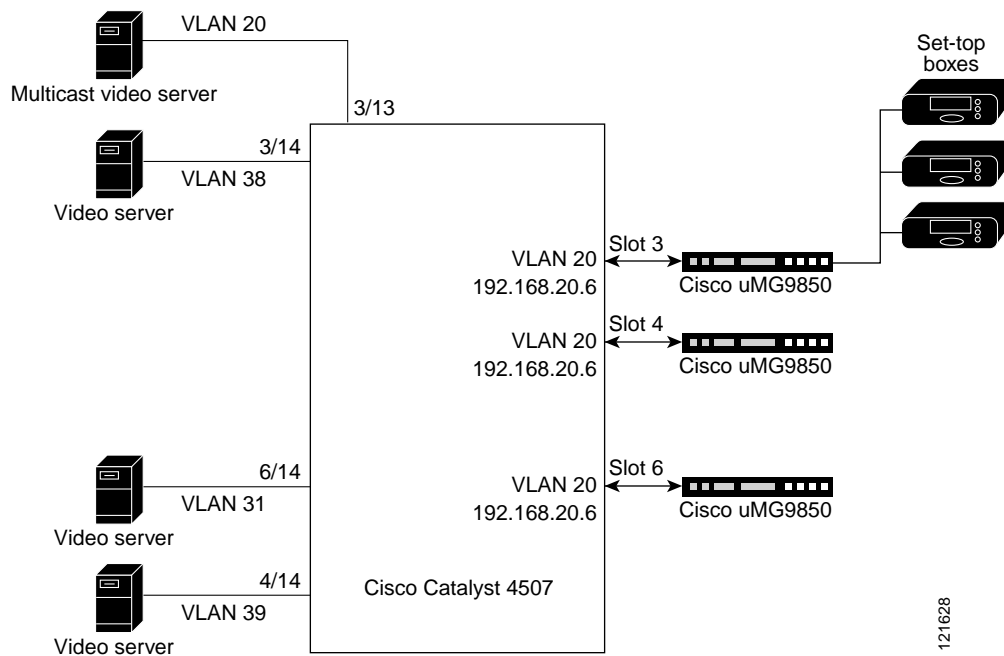
- VLAN 20 supports ingress multicast video traffic to the following:

    – Cisco uMG9850 in slot 3, UDP ports 257–500

    – Cisco uMG9850 in slot 4, UDP ports 501–6200

    – Cisco uMG9850 in slot 5, UDP ports 49152–49500

- The Cisco uMG9850 in slot 3 forwards selected video streams (from QAM channels 3/1.1 to 3/12.2) to set-top boxes.

- The ASI port of the Cisco uMG9850 in slot 3 is configured to route the output of QAM channel 3/1.1 to an MPEG analyzer (not shown).

```
Dhub# show running-config

Current configuration : 19319 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
service compress-config
!
hostname QAM_Sw_A
!
boot system bootflash:cat4000-i5su3-mz.tornado.609
boot system flash slot0:tornado.608
!
vtp mode transparent
ip subnet-zero
!
ip multicast-routing
no ip igmp snooping
video timeout session-close 1
video 3 route Vlan20 udp 257 500
video 3 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam3/12.2
 pass-through
video 4 route Vlan20 udp 501 6200
video 4 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam4/12.2
 pass-through
video 6 route Vlan20 udp 49152 49500
video 6 multicast source-address 192.168.20.110 dest-address 224.5.5.5 qam6/12.2
 pass-through
no cluster run
!
no file verify auto
spanning-tree mode pvst
spanning-tree extend system-id
power redundancy-mode redundant
!
redundancy
 main-cpu
  auto-sync standard
 mode rpr
!
vlan internal allocation policy ascending
!
vlan 20-21,30-31,38-39,151,164-167
!
interface GigabitEthernet1/1
 switchport access vlan 21
 speed nonegotiate
```

```
 unidirectional receive-only
!
interface GigabitEthernet1/2
 switchport access vlan 166
 load-interval 30
 speed nonegotiate
!
interface GigabitEthernet2/1
!
interface GigabitEthernet2/2
!
interface QAM3/1
 no ip address
!
interface QAM3/1.1
 video interleave mode 1
 video power 53
 video freq 717000000
 video sessions 10 udp 257 program 1
!
interface QAM3/1.2
 video interleave mode 1
 video power 53
 video freq 723000000
 video sessions 10 udp 267 program 1
!
interface QAM3/2
 no ip address
!
interface QAM3/2.1
 video interleave mode 1
 video freq 729000000
 video sessions 10 udp 277 program 1
!
interface QAM3/2.2
 video interleave mode 1
 video freq 735000000
 video sessions 10 udp 287 program 1
!
interface QAM3/3
 no ip address
!
interface QAM3/3.1
 video freq 741000000
 video sessions 10 udp 297 program 1
!
interface QAM3/3.2
 video freq 747000000
 video sessions 10 udp 307 program 1
!
interface QAM3/4
 no ip address
!
interface QAM3/4.1
 video freq 753000000
 video sessions 10 udp 317 program 1
!
interface QAM3/4.2
 video freq 759000000
 video sessions 10 udp 327 program 1
!
interface QAM3/5
 no ip address
!
```

```
interface QAM3/5.1
 video freq 765000000
 video sessions 10 udp 337 program 1
!
interface QAM3/5.2
 video freq 771000000
 video sessions 10 udp 347 program 1
!
interface QAM3/6
 no ip address
!
interface QAM3/6.1
 video freq 777000000
 video sessions 10 udp 357 program 1
!
interface QAM3/6.2
 video freq 783000000
 video sessions 10 udp 367 program 1
!
interface QAM3/7
 no ip address
!
interface QAM3/7.1
 video freq 789000000
 video sessions 10 udp 387 program 1
!
interface QAM3/7.2
 video freq 795000000
 video sessions 10 udp 397 program 1
!
interface QAM3/8
 no ip address
!
interface QAM3/8.1
 video freq 801000000
 video sessions 10 udp 407 program 1
!
interface QAM3/8.2
 video freq 807000000
 video sessions 10 udp 417 program 1
!
interface QAM3/9
 no ip address
!
interface QAM3/9.1
 video freq 813000000
 video sessions 10 udp 427 program 1
!
interface QAM3/9.2
 video freq 819000000
 video sessions 10 udp 437 program 1
!
interface QAM3/10
 no ip address
!
interface QAM3/10.1
 video freq 825000000
 video sessions 10 udp 447 program 1
!
interface QAM3/10.2
 video freq 831000000
 video sessions 10 udp 457 program 1
!
interface QAM3/11
```

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```
 no ip address
!
interface QAM3/11.1
 video freq 837000000
 video sessions 10 udp 467 program 1
!
interface QAM3/11.2
 video freq 843000000
 video sessions 10 udp 477 program 1
!
interface QAM3/12
 no ip address
!
interface QAM3/12.1
 video freq 849000000
 video sessions 10 udp 487 program 1
!
interface QAM3/12.2
 video freq 855000000
!
interface GigabitEthernet3/13
 switchport access vlan 20
!
interface GigabitEthernet3/14
 switchport access vlan 38
!
interface ASI3/15
 no ip address
 keepalive 5
 video route qam 3/1.1
!
interface QAM4/1
 no ip address
!
interface QAM4/1.1
 video power 45
 video freq 717000000
 video sessions 10 udp 501 program 1
!
interface QAM4/1.2
 video power 45
 video freq 723000000
 video nitpid 16
 video sessions 10 udp 511 program 1
!
interface QAM4/2
 no ip address
!
interface QAM4/2.1
 video freq 729000000
 video nitpid 16
 video sessions 10 udp 769 program 1
!
interface QAM4/2.2
 video freq 735000000
 video nitpid 16
 video sessions 10 udp 1025 program 1
!
interface QAM4/3
 no ip address
!
interface QAM4/3.1
 video freq 741000000
 video nitpid 16
```

```
 video sessions 10 udp 1281 program 1
!
interface QAM4/3.2
 shutdown
 video freq 747000000
 video nitpid 16
 video sessions 10 udp 1537 program 1
!
interface QAM4/4
 no ip address
!
interface QAM4/4.1
 shutdown
 video freq 753000000
 video nitpid 16
 video sessions 10 udp 2049 program 1
!
interface QAM4/4.2
 video freq 759000000
 video nitpid 16
 video sessions 10 udp 2305 program 1
!
interface QAM4/5
 no ip address
!
interface QAM4/5.1
 video freq 765000000
 video nitpid 16
 video sessions 10 udp 2561 program 1
!
interface QAM4/5.2
 video freq 771000000
 video nitpid 16
 video sessions 10 udp 2817 program 1
!
interface QAM4/6
 no ip address
!
interface QAM4/6.1
 video freq 777000000
 video nitpid 16
 video sessions 10 udp 3073 program 1
!
interface QAM4/6.2
 video freq 783000000
 video nitpid 16
 video sessions 10 udp 3329 program 1
!
interface QAM4/7
 no ip address
!
interface QAM4/7.1
 video freq 789000000
 video nitpid 16
 video sessions 10 udp 3585 program 1
!
interface QAM4/7.2
 video freq 795000000
 video nitpid 16
 video sessions 10 udp 3841 program 1
!
interface QAM4/8
 no ip address
!
```

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```
interface QAM4/8.1
 video freq 801000000
 video nitpid 16
 video sessions 10 udp 4097 program 1
!
interface QAM4/8.2
 video freq 807000000
 video nitpid 16
 video sessions 10 udp 4353 program 1
!
interface QAM4/9
 no ip address
!
interface QAM4/9.1
 video freq 813000000
 video nitpid 16
 video sessions 10 udp 4609 program 1
!
interface QAM4/9.2
 video freq 819000000
 video nitpid 16
 video sessions 10 udp 4865 program 1
!
interface QAM4/10
 no ip address
!
interface QAM4/10.1
 video freq 825000000
 video nitpid 16
 video sessions 10 udp 5121 program 1
!
interface QAM4/10.2
 video freq 831000000
 video nitpid 16
 video sessions 10 udp 5377 program 1
!
interface QAM4/11
 no ip address
!
interface QAM4/11.1
 video freq 837000000
 video nitpid 16
 video sessions 10 udp 5633 program 1
!
interface QAM4/11.2
 video freq 843000000
 video nitpid 16
 video sessions 10 udp 5889 program 1
!
interface QAM4/12
 no ip address
!
interface QAM4/12.1
 video freq 849000000
 video nitpid 16
 video sessions 10 udp 6145 program 1
!
interface QAM4/12.2
 video freq 855000000
 video nitpid 16
!
interface GigabitEthernet4/13
!
interface GigabitEthernet4/14
```

```
 switchport access vlan 39
!
interface ASI4/15
 no ip address
 keepalive 5
 video route qam 4/1.1
!
interface QAM6/1
 no ip address
!
interface QAM6/1.1
 video power 45
 video freq 717000000
 video nitpid 16
 video sessions 10 udp 49152 program 1
!
interface QAM6/1.2
 video power 45
 video freq 723000000
 video nitpid 16
 video sessions 10 udp 49162 program 1
!
interface QAM6/2
 no ip address
!
interface QAM6/2.1
 video freq 729000000
 video nitpid 16
 video sessions 10 udp 49172 program 1
!
interface QAM6/2.2
 video freq 735000000
 video nitpid 16
 video sessions 10 udp 49182 program 1
!
interface QAM6/3
 no ip address
!
interface QAM6/3.1
 video freq 741000000
 video nitpid 16
 video sessions 10 udp 49192 program 1
!
interface QAM6/3.2
 shutdown
 video freq 747000000
 video nitpid 16
 video sessions 10 udp 49202 program 1
!
interface QAM6/4
 no ip address
!
interface QAM6/4.1
 shutdown
 video freq 753000000
 video nitpid 16
 video sessions 10 udp 49212 program 1
!
interface QAM6/4.2
 video freq 759000000
 video nitpid 16
 video sessions 10 udp 49222 program 1
!
interface QAM6/5
```

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```
 no ip address
!
interface QAM6/5.1
 video freq 765000000
 video nitpid 16
 video sessions 10 udp 49232 program 1
!
interface QAM6/5.2
 video freq 771000000
 video nitpid 16
 video sessions 10 udp 49242 program 1
!
interface QAM6/6
 no ip address
!
interface QAM6/6.1
 video freq 777000000
 video nitpid 16
 video sessions 10 udp 49252 program 1
!
interface QAM6/6.2
 video freq 783000000
 video nitpid 16
 video sessions 10 udp 49262 program 1
!
interface QAM6/7
 no ip address
!
interface QAM6/7.1
 video freq 789000000
 video nitpid 16
 video sessions 10 udp 49272 program 1
!
interface QAM6/7.2
 video freq 795000000
 video nitpid 16
 video sessions 10 udp 49282 program 1
!
interface QAM6/8
 no ip address
!
interface QAM6/8.1
 video freq 801000000
 video nitpid 16
 video sessions 10 udp 49292 program 1
!
interface QAM6/8.2
 video freq 807000000
 video nitpid 16
 video sessions 10 udp 49302 program 1
!
interface QAM6/9
 no ip address
!
interface QAM6/9.1
 video freq 813000000
 video nitpid 16
 video sessions 10 udp 49312 program 1
!
interface QAM6/9.2
 video freq 819000000
 video nitpid 16
 video sessions 10 udp 49322 program 1
!
```

```
interface QAM6/10
 no ip address
!
interface QAM6/10.1
 video freq 825000000
 video nitpid 16
 video sessions 10 udp 49332 program 1
!
interface QAM6/10.2
 video freq 831000000
 video nitpid 16
 video sessions 10 udp 49342 program 1
!
interface QAM6/11
 no ip address
!
interface QAM6/11.1
 video freq 837000000
 video nitpid 16
 video sessions 10 udp 49352 program 1
!
interface QAM6/11.2
 video freq 843000000
 video nitpid 16
 video sessions 10 udp 49362 program 1
!
interface QAM6/12
 no ip address
!
interface QAM6/12.1
 video freq 849000000
 video nitpid 16
 video sessions 10 udp 49372 program 1
!
interface QAM6/12.2
 video freq 855000000
 video nitpid 16
!
interface GigabitEthernet6/13
!
interface GigabitEthernet6/14
 switchport access vlan 31
 speed nonegotiate
 unidirectional receive-only
!
interface ASI6/15
 no ip address
 keepalive 5
 shutdown
!
interface Vlan1
 no ip address
!
interface Vlan20
 ip address 192.168.20.6 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan21
 ip address 192.168.21.2 255.255.255.0
 standby ip 192.168.21.3
!
interface Vlan30
 ip address 192.168.30.6 255.255.255.0
```

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```
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan31
 ip address 192.168.31.2 255.255.255.0
 load-interval 30
 standby 31 ip 192.168.31.3
!
interface Vlan38
 ip address 192.168.38.2 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan39
 ip address 192.168.39.2 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
 load-interval 30
!
interface Vlan161
 no ip address
 shutdown
!
interface Vlan164
 ip address 192.168.164.2 255.255.255.0
 load-interval 30
!
interface Vlan165
 ip address 192.168.165.2 255.255.255.0
 ip pim sparse-mode
 ip igmp static-group 224.5.5.5 source 192.168.20.110
!
interface Vlan166
 ip address 192.168.166.3 255.255.255.0 secondary
 ip address 192.168.166.4 255.255.255.0 secondary
 ip address 192.168.166.2 255.255.255.0
 no ip redirects
 load-interval 30
!
interface Vlan167
 ip address 192.168.167.2 255.255.255.0
 load-interval 30
!
interface Vlan222
 no ip address
 shutdown
!
router ospf 1
 log-adjacency-changes
 passive-interface QAM3/1
 passive-interface QAM3/2
 passive-interface QAM3/3
 passive-interface QAM3/4
 passive-interface QAM3/5
 passive-interface QAM3/6
 passive-interface QAM3/7
 passive-interface QAM3/8
 passive-interface QAM3/9
 passive-interface QAM3/10
 passive-interface QAM3/11
 passive-interface QAM3/12
 passive-interface ASI3/15
 passive-interface QAM4/1
 passive-interface QAM4/2
```

```
            passive-interface QAM4/3
            passive-interface QAM4/4
            passive-interface QAM4/5
            passive-interface QAM4/6
            passive-interface QAM4/7
            passive-interface QAM4/8
            passive-interface QAM4/9
            passive-interface QAM4/10
            passive-interface QAM4/11
            passive-interface QAM4/12
            passive-interface ASI4/15
            passive-interface QAM6/1
            passive-interface QAM6/2
            passive-interface QAM6/3
            passive-interface QAM6/4
            passive-interface QAM6/5
            passive-interface QAM6/6
            passive-interface QAM6/7
            passive-interface QAM6/8
            passive-interface QAM6/9
            passive-interface QAM6/10
            passive-interface QAM6/11
            passive-interface QAM6/12
            passive-interface ASI6/15
          network 192.168.164.0 0.0.0.255 area 0
           network 192.168.165.0 0.0.0.255 area 0
           network 192.168.166.0 0.0.0.255 area 0
           network 192.168.167.0 0.0.0.255 area 0
          !
          no ip http server
          !
          line con 0
           stopbits 1
          line vty 0 4
           login
          !
          end
```

Additional References

The following sections provide references related to the Cisco uMG9850 module and the Cisco Catalyst 4500 series switches, as well as an overview of the architecture of the Cisco Video on Demand Solution.

Related Documents

Related Topic	Document Title and URL
Cisco Catalyst 4500 series IOS command reference, software configuration guide, system message guide, and release notes Note Refer to the above documents only for basic switch configuration. These documents do not discuss the use of the Cisco uMG9850 module, or related issues.	Switch Documentation, Cisco IOS Software Release 12.2(20)EWA http://www.cisco.com/univercd/cc/td/doc/product/lan/cat4000/12_2_20a/index.htm
Cisco Gigabit-Ethernet Optimized Video on Demand Solution	Cisco Gigabit-Ethernet Optimized VoD Solution, Release 1.1 http://www.cisco.com/univercd/cc/td/doc/solution/vodsols/geopt1_1/index.htm The *Cisco Gigabit-Ethernet Optimized VoD Solution Design and Implementation Guide* presents the architecture for delivering a video stream to a set-top box.

Standards

Standards	Title
• ISO/IEC 13818-1 (MPEG-2) • ISO/IEC 13818-2 (video coding) • ISO/IEC 13818-3 (audio coding)	*Information Technology – Generic coding of moving pictures and associated audio information (MPEG-2)*
• ITU-T J.83, Annex B	*Digital multi-programme systems for television, sound and data services for cable distribution*

MIBs

MIBs	MIBs Link
The following MIBs are supported: • CISCO-VIDEO-NETWORK-MIB • CISCO-VIDEO-NETWORK-EXT-MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
• RFC 1889	*RTP: A Transport Protocol for Real-Time Applications*
• RFC 2250	*RTP Payload Format for MPEG1/MPEG2 Video*
• RFC 2326	*Real-Time Streaming Protocol (RTSP)*
• RFC 2327	*SDP: Session Description Protocol*

Technical Assistance

Description	Link
The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies.	http://www.cisco.com/techsupport

Command Reference

This section documents new and modified commands for the Cisco uMG9850.

Note   All other commands used with this feature are documented in the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide, 12.1(20)EW, at the following URL:*

http://www.cisco.com/univercd/cc/td/doc/product/lan/cat4000/12_1_20/config/index.htm

clear video <slot> statistics

To clear the video statistics of all sessions or a single session on a selected Cisco uMG9850, use the **clear video** *slot* **statistics** command in privileged EXEC mode.

clear video *slot* **statistics** [**session** *session-number*]

Syntax Description

slot	Physical slot number for the Cisco uMG9850. For valid slot ranges, see Table 7 on page 12.
statistics	Selects video statistics.
session	Selects a specific video session (UDP port).
session-number	Session number. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.

Defaults   No default behaviors or values

Command Modes   Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Examples   The following example shows how to clear video statistics on a Cisco uMG9850 in slot 6:

```
Switch# clear video 6 statistics
Switch#
```

Related Commands

Command	Description
Various	See show, page 87.

interface asi

You can route one of the 24 transport streams (QAM channels) to the asynchronous serial interface (ASI) output port. This allows you to route a stream to a decoder, monitor, or MPEG analyzer for troubleshooting. This command is used to enter ASI interface configuration mode, to use **video route** and **video byte-gap**.

To enter interface configuration mode for an asynchronous serial interface (ASI) output port on the Cisco uMG9850, use the **interface asi** command in global configuration mode.

interface asi *slot*/**15**

Syntax Description

interface	Enables interface configuration mode.
asi	Selects the ASI output port.
slot	Physical slot number for the Cisco uMG9850. For valid slot ranges, see Table 7 on page 12.
15	Required physical port. The number of the ASI port on the Cisco uMG9850 is always 15.

Defaults   The number of the ASI port on the Cisco uMG9850 is always 15.

Command Modes   ASI interface configuration mode. See Interface Configuration Mode, page 5.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines   The ASI port is always port 15 on each module. The slot varies. Use **no shut** to enable the port.

Note   Routing the output of a QAM channel to the ASI port does not disrupt the RF output.

Examples   The following example shows how to enter interface configuration mode for the ASI port on the Cisco uMG9850 in slot 6, assign QAM channel 6/7.2 to the ASI interface, and set a byte gap value of 1:

```
Switch# configure terminal
Switch(config)# interface asi 6/15
Switch(config-if)# video route interface qam 6/7.2
Switch(config-if)# video byte-gap 1
Switch(config-if)# no shut
```

See also Configuring the ASI Port for QAM Channel Routing (Optional), page 35, and Routing the Output of a QAM Channel to the ASI Port, page 36.

Related Commands	Command	Description
	interface qam	See interface qam, page 85.
	video byte-gap	See video byte-gap, page 137.
	video route	See video route, page 153. Do not confuse this command with video <slot> route vlan, page 124

interface qam

To enter interface configuration mode for an output QAM port on a selected Cisco uMG9850, use the **interface qam** command in global configuration mode:

> **interface qam** *interface*

To enter subinterface configuration mode for a QAM channel on a selected Cisco uMG9850, use the **interface qam** *interface.qam* command in interface configuration mode:

> **interface qam** *interface.qam*

Syntax Description

interface	Enables interface configuration mode.
qam	Enables QAM interface configuration for either a single channel, both channels on a QAM port, or all four channels in a QAM modulator group. For background, see Interface Configuration Mode, page 5.
interface	Slot and port number in *slot*/*port* format. See Interface Configuration Mode, page 5. For valid slot ranges, see Table 7 on page 12. The range for port is 1 to 12, with no default.
qam	QAM channel of interest. The range for *qam* is 1 to 2, with no default.

Defaults

No default behaviors or values

Command Modes

Global and interface configuration mode. See Interface Configuration Mode, page 5.

✎
Note Interface configuration mode is not used frequently in video contexts. The command options that can be used at the interface configuration level (slot and port only) are **description**, **exit**, and **shutdown**.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

See the following related tasks:

- Setting the Frequency and Output Power of the QAM Module Channels, page 20
- Setting the Modulation Format, page 23
- Configuring the FEC Interleave Level and Mode, page 24

To address power, frequency, modulation format, and interleave mode, you need to address only a single channel. (See Subinterface Configuration Mode, page 6.) The other channel is configured automatically.

Examples   To enter interface configuration mode for the second QAM port on the Cisco uMG9850 in slot 5:

```
Switch# configure terminal
Switch(config)# interface qam 5/2
Switch(config-if)#
```

To enter subinterface configuration mode for the first QAM channel on the first QAM port on the Cisco uMG9850 in slot 5:

```
Switch# configure terminal
Switch(config)# interface qam 5/1.1
Switch(config-subif)#
```

Related Commands

Command	Description
interface asi	See interface asi, page 83.

show

Table 10 shows the hierarchy of the video-related **show** commands. These commands are executed at the following prompt (see Privileged EXEC Mode, page 5):

```
Switch#
```

> **Note** The **show video** command, without the parameter *slot*, is not available in user mode.

Table 10   show Commands

Command Hierarchy			Reference
show	**interface**	**asi <interface>**	show interface asi <interface> video, page 88
		qam <interface>	show interface qam <interface> video, page 90
		qam <interface.qam>	show interface qam <interface.qam> video, page 92
			show interface qam <interface.qam> video portmap, page 94
	video	**<slot>**	show video <slot>, page 96
			show video <slot> psi session, page 98
			show video <slot> psi session multicast, page 100
			show video <slot> route, page 102
			show video <slot> session, page 103
			show video <slot> session multicast, page 105
			show video <slot> ts_table, page 107
			show video <slot> version, page 109

show interface asi <interface> video

To view information about a single QAM channel routed to the output ASI interface, use the **show interface asi** *interface* **video** command in privileged EXEC mode:

show interface asi *interface* **video**

Syntax Description

interface	Enables interface configuration mode.
asi	Enables reporting on the ASI interface.
interface	Physical slot number and port for the Cisco uMG9850, in *slot*/**15** format. The number of the ASI port on the Cisco uMG9850 is always 15. For valid slot ranges, see Table 7 on page 12. See also Interface Configuration Mode, page 5.
video	Enables reporting on video information. (This is required.)

Defaults The ASI port is always 15.

Command Modes Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines The following information is retrieved:

- Port status (active/inactive)
- QAM channel routed to the ASI interface
- Program details (if available)

Examples To view information about what channel is routed to the ASI port of a Cisco uMG9850 in slot 3:

```
Switch# show interface asi 5/15 video

Port Status :    Inactive
Byte Gap :       1
QAM interface: qam 3/1.1
Total # of active programs :7
Program 1      State: active   PMT PID: 32,    PCR pid: 33
Session UDP 49152
(1) PID: 33     Stream type 2
(2) PID: 36     Stream type 129
(3) PID: 42     Stream type 192
Program 2      State: active   PMT PID: 48,    PCR pid: 49
Session UDP 49153
(1) PID: 49     Stream type 2
(2) PID: 52     Stream type 129
```

```
(3) PID: 58      Stream type 192
Program 3       State: active   PMT PID: 64,    PCR pid: 65
Session UDP 49154
(1) PID: 65      Stream type 2
(2) PID: 68      Stream type 129
(3) PID: 74      Stream type 192
```

Related Commands	Command	Description
	clear video <slot> statistics	See clear video <slot> statistics, page 82.
	Various	See show, page 87.

show interface qam <interface> video

To view video information about both channels on an output QAM interface, use the **show interface qam** *interface* **video** command in privileged EXEC mode.

show interface qam *interface* **video**

Syntax Description

interface	Enables interface configuration mode.
qam	Enables reporting for both channels on a QAM interface.
interface	Slot and port number in *slot*/*port* format. For valid slot ranges, see Table 7 on page 12. See Interface Configuration Mode, page 5.
video	Enables reporting on video parameters.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

Information such as the following is retrieved:

- Number of active QAMs and QAM status (shut/no shut)
- QAM modulator group number
- Transport stream ID (TSID), network information table packet ID (NIT PID), and program-specific information (PSI) interface values
- Upconverter frequency and power, and QAM modulation type
- Port error status

Examples

To view information about both QAM channels on QAM interface 5/1:

```
Switch# show interface qam 5/1 video

Modulator Group 1
QAM 1
        TSID: 10, Nit Pid: 16, PAT Int: 100
        Status: enabled
        Frequency: 100000000 Hz
        Power: 50 dBmV
        Modulation: 256 QAM
        # of active sessions: 7
        Average Output Packet Count: 15482 pps
        Average Output bit rate: 23.284928 Mbps
        Utilization : 60 percentage
```

```
              High Utilization threshold: 75 percentage
              Low Utilization threshold: 10 percentage
      QAM 2
              TSID: 2, Nit Pid: 16, PAT Int: 100
              Status: disabled
              Frequency: 106000000 Hz
              Power: 50 dBmV
              Modulation: 256 QAM
              # of active sessions: 6
              Average Output Packet Count: 13160 pps
              Average Output bit rate: 19.792640 Mbps
              Utilization : 51 percentage
              High Utilization threshold: 75 percentage
              Low Utilization threshold: 10 percentage
```

Related Commands	Command	Description
	clear video <slot> statistics	See clear video <slot> statistics, page 82.
	Various	See show, page 87.

show interface qam <interface.qam> video

To view video information about a single QAM channel, use the **show interface qam** *interface.qam* **video** command in privileged EXEC mode:

> **show interface qam** *interface.qam* **video**

Syntax Description

interface	Enables interface configuration mode.
qam	Enables reporting for both channels on a QAM interface.
interface.qam	Slot and port number in *slot/port.qam* format. For valid slot ranges, see Table 7 on page 12. See Subinterface Configuration Mode, page 6.
video	Enables reporting on video parameters.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

Information such as the following is retrieved:

- Number of programs and active sessions
- TSID and NIT PID information
- Packets per second and bit rate through the channel
- Active trick modes
- Video and audio format for each session
- QAM error status (such as oversubscribed, underflow)

Examples

To view video information about QAM channel 3/2.1:

```
Switch# show interface qam 3/2.1 video

TSID: 37, Nit Pid: 8191, PAT Interval: 100 ms
Total bitrate: 0.0 Mbps

Total # of programs :10
Program 1,       Status: active,          PMT PID: 16,     PCR pid: 17
ECM PIDS:24,
Session UDP 49152
(1) PID: 17      Stream type 128
(2) PID: 20      Stream type 129
(3) PID: 21      Stream type 129
```

```
Program 2,      Status: active,         PMT PID: 32,    PCR pid: 33
ECM PIDS:40,
Session UDP 49153
(1) PID: 33     Stream type 128
(2) PID: 36     Stream type 129
(3) PID: 37     Stream type 129
Program 3,      Status: Inactive
Program 4,      Status: Inactive
Program 5,      Status: Inactive
Program 6,      Status: Inactive
Program 7,      Status: Inactive
Program 8,      Status: Inactive
Program 9,      Status: Inactive
Program 10,     Status: Inactive
```

	Command	Description
Related Commands	**clear video <slot> statistics**	See clear video <slot> statistics, page 82.
	Various	See show, page 87.

show interface qam <interface.qam> video portmap

To view information about the UDP portmaps on an output QAM interface, use the **show interface** *interface.qam* **video portmap** command in privileged EXEC mode.

show interface *interface.qam* **video portmap**

Syntax Description

interface	Enables interface configuration mode.
qam	Enables reporting for both channels on a QAM interface.
interface.qam	QAM slot and port number in *slot*/*port.qam* format. For valid slot ranges, see Table 7 on page 12. See Subinterface Configuration Mode, page 6.
video	Enables reporting on video parameters.
portmap	Selects UDP portmap data.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

Information such as the following is retrieved:

- UDP port number, in decimal and hexadecimal

- Output program number

Tip   Occasionally, if user-defined port mapping is removed, as in the following example:

```
Switch(config-subif)# no video udp 49152 program 1
```

the default port mapping does not appear following the execution of this **show** command. To generate the default port mapping, execute **no video session**. See Related Commands, below.

Examples

To view UDP portmap information on QAM channel 6/1.1:

```
ODI-SW# show interface qam 6/1.1 video portmap

Did not get a reply from the module for this query.
The statistics shown may not be up-to-date.port map for qam 1:
    udp 45089 (0xB021)  out_prog_num 1
    udp 45090 (0xB022)  out_prog_num 2
    udp 45091 (0xB023)  out_prog_num 3
    udp 45092 (0xB024)  out_prog_num 4
```

```
udp 45093 (0xB025)   out_prog_num 5
udp 45094 (0xB026)   out_prog_num 6
udp 45095 (0xB027)   out_prog_num 7
udp 45096 (0xB028)   out_prog_num 8
udp 45097 (0xB029)   out_prog_num 9
udp 45098 (0xB02A)   out_prog_num 10
udp 45099 (0xB02B)   out_prog_num 11
udp 45100 (0xB02C)   out_prog_num 12
udp 45101 (0xB02D)   out_prog_num 13
udp 45102 (0xB02E)   out_prog_num 14
udp 45103 (0xB02F)   out_prog_num 15
udp 45104 (0xB030)   out_prog_num 16
udp 45105 (0xB031)   out_prog_num 17
udp 45106 (0xB032)   out_prog_num 18
udp 45107 (0xB033)   out_prog_num 19
udp 45108 (0xB034)   out_prog_num 20
udp 45109 (0xB035)   out_prog_num 21
udp 45110 (0xB036)   out_prog_num 22
udp 45111 (0xB037)   out_prog_num 23
udp 45112 (0xB038)   out_prog_num 24
udp 45113 (0xB039)   out_prog_num 25
```

Related Commands	Command	Description
	clear video <slot> statistics	See clear video <slot> statistics, page 82.
	no video udp	See video udp, page 160.
	Various	See show, page 87.

show video <slot>

To view information related to the modulator groups, including frequency and power, use the **show video** *slot* command in privileged EXEC mode.

show video *slot*

Syntax Description		
	video	Enables reporting on video information.
	slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.

Defaults   No default behaviors or values

Command Modes   Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines   You must enter a slot number to see all the available options.

The following information is retrieved with the *slot* argument only:

- Active modulator groups
- Upconverter frequency and power for each channel

Tip   To clear statistics, use the **clear video** *slot* **statistics** command (see clear video <slot> statistics, page 82).

Examples   To view video details for a Cisco uMG9850 in slot 3:

```
Switch# show video 3

Annex mode is B

Number of QAMs per port 2

Modulators:
    Group 1: Port  1, Port  2
    Group 2: Port  3, Port  4
    Group 3: Port  5, Port  6
    Group 4: Port  7, Port  8
    Group 5: Port  9, Port 10
    Group 6: Port 11, Port 12

Upconverter settings:
```

```
QAM       Frequency(Hz)    Power(dBmV)
3/1.1     140000000        50
3/1.2     148000000        0
3/2.1     116000000        0
3/2.2     124000000        0
3/3.1     132000000        0
3/3.2     140000000        0
3/4.1     148000000        0
3/4.2     156000000        0
3/5.1     164000000        0
3/5.2     172000000        0
3/6.1     180000000        0
3/6.2     188000000        0
3/7.1     196000000        0
3/7.2     204000000        0
3/8.1     212000000        0
3/8.2     220000000        0
3/9.1     228000000        0
3/9.2     236000000        0
3/10.1    244000000        0
3/10.2    252000000        0
3/11.1    260000000        0
3/11.2    268000000        0
3/12.1    276000000        0
3/12.2    284000000        0
Free UDP ports =
```

	Command	Description
Related Commands	**clear video <slot> statistics**	See clear video <slot> statistics, page 82.
	Various	See show, page 87.

show video <slot> psi session

To view program-specific information (PSI) related to the input for a selected Cisco uMG9850, use the **show video** *slot* **psi session** command in privileged EXEC mode.

> **show video** *slot* **psi session** *session-number*

Syntax Description

video	Enables reporting on video information.
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
psi	Selects PSI-specific information.
session	Reports PSI information for a specific session (UDP port).
session-number	Session number. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

Information such as the following is retrieved:

- UDP port number and session status
- PSI parameters
- Source program
- Streams and stream types

Examples

To view PSI details for a Cisco uMG9850 in slot 3 for a specific session:

```
Switch# show video 3 psi session 0xc000

UDP port#:49152
Session Status: active
TSID: 25891, PAT VERSION: 2, NIT PID : 0
Source Program #: 1
PMT PID  89,    PCR PID  64    CA_SYS ID:18249,        ECM PID  89

Elementary Streams:
(1) Pid: 64      Stream type:128
(2) Pid: 65      Stream type:129
(3) Pid: 66      Stream type:129
```

Related Commands	Command	Description
	clear video <slot> statistics	See clear video <slot> statistics, page 82.
	show video <slot> psi session multicast	See show video <slot> psi session multicast, page 100.
	Various	See show, page 87.

show video <slot> psi session multicast

To view multicast program-specific information (PSI) related to the input for a selected Cisco uMG9850, use the **show video** *slot* **psi session multicast** command in privileged EXEC mode.

> **show video** *slot* **psi session multicast source-address** *source-ip-address*
> **dest-address** *destination-ip-address*

Syntax Description

video	Enables reporting on video information.
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
psi	Selects PSI-specific information.
source-address	Selects the IP address of the multicast source.
source-ip-address	IP address of the multicast source.
dest-address	Selects the IP address of the multicast destination.
destination-ip-address	IP address of the multicast destination.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(20)EU	This command was introduced.

Usage Guidelines

Information such as the following is retrieved:

- Session status
- PSI parameters
- Source program
- Streams and stream types

Examples

To view multicast PSI details for a Cisco uMG9850 in slot 3 for a specific session:

```
Switch# show video 3 psi session multicast source-address 192.168.4.4 dest-address
224.4.4.4

Multicast source 192.168.4.4 destination 224.4.4.4
Session Status: active
TSID: 300, PAT VERSION: 30
Source Program #: 1
PMT PID  32,    PCR PID  33
Elementary Streams:
(1) Pid: 33     Stream type:2
```

```
(2) Pid: 34      Stream type:129
(3) Pid: 35      Stream type:192
```

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
show video <slot> psi session	See show video <slot> psi session, page 98.
Various	See show, page 87.

show video <slot> route

To view video route information related to the input for a selected Cisco uMG9850, use the **show video** *slot* **route** command in privileged EXEC mode.

show video *slot* **route**

Syntax Description		
	video	Enables reporting on video information.
	slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
	route	Enables reporting on video route details.

Defaults   No default behaviors or values

Command Modes   Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Examples   To view input video route details for a Cisco uMG9850 in slot 3:

```
Switch# show video 3 route

video 3 route vlan20 udp 38945 40992
```

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
Various	See show, page 87.

show video <slot> session

To view a variety of video details related to sessions for a selected Cisco uMG9850, use the **show video** *slot* **session** command in privileged EXEC mode.

show video *slot* **session** {*UDP-port-number* | **active** | **all**}

Syntax Description

video	Enables reporting on video information.
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
session	Invokes a report on a specific session (UDP port).
UDP-port-number	Input UDP port number associated with the session. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
active	Shows data for all active sessions.
all	Shows data for all sessions, including idle sessions.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

You must enter a slot number to see all the available options.

The following information is retrieved, for all sessions:

- All session information
- Input errors
- Continuity count (CC) errors
- Sync loss
- Sender information (source IP address and UDP for each session)

The following information is retrieved for a specified session:

- Session start time
- Source IP address
- Input CC errors
- Jitter (peak, average)
- Encryption (on/off)
- Source data rate

Tip To clear statistics, use the command clear video <slot> statistics, page 82.

Examples To view video details for a Cisco uMG9850 in slot 3 for a specific session:

```
Switch# show video 3 session 49152

UDP: 49152
State: active
IP address: Source 192.168.51.101, Destination 192.168.20.6
Output: Qam 3/1.1, Program 1
Start time: 06:06:05 UTC Sun Dec 22 2002
Encryption: No
Signalled bit rate (Mbps): avg 3.732, min 3.722, max 11.167
Measured bit rate (Mbps): avg 3.734, min 1.710, max 3.743
Jitter (ms): avg 8.249, max 9.102
PCR interval (ms): avg 13.440, max 23.838
PCR frequency adjustment: 729 Hz, 27.00 ppm
MPEG packets: PCR 76812, non-PCR 2439699, unref 305988, total 2822499
Source errors: signal drop 0, PCR jump 0, sync loss 0, cc error 0
Buffer errors: underflow 0, overflow 0
```

To view session information for a Cisco uMG9850 in slot 6 for all active sessions:

```
Switch# show video 6 session active

Number of active sessions: 0
Total number of sessions: 580
Source continuity count errors: 0
Source peak network jitter (ms): 0
Source average network jitter (ms): 0
Link Utilization (5 minutes): 0 %

Number of failed sessions: 0
```

To view session information for a Cisco uMG9850 in slot 6 for all sessions:

```
Switch# show video 6 session all

State: idle Source IP 0.0.0.0 Dest UDP 49152 to qam 6/1.1
State: idle Source IP 0.0.0.0 Dest UDP 49153 to qam 6/1.1
State: idle Source IP 0.0.0.0 Dest UDP 49154 to qam 6/1.1
State: idle Source IP 0.0.0.0 Dest UDP 49155 to qam 6/1.1
State: idle Source IP 0.0.0.0 Dest UDP 49156 to qam 6/1.1
State: idle Source IP 0.0.0.0 Dest UDP 61505 to qam 6/1.2
State: idle Source IP 0.0.0.0 Dest UDP 61506 to qam 6/1.2
<---snip--->
```

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
show video <slot> session multicast	See show video <slot> session multicast, page 105.
Various	See show, page 87.

show video <slot> session multicast

To view a variety of video details related to multicast sessions for a selected Cisco uMG9850, use the **show video** *slot* **session multicast** command in privileged EXEC mode.

> **show video** *slot* **session multicast source-address** *source-ip-address*
> **dest-address** *destination-ip-address*

Syntax Description

video	Enables reporting on video information.
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
session	Invokes a report on a specific session (UDP port).
source-address	Selects the IP address of the multicast source.
source-ip-address	IP address of the multicast source.
dest-address	Selects the IP address of the multicast destination.
destination-ip-address	IP address of the multicast destination.

Defaults
No default behaviors or values

Command Modes
Privileged EXEC

Command History

Release	Modification
12.2(20)EU	This command was introduced.

Usage Guidelines
You must enter a slot number to see all the available options.

Information such as the following is retrieved:

- UDP port number
- Output QAM channel and program number
- Session start time
- Encryption status
- Source data rates
- Jitter (peak, average)
- Program clock reference (PCR) parameters
- Errors

Tip To clear statistics, use the command **clear video** *slot* **statistics** (see clear video <slot> statistics, page 82).

Examples   To view video details for a Cisco uMG9850 in slot 3 for a multicast session:

```
Switch# show video 3 session multicast source-address 192.168.4.4 dest-address 224.4.4.4

UDP: 50000
State:  active
IP address: Source 192.168.4.4, Destination 224.4.4.4
Output: QAM4/1.1 Program 30
Start time: 03:16:33 UTC Mon Dec 1 2003
Encryption: No
Signalled bit rate (Mbps): avg 19.385, min 65.535, max 0.000
Measured bit rate (Mbps): avg 3.093, min 2.293, max 3.753
Jitter (ms): avg 0.000, max 0.000
PCR interval (ms): avg 0.000, max 0.000
PCR frequency adjustment: 0 Hz, 0.00 ppm
MPEG packets: PCR 3186, non-PCR 93795, unref 12380, total 109361
Source errors: signal drop 0, PCR jump 0, sync loss 0, cc error 0
Buffer errors: underflow 0, overflow 0
```

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
show video <slot> psi session multicast	See show video <slot> psi session multicast, page 100.
show video <slot> session	See show video <slot> session, page 103.
Various	See show, page 87.

show video <slot> ts_table

To view the transport stream ID (TSID) table for each QAM channel for a selected Cisco uMG9850, use the **show video** *slot* **ts_table** command in privileged EXEC mode.

> **show video** *slot* **ts_table**

Syntax Description

video	Enables reporting on video information.
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
ts_table	Returns the TSID table for all QAM channels in a module.

Defaults

No default behaviors or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

The following information is retrieved:

- The TSID for each QAM channel

Examples

To view the TSID table for a Cisco uMG9850 in slot 3:

```
Switch# show video 3 ts_table

qam 6/1.1  tsid 600
qam 6/1.2  tsid 601
qam 6/2.1  tsid 603
qam 6/2.2  tsid 604
qam 6/3.1  tsid 606
qam 6/3.2  tsid 607
qam 6/4.1  tsid 609
qam 6/4.2  tsid 610
<---snip--->
qam 6/8.1  tsid 621
qam 6/8.2  tsid 622
qam 6/9.1  tsid 624
qam 6/9.2  tsid 625
qam 6/10.1  tsid 627
qam 6/10.2  tsid 628
qam 6/11.1  tsid 630
qam 6/11.2  tsid 631
qam 6/12.1  tsid 633
qam 6/12.2  tsid 634
```

■ show video <slot> ts_table

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
Various	See show, page 87.

show video <slot> version

To view software version information for a selected Cisco uMG9850, use the **show video** *slot* **version** command in privileged EXEC mode:

> **show video** *slot* **version**

Syntax Description		
video	Enables reporting on video information.	
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.	
version	Shows software version information for a module.	

Defaults   No default behaviors or values

Command Modes   Privileged EXEC

Command History	Release	Modification
	12.1(20)EU	This command was introduced.

Usage Guidelines   Information such as the following is retrieved:

- Hardware details
- Software details

Examples   To view software version information for a Cisco uMG9850 in slot 3:

```
Switch# show video 3 version

Board Type:                    0
 CPLD Revision:                    0.0
 Sailfish FPGA Hardware Revision:  0x0
 Blackfin FPGA Hardware Revision:  0x0
 Last Reset Cause Register:        0
 Marvell Version:                  0
 CPU Version:                      0.0
 CPU Speed:                        0 KHz
 Main Memory:                      0 Bytes
 Video Software Build Revision:    0
 Video Software Release:
 Rom Monitor Build Revision:       0
 Rom Monitor Release:
 Sailfish FPGA Build Revision:     0
 Sailfish FPGA Release:
 Blackfin FPGA Build Revision:     0
 Blackfin FPGA Release:

 Versions of software bundled in IOS are:
```

```
Embedded Video Software Build:       111
Embedded Video Software Release:     12.1E(24VQ)EWV
Embedded Rom Monitor Build:          109
Embedded Rom Monitor Release:        12.1E(14VR)EW
Embedded Sailfish Build:             109
Embedded Sailfish Release:           12.1E(24SF)EWV
Embedded Blackfin Build:             107
Embedded Blackfin Release:           12.1E(24BF)EWV
```

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
Various	See show, page 87.

video

The video commands can be categorized as either *global* (see Global Configuration Mode, page 5) or *interface* (see Interface Configuration Mode, page 5) commands.

Table 11 on page 111 shows the hierarchy of the global **video** commands. These commands are executed at the following prompt:

```
Switch(config)#
```

Note Program-specific information (PSI) commands and video control-plane commands are so indicated in the Notes column of the table.

Table 11   Global video Commands and Hierarchy

Command Hierarchy			Reference	Notes
video	<3-7>	emulation-mode	video <slot> emulation-mode, page 114	You must first select an individual slot in which a Cisco uMG9850 resides.
		frequency	video <slot> frequency allow-any, page 117	
		jitter	video <slot> jitter, page 119	
		multicast	video <slot> multicast, page 121	
		route vlan	video <slot> route vlan, page 124	
		timeout	video <slot> timeout, page 127	
		udp <UDP-port-number> filter-pid	video <slot> udp <UDP-port-number> filter-pid, page 131	
		udp <UDP-port-number> jitter	video <slot> udp <UDP-port-number> jitter, page 133	
		udp <UDP-port-number> <interface.qam> program	video <slot> udp <UDP-port-number> qam, page 135	
		udp <UDP-port-number> all program	video <slot> udp <UDP-port-number> all, page 129	
	interval	pat	video interval pat, page 143	These PSI commands apply to all Cisco uMG9850 modules in a switch.
		pmt	video interval pmt, page 145	
		stats	video interval stats, page 147	
	psi		video psi, page 151	
	timeout	session-close	video timeout, page 156	Syntax is similar to that for video <slot> timeout, page 127. This addresses all Cisco uMG9850 modules in a switch.
		signal-loss		

■ **video**

Table 12 on page 112 shows the hierarchy of the interface and subinterface **video** commands (see Interface Configuration Mode, page 5, and Subinterface Configuration Mode, page 6).

✎
Note Program-specific information (PSI) commands are so indicated in the Notes column of the table.

🔎
Tip When you enter **video** command mode on a subinterface, configuring one QAM channel configures the other automatically. For consistency in entering subinterface configuration mode, do the following:

For a QAM interface:

```
Switch(config)# interface qam slot/1.1
```

For an ASI interface:

```
Switch(config)# interface asi slot/15
```

Table 12   Interface and Subinterface video Commands and Hierarchy

Command Hierarchy			Reference	Notes
video	byte-gap		video byte-gap, page 137	This is an ASI interface command. See Interface Configuration Mode, page 5.
	format		video format, page 138	
	frequency		video frequency, page 139	
	interleave		video interleave, page 141	Includes both interleave level and interleave mode.
	interval	pat	video interval pat, page 143	PSI command
		pmt	video interval pmt, page 145	
		stats	video interval stats, page 147	
	nitpid		video nitpid, page 148	PSI command
	power		video power, page 149	
	route		video route, page 153	This is an ASI interface command. See Interface Configuration Mode, page 5.
	sessions		video sessions, page 154	PSI command
	tsid		video tsid, page 158	
	udp		video udp, page 160	
	utilization-threshold		video utilization-threshold, page 162	

Defaults   Various. See individual command descriptions.

Command Modes	Interface configuration. See Interface Configuration Mode, page 5.	
	Subinterface configuration. Subinterface Configuration Mode, page 6.	

Command History

Release	Modification
12.1(20)EU	These commands were introduced.

Usage Guidelines Various. See individual command descriptions.

Examples Various. See individual command descriptions.

Related Commands

Command	Description
Various	See individual command descriptions.

video <slot> emulation-mode

You can configure the Cisco uMG9850 to emulate the UDP port mapping of third-party QAM gateways that accommodate fixed QAM-channel groups of eight or 24 channels each. Up to three eight-channel gateways or one 24-channel gateway can be emulated. The user's mappings are converted to the scheme used by the Cisco uMG9850, and then are reconverted to the user's mapping scheme. See Emulation Mode, page 9.

To emulate UDP port mapping on a selected Cisco uMG9850, use the **video** *slot* **emulation-mode** command in global configuration mode. To enable default port mapping, use the **no** form of this command.

> **video** *slot* **emulation-mode** {**bitwise** | **8-qam-number** | **24-qam-number**} [**number** *number-ip-address*]

> **no video** *slot* **emulation-mode**

Syntax Description		
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
emulation-mode	Selects emulation mode on the selected module.
bitwise	Sets bitwise emulation mode.
8-qam-number	Sets 8-QAM-channel emulation mode.
24-qam-number	Sets 24-QAM-channel emulation mode.
number	Selects the number of IP addresses (where applicable). The options **bitwise** and **8-qam-number** support up to three IP addresses. The option **24-qam-number** supports only one IP address.
number-ip-address	Number of IP addresses (1, 2, or 3).

Defaults

The option **bitwise** without the **number** option automatically sets three IP addresses.

The option **24-qam-number** without the **number** option automatically sets one IP address.

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU1	This command was introduced.

Usage Guidelines

For an overview of emulation mode, see Emulation Mode, page 9. Note the following conditions and constraints:

- You must first establish a VLAN, using the command **vlan** *vlan-id*. See Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14.

- You need to establish only one IP address. The additional second or third IP address is added automatically, based on the address established in the previous step.

- Additional IP addresses apply only to bitwise and bytewise eight-channel QAM gateways.

- If emulation mode is active, the **no video** *slot* **route** command is not allowed. Use the **no video** *slot* **emulation-mode** command to disable emulation mode.

- If emulation mode is active, user-defined mappings are not allowed, through either the **video session** command or the **video udp** command.

- If any user-defined port map has been configured (see UDP Port Mappings: Default, Manual, and Emulation Mode, page 6), the emulation mode command is denied, with a warning to remove the map first:

  ```
  Unconfigure the PIDs to be filtered, before configuring emulation mode
  ```

- Emulation mode does not accept packet ID (PID) remapping or filtering.

- There are constraints when the **video** *slot* **route vlan** command is used and emulation mode is enabled. See Setting Emulation Modes for UDP Port Mapping (Optional), page 17, and video <slot> route vlan, page 124.

  - Before changing the video route, first disable emulation mode, as in the following example:

    ```
    no video 4 emulation-mode
    ```

  - If the UDP range required by the chosen emulation mode is not included in the UDP range used for video routing, the command is rejected with the following message:

    ```
    Cannot support emulation mode if video routing is not configured to include the
    range of UDP ports x to y required for this emulation mode.
    ```

Examples

The following example shows how to set bitwise emulation mode with a single IP address on a Cisco uMG9850 in slot 4:

```
Switch(config)# video 4 emulation-mode bitwise number 1
```

The following example shows how to set bitwise emulation mode with three IP addresses (default) on a Cisco uMG9850 in slot 4:

```
Switch(config)# video 4 emulation-mode bitwise
```

The following example shows how to set bytewise 8-QAM-channel emulation mode with three IP addresses (default) on a Cisco uMG9850 in slot 4:

```
Switch(config)# video 4 emulation-mode 8-qam-number
```

The following example shows how to set 8-QAM-channel emulation mode with two IP addresses on a Cisco uMG9850 in slot 4:

```
Switch(config)# video 4 emulation-mode 8-qam-number number 2
```

The following example shows how to set 24-QAM-channel emulation mode with a single IP address (only one address is supported in this mode) on a Cisco uMG9850 in slot 4:

```
Switch(config)# video 4 emulation-mode 24-qam-number
```

The following example shows how to enable default and manual UDP port mapping on a Cisco uMG9850 in slot 4:

```
Switch(config)# no video 4 emulation-mode
```

See also Using Emulation Mode to Clone a Session, page 43.

■ video <slot> emulation-mode

Note   See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.

Related Commands

Command	Description
video <slot> route vlan	See video <slot> route vlan, page 124.
Various	See video, page 111.

video <slot> frequency allow-any

Frequency conflicts can result in undesirable results, depending on how QAM channels are cabled. This command allows you to configure the software either to allow frequency conflicts or to check for them and block conflicting assignments.

To configure a selected Cisco uMG9850 to ignore conflicting frequencies from being configured, use the **video** *slot* **frequency allow-any** command in global configuration mode. To configure the Cisco uMG9850 to check for conflicting frequencies, use the **no** form of this command.

video *slot* **frequency allow-any**

no video *slot* **frequency allow-any**

Syntax Description

no	Instructs the software to check for frequencies that conflict with frequencies that have already been set.
slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
frequency	Instructs the software to check for conflicting frequencies. Used with **allow-any** (see below).
allow-any	Parameter required to complete the command, both with and without the **no** form.

Defaults

Frequency conflicts are allowed.

⚠

Caution   Because the default allows frequency conflicts, it is the responsibility of the multiple system operator (MSO) to avoid such conflicts. To instruct the Cisco uMG9850 to check for frequency conflicts, use the **no video** *slot* **frequency allow-any** command.

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

If instructed to check for conflicts, the software checks whether any QAM channel has already been set to a frequency within the range –6 through +6 MHz of the frequency about to be configured. If the new frequency is within this range, the user is prevented from configuring the conflicting frequency.

The **allow-any** option is required to complete this command. There are no other options. Use the **interface qam** *interface.qam* **frequency** command to set the frequency on QAM channels.

■ video <slot> frequency allow-any

Examples   The following example shows how to allow any frequency to be set on a Cisco uMG9850 in slot 6:

```
Switch(config)# video 6 frequency allow-any
```

The following example shows how to check for conflicting frequencies on a Cisco uMG9850 in slot 6, and prevent conflicting assignments:

```
Switch(config)# no video 6 frequency allow-any
```

Related Commands

Command	Description
interface qam	See interface qam, page 85.
video frequency	See video frequency, page 139.

video <slot> jitter

To configure jitter levels for a selected Cisco uMG9850, use the **video** *slot* **jitter** command in global configuration mode. To return to default values, use the **no** form of this command.

video *slot* **jitter** *level*

no video *slot* **jitter**

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
jitter	Configures the size of the dejitter buffer for all the UDP sessions on the selected Cisco uMG9850.
level	Size of dejitter buffer in milliseconds. Range is 0 to 300.

Defaults

See Usage Guidelines, below.

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

The **jitter** option sets the size of a dejittering buffer that absorbs the input jitter. This buffer introduces system delay (the time for a packet to enter and leave the Cisco uMG9850). The greater the value of **jitter**, the greater the delay introduced to the output stream. You can change the size of the dejitter buffer at either the slot or the session level. (The default level is 100 milliseconds.) Changing it at the slot level changes the default value for jitter. Consequently, for all sessions having the default value for jitter, the jitter value is changed to the new value. For sessions that have nondefault jitter values (as configured by the **video** *slot* **udp** *UDP-port-number* **jitter** command; see video <slot> udp <UDP-port-number> jitter, page 133), their current jitter value is maintained.

Tip When setting the jitter value (the size of the dejitter buffer), take into consideration the network jitter (the inherent jitter introduced at the input of the Cisco uMG9850) and allow for clock tracking. Leave approximately 50 milliseconds for clock tracking. For example, if peak-to-peak network jitter is 100 milliseconds, set the jitter value to 150 milliseconds.

The value set by the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command should always be larger than the value configured for jitter.

Examples

The following example shows how to set the jitter level on a Cisco uMG9850 in slot 6 to 150 milliseconds:

```
Switch(config)# video 6 jitter 150
```

The following example shows how to return the jitter level for a Cisco uMG9850 in slot 6 to default values:

```
Switch(config)# no video 6 jitter
```

See also Configuring Maximum Jitter for a Session, page 29.

Related Commands

Command	Description
video <slot> udp <UDP-port-number> jitter	See video <slot> udp <UDP-port-number> jitter, page 133.
Various	See video, page 111.

video <slot> multicast

You can clone (map) a multicast session to several or all QAM channels on a Cisco uMG9850.

To enable or disable multicast sessions on a selected Cisco uMG9850, use the **video** *slot* **multicast** command in global configuration mode. The **pass-through** option causes a multiple program transport stream (MPTS) multicast session to be passed through to the selected QAM channel. To disable cloning of multicast sessions, use the **no** form of this command.

> **video** *slot* **multicast source-address** *source-ip-address* **dest-address** *dest-ip-address*
> {**qam** *interface.qam* | **all**} {**program** *program-number* / **pass-through**}
> [**bitrate** *bits-per-sec*]

> **no video** *slot* **multicast**

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
multicast	Enables mapping of multicast session to several or all QAM channels.
source-address	Selects the source address of the session to be multicast.
source-ip-address	Source address of the session to be multicast.
dest-address	Selects the destination address of the session to be multicast.
dest-ip-address	Destination address of the session to be multicast. The multicast addresses for *dest-ip-address* are in the range 224.0.0.0 through 239.255.255.255. See Usage Guidelines, below.
qam	Enables the selection of a single QAM channel. See Usage Guidelines, below.
interface.qam	Selected QAM channel on the Cisco uMG9850.
all	Specifies all QAM channels on the Cisco uMG9850.
program	Enables the selection of the output program number.
program-number	Output program number. All output programs must have the same number. Range is 1 to 255.
pass-through	Causes a multicast session to be passed through to the selected QAM channel.
bitrate	Specifies the reserved bit rate for the session. See Defaults, below.
bits-per-sec	Bit rate in bits per second. Range is 0 to 38800000.

Defaults

If the **bitrate** option is not used, the default reserved bit rate is 3.750 Mbps.

Command Modes

Global configuration

Command History

Release	Modification
12.2(20)EU	This command was introduced.

■ video <slot> multicast

Usage Guidelines   All output programs have the same output program number.

The destination address is configured by the **ip igmp static-group** switch command. See Cloning a Unicast UDP Session to One, Several, or All QAM Channels on a Module, page 39, and references therein. Use the command video <slot> multicast, page 121, in conjunction with that procedure.

See also PDD Conditions and Restrictions, page 38.

Examples   The following example shows how to enable multicast to QAM channels 1, 3, 5, and 7 on a Cisco uMG9850 in slot 3. The program number is 1, and the source and destination address are as illustrated in the example in Cloning a Unicast UDP Session to One, Several, or All QAM Channels on a Module, page 39.

```
Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/1.1 program 1

Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/3.1 program 1

Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/5.1 program 1

Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/7.1 program 1
```

The following example is similar to the above, except that it shows how to enable multicast to all QAM channels on the Cisco uMG9850. In addition, it changes the default bit rate from 3.750 Mbps to 4.000 Mbps.

```
Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
all program 1 bitrate 4000000
```

The following example shows how to clone a multicast MPTS session to QAM channels 1 and 2 on theCisco uMG9850, with pass-through.

```
Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/1.1 pass-through

Switch(config)# video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/1.2 pass-through
```

The following example shows how to disable pass-through on QAM channel 1.

```
Switch(config)# no video 3 multicast source-address 192.168.4.10 dest-address 224.2.129.16
qam 3/1.1 pass-through
```

The following example shows how to disable multicast on the Cisco uMG9850.

```
Switch(config)# no video 3 multicast
```

See also Cloning a PDD Stream or Multicast UDP Session to One, Several, or All QAM Channels on a Module, page 40.

Related Commands

Command	Description
video <slot> route vlan	See video <slot> route vlan, page 124.
video <slot> udp <UDP-port-number> qam	See video <slot> udp <UDP-port-number> qam, page 135.
video <slot> udp <UDP-port-number> all	See video <slot> udp <UDP-port-number> all, page 129.
Various	See video, page 111.

video <slot> route vlan

To configure the delivery of a video stream from a VoD server (or other video source) to a selected Cisco uMG9850, use the **video** *slot* **route vlan** command in global configuration mode. To restore the video route to the implicit default behavior (in which no explicit video route configuration is given), use the **no** form of this command.

video *slot* **route vlan** *vlan-number* [**udp** *x y*]

no video *slot* **route**

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
route	Enables the routing of video packets to the selected Cisco uMG9850.
vlan	Configures the VLAN in which video packets are routed.
vlan-number	VLAN interfaces range from 1 to 4094.
udp	Optional with the **vlan** option. Selects the upper and lower bounds of a UDP port range for nondefault routing.
x	Lower bound of the UDP port range.
y	Upper bound of the UDP port range.

Defaults

No default behaviors or values

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.
12.2(20)EU	This command was modified to make the supervisor engine the IP host, add support for UDP port ranges, prevent specific UDP/IP packets from being dropped, and provide for default packet routing.

Usage Guidelines

The **vlan** argument is not used with the **no** form of the command.

With Cisco IOS Release 12.2(20)EU, each Cisco uMG9850 module no longer functions as an IP host. Now the supervisor engine (SE) in the Cisco Catalyst 4500 series switch plays that role, allowing for the aggregation of video traffic.

This command sets up the routing of UDP/IP (video) packets to the Cisco uMG9850. Acting as the IP host, the SE generally receives video traffic on the IP address configured on a VLAN. When the IP address of the selected VLAN is configured as the destination IP address of the video packets, any video packet destined to this IP address—and whose destination port matches the UDP range specified for video by this command—is routed to the selected Cisco uMG9850.

Note For a discussion of default and nondefault UDP port mapping, see UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.

This command is also used in emulation mode. See Setting Emulation Modes for UDP Port Mapping (Optional), page 17.

Note the following conditions and constraints:

- The use of VLANs for dedicated video traffic is required. See Configuring Gigabit Ethernet Input Ports into a VLAN (Optional), page 14, and Configuring Video Routing, page 16.

- A Cisco uMG9850 module need not be present in the switch chassis to configure video routing. If no module is present, the video streams are dropped as long as video routing is configured correctly.

Caution If video routing is not configured at all, or is not configured to cover the correct range of UDP ports, high CPU utilization (up to 99% capacity) can lead to instability. To monitor the CPU load, use the **show process** command.

- A default UDP port range is provided. However, a UDP port range can be specified if so desired.

- The VoD server (or other video source) should be configured to deliver a video stream to the destination IP address configured explicitly on a VLAN.

- TFTP uses a randomly assigned UDP port on the client to receive data. An explicit video route can still interfere with TFTP operation if the interface for receiving TFTP is the same as that specified for the video route. We recommend that separate interfaces be used for TFTP and video.

Caution Do not confuse this command with the **video route** command (see video route, page 153), which is a QAM interface command.

- There are constraints when using the **video** *slot* **route vlan** command if emulation mode is enabled. See Setting Emulation Modes for UDP Port Mapping (Optional), page 17, and video <slot> emulation-mode, page 114.

  - Before changing the video route, first disable emulation mode, as in the following example:

    ```
    no video 4 emulation-mode
    ```

  - If an attempt is made to change the video routing UDP range (see video <slot> route vlan, page 124) so that it excludes the UDP range used for video emulation mode, the command is rejected with the following message:

    ```
    Video route: Video emulation is on, cannot change video route UDP range in slot
    <slot> to exclude the UDP port range x to y.
    ```

The range specified by this command is loosely coupled with the user-defined session mapping set by the **video sessions** command (see video sessions, page 154). When the user enters a configuration for user-defined sessions, the selectable range is bound by the range defined by the **video** *slot* **route vlan** command. If, at a later time, the range defined by the command is changed, the user is warned if an already-defined session that is currently active would be made inactive because of this change.

For example, if there is an active session on UDP port 49152 and the user enters

```
video 3 route vlan 20 udp 50000 65535
```

the following message appears:

```
Video route: There exists active session(s) in slot 3 outside of udp ports 50000 to
65535, which will become inactive.
```

However, the command itself does not trigger the removal of the already-defined session.

Examples

The following example shows how to assign video traffic on a Cisco uMG9850 in slot 3 to VLAN 20, with explicit packet routing.

```
Switch(config)# video 3 route vlan 20 udp 49152 65535
```

Note In this case, UDP packets sent to the IP address on VLAN 20, with destination ports from 49152 to 65535, are routed explicitly to the Cisco uMG9850 in slot 3. If no UDP port ranges had been given in the command, then the default range from Table 2 on page 7 would be used.

The following example shows how to restore the video routing to the default behavior on a Cisco uMG9850 in slot 4.

```
Switch(config)# no video 4 route
```

Related Commands

Command	Description
show video <slot> route	See show video <slot> route, page 102.
video sessions	See video sessions, page 154.
video timeout	See video timeout, page 156.
Various	See video, page 111.

video <slot> timeout

You can configure when a video session times out when packets are not received after a certain interval.

To configure timeout parameters for a selected Cisco uMG9850, use the **video** *slot* **timeout** command in global configuration mode. To return to default values, use the **no** forms of this command.

video *slot* **timeout** {**session-close** *minutes* | **signal-loss** *milliseconds*}

no video *slot* **timeout session-close**

no video *slot* **timeout signal-loss**

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
timeout	Configures the timeout options.
session-close	Configures the time after packet loss when the video session is closed
minutes	Number of minutes. Range is 1 to 1440.
signal-loss	Configures the time after packet loss when a signal loss is assumed. The session becomes inactive.
milliseconds	Number of milliseconds. Range is 200 to 10000.

Defaults   See Usage Guidelines, below.

Command Modes   Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines   The syntax of this command is similar to that for the **video timeout** command (see video timeout, page 156), except that this command addresses a single Cisco uMG9850 module. You must configure each parameter on a separate command line.

When a session is closed, this means that the Cisco uMG9850 has not received any video packets for the given session's UDP port for the period determined by the **video** *slot* **timeout session-close** command or the **video timeout session-close** command. The session no longer exists, and is not listed following a **show** command. The range is 1 to 1440 minutes. The default is 10 minutes.

When a session is inactive, this means that the Cisco uMG9850 has not received any video packets for the given session's UDP port for the period determined by the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command. The session still exists and is listed following a **show** command. If packets start arriving before the timer set by the **video** *slot* **timeout session-close** command or the **video timeout session-close** command counts down, the session becomes active. The range is 200 to 10000 milliseconds. The default is 5000 milliseconds.

■ video <slot> timeout

The value for the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command should always be larger than the value configured for jitter.

Examples

The following example shows how to set the **session-close** option to 25 and the **signal-loss** option to 500 on a Cisco uMG9850 in slot 6:

```
Switch(config)# video 3 timeout session-close 25

Switch(config)# video 3 timeout signal-loss 500
```

See also Statically Setting Session Timeouts, page 25.

Related Commands

Command	Description
show video <slot> session	Shows which sessions are inactive. See show video <slot> session, page 103.
video <slot> jitter	See video <slot> jitter, page 119.
video timeout	See video timeout, page 156.
Various	See video, page 111.

video <slot> udp <UDP-port-number> all

To clone (map) a single copy of a Program Data Delivery (PDD) stream or unicast session to all 24 QAM channels on a Cisco uMG9850 with a specified output-program number, use the **video** *slot* **udp** *UDP-port-number* **all** command in global configuration mode. To disable cloning, use the **no** form of this command.

video *slot* **udp** *UDP-port-number* **all program** *program-number* [**bitrate** *bits-per-sec*]

no video *slot* **udp** *UDP-port-number* **all program** *program-number*

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
udp	Enables the selection of the UDP port number for cloning to all QAM channels on the selected Cisco uMG9850.
UDP-port-number	UDP port number. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
all	Specifies all QAM channels on the Cisco uMG9850.
program	Enables the selection of the output program number.
program-number	Specifies the output program number. Only one output program number per session is supported.
bitrate	Specifies the reserved bit rate for the session. See Defaults, below.
bits-per-sec	Bit rate in bits per second. Range is 0 to 38800000.

Defaults

If the **bitrate** option is not used, the default reserved bit rate is 3.750 Mbps.

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.
12.2(20)EU	The **bitrate** option was added.

Usage Guidelines

All output programs have the same specified output-program number.

See the Usage Guidelines for PDD Conditions and Restrictions, page 38.

■ video <slot> udp <UDP-port-number> all

Examples

The following example shows how to clone UDP session 60000 to all QAM channels on a Cisco uMG9850 in slot 3. The UDP session is output as program 1 on all QAM channels.

```
Switch(config)# video 3 udp 60000 qam all program 1
```

The following example does the same as the above, but shows how to change the default reserved bitrate to 4.000 Mbps.

```
Switch(config)# video 3 udp 60000 qam all program 1 4000000
```

The following example shows how to disable cloning for the above.

```
Switch(config)# no video 3 udp 60000 qam all program 1
```

See also Cloning a Unicast UDP Session to One, Several, or All QAM Channels on a Module, page 39.

Related Commands

Command	Description
video <slot> multicast	video <slot> multicast, page 121
video <slot> udp <UDP-port-number> qam	video <slot> udp <UDP-port-number> qam, page 135
Various	See video, page 111.

video <slot> udp <UDP-port-number> filter-pid

You can filter out an input elementary video stream based on its input packet ID (PID). This affects the PIDs in the transport stream that is delivered to the specified UDP port.

To filter out an input elementary video stream based on its input PID for a selected Cisco uMG9850, use the **video** *slot* **udp** *UDP-port-number* **filter-pid** command in global configuration mode.

> **video** *slot* **udp** *UDP-port-number* **filter-pid** *PID-number*

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
udp	Enables the selection of the UDP port number for PID filtering for the selected Cisco uMG9850.
UDP-port-number	UDP port. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
filter-pid	Filters out an input elementary video stream based on its input PID.
PID-number	Input PID. Range is 1 to 255

Defaults

See Usage Guidelines, below.

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

⚠

Caution   Do not confuse this command with the **video udp** subinterface command (see video udp, page 160).

Examples

The following example shows how to set a PID filter on PID 1 for UDP session 49152, for the entire Cisco uMG9850:

```
Switch(config)# video 6 udp 49152 filter-pid 1
```

See also Statically Filtering PIDs, page 30.

■ **video <slot> udp <UDP-port-number> filter-pid**

Related Commands	Command	Description
	video udp	See video udp, page 160, for a discussion of the subinterface (QAM channel) version of this command.
	Various	See video, page 111.

video <slot> udp <UDP-port-number> jitter

You can set the maximum allowable network jitter (packet latency variation) for a specified UDP port session. This global video setting affects the overall packet latency within the Cisco uMG9850.

✎

Note   For more information about jitter, see the Usage Guidelines for video <slot> jitter, page 119.

To configure maximum jitter for a session on a selected Cisco uMG9850, use the **video** *slot* **udp** *UDP-port-number* **jitter** command in global configuration mode.

   video *slot* **udp** *UDP-port-number* **jitter** *level*

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
udp	Enables the selection of the UDP port number for setting maximum jitter on the selected Cisco uMG9850.
UDP-port-number	UDP port. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
jitter	Sets the maximum allowable network jitter for the selected UDP session.
level	Number of milliseconds. Range is 0 to 300.

Defaults   See Usage Guidelines, below.

Command Modes   Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines   See the Usage Guidelines for video <slot> jitter, page 119.

Examples   The following example shows how to set maximum allowable network jitter for UDP session 49152 to 150 milliseconds, for a Cisco uMG9850 in slot 6:

```
Switch(config)# video 6 udp 49152 jitter 150
```

See also Configuring Maximum Jitter for a Session, page 29.

■ video <slot> udp <UDP-port-number> jitter

Related Commands	Command	Description
	video \<slot\> jitter	Configures jitter for all sessions in a selected Cisco uMG9850. See video \<slot\> jitter, page 119.
	Various	See video, page 111.

video <slot> udp <UDP-port-number> qam

To clone (map) a single copy of a Program Data Delivery (PDD) stream or unicast session to a specified QAM channel on a Cisco uMG9850 with a specified output-program number, use the **video** *slot* **udp** *UDP-port-number* **qam** command in global configuration mode. The **pass-through** option causes the session to be passed through to the selected channel, and the **no-snoop** option causes service information (SI) packet IDs (PIDs) and tables to be passed through without modification. (See Usage Guidelines for this command.)

To disable cloning, pass-through, or SI no-snooping, use the **no** forms of this command.

> **video** *slot* **udp** *UDP-port-number* **qam** *interface.qam* {**pass-through** | **program** *program-number* | **no-snoop**} [**bitrate** *bits-per-sec*]

> **no video** *slot* **udp** *UDP-port-number* **qam** *interface.qam*

> **no video** *slot* **udp** *UDP-port-number* **qam** *interface.qam* **pass-through**

> **no video** *slot* **udp** *UDP-port-number* **qam** *interface.qam* **no-snoop**

Syntax Description

slot	Slot in which the Cisco uMG9850 resides in the switch. For valid slot ranges, see Table 7 on page 12.
udp	Enables the selection of the UDP port number for mapping to a QAM channel on the selected Cisco uMG9850.
UDP-port-number	UDP port. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
qam	Enables the selection of a single QAM channel. See Usage Guidelines, below.
interface.qam	Specifies the QAM channel on the Cisco uMG9850.
pass-through	Causes a multicast session to be passed through to the selected QAM channel. See Usage Guidelines, below.
program	Enables the selection of the output program number.
program-number	Specifies the output program number. Output programs can have different numbers.
no-snoop	Causes SI data PIDs to be passed through without modification.
bitrate	Specifies the reserved bit rate for the session. See Defaults, below.
bits-per-sec	Bit rate in bits per second. Range is 0 to 38800000.

Defaults

If the **bitrate** option is not used, the default reserved bit rate is 3.750 Mbps.

Command Modes

Global configuration

Command History

Release	Modification
12.2(20)EU	This command was introduced.

■ video <slot> udp <UDP-port-number> qam

Usage Guidelines   With the **pass-through** option, there can be no other sessions on the QAM. See also the Usage Guidelines for PDD Conditions and Restrictions, page 38.

When the **no-snoop** option is used, SI packet IDs (PIDs) and tables are passed through to the output without modification (with the exception of PID 0 and the null PID, both of which are dropped). SI tables include the network information table (NIT) and the time and date table (TDT).

> **Note**   The **no-snoop** option can be used on only one UDP session per QAM channel.

> ⚠ **Caution**   When the **no-snoop** option is used, PIDs outside the range of SI reserved PIDs can collide with data PIDs. For example, two separate streams could use PID 23.

Examples   The following example shows how to clone UDP session 60000 on QAM channels 1, 5, 9, and 13 on a Cisco uMG9850 in slot 3. Program numbers are 1, 3, 5, and 7, respectively.

```
Switch(config)# video 3 udp 60000 qam 3/1.1 program 1
Switch(config)# video 3 udp 60000 qam 3/3.1 program 3
Switch(config)# video 3 udp 60000 qam 3/5.1 program 5
Switch(config)# video 3 udp 60000 qam 3/7.1 program 7
```

The following example shows how to enable pass-through for UDP session 60000 on QAM channel 1 with a bit rate of 4.000 Mbps.

```
Switch(config)# video 3 udp 60000 qam 3/1.1 pass-through bitrate 4000000
```

The following example shows how to disable snooping (that is, enable SI data pass-through) for UDP session 60000 on QAM channel 1.

```
Switch(config)# video 3 udp 60000 qam 3/1.1 no-snoop
```

See also Cloning a Unicast UDP Session to One, Several, or All QAM Channels on a Module, page 39.

Related Commands

Command	Description
video <slot> multicast	video <slot> multicast, page 121
video <slot> udp <UDP-port-number> all	video <slot> udp <UDP-port-number> all, page 129
Various	See video, page 111.

video byte-gap

You can change the spacing between the data bytes within the output video transport stream.

To configure the size of the byte-gap (S-rate) value for an asynchronous serial interface (ASI) port, use the **video byte-gap** command in interface configuration mode. To reset the ASI port to the default gap size, use the **no** form of this command.

> **video byte-gap** *bytes*

> **no video byte-gap**

Syntax Description

byte-gap	Sets the number of null ASI transport bytes to be inserted between data bytes in the output streams.
bytes	Range is 1 to 4, with a default of 2.

Defaults
The default byte gap is 2 bytes

Command Modes
Interface configuration mode (ASI interface only). See Interface Configuration Mode, page 5.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Examples
The following example shows how to configure an ASI port for a byte-gap value of 3 bytes:

```
Switch# configure terminal
Switch(config)# interface asi 5/15
Switch(config-if)# video byte-gap 3
```

See also Configuring the ASI Port for QAM Channel Routing (Optional), page 35.

Related Commands

Command	Description
interface asi	Required for the command **video byte-gap**. See interface asi, page 83.

video format

To configure the downstream modulation format for a QAM channel, use the **video format** command in subinterface configuration mode. To reset the channel to its default modulation rate (256QAM), use the **no** form of this command.

video format {**64** | **256**}

no video format

Syntax Description

format	Enables selection of modulation format.
64	Configures the channel for the 64QAM modulation rate.
256	Configures the channel for the 256QAM modulation rate (default).

Defaults

256QAM

Command Modes

Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

See Setting the Modulation Format, page 23.

Configuring the video modulation rate for one QAM channel automatically configures the same rate for all four QAM channels in its modulator group. Each Cisco uMG9850 has six modulator groups, yielding a total of 24 channels per module. See Video Configuration Modes, page 5.

Examples

The following example sets a QAM channel for the 64-QAM modulation rate. This configures all four QAM channels (5/1.1 through 5/2.2) in its modulator group for the same modulation rate.

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video format 64
```

Related Commands

Command	Description
video <slot> route vlan	See video <slot> route vlan, page 124.
video frequency	See video frequency, page 139.
video interleave	See video interleave, page 141.
video power	See video power, page 149.

video frequency

To configure the frequency for the upconverter connected to a QAM channel, use the **video frequency** command in subinterface configuration mode.

>**video frequency** *frequency*

Syntax Description

frequency	Sets the frequency on both channels on a QAM port.
frequency	Channel frequency, in megahertz (MHz). The frequency range for QAM *slot*/*port*.1 is 50 to 854 MHz, and for QAM *slot*/*port*.2 is 56 to 860 MHz. For valid slot ranges, see Table 7 on page 12.

Defaults

The default center frequency, in MHz, for each port is determined by the following formula:

$100 + (port\_ID * 12)$

where *port_ID* is an integer from 0 to 11

Command Modes

Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

Configuring the frequency for one QAM channel automatically configures the correct frequency for the other QAM channel in its upconverter group. The frequency bandwidth of each QAM upconverter block is 12 MHz. Consequently, if *slot*/*port*.1 is set to frequency f1, then *slot*/*port*.2 is set to frequency f1 + 6 MHz. Similarly, if *slot*/*port*.2 is set to frequency f2, then *slot*/*port*.1 is set to frequency f2 – 6 MHz.

Tip Frequency conflicts can result in undesirable results, depending on how QAM channels are cabled. To configure the software either to allow frequency conflicts or to check for them and block conflicting assignments, use the **video** *slot* **frequency allow-any** command (see video <slot> frequency allow-any, page 117).

Examples

The following example shows how to set the first QAM channel on port 1 of a Cisco uMG9850 in slot 4 to an upconverter frequency of 850 MHz. This automatically configures the frequency for the second QAM channel on port 1 to 856 MHz.

```
Switch# configure terminal
Switch(config)# interface qam 4/1.1
Switch(config-subif)# video freq 850
```

See also Setting the Frequency and Output Power of the QAM Module Channels, page 20.

■ video frequency

Related Commands

Command	Description
video <slot> frequency allow-any	See video <slot> frequency allow-any, page 117.
video format	See video format, page 138.
video interleave	See video interleave, page 141.
video power	See video power, page 149.

video interleave

You can change the Reed-Solomon forward error correction (FEC) interleave level and mode on a QAM channel.

To configure the FEC interleave parameters for a QAM channel, use the **video interleave** command in subinterface configuration mode. To reset the interleave values to their defaults, use the **no** form of this command.

> **video interleave** {**level** *level* | **mode** *mode*}

> **no video interleave**

Syntax Description

interleave	Enables configuration of FEC interleave level and mode.
level	Configures the FEC interleave level for the QAM channel.
level	Values for *level* are as follows: • 1 = FEC interleave level 1 • 2 = FEC interleave level 2 (default)
mode	Configures the FEC interleave mode for the QAM channel. The **mode** option can be used only when the interleave level is 2 (default).
mode	Range for *mode* is any value from 1 to 14, with the exception of 11 and 13. The default is 6. Each mode configures the channel for the "I" and "J" interleave values as shown in Table 13 on page 142.

Defaults   The default interleave level is 2. The default mode is 6.

> **Note**   The defaults may not work with some MPEG analyzers.

Command Modes   Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines   FEC reduces bit error rate (BER) in data transmission by correcting recovered bit errors in the demodulator. Interleaving is a technique that reorders (in time) individual code-word bits with other code-word bits to spread error bursts over many different code words. The technique used is compliant with ITU J.83, Annex B.

The **video interleave** command configures the operation of the FEC interleave on the QAM channels. If the interleave level and mode values are set on one QAM channel, the same values are applied to all four QAM channels in a modulator group. See Video Configuration Modes, page 5.

■ **video interleave**

When operating with level 2 interleave, you can choose the specific interleave parameters by selecting one of the modes shown in Table 13:

Table 13   FEC Interleave Mode Values

Mode	I (bytes)	J (depth)
1	128	1
2	128	2
3	64	2
4	128	3
5	32	4
6	128	4
7	16	8
8	128	5
9	8	16
10	128	6
12	128	7
14	128	8

Note   You must set mode and level on separate command lines.

Examples   The following example shows how to set a video interleave level of 2 and a mode of 1 on the first QAM channel of interface 2 in a Cisco uMG9850 in slot 5. This configures all four QAM channels (5/1.1 through 5/2.2) in the modulator group to have the same interleave level and mode.

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video interleave level 2
Switch(config-subif)# video interleave mode 1
```

Tip   To set the mode, the interleave level must be 2.

See also Configuring the FEC Interleave Level and Mode, page 24.

Related Commands

Command	Description
video format	See video format, page 138.
video frequency	See video frequency, page 139.
video power	See video power, page 149.

video interval pat

You can set the interval at which all the Cisco uMG9850 modules in a switch, or a single QAM channel, distribute the program access table (PAT).

To set the PAT interval, use the **video interval pat** command in global or subinterface configuration mode. To reset the PAT interval to the default, use the **no** form of this command.

> **video interval pat** *milliseconds*

> **no video interval pat**

Syntax Description

interval	Configures the interval for transmission of the PAT.
pat	Selects the interval PAT distribution.
milliseconds	Range is 50 to 450 milliseconds.

Defaults

The default rate is 100 milliseconds, the same as for the switch. See Usage Guidelines, below.

Command Modes

Global configuration

Subinterface (QAM interface only) configuration. See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

This is a program-specific information (PSI) command.

Changing the default in global configuration overwrites the rate for the switch. Changing the default in subinterface configuration mode overwrites the rate for the selected QAM channel only.

If any sessions are active in the switch, global PAT and PMT commands are rejected. If no sessions are active, the PAT and PMT rates on each QAM channel are checked. If they are different from the original switch rate, they are left unchanged. If they are the same as the original switch rate, the rate is changed on both the QAM channels and the switch.

Examples

The following example shows how to set a PAT interval of 200 milliseconds for all Cisco uMG9850 modules in a switch:

```
Switch# configure terminal
Switch(config)# video interval pat 200
```

The following example shows how to set a PAT interval of 200 milliseconds for the first QAM channel of port 1 in a Cisco uMG9850 module in slot 5:

```
Switch# configure terminal
Switch(config)# interface qam 5/1.1
Switch(config-subif)# video interval pat 200
```

■ **video interval pat**

See also Setting PMT and PAT Intervals for the Switch, page 32, and Setting PMT and PAT Intervals on a QAM Channel, page 33.

Related Commands

Command	Description
video interval pmt	See video interval pmt, page 145.
video interval stats	See video interval stats, page 147.
video psi	See video psi, page 151.
Various	See commands indicated as "PSI commands" in Notes column of Table 11 on page 111.

video interval pmt

You can set the interval at which all the Cisco uMG9850 modules in a switch, or a single QAM channel, distribute the program map table (PMT).

To set the PMT interval, use the **video interval pmt** command in global or subinterface configuration mode. To reset the PMT interval to the default, use the **no** form of this command.

video interval pmt *milliseconds*

no video interval pmt

Syntax Description

interval	Configures the interval for transmission of the PMT.
pmt	Selects the interval for PMT distribution.
milliseconds	Range is 50 to 450 milliseconds.

Defaults

The default rate is 100 milliseconds, the same as for the switch. See Usage Guidelines, below.

Command Modes

Global and subinterface (QAM interface only) configuration. See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

This is a program-specific information (PSI) command.

Changing the default in global configuration overwrites the rate for the switch. Changing the default in subinterface configuration mode overwrites the rate for the selected QAM channel only.

> **Note** If any sessions are active in the switch, global program access table (PAT) and PMT commands are rejected. If no sessions are active, the PAT and PMT rates on each QAM channel are checked. If they are different from the original switch rate, they are left unchanged. If they are the same as the original switch rate, the rate is changed on both the QAM channels and the switch.

Examples

The following example shows how to set a PMT interval of 200 milliseconds for all Cisco uMG9850 modules in a switch:

```
Switch# configure terminal
Switch(config)# video interval pmt 200
```

The following example shows how set a PMT interval of 200 milliseconds for the first QAM channel of port 1 in a Cisco uMG9850 module in slot 5:

```
Switch# configure terminal
```

■ video interval pmt

```
Switch(config)# interface qam 5/1.1
Switch(config-subif)# video interval pmt 200
```

See also Setting PMT and PAT Intervals for the Switch, page 32, and Setting PMT and PAT Intervals on a QAM Channel, page 33.

	Command	Description
Related Commands	**video interval pat**	See video interval pat, page 143
	video interval stats	See video interval stats, page 147.
	video psi	See video psi, page 151.
	Various	See commands indicated as "PSI commands" in Notes column of Table 11 on page 111.

video interval stats

You can set the interval at which all the Cisco uMG9850 modules in a switch report video statistics.

To set the statistics interval for all Cisco uMG9850 modules in a switch, use the **video interval stats** command in global configuration mode. To reset the statistics interval to the default, use the **no** form of this command.

video interval stats *seconds*

no video interval stats

Syntax Description

interval	Configures the interval for transmission of the PAT and PMT.
stats	Selects the interval for the statistics.
seconds	Range is 0 to 3600.

Defaults

The default interval is 30 seconds.

Command Modes

Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

This is a program-specific information (PSI) command. It is not available in subinterface (QAM) configuration mode.

Examples

The following example shows how to set a video statistics interval of 120 seconds for all Cisco uMG9850 modules in a switch:

```
Switch# configure terminal
Switch(config)# video interval stats 120
```

Related Commands

Command	Description
clear video <slot> statistics	See clear video <slot> statistics, page 82.
video interval pat	See video interval pat, page 143.
video interval pmt	See video interval pmt, page 145.
Various	See commands indicated as "PSI commands" in Notes column of Table 11 on page 111.

video nitpid

The PID for the network information table, or NIT-PID, can be configured from the QAM interface. If the NIT-PID is already used as a video, audio, or data PID, the configuration is rejected.

To specify the packet ID (PID) to be used to identify network information table (NIT) packets that are sent on a QAM channel, use the **video nitpid** command in subinterface (QAM) configuration mode. To reset the channel to the default NIT-PID, use the **no** form of this command.

video nitpid *nitpid*

no video nitpid

Syntax Description

nitpid	Configures the PID used to identify the network information table packets.
nitpid	The NIT-PID number. Range is 16 to 8191.

Defaults

The default NIT-PID value is 16

Command Modes

Subinterface configuration mode (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

This is a program-specific information (PSI) command.

Examples

The following example shows how to set a NIT-PID of 1003 on the first QAM channel of port 2 of a Cisco uMG9850 module in slot 5:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video nitpid 1003
```

See also Setting TSID and NIT-PID Values, page 34.

Related Commands

Command	Description
video tsid	See video tsid, page 158.
Various	See commands indicated as "PSI commands" in Notes column of Table 11 on page 111.

video power

To configure the power level for the upconverter connected to a QAM channel, use the **video power** command in subinterface (QAM) configuration mode. To reset the channel to its default power level, use the **no** form of this command.

> **video power** *dBmV*

> **no video power**

Syntax Description

power	Configures the power on both channels of a QAM interface (port).
dBmV	Channel power level, in dBmV. Range is 42 to 58 dBmV (102 to 118 dBmicroV). See Defaults and Usage Guidelines, below.

Defaults

The default power is 50 dBmV.

Command Modes

Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

Configuring the output power for one QAM channel automatically configures the same power level for the other QAM channel in its upconverter group.

When both QAM channels in an RF port are enabled, the allowed power range is 42 to 55 dBmV (102 to 115 dBmicroV). If only one QAM channel is enabled, the allowed range is 45 to 58 dBmV (105 to 118 dBmicroV).

Tip Power values must be entered in dBmV. To convert dBmV to dBmicroV, add 60 to the power in dBmV.

If both QAM channels are up, RF port power is configured to *dBmV* + 3 dBmV. If only one channel is up, RF port power is configured to *dBmV*. If no channel is up, RF port power is not configured.

Caution Output powers in software are approximate. Where precise values are required, check the output with an appropriate power meter according to local practice.

■ **video power**

Examples   The following example shows how to configure a QAM channel in port 1 of a Cisco uMG9850 in slot 5 for an output power level of 45 dBmV. This configures the output power level for both QAM channels using this upconverter (5/1.1 and 5/1.2).

```
Switch# configure terminal
Switch(config)# interface qam 5/1.1
Switch(config-subif)# video power 45
```

See also Setting the Frequency and Output Power of the QAM Module Channels, page 20.

Related Commands

Command	Description
video format	Sets the modulation format on a QAM interface. See video format, page 138.
video frequency	See video frequency, page 139.
video interleave	See video interleave, page 141.

video psi

You can exercise various options to manage the handling of data related to program-specific information (PSI). The **video psi** command applies to all the Cisco uMG9850 modules in a switch. See Usage Guidelines, below.

To select PSI management options, use the **video psi** command in global configuration mode. To disable the options, use the **no** forms of this command.

> **video psi** {**ignore** {**crc-checksum** | **pat-version**} | **private**}

> **no video psi ignore crc-checksum**

> **no video psi ignore pat-version**

> **no video psi private**

Syntax Description

psi	Enables PSI management options.
ignore	Enables either the cyclic redundancy check (CRC) checksum or the program association table (PAT) version in the PSI data to be ignored.
crc-checksum	Causes the CRC checksum to be ignored.
pat-version	Causes the PSI table in the incoming stream to be parsed (snooped). The program map table (PMT) is parsed only if both the PAT content and the PMT version have changed. By default, the PMT is parsed as long as the PAT version or the PMT version change.
private	Causes the MPEG-2 private section to be parsed if it is present. By default, PMT parsing stops after the complete program map section is parsed, and any private section indicated in the program map section is ignored.

Defaults

See Syntax Description, above.

Command Modes

Global configuration

Command History

Release	Modification
12.2(20)EU	This command was introduced.

Usage Guidelines

This is a program-specific information (PSI) command.

- When the **video psi ignore crc-checksum** command is not used, or the **no** form is issued, the CRC checksum in the PSI data is automatically checked. If the checksum fails, the entire PSI is declared invalid for the session.

- When the **video psi ignore pat-version** command is used, other PSI information is still parsed. When the command is not used, or the **no** form is issued, PAT version changes automatically trigger a complete PSI parsing process. Use this command only when there is an issue of compatibility between a VoD server and a set-top box.

- When the **video psi private** command is used, the parsing process is prolonged and session setup is delayed. Use this command only if PSI parsing latency is not an issue.

Examples

✎

Note   The following commands apply to all Cisco uMG9850 modules in the switch.

The following example shows how to cause the CRC checksum to be ignored:

```
Switch# configure terminal
Switch(config)# video psi ignore crc-checksum
```

The following example shows how to cause the PMT not to be parsed if the PMT version has not changed:

```
Switch# configure terminal
Switch(config)# video psi ignore pat-version
```

The following example shows how to cause the PMT private section to be parsed if it is present:

```
Switch# configure terminal
Switch(config)# video psi private
```

Related Commands

Command	Description
video interval pat	See video interval pat, page 143.
video interval pmt	See video interval pmt, page 145.
Various	See video, page 111.

video route

To map the output of a QAM channel to the asynchronous serial interface (ASI) output port monitoring and troubleshooting, use the **video route** command in ASI configuration mode. To remove the mapping, use the **no** form of this command.

video route *interface.qam*

no video route *interface.qam*

Syntax Description

route	Maps the output of a QAM channel to the ASI output port.
interface.qam	Specifies the QAM channel on the Cisco uMG9850.

Defaults

No default behaviors or values. See Usage Guidelines, below.

Command Modes

Interface configuration (ASI interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

The ASI port is port 15 on each module. The slot varies. (See Table 7 on page 12.) Use the **no shut** command to enable the port.

Examples

The following example shows how to map the second QAM channel in port 2 on a Cisco uMG9850 in slot 5 to the ASI output port.

```
Switch# configure terminal
Switch(config)# interface asi 5/15
Switch(config-if)# video route qam 5/2.2
```

See also Routing the Output of a QAM Channel to the ASI Port, page 36.

Related Commands

Command	Description
interface asi	See interface asi, page 83.

video sessions

You can override the default session routing on a video line card, and instead map the UDP port of a particular program to a specific QAM channel. Instead of using the command video udp, page 160, to configure individual port maps, you can use the **video sessions** command to generate 25 portmap entries for the selected QAM channel.

⚠

Caution You cannot use both commands on the same QAM channel. See Usage Guidelines, below.

To configure the UDP port mapping for the video sessions on a QAM port, use the **video sessions** command in subinterface configuration mode. To replace nondefault UDP port mapping with default mapping, use the **no** form of this command.

> **video sessions** *number-of-sessions* **udp** *first-UDP-port-number* **program** *first-program-number* [**even_only**]
>
> **no video sessions**

Syntax Description

sessions	Configures port mapping for a selected number of video sessions.
number	Configures the maximum number of sessions for this UDP port mapping. Range is 2 to 25, with a default of 2.
udp	Selects an incoming UDP port number to be mapped.
first-UDP-port-number	See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.
program	Selects the first outgoing program number to be mapped.
first-program-number	The first output program to be configured. Range is 1 to 255, with no default.
even_only	Optional. Uses even UDP port numbers only, reserving odd numbers for Real Time Control Protocol (RTCP) or other purposes.

Defaults No default behaviors or values

Command Modes Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines Using the **no video sessions** command when programs are running on the QAM channel results in the command being rejected. Also, it does not remove the nondefault map, but simply replaces it with the default map.

Note The user-defined session mapping is loosely coupled with the range specified by the command **video** *slot* **route vlan** (see video <slot> route vlan, page 124). When the user enters a configuration for user-defined sessions, the selectable range is bound by the range defined by **video** *slot* **route vlan**. If, at a later time, the range defined by that command is changed, the user is warned if an already-defined session that is currently active would be made inactive because of this change. However, the command **video** *slot* **route vlan** itself does not trigger the removal of the already-defined session.

Tip Occasionally, if user-defined port mapping is removed, as in the following example:

```
Switch(config-subif)# no video udp 49152 program 1
```

the default port mapping does not appear following the execution of the **show interface qam** *interface.qam* **video portmap** command (see show interface qam <interface.qam> video portmap, page 94). To generate the default port mapping, execute the **no video sessions** command. See Related Commands, below.

Examples The following example shows how to map program 28 on UDP port 49874 to QAM channel 5/2.1:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video sessions 8 udp 49874 program 28
```

The following example shows how to do the same as the above, except that it shows how to select even UDP port numbers only:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video sessions 8 udp 49874 program 28 even_only
```

The following example shows how to replace nondefault UDP port mapping with default mapping:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# no video sessions
```

See also Statically Routing a Range of Program Sessions to a QAM Channel, page 27.

Related Commands

Command	Description
no video udp	See video udp, page 160.
video <slot> route vlan	See video <slot> route vlan, page 124.
no video sessions	See video sessions, page 154.
video udp	See video udp, page 160. This command configures UDP portmaps one at a time.
Various	See video, page 111.

video timeout

You can configure when a video session times out when packets are not received after a certain interval. The **video timeout** command applies to all the Cisco uMG9850 modules in a switch. To address a single module, use the **video** *slot* **timeout** command (see).

To configure timeout parameters on all Cisco uMG9850 modules in a switch, use the **video timeout** command in global configuration mode. To revert to default values, use the **no** forms of this command.

> **video timeout** {**session-close** *minutes* | **signal-loss** *milliseconds*}
>
> **no video timeout session-close**
>
> **no video timeout signal-loss**

Syntax Description

timeout	Configures the timeout options.
session-close	Configures the time after packet loss when the video session is closed
minutes	Number of minutes, from 1 to 1440. If no packets come into a session for *minutes* minutes, the session is closed.
signal-loss	Configures the time after packet loss when a signal loss is assumed. If no packets come into a session after *milliseconds* milliseconds, the signal is assumed to be lost.
milliseconds	Number of milliseconds, from 200 to 10000.

Defaults   See Usage Guidelines, below.

Command Modes   Global configuration

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines   The syntax of this command is similar to that for the **video** *slot* **timeout** command (see), except that the **video timeout** command addresses all the Cisco uMG9850 modules in a switch. You must configure each parameter on a separate command line.

When a session is closed, this means that the Cisco uMG9850 has not received any video packets for the given session's UDP port for the period determined by the **video** *slot* **timeout session-close** command or the **video timeout session-close** command. The session no longer exists, and is not listed following a **show** command. The range is 1 to 1440 minutes. The default is 10 minutes.

When a session is inactive, this means that the Cisco uMG9850 has not received any video packets for the given session's UDP port for the period determined by the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command. The session still exists, and is listed following a **show**

command. If packets start arriving before the timer set by the **video** *slot* **timeout session-close** command or the **video timeout session-close** command counts down, the session becomes active. The range is 200 to 10000 milliseconds. The default is 5000 milliseconds.

The value for the **video** *slot* **timeout signal-loss** command or the **video timeout signal-loss** command should always be larger than the value configured for jitter.

Examples   The following example shows how to set the **session-close** option to 25 and the **signal-loss** option to 500 on all the Cisco uMG9850 modules in a switch:

```
Switch(config)# video timeout session-close 25
Switch(config)# video timeout signal-loss 500
```

See also Statically Setting Session Timeouts, page 25.

Related Commands

Command	Description
show video <slot> session	See show video <slot> session, page 103.
video <slot> jitter	See video <slot> jitter, page 119.
video <slot> timeout	See video <slot> timeout, page 127.
Various	See video, page 111.

video tsid

At each hub, each QAM channel must have a unique transport stream ID (TSID). The software checks for and guarantees the uniqueness of a TSID within a chassis only.

To specify the transport stream ID (TSID) to be used to identify transport stream packets that are sent on a QAM channel, use the **video tsid** command in subinterface configuration mode:

video tsid *tsid*

Syntax Description

tsid	Configures the transport stream ID.
tsid	Unique identifier for the transport stream on the output port. Range is 1 to 65535, with no default.

Defaults

By default, nonconflicting TSIDs are assigned to all Cisco uMG9850 modules in a switch. See Usage Guidelines, below.

Command Modes

Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

⚠

Caution
Although by default nonconflicting TSIDs are assigned to all Cisco uMG9850 modules in a switch, the user can assign conflicting TSIDs within an individual module, resulting in conflicts with other TSIDs in the switch. It is the responsibility of the multiple system operator (MSO) to avoid TSID conflicts. To see all the TSIDs within a switch, use the **show video** *slot* command (see show video <slot>, page 96), and address each Cisco uMG9850 in the switch.

See also Setting TSID and NIT-PID Values, page 34.

Examples

The following example shows how to specify a transport stream ID of 1001 for QAM channel 2 in port 2 of a Cisco uMG9850 in slot 5:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.2
Switch(config-subif)# video tsid 1001
```

Related Commands

Command	Description
video nitpid	See video nitpid, page 148.
Various	See commands indicated as "PSI commands" in Notes column of Table 11 on page 111.

video udp

Each QAM channel has a default UDP port mapping. For example, a video stream with a destination UDP of 0xd821 is sent to slot 3, QAM port 1 as output program 1. However, for a given UDP session, you can remap (1) input packet IDs (PIDs) and (2) output program numbers to output PIDs on a QAM channel.

To do either of the above, use the **video udp** command in subinterface (QAM channel) configuration mode. To remove the user-defined portmapping for a specific port number and program, use the **no** form of this command.

video udp *UDP-port-number* {[**in** *in-pid* **out** *out-pid*] | **program** *prog-number*}

no video udp *UDP-port-number* **program** *prog-number*

Syntax Description		
udp	Configures UDP parameters	
UDP-port-number	UDP port number for the desired incoming session. Range is 49152 to 65535, with no default. See UDP Port Mappings: Default, Manual, and Emulation Mode, page 6.	
in	Configures the input PID to be filtered out from this session.	
in-pid	Range is 16 to 8191, with no default.	
out	Statically maps the input PID to the specified output PID, overriding the default output PID that is generated by the video subsystem.	
out-pid	Range is 16 to 8191, with no default.	
program	Creates a static route that maps an output program number on a UDP port to a QAM channel.	
prog-number	Program to be routed. Range is 1 to 255, with no default.	

Defaults   No default behaviors or values

Command Modes   Subinterface (QAM channel) configuration. See Subinterface Configuration Mode, page 6.

Command History	Release	Modification
	12.1(20)EU	This command was introduced.

Usage Guidelines   An *in-pid* can be filtered whether or not an *out-pid* is specified.

⏱ **Timesaver**   To generate a range of 25 UDP portmaps automatically, use the **video sessions** command (see video sessions, page 154).

Examples

The following example shows how to map input PID 16 on UDP session 49152 on interface 5/2.1 to output PID 17:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video udp 49152 in 16 out 17
```

The following example shows how to route the input stream delivered to UDP port 49152 to QAM channel 5/2.1 as program 1:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video udp 49152 program 1
```

The following example shows how to remove the user-defined portmapping UDP port 49152 to QAM channel 5/2.1 as program 1:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# no video udp 49152 program 1
```

See also Statically Routing a Single Program Session to a QAM Channel, page 28, and Remapping Input PIDs to Output PIDs, page 31.

Tip Occasionally, if user-defined port mapping is removed, the default port mapping does not appear following the execution of the **show interface qam** *interface.qam* **video portmap** command (see show interface qam <interface.qam> video portmap, page 94.) To generate the default port mapping, execute the **no video sessions** command. See Related Commands, below.

Related Commands

Command	Description
no video sessions	See video sessions, page 154.
show interface qam <interface.qam> video portmap	See show interface qam <interface.qam> video portmap, page 94.
video <slot> udp <UDP-port-number> filter-pid	For a discussion of the global version of this command, see video <slot> udp <UDP-port-number> filter-pid, page 131.
video sessions	Use this command to generate 25 UDP portmap entries automatically. See video sessions, page 154.

video utilization-threshold

It is possible that a given QAM channel can be either overwhelmed or underutilized. To monitor and correct for this, you can set either or both minimum and maximum bandwidth-utilization thresholds for video streams over a QAM channel.

To specify the high and low utilization thresholds for video streams, use the **video utilization-threshold** command in subinterface (QAM channel) configuration mode**.** To reset the values to their defaults, use the **no** form of this command.

> **video utilization-threshold** {[**low** *low-utilization threshold*]/ [**high** *high-utilization-threshold*]}

> **no video utilization-threshold**

Syntax Description

utilization-threshold	Enables the setting of low and high utilization thresholds for video traffic on a QAM channel.
low	Sets the low threshold.
low-utilization-threshold	Utilization in percent. Range is 0 to 95. See Defaults. below.
high	Sets the high threshold.
high-utilization-threshold	Utilization in percent. Range is 5 to 95. See Defaults. below.

Defaults

The default low utilization threshold is 0 percent. The default high utilization threshold is 75 percent.

Command Modes

Subinterface configuration (QAM interface only). See Subinterface Configuration Mode, page 6.

Command History

Release	Modification
12.1(20)EU	This command was introduced.

Usage Guidelines

If the percentage of QAM bandwidth being used is below the value for the **low** option, then the QAM channel is being underutilized. If the percentage of QAM bandwidth being used is above the value for the **high** option, then the QAM channel is being overutilized.

The high utilization threshold must be greater than the low utilization threshold. You can set either or both thresholds.

Examples

The following example shows how to set a low utilization threshold of 10 percent on interface 5/2.1:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video utilization-threshold low 10
```

The following example shows how to set a high utilization threshold of 80 percent on interface 5/2.1:

```
Switch# configure terminal
Switch(config)# interface qam 5/2.1
Switch(config-subif)# video utilization-threshold high 80
```

Related Commands	Command	Description
	Various	See video, page 111.

Glossary

ASI—asynchronous serial interface

CLI—command-line interface

Dhub—distribution hub

DOCSIS—Data Over Cable Service Interface Specification

EPG—electronic program guide

ETSI—European Telecommunications Standards Institute

ES—elementary stream

GE—Gigabit Ethernet

ISA—Industry Standard Architecture

MIB—Management Information Base

MPTS—multiple program transport stream

MPEG—Moving Picture Experts Group

MSO—multiple systems operator

NIT—network information table

PAT—program association table

PCR—program clock reference

PDD—Program Data Delivery

PID—packet ID

PMT—program map table

PSI—program-specific information

QPSK—quaternary phase-shift keying

RTCP—Real-Time Control Protocol

SCTE—Society of Cable Telecommunications Engineers, Inc.

SE—supervisor engine

Session—a presentation program in Video on Demand (VoD)

SI—service information

SM—session manager

SPTS—single program transport stream

STB—set-top box

TDT—time and date table

UDLR—unidirectional link routing

UDP—User Datagram Protocol

uMG—universal media gateway

VoD—Video on Demand

Note Refer to *Internetworking Terms and Acronyms* for terms not included in this glossary.