Troubleshooting Tips for the Cisco uBR924 Cable Access Router

Feature Summary

This document describes the Cisco IOS troubleshooting commands that may be used by cable service providers to verify communication between a Cisco uBR924 cable access router and other peripheral devices installed in the HFC headend such as a Cisco uBR7200 series universal broadband router, a DHCP server, and a TFTP server.

Benefits

The Cisco uBR924 cable access router troubleshooting system provides the following benefits:

- A MAC-layer system log file that provides a snapshot of detailed reasons why an interface might reset, along with all the negotiations that occurred between the Cisco uBR924 cable access router and the CMTS. Over 220 possible description fields exist in this log, which is displayed using the **show controllers cable-modem 0 mac log** command from privileged EXEC mode.
- Debug does not need to be turned on in order to troubleshoot a Cisco uBR924 cable access router.
- The progression of normal data-over-cable communication events is clearly explained, simplifying the resolution of faulty system connections.
- Troubleshooting and diagnostic tasks can be performed on the Cisco uBR924 from a remote location using TELNET.

Restrictions

When using the Cisco uBR924 cable access router, keep the following restrictions and limitations in mind:

- The Cisco uBR924 is able to implement multiple classes of service (CoS) on the cable interface; however, separate CoS streams are only available when the cable access router is connected to a headend that supports multiple CoS per cable access router. In addition, the configuration file downloaded to the cable access router must specify the use of multiple classes of service.
- If the Cisco uBR924 cable access router is connected to a DOCSIS 1.0 headend that does not support multiple CoS per cable access router, voice and data will be mixed, and voice traffic will be transmitted on a best effort basis. This may cause poorer voice quality and lower data throughput when calls are being made from the cable access router's telephone ports. Voice quality may also be affected when transmitting or downloading large files, or at other times when network traffic is heavy.

Note The Cisco uBR924 cable access router is typically configured at the headend. Most cable service operators do not permit local configuration at subscriber sites.

Caution Before attempting to reconfigure a Cisco uBR924 cable access router at a subscriber site, contact your network management, provisioning manager, or billing system administrator to ensure remote configuration is allowed. If remote configuration is disabled, settings you make and save at the local site will not remain in effect after the cable access router is reset or powered off and back on. Instead, settings will return to the previous configuration.

Related Features and Technologies

The Cisco uBR924 cable access router is intended to be used in conjunction with a Cisco uBR7200 series universal broadband router or other DOCSIS-based CMTS located at the cable operator's headend facility.

Related Documents

For related information on the Cisco uBR924 cable access router, refer to the following documents:

- *Cisco uBR924 Cable Access Router Quick Start Guide*
- *Cisco uBR924 Cable Access Router Installation and Configuration Guide*
- *Regulatory Compliance and Safety Info. for the Cisco uBR924 Cable Access Router*
- *Cisco uBR7246 Installation and Configuration Guide*
- *Cisco uBR7223 Installation and Configuration Guide*
- *Cisco uBR7200 Series Configuration Notes*
- *Cisco Network Registrar for the uBR7200 Series*
- *Regulatory and Safety Compliance for the Cisco uBR7246*
- *Regulatory and Safety Compliance for the Cisco uBR7223*
- *Cisco uBR7200 Series Features*
- *Cisco uBR7200 Series Feature Enhancements*
- *Cisco uBR7200 Series Feature Enhancements in Release 12.0*
- *Cisco uBR7200 Series Installation and Configuration Guide*

Platforms

The Cisco uBR924 cable access router is a single-platform standalone device; it works in conjunction with the Cisco uBR7200 series universal broadband routers.

Prerequisites

In order to use the Cisco uBR924 cable access router for data-over-cable applications, the following conditions must be met:

- The Cisco uBR7200 series universal broadband router or other DOCSIS-based CMTS must be installed at the cable headend and configured. Refer to the *Cisco uBR7246 Installation and Configuration Guide* or the *Cisco uBR7223 Installation and Configuration Guide* for detailed information.
- The Cisco uBR924 cable access router must be physically installed and cabled as follows:
  - To the headend via CATV coaxial cable
  - To at least one PC via the straight-through yellow Ethernet cable supplied with the cable access router. Refer to the *Cisco uBR924 Cable Access Router Quick Start Guide* for detailed information.
- The PC(s) connected to the Cisco uBR924 cable access router must be configured for Internet Protocol (IP).
- The cable service provider must have a correctly configured network DHCP server and Electronic Industries Association (EIA) downstream channel.
- Cisco IOS Release 11.3(4)NA or later must be running on the Cisco uBR924 cable access router. When the cable access router is up and running, you can display the IOS release number by entering the **show version** command from user EXEC mode.

Note If the Cisco uBR7246 universal broadband router at the cable headend is using MC16 modem cards, Cisco IOS Release 11.3(7)NA or later must be running on the Cisco uBR924 cable access router.

In order to use the Cisco uBR924 cable access router for VoIP-over-cable applications, the following additional conditions must be met:

- Cisco IOS Release 12.0(4)XI1 or higher must be running on the Cisco uBR924 cable access router.
- In order to run VoIP Fax, the uBR924 cable access router must be configured for voice and you must be using Cisco IOS Release 12.0(5)T or higher.
- For multiple CoS (class of service) support, the CMTS must allow the definition of multiple service identifiers (SIDs) on the upstream. If the CMTS is a Cisco uBR7200 series universal broadband router, Cisco IOS Release 12.0(4)XI1 or higher must be used on the headend router.
- The Cisco uBR924 must be configured to operate in routing mode.

Supported MIBs and RFCs

The Cisco uBR924 cable access router supports the following MIBs and RFCs:

- Cisco Standard MIBs:
  - Cisco Product MIB
  - Cisco Chassis MIB
  - Cisco Syslog MIB

  - — Cisco Flash MIB
  - — Bridge MIB
  - — IF MIB
  - — MIB-II
- Cisco VoIP MIBs:
  - — Cisco Voice IF MIB
  - — Cisco Voice Dial-Control MIB
  - — Cisco Voice Analog IF MIB
  - — Cisco Dial-Control MIB
- Radio Frequency Interface Specification—Developed by the Multimedia Cable Network System (MCNS) consortium. It defines the radio-frequency interface specification for high-speed data-over-cable systems.
- CiscoWorks—Network management program for planning, troubleshooting, and monitoring Cisco internetworks. CiscoWorks uses Simple Network Management Protocol (SNMP) to monitor all SNMP devices.
  - — For more information about CiscoWorks on CCO, follow this path: **Products & Ordering: Cisco Products: Network Management: CiscoWorks**
  - — For more information about CiscoWorks on the Documentation CD-ROM, follow this path: **Cisco Product Documentation: Network Management: CiscoWorks**
- Radio Frequency Interface (RFI) MIB—Specific to Data-Over-Cable Service Interface Specification (DOCSIS) cable implementations. The RIF MIB provides an interface that permits management of the Cisco uBR924 cable access router over the cable or Ethernet interface. Using SNMP management applications, this MIB allows access to statistics such as MAC, driver configuration, and counters.
- Cable Device MIB—Records statistics related to the configuration and status of the Cisco uBR924 cable access router. Statistics include an events log and device status. The Cable Device MIB is very similar to the RFI MIB in that both allow access to statistics; they are different in that the Cable Device MIB reports statistics on the cable access router, while the RFI MIB reports statistics on the radio frequency transmissions over the cable television line.

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB web site on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

List of Terms

broadband—Transmission system that combines multiple independent signals onto one cable. In the cable industry, broadband refers to the frequency-division multiplexing of many signals in a wide bandwidth of RF frequencies using a hybrid fiber-coaxial (HFC) network.

CATV—Originally stood for Community Antenna Television. Now refers to any coaxial or fiber cable-based system that provides television services.

cable modem (CM)—A modulator-demodulator device that is placed at subscriber locations to convey data communications on a cable television system. The Cisco uBR924 cable access router is also a cable modem.

Cable Modem Termination System (CMTS)—A termination system located at the cab le television system headend or distribution hub which provides complementary functionality to the cable modems, enabling data connectivity to a wide-are network.

cable router—A modular chassis-based router optimized for data-over-CATV hybrid fiber-coaxial (HFC) applications.

carrier—A signal on which another, lower-frequency signal is modulated in order to transport the lower-frequency signal to another location.

Carrier-to-Noise—C/N (also CNR). The difference in amplitude between the desired RF carrier and the noise in a portion of the spectrum.

channel—A specific frequency allocation and bandwidth. Downstream channels used for television are 6 MHz wide in the United States; 8 MHz wide in Europe.

CM—cable modem.

CMTS—Cable Modem Termination System.

coaxial cable—The principal physical media over which CATV systems are built.

dB—Decibel. A measure of the relative strength of two signals.

dBm—Decibels with respect to one milliwatt. A unit of RF signal strength used in satellite work and other communications applications.

dBmV—Decibels with respect to one millivolt in a 75-ohm system. The unit of RF power used in CATV work in North America.

DHCP—Dynamic Host Configuration Protocol. This protocol provides a mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.

DOCSIS—Data Over Cable Service Interface Specification. Defines technical specifications for equipment at both subscriber locations and cable operators' headends.

downstream—The set of frequencies used to send data from a headend to a subscriber.

FDM—Frequency Division Multiplexing. A data transmission method in which a number of transmitters share a transmission medium, each occupying a different frequency.

FEC—Forward Error Correction. In data transmission, a process by which additional data is added that is derived from the payload by an assigned algorithm. It allows the receiver to determine if certain classes of errors have occurred in transmission and, in some cases, allows other classes of errors to be corrected.

headend—Central distribution point for a CATV system. Video signals are received here from satellite (either co-located or remote), frequency converted to the appropriate channels, combined with locally originated signals, and rebroadcast onto the HFC plant. For a CATV data system, the headend is the typical place to create a link between the HFC system and any external data networks.

HFC—Hybrid fiber-coaxial (cable network). Older CATV systems were provisioned using only coaxial cable. Modern systems use fiber transport from the headend to an optical node located in the neighborhood to reduce system noise. Coaxial cable runs from the node to the subscriber. The fiber plant is generally a star configuration with all optical node fibers terminating at a headend. The coaxial cable part of the system is generally a trunk-and-branch configuration.

host—Any end-user computer system that connects to a network. In this document, the term host refers to the computer system connected to the LAN interface of the cable access router.

ingress noise—Over-the-air signals that are inadvertently coupled into the nominally closed coaxial cable distribution system. Ingress noise is difficult to track down and intermittent in nature.

MAC layer—Media Access Control sublayer. Controls access by the cable access router to the CMTS and to the upstream data slots.

MCNS—Multimedia Cable Network System Partners Ltd. A consortium of cable companies providing service to the majority of homes in the United States and Canada. This consortium has decided to drive a standard with the goal of having interoperable cable access routers.

MSO—Multiple System Operator. A cable service provider that operates in more than one geographic area, thus having multiple headend facilities.

narrowband—A single RF frequency.

NTSC—National Television Systems Committee. A United States TV technical standard, named after the organization that created the standard in 1941. Specifies a 6 MHz-wide modulated signal.

PAL—Phase Alternating Line. The TV system used in most of Europe, in which the color carrier phase definition changes in alternate scan lines. Utilizes an 8 MHz-wide modulated signal.

QAM—Quadrature Amplitude Modulation. A method of modulating digital signals onto a radio-frequency carrier signal in which the value of a symbol consisting of multiple bits is represented by amplitude and phase states of the carrier. QAM is a modulation scheme mostly used in the downstream direction (64-QAM, 256-QAM). 16-QAM is expected to be usable in the upstream direction. Numbers indicate number of code points per symbol. The QAM rate or the number of points in the QAM constellation can be computed by 2 raised to the power of <number of bits/symbol>. For example, 16-QAM has 4 bits per symbol, 64-QAM has 6 bits per symbol, and 256-QAM has 8 bits per symbol.

QPSK—Quadrature Phase-Shift Keying. A digital modulation method in which there are 2 data bits represented with each baud symbol.

ranging—The process of acquiring the correct timing offset such that the transmissions of a cable access router are aligned with the correct mini-slot boundary.

RF—Radio frequency. The portion of the electromagnetic frequency spectrum from 5 MHz to approximately 860 MHz.

SECAM—TV system used in France and elsewhere, utilizing an 8 MHz-wide modulated signal.

SID (Service ID)—A number that defines (at the MAC sublayer) a particular mapping between a cable access router (CM) and the CMTS. The SID is used for the purpose of upstream bandwidth allocation and class-of-service management.

Signal-to-Noise—S/N (also SNR). The difference in amplitude between a baseband signal and the noise in a portion of the spectrum.

spectrum reuse—CATV's most fundamental concept. Historically, the over-the-air spectrum has been assigned to many purposes other than that of carrying TV signals. This has resulted in an inadequate supply of spectrum to serve the needs of viewers. Cable can reuse spectrum that is sealed in its aluminum tubes.

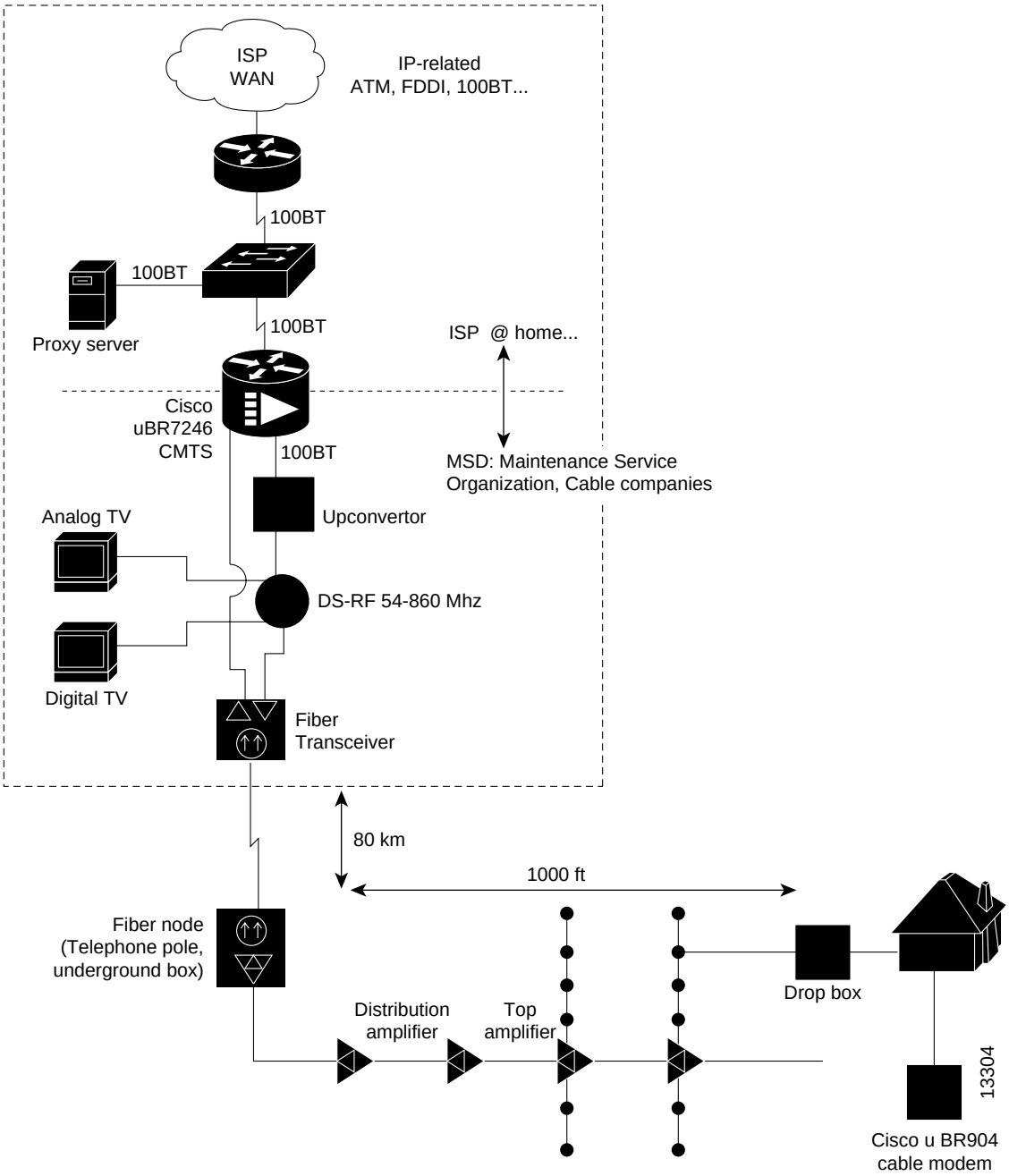
subscriber unit (SU)—An alternate term for cable access router. See *cable access router.*

upstream—The set of frequencies used to send data from a subscriber to the headend.

CMTS to Cable Modem Network Topology

Figure 1 shows the physical relationship between the devices in the HFC network and the Cisco uBR924 cable access router.

Figure 1 Sample Topology



Troubleshooting Steps

To troubleshoot a malfunctioning cable modem, perform the following tasks:

- Step 1—Understand How Basic Initialization Works
- Step 2—Connect to the Cisco uBR924
- Step 3—Display the Cisco uBR924's MAC Log File
- Step 4—Interpret the MAC Log File and Take Action
- (Optional) Step 5—Use Additional Troubleshooting Commands

Step 1—Understand How Basic Initialization Works

Before you troubleshoot a Cisco uBR924 cable access router, you should be familiar with the cable modem initialization process. See Figure 2 and Table 1. Understanding this flowchart and sequence of events will help you determine where and why connections fail.

The sequence numbers shown in Figure 2 are explained in Table 1, which appears after the illustration. The Cisco uBR924 will complete all the steps in this flowchart each time it needs to reestablish ranging and registration with the CMTS.

Figure 2 Cable Modem Initialization Flowchart

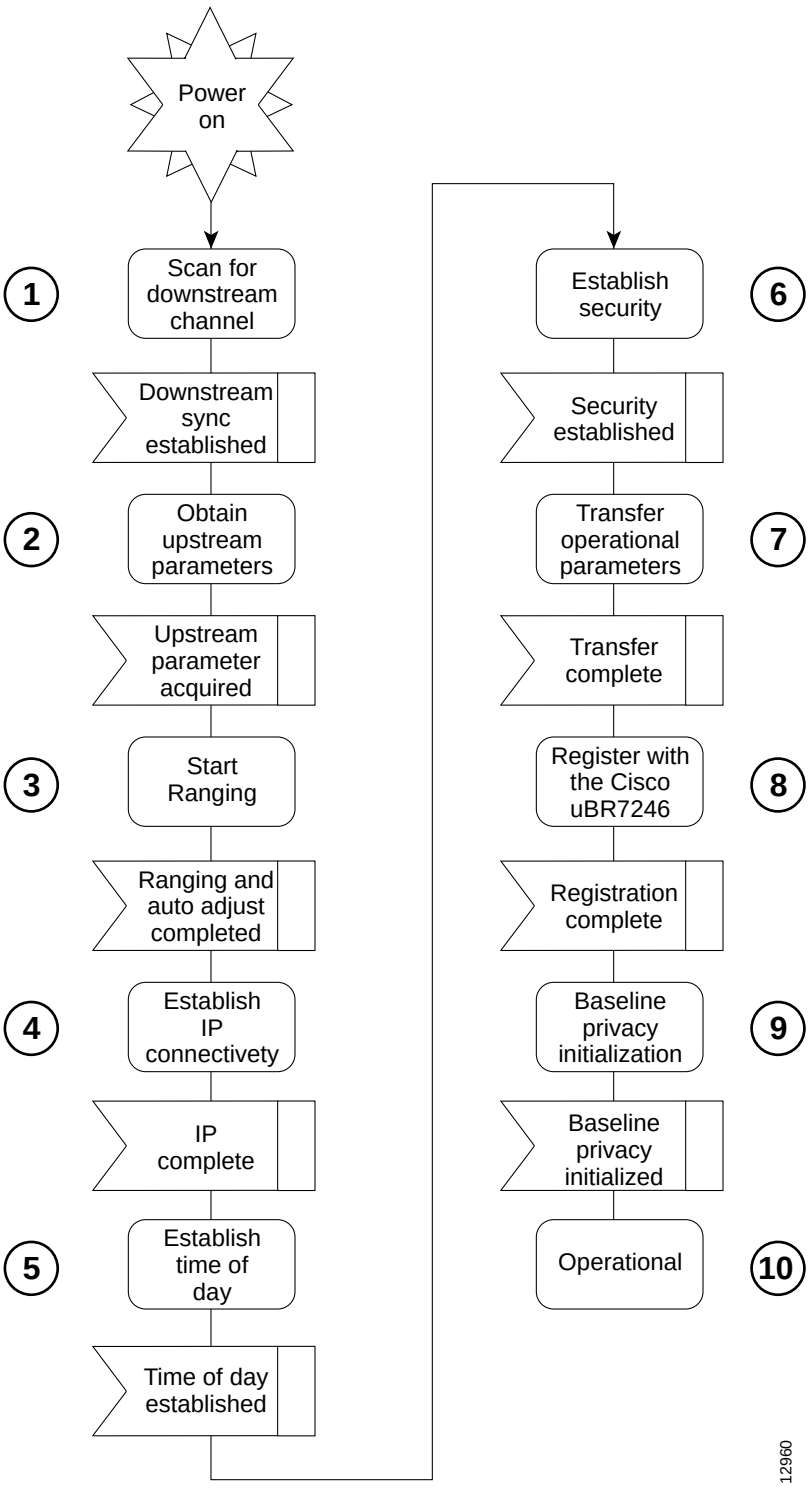


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Table 1 Cable Modem Initialization Sequences and Events

Sequence	Event	Description
1	Scan for a downstream channel and establish synchronization with the CMTS.	The Cisco uBR924 acquires a downstream channel from the CMTS and saves the last operational frequency in non-volatile memory. The Cisco uBR924 tries to reacquire the saved downstream channel the next time a request is made. **Note** An ideal downstream signal is one that synchronizes QAM symbol timing, FEC framing, MPEG packetization, and recognizes downstream sync MAC layer messages.
2	Obtain upsteam channel parameters.	The Cisco uBR924 waits for an upstream channel descriptor (UCD) message from the CMTS. The UCD provides transmission parameters for the upstream channel.
3	Start ranging for power adjustments.	The ranging process adjusts the Cisco uBR924's transmit power. Ranging is performed in two stages: ranging state 1 and ranging state 2.
4	Establish IP connectivity.	The Cisco uBR924 sends a DHCP request to obtain an IP address, which is needed for IP connectivity. The DHCP response also includes the name of a file that contains additional configuration parameters, the TFTP server's address, and the Time of Day (TOD) server's address.
5	Establish the time of day.	The Cisco uBR924 accesses the TOD server for the current date and time, which is used to create time stamps for logged events (such as those displayed in the MAC log file).
6	Establish security.	Keys for privacy are exchanged between the Cisco uBR924 and the CMTS. **Note** The Cisco uBR924 cable access router supports baseline privacy in Cisco IOS Release 12.0(5)T and later.
7	Transfer operational parameters.	After the DHCP and security operations are successful, the Cisco uBR924 downloads operational parameters from a configuration file stored on the cable company's TFTP server.
8	Perform registration.	The Cisco uBR924 registers with the CMTS. After it is initialized, authenticated, and configured, the Cisco uBR924 is authorized to forward traffic onto the cable network. .
9	Comply with baseline privacy.	If the software image running on the Cisco uBR924 includes baseline privacy, link level encryption keys are exchanged between the CMTS and the Cisco uBR924.
10	Enter the operational maintenance state.	As soon as the Cisco uBR924 has successfully completed the above sequence, it enters operational maintenance state.

Step 2—Connect to the Cisco uBR924

Telnet to the IP address assigned to the cable interface or Ethernet interface. If the interface is not up, you will need to access the Cisco IOS software via the RJ-45 console port, which is a physical port on the back of the Cisco uBR924.

Note For security purposes, the console port on the Cisco uBR924 may have been deactivated by the cable service company prior to installation at the subscriber site.

Step 3—Display the Cisco uBR924's MAC Log File

A MAC-layer circular log file is stored inside the Cisco uBR924. This file contains a history of the log messages such as state event activities and timestamps. This is the most valuable information for troubleshooting the cable interface.

The MAC log file is displayed by entering the **show controllers cable-modem 0 mac log** command from privileged EXEC mode.

The most useful display fields in this log file are the reported state changes. These fields are preceded by the message `CMAC_LOG_STATE_CHANGE`. These fields show how the Cisco uBR924 progresses through the various processes involved in establishing communication and registration with the CMTS. The `maintenance_state` is the normal operational state; the `wait_for_link_up_state` is the normal state when the interface is shut down.

Note Because the MAC log file only holds a snapshot of 1023 entries at a time, you should try to display the Cisco uBR924's log file within 5 minutes after the reset or problem occurs.

The following is the normal progression of states as displayed by the MAC log:

```
wait_for_link_up_state
ds_channel_scanning_state
wait_ucd_state
wait_map_state
ranging_1_state
ranging_2_state
dhcp_state
establish_tod_state
security_association_state
configuration_file_state
registration_state
establish_privacy_state
maintenance_state
```

Note To translate this output into more meaningful information, see "Step 4—Interpret the MAC Log File and Take Action" on page 13.

Following is an example of what the MAC log file looks like when the Cisco uBR924 interface successfully comes up and registers with the CMTS. The output you see is directly related to the messages that are exchanged between the Cisco uBR924 and the headend CMTS.

```
uBR924# show controllers cable-modem 0 mac log
508144.340 CMAC_LOG_DRIVER_INIT_IDB_RESET             0x08098FEA
508144.342 CMAC_LOG_LINK_DOWN
508144.344 CMAC_LOG_LINK_UP
508144.348 CMAC_LOG_STATE_CHANGE                      ds_channel_scanning_state
508144.350 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     88/453000000/855000000/6000000
508144.354 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     89/93000000/105000000/6000000
508144.356 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     90/111250000/117250000/6000000
508144.360 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     91/231012500/327012500/6000000
508144.362 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     92/333015000/333015000/6000000
508144.366 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     93/339012500/399012500/6000000
508144.370 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     94/405000000/447000000/6000000
508144.372 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     95/123015000/129015000/6000000
508144.376 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     96/135012500/135012500/6000000
508144.380 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     97/141000000/171000000/6000000
508144.382 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     98/219000000/225000000/6000000
508144.386 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     99/177000000/213000000/6000000
```

```
508144.390 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY     699000000
508145.540 CMAC_LOG_UCD_MSG_RCVD                       3
508146.120 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED             699000000
508146.122 CMAC_LOG_DS_CHANNEL_SCAN_COMPLETED
508146.124 CMAC_LOG_STATE_CHANGE                       wait_ucd_state
508147.554 CMAC_LOG_UCD_MSG_RCVD                       3
508147.558 CMAC_LOG_UCD_NEW_US_FREQUENCY               20000000
508147.558 CMAC_LOG_SLOT_SIZE_CHANGED                  8
508147.622 CMAC_LOG_FOUND_US_CHANNEL                   1
508147.624 CMAC_LOG_STATE_CHANGE                       wait_map_state
508148.058 CMAC_LOG_MAP_MSG_RCVD
508148.060 CMAC_LOG_INITIAL_RANGING_MINISLOTS          40
508148.062 CMAC_LOG_STATE_CHANGE                       ranging_1_state
508148.064 CMAC_LOG_RANGING_OFFSET_SET_TO              9610
508148.066 CMAC_LOG_POWER_LEVEL_IS                     28.0  dBmV (commanded)
508148.068 CMAC_LOG_STARTING_RANGING
508148.070 CMAC_LOG_RANGING_BACKOFF_SET                0
508148.072 CMAC_LOG_RNG_REQ_QUEUED                     0
508148.562 CMAC_LOG_RNG_REQ_TRANSMITTED
508148.566 CMAC_LOG_RNG_RSP_MSG_RCVD
508148.568 CMAC_LOG_RNG_RSP_SID_ASSIGNED               2
508148.570 CMAC_LOG_ADJUST_RANGING_OFFSET              2408
508148.572 CMAC_LOG_RANGING_OFFSET_SET_TO              12018
508148.574 CMAC_LOG_ADJUST_TX_POWER                    20
508148.576 CMAC_LOG_POWER_LEVEL_IS                     33.0  dBmV (commanded)
508148.578 CMAC_LOG_STATE_CHANGE                       ranging_2_state
508148.580 CMAC_LOG_RNG_REQ_QUEUED                     2
508155.820 CMAC_LOG_RNG_REQ_TRANSMITTED
508155.824 CMAC_LOG_RNG_RSP_MSG_RCVD
508155.826 CMAC_LOG_ADJUST_RANGING_OFFSET              -64
508155.826 CMAC_LOG_RANGING_OFFSET_SET_TO              11954
508155.828 CMAC_LOG_RANGING_CONTINUE
508165.892 CMAC_LOG_RNG_REQ_TRANSMITTED
508165.894 CMAC_LOG_RNG_RSP_MSG_RCVD
508165.896 CMAC_LOG_ADJUST_TX_POWER                    -9
508165.898 CMAC_LOG_POWER_LEVEL_IS                     31.0  dBmV (commanded)
508165.900 CMAC_LOG_RANGING_CONTINUE
508175.962 CMAC_LOG_RNG_REQ_TRANSMITTED
508175.964 CMAC_LOG_RNG_RSP_MSG_RCVD
508175.966 CMAC_LOG_RANGING_SUCCESS
508175.968 CMAC_LOG_STATE_CHANGE                       dhcp_state
508176.982 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS           188.188.1.62
508176.984 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS           4.0.0.1
508176.986 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS            4.0.0.32
508176.988 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
508176.988 CMAC_LOG_DHCP_TZ_OFFSET                     360
508176.990 CMAC_LOG_DHCP_CONFIG_FILE_NAME              platinum.cm
508176.992 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
508176.996 CMAC_LOG_DHCP_COMPLETE
508177.120 CMAC_LOG_STATE_CHANGE                       establish_tod_state
508177.126 CMAC_LOG_TOD_REQUEST_SENT
508177.154 CMAC_LOG_TOD_REPLY_RECEIVED                 3107617539
508177.158 CMAC_LOG_TOD_COMPLETE
508177.160 CMAC_LOG_STATE_CHANGE                       security_association_state
508177.162 CMAC_LOG_SECURITY_BYPASSED
508177.164 CMAC_LOG_STATE_CHANGE                       configuration_file_state
508177.166 CMAC_LOG_LOADING_CONFIG_FILE                platinum.cm
508178.280 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
508178.300 CMAC_LOG_STATE_CHANGE                       registration_state
508178.302 CMAC_LOG_REG_REQ_MSG_QUEUED
508178.306 CMAC_LOG_REG_REQ_TRANSMITTED
508178.310 CMAC_LOG_REG_RSP_MSG_RCVD
508178.312 CMAC_LOG_COS_ASSIGNED_SID                   5/19
508178.314 CMAC_LOG_COS_ASSIGNED_SID                   6/20
508178.316 CMAC_LOG_COS_ASSIGNED_SID                   7/21
```

```
508178.318 CMAC_LOG_RNG_REQ_QUEUED                    19
508178.320 CMAC_LOG_REGISTRATION_OK
508178.322 CMAC_LOG_REG_RSP_ACK_MSG_QUEUED            0
508178.324 CMAC_LOG_STATE_CHANGE                      establish_privacy_state
508178.326 CMAC_LOG_NO_PRIVACY
508178.328 CMAC_LOG_STATE_CHANGE                      maintenance_state
```

You can display other aspects of the MAC layer by using variations of the **show controllers cable-modem 0 mac** command:

```
uBR924# show controllers cable-modem 0 mac ?
  errors    Mac Error Log data
  hardware  All CM Mac Hardware registers
  log       Mac log data
  resets    Resets of the MAC
  state     Current MAC state
```

For examples and descriptions of how to use these keywords, see the **show controllers cable-modem mac** command reference page.

Step 4—Interpret the MAC Log File and Take Action

The MAC log file gives a detailed history of initialization events that occurred in the Cisco uBR924. All pertinent troubleshooting information is stored here.

The following sample log file is broken down into the chronological sequence of events listed below. Sample comments are also included in the log file.

- Event 1—Wait for the Link to Come Up
- Event 2—Scan for a Downstream Channel, then Synchronize
- Event 3—Obtain Upstream Parameters
- Event 4—Start Ranging for Power Adjustments
- Event 5—Establish IP Connectivity
- Event 6—Establish the Time of Day
- Event 7—Establish Security
- Event 8—Transfer Operational Parameters
- Event 9—Perform Registration
- Event 10—Comply with Baseline Privacy
- Event 11—Enter the Maintenance State

Event 1—Wait for the Link to Come Up

When the Cisco uBR924 cable access router is powered on and begins initialization, the first event that occurs is that the MAC layer informs the cable access router drivers that it needs to reset. The LINK_DOWN and LINK_UP fields are similar to the shut and no shut conditions on a standard Cisco interface.

```
uBR924# show controllers cable-modem 0 mac log

528302.040 CMAC_LOG_LINK_DOWN
528302.042 CMAC_LOG_RESET_FROM_DRIVER
528302.044 CMAC_LOG_STATE_CHANGE                        wait_for_link_up_state
528302.046 CMAC_LOG_DRIVER_INIT_IDB_SHUTDOWN            0x08098D02
528302.048 CMAC_LOG_LINK_DOWN
528308.428 CMAC_LOG_DRIVER_INIT_IDB_RESET               0x08098E5E
528308.432 CMAC_LOG_LINK_DOWN
528308.434 CMAC_LOG_LINK_UP
```

Event 2—Scan for a Downstream Channel, then Synchronize

Different geographical regions and different cable plants use different frequency bands. The Cisco uBR924 cable access router uses a built-in default frequency scanning feature to address this issue. After the Cisco uBR924 finds a successful downstream frequency channel, it saves the channel to NVRAM. The Cisco uBR924 recalls this value the next time it needs to synchronize its frequency.

The CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND field tells you what frequency the Cisco uBR924 will scan for. The CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY field tells you the frequency the Cisco uBR924 locked onto and saved to NVRAM for future recall. The CMAC_LOG_DS_64QAM_LOCK_ACQUIRED field communicates the same information. The CMAC_LOG_DS_CHANNEL_SCAN_COMPLETED field indicates that the scanning and synchronization was successful.

```
508144.348 CMAC_LOG_STATE_CHANGE                        ds_channel_scanning_state
508144.350 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       88/453000000/855000000/6000000
508144.354 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       89/93000000/105000000/6000000
508144.356 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       90/111250000/117250000/6000000
508144.360 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       91/231012500/327012500/6000000
508144.362 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       92/333015000/333015000/6000000
508144.366 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       93/339012500/399012500/6000000
508144.370 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       94/405000000/447000000/6000000
508144.372 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       95/123015000/129015000/6000000
508144.376 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       96/135012500/135012500/6000000
508144.380 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       97/141000000/171000000/6000000
508144.382 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       98/219000000/225000000/6000000
508144.386 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND       99/177000000/213000000/6000000
508144.390 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY      699000000
508145.540 CMAC_LOG_UCD_MSG_RCVD                        3
508146.120 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED              699000000
508146.122 CMAC_LOG_DS_CHANNEL_SCAN_COMPLETED
```

A frequency band is a group of adjacent channels. These bands are numbered from 88 to 99. Each band has starting and ending digital carrier frequencies and a 6 MHz step size. For example, a search of EIA channels 95-97 is specified using band 89. The starting frequency is 93 MHz, the ending frequency is 105 MHz.

The Cisco uBR924's default frequency bands correspond to the North American EIA CATV channel plan for 6 MHz channel slots between 90 MHz and 858 MHz. For example, EIA channel 95 occupies the slot 90-96 MHz. The digital carrier frequency is specified as the center frequency of 93 MHz. Channel 95 is usually specified using the analog video carrier frequency of 91.25 MHz, which lies 1.75 MHz below the center of the slot.

The search table is arranged so that the first frequencies tried are above 450 MHz. Because many CATV systems have been upgraded from 450 MHz to 750 MHz coaxial cable, digital channels have a high chance of being assigned in the new spectrum. The search table omits channels below 90 MHz and above 860 MHz since the DOCSIS specification does not mandate their coverage.

Some CATV systems use alternative frequency plans such as the IRC (Incrementally Related Carrier) plan and HRC (Harmonically Related Carrier) plan. Cisco cable access routers support both of these plans. Most of the IRC channel slots overlap the EIA plan.

Event 3—Obtain Upstream Parameters

The Cisco uBR924 waits for an upstream channel descriptor (UCD) message from the headend CMTS. The UCD provides transmission parameters for the upstream channel.

```
508146.124 CMAC_LOG_STATE_CHANGE                    wait_ucd_state
508147.554 CMAC_LOG_UCD_MSG_RCVD                    3
508147.558 CMAC_LOG_UCD_NEW_US_FREQUENCY            20000000
508147.558 CMAC_LOG_SLOT_SIZE_CHANGED               8
508147.622 CMAC_LOG_FOUND_US_CHANNEL                1
508147.624 CMAC_LOG_STATE_CHANGE                    wait_map_state
508148.058 CMAC_LOG_MAP_MSG_RCVD
508148.060 CMAC_LOG_INITIAL_RANGING_MINISLOTS       40
```

Event 4—Start Ranging for Power Adjustments

The ranging process adjusts the transmit power of the cable access router. The Cisco uBR924 performs ranging in two stages: ranging state 1 and ranging state 2.

The `CMAC_LOG_POWER_LEVEL_IS` field is the power level that the CMTS told the Cisco uBR924 to adjust to. The `CMAC_LOG_RANGING_SUCCESS` field indicates that the ranging adjustment was successful.

```
508148.062 CMAC_LOG_STATE_CHANGE                    ranging_1_state
508148.064 CMAC_LOG_RANGING_OFFSET_SET_TO           9610
508148.066 CMAC_LOG_POWER_LEVEL_IS                  28.0  dBmV (commanded)
508148.068 CMAC_LOG_STARTING_RANGING
508148.070 CMAC_LOG_RANGING_BACKOFF_SET             0
508148.072 CMAC_LOG_RNG_REQ_QUEUED                  0
508148.562 CMAC_LOG_RNG_REQ_TRANSMITTED
508148.566 CMAC_LOG_RNG_RSP_MSG_RCVD
508148.568 CMAC_LOG_RNG_RSP_SID_ASSIGNED            2
508148.570 CMAC_LOG_ADJUST_RANGING_OFFSET           2408
508148.572 CMAC_LOG_RANGING_OFFSET_SET_TO           12018
508148.574 CMAC_LOG_ADJUST_TX_POWER                 20
508148.576 CMAC_LOG_POWER_LEVEL_IS                  33.0  dBmV (commanded)
508148.578 CMAC_LOG_STATE_CHANGE                    ranging_2_state
508148.580 CMAC_LOG_RNG_REQ_QUEUED                  2
508155.820 CMAC_LOG_RNG_REQ_TRANSMITTED
508155.824 CMAC_LOG_RNG_RSP_MSG_RCVD
508155.826 CMAC_LOG_ADJUST_RANGING_OFFSET           -64
508155.826 CMAC_LOG_RANGING_OFFSET_SET_TO           11954
508155.828 CMAC_LOG_RANGING_CONTINUE
508165.892 CMAC_LOG_RNG_REQ_TRANSMITTED
508165.894 CMAC_LOG_RNG_RSP_MSG_RCVD
508165.896 CMAC_LOG_ADJUST_TX_POWER                 -9
508165.898 CMAC_LOG_POWER_LEVEL_IS                  31.0  dBmV (commanded)
508165.900 CMAC_LOG_RANGING_CONTINUE
508175.962 CMAC_LOG_RNG_REQ_TRANSMITTED
508175.964 CMAC_LOG_RNG_RSP_MSG_RCVD
508175.966 CMAC_LOG_RANGING_SUCCESS
```

Event 5—Establish IP Connectivity

After ranging is complete, the cable interface on the cable access router is UP. Now the Cisco uBR924 accesses a remote DHCP server to get an IP address. The DHCP request also includes the name of a file that contains additional configuration parameters, the TFTP server's address and the Time of Day (TOD) server's address.

The `CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS` field indicates the IP address assigned from the DHCP server to the Cisco uBR924 interface. The `CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS` field marks the TFTP server's address. The `CMAC_LOG_DHCP_TOD_SERVER_ADDRESS` field indicates the time of day server's address. The `CMAC_LOG_DHCP_CONFIG_FILE_NAME` field shows the filename containing the transmission parameters. The `CMAC_LOG_DHCP_COMPLETE` field shows that the IP connectivity was successful.

```
508175.968 CMAC_LOG_STATE_CHANGE                        dhcp_state
508176.982 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS            188.188.1.62
508176.984 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS            4.0.0.1
508176.986 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS             4.0.0.32
508176.988 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
508176.988 CMAC_LOG_DHCP_TZ_OFFSET                      360
508176.990 CMAC_LOG_DHCP_CONFIG_FILE_NAME               platinum.cm
508176.992 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
508176.996 CMAC_LOG_DHCP_COMPLETE
```

Event 6—Establish the Time of Day

The Cisco uBR924 cable access router accesses the Time of Day server for the current date and time, which is used to create time stamps for logged events. The `CMAC_LOG_TOD_COMPLETE` field indicates a successful time of day sequence.

```
508177.120 CMAC_LOG_STATE_CHANGE                        establish_tod_state
508177.126 CMAC_LOG_TOD_REQUEST_SENT
508177.154 CMAC_LOG_TOD_REPLY_RECEIVED                  3107617539
508177.158 CMAC_LOG_TOD_COMPLETE
```

Event 7—Establish Security

The Cisco uBR924 establishes a security association. The `security_association_state` is normally bypassed since "full security" as defined by DOCSIS is not supported.

Note "Full security" was a request made by MSOs for a very strong authorization and authentication check by the CMTS. This request has not been granted by cable modem manufacturers. The Cisco uBR924 supports DOCSIS baseline privacy beginning with Cisco IOS Release 12.0(5)T, which protects user's data from being "sniffed" on the cable network. For information on baseline privacy, refer to "Event 10—Comply with Baseline Privacy" on page 17.

```
508177.160 CMAC_LOG_STATE_CHANGE                        security_association_state
508177.162 CMAC_LOG_SECURITY_BYPASSED
```

Event 8—Transfer Operational Parameters

After the DHCP and security operations are successful, the Cisco uBR924 downloads operational parameters via a configuration file located on the cable company's TFTP server. The CMAC_LOG_DHCP_CONFIG_FILE_NAME field shows the filename containing the transmission parameters.

```
508177.164 CMAC_LOG_STATE_CHANGE                      configuration_file_state
508177.166 CMAC_LOG_LOADING_CONFIG_FILE               platinum.cm
508178.280 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
```

Event 9—Perform Registration

After the Cisco uBR924 is initialized, authenticated, and configured, it requests to be registered with the headend CMTS. The CMAC_LOG_COS_ASSIGNED_SID field assigns a class of service (CoS) number and a service ID (SID). Multiple CoS entries in the configuration file imply that multiple SIDs are supported by the cable access router. If several cable access routers use the same configuration file, they will have the same CoS numbers but will be assigned different SIDs.

A successful registration is indicated by the CMAC_LOG_REGISTRATION_OK field.

```
508178.300 CMAC_LOG_STATE_CHANGE                      registration_state
508178.302 CMAC_LOG_REG_REQ_MSG_QUEUED
508178.306 CMAC_LOG_REG_REQ_TRANSMITTED
508178.310 CMAC_LOG_REG_RSP_MSG_RCVD
508178.312 CMAC_LOG_COS_ASSIGNED_SID                  5/19
508178.314 CMAC_LOG_COS_ASSIGNED_SID                  6/20
508178.316 CMAC_LOG_COS_ASSIGNED_SID                  7/21
508178.318 CMAC_LOG_RNG_REQ_QUEUED                    19
508178.320 CMAC_LOG_REGISTRATION_OK
```

Event 10—Comply with Baseline Privacy

Keys for baseline privacy are exchanged between the Cisco uBR924 and the headend CMTS. During this event, a link level encryption is performed so that a user's data cannot be "sniffed" by anyone else who is on the cable network.

Following is a trace that shows baseline privacy enabled. The key management protocol is responsible for exchanging two types of keys: KEKs and TEKs. The KEK (key exchange key, also referred to as the authorization key) is used by the headend CMTS to encrypt the TEKs (traffic encryption keys) it sends to the Cisco uBR924. The TEKs are used to encrypt/decrypt the data. There is a TEK for each SID that is configured to use privacy.

```
   851.088 CMAC_LOG_STATE_CHANGE                      establish_privacy_state
   851.094 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE          machine: KEK, event/state:
EVENT_1_PROVISIONED/STATE_A_START, new state: STATE_B_AUTH_WAIT
   851.102 CMAC_LOG_BPKM_REQ_TRANSMITTED
   851.116 CMAC_LOG_BPKM_RSP_MSG_RCVD
   851.120 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE          machine: KEK, event/state:
EVENT_3_AUTH_REPLY/STATE_B_AUTH_WAIT, new state: STATE_C_AUTHORIZED
   856.208 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE          machine: TEK, event/state:
EVENT_2_AUTHORIZED/STATE_A_START, new state: STATE_B_OP_WAIT
   856.220 CMAC_LOG_BPKM_REQ_TRANSMITTED
   856.224 CMAC_LOG_BPKM_RSP_MSG_RCVD
   856.230 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE          machine: TEK, event/state:
EVENT_8_KEY_REPLY/STATE_B_OP_WAIT, new state: STATE_D_OPERATIONAL
   856.326 CMAC_LOG_PRIVACY_INSTALLED_KEY_FOR_SID     2
   856.330 CMAC_LOG_PRIVACY_ESTABLISHED
```

Note In order for baseline privacy to work, you must use a code image name on the Cisco uBR924 that contains the characters **k1**. In addition, baseline privacy must be supported on the headend CMTS, and it must be turned on in the configuration file that is downloaded to the Cisco uBR924.

Event 11—Enter the Maintenance State

As soon as the Cisco uBR924 has successfully completed the above events, it enters the operational maintenance state and is authorized to forward traffic into the cable network.

```
508178.322 CMAC_LOG_STATE_CHANGE                    maintenance_state
```

Step 5—Use Additional Troubleshooting Commands

You can use other **show controllers** and **debug cable modem** commands to troubleshoot different aspects of a Cisco uBR924 cable access router. However, the most useful command is the **show controllers cable-modem 0 mac** command.

To display additional controller information inside a Cisco uBR924, enter one or more of the following commands in privileged EXEC mode:

Command	Purpose
show controllers cable-modem	Displays high-level controller information.
show controllers cable-modem bpkm	Displays privacy state information.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	Displays information about the MAC and SID filters.
show controllers cable-modem lookup-table	Displays the Cisco uBR924's internal mini-slot lookup table.
show controllers cable-modem mac [**errors** | **hardware** | **log** | **resets** | **state**]	Displays detailed MAC-layer information.
show controllers cable-modem phy	Displays physical-layer information such as receive and transmit physical registers.
show controllers cable-modem tuner	Displays tuning information.
show interface cable-modem	Displays information about the Cisco uBR924 interface.

To debug different components of a Cisco uBR924, enter one or more of the following commands in privileged EXEC mode:

Command	Purpose
debug cable-modem bpkm {**errors** | **events** | **packets**}	Debugs baseline privacy information.
debug cable-modem bridge	Debugs the bridge filter.
debug cable-modem error	Debugs cable interface errors.
debug cable-modem interrupts	Debugs Cisco uBR924 interface interrupts.
debug cable-modem mac {**log** [*verbose*] | **messages**}	Displays and debugs the MAC-layer log entries in real time.
debug cable-modem map	Debugs map message processing information.

Command Reference

This section describes the commands used in Cisco IOS Release 12.0(5)T for troubleshooting the cable side of the Cisco uBR924 cable access router.

The commands used to troubleshoot VoIP applications are documented in the Cisco IOS Release 12.0 command references.

- **show controllers cable-modem**
- **show controllers cable-modem bpkm**
- **show controllers cable-modem des**
- **show controllers cable-modem filters**
- **show controllers cable-modem lookup-table**
- **show controllers cable-modem mac**
- **show controllers cable-modem phy**
- **show controllers cable-modem tuner**

In Cisco IOS Release 12.0(1)T or later, you can search and filter the output for **show** and **more** commands. This functionality is useful when you need to sort through large amounts of output, or if you want to exclude output that you do not need to see.

To use this functionality, enter a **show** or **more** command followed by the "pipe" character (|), one of the keywords **begin**, **include**, or **exclude**, and an expression that you want to search or filter on:

command **|** {**begin** | **include** | **exclude**} *regular-expression*

Following is an example of the **show atm vc** command in which you want the command output to begin with the first line where the expression "PeakRate" appears:

show atm vc | begin PeakRate

For more information on the search and filter functionality, refer to the Cisco IOS Release 12.0(1)T feature module titled *CLI String Search*.

show controllers cable-modem

To display high-level controller information about a Cisco uBR924 cable access router, use the **show controllers cable-modem** command in privileged EXEC mode.

show controllers cable-modem *number*

Syntax Description

number	Controller number inside the Cisco uBR924.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

The **show controllers cable-modem** display begins with information from the first few registers of the Broadcom BCM3300 chip. Next is buffer information for the receive, receive MAC message, buffer descriptor, and packet descriptor rings. Then comes MIB statistics from the BCM3300 chip, DMA base registers to indicate where the rings start, global control and status information, and finally interrupts for the interrupt code.

When using this command, be sure to check the tx_count and the tx_head and tx_tail values for the buffer descriptor (TX BD) and packet descriptor (TX PD) rings. The tx_count should be greater than 0, and the tx_head and tx_tail values should not be equal. If these values do not change for a long period of time, it indicates there are packets stuck on the ring. This condition is often caused by the headend not giving grants.

Examples

Following is sample output for the **show controllers cable-modem 0** command:

```
uBR924# show controllers cable-modem 0
BCM Cable interface 0:
BCM3300 unit 0, idb 0x200EB4, ds 0x82D4748, regaddr = 0x800000, reset_mask 0x80
station address 0010.7b43.aa01  default station address 0010.7b43.aa01
PLD VERSION: 32

MAC State is ranging_2_state, Prev States = 7
MAC mcfilter 01E02F00  data mcfilter 01000000

DS: BCM 3116 Receiver: Chip id = 2
US: BCM 3037 Transmitter: Chip id = 30B4

Tuner: status=0x00
Rx: tuner_freq 699000000, symbol_rate 5055849, local_freq 11520000
    snr_estimate 33406, ber_estimate 0, lock_threshold 26000
    QAM in lock, FEC in lock, qam_mode QAM_64
Tx: tx_freq 20000000, power_level 0x3E, symbol_rate 1280000

DHCP: TFTP server = 4.0.0.32, TOD server = 4.0.0.188
      Security server = 0.0.0.0, Timezone Offest = 0.0.4.32
      Config filename =

buffer size 1600

RX data PDU ring with 32 entries at 0x201D40
  rx_head = 0x201D78 (7), rx_p = 0x831BE04 (7)
    00 pak=0x8326318 buf=0x225626 status=0x80 pak_size=0
    01 pak=0x83241A0 buf=0x21DE5A status=0x80 pak_size=0
    02 pak=0x83239C0 buf=0x21C22A status=0x80 pak_size=0
    03 pak=0x8328C70 buf=0x22EA22 status=0x80 pak_size=0
    04 pak=0x8325F28 buf=0x22480E status=0x80 pak_size=0
    05 pak=0x8327CB0 buf=0x22B1C2 status=0x80 pak_size=0
    06 pak=0x8323BB8 buf=0x21C936 status=0x80 pak_size=0

RX MAC message ring with 8 entries at 0x201E80
  rx_head_mac = 0x201E88 (1), rx_p_mac = 0x831BE80 (1)
    00 pak=0x8326120 buf=0x224F1A status=0x80 pak_size=0
    01 pak=0x8324590 buf=0x21EC72 status=0x80 pak_size=0
    02 pak=0x8323FA8 buf=0x21D74E status=0x80 pak_size=0
    03 pak=0x8326EE8 buf=0x22806E status=0x80 pak_size=0
    04 pak=0x8328E68 buf=0x22F12E status=0x80 pak_size=0
    05 pak=0x8327AB8 buf=0x22AAB6 status=0x80 pak_size=0
    06 pak=0x8328880 buf=0x22DC0A status=0x80 pak_size=0
    07 pak=0x8326CF0 buf=0x227962 status=0xA0 pak_size=0

TX BD ring with 8 entries at 0x201FB8, tx_count = 0
  tx_head = 0x201FD8 (4), head_txp = 0x831BF20 (4)
  tx_tail = 0x201FD8 (4), tail_txp = 0x831BF20 (4)
    00 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    01 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    02 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    03 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    04 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    05 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    06 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    07 pak=0x000000 buf=0x200000 status=0x20 pak_size=0

TX PD ring with 8 entries at 0x202038, tx_count = 0
  tx_head_pd = 0x202838 (4)
  tx_tail_pd = 0x202838 (4)
    00 status=0x00 bd_index=0x0000 len=0x0000 hdr_len=0x0000
```

```
    ehdr: 01 06 02 74 34 11
    01 status=0x00 bd_index=0x0001 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11
    02 status=0x00 bd_index=0x0002 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11
    03 status=0x00 bd_index=0x0003 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11
    04 status=0x00 bd_index=0x0004 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11
    05 status=0x00 bd_index=0x0005 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11
    06 status=0x00 bd_index=0x0006 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11
    07 status=0x20 bd_index=0x0007 len=0x0000 hdr_len=0x0000
    ehdr: 01 06 02 74 34 11

MIB Statistics
  DS fifo full = 0, Rerequests = 0
  DS mac msg overruns = 0, DS data overruns = 0
  Qualified maps = 348, Qualified syncs = 73
  CRC fails = 0, HDR chk fails = 0
  Data pdus = 0, Mac msgs = 423
  Valid hdrs = 423

BCM3300 Registers:
downstream dma:
  ds_data_bd_base=0x001D40, ds_mac_bd_base=0x001E80
  ds_data_dma_ctrl=0x98, ds_mac_dma_ctrl=0xD8
  ds_dma_data_index=0x0007, ds_dma_msg_index=0x0000
upstream dma:
  us_bd_base=0x001FB8, us_pd_base=0x002038
  us_dma_ctrl=0x80, us_dma_tx_start=0x00
Global control and status:
  global_ctrl_status=0x00
interrupts:
  irq_pend=0x0008, irq_mask=0x00F7
```

Table 2 briefly describes some of the fields shown in the display. For more information, see the Broadcom documentation for the BCM3300 chip.

Table 2 Show Controllers Cable-Modem Field Descriptions

Field	Description
BCM3300 unit	The unit number of this BCM3300 chip.
idb	Interface description block number.
ds	Downstream channel.
regaddr	Indicates the start of the BCM3300 registers.
reset_mask	Indicates the bit to hit when resetting the chip.
station address	MAC address of this Cisco uBR924 cable access router interface.
default station address	Default MAC address assigned by the factory for this Cisco uBR924 cable access router.
PLD VERSION	PLD version of the BCM3300 chip.
MAC state	Current MAC state of the Cisco uBR924.
Prev States	Number of states that have previously existed since initialization.
MAC mcfilter	MAC control filter for MAC messages.

Table 2 Show Controllers Cable-Modem Field Descriptions (continued)

Field	Description
data mcfilter	MAC control filter for data.
DS	Downstream Broadcom receiver chip number and ID.
US	Upstream Broadcom transmitter chip number and ID.
Tuner: status	Current status of the tuner.
Rx: tuner_freq	Downstream frequency (in Hz) that the Cisco uBR924 searched for and found.
symbol_rate	Downstream frequency in symbols per second.
local_freq	Frequency on which the transmitter and the tuner communicate.
snr_estimate	Estimate of signal-to-noise ratio (SNR) in Db X 1000.
ber_estimate	Estimate of bit error rate (always 0).
lock_threshold	Minimum signal-to-noise ratio (SNR) that the Cisco uBR924 will accept as a valid lock.
qam_mode	The modulation scheme used in the downstream direction.
Tx: tx_freq	Upstream frequency sent to the Cisco uBR924 by the CMTS in the UCD message.
power_level	Transmit power level as set in the hardware, expressed as a hexadecimal value. The units are unique to the hardware used. Use the **show controllers cable-modem 0 mac state** command to see the power level in dBmV.
symbol_rate	Upstream frequency in symbols per second.
TFTP server	IP address of the TFTP server at the headend.
TOD server	IP address of the time-of-day server at the headend.
Security server	IP address of the security server at the headend.
Timezone Offset	Correction received from the DHCP server to synchronize the Cisco uBR924 time clock with the CMTS.
Config filename	Name of the file stored on the cable company's TFTP server that contains operational parameters for the Cisco uBR924.
buffer size	Size in bytes of the BCM3300 message buffers.
RX data PDU ring:	Indicates the memory location of the beginning of buffer information for the receive data ring.
rx_head	Indicates current head buffer descriptor.
rx_p	Indicates current head packet descriptor.
RX MAC message ring:	Indicates the memory location of the beginning of buffer information for the receive MAC message ring.
rx_head_mac	Indicates current head buffer descriptor.
rx_p_mac	Indicates current head packet descriptor.
TX BD ring:	Indicates the memory location of the beginning of buffer information for the transmit buffer descriptor ring.
tx_count tx_head	If tx_count is 0, or if tx_head and tx_tail are equal and there is no change for a period of time, it means there are packets stuck on the ring. This condition may be caused by the headend not giving grants.
head_txp	The next packet descriptor to get used, along with its index.
tx_tail tail_txp	The next packet descriptor to get sent, along with its index. When head_txp and tail_txp are the same, the transmit queue is empty.

Table 2 Show Controllers Cable-Modem Field Descriptions (continued)

Field	Description
TX PD ring:	Indicates the memory location of the beginning of buffer information for the transmit packet descriptor ring.
tx_head_pd	Indicates current head packet descriptor.
tx_tail_pd	Indicates current tail packet descriptor.
ehdr	Extended MCNS header.
MIB Statistics:	
DS fifo full	Number of times the downstream input first-in first-out (FIFO) buffer became full on the Cisco uBR924.
rerequests	Number of times a bandwidth request generated by the Cisco uBR924 was not responded to by the CMTS.
DS mac msg overruns	Number of times the Cisco uBR924's DMA controller had a downstream MAC message and there were no free MAC message buffer descriptors to accept the message.
DS data overruns	Number of times the Cisco uBR924's DMA controller had downstream data and there were no free data PDU buffer descriptors to accept the data.
Qualified maps	Number of times a MAP message passed all filtering requirements and was received by the Cisco uBR924.
Qualified syncs	Number of times a timestamp message was received by the Cisco uBR924.
CRC fails	Number of times a MAC message failed a cyclic redundancy (CRC) check.
HDR chk fails	Number of times a MAC header failed its 16-bit CRC check. The MAC header CRC is a 16-bit Header Check Sequence (HCS) field that ensures the integrity of the MAC header even in a collision environment.
Data pdus	Total number of data PDUs (protocol data units) of all types received by the Cisco uBR924.
Mac msgs	Number of MAC messages received by the Cisco uBR924.
Valid hdrs	Number of valid headers received by the Cisco uBR924, including PDU headers, MAC headers, and headers only.
Global control and status:	Used to reset the BCM3300 chip.
interrupts:	Hexadecimal values of the pending IRQ interrupt and IRQ mask.

Related Commands

Command	Description
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem bpkm

To display information about the baseline privacy key management exchange between the Cisco uBR924 cable access router and the headend CMTS, use the **show controllers cable-modem bpkm** command in privileged EXEC mode.

show controllers cable-modem *number* **bpkm**

Syntax Description

number	Controller number inside the Cisco uBR924 cable access router.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

Baseline privacy key management exchanges take place only when both the Cisco uBR924 and the CMTS are running code images that support baseline privacy, and the privacy class of service is enabled via the configuration file that is downloaded to the cable access router. Baseline privacy code images for the Cisco uBR924 contain **k1** in the code image name.

Examples

The following output is displayed when the headend CMTS does not have baseline privacy enabled:

```
uBR924# show controllers cable-modem 0 bpkm
CM Baseline Privacy Key Management
  configuration (in seconds):
      authorization wait time:    10
      reauthorization wait time:  10
      authorization grace time:   600
      operational wait time:      1
      rekey wait time:            1
      tek grace time:             600
      authorization rej wait time: 60
  kek state:    STATE_B_AUTH_WAIT
  sid 4:
      tek state: No resources assigned
```

Table 3 describes the fields shown in the display.

Table 3 Show Controllers Cable-Modem bpkm Field Descriptions

Field	Description
authorization wait time	The number of seconds the Cisco uBR924 waits for a reply after sending the Authorization Request message to the CMTS.
reauthorization wait time	The number of seconds the Cisco uBR924 waits for a reply after it has sent an Authorization Request message to the CMTS in response to a reauthorization request or an Authorization Invalid message from the CMTS.
authorization grace time	The number of seconds before the current authorization is set to expire that the grace timer begins, signaling the Cisco uBR924 to begin the reauthorization process.
operational wait time	The number of seconds the TEK state machine waits for a reply from the CMTS after sending its initial Key Request for its SID's keying material.
rekey wait time	The number of seconds the TEK state machine waits for a replacement key for this SID after the TEK grace timer has expired and the request for a replacement key has been made.
tek grace time	The number of seconds before the current TEK is set to expire that the TEK grace timer begins, signaling the TEK state machine to request a replacement key.
authorization rej wait time	Number of seconds the Cisco uBR924 waits before sending another Authorization Request message to the CMTS after it has received an Authorization Reject message.
kek state	The current state of the key encryption key that the CMTS uses to encrypt the traffic encryption keys it sends to the Cisco uBR924.
tek state	The current state of the traffic encryption key state machine for the specified SID.

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem des

To display information about the Data Encryption Standard (DES) engine registers, use the **show controllers cable-modem des** command in privileged EXEC mode.

show controllers cable-modem *number* **des**

Syntax Description

number	Controller number inside the Cisco uBR924.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Examples

DES engine registers are displayed in the following example:

```
uBR924# show controllers cable-modem 0 des
downstream des:
  ds_des_key_table:
    key 0: even 0, odd 0
    key 1: even 0, odd 0
    key 2: even 0, odd 0
    key 3: even 0, odd 0
  ds_des_cbc_iv_table:
    iv  0: even 0, odd 0
    iv  1: even 0, odd 0
    iv  2: even 0, odd 0
    iv  3: even 0, odd 0
  ds_des_sid_table:
    sid_1=0x0000, sid_2=0x0000, sid_3=0x0000, sid_4=0x0000
  ds_des_sid_enable=0x80, ds_des_ctrl=0x2E
  ds_des_sv=0x0F00
  ds_unencrypted_length=0x0C
upstream des:
  us_des_key_table:
    key 0: even 0, odd 0
    key 1: even 0, odd 0
    key 2: even 0, odd 0
    key 3: even 0, odd 0
  us_des_cbc_iv_table:
    iv  0: even 0, odd 0
    iv  1: even 0, odd 0
    iv  2: even 0, odd 0
    iv  3: even 0, odd 0
  pb_req_bytes_to_minislots=0x10
  us_des_ctrl=0x00, us_des_sid_1= 0x1234
  ds_unencrypted_length=0x0C
```

Table 4 briefly describes some of the fields shown in the display. For more information, see the Broadcom documentation for the BCM3300 chip.

Table 4 Show Controllers Cable-Modem DES Field Descriptions

Field	Description
ds_des_key_table	Table showing downstream DES keys.
ds_des_cbc_iv_table	Table of downstream DES Cipher Block Chaining mode information.
ds_des_sid_table	Table showing the SID values to be enabled for DES encryption.
ds_des_sid_enable	Controls which SID entries in the SID table are enabled for encryption. In the above example, none of the entries are enabled for encryption.
ds_des_ctrl	Control register that controls the operating mode of the downstream DES engine.
ds_des_sv	DES security version register; the range of the version field in the Baseline Privacy Interface (BPI) extended headers that will be accepted by the hardware. High byte is upper limit, low byte is lower limit. The Cisco uBR924 will accept versions 0 to 15.

Table 4 Show Controllers Cable-Modem DES Field Descriptions (continued)

Field	Description
ds_unencrypted_length	Specifies the number of bytes that will be unencrypted at the beginning of the MAC frame. 0x0C means the first 12 bytes are not encrypted, which is what the DOCSIS Baseline Privacy specification calls for.
us_des_key_table	Table showing upstream DES keys.
us_des_cbc_iv_table	Table of upstream DES Cipher Block Chaining mode information.
us_des_ctrl	Control register that controls the operating mode of the upstream DES engine. The value 0x24 means that the upstream is configured to enable decryption and to use CBC mode.

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem filters	Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem filters

To display the registers in the MAC hardware that are used for filtering received frames, use the **show controllers cable-modem filters** command in privileged EXEC mode.

show controllers cable-modem *number* **filters**

Syntax Description

number	Controller number inside the Cisco uBR924.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

Some of the filtering parameters are MAC hardware addresses, Service IDs (SIDs), and upstream channel IDs.

Examples

MAC and SID filter information is displayed in the following example:

```
uBR924# show controllers cable-modem 0 filters
downstream mac message processing:
  ds_mac_da_filters:
    filter_1=0010.7b43.aa01, filter_2=0000.0000.0000
    filter_3=0000.0000.0000, filter_4=0000.0000.0000
  ds_mac_da_filter_ctrl=0x71, ds_mac_msg_sof=0x0000
  ds_mac_da_mc=01E02F00
  map_parser_sids:
    sid_1=0x0000, sid_2=0x0000, sid_3=0x0000, sid_4=0x0000
  ds_mac_filter_ctrl=0x00, us_channel_id=0x0000
  ds_pid=0x0000, mac_msg_proto_ver=FF 00
  reg_rang_req_sid=0x0000
downstream data processing:
  ds_data_da_filter_table:
    filter_1 0010.7b43.aa01, filter_2 0000.0000.0000
    filter_3 0000.0000.0000, filter_4 0000.0000.0000
  ds_data_da_filter_ctrl=0x61, ds_pdu_sof=0xDEAD
  ds_data_da_mc=01000000
upstream processing:
  us_ctrl_status=0x04, Minislots per request=0x01
  burst_maps:
    map[0]=0 map[1]=0 map[2]=0 map[3]=0
  bytes_per_minislot_exp=0x04
  us_map_parser_minislot_adv=0x03, ticks_per_minislot=0x08, maint_xmit=0x0001
  us_sid_table:
    sid_1=0x0000, sid_2=0x0000, sid_3=0x0000, sid_4=0x0000
  max_re_req=0x0010, rang_fifo=0x00
```

Table 5 briefly describes some of the fields shown in the display. For more information, see the Broadcom documentation for the BCM3300 chip.

Table 5 Show Controllers Cable-Modem Filters Field Descriptions

Field	Description
ds_mac_da_filters	Shows the MAC address of the cable interface and the MAC address of any Ethernet MAC it is bridging.
ds_mac_da_filter_ctrl	Downstream MAC filter control for data.
ds_mac_msg_sof	Downstream MAC message start of frame.
ds_mac_da_mc	Downstream MAC control filter for data.
map_parser_sids	Service IDs used for upstream bandwidth allocation.
ds_mac_filter_ctrl	Downstream MAC filter control for MAC messages.
us_channel_id	Upstream channel ID.
ds_pid	Downstream packet ID
mac_msg_proto_ver	Version of the MAC management protocol in use.
reg_rang_req_sid	Service ID (SID) field of the ranging request message.
ds_data_da_filter_table	Downstream data processing filter table.
ds_data_da_filter_ctrl	Downstream data processing filter control.
ds_pdu_sof	Downstream PDU start of frame.
ds_data_da_mc	Downstream data processing MAC control.
us_ctrl_status	Upstream control status.

Table 5 Show Controllers Cable-Modem Filters Field Descriptions (continued)

Field	Description
Minislots per request	Length of each registration request in mini-slots.
burst_maps	Maps the burst profiles saved in the BCM3037 registers to interval usage codes (IUCs).
bytes_per_minislot_exp	Number of bytes per expansion mini-slot.
ticks_per_minislot	Number of time ticks (6.25-microsecond intervals) in each upstream mini-slot.
maint_xmit	Number of initial maintenance transmit opportunities.
us_sid_table	Upstream service ID table.
max_re_req	Maximum number of registration re-requests allowed.
rang_fifo	Number of ranging requests that can be held in the first-in-first-out (FIFO) buffer.

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem lookup-table

To display the mini-slot lookup table inside a Cisco uBR924, use the **show controllers cable-modem lookup-table** command in privileged EXEC mode.

show controllers cable-modem *number* **lookup-table**

Syntax Description

number	Controller number inside the Cisco uBR924.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

This command displays the details of the lookup table. The driver uses this table to convert the size of the packets that the Cisco uBR924 wants to transmit into a bandwidth request to the CMTS in mini-slots. The contents of this table are affected by the upstream symbol rate that is negotiated between the CMTS and the cable access router.

Use this table to look up the packet size and determine how many mini-slots will be needed.

Examples

The mini-slot lookup table is displayed in the following example:

```
uBR924# show controllers cable-modem 0 lookup-table
Max Burst Size (minislots) = 0x6
Max Burst Length (bytes) = 0x4B

PHY Overhead Lookup Table:

000:    01 06 06 06 06 06 06 06 06 06 06 06 06 06 06 06
010:    06 06 06 06 06 06 06 06 06 06 06 06 06 06 06 06
020:    06 06 06 06 06 06 06 06 06 06 06 06 06 06 06 06
030:    06 06 06 06 06 06 06 06 06 06 06 06 06 06 06 06
040:    06 06 06 06 06 06 06 06 06 06 06 06 10 10 10 10
050:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
060:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
070:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
080:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
090:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
0A0:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
0B0:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
0C0:    10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
0D0:    10 10 10 10 10 10 10 10 10 10 10 10 10 1F 1F 1F
0E0:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
0F0:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
100:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
110:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
120:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
130:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
140:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
150:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
160:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
170:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
180:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
190:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
1A0:    1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F 1F
1B0:    1F 1F 1F 1F 1F 1F 1F 1F 1F 2D 2D 2D 2D 2D 2D 2D
1C0:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
1D0:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
1E0:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
1F0:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
200:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
210:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
220:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
230:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
240:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
250:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
260:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
270:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
280:    2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D 2D
290:    2D 2D 2D 2D 2D 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
2A0:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
2B0:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
2C0:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
2D0:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
2E0:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
2F0:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
300:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
310:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
320:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
330:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
340:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
350:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
360:    3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C 3C
```

```
370:    3C 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
380:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
390:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
3A0:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
3B0:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
3C0:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
3D0:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
3E0:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
3F0:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
400:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
410:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
420:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
430:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B
440:    4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 4B 5A 5A 5A
450:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
460:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
470:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
480:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
490:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
4A0:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
4B0:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
4C0:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
4D0:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
4E0:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
4F0:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
500:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
510:    5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A
520:    5A 5A 5A 5A 5A 5A 5A 5A 68 68 68 68 68 68 68
530:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
540:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
550:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
560:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
570:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
580:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
590:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
5A0:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
5B0:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
5C0:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
5D0:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
5E0:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
5F0:    68 68 68 68 68 68 68 68 68 68 68 68 68 68 68
600:    68 68 68 68 68 77 77 77 77 77 77 77 77 77 77
610:    77 77 77 77 77 77 77 77 77 77 77 77 77 77 77
620:    77 77 77 77 77 77 77 77 77 77 77 77 77 77 77
630:    77 77 77 77 77 77 77 77 77 77 77 77 77 77 77

PHY Reverse Lookup Table:

00:    0000 0000 0000 0000 0000 0000 004B 0000
08:    0000 0000 0000 0000 0000 0000 0000 0000
10:    00DC 00DC 00DC 00DC 00DC 00DC 00DC 00DC
18:    00DC 00DC 00DC 00DC 00DC 00DC 00DC 01B8
20:    01B8 01B8 01B8 01B8 01B8 01B8 01B8 01B8
28:    01B8 01B8 01B8 01B8 01B8 0294 0294 0294
30:    0294 0294 0294 0294 0294 0294 0294 0294
38:    0294 0294 0294 0294 0370 0370 0370 0370
40:    0370 0370 0370 0370 0370 0370 0370 0370
48:    0370 0370 0370 044C 044C 044C 044C 044C
50:    044C 044C 044C 044C 044C 044C 044C 044C
58:    044C 044C 0528 0528 0528 0528 0528 0528
60:    0528 0528 0528 0528 0528 0528 0528 0528
68:    0604 0604 0604 0604 0604 0604 0604 0604
70:    0604 0604 0604 0604 0604 0604 0604 06E0
78:    06E0 06E0 06E0 06E0 06E0 06E0 06E0 06E0
80:    06E0 06E0 06E0 06E0 06E0 06E0 07BC 07BC
```

```
88:     07BC 07BC 07BC 07BC 07BC 07BC 07BC 07BC
90:     07BC 07BC 07BC 07BC 07BC 0898 0898 0898
98:     0898 0898 0898 0898 0898 0898 0898 0898
A0:     0898 0898 0898 0974 0974 0974 0974 0974
A8:     0974 0974 0974 0974 0974 0974 0974 0974
B0:     0974 0974 0A50 0A50 0A50 0A50 0A50 0A50
B8:     0A50 0A50 0A50 0A50 0A50 0A50 0A50 0A50
C0:     0A50 0B2C 0B2C 0B2C 0B2C 0B2C 0B2C 0B2C
C8:     0B2C 0B2C 0B2C 0B2C 0B2C 0B2C 0B2C 0B2C
D0:     0C08 0C08 0C08 0C08 0C08 0C08 0C08 0C08
D8:     0C08 0C08 0C08 0C08 0C08 0C08 0CE4 0CE4
E0:     0CE4 0CE4 0CE4 0CE4 0CE4 0CE4 0CE4 0CE4
E8:     0CE4 0CE4 0CE4 0CE4 0CE4 0DC0 0DC0 0DC0
F0:     0DC0 0DC0 0DC0 0DC0 0DC0 0DC0 0DC0 0DC0
F8:     0DC0 0DC0 0DC0 0DC0 0E9C 0E9C 0E9C 0E9C
```

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	.Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem mac

To display detailed MAC-layer information for a Cisco uBR924, use the **show controllers cable-modem mac** command in privileged EXEC mode.

show controllers cable-modem *number* **mac** [**errors** | **hardware** | **log** | **resets** | **state**]

Syntax Description

number	Controller number inside the Cisco uBR924.
errors	(Optional) Displays a log of the error events that are reported to SNMP. This keyword enables you to look at the error events without accessing a MIB.
hardware	(Optional) Displays all MAC hardware registers.
log	(Optional) Displays a history of MAC log messages, up to 1023 entries. This is the same output that is displayed when using the **debug cable-modem mac log** command.
resets	(Optional) Extracts all of the reset causes out of the MAC log file and summarizes them in a mini report.
state	(Optional) Displays a summary of the MAC state.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

MAC log messages are written to a circular log file even when debugging is not turned on. These messages include timestamps, events, and information pertinent to these events. Use the **show controllers cable-modem mac log** command to view MAC log messages.

If the Cisco uBR924 interface fails to come up or resets periodically, the MAC log will capture what happened. For example, if an address is not obtained from the DHCP server, an error is logged, initialization starts over, and the Cisco uBR924 scans for a downstream frequency.

The most useful keywords for troubleshooting a Cisco uBR924 are **log**, **errors**, and **resets**. See Example 1, Example 2, and Example 3.

Example 1

The following sample display shows the MAC log file for a cable-modem interface that has successfully registered with the CMTS:

```
uBR924# show controllers cable-modem 0 mac log
00:14:24:    864.124 CMAC_LOG_DRIVER_INIT_IDB_RESET             0x080B7430
00:14:24:    864.128 CMAC_LOG_LINK_DOWN
00:14:24:    864.132 CMAC_LOG_RESET_FROM_DRIVER
00:14:24:    864.134 CMAC_LOG_STATE_CHANGE                      wait_for_link_up_state
00:14:24:    864.138 CMAC_LOG_LINK_UP
00:14:24:    864.142 CMAC_LOG_STATE_CHANGE                      ds_channel_scanning_state
00:14:24:    864.270 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     81/453000000/855000000/6000000
00:14:24:    864.276 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     82/93000000/105000000/6000000
00:14:24:    864.280 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     83/111025000/117025000/6000000
00:14:24:    864.286 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     84/231012500/327012500/6000000
00:14:24:    864.290 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     85/333025000/333025000/6000000
00:14:24:    864.294 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     86/339012500/399012500/6000000
00:14:24:    864.300 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     87/405000000/447000000/6000000
00:14:24:    864.304 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     88/123012500/129012500/6000000
00:14:24:    864.310 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     89/135012500/135012500/6000000
00:14:24:    864.314 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     90/141000000/171000000/6000000
00:14:24:    864.320 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     91/219000000/225000000/6000000
00:14:24:    864.324 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     92/177000000/213000000/6000000
00:14:24:    864.330 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     93/55752700/67753300/6000300
00:14:24:    864.334 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     94/79753900/85754200/6000300
00:14:24:    864.340 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     95/175758700/211760500/6000300
00:14:24:    864.344 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     96/121756000/169758400/6000300
00:14:24:    864.348 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     97/217760800/397769800/6000300
00:14:24:    864.354 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     98/73753600/115755700/6000300
00:14:24:    864.358 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     99/403770100/997799800/6000300
00:14:24:    864.364 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY    213000000
00:14:25:    865.450 CMAC_LOG_UCD_MSG_RCVD                      1
00:14:25: %LINK-3-UPDOWN: Interface cable-modem0, changed state to up
00:14:26:    866.200 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED            213000000
00:14:26:    866.204 CMAC_LOG_DS_CHANNEL_SCAN_COMPLETED
00:14:26:    866.206 CMAC_LOG_STATE_CHANGE                      wait_ucd_state
00:14:26: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to down
00:14:27:    867.456 CMAC_LOG_UCD_MSG_RCVD                      1
00:14:29:    869.470 CMAC_LOG_UCD_MSG_RCVD                      1
00:14:29:    869.472 CMAC_LOG_ALL_UCDS_FOUND
00:14:29:    869.476 CMAC_LOG_STATE_CHANGE                      wait_map_state
00:14:29:    869.480 CMAC_LOG_UCD_NEW_US_FREQUENCY              20000000
00:14:29:    869.484 CMAC_LOG_SLOT_SIZE_CHANGED                 8
00:14:29:    869.564 CMAC_LOG_FOUND_US_CHANNEL                  1
00:14:31:    871.484 CMAC_LOG_UCD_MSG_RCVD                      1
00:14:31:    871.692 CMAC_LOG_MAP_MSG_RCVD
00:14:31:    871.694 CMAC_LOG_INITIAL_RANGING_MINISLOTS         40
00:14:31:    871.696 CMAC_LOG_STATE_CHANGE                      ranging_1_state
00:14:31:    871.700 CMAC_LOG_RANGING_OFFSET_SET_TO             9610
00:14:31:    871.704 CMAC_LOG_POWER_LEVEL_IS                    32.0  dBmV (commanded)
00:14:31:    871.708 CMAC_LOG_STARTING_RANGING
00:14:31:    871.710 CMAC_LOG_RANGING_BACKOFF_SET               0
00:14:31:    871.714 CMAC_LOG_RNG_REQ_QUEUED                    0
00:14:32:    872.208 CMAC_LOG_RNG_REQ_TRANSMITTED
00:14:32:    872.216 CMAC_LOG_RNG_RSP_MSG_RCVD
00:14:32:    872.218 CMAC_LOG_RNG_RSP_SID_ASSIGNED              16
00:14:32:    872.222 CMAC_LOG_ADJUST_RANGING_OFFSET             2853
00:14:32:    872.224 CMAC_LOG_RANGING_OFFSET_SET_TO             12463
00:14:32:    872.228 CMAC_LOG_ADJUST_TX_POWER                   8
00:14:32:    872.230 CMAC_LOG_POWER_LEVEL_IS                    34.0  dBmV (commanded)
00:14:32:    872.234 CMAC_LOG_STATE_CHANGE                      ranging_2_state
00:14:32:    872.238 CMAC_LOG_RNG_REQ_QUEUED                    16
00:14:32:    872.848 CMAC_LOG_RNG_REQ_TRANSMITTED
00:14:32:    872.852 CMAC_LOG_RNG_RSP_MSG_RCVD
```

```
00:14:32:    872.856 CMAC_LOG_RANGING_SUCCESS
00:14:32:    872.874 CMAC_LOG_STATE_CHANGE                       dhcp_state
00:14:33:    873.386 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS           188.188.1.62
00:14:33:    873.388 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS           4.0.0.32
00:14:33:    873.392 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS            4.0.0.32
00:14:33:    873.396 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
00:14:33:    873.398 CMAC_LOG_DHCP_TZ_OFFSET                     60
00:14:33:    873.402 CMAC_LOG_DHCP_CONFIG_FILE_NAME              platinum.cm
00:14:33:    873.406 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
00:14:33:    873.410 CMAC_LOG_DHCP_COMPLETE
00:14:33:    873.536 CMAC_LOG_STATE_CHANGE                       establish_tod_state
00:14:33:    873.546 CMAC_LOG_TOD_REQUEST_SENT
00:14:33:    873.572 CMAC_LOG_TOD_REPLY_RECEIVED                 3140961992
00:14:33:    873.578 CMAC_LOG_TOD_COMPLETE
00:14:33:    873.582 CMAC_LOG_STATE_CHANGE                       security_association_state
00:14:33:    873.584 CMAC_LOG_SECURITY_BYPASSED
00:14:33:    873.588 CMAC_LOG_STATE_CHANGE                       configuration_file_state
00:14:33:    873.592 CMAC_LOG_LOADING_CONFIG_FILE                platinum.cm
00:14:34: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to up
00:14:34:    874.728 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
00:14:34:    874.730 CMAC_LOG_STATE_CHANGE                       registration_state
00:14:34:    874.734 CMAC_LOG_REG_REQ_MSG_QUEUED
00:14:34:    874.744 CMAC_LOG_REG_REQ_TRANSMITTED
00:14:34:    874.754 CMAC_LOG_REG_RSP_MSG_RCVD
00:14:34:    874.756 CMAC_LOG_COS_ASSIGNED_SID                   1/16
00:14:34:    874.760 CMAC_LOG_RNG_REQ_QUEUED                     16
00:14:34:    874.768 CMAC_LOG_REGISTRATION_OK
00
:14:34:    874.770 CMAC_LOG_REG_RSP_ACK_MSG_QUEUED             0
00:14:34:    874.774 CMAC_LOG_STATE_CHANGE                       establish_privacy_state
00:14:34:    874.778 CMAC_LOG_PRIVACY_NOT_CONFIGURED
00:14:34:    874.780 CMAC_LOG_STATE_CHANGE                       maintenance_state
00:14:34:    874.784 CMAC_LOG_REG_RSP_ACK_MESSAGE_EVENT
00:14:34:    874.788 CMAC_LOG_REG_RSP_ACK_MSG_SENT
```

If the DHCP server cannot not be reached, the error will look like this in the MAC log:

```
00:14:32:    872.874 CMAC_LOG_STATE_CHANGE                       dhcp_state
00:14:33:    873.386 CMAC_LOG_RNG_REQ_TRANSMITTED
00:14:33:    873.388 CMAC_LOG_RNG_RSP_MSG_RCVD
00:14:33:    873.386 CMAC_LOG_RNG_REQ_TRANSMITTED
00:14:33:    873.392 CMAC_LOG_RNG_RSP_MSG_RCVD
00:14:33:    873.396 CMAC_LOG_WATCHDOG_TIMER
00:14:33:    873.398 CMAC_LOG_RESET_DHCP_WATCHDOG_EXPIRED
00:14:33:    873.402 CMAC_LOG_STATE_CHANGE                       reset_interface_state
00:14:33:    873.406 CMAC_LOG_DHCP_PROCESS_KILLED
```

The fields in this display are explained in the section "Step 4—Interpret the MAC Log File and Take Action" on page 13.

Example 2

MAC error log information is displayed in the following example, which is also reported via SNMP:

```
uBR924# show controllers cable-modem 0 mac errors
 74373.574 R02.0  No Ranging Response received.  T3 time-out.
 74374.660 R02.0  No Ranging Response received.  T3 time-out.
 74375.508 R02.0  No Ranging Response received.  T3 time-out.
 74375.748 R02.0  No Ranging Response received.  T3 time-out.
 74375.748 R03.0  Ranging Request Retries exhausted.
 74376.112 R02.0  No Ranging Response received.  T3 time-out.
 74376.354 R02.0  No Ranging Response received.  T3 time-out.
 74376.778 R02.0  No Ranging Response received.  T3 time-out.
 74377.442 R02.0  No Ranging Response received.  T3 time-out.
```

This output indicates that the Cisco uBR924 acquired a downstream lock, successfully read a UCD, and successfully read a MAP. However, it was unable to communicate with the CMTS after ranging through all upstream transmit power levels. The Cisco uBR924 tried to communicate with the CMTS 16 times without success, after which it reset the cable interface to try to find a better downstream frequency.

If the DHCP server could not be reached, the error would look like this in the MAC error display:

```
uBR924# show controllers cable-modem 0 mac errors
497989.804 D01.0  Discover sent no Offer received.  No available DHCP Server.
498024.046 D01.0  Discover sent no Offer received.  No available DHCP Server.
498058.284 D01.0  Discover sent no Offer received.  No available DHCP Server.
```

Example 3

The **show controllers cable-modem 0 mac resets** command shows only the entries in the MAC log that begin with the field CMAC_LOG_RESET. Collectively presenting these fields provides you with a summary of the most recent reasons why the cable interface was reset.

Reset messages and brief explanations are included in the following examples and in Table 6; however, the reset messages in Table 6 do not commonly occur.

In the following example, the configuration file downloaded from the TFTP server could not be read. The file might not exist, or the file might have incorrect permissions.

```
uBR924# show controllers cable-modem 0 mac resets
 62526.114 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 62564.368 CMAC_LOG_RESET_T4_EXPIRED
 62677.178 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 62717.462 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 62757.746 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 62796.000 CMAC_LOG_RESET_T4_EXPIRED
 62908.808 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 62949.092 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 62989.380 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 63029.662 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 63069.944 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 63110.228 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
 63148.484 CMAC_LOG_RESET_T4_EXPIRED
 63261.296 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
```

The following example shows that the DHCP server could not be reached, or that it took too long to respond.

```
uBR924# show controllers cable-modem 0 mac resets
497989.804 CMAC_LOG_RESET_DHCP_WATCHDOG_EXPIRED
498024.046 CMAC_LOG_RESET_DHCP_WATCHDOG_EXPIRED
498058.284 CMAC_LOG_RESET_DHCP_WATCHDOG_EXPIRED
```

The following example indicates that an event in the cable interface driver caused the interface to reset. This often occurs because a shut or clear command is currently being issued on the interface.

```
uBR924# show controllers cable-modem 0 mac resets
527986.444 CMAC_LOG_RESET_FROM_DRIVER
528302.042 CMAC_LOG_RESET_FROM_DRIVER
528346.600 CMAC_LOG_RESET_FROM_DRIVER
528444.494 CMAC_LOG_RESET_FROM_DRIVER
```

Table 6 Possible but Uncommon Cable Interface Reset Causes

Message	Description
CMAC_LOG_RESET_CONFIG_FILE_PARSE_FAILED	The format of the DOCSIS configuration file acquired from the TFTP server is not acceptable.
CMAC_LOG_RESET_LOSS_OF_SYNC	Synchronization with the CMTS has been lost (SYNC messages are not being received).
CMAC_LOG_RESET_T4_EXPIRED	Maintenance ranging opportunities for this Cisco uBR924 are not being received from the CMTS.
CMAC_LOG_RESET_DHCP_WATCHDOG_EXPIRED	The DHCP server took too long to respond.
CMAC_LOG_RESET_TOD_WATCHDOG_EXPIRED	The Time Of Day server took too long to respond.
CMAC_LOG_RESET_PRIVACY_WATCHDOG_EXPIRED	The baseline privacy exchange with the CMTS took too long.
CMAC_LOG_RESET_CHANGE_US_WATCHDOG_EXPIRED	The Cisco uBR924 was unable to transmit a response to a UCC-REQ message.
CMAC_LOG_RESET_SECURITY_WATCHDOG_EXPIRED	The “full security” exchange with the CMTS took too long.
CMAC_LOG_RESET_CONFIG_FILE_WATCHDOG_EXPIRED	The TFTP server took too long to respond.
CMAC_LOG_RESET_ALL_FREQUENCIES_SEARCHED	All downstream frequencies to be searched have been searched. **Note** This message indicates that downstream frequencies were found, but the Cisco uBR924 failed to acquire a downstream lock.
CMAC_LOG_RESET_T2_EXPIRED	Initial ranging opportunities are not being received.
CMAC_LOG_RESET_T3_RETRIES_EXHAUSTED	The CMTS failed too many times to respond to a RNG-REQ message. **Note** After 16 T3 timeouts, the Cisco uBR924 will reset the cable interface.
CMAC_LOG_RESET_RANGING_ABORTED	The CMTS commanded the Cisco uBR924 to abort the ranging process.
CMAC_LOG_RESET_NO_MEMORY	The Cisco uBR924 has run out of memory.
CMAC_LOG_RESET_CANT_START_PROCESS	The Cisco uBR924 was unable to start an internal process necessary to complete ranging and registration.
CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED	The reading of the configuration file from the TFTP server failed. **Note** The file might not exist, or it might have incorrect permissions.
CMAC_LOG_RESET_AUTHENTICATION_FAILURE	The Cisco uBR924 failed authentication as indicated in a REG-RSP message from the CMTS.

Table 6 Possible but Uncommon Cable Interface Reset Causes (continued)

Message	Description
CMAC_LOG_RESET_SERVICE_NOT_AVAILABLE	The CMTS has failed the Cisco uBR924's registration because a required or requested class of service is not available.
CMAC_LOG_RESET_T6_RETRIES_EXHAUSTED	The CMTS failed too many times to respond to a REG-REQ message.
CMAC_LOG_RESET_MAINTENANCE_WATCHDOG_DRIVER	The Cisco uBR924 MAC layer failed to detect a change in the interface driver.
CMAC_LOG_RESET_NET_ACCESS_MISSING	The Network Access parameter is missing from the DOCSIS configuration file.
CMAC_LOG_RESET_FAILED_WRITE_ACCESS_CONTROL	The Cisco uBR924 was unable to set the Write Access Control for an SNMP parameter as specified by the DOCSIS configuration file.
CMAC_LOG_RESET_DHCP_FAILED	The DHCP server did not respond with all the required values. The required values are: IP address, network mask, TFTP server IP address, TOD server IP address, DOCSIS configuration file name, and time zone offset.
CMAC_LOG_RESET_CANT_START_DS_TUNER_PRCESS	The Cisco uBR924 was unable to start the internal process used to manage the downstream tuner.
CMAC_LOG_RESET_TOO_MANY_DS_LOCKS_LOST	Downstream QAM/FEC lock has been lost too many times.
CMAC_LOG_RESET_NO_SEND_TO_DS_TUNER_PROCESS	The Cisco uBR924 MAC-layer process was unable to communicate with the downstream tuner management process.
CMAC_LOG_RESET_DS_TUNER_WATCHDOG	The downstream tuner process failed to report its continuing operation for a long period of time.
CMAC_LOG_RESET_UNABLE_TO_SET_MIB_OBJECT	The Cisco uBR924 was unable to set an SNMP parameter as specified by the DOCSIS configuration file.
CMAC_LOG_RESET_MIB_OBJECT_PROCESS_WATCHDOG	The internal MIB object took too long to process the entries in the DOCSIS configuration file.

Example 4

The following example display for the **show controllers cable-modem 0 mac hardware** command shows the detailed configuration of the interface driver and the MAC-layer hardware. The most interesting bit is the station address (hardware address). The MIB statistics reflect the MAC hardware counters for various events, but these counters are typically reset every few seconds, so their contents are not accurate in this display.

```
uBR924# show controllers cable-modem 0 mac hardware
PLD VERSION: 32

BCM3300 unit 0, idb 0x200EB4, ds 0x82D4748, regaddr = 0x800000, reset_mask
0x80
station address 0010.7b43.aa01  default station address 0010.7b43.aa01
MAC mcfilter 01E02F00  data mcfilter 01000000

buffer size 1600
RX data PDU ring with 32 entries at 0x201D40
  rx_head = 0x201D40 (0), rx_p = 0x82D4760 (0)
    00 pak=0x82DF844 buf=0x227F1A status=0x80 pak_size=0
    01 pak=0x82E0BF4 buf=0x22C56A status=0x80 pak_size=0
    02 pak=0x82DF454 buf=0x22710A status=0x80 pak_size=0
    03 pak=0x82DF64C buf=0x227812 status=0x80 pak_size=0
    04 pak=0x82E0024 buf=0x229B3A status=0x80 pak_size=0
    05 pak=0x82DBF2C buf=0x21B332 status=0x80 pak_size=0
    06 pak=0x82DFE2C buf=0x229432 status=0x80 pak_size=0
    07 pak=0x82E0FE4 buf=0x22D37A status=0x80 pak_size=0
    08 pak=0x82DF064 buf=0x2262FA status=0x80 pak_size=0
    09 pak=0x82DEC74 buf=0x2254EA status=0x80 pak_size=0
    10 pak=0x82DEA7C buf=0x224DE2 status=0x80 pak_size=0
    11 pak=0x82DE884 buf=0x2246DA status=0x80 pak_size=0
    12 pak=0x82DE68C buf=0x223FD2 status=0x80 pak_size=0
    13 pak=0x82DE494 buf=0x2238CA status=0x80 pak_size=0
    14 pak=0x82DE29C buf=0x2231C2 status=0x80 pak_size=0
    15 pak=0x82DE0A4 buf=0x222ABA status=0x80 pak_size=0
    16 pak=0x82DDEAC buf=0x2223B2 status=0x80 pak_size=0
    17 pak=0x82DDCB4 buf=0x221CAA status=0x80 pak_size=0
    18 pak=0x82DDABC buf=0x2215A2 status=0x80 pak_size=0
    19 pak=0x82DD8C4 buf=0x220E9A status=0x80 pak_size=0
    20 pak=0x82DD6CC buf=0x220792 status=0x80 pak_size=0
    21 pak=0x82DD4D4 buf=0x22008A status=0x80 pak_size=0
    22 pak=0x82DD2DC buf=0x21F982 status=0x80 pak_size=0
    23 pak=0x82DD0E4 buf=0x21F27A status=0x80 pak_size=0
    24 pak=0x82DCEEC buf=0x21EB72 status=0x80 pak_size=0
    25 pak=0x82DCCF4 buf=0x21E46A status=0x80 pak_size=0
    26 pak=0x82DCAFC buf=0x21DD62 status=0x80 pak_size=0
    27 pak=0x82DC904 buf=0x21D65A status=0x80 pak_size=0
    28 pak=0x82DC70C buf=0x21CF52 status=0x80 pak_size=0
    29 pak=0x82DC514 buf=0x21C84A status=0x80 pak_size=0
    30 pak=0x82DC31C buf=0x21C142 status=0x80 pak_size=0
    31 pak=0x82DC124 buf=0x21BA3A status=0xA0 pak_size=0
RX MAC message ring with 8 entries at 0x201E80
  rx_head_mac = 0x201EB0 (6), rx_p_mac = 0x82D480C (6)
    00 pak=0x82E0DEC buf=0x22CC72 status=0x80 pak_size=0
    01 pak=0x82E021C buf=0x22A242 status=0x80 pak_size=0
    02 pak=0x82E060C buf=0x22B052 status=0x80 pak_size=0
    03 pak=0x82E11DC buf=0x22DA82 status=0x80 pak_size=0
    04 pak=0x82DFC34 buf=0x228D2A status=0x80 pak_size=0
    05 pak=0x82E09FC buf=0x22BE62 status=0x80 pak_size=0
    06 pak=0x82DEE6C buf=0x225BF2 status=0x80 pak_size=0
    07 pak=0x82DFA3C buf=0x228622 status=0xA0 pak_size=0
```

```
TX BD ring with 8 entries at 0x201FB8, tx_count = 0
  tx_head = 0x201FB8 (0), head_txp = 0x82D4888 (0)
  tx_tail = 0x201FB8 (0), tail_txp = 0x82D4888 (0)
    00 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    01 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    02 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    03 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    04 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    05 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    06 pak=0x000000 buf=0x200000 status=0x00 pak_size=0
    07 pak=0x000000 buf=0x200000 status=0x20 pak_size=0
TX PD ring with 8 entries at 0x202038, tx_count = 0
  tx_head_pd = 0x202038 (0)
  tx_tail_pd = 0x202038 (0)
    00 status=0x00 bd_index=0x0000 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 2E FF FF
    01 status=0x00 bd_index=0x0001 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 2E FF FF
    02 status=0x00 bd_index=0x0002 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 2E FF FF
    03 status=0x00 bd_index=0x0003 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 2E FF FF
    04 status=0x00 bd_index=0x0004 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 2E 00 00
    05 status=0x00 bd_index=0x0005 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 2E 00 00
    06 status=0x00 bd_index=0x0006 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 00 00 00
    07 status=0x20 bd_index=0x0007 len=0x0000 hdr_len=0x0000
    ehdr:  00 00 00 00 00 00

MIB Statistics
  DS fifo full = 0, Rerequests = 0
  DS mac msg overruns = 0, DS data overruns = 0
  Qualified maps = 0, Qualified syncs = 0
  CRC fails = 0, HDR chk fails = 0
  Data pdus = 0, Mac msgs = 0
  Valid hdrs = 0
BCM3300 Registers:
downstream dma:
  ds_data_bd_base=0x001D40, ds_mac_bd_base=0x001E80
  ds_data_dma_ctrl=0x98, ds_mac_dma_ctrl=0x98
  ds_dma_data_index=0x0000, ds_dma_msg_index=0x0000
upstream dma:
  us_bd_base=0x001FB8, us_pd_base=0x002038
  us_dma_ctrl=0x00, us_dma_tx_start=0x00
global control and status:
  global_ctrl_status=0x00
interrupts:
  irq_pend=0x0018, irq_mask=0x00E7
timing recovery circuit:
  loop_enable=0x00, minislot_divisor=0x00
  K0_ctrl=0x06, K1_ctrl=0x07, acq_threshhold=0x01
  err_threshhold=0x04, timeout_threshold=0xFF
  nco_bias=0x4F7004F7, ranging_offset=0x00000000
  ts_err=0x00, sync_valid=0x00, delta_F=0x00
  timeout_err=0x00
spi:
  dynamic_ctrl=0x09, static_ctr=0x9F, autonomous=0x01
  irq_ack=0x00, spi_cmd=0x51, spi_addr=0x11
  spi_data= FF/00/00/00/00/00/00
```

```
burst profiles:
  profile 0:
             01 19 1D 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  profile 1:
             01 19 1D 03 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  profile 2:
             01 19 1D 04 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  profile 3:
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
             00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Most of the fields in this display are described in Table 2, Show Controllers Cable-Modem Field Descriptions. Table 7 describes the MIB statistics shown in the display.

Table 7 Show Controllers Cable-Modem MIB Statistics Field Descriptions

Field	Description
DS fifo full	Number of times the downstream receive buffer on the Cisco uBR924 has become full.
Rerequests	Number of registration requests sent by the Cisco uBR924 to the CMTS.
DS mac msg overruns	Number of times the DMA controller has had a downstream MAC message and there were no free MAC message buffer descriptors to accept the message.
DS data overruns	Number of times the DMA controller has had downstream data and there were no free data PDU buffer descriptors to accept the data.
Qualified maps	Number of valid MAP messages received by the Cisco uBR924.
Qualified syncs	Number of times the Cisco uBR924 has received synchronization with the downstream channel.
CRC fails	Number of cyclic redundancy checksums generated by the far-end device that did not match the checksums calculated from the message portions of the packets received.
HDR check fails	Number of cyclic redundancy checksums generated by the far-end device that did not match the checksums calculated from the MAC headers of the packets received. The MAC header CRC is a 16-bit Header Check Sequence (HCS) field that ensures the integrity of the MAC header even in a collision environment.
Data pdus	Total number of data PDUs (protocol data units) of all types received by the cable interface.
Mac msgs	Number of MAC messages received by the cable interface.
Valid hdrs	Number of valid MAC headers received by the cable interface.

Below the MIB statistics in the **show controllers cable-modem 0 mac hardware** display, the BCM3300 registers section shows the DMA locations of the indicated processing routines of the Broadcom 3220 MAC chip within the Cisco uBR924.

Example 5

The **show controllers cable-modem mac state** command summarizes the state of the cable MAC layer and provides a list of downstream search frequency bands and the order in which they are searched. If the cable MAC layer is in the `wait_for_link_up_state`, the information shown in the display corresponds to the last time the interface was up. This allows useful information to be acquired from this display even though the modem has not been able to range and register. The normal operational state of the interface is the `maintenance_state`.

```
uBR924# show controller cable-modem 0 mac state
MAC State:                  maintenance_state
Ranging SID:                5
Registered:                 TRUE
Privacy Established:        TRUE

MIB Values:
  Mac Resets:       0
  Sync lost:        0
  Invalid Maps:     0
  Invalid UCDs:     0
  Invalid Rng Rsp:  0
  Invalid Reg Rsp:  0
  T1 Timeouts:      0
  T2 Timeouts:      0
  T3 Timeouts:      4
  T4 Timeouts:      0
  Range Aborts:     0

DS ID:                      1
DS Frequency:               663000000
DS Symbol Rate:             5056941
DS QAM Mode                 64QAM
DS Search:
  88 453000000 855000000 6000000
  89  93000000 105000000 6000000
  90 111250000 117250000 6000000
  91 231012500 327012500 6000000
  92 333015000 333015000 6000000
  93 339012500 399012500 6000000
  94 405000000 447000000 6000000
  95 123015000 129015000 6000000
  96 135012500 135012500 6000000
  97 141000000 171000000 6000000
  98 219000000 225000000 6000000
  99 177000000 213000000 6000000
US ID:                      1
US Frequency:               20000000
US Power Level:             34.0 (dBmV)
US Symbol Rate:             1280000
Ranging Offset:             12460
Mini-Slot Size:             8
Change Count:               4
Preamble Pattern:           CC CC CC CC CC CC CC CC  CC CC CC CC CC CC 0D 0D
                               A9 17 D9 C3 52 2F B3 86  A4 5F 67 0D 48 BE CE 1A
                               91 7D 9C 35 22 FB 38 6A  45 F6 70 D4 8B EC E1 A9
                               17 D9 C3 52 2F B3 86 A4  5F 67 0D 48 BE CE 1A 91
                               F3 F3 F3 F3 F3 F3 F3 F3  F3 F3 F3 F3 F3 F3 F3 F3
                               F3 F3 F3 F3 F3 F3 F3 F3  F3 F3 F3 F3 33 F7 33 F7
                               88 84 04 4C C4 84 C0 0C  44 08 08 CC 8C 0C 80 48
                               88 40 44 CC 48 4C 00 C4  40 80 8C C8 C0 C8 04 88
```

```
Burst Descriptor  0:
  Interval Usage Code:      1
  Modulation Type:          1
  Differential Encoding:    2
  Preamble Length:          64
  Preamble Value Offset:    56
  FEC Error Correction:     0
  FEC Codeword Info Bytes:  16
  Scrambler Seed:           338
  Maximum Burst Size:       1
  Guard Time Size:          8
  Last Codeword Length:     1
  Scrambler on/off:         1
Burst Descriptor  1:
  Interval Usage Code:      3
  Modulation Type:          1
  Differential Encoding:    2
  Preamble Length:          128
  Preamble Value Offset:    0
  FEC Error Correction:     5
  FEC Codeword Info Bytes:  34
  Scrambler Seed:           338
  Maximum Burst Size:       0
  Guard Time Size:          48
  Last Codeword Length:     1
  Scrambler on/off:         1
Burst Descriptor  2:
  Interval Usage Code:      4
  Modulation Type:          1
  Differential Encoding:    2
  Preamble Length:          128
  Preamble Value Offset:    0
  FEC Error Correction:     5
  FEC Codeword Info Bytes:  34
  Scrambler Seed:           338
  Maximum Burst Size:       0
  Guard Time Size:          48
  Last Codeword Length:     1
  Scrambler on/off:         1
Burst Descriptor  3:
  Interval Usage Code:      5
  Modulation Type:          1
  Differential Encoding:    2
  Preamble Length:          72
  Preamble Value Offset:    48
  FEC Error Correction:     5
  FEC Codeword Info Bytes:  75
  Scrambler Seed:           338
  Maximum Burst Size:       0
  Guard Time Size:          8
  Last Codeword Length:     1
  Scrambler on/off:         1
Config File:
Network Access:             TRUE
  Vendor ID:                0.240.30
    Baseline Privacy:
    Auth. Wait Timeout:     10
    Reauth. Wait Timeout:   10
    Auth. Grace Time:       600
    Op. Wait Timeout:       1
    Retry Wait Timeout:     1
    TEK Grace Time:         600
    Auth. Reject Wait Time: 60
```

```
  COS  1:
    Assigned SID:           5
    Max Downstream Rate:    4000000
    Max Upstream Rate:      2000000
    Upstream Priority:      7
    Min Upstream Rate:      100000
    Max Upstream Burst:     12
    Privacy Enable:         TRUE
Ranging Backoff Start:      0 (at initial ranging)
Ranging Backoff End:        4 (at initial ranging)
Data Backoff Start:         0 (at initial ranging)
Data Backoff End:           4 (at initial ranging)
IP Address:                 0.0.0.0
Net Mask:                   0.0.0.0

TFTP Server IP Address:     223.255.254.254
Time Server IP Address:     188.188.1.5
Config File Name:           muck/ebuell/tftp/cm_conf
Time Zone Offset:           -28800
```

Table 8 describes the fields shown in the display.

Table 8 Show Controllers Cable-Modem MAC State Field Descriptions

Field	Description
MAC State	Current operational state of the MAC layer of the Cisco uBR924.
Ranging SID	Service ID used for ranging requests.
Registered	Indicates whether or not the Cisco uBR924 is currently registered with the CMTS.
Privacy Established	Indicates whether or not keys for baseline privacy have been exchanged between the Cisco uBR924 and the CMTS, establishing privacy.
Mac Resets	Number of times the Cisco uBR924 reset or initialized this interface.
Sync lost	Number of times the Cisco uBR924 lost synchronization with the downstream channel.
Invalid Maps	Number of times the Cisco uBR924 received invalid MAP messages.
Invalid UCDs	Number of times the Cisco uBR924 received invalid UCD messages.
Invalid Rng Rsp	Number of times the Cisco uBR924 received invalid ranging response messages.
Invalid Reg Rsp	Number of times the Cisco uBR924 received invalid registration response messages.
T1 Timeouts	Number of timeouts caused by the Cisco uBR924 not receiving a valid upstream channel descriptor (UCD) from the CMTS within the specified time.
T2 Timeouts	Number of timeouts caused by the Cisco uBR924 not receiving a maintenance broadcast for ranging opportunities from the CMTS within a specified time.
T3 Timeouts	Number of timeouts caused by the Cisco uBR924 not receiving a response within a specified time from the CMTS to a RNG-REQ message during initial maintenance.
T4 Timeouts	Number of timeouts caused by the Cisco uBR924 not receiving a response within a specified time from the CMTS to a periodic maintenance request.
Range Aborts	Number of times the ranging process was aborted by the CMTS.
DS ID	Identifier of the downstream channel on which this MAC management message has been transmitted. This identifier is arbitrarily chosen by the CMTS and is only unique within the MAC-sublayer domain.
DS Frequency	Downstream frequency acquired by the Cisco uBR924 during its last initialization sequence.

Table 8 Show Controllers Cable-Modem MAC State Field Descriptions (continued)

Field	Description
DS Symbol Rate	Downstream frequency in symbols per second.
DS QAM Mode	Downstream modulation scheme being used by the Cisco uBR924.
DS Search	Frequency bands scanned by the Cisco uBR924 when searching for a downstream channel. The Cisco uBR924's default frequency bands correspond to the North American EIA CATV channel plan for 6 MHz channel slots between 90 MHz and 858 MHz.
US ID	Identifier of the upstream channel to which this MAC management message refers. This identifier is arbitrarily chosen by the CMTS and is only unique within the MAC-sublayer domain.
US Frequency	Transmission frequency used by the Cisco uBR924 in the upstream direction.
US Power Level	Transmit power level of the Cisco uBR924 in the upstream direction.
US Symbol Rate	Upstream frequency in symbols per second.
Ranging Offset	Delay correction (in increments of 6.25 µs/64) applied by the Cisco uBR924 to the CMTS upstream frame time derived at the Cisco uBR924. Used to synchronize the upstream transmissions in the time division multiple access (TDMA) scheme, this value is roughly equal to the round-trip delay of the Cisco uBR924 from the CMTS.
Mini-Slot Size	Size T of the mini-slot for this upstream channel in units of the timebase tick of 6.25 µs. Allowable values are 2, 4, 8, 16, 32, 64, or 128.
Change Count	Incremented by 1 by the CMTS whenever any of the values of this channel descriptor change. If the value of this count in a sebsequent upstream channel descriptor (UCD) remains the same, the Cisco uBR924 can quickly decide that the remaining fields have not changed, and may be able to disregard the remainder of the message.
Preamble Pattern	Byte pattern used for the preamble.
Burst Descriptor:	A compound type/length/value (TLV) encoding that defines, for each type of upstream usage interval, the physical-layer characteristics that are to be used during that interval. Each burst descriptor is given an identifying number.
Interval Usage Code	Each upstream transmit burst belongs to a class which is given a number called the IUC (interval usage code). Bandwidth MAP messages are used by IUC codes to allocate upstream time slots. The following types are currently defined: 1. Request: bandwidth request slot 2. Request/Data: bandwidth request or data slot 3. Initial Maintenance: initial link registration contention slot 4. Station Maintenance: link keep-alive slot 5. Short Data Grant: short data burst slot 6. Long Data Grant: long data burst slot
Modulation Type	Upstream modulation format. (1 = QPSK; 2 = 16QAM)
Differential Encoding	Indicates whether or not differential encoding is used. (1 = yes; 2 = no)
Preamble Length	Length of the preamble in bits. This value must be an integral number of symbols—a multiple of 2 for QPSK; a multiple of 4 for 16QAM.
FEC Error Correction	Length of the forward error correction in bytes. The range is 0-10 bytes; a value of 0 implies no forward error correction.
FEC Codeword Info Bytes	Number of information bytes in the FEC codeword.
Scrambler Seed	15-bit seed value loaded at the beginning of each burst after the register has been cleared. Not used if scrambler is off.

Table 8 Show Controllers Cable-Modem MAC State Field Descriptions (continued)

Field	Description
Maximum Burst Size	Maximum number of mini-slots that can be transmitted during this burst type. When the interval type is Short Data Grant, this value must be greater than 0. If this value is 0, the burst size is limited elsewhere.
Guard Time Size	Amount of time in symbols between the center of the last symbol of a burst and the center of the first symbol of the preamble of an immediately following burst in an upstream transmission from the Cisco uBR924 to the CMTS.
Last Codeword Length	Indicates whether or not the length of the last codeword is fixed or shortened. (1 = fixed; 2 = shortened)
Scrambler on/off	Indicates whether or not a scrambler is enabled in the upstream modulator. (1 = on; 2 = off)
Network Access	Indicates whether or not the Cisco uBR924 has access to the HFC network.
Vendor ID	Unique identifier specifying the cable modem manufacturer.
Auth. Wait Timeout	Number of seconds the Cisco uBR924 waits for a reply after sending the Authorization Request message to the CMTS.
Reauth. Wait Timeout	Number of seconds the Cisco uBR924 waits for a reply after it has sent an Authorization Request message to the CMTS in response to a reauthorization request or an Authorization Invalid message from the CMTS.
Auth. Grace Time	Number of seconds before the current authorization is set to expire that the grace timer begins, signaling the Cisco uBR924 to begin the reauthorization process.
Op. Wait Timeout	Number of seconds the TEK state machine waits for a reply from the CMTS after sending its initial Key Request for its SID's keying material.
Retry Wait Timeout	Number of seconds the TEK state machine waits for a replacement key for this SID after the TEK grace timer has expired and the request for a replacement key has been made.
TEK Grace Time	Number of seconds before the current TEK is set to expire that the TEK grace timer begins, signaling the TEK state machine to request a replacement key.
Auth. Reject Wait Time	Number of seconds the Cisco uBR924 waits before sending another Authorization Request message to the CMTS after it has received an Authorization Reject message.
Assigned SID	Service ID assigned by the CMTS for the corresponding service class.
Max Downstream Rate	Maximum downstream rate in bits per second that the CMTS is permitted to forward to CPE unicast MAC addresses learned or configured as mapping to this Cisco uBR924. (This does not include MAC packets addressed to broadcast or multicast MAC addresses.)
Max Upstream Rate	Maximum upstream rate in bits per second that the Cisco uBR924 is permitted to forward to the RF network. This includes packet PDU data packets addressed to broadcast or multicast addresses.
Upstream Priority	Relative priority assigned to this service class for data transmission in the upstream channel. Higher numbers indicate higher priority.
Min Upstream Rate	Date rate in bits per second that will be guaranteed to this service class on the upstream channel.
Max Upstream Burst	Maximum transmit burst in bytes allowed for this service class on the upstream channel.
Privacy Enable	Indicates whether or not Baseline Privacy is enabled for this service class.
Ranging Backoff Start	Initial back-off window for initial ranging contention, expressed as a power of 2. Valid values are from 0 to 15.

Table 8 Show Controllers Cable-Modem MAC State Field Descriptions (continued)

Field	Description
Ranging Backoff End	Final back-off window for initial ranging contention, expressed as a power of 2. Valid values are from 0 to 15.
Data Backoff Start	Initial back-off window for contention data and requests, expressed as a power of 2. Valid values are from 0 to 15.
Data Backoff End	Final back-off window for contention data and requests, expressed as a power of 2. Valid values are from 0 to 15.
IP Address	IP address of the cable interface.
Net Mask	Subnet mask of the cable interface.
TFTP Server IP Address	IP address of the CMTS TFTP server.
Time Server IP Address	IP address of the CMTS Time of Day (TOD) server.
Config File Name	Name of the configuration file that is downloaded from the TFTP server to provide the Cisco uBR924 with operational parameters.
Time Zone Offset	Correction received from the DHCP server to synchronize the Cisco uBR924 time clock with the CMTS.

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	.Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem phy

To display the contents of the registers used in the downstream physical hardware of the Cisco uBR924 cable access router, use the **show controllers cable-modem phy** command in privileged EXEC mode.

show controllers cable-modem phy {**receive** | **transmit**}

Syntax Description

receive	Displays all receiver registers in the downstream physical hardware.
transmit	Displays all transmitter registers in the upstream physical hardware.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

To understand the output from this command, consult the Broadcom specifications for the BCM3116 and BCM3037 chips.

Examples

Physical receive registers are displayed in the following example:

```
uBR924# show controllers cable-modem 0 phy receive
BCM3116 Receiver Registers: Chip ID = C2C1

  rstctl=    frzctl=20  qamctl=1B  lmsctl=0B  tpctl=00  fmtctl=24
  ffectl=3F  irqsts=09  irqmask=00 stoscm=9E  rstctr=00  frzctl2=46
  dvctl=30   idepth=55  eqlctl=00  tstctl=02  berctl=00  clkset=00
  tunset=00  tunctl=03

FFC coefficient registers:
  F0=0067FFBC  F1=FF880080  F2=00C1FEFB  F3=FF75019D
  F4=00C5FD89  F5=FF6D0485  F6=FC95F690  F7=2D280000

DFE coefficient registers:
  D00=0636031E  D01=FBDD0314  D02=0077FD39  D03=001B00C6
  D04=0024FF74  D05=0015007E  D06=000CFFC4  D07=FFC0004B
  D08=0044FFF6  D09=FFE00019  D10=00190005  D11=FFD3FFAD
  D12=FFD3FFE0  D13=001A000A  D14=FFF3FFED  D15=0008FFFD
  D16=FFFC0024  D17=0023FFDF  D18=0029FFFF  D19=000D001E
  D20=00020017  D21=00250001  D22=0007FFF4  D23=FFF60014
```

```
ldsft=B0EE      ldsnre=0098AF  ldif=0D004E   ldbbi=00000000
ldbbq=00000000  ldali=032E00   ldaii=E62AF2  ldbrfo=705A05
ldbri=F9CDC200  lddrfo=007E7D  lddri=007EF0

FEC correctable error count:   0
FEC uncorrectable error count: 0
Bit Error Rate Count: 0
```

Physical transmit registers are displayed in the following example:

```
uBR924# show controllers cable-modem 0 phy transmit
BCM3037 Transmitter Registers:
part_id     = 3037       rev_id      = 01
test_mode   = 00         test_input  = 00
test_misc   = 2009       rst         = 00
power       = 0000       power_2     = 00
port        = 6F         pll         = F7
map         = 66         mod         = 28
tx_oen_bdly = 14         tx_oen_edly = C8
prbs_cfg    = 00C000     baud        = 1A36E3
burst       = 0000       if_freq     = 200000
dac         = 37         tx_config   = 00

burst config 0 : prbs_init    = FFFFFF   rs      = 343E
                 fec          = 00       qam     = 01
                 pream_len    = 0018     offset  = 0000
burst config 1 : prbs_init    = FFFFFE   rs      = 033B
                 fec          = 1C       qam     = 65
                 pream_len    = 0000     offset  = 0000
burst config 2 : prbs_init    = FFFFFE   rs      = 033B
                 fec          = 1D       qam     = 65
                 pream_len    = 0000     offset  = 0000
burst config 3 : prbs_init    = FFFFFE   rs      = 033B
                 fec          = 1E       qam     = 65
burst config 4 : prbs_init    = FFFFFE   rs      = 033B
                 fec          = 1F       qam     = 65
                 pream_len    = 0000     offset  = 0000
burst config 5 : prbs_init    = FFFFFE   rs      = 033B
                 fec          = 0F       qam     = 66
                 pream_len    = 0000     offset  = 0000
Eq Coeff:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Preamble values:
CC CC CC CC CC 0D 0D CC CC CC CC CC CC CC CC 0D
04 25 01 01 01 01 02 01 02 03 02 00 40 04 02 00
40 05 01 00 06 01 10 07 02 01 52 08 01 01 09 01
08 0A 01 01 0B 01 02 04 25 03 01 01 01 02 01 02
03 02 00 50 04 02 00 30 05 01 00 06 01 22 07 02
01 52 08 01 00 09 01 30 0A 01 01 0B 01 02 04 25
04 01 01 01 02 01 02 03 02 00 40 04 02 00 40 05
01 00 06 01 22 07 02 01 52 08 01 00 09 01 30 0A
```

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	.Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem tuner	Displays the settings for the upstream and downstream tuners used by a Cisco uBR924.

show controllers cable-modem tuner

To display the settings for the upstream and downstream tuners used by a Cisco uBR924 cable access router, use the **show controllers cable-modem tuner** command in privileged EXEC mode.

show controllers cable-modem tuner

Syntax Description

There are no key words or arguments for this command.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Examples

Typical Cisco uBR924 tuner settings are displayed in the following example. See Table 9 for output field possibilities and descriptions.

```
uBR924# show controllers cable-modem 0 tuner
Tuner: status=0x00
Rx: tuner_freq 507000000, symbol_rate 5360736, local_freq 11520000
    snr_estimate 17488, ber_estimate 0, lock_threshold 26000
    QAM not in lock, FEC not in lock, qam_mode QAM_64
Tx: tx_freq 20000000, power_level 0x3E, symbol_rate 1280000
```

Table 9 Show Controllers Cable-Modem Tuner Field Descriptions

Field	Description
tuner_freq	Indicates the current downstream frequency.
symbol_rate	Indicates the downstream symbol rate in symbols per second.
local_freq	Frequency on which the transmitter and tuner communicate.
snr_estimate	Signal to noise estimate in dB X 1000.
ber_estimate	Bit error rate estimate (always 0).
lock_threshold	Minimum signal-to-noise ratio (SNR) that the Cisco uBR924 will accept as a valid lock.
QAM status	Indicates if QAM/FEC lock has been acquired and the modulation mode in use.
tx_freq	Upstream frequency sent to the Cisco uBR924 by the CMTS in the UCD message.
power_level	Transmit power level as set in the hardware, given as a hexadecimal value. The units are unique to the hardware used. Use the **show controllers cable-modem 0 mac state** command to see the power level in dBmV.
symbol_rate	Indicates the upstream symbol rate in symbols per second that is negotiated between the CMTS and the cable access router.

Related Commands

Command	Description
show controllers cable-modem	Displays high-level controller information about a Cisco uBR924 cable access router.
show controllers cable-modem bpkm	Displays information about the baseline privacy key management exchange between the Cisco uBR924 and the CMTS.
show controllers cable-modem des	Displays information about the Data Encryption Standard (DES) engine registers.
show controllers cable-modem filters	.Displays the registers in the MAC hardware that are used for filtering received frames.
show controllers cable-modem lookup-table	Displays the mini-slot lookup table inside a Cisco uBR924.
show controllers cable-modem mac	Displays detailed MAC-layer information for a Cisco uBR924.
show controllers cable-modem phy	Displays the contents of the registers used in the downstream physical hardware of the Cisco uBR924.

Debug Commands

The following debug commands are available to troubleshoot a Cisco uBR924 cable access router:

- **debug cable-modem bpkm**
- **debug cable-modem bridge**
- **debug cable-modem error**
- **debug cable-modem interrupts**
- **debug cable-modem mac**
- **debug cable-modem map**

Note Troubleshooting the Cisco uBR924 cable access router is typically accomplished using the CMTS at the cable operator's headend facility; it is rarely done by directly accessing the Cisco uBR924. For information on troubleshooting the Cisco uBR924 using Cisco uBR7200 series universal broadband routers, see the document *Cisco uBR7246 Universal Broadband Router Features*. Also see the "Related Documents" section on page 2 for additional documents relating to troubleshooting.

debug cable-modem bpkm

To debug baseline privacy information on a Cisco uBR924, use the **debug cable-modem bpkm** command in privileged EXEC mode. To turn the debugging messages off, use the **no** form of this command.

[**no**] **debug cable-modem bpkm** {**errors** | **events** | **packets**}

Syntax Description

errors	Debugs Cisco uBR924 privacy errors.
events	Debugs events related to cable baseline privacy.
packets	Debugs baseline privacy packets.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

Baseline privacy key management exchanges take place only when both the Cisco uBR924 and the CMTS are running code images that support baseline privacy, and the privacy class of service is enabled via the configuration file that is downloaded to the cable access router. Baseline privacy code images for the Cisco uBR924 contain **k1** in the code image name.

Examples

The following example shows debug output when the headend does not have privacy enabled:

```
uBR924# debug cable-modem bpkm errors
cm_bpkm_fsm(): machine: KEK, event/state: EVENT_4_TIMEOUT/STATE_B_AUTH_WAIT, new state:
STATE_B_AUTH_WAIT

cm_bpkm_fsm(): machine: KEK, event/state: EVENT_4_TIMEOUT/STATE_B_AUTH_WAIT, new state:
STATE_B_AUTH_WAIT

%LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to down
cm_bpkm_fsm(): machine: KEK, event/state: EVENT_1_PROVISIONED/STATE_A_START, new state:
STATE_B_AUTH_WAIT

%LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to up
```

Related Commands

Command	Description
debug cable-modem bridge	Debugs bridge filter processing information on a Cisco uBR924.
debug cable-modem error	Enables debugging messages for the cable interface driver on a Cisco uBR924.
debug cable-modem interrupts	Debugs Cisco uBR924 interrupts.
debug cable-modem mac	Troubleshoots the Cisco uBR924 MAC layer.
debug cable-modem map	Displays the timing from MAP messages to sync messages and the timing between MAP messages.

debug cable-modem bridge

Use the **debug cable-modem bridge** command in privileged EXEC mode to debug bridge filter processing information on a Cisco uBR924. To turn the debugging messages off, use the **no** form of this command.

[**no**] **debug cable-modem bridge**

Syntax Description

This command has no keywords or arguments.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

When the interface is down, all bridge table entries learned on the Ethernet interface are set to discard because traffic is not bridged until the cable interface has completed initialization. After the interface (the line protocol) is completely up, bridge table entries learned on the Ethernet interface program the cable MAC data filters. The cable MAC hardware filters out any received packets whose addresses are not in the filters. In this way, the cable interface only receives packets addressed to its own MAC address or an address it has learned on the Ethernet interface.

Examples

The following example shows sample display output for the **debug cable-modem bridge** privileged EXEC command:

```
uBR924# debug cable-modem bridge
%LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to downshut
cm_tbridge_add_entry(): MAC not initialized, discarding entry: 00e0.fe7a.186fno shut
cm_tbridge_add_entry(): MAC not initialized, discarding entry: 00e0.fe7a.186f
%LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to up
cm_tbridge_add_entry(): Adding entry 00e0.fe7a.186f to filter 2
```

Related Commands

Command	Description
debug cable-modem bpkm	Debugs baseline privacy information on a Cisco uBR924.
debug cable-modem error	Enables debugging messages for the cable interface driver on a Cisco uBR924.
debug cable-modem interrupts	Debugs Cisco uBR924 interrupts.
debug cable-modem mac	Troubleshoots the Cisco uBR924 MAC layer.
debug cable-modem map	Displays the timing from MAP messages to sync messages and the timing between MAP messages.

debug cable-modem error

Use the the **debug cable-modem error** command in privileged EXEC mode to enable debugging messages for the cable interface driver. To turn the debugging messages off, use the **no** form of this command.

[**no**] **debug cable-modem error**

Syntax Description

This command has no keywords or arguments.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

This command displays detailed output about the sanity checking of received frame formats, the acquisition of downstream QAM/FEC lock, the receipt or non-receipt of SYNC messages from the CMTS, reception errors, and bandwidth request failures.

Examples

The following example shows sample display output for the **debug cable-modem error** privileged EXEC command:

```
uBR924# debug cable-modem error
*Mar  7 20:16:29: AcquireSync(): Update rate is 100 Hz
*Mar  7 20:16:30: 1st Sync acquired after 1100 ms.
*Mar  7 20:16:30: Recovery loop is locked (7/9)
*Mar  7 20:16:30: 2nd Sync acquired after 100 ms.
*Mar  7 20:16:30: Recovery loop is locked (10/15)
```

Related Commands

Command	Description
debug cable-modem bpkm	Debugs baseline privacy information on a Cisco uBR924.
debug cable-modem bridge	Debugs bridge filter processing information on a Cisco uBR924.
debug cable-modem interrupts	Debugs Cisco uBR924 interrupts.
debug cable-modem mac	Troubleshoots the Cisco uBR924 MAC layer.
debug cable-modem map	Displays the timing from MAP messages to sync messages and the timing between MAP messages.

debug cable-modem interrupts

To debug Cisco uBR924 interrupts, use the **debug cable-modem interrupts** command in privileged EXEC mode . To turn the debugging messages off, use the **no** form of this command.

[**no**] **debug cable-modem interrupts**

Syntax Description

This command has no keywords or arguments.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Examples

The following example shows sample debug output for Cisco uBR924 interrupts.

```
uBR924# debug cable-modem interrupts
*** BCM3300_rx_mac_msg_interrupt ***
*** BCM3300_rx_mac_msg_interrupt ***
### BCM3300_tx_interrupt ###
*** BCM3300_rx_mac_msg_interrupt ***
### BCM3300_tx_interrupt ###
*** BCM3300_rx_mac_msg_interrupt ***
### BCM3300_tx_interrupt ###
### BCM3300_tx_interrupt ###
### BCM3300_tx_interrupt ###
### BCM3300_tx_interrupt ###
```

Related Commands

Command	Description
debug cable-modem bpkm	Debugs baseline privacy information on a Cisco uBR924.
debug cable-modem bridge	Debugs bridge filter processing information on a Cisco uBR924.
debug cable-modem error	Enables debugging messages for the cable interface driver on a Cisco uBR924.
debug cable-modem mac	Troubleshoots the Cisco uBR924 MAC layer.
debug cable-modem map	Displays the timing from MAP messages to sync messages and the timing between MAP messages.

debug cable-modem mac

To troubleshoot the Cisco uBR924 MAC layer, use the **debug cable-modem mac** command in privileged EXEC mode. To turn the debugging messages off, use the **no** form of this command.

[**no**] **debug cable-modem mac** {**log** [**verbose**] **| messages**}

Syntax Description

log	Realtime MAC log display.
verbose	(Optional) Displays periodic MAC layer events, such as ranging.
messages	MAC layer management messages.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Usage Guidelines

Of all the available debug cable modem commands, the most useful is **debug cable-modem mac log**.

MAC log messages are written to a circular log file even when debugging is not turned on. These messages include timestamps, events, and information pertinent to these events. Enter the **debug cable-modem mac log** command to view MAC log messages. If you want to view this information without entering debug mode, enter the **show controllers cable-modem** *number* **mac log** command. The same information is displayed by both commands.

If the Cisco uBR924 interface fails to come up or resets periodically, the MAC log will show what happened. For example, if an address is not obtained from the DHCP server, an error is logged, initialization starts over, and the Cisco uBR924 scans for a downstream frequency. The **debug cable-modem mac log** command displays the log from the oldest to the newest entry.

After initial ranging is successful (dhcp_state has been reached), further `RNG-REQ/RNG-RSP` messages and watchdog timer entries are suppressed from output unless the **verbose** keyword is used. Note that `CMAC_LOG_WATCHDOG_TIMER` entries while in the maintenance_state are normal when using the **verbose** keyword.

Examples

Example 1

This example shows sample display output from the **debug cable-modem mac log** command. The fields of the output are the time since bootup, the log message, and in some cases a parameter that gives more detail about the log entry.

```
uBR924# debug cable-modem mac log
*Mar  7 01:42:59: 528302.040 CMAC_LOG_LINK_DOWN
*Mar  7 01:42:59: 528302.042 CMAC_LOG_RESET_FROM_DRIVER
*Mar  7 01:42:59: 528302.044 CMAC_LOG_STATE_CHANGE                      wait_for_link_up_state
*Mar  7 01:42:59: 528302.046 CMAC_LOG_DRIVER_INIT_IDB_SHUTDOWN          0x08098D02
*Mar  7 01:42:59: 528302.048 CMAC_LOG_LINK_DOWN
*Mar  7 01:43:05: 528308.428 CMAC_LOG_DRIVER_INIT_IDB_RESET             0x08098E5E
*Mar  7 01:43:05: 528308.432 CMAC_LOG_LINK_DOWN
*Mar  7 01:43:05: 528308.434 CMAC_LOG_LINK_UP
*Mar  7 01:43:05: 528308.436 CMAC_LOG_STATE_CHANGE                      ds_channel_scanning_state
*Mar  7 01:43:05: 528308.440 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     88/453000000/855000000/6000000
*Mar  7 01:43:05: 528308.444 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     89/93000000/105000000/6000000
*Mar  7 01:43:05: 528308.448 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     90/111250000/117250000/6000000
*Mar  7 01:43:05: 528308.452 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     91/231012500/327012500/6000000
*Mar  7 01:43:05: 528308.456 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     92/333015000/333015000/6000000
*Mar  7 01:43:05: 528308.460 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     93/339012500/399012500/6000000
*Mar  7 01:43:05: 528308.462 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     94/405000000/447000000/6000000
*Mar  7 01:43:05: 528308.466 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     95/123015000/129015000/6000000
*Mar  7 01:43:05: 528308.470 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     96/135012500/135012500/6000000
*Mar  7 01:43:05: 528308.474 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     97/141000000/171000000/6000000
*Mar  7 01:43:05: 528308.478 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     98/219000000/225000000/6000000
*Mar  7 01:43:05: 528308.482 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND     99/177000000/213000000/6000000
*Mar  7 01:43:05: 528308.486 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY    663000000
*Mar  7 01:43:05: 528308.488 CMAC_LOG_WILL_SEARCH_USER_DS_FREQUENCY     663000000
*Mar  7 01:43:07: 528310.292 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED            663000000
.
528383.992 CMAC_LOG_STATE_CHANGE                        registration_state
528384.044 CMAC_LOG_REG_REQ_MSG_QUEUED
528384.050 CMAC_LOG_REG_REQ_TRANSMITTED
528384.052 CMAC_LOG_REG_RSP_MSG_RCVD
528384.078 CMAC_LOG_COS_ASSIGNED_SID                    1/4
528384.102 CMAC_LOG_RNG_REQ_QUEUED                      4
528384.102 CMAC_LOG_REGISTRATION_OK
528384.102 CMAC_LOG_STATE_CHANGE                        establish_privacy_state
528384.102 CMAC_LOG_STATE_CHANGE                        maintenance_state
528388.444 CMAC_LOG_RNG_REQ_TRANSMITTED
528388.444 CMAC_LOG_RNG_RSP_MSG_RCVD
528398.514 CMAC_LOG_RNG_REQ_TRANSMITTED
528398.516 CMAC_LOG_RNG_RSP_MSG_RCVD
528408.584 CMAC_LOG_RNG_REQ_TRANSMITTED
528408.586 CMAC_LOG_RNG_RSP_MSG_RCVD
528414.102 CMAC_LOG_WATCHDOG_TIMER
528418.654 CMAC_LOG_RNG_REQ_TRANSMITTED
528418.656 CMAC_LOG_RNG_RSP_MSG_RCVD
528428.726 CMAC_LOG_RNG_REQ_TRANSMITTED
528428.728 CMAC_LOG_RNG_RSP_MSG_RCVD
528438.796 CMAC_LOG_RNG_REQ_TRANSMITTED
528438.798 CMAC_LOG_RNG_RSP_MSG_RCVD
528444.102 CMAC_LOG_WATCHDOG_TIMER
528444.492 CMAC_LOG_LINK_DOWN
528444.494 CMAC_LOG_RESET_FROM_DRIVER
528444.494 CMAC_LOG_STATE_CHANGE                        wait_for_link_up_state
528444.494 CMAC_LOG_DRIVER_INIT_IDB_SHUTDOWN            0x08098D02
528444.494 CMAC_LOG_LINK_DOWN
528474.494 CMAC_LOG_WATCHDOG_TIMER
528504.494 CMAC_LOG_WATCHDOG_TIMER
528534.494 CMAC_LOG_WATCHDOG_TIMER
```

```
0 events dropped due to lack of a chunk
```

The line "`0 events dropped due to lack of a chunk`" at the end of a display indicates that no log entries were discarded due to a temporary lack of memory. This means the log is accurate and reliable.

Example 2

The following example compares the output of the **debug cable-modem mac log** command with the **debug cable-modem mac log verbose** command. The **verbose** keyword displays periodic events such as ranging.

```
uBR924# debug cable mac log
Cable Modem mac log debugging is on
uBR924#
uBR924# debug cable mac log verbose
Cable Modem mac log debugging is on (verbose)
uBR924#
574623.810 CMAC_LOG_RNG_REQ_TRANSMITTED
574623.812 CMAC_LOG_RNG_RSP_MSG_RCVD
574627.942 CMAC_LOG_WATCHDOG_TIMER
574633.880 CMAC_LOG_RNG_REQ_TRANSMITTED
574633.884 CMAC_LOG_RNG_RSP_MSG_RCVD
574643.950 CMAC_LOG_RNG_REQ_TRANSMITTED
574643.954 CMAC_LOG_RNG_RSP_MSG_RCVD
574654.022 CMAC_LOG_RNG_REQ_TRANSMITTED
574654.024 CMAC_LOG_RNG_RSP_MSG_RCVD
574657.978 CMAC_LOG_WATCHDOG_TIMER
574664.094 CMAC_LOG_RNG_REQ_TRANSMITTED
574664.096 CMAC_LOG_RNG_RSP_MSG_RCVD
574674.164 CMAC_LOG_RNG_REQ_TRANSMITTED
574674.166 CMAC_LOG_RNG_RSP_MSG_RCVD

uBR924# no debug cable mac log verbose
Cable Modem mac log debugging is off
uBR924#
574684.234 CMAC_LOG_RNG_REQ_TRANSMITTED
574684.238 CMAC_LOG_RNG_RSP_MSG_RCVD
```

Example 3

The following example shows display output for the **debug cable mac messages** command. This command causes received cable MAC management messages to be displayed in a verbose format. The messages that are displayed are shown below:

```
uBR924# debug cable-modem mac messages ?
  dynsrv   dynamic service mac messages
  map      map messages received
  reg-req  reg-req  messages transmitted
  reg-rsp  reg-rsp messages received
  rng-req  rng-req  messages transmitted
  rng-rsp  rng-rsp messages received
  sync     Sync messages received
  ucc-req  ucc-req messages received
  ucc-rsp  ucc-rsp messages transmitted
  ucd      UCD messages received
  <cr>
```

The **dynsrv** keyword displays Dynamic Service Add or Dynamic Service Delete messages during the off-hook/on-hook transitions of a phone connected to the Cisco uBR924.

In addition, transmitted REG-REQs are displayed in hex dump format. The output from this command is very verbose and is usually not needed for normal interface debugging. The command is most useful when attempting to attach a Cisco uBR924 cable access router to a CMTS that is not DOCSIS-qualified.

For a description of the displayed fields of each message, refer to the DOCSIS Radio Frequency Interface Specification, v1.0 (SP-RFI-I04-980724).

```
uBR924# debug cable mac messages
*Mar  7 01:44:06:
*Mar  7 01:44:06: UCD MESSAGE
*Mar  7 01:44:06: -----------
*Mar  7 01:44:06:   FRAME HEADER
*Mar  7 01:44:06:     FC                        - 0xC2 == MAC Management
*Mar  7 01:44:06:     MAC_PARM                  - 0x00
*Mar  7 01:44:06:     LEN                       - 0xD3
*Mar  7 01:44:06:   MAC MANAGEMENT MESSAGE HEADER
*Mar  7 01:44:06:     DA                        - 01E0.2F00.0001
*Mar  7 01:44:06:     SA                        - 00E0.1EA5.BB60
*Mar  7 01:44:06:     msg LEN                   - C1
*Mar  7 01:44:06:     DSAP                      - 0
*Mar  7 01:44:06:     SSAP                      - 0
*Mar  7 01:44:06:     control                   - 03
*Mar  7 01:44:06:     version                   - 01
*Mar  7 01:44:06:     type                      - 02 == UCD
*Mar  7 01:44:06:     RSVD                      - 0
*Mar  7 01:44:06:   US Channel ID               - 1
*Mar  7 01:44:06:   Configuration Change Count  - 4
*Mar  7 01:44:06:   Mini-Slot Size              - 8
*Mar  7 01:44:06:   DS Channel ID               - 1
*Mar  7 01:44:06:   Symbol Rate                 - 8
*Mar  7 01:44:06:   Frequency                   - 20000000
*Mar  7 01:44:06:   Preamble Pattern            - CC CC CC CC CC CC CC CC CC CC CC CC CC CC 0D 0D
*Mar  7 01:44:06:   Burst Descriptor 0
*Mar  7 01:44:06:     Interval Usage Code       - 1
*Mar  7 01:44:06:     Modulation Type           - 1 == QPSK
*Mar  7 01:44:06:     Differential Encoding     - 2 == OFF
*Mar  7 01:44:06:     Preamble Length           - 64
*Mar  7 01:44:06:     Preamble Value Offset     - 56
*Mar  7 01:44:06:     FEC Error Correction      - 0
*Mar  7 01:44:06:     FEC Codeword Info Bytes   - 16
*Mar  7 01:44:06:     Scrambler Seed            - 0x0152
*Mar  7 01:44:06:     Maximum Burst Size        - 1
*Mar  7 01:44:06:     Guard Time Size           - 8
*Mar  7 01:44:06:     Last Codeword Length      - 1 == FIXED
*Mar  7 01:44:06:     Scrambler on/off          - 1 == ON
*Mar  7 01:44:06:   Burst Descriptor 1
*Mar  7 01:44:06:     Interval Usage Code       - 3
*Mar  7 01:44:06:     Modulation Type           - 1 == QPSK
*Mar  7 01:44:06:     Differential Encoding     - 2 == OFF
*Mar  7 01:44:06:     Preamble Length           - 128
*Mar  7 01:44:06:     Preamble Value Offset     - 0
*Mar  7 01:44:06:     FEC Error Correction      - 5
*Mar  7 01:44:06:     FEC Codeword Info Bytes   - 34
*Mar  7 01:44:06:     Scrambler Seed            - 0x0152
*Mar  7 01:44:06:     Maximum Burst Size        - 0
*Mar  7 01:44:06:     Guard Time Size           - 48
*Mar  7 01:44:06:     Last Codeword Length      - 1 == FIXED
*Mar  7 01:44:06:     Scrambler on/off          - 1 == ON
*Mar  7 01:44:06:   Burst Descriptor 2
*Mar  7 01:44:06:     Interval Usage Code       - 4
*Mar  7 01:44:06:     Modulation Type           - 1 == QPSK
*Mar  7 01:44:06:     Differential Encoding     - 2 == OFF
*Mar  7 01:44:06:     Preamble Length           - 128
```

```
*Mar  7 01:44:06:     Preamble Value Offset     - 0
*Mar  7 01:44:06:     FEC Error Correction      - 5
*Mar  7 01:44:06:     FEC Codeword Info Bytes   - 34
*Mar  7 01:44:06:     Scrambler Seed            - 0x0152
*Mar  7 01:44:06:     Maximum Burst Size        - 0
*Mar  7 01:44:06:     Guard Time Size           - 48
*Mar  7 01:44:06:     Last Codeword Length      - 1 == FIXED
*Mar  7 01:44:06:     Scrambler on/off          - 1 == ON
*Mar  7 01:44:06:   Burst Descriptor 3
*Mar  7 01:44:06:     Interval Usage Code       - 5
*Mar  7 01:44:06:     Modulation Type           - 1 == QPSK
*Mar  7 01:44:06:     Differential Encoding     - 2 == OFF
*Mar  7 01:44:06:     Preamble Length           - 72
*Mar  7 01:44:06:     Preamble Value Offset     - 48
*Mar  7 01:44:06:     FEC Error Correction      - 5
*Mar  7 01:44:06:     FEC Codeword Info Bytes   - 75
*Mar  7 01:44:06:     Scrambler Seed            - 0x0152
*Mar  7 01:44:06:     Maximum Burst Size        - 0
*Mar  7 01:44:06:     Guard Time Size           - 8
*Mar  7 01:44:06:     Last Codeword Length      - 1 == FIXED
*Mar  7 01:44:06:     Scrambler on/off          - 1 == ON
*Mar  7 01:44:06:
*Mar  7 01:44:06:
*Mar  7 01:44:06: MAP MESSAGE
*Mar  7 01:44:06: -----------
*Mar  7 01:44:06:   FRAME HEADER
*Mar  7 01:44:06:     FC                        - 0xC3 == MAC Management with Extended Header
*Mar  7 01:44:06:     MAC_PARM                  - 0x02
*Mar  7 01:44:06:     LEN                       - 0x42
*Mar  7 01:44:06:     EHDR                      - 0x00 0x00
*Mar  7 01:44:06:   MAC MANAGEMENT MESSAGE HEADER
*Mar  7 01:44:06:     DA                        - 01E0.2F00.0001
.
.
*Mar  7 01:44:17: RNG-RSP MESSAGE
*Mar  7 01:44:17: ---------------
*Mar  7 01:44:17:   FRAME HEADER
*Mar  7 01:44:17:     FC                        - 0xC2 == MAC Management
*Mar  7 01:44:17:     MAC_PARM                  - 0x00
*Mar  7 01:44:17:     LEN                       - 0x2B
*Mar  7 01:44:17:   MAC MANAGEMENT MESSAGE HEADER
*Mar  7 01:44:17:     DA                        - 00F0.1EB2.BB61
.
.
*Mar  7 01:44:20: REG-REQ MESSAGE
*Mar  7 01:44:20: ---------------
*Mar  7 01:44:20: C20000A5 000000E0  1EA5BB60 00F01EB2
*Mar  7 01:44:20: BB610093 00000301  06000004 03010104
*Mar  7 01:44:20: 1F010101 0204003D  09000304 001E8480
*Mar  7 01:44:20: 04010705 04000186  A0060200 0C070101
*Mar  7 01:44:20: 080300F0 1E112A01  04000000 0A020400
*Mar  7 01:44:20: 00000A03 04000002  58040400 00000105
*Mar  7 01:44:20: 04000000 01060400  00025807 04000000
*Mar  7 01:44:20: 3C2B0563 6973636F  06105E4F C908C655
*Mar  7 01:44:20: 61086FD5 5C9D756F  7B730710 434D5453
*Mar  7 01:44:20: 204D4943 202D2D2D  2D2D2D2D 0C040000
*Mar  7 01:44:20: 00000503 010100
*Mar  7 01:44:20:
*Mar  7 01:44:20:
*Mar  7 01:44:20: REG-RSP MESSAGE
*Mar  7 01:44:20: ---------------
*Mar  7 01:44:20:   FRAME HEADER
*Mar  7 01:44:20:     FC                        - 0xC2 == MAC Management
*Mar  7 01:44:20:     MAC_PARM                  - 0x00
*Mar  7 01:44:20:     LEN                       - 0x29
```

```
*Mar  7 01:44:20:   MAC MANAGEMENT MESSAGE HEADER
*Mar  7 01:44:20:     DA                        - 00F0.1EB2.BB61
```

Related Commands

Command	Description
debug cable-modem bpkm	Debugs baseline privacy information on a Cisco uBR924.
debug cable-modem bridge	Debugs bridge filter processing information on a Cisco uBR924.
debug cable-modem error	Enables debugging messages for the cable interface driver on a Cisco uBR924.
debug cable-modem interrupts	Debugs Cisco uBR924 interrupts.
debug cable-modem map	Displays the timing from MAP messages to sync messages and the timing between MAP messages.

debug cable-modem map

To display the timing from MAP messages to sync messages and the timing between MAP messages on a Cisco uBR924 cable access router, use the **debug cable-modem map** command in privileged EXEC mode. To turn the debugging messages off, use the **no** form of this command.

[**no**] **debug cable-modem map**

Syntax Description

This command has no keywords or arguments.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3 NA	This command was first introduced.

Examples

The following example shows display output for the **debug cable-modem map** privileged EXEC command.

```
uBR924# debug cable-modem map
Cable Modem MAP debugging is on
uBR924#
*Mar  7 20:12:08: 595322.942: Min MAP to sync=72
*Mar  7 20:12:08: 595322.944: Max map to map time is 40
*Mar  7 20:12:08: 595322.982: Min MAP to sync=63
*Mar  7 20:12:08: 595323.110: Max map to map time is 41
*Mar  7 20:12:08: 595323.262: Min MAP to sync=59
*Mar  7 20:12:08: 595323.440: Max map to map time is 46
*Mar  7 20:12:09: 595323.872: Min MAP to sync=58
```

Related Commands

Command	Description
debug cable-modem bpkm	Debugs baseline privacy information on a Cisco uBR924.
debug cable-modem bridge	Debugs bridge filter processing information on a Cisco uBR924.
debug cable-modem error	Enables debugging messages for the cable interface driver on a Cisco uBR924.
debug cable-modem interrupts	Debugs Cisco uBR924 interrupts.
debug cable-modem mac	Troubleshoots the Cisco uBR924 MAC layer.