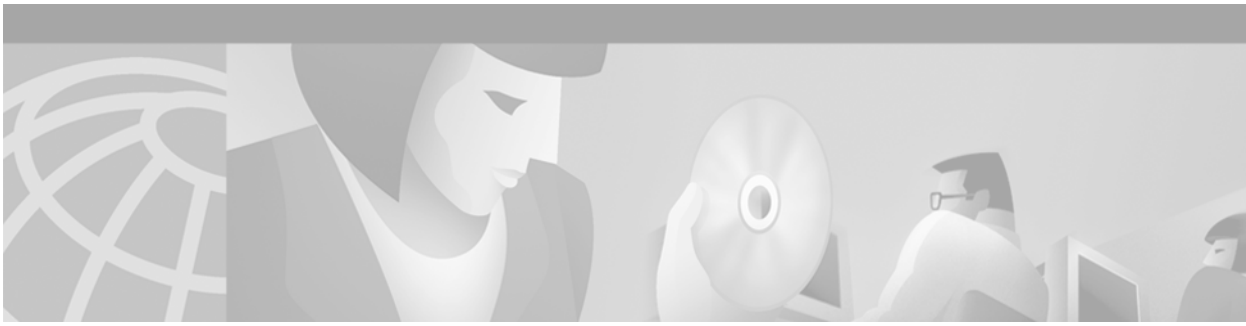


V.92 Modem on Hold for Cisco AS5300 and Cisco AS5800 Universal Access Servers

Feature History

Release	Modification
12.2(2)XA	This feature was introduced on Cisco AS5350 and Cisco AS5400 universal gateways running NextPort firmware. This feature was introduced on the Cisco AS5300 universal access server running Cisco MICA Portware Version 2.9.1.0.
12.2(2)XB	This feature was supported with Cisco IOS Release 12.2(2)XB.
12.2(2)XB1	This feature was supported on Cisco AS5800 universal access servers.
12.2(11)T	This feature was integrated into Cisco IOS Release 12.2(11)T and support was added for the Cisco AS5300 and Cisco AS5800 platforms.

This feature module introduces the V.92 International Telecommunication Union Telecommunication Standardization Sector (ITU-T) standard Modem on Hold (MOH) feature with Cisco MICA portware for use with Cisco IOS Release 12.2(2)XB1 and 12.2(11)T.

This document includes the following sections:

Feature Overview

V.92

To remain current with industry needs, the ITU-T V.90 modem standard recommendations have been enhanced. The new standard, V.92, meets the need for a digital modem and analog modem pair on the Public Switched Telephone Network (PSTN). V.92 improves the upstream data signaling rate and adds new features that enhance modem usability.

This feature module introduces the V.92 Modem on Hold feature on Cisco AS5300 and Cisco AS5800 universal access servers with Cisco MICA Portware Version 2.9.1.0 and higher.

Note The other feature introduced with the new V.92 standard is V.92 Quick Connect, which is documented in the *V.92 Quick Connect for Cisco AS5300 and Cisco AS5800 Universal Access Servers* feature module. V.92 Modem On Hold and V.92 Quick Connect can be enabled independently of each other.

V.92 is implemented at the modem level as new modem protocols and standards. The new V.92 features co-reside with existing portware features and have no impact on the hardware configuration of either the HMM or DMM (including memory requirements). Cisco IOS software is responsible for controlling the features and displaying the new statistics. V.92 and V.44 support is bound with the rest of the Cisco IOS device driver components.

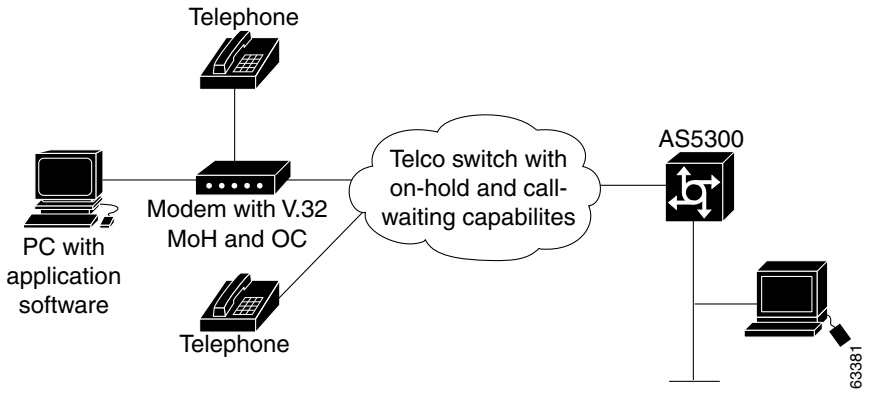
Note V.92 is packaged with V.44 in Cisco IOS software. For more information about V.44, refer to the *V.44 LZJH Compression for Cisco AS5300 and Cisco AS5800 Universal Access Servers* feature module.

Note This feature does not support pulse code modulation (PCM) upstream as defined in the V.92 ITU standard. This feature does, however, interoperate with modems that support PCM upstream.

Modem on Hold

V.92 Modem on Hold allows a dial-in customer to suspend a modem session to answer an incoming voice call or to place an outgoing call while engaged in a modem session. When the dial-in customer uses Modem on Hold to suspend an active modem session to engage in an incoming voice call, the Internet service provider (ISP) modem listens to the original modem connection and waits for the dial-in customer's modem to resume the connection. When the voice call ends, the modem signals the telephone system to end the second call and return to the original modem connection, then the modem signals the ISP modem that it is ready to resume the modem call. Both modems renegotiate the connection, and the original exchange of data continues.

Note This feature is designed for use on telephone lines that are configured for call-waiting service; call-waiting signals trigger the suspension of the modem session. If call-waiting service is not present on the subscriber's line, callers receive a busy signal, and the modem session is not interrupted.



Use of the V.92 Modem on Hold feature for Cisco MICA portware can be controlled globally using **AT** commands (modemcaps) or can be controlled on a per-caller basis using the RADIUS distributed client/server system.

Note You are not required to have a RADIUS server to use the Modem on Hold feature.

The following sections contain information about controlling the V.92 Modem on Hold feature:

- AT Commands (Modemcaps) and S-Registers
- RADIUS Authorization

AT Commands (Modemcaps) and S-Registers

V.92 Modem on Hold is disabled by default and is controlled with standard **AT** commands and S-registers. V.92 is enabled and disabled with the S29 S-register (S29 = 12), and Modem on Hold is controlled with the S62 S-register (S62 must be set to enable Modem on Hold). **AT** commands download the configuration to the modem at the end of every call. The **ATSn=v** and **ATSn? AT** commands are used to configure V.92 Modem on Hold on Cisco MICA platforms. Table 1 lists additional S-register parameters used to enable and disable the feature.

To disable V.92 Modem on Hold, you can use a modemcap (for example, s62=0s63=3s21=15s29=12) or set the S29 register to any number other than 12. You can also use the RADIUS vendor-specific attribute (VSA) to disable Modem on Hold if the feature was initially enabled by the default value (modemcap).

Note If the feature is enabled using S29=12 and Modem on Hold is disabled using S62=0, statistics for the number of times a dial-in customer requests an on-hold are tracked in the MOH link information parameters. However, completely disabling the feature by setting S29 to a value other than 12 disables the reporting of all MOH statistics.

For detailed information about the **AT** commands and S-registers used to control V.92 on Cisco MICA platforms, refer to the *AT Command Set and Register Summary for MICA 6-Port Modules*.

Table 1 V.92 Modem on Hold S-Registers

Name	Register	Index	Default	Description
Modem standard	S29	MICA 19	12 (V.92 enabled)	0 = V.34bis Automode, with V.32ter 1 = V.34bis Automode, without V.32ter 2 = reserved 3 = V.32bis Automode 4 = V22bis Automode 5 = K56Flex 1.1 Automode 6 = V.90 Automode 7 = MICA:SS7/COT 8 = V.110 9 = Reserved 10 = Reserved 11 = Reserved 12 = V.92 Auto-mode
MOH timeout	S62	MICA 63	0	0: MOH disabled 1: 10 seconds 2: 20 seconds 3: 30 seconds 4: 40 seconds 5: 1 minute 6: 2 minutes 7: 3 minutes 8: 4 minutes 9: 6 minutes 10: 8 minutes 11: 12 minutes 12: 16 minutes 13: No limit

RADIUS Authorization

Per-user control of Modem on Hold can be configured for caller authorization using a RADIUS server. RADIUS servers use the vendor-specific attribute (VSA) capability to configure Modem on Hold for individual users. The current attribute=value protocol syntax has been extended with the new Modem on Hold attribute. You can enter the following value for this attribute:

- An unsigned integer in the range 0 through 65,535—Represents the maximum number of seconds that a modem may remain on hold, which can range from ten seconds to an unlimited number of minutes.

Note Although the integer attribute values can be specified as any value in a contiguous range, V.92 specifications limit configuration to a limited set of values. Attribute values are rounded down to the next permitted value when they are used to configure a modem.

Alternatively, you can enter the **inf** keyword, which allows the modem to remain on hold indefinitely.

If the Modem on Hold configuration is not present, or if it is not syntactically correct, the modem uses its default configuration for Modem on Hold. The default operation can be modified by using a modemcap string. Following authentication of a dial-in user, an additional control command is sent to the modem if the dial-in user does not have a default Modem on Hold configuration.

Note Code space requirements for RADIUS support is less than 2KBs. There are no additional data space requirements.

V.92 Modem on Hold running on systems using RADIUS authorization increases the length of RADIUS response packets by approximately 20 bytes. RADIUS databases increase in size by approximately the same amount for each dial-in user with a nondefault Modem on Hold attribute value.

With RADIUS, authentication and authorization occur as part of the same process. When a caller connects to the access server, the caller enters a user ID and password in response to prompts from the access server. This information is formatted as a RADIUS request packet and is sent to the appropriate RADIUS server. If the user ID is valid and the password matches, the RADIUS server responds with a packet containing authorization data for the connection. This authorization data contains the Modem on Hold configuration if it is present in the RADIUS database.

The access server interprets the response from the RADIUS server and performs any actions associated with the authorization data. For Modem on Hold, a command is sent from the Cisco IOS host to the Cisco MICA channel to set the Modem on Hold parameters. No confirmation from the channel is required.

When the client modem requests a Modem on Hold operation, the modem switches to an on-hold state, which prevents further data from being queued to the connection. When the Cisco IOS software receives the request to go on hold, any transmit packets queued to local Cisco IOS queues (packets not already posted to the queues shared between the Cisco IOS software and the modem) are discarded. This mechanism reduces the possibility that stale data will be transmitted to the modem when the connection is reactivated. It also reduces the number of buffer resources that are tied up while a modem is on hold.

Note When using a RADIUS server, placement of commas is important. The asterisk in the modem-on-hold attribute indicates that the attribute is optional. If a modem does not support Modem on Hold, then the call might continue anyway. If the asterisk is replaced by an “=”, the attribute is required, and modems that do not support Modem on Hold terminate the calls following authentication.
The value of the attribute is the number of seconds allowed for the on-hold state. This value is rounded by the Cisco IOS software to one of the permissible values. The number can be replaced with the **inf** command, which allows unlimited on-hold time. Case is significant for both attribute names and values.

Note If your router is configured for RADIUS, the RADIUS server must be accessible to the router. The server must also be capable of responding to authentication requests with VSA attributes.

Configuring V.92 Modem on Hold with RADIUS

If you use Radius to configure the Modem on Hold feature, use the modem-on-hold attribute, where the VALUE attribute is a nonnegative integer in seconds for maximum time on hold allowed. VALUE can be one of the following:

- modem-on-hold=VALUE—MOH support is required for call to be accepted.
- modem-on-hold*VALUE—MOH support is optional.

The following example shows RADIUS enabled where Modem on Hold is optional:

```
vendor-specific=9:1:modem-on-hold*VALUE
```

Note The examples shown below were established on the Cistron open-source server. Your server syntax may vary.

```
# This user can use MOH without time limits. (inf)
# MOH capability is not required for the connection (*)
testi Auth-Type = Local, Password = "test"
Service-Type = Login-User,
Cisco-AVPair = "modem-on-hold*inf"

# This user can use MOH for 30 seconds.
# MOH capability is not required for the connection.
test30 Auth-Type = Local, Password = "test"
Service-Type = Login-User,
Cisco-AVPair = "modem-on-hold*30"

# This user can not use MOH.
# MOH capability is not required for the connection.
test0 Auth-Type = Local, Password = "test"
Service-Type = Login-User,
Cisco-AVPair = "modem-on-hold*0"

# This user can not use MOH.
# But MOH capability IS required for the connection.
# If the user logs on to a device that does not support
# MOH (eg the console), he will be disconnected after
# authentication.
testr Auth-Type = Local, Password = "test"
    Service-Type = Login-User,
    Cisco-AVPair = "modem-on-hold=0"

# This user gets the default MOH setting.
# The default setting is disabled, unless overridden
# by a modemcap entry.
testx Auth-Type = Local, Password = "test"
    Service-Type = Login-User

# This user can go on hold for 60 seconds
# in a PPP link. The service type determines
# which calls get the MOH setting.
lucy Auth-Type = Local, Password = "test"
    Service-Type = Framed-User,
```

```
Cisco-AVPair = "modem-on-hold*60"
```

Note The service type defines when the AVPair is applied. For different RADIUS servers, the Cisco-AVPair syntax might be different, but the value in quotes does not change. Case is important: The entire text in quotes must be lowercase.

For more information about using RADIUS, refer to the *Configuring RADIUS* documentation.

Modem Enhancements for V.92 Modem On Hold

The following modem enhancements have been made for the implementation of the V.92 Modem on Hold feature:

- Disconnect Reasons
- Duration Limit Timer
- Modem on Hold Link Information Parameters
- Modem States
- New and Modified MIBs

Disconnect Reasons

V.92 Modem on Hold Disconnect Reasons is the method by which a modem tells the Cisco IOS software (host) why it has terminated its session with a client through the Modem on Hold cleardown by modem and the Modem on Hold timeout values. Table 2 lists the new Modem on Hold Disconnect Reasons.

Table 2 Modem On Hold Disconnect Reasons

Name	Description
DR_MOH_CLRD	Modem On Hold cleardown by modem
DR_MOH_TIMEOUT	Modem On Hold timeout value reached

Duration Limit Timer

The Modem on Hold duration limit timer is supported within dialed number ID service (DNIS), calling line ID (CLID), RADIUS (but not TACACS+), and global resource pool manager server (RPMS) virtual groups. This support permits ISPs to associate the Modem on Hold feature and its timer limit according to customer needs. When the Modem on Hold timer is active (a modem is on hold), it must take precedence over the idle timer. For example, if the idle value is five minutes and the Modem on Hold duration limit is ten minutes, the customer is permitted to be on another call for up to ten minutes without being disconnected after five minutes by the idle timer. The Modem on Hold timer value resets at the end of each on-hold session.

Modem on Hold Link Information Parameters

Table 3 Modem on Hold Link Information Parameters

Name	Description
MOH Status	0: Modem is not on hold 1: Modem is on hold
MOH Count	Number of times the modem is on hold

Table 3 Modem on Hold Link Information Parameters

Name	Description
MOH Request Count	Number of times the modem received Modem on Hold requests.
Total MOH Time	Total holding time: 65,535 seconds maximum
Current MOH Time	Current holding time: 65,535 seconds maximum
Call Waiting Retrains	Number of times a retrain occurred due to a call-waiting signal

Modem States

This feature supports modem states, which are discrete states that a modem transitions through, during, and after negotiation with a client modem. These states include the Modem on Hold input state, the Steady input state, and the Steady, Steady Retrain, and Terminate output states.

New and Modified MIBs

Existing MIBs that show the status of modem settings have been extended to show V.92 Modem on Hold configuration status. New MIBs have been created to report the incidence of V.92 Modem on Hold request calls coming into the server and to monitor on-hold status.

Supported Module Firmware and Cisco IOS Software

V.92 Modem on Hold is supported on the following:

- Module Firmware—The module firmware is a combination of modem (Digital Signal Processor or DSP) firmware and the module controller firmware. It is responsible for the collection of statistics and the actual implementation of V.92, including additional required state transitions.
- Cisco IOS software—The Cisco IOS software is responsible for the control and statistics reporting of the new features, including modemcaps, RADIUS authorization, and command-line interface (CLI) support. See the "Related Documents" section on page 10 for information about new Cisco IOS Release features.
- Boardware—On the Cisco AS5300 and Cisco AS5800 with Cisco MICA Portware Version 2.9.1.0 only. The boardware runs on the Amazon carrier card and provides the interface between Cisco IOS and the Cisco MICA module.

Benefits

Allows Voice Calls Without Interruption of Existing Modem Connection

V.92 Modem on Hold allows the origination and reception of voice calls without disturbing preexisting modem sessions. With Modem on Hold, calls can ring through to the dial-in user without requiring the expense of a second telephone line.

Per-Use Enabling

Service providers can enable Modem on Hold on a per-user basis for premium service opportunities.

Standard Modem Feature

V.92 is a standard modem feature that is offered as a no-cost upgrade to the installed system.

V.92 Compatibility

Modems that support V.92 are fully compatible with modems that do not support it. If a modem that supports Modem on Hold connects with a modem that does not support it, the modems will connect normally. However, the Modem on Hold function is not available for that call.

Restrictions

- Client modem vendors must supply their own utilities to enable Modem on Hold with each client modem.
- There is no standard method for notifying remote or user applications that a modem session has been placed on hold. Extending timeouts or increasing the maximum number of attempts to perform certain operations might be necessary. No e-mail data should be lost because of on-hold times.
- When a Modem on Hold transaction returns to the data-connected state, it retains the same IP network connection. Any other connected applications might not be returned to their prior state, depending on the application's data transaction requirements during the Modem on Hold active state.
- Configuration of these features using S-registers is carried out by using modemcaps (**AT** commands). Cisco IOS software does not check these values to guarantee that they are valid. The behavior of invalid values is determined by the module.
- Authorization of Modem on Hold is not provided as a standard service by RADIUS. However, RADIUS provides a vendor-specific attribute (VSA) capability that can be used to extend authorization mechanisms. This capability is already used by Cisco routers to provide other custom services.
- Cisco IOS software is packaged as multiple program image types with varying capabilities. Because not all modem interfaces support Modem on Hold and because images may be built to support specific modem types, not all software images contain functions to control Modem on Hold. In addition, the modems that do support Modem on Hold implement their control functions differently. Therefore, registry functions are used to interface between RADIUS, local authorization, and Modem on Hold control for modems.
- Server-initiated Modem on Hold is not supported.
- During a suspended modem session, some data might be dropped. The ISP idle timer, which disconnects a dial-in user if there is no data exchanged for a period of time, should be reset and suspended while a connection is on hold.

Note Many client modems used in Europe are known to have problems with the Modem on Hold feature. The vendors are aware of the issue and are working to correct it. If you are having trouble with the Modem on Hold feature in Europe, it is suggested that the customer contact the client modem vendor to verify that the modem complies with the telephony signaling for call waiting, caller ID, and 3-way calling in their particular country.

Related Features and Technologies

- V.92 Quick Connect
- V.44 LZJH data compression service
- Mindspeed CSMv6 hardware solution

Related Documents

- *AT Command Set and Register Summary for MICA Six-Port Modules*
- *Call Tracker plus ISDN and AAA Enhancements for the Cisco AS5300*
- Cisco AS5300 documentation index
- Cisco AS5800 documentation index
- Cisco IOS Release 12.2 Master Indexes
- *Comparing NextPort SPE Commands to MICA Modem Commands*
- New Features in Release 12.2(2)XB
- *Release Notes for Cisco AS5300 Universal Access Servers, Cisco IOS Release 12.2(2)XA*
- *Release Notes for Cisco AS5300 Universal Access Servers, Cisco IOS Release 12.2(2)XB*
- Cisco IOS Release 12.2T Cross-Platform Release Notes
- Cisco AS5800 Universal Access Server Release Notes
- *Release Notes for Cisco MICA Portware Version 2.9.1.0 on Cisco AS5300 Universal Access Servers*
- *SPE and Firmware Download Enhancements*
- *V.44 LZJH Compression for Cisco AS5300 and Cisco AS5800 Universal Access Servers*
- *V.92 Quick Connect for Cisco AS5300 and Cisco AS5800 Universal Access Servers*

Supported Platforms

- Cisco AS5300
- Cisco AS5800

Table 4 Cisco IOS Release and Platform Support for this Feature

Platform	12.2(2)XA	12.2(2)XB	12.2XB1	12.2(11)T
Cisco AS5300	X	X	X	X
Cisco AS5800	Not supported	Not supported	X	X

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at http://www.cisco.com/register.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

http://www.cisco.com/go/fn

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

- V.44
- V.92 Modem on Hold
- V.92 Quick Connect

MIBs

- CISCO-MODEM-MGMT-MIB
- CISCO-CALL-TRACKER-MODEM-MIB

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

No new or changed RFCs are supported by this feature.

Prerequisites

- Cisco IOS Release 12.2(2)XA, 12.2(2)XB, or 12.2(11)T
- V.92 MOH Portware DSP program memory required (in 16-bit words): 500
- Less than 50k bytes needed for CP memory
- Basic configuration of the Cisco AS5300 or Cisco AS5800 universal access server
- Upgraded modem firmware (Cisco MICA portware 2.9.1.0)
- Modems must be capable of supporting Modem on Hold

Configuration Tasks

None

Monitoring and Maintaining Modem on Hold

Use the following **show** commands in privileged EXEC mode.

Command	Purpose
`Router# show modem configuration`	Displays the current modem configuration for digital Cisco MICA technologies modems.
`Router# show modem log`	Displays the event log with oldest event first.
`Router# show modem operational-status`	Displays the operational status of the specified ports or the specified port range.

Configuration Examples

None

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- **show modem configuration**
- **show modem log**
- **show modem operational-status**

show modem configuration

To display the current modem configuration for digital Cisco MICA technologies modems loaded inside an access server or router, use the **show modem configuration** command in privileged EXEC mode.

show modem configuration [*slot*/*port*]

Syntax Descriptions

slot/port	(Optional) Specifies the location of a slot and modem port. If this number is not specified, statistics for all connected modems are displayed. Remember to include the forward slash (/) when entering this variable.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.2P	This command was introduced on Cisco AS5400 and Cisco 5800 universal access servers running NextPort firmware.
12.1(5)T	This command was enhanced to display information about digital modems on the Cisco 3600 series that support V.110.
12.2(2)XA	This command was supported on Cisco AS5350 and Cisco AS5400 universal access servers running NextPort firmware. This command was supported on Cisco AS5300 universal access servers running Cisco MICA Portware Version 2.9.1.0.
12.2(2)XB	This command was supported with Cisco IOS Release 12.2(2)XB.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for Cisco AS5300 and Cisco AS5800 platforms.

Examples

The following example displays the operational status for modem 0/1 in a Cisco AS5300. This modem resides in slot 0 and is assigned to port number 1.

```
Router# show modem configuration 2/10
Modem(2/10) Configuration Block:
 Country Code: 1
 Originate/Answer Mode: Answer
 Data Bits Selection: 8
 Parity Selection: 0
 Stop Bits Selection: 1
 V.42 ODP generation: Generate ODP sequence when originating a call
 Error Correction Autodetect Time-out value: 5000 ms
 Protocol Negotiation Time-out value: 10000 ms
 Protocol Negotiation Fallback Character:
 Protocol Negotiation Retransmission Limit: 12
 Error Correction Frame Length: 256 bytes
 Data Compression: V.44Tx   V.44Rx
 ARA Error Correction: ARA1.0 & ARA2.0 Disabled
```

```
 V.42 Error Correction: V.42(LAP-M) Originate&Answer enabled
 MNP Error Correction: MNP Originate&Answer enabled
 Link Protocol Fallback: Asynchronous Framing (Start/Stop/Parity)
 DSP processor MVIP TDM slice: 0
 Calling Tone: Disabled
 Guard Tone: Disabled
 Modem Standard: V.90 Automode
 Max. Connect Rate: 33600 bps
 Min. Connect Rate: 300 bps
 Signal Quality Threshold: Bit Errors >=1:1000 cause recovery
 Fallback/Fallforward Squelch Timer: 500 ms
 Fall Forward Timer: 10000 ms
 Fall Back Timer: 500 ms
 Terminate Time-out: 20 second(s)
 Wait For Data Mode Time-out: 60 second(s)
 Lost Carrier To Hang-up Delay: 1400 ms
 Transmit Level Setting: -13 dBm
 Retrain Limit: 4
 V.34 Max. Symbol Rate: 3249 Baud
 V.34 Min. Symbol Rate: 2400 Baud
 V.34 Carrier Frequency: Auto Carrier Selection
 V.34 Preemphasis Filter Selection: 11
 Tx and RX Signaling Type: NULL signaling
 Call Progress Tone Detection: No tone detection
 +++ Escape Detection: Enabled-Originate-Mode-Only
 AT Command Processor: Enabled
 Call Set Up Delay: no delay before link initiation
 Automatic Answer: delay 2 second(s)
 Escape Detection Character: ASCII 43 ('+')
 Carriage Return Character: ASCII 13 (CR)
 Line Feed Character: ASCII 10 (LF)
 Backspace Character: ASCII 8 (BS)
 Pause Before Blind Dialing: 2 second(s)
 Wait For Carrier After Dial: 60 second(s)
 Comma Dial Modifier Time: 2 second(s)
 Bit-mapped Register(S9=0x13D): E1Q2V1&D3X4
 Delay For Hangup After Carrier Loss: 1400 ms
 MOH Timeout: No limit
QC Config: Enabled  ANSpcm Level -12 dBm
V.44 Max Tx Codewords: 256
V.44 Max Rx Codewords: 256
V.44 Max Tx String Length: 32
V.44 Max Rx String Length: 32
V.44 Max Tx History Size: 256
V.44 Max Rx History Size: 256
```

Table 5 show modem configuration Field Descriptions for MICA Modems

Field	Description
Modem slot/port	Slot and port for the specified modem.
Country code:	Transmit level limits with respect to the S39 register. Default is 1 (U.S. domestic).
Originate/Answer Mode:	Answer or originate. Default is answer.
Data Bits Selection:	7, 8, or 9 data bits. Default is 8.
Parity Selection:	0 = no parity, 1 = even parity, 2 = odd parity. Default is no parity.
Stop Bits Selection:	1 or 2 stop bits. Default is 1 stop bit.
V.42 ODP generation:	Disabled or generate ODP sequence when originating a V.42 call. Default is Generate ODP sequence when originating a V.42 call.

Table 5 show modem configuration Field Descriptions for MICA Modems (continued)

Field	Description
Error Correction Autodetect Time-out value:	Maximum period during which the modem will run an automated detection machine upon the incoming data. Default is 5000 ms.
Protocol Negotiation Time-out value:	Maximum wait for error correction protocol negotiation before fallback. Default is 10,000 ms.
Protocol Negotiation Fallback Character:	0 to 127. Default is 13.
Protocol Negotiation Retransmission Limit:	0 = Do not disconnect on excessive retransmission; 1 to 255 = number of successive retransmissions to cause disconnect. Default is 12.
Error Correction Frame Length:	Buffer length; 64 to 1024 octets of data. Default is 256.
Data Compression:	Disabled, V.42bis, MNP5, or V.42bis or MNP5 (V.42 has precedence). Default is V.42bis or MNP5 (V.42 has precedence).
ARA Error Correction:	ARA1.0 & ARA2.0 Disabled, Enabled for Answer only, Enabled for Answer originate ARA1.0, and Enabled for Answer originate ARA2.0. Default is Enabled for Answer only.
V.42 Error Correction:	V.42(LAP-M) Disabled, V.42(LAP-M) Originate & Answer enabled. Default is disabled.
MNP Error Correction:	MNP Disabled or MNP Originate and Answer enabled. Default is MNP Originate and Answer enabled.
Link Protocol Fallback:	Asynchronous framing (Start/Stop/Parity), Synchronous framing (Raw 8 bits to DSP), or Disconnect (Hang-up). Default is Asynchronous framing (Start/Stop/Parity).
DSP processor MVIP TDM slice:	0 to 15.
Calling Tone:	Disable or Send calling tone. Default is disable.
Guard Tone:	Guard tone disabled, Use Guard tone (V.22 & V.22bis only). Default is disabled.
Modem Standard:	V.34bis Automode with terbo, V.34bis Automode skip terbo, V.32 terbo Automode, V.32bis Automode, V.22bis Automode, or K56Flex 1.1. Default is V.34bis Automode with terbo.
Max. Connect Rate:	75 to 56000 bps.
Min. Connect Rate:	75 to 56000 bps.
Signal Quality Threshold:	No action on bit errors, Bit Errors >=1:100 cause recovery, Bit Errors >=1:1000 cause recovery, Bit Errors >=1:10000 cause recovery, Bit Errors >=1:100000 cause recovery, or Bit Errors >=1:1000000 cause recovery. Default is 1:1000.
Fallback/Fallforward Squelch Timer:	Time to delay after a speed shift before allowing another speed shift. Default is 500 ms.
Fall Forward Timer:	Elapsed time with continuous good signal quality to cause a fall forward. Default is 10,000 ms.
Fall Back Timer:	Elapsed time with bad signal quality to cause a fallback. Default is 500 ms.

Table 5 show modem configuration Field Descriptions for MICA Modems (continued)

Field	Description
Terminate Time-out:	Elapsed time after a disconnect request before forcing a link disconnect. During this period, the modem sends buffered data and then clears down the link. Default is 20 seconds.
Wait for Data Mode Time-out:	Maximum time during link establishment before disconnection. Default is 40; 60 for K56Flex.
Lost Carrier To Hang-up Delay:	Maximum time without a carrier to cause the link disconnect. Default is 1400 ms.
Transmit Level Setting:	6dBm, 7dBm, 8dBm, -20dBm, or -21dBm. Default is 9 dBm.
Retrain Limit:	Maximum successive failed retrains to cause the link to disconnect. Default is 4.
V.34 Max. Symbol Rate:	2400 baud, 2743 baud, 2800 baud, 3000 baud, 3200 baud, or 3429 baud. Default is 3429 baud.
V.34 Min. Symbol Rate:	2400 baud, 2743 baud, 2800 baud, 3000 baud, 3200 baud, or 3429 baud. Default is 2400 baud.
V.34 Carrier Frequency:	Low Carrier, High Carrier, or Auto Carrier Selection. Default is High Carrier.
V.34 Preemphasis Filter Selection:	0 to 10 = a selected filter; 11 = Automatic Preemphasis Selection. Default is 11.
Tx and Rx Signaling Type:	NULL signaling, MF signaling, DTMF signaling, Lower band R2 signaling, Upper band R2 signaling, or R1 signaling. Default is NULL signaling.
Call Progress Tone Detection:	No tone detection, Dial tone detection, Ring-Back tone detection, or Busy tone detection. Default is no tone detection.
+++ Escape Detection:	Disabled, Enabled, or Enabled-in-Originate-Mode-Only. Default is Enabled-in-Originate-Mode-Only.
AT Command Processor:	Disabled or Enabled. Default is disabled.
Call Set Up Delay:	No delay before link initiation, delay value (1 to 255). Default is no delay.
Automatic Answer:	Answer immediately, delay value (1 to 255 seconds). default is 1 second.
Escape Detection Character:	ASCII value (0 to 127). Default is 43.
Carriage Return Character:	ASCII value (0 to 127). Default is 13.
Line Feed Character:	ASCII value (0 to 127). Default is 10.
Backspace Character:	ASCII value (0 to 127). Default is 8.
Pause Before Blind Dialing:	2 to 255 seconds. Default is 2.
Wait For Carrier After Dial:	Wait for data mode timeout.
Comma Dial Modifier Time:	2 to 255 seconds. Default is 2.
Bit-mapped Register(S9=0x13D):	Bit mapped register.
Delay For Hang-up After Carrier Loss:	Lost carrier to hang-up delay.

Related Commands

Command	Description
show modem log	Displays the modem history event status performed on a manageable modem or group of modems.
show modem operational-status	Displays the statistics of the active session.

show modem log

To display the modem history event status performed on a manageable modem or group of modems, use the **show modem log** command in privileged EXEC mode.

show modem log [*slot*/*port* | **group** *number*]

Syntax Descriptions

slot/*port*	(Optional) Specifies the location of a slot and modem port. If this number is not specified, statistics for all connected modems are displayed. Remember to include the forward slash (/) when entering this variable.
group *number*	(Optional) Specifies the location of a specific group of modems. If this number is not specified, statistics for all modems in the access server are displayed. The group number range is between 1 and 200.

Defaults

No default behavior or values

Command Modes

Privileged EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.1(5)T	This command was enhanced to display information about the Cisco 3600 series digital modems that support V.110, and about the Cisco 2600 and Cisco 3600 series modems that support leased-line operation.
12.2(2)XA	Additional link info and states were added.
12.2(2)XB	This command was supported with Cisco IOS Release 12.2(2)XB.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for Cisco AS5300 and Cisco AS5800 platforms.

Examples

The following example displays the operational status for modem 0/1 in a Cisco AS5300. This modem resides in slot 0 and is assigned to port number 1.

```
Router# show modem log 0/1
Static event:
    Connect Protocol:  LAP-M
    Compression:  V.44 both
    Connected Standard:  V.90
    TX,RX Symbol Rate:  8000, 3200
    TX,RX Carrier Frequency:  0, 1920
    TX,RX Trellis Coding:  0, 16
    Frequency Offset:  0 Hz
    Round Trip Delay:  0 msecs
    TX,RX Bit Rate:  49333, 31200
    Robbed Bit Signalling (RBS) pattern:  0
    Digital Pad:  0.0   dB,  Digital Pad Compensation: None
    QC Exchange: No QC Requested
    DC TX,RX Negotiated String Length: 32, 32
    DC TX,RX Negotiated Codewords: 256, 256
```

```
    DC TX,RX Negotiated History Size: 256, 256
    Diagnostic Code: 00 00 00 00 00 00 00 00

Dynamic event:
    Sq Value:  3
    Signal Noise Ratio:  28 dB
    Receive Level:  -19 dBm
    Phase Jitter Frequency:  0 Hz
    Phase Jitter Level:  0 degrees
    Far End Echo Level:  -50 dBm
    Phase Roll:  0 degrees
    Total Retrains:  1
    EC Retransmission Count:  1
    Characters transmitted, received:  133, 188
    Characters received BAD:  4
    PPP/SLIP packets transmitted, received:  5, 5
    PPP/SLIP packets received (BAD/ABORTED):  0
    EC packets transmitted, received OK:  11, 19
    EC packets (Received BAD/ABORTED):  1
    V110/PIAFS frames received bad: 0
    V110/PIAFS frames received good: 0
    V110/PIAFS frames transmitted: 0
    V110/PIAFS sync lost: 0
    PIAFS RTF: 0
    Total Speedshifts: 0
    Total MOH Time: 0 secs
    Current MOH Time: 0 secs
    MOH Status: Modem is Not on Hold
    MOH Count: 0
    MOH Request Count: 0
    Retrains due to Call Waiting: 0
    DC Encoder,Decoder State: compressed/compressed
    DC Tx,Rx Compression Ratio                 :  0.00:1, 0.00:1
    DC Tx,Rx Dictionary Reset Count            :  0, 0
    Diagnostic Code                          :  00 00 00 00 00 00 00 00


End Connect event:
    Call Timer:  6683 secs
    Disconnect Reason Info:  (0x108)
       Type (=5 ):  Rx (line to host) data flushing, OK
      Class (=1 ):  DSP condition
     Reason (=8 ): Modem On Hold cleardown by modem
    Total Retrains:  24
    EC Retransmission Count:  73
    Characters transmitted, received:  1238, 1319
    Characters received BAD:  4
    PPP/SLIP packets transmitted, received:  18, 18
    PPP/SLIP packets received (BAD/ABORTED):  0
    EC packets transmitted, received OK:  37, 78
    EC packets (Received BAD/ABORTED):  73
    V110/PIAFS frames received bad: 0
    V110/PIAFS frames received good: 0
    V110/PIAFS frames transmitted: 0
    V110/PIAFS sync lost: 0
    TX,RX Bit Rate: 26400, 28800
    Total Speedshifts: 0
    Total MOH Time: 0 secs
    Current MOH Time: 0 secs
    MOH Status: Modem is Not on Hold
    MOH Count: 0
    MOH Request Count: 0
    Retrains due to Call Waiting: 0
    DC Encoder,Decoder State: compressed/compressed
```

```
    DC TX,RX Compression Ratio: 0.0/0.0
    DC Tx,Rx Dictionary Reset Count            :  0, 0
    Diagnostic Code                          :  00 00 00 00 00 00 00 00


Modem State event:
     State: Idle
     State: Call Setup
     State: Connect
     State: Link
     State: Quick Connect
     State: Train Up
     State: EC Negotiating
     State: Steady
     State: Steady Retrain
     State: Steady Speedshift
     State: Steady Escape
     State: Terminate
     State: Modem On Hold
     State: Steady QC
     State: V.8bis Exchange
     State: Ranging
     State: Ranging Short
     State: Half Duplex Train
```

Table 6 show modem log Field Descriptions for MICA Modems

Field	Event State	Description
Modem <slot/port> Events Log:		The modem for which log events are currently displayed.
00:00:00:		Identifies the time elapsed since each MICA modem event was performed (for example, 01:02:41 means the modem event occurred 1 hour, 2 minutes, and 41 seconds ago).
Startup event:		Type of specified MICA modem.
Modem firmware:		Modem firmware version.
RS232 event:		Detected modem signaling event.
ISDN outgoing called number:		Outgoing ISDN phone number dialed by the specified MICA modem.

Table 6 show modem log Field Descriptions for MICA Modems (continued)

Field	Event State	Description
Modem State Event	Current state of the MICA modem, which can be any of the following:	
	Connect	Modem is connected to a remote host.
	Open	Open modem event.
	Link	Link protocol event occurred.
	Training	Modem retraining event.
	EC correction	Error correction frames transmitted or received.
	Steady	Steady modem event.
	Bad	Inoperable state, which is configured by the **modem bad** command.
	Bad*	Inoperable state, which is configured by the **modem startup-test** command during initial power-up testing.
	Reset	Modem is in reset mode.
	D/L	Modem is downloading firmware.
	Bad FW	Downloaded modem firmware is not operational.
	Busy	Modem is out of service and not available for calls.
	Idle	Modem is ready for incoming and outgoing calls.
Static event:	Current static event of the MICA modem, which can be any of the following:	
	Connect protocol	Connection protocol used for the current session, which can be SYNC mode, ASYNC mode, ARA1.0, ARA2.0, LAP-M, or MNP.
	Compression	Type of compression used for the current session, which can be None, V.42bis TX, V.42bis RX, V.42bis both, or MNP5 data compression.
	Connected standard	Standards protocol used to connect, which can be V.21, Bell103, V.22, V.22bis, Bell212, V.23, V.32, V.32bis, V.32terbo, V.34, V.34+, or K56Flex 1.1.
	TX, RX symbol rate	Symbol rate used to send samples to the line or receive samples off of the line.
	TX, RX carrier frequency	Carrier frequency used by the remote service provider.
	TX, RX trellis coding	Trellis coding received and transmitted.
	Frequency offset	+/-32 in 1/8 Hx steps.
	Round trip delay	Total round trip propagation delay of the link, which is expressed in milliseconds.
	TX, RX bit rate	For RX, the bit rate from the remote service provider to the local service provider. For TX, the bit rate from the local service provider to the remote service provider.

Table 6 show modem log Field Descriptions for MICA Modems (continued)

Field	Event State	Description
Dynamic event:	Current dynamic event of the MICA modem, which can be any of the following:	
	Sq value	Signal quality value, which can be between 0 and 7 (0 is the worst possible quality).
	Signal noise ratio	Expressed in decibels, which can be between 0 and 70 dB steps.
	Receive level	Expressed in decibels, which can be between 0 and -128 dBm steps.
	Phase jitter frequency	+/-32 in 1/8 Hz steps.
	Phase jitter level	0 to 90 degrees.
	Far end echo level	0 to -90 in dBm of far end echo level (that portion of the transmitted analog signal that has bounced off the remote modem's analog front end).
	Phase roll	+/-32 in 1/8 Hz steps.
	Total retrains	Count of total retrains.
	EC retransmission	Count of total error correction retransmissions that occurred during the duration of the link.
	Characters received, transmitted	Count of total characters received and transmitted.
	Characters received BAD	A subset of the above total (Characters received, transmitted). Represents the total number of parity error characters.
	PPP/SLIP packets received, transmitted	Total count of PPP/SLIP packets transmitted and received. This total could include all PPP/SLIP packets, including BAD/ABORTED packets.
	PPP/SLIP packets received, (BAD/ABORTED)	Total count of the bad or aborted PPP/SLIP packets, which is a subset of the above (PPP/SLIP packets received, transmitted).
	EC packets transmitted, received	Count of total error correction frames transmitted or received. This total could include all error correction packets, including BAD/ABORTED packets.
	EC packets (received BAD/ABORTED)	Total count of the bad or aborted error correction packets, which is a subset of the above (EC packets transmitted, received).

Related Commands

Command	Description
show modem configuration	Displays the current modem configuration.
show modem operational-status	Displays the statistics of the active session.

show modem operational-status

To display the active session's statistics, use the **show modem operational-status** command in privileged EXEC mode.

For Cisco 3600 series and Cisco AS5300 universal access servers:

show modem operational-status {*slot* | *slot*/*port*}

For Cisco AS5800 universal access servers:

show modem operational-status [*shelf*/*slot*/*port*]

Syntax Descriptions

slot/*port*	(Optional) On Cisco 3600 series and Cisco AS5300 universal access servers, specifies the location of the slot and modem port. If these numbers are not specified, statistics for all connected modems are displayed. (Remember to include the forward slash (/) when entering these variables.)
shelf/*slot*/*port*	(Optional) On Cisco AS5800 universal access servers, specifies the shelf, slot, and modem port. If these numbers are not specified, statistics for all connected modems are displayed. (Include the forward slash (/) when entering these arguments.)

Defaults

No default behavior or values

Command Modes

Privileged EXEC

Command History

Release	Modification
11.2P	This command was introduced on the Cisco AS5400.
12.2(2)XA	Additional disconnect reasons and states information was added.
12.2(2)XB	This command was supported with Cisco IOS Release 12.2(2)XB.
12.2(11)T	This command was integrated into Cisco IOS Release 12.2(11)T and support was added for Cisco AS5300 and Cisco AS5800 platforms.

Usage Guidelines

The **show modem operational-status** command is supported on Cisco AS2600, Cisco AS3600, and Cisco AS5300 series access servers with internal MICA technologies or Microcom analog (NM-AM) modems, but not in servers with internal Microcom digital modems.

To display performance statistics for Cisco AS3600 access servers with other modem types, use the following command sequence:

```
Router# modem at-mode s/p
AT@E1
```

Sample output and explanations of the **AT@E1** modem command are provided in the document *AT Command Set and Register Summary for Analog Modem Network Modules*, found in the Analog Modem Firmware index of the Cisco 3600 Series Router documentation on CCO.

To see the operational status of a specific modem port or port range for the Cisco AS5400 and AS5800 access servers, use the **show port operational-status** command.

For the Cisco AS5300 and Cisco AS5800, this command displays the operational status of a specific port or range of ports. The port should have an associated active modem session when the command is entered.

Examples

The following example displays the operational status for modem 2/10 in a Cisco AS5300. This modem resides in slot 0 and is assigned to port number 10.

```
Router#  show modem operational-status 0/1
Modem(2/10) Operational-Status:

 Parameter #0  Disconnect Reason Info:  (0x109)
       Type (=4 ):  Rx (line to host) data flushing, OK
      Class (=1 ): DSP condition
     Reason (=9 ): Modem On Hold timeout value reached
 Parameter #1  Connect Protocol:  LAP-M
 Parameter #2  Compression:  V.44 both
 Parameter #3  EC Retransmission Count:  0
 Parameter #4  Self Test Error Count:  0
 Parameter #5  Call Timer:  52 secs
 Parameter #6  Total Retrains:  0
 Parameter #7  Sq Value:  3
 Parameter #8  Connected Standard:  V.90
 Parameter #9  TX,RX Bit Rate:  49333, 31200
 Parameter #11 TX,RX Symbol Rate:  8000, 3200
 Parameter #13 TX,RX Carrier Frequency:  0, 1920
 Parameter #15 TX,RX Trellis Coding:  0, 16
 Parameter #16 TX,RX Preemphasis Index:  0, 0
 Parameter #17 TX,RX Constellation Shaping:  Off, Off
 Parameter #18 TX,RX Nonlinear Encoding:  Off, Off
 Parameter #19 TX,RX Precoding:  Off, Off
 Parameter #20 TX,RX Xmit Level Reduction:  0, 0 dBm
 Parameter #21 Signal Noise Ratio:  39 dB
 Parameter #22 Receive Level:  -19 dBm
 Parameter #23 Frequency Offset:  0 Hz
 Parameter #24 Phase Jitter Frequency:  0 Hz
 Parameter #25 Phase Jitter Level:  0 degrees
 Parameter #26 Far End Echo Level:  -50 dBm
 Parameter #27 Phase Roll:  0 degrees
 Parameter #28 Round Trip Delay:  2 msecs
 Parameter #30 Characters transmitted, received:  109, 188
 Parameter #32 Characters received BAD:  4
 Parameter #33 PPP/SLIP packets transmitted, received:  5, 5
 Parameter #35 PPP/SLIP packets received (BAD/ABORTED):  0
 Parameter #36 EC packets transmitted, received OK:  10, 19
 Parameter #38 EC packets (Received BAD/ABORTED):  0
 Parameter #39 Robbed Bit Signalling (RBS) pattern:  0
 Parameter #40 Digital Pad:  6.0   dB,  Digital Pad Compensation: None
Parameter #43 V110/PIAFS frames received bad: (n/a)
 Parameter #44 V110/PIAFS frames received good: (n/a)
 Parameter #120 Total Speedshifts: 0
 Parameter #108 Total MOH Time: 0 secs
 Parameter #109 Current MOH Time: 0 secs
 Parameter #105 MOH Status: Modem is Not on Hold
 Parameter #106 MOH Count: 0
```

```
 Parameter #107 MOH Request Count: 0
 Parameter #110 Retrains due to Call Waiting: 0
 Parameter #114 DC Encoder,Decoder State: compressed, compressed
 Parameter #115 DC TX,RX Compression Ratio: 0.00:1, 0.00:1
 Parameter #117 DC TX,RX Dictionary Reset Count: 0, 0
Parameter #119 Diagnostic Code: 00 00 00 00 00 00 00 00
```

Table 7 show modem operational-status Field Descriptions for MICA Modems

Field	Description
Modem (slot/port) Operational-Status:	This parameter identifies the modem.
Parameter #0 Disconnect Reason Info:	This parameter displays reasons for call disconnect.
Parameter #1 Connect Protocol:	This parameter displays the connect protocol for the current session, which can be synchronous (SYNC) mode, asynchronous (ASYNC) mode, AppleTalk Remote Access (ARA) 1.0, ARA 2.0, LAP-M, MNP, FAX mode, Signalling System 7/Continuity Test (SS7/COT), or ISDN mode.
Parameter #2 Compression:	This parameter displays the compression protocol used for the current connection, which can be None, V.42*bis* TX (transmit), V.42*bis* RX (receive), V.42*bis* both, or MNP5 data compression.
Parameter #3 EC Retransmission Count:	This parameter displays the error correction (EC) retransmission count, or the number of times the MICA technologies modem has gone into error recovery in the TX direction for a particular connection. The bigger the number, the worse the connection. However, compare this parameter against the count produced by Parameter #36 (EC packets transmitted, received) to determine if there really is a problem.
Parameter #4 Self Test Error Count:	This parameter displays the total errors generated during a self-test run.
Parameter #5 Call Timer:	This parameter displays the length of the call in seconds. The timer starts when the CONNECT modem state is reached.
Parameter #6 Total Retrains:	This parameter displays the count of total retrains and speed shifts.
Parameter #7 Sq Value:	This parameter displays the measure of the receive signal quality (SQ) bit error rate for the chosen modulation, as estimated by the DSP, where 0 is the highest BER value and 7 the lowest. Depending on the setting of the SQ Threshold (S32), the DSP seeks an SQ value somewhere between the highest and lowest levels. For example, if S32 = 2 (the default), an SQ value of 3 is sought. If the SQ value drops below the threshold for longer than the duration of S35, the DSP attempts a downward speed shift or retrain. Similarly, if the SQ value goes above the threshold for longer than S34, an upward speed shift or retrain is attempted.
Parameter #8 Connected Standard:	This parameter displays the modulation, which can be V.21, Bell03, V.22, V.22*bis*, Bell212, V.23, V.32, V.32*bis*, V.32terbo, V.34, V.34+, K56Flex, V.90, or V.110.

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #9 TX, RX Bit Rate:	This parameter displays the TX bit rate from the local data communication equipment (DCE) to the remote DCE and the RX bit rate from the remote DCE to the local DCE. The following data carrier connect standards support the rates indicated in bits per second (bps): • V.21 TX, RX—300 bps • V.22 TX, RX—1200 bps • V.22*bis* TX, RX—2400 bps • V.23 TX (originate)—1200 bps • V.23 RX (originate)—75 bps • V.32 TX, RX—4800 and 9600 bps • V.32bis TX, RX—4800, 7200, 9600, 12000, and 14400 bps • V.34 TX, RX—2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, and 28800 bps • V.34+ TX, RX—2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, and 33600 bps • K56Flex TX—32000, 34000, 36000, 38000, 40000, 42000, 44000, 46000, 48000, 50000, 52000, 54000, 56000, 58000, and 60000 bps • K56Flex RX—2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, and 31200 bps • V.90 TX—28000, 29333, 30666, 32000, 33333, 34666, 36000, 37333, 38666, 40000, 41333, 42666, 44000, 45333, 46666, 48000, 49333, 50666, 52000, 53333, 54666, and 56000 bps • V.90 RX—2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, and 33600 bps • Bell103 TX, RX—Up to 300 bps • Bell212 TX, RX—0 to 300 and 1200 bps The following fax connect standards support the rates indicated in bits per second (bps): • V.17 TX, RX—7200, 9600, 12000, and 14400 bps • V.27ter TX, RX—2400 and 4800 bps • V.29 TX, RX—7200 and 9600 bps

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #11 TX, RX Symbol Rate:	This parameter displays the TX symbol rate used to transmit samples to the line and the RX symbol rate used to receive samples from the line. The rates are synchronous with each other. The following data carrier connect standards support the indicated baud rates: • V.21 TX, RX—300 baud • V.22 TX, RX—600 baud • V.22bis TX, RX—600 baud • V.23 TX (originate)—1200 baud • V.23 RX (originate)—75 baud • V.23 TX (answer)—75 baud • V.23 RX (answer)—1200 baud • V.32 TX, RX—2400 baud • V.32bis TX, RX—2400 baud • V.34 TX, RX—2400, 2743, 2800, 3000, 3200, and 3429 baud • V.34+ TX,RX—2400, 2743, 2800, 3000, 3200, and 3429 baud • K56Flex TX—8000 baud • K56Flex RX—3200 baud • V.90 TX—8000 baud • V.90 RX—3000, 3200, and 3429 baud • Bell103 TX, RX—300 baud • Bell212 TX, RX—600 baud The following fax connect standards support the indicated baud rates: • V.17 TX, RX—2400 baud • V.27ter TX, RX—1800 baud • V.29 TX, RX—2400 baud

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #13 TX, RX Carrier Frequency:	This parameter displays the TX carrier frequency used by the local DCE and the RX carrier frequency used by the remote DCE. Data carrier frequencies are as follows: • V.21 TX RX—1080 Hz (originate) and 1750 Hz (answer) • V.22 TX, RX—1200 Hz (originate) and 2400 Hz (answer) • V.22bis TX, RX—1200 Hz (originate) and 2400 Hz (answer) • V.23 TX (originate)—1700 Hz • V.23 RX (originate)—420 Hz • V.23 TX (answer)—420 Hz • V.23 RX (answer)—1700 Hz • V.32 TX, RX—1800 Hz • V.32bis TX, RX—1800 Hz • V.34 TX, RX—1600, 1800, 1646, 1680, 1829, 1829, 1867, 1900, 1920, 1959 Hz • V.34+ TX, RX—1600, 1800, 1646, 1680, 1829, 1829, 1867, 1900, 1920, 1959 Hz • K56Flex TX—N/A • K56Flex RX—1600, 1800, 1646, 1680, 1829, 1829, 1867, 1900, 1920, 1959 Hz • V90 TX—N/A • V90 RX—1600, 1800, 1646, 1680, 1829, 1829, 1867, 1900, 1920, 1959 Hz • Bell103 TX, RX—1080 Hz (originate) and 1750 Hz (answer) • Bell212 TX, RX—1200 Hz (originate) and 2400 Hz (answer) Fax carrier frequencies are as follows: • V.17 TX, RX—1800 Hz • V.27ter TX, RX—1200 (originate) and 1600 (answer) • V.29 TX, RX—1700 Hz

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #15 TX, RX Trellis Coding:	Trellis coding adds dependency between symbols to make the detection in noise more robust (Forward Error Correction). Trellis coding is displayed in values of 0, 8, 16, 32, or 64. Use the following key to correlate the trellis code values with the connection standard: • 0—V.22, V.22*bis*, V.21, Bell212, Bell103, V.29, or V.27 • 8—V.32, V.32*bis*, or V.17 • 16, 32, 64—V.34, V.34+, V.90, K56Flex **Note** MICA technologies modems do not support values of 32 or 64 in the RX direction, but do support values of 16, 32, and 64 in the TX direction.
Parameter #16 TX, RX Preemphasis Index:	The pre-emphasis index involves shaping the raw transmit spectrum to deal with spectrum roll-offs. The preemphasis index can take on the values from 0 to 10. A zero denotes no reshaping. Typical values usually fall in the range from 0 to 2, or 6 to 7. This index is used with V.34 and V.34+ connection standards.
Parameter #17 TX, RX Constellation Shaping:	Constellation shaping is a technique for improving noise immunity by using a probability distribution for transmitted signal points. The signal states are used to predict the sensitivity to certain transmission impairments. Constellation shaping is used with the V.34 and V.34+ connection standards. Values displayed by this parameter are either none or active (Off or On).
Parameter #18 TX, RX Nonlinear Encoding:	Nonlinear encoding occurs during the training phase and moves the outer points of the constellation away to deal with nonlinear distortion. Nonlinear distortion (in the range from 0 to 200 Hz) tends to affect the higher-powered signals. Moving the outer constellation points out reduces the chance of error. Nonlinear encoding is used with the V.34 and V.34+ connection standards. Values displayed by this parameter are either none or active (Off or On). **Note** MICA technologies modems support nonlinear coding in both directions.
Parameter #19 TX, RX Precoding:	Precoding serves the same purpose as the preemphasis index, but instead manages the bits and not the raw transmit signals. This management is done only when asked for and therefore will occur only in the RX mode. Precoding is used with the V.34 and V.34+ connection standards. Values displayed by this parameter are either none or active (Off or On).
Parameter #20 TX, RX Xmit Level Reduction:	The Xmit (transmit) level affects the transmit signal with 0 to 15 in dBm of reduction. If nonlinear distortion is detected, the MICA technologies modem will request a lower-powered TX signal. If the remote end detects nonlinear distortion, it will also request a lower-powered TX signal. Xmit level reduction is used with the V.34 and V.34+ connection standards. Values displayed by this parameter are the transmit signal and reduction, in dBm.

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #21 Signal Noise Ratio:	A signal to noise ratio (SNR) is the ratio between the expected signal and the error signal. For example, consider a four-point constellation at (*x*,*y*) = (–1,1), (1,1), (1,–1), and (–1,–1). The receive signal comes in at (*x*^,*y*^) = (0.5,1.5). The expected value, although not guaranteed, is (1,1). The error vector is then calculated as follows: *e* = (*x* – *x*^, *y* – *y*^) = ([1–0.5], [1–1.5]) = (0.5,–0.5) and the SNR is calculated as follows: SNR = 20*log10 [magnitude(expected value *x*,*y* of constellation) / magnitude(error)] SNR = 20 log10 [magnitude(1,1) / magnitude(0.5,–0.5)] = 6.02 dB This parameter displays the ratio measurement of the desired signal to noise. MICA technologies modems measure the SNR in only the signal band that has a rate equal to the baud rate (that is, 3200 Hz, 2400 Hz, and so on). Note that a 28.8-kbps connection demands an SNR of about 37 dB. If the rate is lower than this, the quality of the connection diminishes. A 33.6-kbps connection demands an SNR of 38 to 39 dB. A clean line has an SNR of about 41 dB. The values displayed by this parameter range from 0 to 70 decibels (dB) and change in 1-dB steps.
Parameter #22 Receive Level:	The receive level is the power of the received signal and ranges from 0 to –128 dBm in 1-dBm incremental steps. The ideal range is about –22 dBm in the United States and –12 dBm in Europe. In theory, MICA technologies modems can handle a receive level up to –4 dBm. However, the receive level they can handle is a function of the echo level. If there is absolutely no echo, the MICA modem should be able to handle a –4 dBm level. As the echo level goes up, the receive level that the MICA modem can handle moves from –4 dBm to –5 dBm, and so on. The optimum range for the receive level displayed by this parameter is from –12 dBm to –24 dBm.
Parameter #23 Frequency Offset:	Frequency offset is a difference between the modulation carriers—that is, the frequency shift in the receive spectrum between the expected RX carrier frequency and the actual RX carrier frequency. The values displayed by this parameter range from +/–32 in 0.125-Hz steps. The typical value is 0 Hz. **Note** Values of up to +/–7 Hz can be found on analog trunk circuits and will be compensated for by the MICA technologies modems.

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #24 Phase Jitter Frequency:	Phase jitter frequency is the peak-to-peak differential between two signal points. The following calculation models a typical RX carrier: $e^{j(wt+a)}$ but when phase jitter is detected, the RX carrier is modeled as follows: $e^{j[wt+a+K \sin(bt+c)]}$ where: *w* = carrier frequency *a* = carrier phase *K* = magnitude of sinusoidal phase jitter *b* = frequency of sinusoidal phase jitter *c* = phase of sinusoidal phase jitter Uncanceled phase jitter looks like "rocking" of the baseband QAM constellation. The points look like arcs with the outer points having longer arcs. The phase jitter measurements displayed by this parameter range from +/–32 in 0.125-Hz steps. The typical value is 0 degrees (that is, phase jitter is not normally present). **Note** This value is found only on analog trunk circuits. Typical frequencies are power generation frequencies and their harmonics (that is, 60, 120 Hz within the U.S; 50, 100 Hz international). MICA technologies modems cancel all known frequencies.
Parameter #25 Phase Jitter Level:	Phase jitter level is the amount of phase jitter measured and indicates how large the "rocking" is, in degrees. On an oscilloscope, the constellation points would look like crescent moons. The jitter level corresponds to magnitude *K* as described in Parameter #24. Values displayed by this parameter can range up to 15 degrees. The typical value is 0 degrees (that is, phase jitter is not normally present).

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #26 Far End Echo Level:	Over long connections, an echo is produced by impedance mismatches at 2-wire-to-4-wire and at 4-wire-to-2-wire hybrid circuitry. This parameter displays the far-end echo level (that portion of the transmitted analog signal that has bounced off of the analog front end of the remote modem), which can range from 0 to –90 dBm. A MICA modem cannot handle near-end echo if far-end echo is present and the round-trip delay is greater than 10 microseconds. This constraint comes from the number of taps in the echo canceler of MICA modems. Assuming that there is no near-end echo, the performance of the receiver varies as the ratio of the receive level divided by the far-end echo (RECEIVE LEVEL/FAR END ECHO). As the echo level rises, the receiver performance degrades. (This is why the MICA modem can handle "hotter" receive levels with less echo.) The technical reason for this degradation has to do with *dynamic range*. Every echo canceler has some residual echo (error) left in the signal. This residual echo adds to the power of the receive signal going through the rest of the MICA modem receiver. With little residual echo, there is more dynamic range for the actual receive signal. For a call to go from the MICA modem to the local switch and back into MICA, the reported far-end echo level must be less than –55 dBm. A greater echo level indicates a digital-to-analog conversion in the path between the MICA modem and the switch. MICA modems are not supported in this topology.
Parameter #27 Phase Roll:	This parameter displays the phase roll, which affects the echo signal coming back to the MICA modem. A certain constellation pattern is transmitted from a MICA modem when the echo signal reaches the central office (CO). Some echoed form of this signal/constellation pattern is sent back to the MICA modem; however, the constellation shape may be rotated from 0 to 359 degrees. This rotation is called the *phase roll*. The echoed signal consists of a frequency component and a phase component. If the frequency component changes at all, a correction is needed for echo cancellation to work correctly. A slight variance (an unknown amount that would have to be determined through experimentation) in the phase may not affect how the echo canceler performs. Too much change in phase also needs correcting for proper echo cancellation to occur. The phase roll value ranges from +/–32 in 0.125-Hz steps. The typical value is 0 or close to 0.

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #28 Round Trip Delay:	Round-trip delay is the total round-trip propagation delay of the link in microseconds. This delay is important for proper echo cancellation. This parameter displays the round-trip delay; the amount of delay varies with each network. **Note** The buffer speed for MICA modems is 4096 baud; therefore, at 2400 baud the delay is 1.7 seconds, and at 3429 baud, 1.19 seconds. Since round-trip delay is measured before the baud rate is chosen, round-trip delay is used to disable those baud rates for which the round-trip delay cannot be supported. For example, if the round trip-delay is 1.25 seconds, 3429 is disabled for that train attempt.
Parameter #30 Characters received, transmitted:	This parameter displays the total count of characters (before modem compression of any type) received and transmitted.
Parameter #32 Characters received BAD:	Not used.
Parameter #33 PPP/SLIP packets received, transmitted:	This parameter displays the total count of Point-to-Point Protocol (PPP) and Serial Line Internet Protocol (SLIP) packets transmitted and received. This total could include all PPP/SLIP packets, including BAD/ABORTED packets.
Parameter #35 PPP/SLIP packets received (BAD/ABORTED):	This parameter displays the total count of the bad or aborted PPP/SLIP packets, and is a subset of the counter shown in Parameter #33 (PPP/SLIP packets received). A counted PPP packet has a bad FCS, or the SLIP packet has a transparency error. Errored PPP frames should be seen only when asynchronous framing (no EC protocol) is being used.
Parameter #36 EC packets transmitted, received OK:	This parameter displays the number of EC packets transmitted (the number of TX frames that the client modem has accepted) and the number of EC packets received (the number of RX frames that the MICA modem has accepted).
Parameter #38 EC packets (Received BAD/ABORTED):	Parameter #38 is identical to Parameter #3 (EC Retransmission Count). It may read differently from Parameter #3, depending on how the software requests the parameter information.
Parameter #39 Robbed bit Signalling (RBS) pattern:	This parameter displays the number of robbed bits detected in the connection. The robbed bits are used for in-band signalling. This information is reported only for K56Flex by the analog modem. The 6 least significant bits of the returned value indicate the periodic RBS pattern, where a 1 denotes a pulse code modulation sample with a robbed bit.

Table 7 show modem operational-status Field Descriptions for MICA Modems (continued)

Field	Description
Parameter #40 Digital Pad, Digital Pad Compensation:	A digital pad can be implemented by the CO to attenuate a "hot" signal. Compensation boosts the signal by the amount of the pad. This parameter displays values that usually range from 0 to 10 dB, with typical values being 0, 3, and 6 dB. **Note** A digital pad is mandatory for K56Flex, but configurable for V.90 using S52. K56Flex supports only 0, 3, and 6 dB. V.90 supports steps of 1/8192 dB, but it is reported to the host in steps of 0.125-dB granularity.
Line Shape:	The display at the bottom of the report shows line shaping as a frequency-response graph of the channel. The *Y* (vertical) axis represents frequencies from 150 Hz (top of chart) to 3750 Hz (bottom of chart) in 150-Hz steps. The *X* (horizontal) axis represents a normalized amplitude. The graph can help identify nulls, bandwidth, and distortion (irregular shape). A flat spectrum plot is best. This display is available only for V.34, V.90, and K56Flex connection standards.

Related Commands

Command	Description
show modem configuration	Displays the current modem configuration.
show modem log	Displays the modem history event status performed on a manageable modem or group of modems.

Glossary

CLI—command-line interface.

CSMv6—Mindspeed modem hardware solution.

CSR—call success rate.

DFC—dial feature card.

DSP—Digital Signal Processor. Microprocessor on which the modulation/demodulation process is carried out.

ISP—Internet service provider.

ITU-T—International Telecommunication Union Telecommunication Standardization Sector.

LZJH—Lempel-Ziv-Jeff-Heath data compression algorithm used in V.44.

MICA—Modem ISDN channel aggregation. Used as a generic term to describe the Dial Technology Division (DTD) high-density modem technology.

MOH—Modem on Hold functionality specified in V.92.

NextPort—Device driver architecture for Cisco IOS software that supports the NextPort hardware and software interfaces. Supports the Universal Port concept.

PCM—pulse code modulation.

PSTN—Public Switched Telephone Network.

RADIUS—Remote Dial-In User Service. Database for authenticating modem and ISDN connections and for tracking connection time.

SPE—service processing element.

universal port—Concept of a single device that can terminate one digital signaling level zero (DS0) with a data modem, fax modem, ISDN, or voice solution.

QC—Quick Connect functionality specified in V.92.

V.44—ITU modem standard for LZJH data compression algorithm.

V.92—ITU modem standard that contains Quick Connect, Modem On Hold, and PCM upstream.

VSA—vendor-specific attribute (as used with RADIUS).