



## V.92 and V.44 Support for Digital Modems

---

The V.92 and V.44 Support for Digital Modems feature supports the V.92 Modem on Hold and V.92 Quick Connect portions of the new V.92 modem standard, and the new V.44 LZJH compression standard based on Lempel-Ziv, on the Cisco 3600 and 3700 router platforms.

### Feature Specifications for V.92 and V.44 Support for Digital Modems

---

#### Feature History

Release	Modification
12.2(11)YT	This feature was introduced.
12.2(15)T	This feature was integrated into Cisco IOS Release 12.2(15)T.

---

#### Supported Platforms

Cisco 3620; Cisco 3640; Cisco 3640A; Cisco 3660; Cisco 3725; Cisco 3745

---

### Finding Support Information for Platforms and Cisco IOS Software Images

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

## Contents

- [Prerequisites for V.92 and V.44 Support for Digital Modems, page 2](#)
- [Restrictions for V.92 Support for Digital Modems, page 2](#)
- [Information About V.92 and V.44 Support for Digital Modems, page 2](#)
- [How to Use the V.92 and V.44 Support for Digital Modems Feature, page 8](#)
- [Additional References, page 9](#)



---

**Americas Headquarters:**  
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

## Prerequisites for V.92 and V.44 Support for Digital Modems

Client modem vendors must supply their own utilities to enable the V.92 Modem on Hold feature with each client modem.

## Restrictions for V.92 Support for Digital Modems

- Cisco modems do not support pulse code modulation (PCM) upstream as defined in the V.92 International Telecommunication Union (ITU) standard. Cisco hardware will, however, interoperate with modems that support PCM upstream.
- 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 (MOH) transaction returns to the data-connected state, it retains the same IP network connection. Any other connected application might not be returned to its prior state, depending on the application's data transaction requirements during the MOH active state.
- Configuration of the features described in this document using S-registers is carried out by using modemcaps (modem attention or 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 MOH 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 MOH and because images may be built to support specific modem types, not all software images contain functions to control MOH. In addition, the modems that do support MOH each implement their control functions differently. Therefore, registry functions are used to interface between RADIUS, local authorization, and MOH control for modems.
- Server-initiated MOH is not supported.
- During a suspended modem session, some data might be dropped. The ISP idle timer, which disconnects a dial-in user if no data is 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 MOH feature. The vendors are aware of the issue and are working to correct it. If you are a customer having trouble with the MOH feature in Europe, we suggest that you contact the client modem vendor to verify that the modem complies with the telephony signaling for call waiting, caller ID, and three-way calling in their particular country.

## Information About V.92 and V.44 Support for Digital Modems

The following sections provide information about the V.92 and V.44 Support for Digital Modems feature.

- [ITU-T V.92 Modem Standard, page 3](#)
- [V.44 LZJH Compression, page 7](#)

## ITU-T V.92 Modem Standard

The ITU-T V.90 modem standard recommendations have been enhanced with V.92, a new standard that 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 supports the following parts of the V.92 modem standard:

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

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 hex MICA technologies module (HMM) or dual MICA technologies module (DMM), including on memory requirements.

### V.92 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 V.92 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 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 the 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. (You are not required to have a RADIUS server to use the V.92 Modem on Hold feature.)

### V.92 Modem on Hold AT Commands 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 MOH is controlled with the S62 S-register (S62 must be set to enable MOH). AT commands download the configuration to the modem at the end of every call. The **ATS $n$ =v** and **ATS $n$ ?** AT commands are used to configure the V.92 Modem on Hold feature on Cisco MICA platforms. [Table 1](#) lists additional S-register parameters used to enable and disable the feature.

**Table 1** V.92 Modem on Hold S-Registers

Name	Register	Index	Default	Description
MOH Timeout	S62	63	0 MOH Disabled	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

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 VSA to disable MOH if the feature was initially enabled by the default value (modemcap).

**Note**

If the feature is enabled using `S29=12` and V.92 Modem on Hold is disabled using `S62=0`, statistics for the number of times a dial-in customer requests an on-hold function 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](#).

**RADIUS Authorization**

Per-user control of V.92 Modem on Hold can be configured for caller authorization using a RADIUS server. RADIUS servers use the VSA capability to configure MOH for individual users. The current `attribute=value` protocol syntax has been extended with the new Modem on Hold attribute. You can enter an unsigned integer in the range from 0 through 65,535 that represents the maximum number of seconds that a modem may remain on hold, and which can extend from 10 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 V.92 Modem on Hold configuration is not present, or if it is not syntactically correct, the modem uses its default configuration for MOH. 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 MOH configuration.

**Note**

---

Code space requirements for RADIUS support is less than 2 KBs. 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 MOH 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 MOH 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 V.92 Modem on Hold, a command is sent from the Cisco IOS host to the Cisco MICA channel to set the MOH parameters. No confirmation from the channel is required.

When the client modem requests a V.92 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 unavailable while a modem is on hold.

**Note**

When a RADIUS server is used, 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 V.92 Modem on Hold, then the call might continue anyway. If the asterisk is replaced by an equal sign (=), the attribute is required, and modems that do not support MOH 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 down 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.

## V.92 Quick Connect

V.92 Quick Connect speeds up the client-to-server startup negotiation, reducing the overall connect time by up to 30 percent. The client modem retains line condition information and characteristics of the connection to the ISP, which reduces connect time by avoiding some of the initial signal handshaking.

### V.92 Quick Connect AT Commands and S-Registers

V.92 Quick Connect is enabled by default and is controlled with standard AT commands and S-registers. S29 is used to enable V.92 sequence detection and S63 is used to enable V.92 Quick Connect, both of which are enabled by default. The S63 S-register controls the feature through the ANSpcm signal. You can choose the power level of the ANSpcm signal, which defaults to -12 dBm (the transmit power level for the United States). The **ATSn=v** and **ATSn?** AT commands are used to configure V.92 Quick Connect on Cisco MICA platforms.

To disable V.92 Quick Connect or to set a different ANSpcm value, you can use a modemcap (for example, v92\_v44:MSC=s62=8s63=0s21=15s29=12), or you can set the S29 register to any number other than 12. [Table 2](#) lists the S-registers used to enable and disable the V.92 Quick Connect feature.

**Table 2 Quick Connect (QC) Config S-Registers**

Name	Register	Index	Default	Description
V.92 QC Config	S63	64	0x3  QC Enabled  ANSpcm Level -12 dBm	Bit 0: QC Enable  0: Disabled 1: Enabled  Bits 1–2 ANSpcm Level  00: -9 dBm 01: -12 dBm 10: -15 dBm 11: -18 dBm

**Note**

If the V.92 Modem on Hold feature is enabled using S29=12, and QC is disabled using S63=0, then the QC Exchange Link Information Parameter is updated to show if QC was requested. However, completely disabling the feature by setting S29 to a value other than 12 disables the reporting of QC requests.

For detailed information about the AT commands and S-registers that are used to configure the V.92 Quick Connect feature on Cisco MICA platforms, refer to the [AT Command Set and Register Summary for MICA 6-Port Modules](#).

## V.44 LZJH Compression

V.44 LZJH is a new compression standard based on Lempel-Ziv that uses a new string-matching algorithm that increases upload and download speeds to make Internet access and Web browsing faster. The V.44 call success rate (CSR) is similar to V.42bis with significant compression improvement for most file types, including HTML files. V.44 applies more millions of instructions per second than V.42bis toward the same application data stream and yields better compression rates in almost any data stream in which V.42bis shows positive results.

V.44 supports automatic switching between compressed and transparent modes on supported platforms. Automatic switching allows overall performance gain without loss in throughput for file streams that are not compressible.

V.44 is globally controlled through dialed number identification service (DNIS), calling line identification (CLID), and resource pool manager server (RPMS) virtual groups, and performance improvement is determined by the LZJH algorithms.

To support V.44 LZJH compression, the control switch module (CSM) has been modified. MIBs that show the status of V.42bis have been extended to show V.44 configuration status. New disconnect reasons help manage V.44 session status and debugging.

## V.44 AT Commands and S-Registers

V.44 compressor/decompressor optimizes throughput and the CSR using the standard AT command interface. New AT commands are provided so that V.44 can be enabled or disabled at the modem level. Modemcaps (dial in) or chat scripts (dial out) are required to enable or disable V.44 globally on the access server.

The AT command interface supports new S-registers for tuning V.44 negotiation parameters and lets you monitor V.44 configuration and session status. The **ATSn=v** AT command is used to configure V.44, and the **ATSn?**, **AT%R**, and **AT\S** commands are used for obtaining V.44 status. These commands modify the operation of S21 to enable and disable the algorithm.

[Table 3](#) shows the S21 register values, and [Table 4](#) shows additional S-register values used with the V.44 feature. V.44 is enabled by default.

**Table 3** V.44 S-Registers (Existing)

Name	Register	Index	Default	New Values
Data Compression	S21	NextPort 0x800b MICA 11	0xf	Bit 2: V.44 Tx Bit 3: V.44 Rx

**Table 4** V.44 S-Registers (Redefined)

Name	Register	Index	Default	Description
V.44 Max Tx Codewords	S65	NextPort 0x8042 MICA 66	2048	256–2048
V.44 Max Rx Codewords	S66	NextPort 0x8043 MICA 67	2048	256–2048
V.44 Max Tx String Length	S67	NextPort 0x8044 MICA 68	255	0–255 characters
V.44 Max Rx String Length	S68	NextPort 0x8045 MICA 69	255	0–255 characters
V.44 Max Tx History Size	S69	NextPort 0x8046 MICA 70	10240	256–10240 bytes
V.44 Max Rx History Size	S70	NextPort 0x8047 MICA 71	10240	256–10240 bytes

## How to Use the V.92 and V.44 Support for Digital Modems Feature

Cisco IOS software is responsible for controlling the features and displaying the new statistics. There are no tasks associated with configuring this feature. However, you may find the following table listing commands for monitoring digital modems that support the V.92 and V.44 modem standards useful.

- [Monitoring Cisco Modems, page 8](#)

### Monitoring Cisco Modems

To monitor Cisco digital modems that support the V.92 and V.44 modem standards, use the following **show** commands in privileged EXEC mode:

Command	Purpose
Router# <b>show modem</b>	Displays a high-level performance report for all the modems or a single modem.
Router# <b>show modem call-stats</b>	Displays the local disconnect reasons for all modems inside an access server or router.
Router# <b>show modem configuration</b>	Displays the current modem configuration for digital Cisco MICA technologies modems.
Router# <b>show modem log</b>	Displays the modem event log with oldest event first.
Router# <b>show modem operational-status</b>	Displays the operational status of the specified ports or the specified port range.



# Configuration Examples

None.

## Additional References

For additional information related to V.92 and V.44 Support for Digital Modems feature, refer to the following references:

## Related Documents

Related Topic	Document Title
Modem commands	<a href="#">Cisco IOS Dial Technologies Command Reference</a>
Modem configuration and management	<a href="#">Cisco IOS Dial Technologies Configuration Guide</a>
AT Commands and S Registers	<a href="#">AT Command Set and Register Summary for MICA 6-Port Modules</a>

## Standards

Standards <sup>1</sup>	Title
ITU-T	V.92 — “Enhancements to Recommendation V.90”
ITU-T	V.44 — “Data Compression Procedures”

1. Not all supported standards are listed.

## MIBs

MIBs	MIBs Link
Table 5, Table 6, and Table 7 provide Cisco MIBs for the V.92 Modem on Hold and V.44 MIBs.	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: <a href="http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a>

**Table 5** Modem On Hold MIBs (Existing)

MIBs	Attribute	New Values	
CISCO-MODEM-MGMT-MIB	cmDisconnectReason	modemDrMohClrd	87
		modemDrMohTimeout	88

**Table 6** V.44 MIBs (Existing)

MIBs	Attribute	New Values	
CISCO-MODEM-MGMT-MIB	cmDisconnectReason	modemDrDcIllegalCodewordStepup	94
		modemDrDcIllegalTokenEmptyNode	95
		modemDrDcIllegalTokenTooLarge	96
		modemDrDcReservedCommand	97
		modemDrDcIllegalCharacterSizeStepup	98
		modemDrDcRxDictionaryFull	99
		modemDrDcRxHistoryFull	100
		modemDrDcRxStringSizeExceeded	101
		modemDrDcNegotiationError	102
		modemDrDcCompressionError	103
CISCO-CALL-TRACKER-MODEM-MIB	CctmDataCompression	v44Tx	6
		v44Rx	7
		v44Both	8

**Table 6** V.44 MIBs (Existing)

MIBs	Attribute	New Values	
CISCO-CALL-TRACKER-MODEM-MIB	cctmActiveSupportedDC	v44Rx v44Tx	Bit 3 Bit 4
CISCO-CALL-TRACKER-MODEM-MIB	cctmHistorySupportedDC	v44Rx v44Tx	Bit 3 Bit 4

**Table 7** V.44 MIBs (Redefined)

MIBs	Attribute	Value	Old Name	New Name
CISCO-MODEM-MGMT-MIB	cmDisconnectReason	41	modemDrBadV42bisRxdata	modemDrDc GeneralError

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>

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com 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](mailto: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

RFCs	Title
None	—

## Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: [www.cisco.com/go/trademarks](http://www.cisco.com/go/trademarks). Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

© 2001-2008 Cisco Systems, Inc. All rights reserved.