# Recommended Modemcaps for Internal Digital and Analog Modems on Cisco Access Servers

**Document ID: 21505**

# Contents

# Introduction

Many Internet Service Providers (ISPs) purchase 56k modems and V.92 capable modems so that their users can use V.90 connection speeds. Unfortunately, V.90 performance can be elusive. In many cases, this is due in part to the many different client modems used by customers.

# Prerequisites

## Requirements

There are no specific requirements for this document.

## Components Used

This document is not restricted to specific software and hardware versions.

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live

network, ensure that you understand the potential impact of any command before using it.

## Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

## Background Information

Connection problems usually involve more than two modems on each end. Determining the cause of a substandard connection speed or poor call success rate can become very involved. It may require you to examine every connecting element along the path, such as the customer phone line, the path the call takes through the Telco network and the final leg to the network access server (NAS).

In modem tuning, increases in speed are made at the expense of stability. A V.90 connection is very sensitive to line noise and interference. Individual users with problems getting V.90 performance should look into line noise problems in their local environment. ISPs with problems getting V.90 performance should look into possible T1/E1 problems. ISPs should also request that their Telco check the media path calls take when reaching the ISP's equipment. Depending on the specific needs of the connection, it may be better to tune the modems to use a lower speed so the connection will be more reliable, albeit at lower speeds.

Assuming that the physical path between the client and NAS is sound, modems should be able to negotiate a matching set of features and settings. On the server side, the modem settings are controlled by an included database called a modem capability (modemcap). The modemcap is used by Cisco IOS® software to associate some commonly−used modem types with settings that have shown to work in the past. Cisco updates the modemcap entries periodically to make them correct for normal use. If there is a useful setting, it is incorporated into the default setting of the next version of the modemcap. Customers often ask for an initialization string that works best in all situations, however, if such a string were available then it would be made the default. However, although default modemcaps are designed for normal use, they can be used to customize the behavior of the Access Server's built−in digital modems as the situation warrants. Procedures for using the modemcap are included below.

This document provides recommended modemcaps for the various modem firmware and portwares in use. We also discuss several tips regarding modemcaps as well as the procedure for configuring them.

## Upgrade Modem Firmware

Cisco does not recommend needlessly upgrading modems to the latest firmware revision. If you are satisfied with the performance of the existing modem firmware version, then continue to use the same one. Unnecessary upgrades can cause a degradation in service, since a setting or feature that performed well in a previous revision may have been modified in the newer version. Such changes can be difficult to track down.

You can determine the version of firmware that is running on the Access Server using the **show modem version** command for Mica and Microcom modems, and the **show spe version** command for NextPort service processing elements (SPEs).

If you wish to upgrade your firmware, proceed to the Cisco Software Upgrade Planner to download the firmware you want.

Refer to Upgrading the Modem Firmware/Portware in Cisco Routers with Internal Digital Modems for the upgrade procedure for MICA, Microcom and NextPort modems.

For the NM−8AM and NM−16AM Analog modem modules, use the procedure in Analog Modem Firmware Upgrade Configuration Note.

# Configure Modems Using modem autoconfigure

This section describes how to apply a new modemcap to an integrated modem. A modemcap is a database of setup strings that is used by the modem autoconfigure function to change a modem's default settings. The modemcap is configured using the **modem autoconfigure** command.

For more information on the application of modemcaps refer to the document Modem Management Operations.

Keep the following rules in mind:

- Do not use the **modem autoconfigure discovery** command.
- If using the **modem autoconfigure** command, remove any commands under the line configuration section for **script reset** and **script startup**. These commands are redundant and have been harmful in some cases.
- When writing a modemcap, ignore the descriptive fields seen in **show modemcap**. Put the modem initialization string you want into the miscellaneous (MSC) field of the modemcap.
- Always start the initialization string with **&F** (for non−Cisco modems, start with the preferred **&F1**, **&F2**, as appropiate).
- Never put **&W** into an initialization string. On modems where **&W** is not a no op (that is, a statement or operation that does nothing), this can wear out the erasable programmable read−only memory (EPROM).
- With MICA modems, use **&F&D2**, unless you have specific setting you wish to adjust.
- Always use the **modem autoconfigure type** *modemcap−name* command (in line configuration mode) to apply the modemcap to the modems.
- If you want the modems to use the default configuration, use the **modem autoconfigure type mica** command, regardless of the kind of modem, to reset the modem to factory defaults (**&F**).
- All modems (internal, external, and so on) are susceptible to denial of service problems if Reverse Telnet is allowed and a modemcap is not configured. Therefore, always specify a modemcap.

## Create and Apply the Modemcap

The following section demonstrates how to configure and apply a simple modemcap:

```
maui-nas-02#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
maui-nas-02(config)#modemcap edit MY_MODEMCAP miscellaneous &F&D2

! --- In this example the modemcap name selected is MY_MODEMCAP
! --- The miscellaneous field is used to input the initialization string &F&D2


maui-nas-02(config)#line 1 192
maui-nas-02(config-line)#modem autoconfigure type MY_MODEMCAP

! --- Apply the modemcap (named MY_MODEMCAP) to the modems in line configuration mode
```

**Tip:** Activate the **debug confmodem** command (prior to applying the modemcap) to see the initialization string being applied to the individual modems. Note that for devices with a large number of modems this may take a while and generate numerous console messages. An example is shown below:

```
maui-nas-02#debug confmodem
Modem Configuration Database debugging is on

maui-nas-02(config)#line 1 192
maui-nas-02(config-line)#modem autoconfigure type MY_MODEMCAP
```

```
    ...
    ...
    *Apr  5 20:30:42.322: TTY7: detection speed (115200) response ---OK---
    *Apr  5 20:30:42.322: TTY7: Modem command:  --AT&F&D2--

    ! --- The initialization string &F&D2 (from the modemcap) was applied

    *Apr  5 20:30:42.322: TTY8: detection speed (115200) response ---OK---
    *Apr  5 20:30:42.322: TTY8: Modem command:  --AT&F&D2--
    *Apr  5 20:30:42.322: TTY9: detection speed (115200) response ---OK---
    *Apr  5 20:30:42.326: TTY9: Modem command:  --AT&F&D2--
    *Apr  5 20:30:44.878: TTY7: Modem configuration succeeded

    !---Modem configuration is successful

    *Apr  5 20:30:44.878: TTY7: Detected modem speed 115200
    *Apr  5 20:30:44.878: TTY7: Done with modem configuration
    *Apr  5 20:30:44.878: TTY8: Modem configuration succeeded
    *Apr  5 20:30:44.878: TTY8: Detected modem speed 115200
    *Apr  5 20:30:44.878: TTY8: Done with modem configuration
    *Apr  5 20:30:44.878: TTY9: Modem configuration succeeded
    *Apr  5 20:30:44.878: TTY9: Detected modem speed 115200
    *Apr  5 20:30:44.878: TTY9: Done with modem configuration
    ...
    ...
```

# Integrated Modems

The modems used in Cisco Access Servers are either analog or digital depending on the modem hardware.

The analog modems are designed to accept RJ−11 connectors (regular phone jacks) from the public switched telephone network (PSTN). Analog modems are most useful for a site that just needs a few phone lines to be used for data. Analog modem modules can only be used in Cisco 2600 and 3600 servers, and are designated with an "AM" part number (for example, NM−8AM, NM−16AM, WIC−1AM, and so on). All integrated analog modems are a type of Microcom modem.

Digital modems take calls that come in on a line that is digitally encoded, such as a T1 or BRI. Digital modems can be found on any modular Access Server and are designated with a "DM" part number (such as NM−30DM or AS53−6DM). Digital modems are available as MICA, NextPort, and Microcom. However, the older Microcom digital modem cards are normally only seen in the AS5200.

In order to achieve the desired connectivity between client and server modems, it is important to be aware of which server modems support which modulations with which client modems running which versions of firmware. Refer to Firmware and Portware Information for more information. In general, the list of modulations supported by an external modem is provided in its documentation.

# Analog Modems

V.90 speeds are not available on Access Servers with analog modems. Analog modems are limited to V.34 speeds. V.90 depends on the availability of digital access to the telephone network. For more information on this topic, refer to Overview of General Modem and NAS Line Quality. The analog modem modules have RJ−11 connectors to plug directly into the wall outlets where an external modem would be attached. Analog modem firmware must be loaded in the router's Flash.

**Note:** The WIC−1AM and WIC−2AM Analog Modems can get 56 kbps (V.90) for an outgoing call to a NAS connected to a digital circuit.

For configuration purposes, analog modems are addressed as:

```
interface async
line_number
```

## Line Numbers

In Cisco 3600 modular routers, Cisco IOS software reserves 32 line numbers per slot. The AUX port is line 65 on the Cisco 3620, and line 129 on the Cisco 3640.

```
line_number = (slot * 32) + unit + 1
```

Refer to How Async Lines are Numbered in Cisco 3600 Series Routers for more information.

## Country Configuration

Configure the country with the **modem country microcom country global** configuration command. Use **europe** as the country code for all TBR21 countries.

To find out which modem firmware version you have, enter the **show modem version** command at the EXEC prompt (Router> or Router#:). For example:

```
Router> show modem version
    Slot1: MCOM Analog Integrated Modem Firmware
    Source: slot1:1:c3600-2600-analog-fw.1.2.0.bin
    Boot firmware: 1.1.5
    MIMIC firmware: 1.3.3
    Modem firmware: 2.3.8
    DSP firmware: 0.0.2
```

## Modem Firmware Versions

Following is a table of modem firmware versions:

| Command Output | Actual Modem Firmware Version |
|---|---|
| 2.2.44 | 1.0.0 |
| 2.2.46 | 1.0.1 |
| 2.2.47 | 1.0.2 |
| 2.2.48 | 1.0.3 |
| 2.3.8 | 1.2.0 |
| 2.4.0 | 1.2.2 |

For Microcom NM−AM analog modems (in Cisco 2600 and 3600 routers):

- Use modem firmware version 1.2.2 from the Access Products 2600 and 3600 Analog Modem Firmware page. Look for firmware version 2.4.0 in the **show modem version** command output.
- Use the **&F** factory default modemcap. You can use the **modem autoconfigure type mica** command, since that entry is **&F**.

To review the full **AT** command set for the analog modems, see the AT Command Set and Register Summary for Analog Modem Network Modules documentation. See the Cisco 2600 Series and 3600 Series Analog Modem Firmware Upgrade Configuration Note for more detailed information on checking and upgrading the modem firmware.

**Note:** Be absolutely sure to use a properly−grounded power source for the Cisco 2600 and 3600 with NM−AM modules; otherwise, your NM−AM modem calls will have a buzzing sound that manifests itself as poor or failed connections. Refer to the document Installing the Grounding Lug on Cisco 2600 Series and Cisco 3600 Series Routers for more information.

# Digital Modems

## 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 PSTN. V.92 improves the upstream data signaling rate and adds new features that enhance modem usability. These new modem protocols and standards are implemented at the modem level.

## MICA and V.92 (for AS5300 and AS5800 Only)

This feature module introduces the V.92 (Quick Connect MOH and V.44) feature on Cisco AS5300 Universal Access Servers with Cisco MICA Portware Version 2.9.1.0 and later. Portware version 2.9.5.0 is **strongly recommended** for V.92 applications.

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 Modem Module (HMM) or Double Density Modem Module (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.

Portware 2.9.1.0, 2.9.2.0, 2.9.4.0 and 2.9.5.0 and higher support V.92 Modem on Hold and Quick Connect (but not PCM Upstream), and V.44; V.92 digital, V.34, etc.

The recommended modemcap for 2.9.4.0 and 2.9.5.0 in a V.92 application is:

```
&F&D2S54=16584S0=0S29=12S21=15S62=8S63=3S34=18000S40=10S10=50
```

S54=16584 Enable V.92 (16384) + 200 (default)

S0=0 Do not delay answerback tone

S29=12 Enable V.92

S21=15 Enable V.44, V.42bis, MNP5 compression

S62=8 Maximum MoH time 4 minutes (or desired value)

S63=3 Enable V.92 QC ANSpcm at −12dBm

S34=18000 Upshift after 3 good minutes (default: 2000 [20 seconds])

S40=10 Disconnect after 10 consecutive retrains (default: 4)

S10=50 Disconnect after a 5−second loss of carrier (default: 14 [1.4 seconds])

The recommended modemcap for other V.92 portware are listed below:

- 2.9.2.0 in a V.92 application is the same as that for 2.9.4.0 and 2.9.5.0 shown above.
- 2.9.1.0:

```
&F&D2S62=8S63=3S21=15S29=12S34=18000S40=10S54=456S10=50debugthismodemS71=4
```

**Note:** There are IOS requirements for V.92. For more information, refer to Configuring and Troubleshooting V.92 Modems.

Refer to the AT Command Set and Register Summary for Cisco MICA Six−Port Modules for more information on MICA S−Regsisters.

## Nextport (CSMV/6) V.92 (for AS5350, AS5400, AS5800, AS5850)

NextPort firmware provides V.92 capabilities bundled with existing NextPort features. The NextPort Dial Feature Card (DFC−108NP) is responsible for the ITU implementation of V.92 and the collection of statistics related to the new features, including the new Modem States that occur with the additional negotiations for V.92. The statistics are collected by the dial feature card (DFC) but are passed to and stored in Cisco IOS software. Cisco IOS software is responsible for controlling the features and displaying the new statistics.

For Nextport modem's available firmware on CCO, please refer to the Software Download page.

We do not recommend any specific modemcap for Nextport modems. The default has been tuned for most purposes.

V.92 Modem on Hold is disabled by default and is controlled with standard **AT** commands and S−registers. V.92 is enabled by default (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 NextPort platforms. Refer to Table 1 in V.92 Modem on Hold for Cisco AS5350, Cisco AS5400, and Cisco AS5850 Universal Gateways and Cisco AS5800 Universal Access Servers which 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.

For more information on Modem on Hold refer to V.92 Modem on Hold for Cisco AS5350, Cisco AS5400, and Cisco AS5850 Universal Gateways and Cisco AS5800 Universal Access Servers.

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 Quick Connect negotiation, 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 −12dBm (the transmit power level for the United States). The ATSn=v and ATSn? AT commands are used to configure V.92 Quick Connect on NextPort 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.

For more information on QC, refer to V.92 Quick Connect for Cisco AS5350, Cisco AS5400, and Cisco AS5850 Universal Gateways and Cisco AS5800 Universal Access Servers.

For more information on the NextPort S−Regsisters, refer to AT Command Set and Register Summary for NextPort Universal Digital Signal Processor Platforms.

For additional information on configuring V.92, refer to Configuring and Troubleshooting V.92 Modems.

## V.90

MICA, Nextport and recent Microcom modems support V.90 as well as K56Flex 1.1. Early revisions of Microcom modems are only capable of V.34 and need to be replaced with newer modules to give the Access Server V.90 abilities. To see if your Microcom modems are V.90 capable, check the vendor banner in the output from the **show modem version** command. If the following line appears, the Micorcom modems are not capable of V.90:

```
vendor_banner= Microcom MNP10 V34 Modem
```

MICA modem hardware has always been capable of 56 K speeds.

Assuming that the circuit supports the desired modulation, here are the firmware versions and modemcaps:

## NEXTPORT V.90

Cisco does not recommend any specific modemcap for Nextport modems. Defaults have been tuned for optimized performance in most situations.

For Nextport modem's available firmware on CCO, refer to the Software Download page.

If you plan to run V.90 only on V.92 capable Nextport Firmwares, set S29 to a value other than 12 using modemcap &Fs29=n. This disables V.92 on Nextport modems.

For more information on the NextPort S−Regsisters, refer to AT Command Set and Register Summary for NextPort Universal Digital Signal Processor Platforms.

## MICA V.90

Portware releases 2.7.4.0 and 2.9.5.0 support V.90 digital, K56Flex V1.1, V.34 and below, V.110, and offramp fax. 2.9.2.0 (formerly called 2.9.1.2) also supports V.92 Modem on Hold and Quick Connect (not PCM Upstream) while 2.7.4.0 does neither; either portware is suitable for a V.90 or below application.

Release 2.7.4.0 (or 2.9.5.0) is **strongly** recommended, especially for sites that are reporting any problems with earlier portware.

**Tip:** If you plan to support V.92 in the future, then use 2.9.5.0; even if you do not enable V.92 at this time.

Recommended modemcaps for release 2.9.2.0, 2.9.4.0 and 2.9.5.0 in a non−V.92 application is:

```
&F&D2S0=0S29=6S21=3S34=18000S40=10S10=50
```

For 2.9.5.0, 2.9.4.0 and 2.9.2.0 modemcap in a V.92 application refer to the section V.92.

Recommended modemcaps for release 2.7.4.0 and 2.7.3.0 are:

```
&F&D2S0=0S34=18000S40=10S10=50debugthismodemS71=4
```

- S34=18000 upshift after three minutes
- S40=10 disconnect after ten consecutive retrains
- S10=50 disconnect after a 5−second loss of carrier (default: 14 [1.4 seconds])
- debugthismodemS71=4 maximum 3200Hz V.90 uplink symbol rate

If you are willing to sacrifice K56Flex, then disable V.8bis (S53=0). This improves CSR for some old clients (such as old Rockwell ACF V.34 clients, flaky Xircom LT Venus clients in a–law) and reduces modem trainup times by about 3 seconds for all modem connections.

- If using firmware: **2.7.2.0** or **2.7.2.1**:

  Modemcap:

  ```
  &F&D2S34=18000S40=10S54=392S10=50debugthismodemS41=4
  ```

  - If using K56Flex, any Rockwell or Lucent client that supports K56Flex V1.1 or later should work. Clients that only support K56Plus or K56Flex V1.0 will not connect at 56 K speeds; only V.34 speeds are available for them.
  - If you don't want K56Flex, disable V.8bis with S53=0 in a modemcap entry.
- Portware **2.7.1.4** is the same as 2.7.2.0.
- Portware **2.7.1.3** is not recommended due to bug ID CSCdr24758 (registered customers only) .
- If using **2.7.1.2** portware, the recommended starting modemcap is **&F&D2S32=3S34=12000S40=10S54=44S59=6s10=50**
- If using **2.5.1.0, 2.6.1.0, 2.6.2.0, 2.7.1.0 or 2.7.1.1** portware, the recommended starting modemcap is **&F&D2S32=3S34=12000S40=10S52=1S10=50debugthismodemS41=4**
- If you have a large number of Lucent client modems with old firmware (especially Lucent Venus, such as Xircom), add S53=1 to the modemcap entry to advertise only K56Flex in V.8bis to discourage LT clients from attempting V.90. This is because LT Venus code builds greater than or equal to 111098 and less than 052099 are known to have V.90 training problems.

  **Note:** The preceding information applies to u–law territory. In a–law territory, Xircom clients are found to work better if they are configured with K56Flex disabled (for example, S109=2 on the client side).
- If you do not have a significant population of clients running K56Flex, consider disabling V.8bis (S53=0). This will improve the call success rate (CSR) with clients that may have a hard time hearing V.8bis (for example, old V.34 Rockwell ACF), and will reduce train–up times by about three seconds for all clients.
- If you are seeing "soft" modems not behaving properly while connected in V.90 with a 3429Hz uplink symbol rate, consider disabling 3429Hz with DEBUGTHISMODEMS41=4.

To set a modemcap on MICA and Nextport modems refer to the section Configuring Modems Using Modem Autoconfigure above.

You can download the MICA Modem Portware. Refer to the AT Command Set and Register Summary for Cisco MICA Six–Port Modules for more information on MICA S–Regsisters.

## Microcom V.90

- Recommended firmware: 5.3.30.

  - If using K56Flex, any Lucent clients that support K56Flex V1.0 or later and all Rockwell clients should work.
  - If you don't want K56Flex to be offered by the Access Server, disable V.8bis with :T110=38 and disable K56Plus with :T124=11.
  - If using V.90, all clients with reasonable firmware should be able to achieve V.90.
  - LT clients will need to disable K56Flex (S38=0 if winmodem, S109=2 if Venus) to get V.90 (unless V.8bis is disabled on the server side as mentioned above).
- There is no recommended modemcap; use the factory defaults. If you want to make the speed be more conservative, consider setting register :T127 to be less aggressive (see Table 2 in the Firmware

Release Notes Version 5.3.30 for Cisco Universal Access Server 56K 12–Port Modem Modules documentation).

To set a modemcap on Microcom modems, refer to the section Configuring Modems Using modem autoconfigure above.

Download the Microcom 56K Modem Firmware. Refer to the AT Command Set and Register Summary for V.34, 56K, and V.90 12–Port Modules for more Microcom modems.

## Microcom V.34 Digital Modems (in AS5200s and AS5300s)

- Recommended firmware: 2.3.6.
- Use the factory default modemcap **&F**. Use the **modem autoconfigure type mica** command (even though the modems here are MCOM) since that entry is simply **&F**.

Download the Microcom V.34 Modem Firmware. Refer to the AT Command Set and Register Summary for V.34, 56K, and V.90 12–Port Modules for Microcom modems.

More detailed information on checking and upgrading digital modem firmware is available in the Modem Management Operations documentation.

# Related Information

- **Access Support**
- **Dial Technology Support**
- **Technical Support & Documentation – Cisco Systems**

Updated: Feb 04, 2010                                                    Document ID: 21505