

# Configuring Passwords and Privileges

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Using passwords and assigning privilege levels is a simple way of providing terminal access control in your network.

This chapter describes the following topics and tasks:

- Protect Access to Privilege EXEC Commands
- Encrypt Passwords
- Configure Multiple Privilege Levels
- Recover a Lost Enable Password
- Recover a Lost Line Password
- Configure Identification Support

For a complete description of the commands used in this chapter, refer to the “Password and Privileges Commands” chapter in the *Security Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online. For configuration examples using the commands in this chapter, refer to the “Passwords and Privileges Configuration Examples” section located at the end of the this chapter.

## Protect Access to Privilege EXEC Commands

The following tasks provide a way to control access to the system configuration file and privilege EXEC (enable) commands:

- Set or Change a Static Enable Password
- Protect Passwords with Enable Password and Enable Secret
- Set or Change a Line Password
- Set TACACS Password Protection for Privilege EXEC Mode

### Set or Change a Static Enable Password

To set or change a static password that controls access to privileged EXEC (enable) mode, perform the following task in global configuration mode:

Task	Command
Establish a new password or change an existing password for the privileged command level.	<b>enable password</b> <i>password</i>

For examples of how to define enable passwords for different privilege levels, see the “Multiple Levels of Privileges Examples” section at the end of this chapter.

### Protect Passwords with Enable Password and Enable Secret

To provide an additional layer of security, particularly for passwords that cross the network or are stored on a TFTP server, you can use either the **enable password** or **enable secret** commands. Both commands accomplish the same thing; that is, they allow you to establish an encrypted password that users must enter to access enable mode (the default), or any privilege level you specify.

We recommend that you use the **enable secret** command because it uses an improved encryption algorithm. Use the **enable password** command only if you boot an older image of the Cisco IOS software, or if you boot older boot ROMs that do not recognize the **enable secret** command.

If you configure the **enable secret** command, it takes precedence over the **enable password** command; the two commands cannot be in effect simultaneously.

To configure the router to require an enable password, perform one of the following tasks in global configuration mode:

Task	Command
Establish a password for a privilege command mode.	<b>enable password</b> [level <i>level</i> ] { <i>password</i>   <i>encryption-type encrypted-password</i> }
Specify a secret password, saved using a non-reversible encryption method. (When enable password and enable secret are both set, users must enter the enable secret password.)	<b>enable secret</b> [level <i>level</i> ] { <i>password</i>   <i>encryption-type encrypted-password</i> }

Use either of these commands with the **level** option to define a password for a specific privilege level. After you specify the level and set a password, give the password only to users who need to have access at this level. Use the **privilege level** configuration command to specify commands accessible at various levels.

If you have the **service password-encryption** command enabled, the password you enter is encrypted. When you display it with the **show running-config** command, it is displayed in encrypted form.

If you specify an encryption type, you must provide an encrypted password—an encrypted password you copy from another router configuration.

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**Note** You cannot recover a lost encrypted password. You must clear NVRAM and set a new password. See the sections “Recover a Lost Enable Password” or “Recover a Lost Line Password” in this chapter if you have lost or forgotten your password.

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### Set or Change a Line Password

To set or change a password on a line, perform the following task in global configuration mode:

Task	Command
Establish a new password or change an existing password for the privileged command level.	<b>password</b> <i>password</i>

## Set TACACS Password Protection for Privilege EXEC Mode

You can set the TACACS protocol to determine whether a user can access privileged EXEC (enable) mode. To do so, perform the following task in global configuration mode:

Task	Command
Set the TACACS-style user ID and password-checking mechanism at the privileged EXEC level.	<b>enable use-tacacs</b>

When you set TACACS password protection at the privilege EXEC mode, the **enable EXEC** command prompts for both a new username and a password. This information is then passed to the TACACS server for authentication. If you are using the extended TACACS, it also passes any existing UNIX user identification code to the TACACS server.



**Caution** If you use the **enable use-tacacs** command, you must also specify **tacacs-server authenticate enable**, or you will be locked out of the privilege EXEC (enable) mode.

**Note** When used without extended TACACS, the **enable use-tacacs** command allows anyone with a valid username and password to access the privileged EXEC mode, creating a potential security problem. This occurs because the TACACS query resulting from entering the **enable** command is indistinguishable from an attempt to log in without extended TACACS.

## Encrypt Passwords

Because protocol analyzers can examine packets (and read passwords), you can increase access security by configuring the Cisco IOS software to encrypt passwords. Encryption prevents the password from being readable in the configuration file.

Configure the Cisco IOS software to encrypt passwords by performing the following task in global configuration mode:

Task	Command
Encrypt a password.	<b>service password-encryption</b>

The actual encryption process occurs when the current configuration is written or when a password is configured. Password encryption is applied to all passwords, including authentication key passwords, the privileged command password, console and virtual terminal line access passwords, and BGP neighbor passwords. The **service password-encryption** command is primarily useful for keeping unauthorized individuals from viewing your password in your configuration file.



**Caution** The **service password-encryption** command does not provide a high level of network security. If you use this command, you should also take additional network security measures.

Although you cannot recover a lost encrypted password (that is, you cannot get the original password back), you can recover from a lost encrypted password. See the sections “Recover a Lost Enable Password” or “Recover a Lost Line Password” in this chapter if you have lost or forgotten your password.

## Configure Multiple Privilege Levels

By default, the Cisco IOS software has two modes of password security: user mode (EXEC) and privilege mode (enable). You can configure up to 16 hierarchical levels of commands for each mode. By configuring multiple passwords, you can allow different sets of users to have access to specified commands.

For example, if you want the **configure** command to be available to a more restricted set of users than the **clear line** command, you can assign level 2 security to the **clear line** command and distribute the level 2 password fairly widely, and assign level 3 security to the **configure** command and distribute the password to level 3 commands to fewer users.

The following tasks describe how to configure additional levels of security:

- Set the Privilege Level for a Command
- Change the Default Privilege Level for Lines
- Display Current Privilege Levels
- Log In to a Privilege Level

### Set the Privilege Level for a Command

To set the privilege level for a command, perform the following tasks in global configuration mode:

Task	Command
Set the privilege level for a command.	<b>privilege mode level level command</b>
Specify the enable password for a privilege level.	<b>enable password level level [encryption-type] password</b>

### Change the Default Privilege Level for Lines

To change the default privilege level for a given line or a group of lines, perform the following task in line configuration mode:

Task	Command
Specify a default privilege level for a line.	<b>privilege level level</b>

### Display Current Privilege Levels

To display the current privilege level you can access based on the password you used, perform the following task in EXEC mode:

Task	Command
Display your current privilege level.	<b>show privilege</b>

### Log In to a Privilege Level

To log in to a router at a specified privilege level, perform the following task in EXEC mode:

Task	Command
Log in to a specified privilege level.	<b>enable level</b>

To exit to a specified privilege level, perform the following task in EXEC mode:

Task	Command
Exit to a specified privilege level.	<b>disable</b> <i>level</i>

## Recover a Lost Enable Password

You can restore access to enable mode on a router when the password is lost using one of the three procedures described in this section. The procedure you use depends on your router platform. Table 15 shows which password recovery procedure to use with each router platform.

You can perform password recovery on most of the platforms without changing hardware jumpers, but all platforms require the configuration to be reloaded. Password recovery can be done only from the console port on the router.

**Table 15 Platform-Specific Password Recovery Procedures**

Password Recovery Procedure	Router Platform
Password Recovery Procedure 1	Cisco 2000 series
	Cisco 2500 series
	Cisco 3000 series
	Cisco 4000 series with 680x0 Motorola CPU
	Cisco 7000 series running Cisco IOS Release 10.0 or later in ROMs installed on the RP card
	IGS series running Cisco Release IOS 9.1 or later in ROMs
Password Recovery Procedure 2	Cisco 1003
	Cisco 1600 series
	Cisco 3600 series
	Cisco 4500 series
	Cisco 7200 series
	Cisco 7500 series
	IDT Orion-based routers
AS5200 and AS5300 platforms	

## Password Recovery Process

Both password recovery procedures involve the following basic steps:

- Step 1** Configure the router to boot up without reading the configuration memory (NVRAM). This is sometimes called the test system mode.
- Step 2** Reboot the system.
- Step 3** Access enable mode (which can be done without a password if you are in test system mode).
- Step 4** View or change the password, or erase the configuration.
- Step 5** Reconfigure the router to boot up and read the NVRAM as it normally does.
- Step 6** Reboot the system.

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**Note** Some password recovery requires that a terminal issue a Break signal; you must be familiar with how your terminal or PC terminal emulator issues this signal. For example, in ProComm, the keys Alt-B by default generates the Break signal, and in a Windows terminal you press Break or CTRL-Break. A Windows terminal also allows you to define a function key as a BREAK signal. To do so, select function keys from the Terminal window and define one as Break by entering the characters **^\$B** (**Shift 6**, **Shift 4**, and uppercase **B**).

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### Password Recovery Procedure 1

Use this procedure to recover lost passwords on the following Cisco routers:

- Cisco 2000 series
- Cisco 2500 series
- Cisco 3000 series
- Cisco 4000 series with 680x0 Motorola CPU
- Cisco 7000 series running Cisco IOS Release 10.0 or later in ROMs installed on the RP card. The router can be booting Cisco IOS Release 10.0 software in Flash memory, but it needs the actual ROMs on the processor card too.
- IGS Series running Cisco IOS Release 9.1 or later in ROMs

To recover a password using Procedure 1, perform the following steps:

**Step 1** Attach a terminal or PC with terminal emulation software to the console port of the router.

**Step 2** Enter the **show version** command and record the setting of the configuration register. It is usually 0x2102 or 0x102.

The configuration register value is on the last line of the display. Note whether the configuration register is set to enable Break or disable Break.

The factory-default configuration register value is 0x2102. Notice that the third digit from the left in this value is 1, which disables Break. If the third digit is *not* 1, Break is enabled.

**Step 3** Turn off the router, then turn it on.

**Step 4** Press the **Break** key on the terminal within 60 seconds of turning on the router.

The rommon> prompt with no router name appears. If it does not appear, the terminal is not sending the correct Break signal. In that case, check the terminal or terminal emulation setup.

**Step 5** Enter **o/r0x42** at the rommon> prompt to boot from Flash memory or **o/r0x41** to boot from the boot ROMs.

Note that the first character is the letter o, not the numeral zero. If you have Flash memory and it is intact, 0x42 is the best setting. Use 0x41 only if the Flash memory is erased or not installed. If you use 0x41, you can only view or erase the configuration. You cannot change the password.

**Step 6** At the rommon> prompt, enter the initialize command to initialize the router.

This causes the router to reboot but ignore its saved configuration and use the image in Flash memory instead.

The system configuration display appears.

**Step 7** Enter **no** in response to the System Configuration Dialog prompts until the following message appears:

```
Press RETURN to get started!
```

**Step 8** Press **Return**.

The Router> prompt appears.

**Step 9** Enter the **enable** command.

The Router# prompt appears.

**Step 10** Choose one of the following options:

- To view the password, if it is not encrypted, enter the **more nvram:startup-config** command.
- To change the password (if it is encrypted, for example), enter the following commands:

```
Router # configure memory
Router # configure terminal
Router(config)# enable secret 1234abcd
Router(config)# ctrl-z
Router # write memory
```

---

**Note** The **enable secret** command provides increased security by storing the enable secret password using a non-reversible cryptographic function; however, you cannot recover a lost password that has been encrypted.

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**Step 11** Enter the **configure terminal** command at the EXEC prompt to enter configuration mode.

**Step 12** Enter the **config-register** command and whatever value you recorded in step 2.

**Step 13** Press **Ctrl-Z** to quit from the configuration editor.

**Step 14** Enter the **reload** command at the privileged EXEC prompt and issue the **write memory** command to save the configuration.

## Password Recovery Procedure 2

Use this procedure to recover lost passwords on the following Cisco routers:

- Cisco 1003
- Cisco 1600 series
- Cisco 3600 series
- Cisco 4500 series
- Cisco 7200 series
- Cisco 7500 series
- IDT Orion-Based Routers
- AS5200 and AS5300 platforms

To recover a password using Procedure 2, perform the following steps:

**Step 1** Attach a terminal or PC with terminal emulation software to the console port of the router.

**Step 2** Enter the **show version** command and record the setting of the configuration register. It is usually 0x2102 or 0x102.

The configuration register value is on the last line of the display. Note whether the configuration register is set to enable Break or disable Break.

The factory-default configuration register value is 0x2102. Notice that the third digit from the left in this value is 1, which disables Break. If the third digit is *not* 1, Break is enabled.

**Step 3** Turn off the router, then turn it on.

**Step 4** Press the **Break** key on the terminal within 60 seconds of turning on the router.

The rommon> prompt appears. If it doesn't appear, the terminal is not sending the correct Break signal. In that case, check the terminal or terminal emulation setup.

**Step 5** Enter the **confreg** command at the rommon> prompt.

The following prompt appears:

```
Do you wish to change configuration[y/n]?
```

**Step 6** Enter **yes** and press **Return**.

**Step 7** Enter **no** to subsequent questions until the following prompt appears:

```
ignore system config info[y/n]?
```

**Step 8** Enter **yes**.

**Step 9** Enter **no** to subsequent questions until the following prompt appears:

```
change boot characteristics[y/n]?
```

**Step 10** Enter **yes**.

The following prompt appears:

```
enter to boot:
```

**Step 11** At this prompt, either enter **2** and press Return if Flash memory or, if Flash memory is erased, enter **1**. If Flash memory is erased, the Cisco 4500 must be returned to Cisco for service. If you enter **1**, you can only view or erase the configuration. You cannot change the password.

A configuration summary is displayed and the following prompt appears:

```
Do you wish to change configuration[y/n]?
```

**Step 12** Answer **no** and press **Return**.

The following prompt appears:

```
rommon>
```

**Step 13** Enter the **reload** command at the privileged EXEC prompt or, for Cisco 4500 series and Cisco 7500 series routers, power cycle the router.

**Step 14** As the router boots, enter **no** to all the setup questions until the following prompt appears:

```
Router>
```

**Step 15** Enter the **enable** command to enter enable mode.

The `Router#` prompt appears.

**Step 16** Choose one of the following options:

- To view the password, if it is not encrypted, enter the **more nvram:startup-config** command.
- To change the password (if it is encrypted, for example), enter the following commands:

```
Router # configure memory
Router # configure terminal
Router(config)# enable secret 1234abcd
Router(config)# ctrl-z
Router # write memory
```

---

**Note** The **enable secret** command provides increased security by storing the enable secret password using a non-reversible cryptographic function; however, you cannot recover a lost password that has been encrypted.

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**Step 17** Enter the **configure terminal** command at the prompt.

**Step 18** Enter the **config-register** command and whatever value you recorded in step 2.

**Step 19** Press **Ctrl-Z** to quit from the configuration editor.

**Step 20** Enter the **reload** command at the prompt and issue the **write memory** command to save the configuration.

## Recover a Lost Line Password

If your router has the nonvolatile memory option, you can accidentally lock yourself out of enable mode if you enable password checking on the console terminal line and then forget the line password. To recover a lost line password, perform the following steps:

**Step 1** Force the router into factory diagnostic mode.

See the hardware installation and maintenance publication for your product for specific information about setting the processor configuration register to factory diagnostic mode. Table 16 summarizes the hardware or software settings required by various products to set factory diagnostic mode.

**Step 2** Enter **Yes** when asked if you want to set the manufacturers' addresses.

The following prompt appears:

```
TEST-SYSTEM >
```

**Step 3** Issue the **enable** command to enter enable mode:

```
TEST-SYSTEM > enable
```

**Step 4** Enter the **show startup-config** command to review the system configuration and find the password. Do not change anything in the factory diagnostic mode.

```
TEST-SYSTEM # show startup-config
```

**Step 5** To resume normal operation, restart the router or reset the configuration register.

**Step 6** Log in to the router with the password that was shown in the configuration file.

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**Note** All debugging capabilities are turned on during diagnostic mode.

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See the hardware installation and maintenance publication for your product for specific information about configuring the processor configuration register for factory diagnostic mode. Table 16 summarizes the hardware or software settings required by the various products to set factory diagnostic mode.

**Table 16** Factory Diagnostic Mode Settings for the Configuration Register

Platform	Setting
Modular products	Set jumper in bit 15 of the processor configuration register, then restart; remove the jumper when finished.
Cisco AS5100	Use the <b>config-register</b> command to set the processor configuration register to 0x8000, then <b>initialize</b> and <b>boot</b> the system. Use the <b>reload</b> command to restart and set the processor configuration register to 0x2102 when finished.
Cisco AS5200	
Cisco AS5300	
Cisco 1600 series	
Cisco 2500 series	
Cisco 3000 series	
Cisco 3600 series	
Cisco 4000 series	
Cisco 4500 series	
Cisco 7000 series	
Cisco 7200 series	
Cisco 7500 series	

## Configure Identification Support

Identification support allows you to query a Transmission Control Protocol (TCP) port for identification. This feature enables an unsecure protocol, described in RFC 1413, to report the identity of a client initiating a TCP connection and a host responding to the connection. With identification support, you can connect a TCP port on a host, issue a simple text string to request information, and receive a simple text-string reply.

To configure identification support, perform the following task in global configuration mode:

Task	Command
Enable identification support.	<b>ip identd</b>

## Passwords and Privileges Configuration Examples

This section describes multiple privilege level and username authentication examples and contains the following sections:

- Multiple Levels of Privileges Examples
- Username Examples

### Multiple Levels of Privileges Examples

This section provides examples of using multiple privilege levels to specify who can access different sets of commands.

#### Allow Users to Clear Lines Examples

If you want to allow users to clear lines, you can do either of the following:

- Change the privilege level for the **clear** and **clear line** commands to 1 or “ordinary user level,” as follows. This allows any user to clear lines.

```
privilege exec level 1 clear line
```

- Change the privilege level for the **clear** and **clear line** commands to level 2. To do so, use the **privilege level** global configuration command to specify privilege level 2. Then define an enable password for privilege level 2 and tell only those users who need to know what the password is.

```
enable password level 2 pswd2
privilege exec level 2 clear line
```

#### Define an Enable Password for System Operators Examples

In the following example, you define an enable password for privilege level 10 for system operators and make **clear** and **debug** commands available to anyone with that privilege level enabled.

```
enable password level 10 pswd10
privilege exec level 10 clear line
privilege exec level 10 debug ppp chap
privilege exec level 10 debug ppp error
privilege exec level 10 debug ppp negotiation
```

The following example lowers the privilege level of the **show running-config** command and most configuration commands to operator level so that the configuration can be viewed by an operator. It leaves the privilege level of the **configure** command at 15. Individual configuration commands are displayed in the **show running-config** output only if the privilege level for a command has been lowered to 10. Users are allowed to see only those commands that have a privilege level less than or equal to their current privilege level.

```
enable password level 15 pswd15
privilege exec level 15 configure
enable password level 10 pswd10
privilege exec level 10 show running-config
```

### Disable a Privilege Level Example

In the following example, the **show ip route** command is set to privilege level 15. To keep all **show ip** and **show** commands from also being set to privilege level 15, these commands are specified to be privilege level 1.

```
privilege exec level 15 show ip route
privilege exec level 1 show ip
privilege exec level 1 show
```

### Username Examples

The following sample configuration sets up secret passwords on Routers A, B, and C, to enable the three routers to connect to each other.

To authenticate connections between Routers A and B, enter the following commands:

On Router A:

```
username B password a-b_secret
```

On Router B:

```
username A password a-b_secret
```

To authenticate connections between Routers A and C, enter the following commands:

On Router A:

```
username C password a-c_secret
```

On Router C:

```
username A password a-c_secret
```

To authenticate connections between Routers B and C, enter the following commands:

On Router B:

```
username C password b-c_secret
```

On Router C:

```
username B password b-c_secret
```

For example, suppose you enter the following command:

```
username bill password westward
```

The system displays this command as follows:

```
username bill password 7 21398211
```

The encrypted version of the password is 21398211. The password was encrypted by the Cisco-defined encryption algorithm, as indicated by the “7.”

However, if you enter the following command, the system determines that the password is already encrypted and performs no encryption. Instead, it displays the command exactly as you entered it:

```
username bill password 7 21398211
username bill password 7 21398211
```