



G.732 Support for the Integrated Signaling Link Terminal

This feature ports the existing International Telecommunication Union Telecommunication Standardization Sector (ITU-T) G.732 bit-error-rate (BER) detection and alarm processing functionality from the Cisco Signaling Link Terminal (SLT) onto the Cisco AS5350 and Cisco AS5400 network access server (NAS) platforms. This functionality is already available on the Cisco 2600 SLT and is now fully integrated into the Cisco AS5350 and Cisco AS5400 using 2-, 4-, or 8-PRI E1 dial feature cards (DFCs).

ITU-T G.732 support for the SLT is a fundamental requirement for passing homologation in many European countries. As an integral part of the Cisco PGW2200 architecture, the Cisco SLT provides Signaling System 7 (SS7) connectivity to the Cisco PGW2200 node.

This feature document describes the tasks required to port G.732 functionality to the Cisco SLT in the Cisco IOS software image and the trunk DFC firmware.

Feature Specifications for the G.732 Support for the Integrated Signaling Link Terminal Feature

Feature History

Release	Modification
12.2(15)T	This feature was introduced.

Supported Platforms

Cisco AS5350 and Cisco AS5400.

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

- [Restrictions, page 2](#)
- [Information About G.732 Support for the Integrated SLT, page 2](#)
- [Configuring G.732 Support for the Integrated SLT, page 3](#)
- [Configuration Examples for G.732 Support for the Integrated SLT, page 4](#)

- [Additional References, page 6](#)
- [Command Reference, page 8](#)
- [Glossary, page 10](#)

Restrictions

Command-line interface (CLI) support to allow G.732 alarm processing is available only on the Cisco AS5350 and Cisco AS5400 platforms.

Information About G.732 Support for the Integrated SLT

The following concepts are helpful in understanding the G.732 Support for the Integrated Signaling Link Terminal feature:

- [ITU-T G.732 Support on the Cisco SLT, page 2](#)
- [G.732 Alarm Detection Capabilities on E1 Interfaces, page 2](#)
- [Cisco SLT, page 3](#)
- [Cisco Integrated SLT, page 3](#)

ITU-T G.732 Support on the Cisco SLT

The Cisco SLT enables you to reliably transport SS7 protocols across an IP network. The Cisco SLT uses the Cisco IOS SS7 SLT feature set, providing reliable interoperability with the Cisco PGW2200. The Cisco SLT is responsible for terminating the Message Transfer Part (MTP) 1 and MTP 2 layers of the SS7 protocol stack. Using the Cisco Reliable User Datagram Protocol (RUDP), the Cisco SLT backhauls, or transports, upper-layer SS7 protocols across an IP network to the Cisco PGW2200. The Cisco SLT is supported on the Cisco 2611, Cisco 2651, Cisco AS5350, and Cisco AS5400.

ITU-T G.732 is an extract from the ITU-T blue book that describes characteristics of primary pulse-code-modulation (PCM) multiplex equipment that operates at 2048 kbps (E1). The requirements that describe excessive bit error rate detected by monitoring the frame alignment signal (loss of frame alignment fault conditions) and subsequent alarming actions relate to the Cisco SLT.

For more information about G.732 support on the Cisco SLT, refer to the [Cisco Signaling Link Terminal G.732 Support](#) feature document for Cisco IOS Release 12.2(2)T on Cisco.com.

G.732 Alarm Detection Capabilities on E1 Interfaces

The G.732 Support for the Integrated Signaling Link Terminal feature adds a new value to the dsx1LineStatus variable of the RFC 1406 SNMP MIB:

- 4100 value—Excessive bit error rate detected. When this condition occurs, a Simple Network Management Protocol (SNMP) trap is also sent to the network management system (NMS).

Cisco SLT

The Cisco SLT consists of a custom Cisco IOS software image running on a Cisco 2611, Cisco 2651 (4 SS7 links), Cisco AS5350, or Cisco AS5400.

This feature includes the following benefits:

- SS7 link termination on a high-availability platform—SS7 network access and interconnection requires a high degree of reliability in the signaling links and associated equipment. The Cisco SLT provides the reliability of a dedicated signaling link terminal device and maximizes the availability of the SS7 signaling links.
- Distributed SS7 MTP processing—Processor-intensive parts of the SS7 MTP1 and 2 are offloaded from the MGC to the Cisco SLT. This distributed MTP model allows the controller to better utilize its resources to provide optimal call control.
- Call control—Signaling backhaul provides a means for combining gateways into a virtual switch with the call control intelligence centralized in the MGC.
- Standard physical interfaces—Interconnection with SS7 network elements is supported using the following SS7 physical interface standards: T1, E1, V.35, RS-449, and RS-530.
- Drop and Insert—T1/E1 interface cards support Drop and Insert (also called TDM Cross-Connect), which allows individual T1/E1 channels to be transparently passed and uncompressed between T1/E1 ports. This feature enables direct termination of SS7 A-links or F-links in T1 or E1 carriers, while the remaining bearer channels are passed on to a gateway device for processing.

For more information about the Cisco SLT, refer to the [Cisco Signaling Link Terminal](#) documentation index on Cisco.com.

Cisco Integrated SLT

The integrated Cisco SLT feature pulls existing Cisco distributed MTP SS7 signaling architecture functionality—previously available only on Cisco 2600-based SLTs—directly onto a single Cisco AS5350 or Cisco AS5400 gateway. Like the Cisco 2600-based SLT, the integrated Cisco SLT backhauls upper-layer SS7 protocols across an IP network using RUDP, which terminate at the MTP1 and MTP2 layers of the SS7 protocol stack at the MGC.

For more information about this feature, refer to the [Integrated Signaling Link Terminal](#) document on Cisco.com.

Configuring G.732 Support for the Integrated SLT

The following section contains configuration tasks for the G.732 Support for the Integrated Signaling Link Terminal feature.

- [Enabling G.732 on the Cisco SLT, page 3](#) (required)

Enabling G.732 on the Cisco SLT

To enable ITU-T G.732 functionality on the Cisco SLT, use the following commands.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller e1 4/0**
4. **g732 ber**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	controller e1 4/0 Example: Router(config)# controller e1 4/0	Configures an E1 controller and enters controller configuration mode.
Step 4	g732 ber Example: Router(config-controller)# g732 ber	Enables G.732 processing and reporting. Note This command is only available on the E1 interface for alarm detection on the Cisco SLT.
Step 5	end Example: Router(config-controller)# end	Exits controller configuration mode and completes the configuration.

Troubleshooting Tips

To verify whether G.732 functionality is enabled or disabled, use the **show controller** command in privileged EXEC mode. See the “[Verifying G.732 Configuration Example](#)” section on page 5 for sample command output.

Configuration Examples for G.732 Support for the Integrated SLT

This section provides the following examples:

- [Enabling G.732 Functionality Example, page 5](#)
- [Verifying G.732 Configuration Example, page 5](#)

Enabling G.732 Functionality Example

The following example enables G.732 processing and reporting for E1 controller 0/0:

```
controller e1 0/0
g732 ber
```

Verifying G.732 Configuration Example

The following sample output from the **show controller** command verifies that G.732 functionality is enabled. This example shows that the E1 controller slot 4, port 0 is configured on a Cisco AS5400. The bold text in the output indicates that G.732 functionality is enabled.

```
Router# show controllers e1 4/0

E1 4/0 is down.
  Applique type is Channelized E1 - balanced
  Far End Block Errors Detected
  Receiver has loss of signal.
  alarm-trigger is not set
  Version info of slot 4: HW:768, PLD Rev:1
  Framer Version:0x8

Manufacture Cookie Info:
  EEPROM Type 0x0001, EEPROM Version 0x01, Board ID 0x03,
  Board Hardware Version 3.0, Item Number 73-3996-03,
  Board Revision A0, Serial Number JAB043507HL,
  PLD/ISP Version <unset>, Manufacture Date 26-Aug-2000.

  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
G732 BER detection enabled.
  Data in current interval (580 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 580 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 580 Unavail Secs
```

The following sample output from the **show controllers** command verifies the ITU-T G.732 functionality is disabled. This example indicates that G.732 on E1 interface slot 4, port 0 is disabled on a Cisco AS5400.

```
Router# show controllers e1 4/0

E1 4/0 is down.
  Applique type is Channelized E1 - balanced
  Far End Block Errors Detected
  Receiver has loss of signal.
  alarm-trigger is not set
  Version info of slot 4: HW:768, PLD Rev:1
  Framer Version:0x8

Manufacture Cookie Info:
  EEPROM Type 0x0001, EEPROM Version 0x01, Board ID 0x03,
  Board Hardware Version 3.0, Item Number 73-3996-03,
  Board Revision A0, Serial Number JAB043507HL,
  PLD/ISP Version <unset>, Manufacture Date 26-Aug-2000.

  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (580 seconds elapsed):
    0 Line Code Violations, 0 Path Code Violations
    0 Slip Secs, 580 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 580 Unavail Secs
```

Additional References

For additional information related to the G.732 Support for the Integrated Signaling Link Terminal feature, see the following sections:

- [Related Documents, page 7](#)
- [Standards, page 7](#)
- [MIBs, page 7](#)
- [RFCs, page 8](#)
- [Technical Assistance, page 8](#)

Related Documents

Related Topic	Document Title
Cisco 2600 series routers	Cisco 2600 series product documentation
Cisco AS5350 gateway	Cisco AS5350 documentation index
Cisco AS5400 gateway	Cisco AS5400 documentation index
How to use Cisco IOS commands to support voice, video, and fax applications	Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2 T
Cisco SLT	Cisco Signaling Link Terminal documentation index
Cisco SLT dual Ethernet support to the VSC	Cisco Signaling Link Terminal Dual Ethernet, Release 12.2(11)T
ITU-T G.732 support on the Cisco SLT	Cisco Signaling Link Terminal G.732 Support, Release 12.2(2)T
Components of dial and voice solutions that require SS7 signaling	Cisco SS7 Interconnect for Access Servers Solution Release 2.2
Cisco IOS software configuration	Configuration guides and command references, Release 12.2
Cisco IOS Release 12.2	Release notes index, Cisco IOS Release 12.2 T

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs ¹	MIBs Link
RFC 1406 MIB—Adds a new value to the dsx1LineStatus variable of the RFC 1406 SNMP MIB: <ul style="list-style-type: none"> 4100—Excessive bit error rate detected. 	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

1. Not all supported MIBs are listed.

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

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

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

- [g732 ber](#)

g732 ber

To enable G.732 processing and reporting for the E1 controller, use the **g732 ber** command in controller configuration mode. To disable processing and reporting, use the **no** form of this command.

g732 ber

no g732 ber

Syntax Description This command has no arguments or keywords.

Defaults Disabled

Command Modes Controller configuration

Command History	Release	Modification
	12.2(2)T	This command was introduced on the Cisco 2611.
	12.2(15)T	This command was implemented on the Cisco AS5350 and Cisco AS5400.

Usage Guidelines By default, G.732 processing and reporting is disabled to prevent a change in E1 behavior for sites that do not want G.732 reporting. Once ITU-T G.732 processing and reporting is enabled, the E1 controller is placed in the DOWN state if the bit error rate (BER) on the line is greater than 10e-3. The controller is restored to the UP state if the BER drops below 10e-4 for longer than 2 seconds. When the G.732 alarm is declared, the transmitter sends a remote-alarm-indication (RAI) yellow alarm.

You can restore ITU-T G.732 functionality by performing a power cycle or a software reload.

Examples The following example applies to a Cisco 2611 and shows enabled G.732 processing and reporting for E1 controller 0/0:

```
controller e1 0/0
g732 ber
```

The following example applies to a Cisco AS5400 with an 8-PRI E1 dial feature card (DFC) in slot 4:

```
controller e1 4/0
g732 ber
```

Related Commands	Command	Description
	show controllers e1	Displays information about E1 links.

Glossary

BER—bit error rate. Ratio of received bits that contain errors.

CLI—command-line interface.

DFC—dial feature card.

E1—A digital carrier used to transmit a formatted signal at 2.048 MHz.

ITU-T—International Telecommunication Union Telecommunication Standardization Sector. International body that develops worldwide standards for telecommunications technologies.

MGC—media gateway controller.

NAS—network access server.

NMS—network management system.

PCM—pulse code modulation.

PRI—Primary Rate Interface.

RAI—remote alarm indication (yellow alarm).

SLT—Cisco Signaling Link Terminal.

SS7—Signaling System 7.

**Note**

Refer to the [Internetworking Terms and Acronyms](#) for terms not included in this glossary.
