G.SHDSL

Overview

Q. What is G.SHDSL?

A. Symmetric high-speed DSL (SHDSL) was based on high-data-rate DSL (HDSL) and is specified in the ITU recommendation G.991.2 (December 2003) titled “Single-Pair High-Speed Digital Subscriber Line Transceivers”. Single-pair SHDSL transceivers can support selected symmetric user data rates in the range of 192 to 2312 kbps using a Trellis Coded Pulse Amplitude Modulation (TCPAM) line code. Optional extensions described in Annex F and G allow user data rates up to 5696 kbps.

Q. What do the different annexes supported by the G.SHDSL high-bit-rate WAN interface cards (HWICs) specify?

A. The G.991.2 has the following annexes:

- **Annex A**—This annex describes those specifications that are unique to SHDSL systems operating under conditions such as those typically encountered within the North American network. The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body.
- **Annex B**—This annex describes those specifications that are unique to SHDSL systems operating under conditions such as those typically encountered within European networks. The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body.
- **Annex F**—The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body and Annex A for payload data rates up to 5696 kbps. Support for this annex is optional.
- **Annex G**—The clauses in this annex provide the additions and modifications to the corresponding clauses in the main body and Annex B for payload data rates up to 5696 kbps. Support for this annex is optional.

Q. What are the G.SHDSL HWICs?

A. The G.SHDSL HWICs are single port modules that enable high-speed Internet and intranet access. They can be inserted into the HWIC slots on Cisco® Integrated Services Routers.

Q. What are the key features of the G.SHDSL HWICs?

A. A summary of the features follows:

- Based on ITU Recommendation G.991.2
- Symmetrical WAN speeds up to 2.3 Mbps over a single copper pair and up to 4.6 Mbps over two copper pairs using ITU-T G.991.2 Annexes A and B
- Symmetrical WAN speeds from 768 kbps up to 5.696 Mbps over a single copper pair and from 1.536 to 11.392 Mbps over two copper pairs using ITU-T G.991.2 Annexes F and G
- Symmetrical WAN speeds of 2.304 Mbps per pair up to 9.2 Mbps over four pairs on the 4-pair G.SHDSL WAN interface card (HWIC-4SHDSL) by bonding with Inverse Multiplexing over ATM (IMA) Version 1.1
- m-pair bonding on the 4-pair G.SHDSL WAN interface card (HWIC-4SHDSL) using Annexes F and G with symmetrical WAN speeds of 768 kbps to 5.696 Mbps for m = 2 and 768 kbps to 4.096 Mbps for m = 3 and m = 4
- Support for dying gasp; uses power status bit (Section 7.1.2.5.3 of G.991.2) for signaling (only on HWIC-2SHDSL)

- Support for wetting current (Section A.5.3.3 of G.991.2)
- Support for G.SHDSL Regional Annexes A (U.S. signaling) and B (European signaling)
- Multiple G.SHDSL HWICs configurable per router chassis
- Toll-quality voice over data through ATM Adaption Layer 5 (AAL5) and voice over IP (VoIP), note that voice termination is supported only on the Cisco ISRs.
- Extensive ATM class-of-service (CoS) and IP quality-of-service (QoS) support
- Operation possible when connected to a DSL access multiplexer (DSLAM)
- Ability to sustain up to 8 permanent virtual circuits (PVCs) per HWIC
- Single RJ-11 connector on 2-pair G.SHDSL HWIC (HWIC-2SHDSL) and single RJ-45 connector on 4-pair G.SHDSL HWIC (HWIC-4SHDSL)

Q. What are the part numbers of the G.SDSL HWICs?

A. Two new G.SHDSL HWICs are available:

- 2-pairG.SHDSL HWIC (HWIC-2SHDSL)
- 4-pair G.SHDSL HWIC with IMA (HWIC-4SHDSL)

Q. What G.SHDSL chipset do the G.SHDSL HWICs use?

A. The G.SHDSL HWICs are based on the Infineon Socrates-bis chipset.

Q. When will the G.SHDSL HWICs be available?

A. The G.SHDSL HWICs are available now.

Q. What Cisco IOS® Software release is required?

A. The routers supporting the hardware will need to run Cisco IOS Release per Table 1.

Table 1. Cisco IOS Software Release Supporting G.SHDSL HWICs

Platform	G.SHDSL Firmware	Minimum Cisco IOS Software Release	Recommended Cisco IOS Software Release	Cisco IOS Software Feature Set
Cisco 1841, 2801, 2811, 2821, 2851, 3825, and 3845	Ver 1.1-1.5.0__004	12.4(6)T	12.4(20)T	IP Base and up
Cisco 1941, 2911, 2951, 3925, and 3945	Ver 1.1-1.5.0__004	15.0(1)M	15.0(1)M	IP Base and up

Q. How many G.SHDSL HWICS can be installed in a Cisco 1841, 1941, 2800, 2900, 3800, and 3900 Series Integrated Services Routers?

A. Table 2 gives the number of G.SHDSL HWICs supported on each platform.

Table 2. Number of G.SHDSL HWICs Supported by Cisco Integrated Services Routers

Platform	Maximum G.SHDSL HWICs per Platform
Cisco 1841, 1941 and 2801	2
Cisco 2811 through Cisco 2851, and Cisco 3825 through Cisco 3845	4
Cisco 2911 through Cisco 2951, and Cisco 3925 through Cisco 3945	4

Q. How do the G.SHDSL HWICs differ from the 1-port G.SHDSL WIC with part number WIC-1SHDSL-V3?

A. Other than the fact the interface to the routers is HWIC versus WIC, Table 3 identifies the major differences in the offering.

Table 3. Differences between G.SHDSL HWICs and WIC-1SHDSL-V3

Features, Parts, and Firmware	G.SHDSL WIC (WIC-1SHDSL-V3)	2-pair G.SHDSL HWIC (HWIC-2SHDSL)	4-pair G.SHDSL HWIC (HWIC-4SHDSL)
Two- or 4-wire support	Yes	Yes	Yes
Eight-wire support	No	No	Yes
IMA	No	No	Yes
Annexes A and B	Yes	Yes	Yes
Annexes F and G	No	Yes	Yes
m-pair bonding with Annexes F and G	No	No	Yes
Connector	RJ-11	RJ-11	RJ-45
Dying gasp	Yes	Yes	No
Wetting current	Yes	Yes	Yes
Line coding	16-TCPAM	16-TCPAM and 32-TCPAM	16-TCPAM and 32-TCPAM

Q. What data rates are supported by the G.SHDSL HWICs?

A. Table 4 lists the data rates supported by the G.SHDSL HWICs.

Table 4. Data Rates Supported by G.SHDSL HWICs

Feature	4-pair G.SHDSL HWIC (HWIC-4SHDSL)	2-pair G.SHDSL HWIC (HWIC-2SHDSL)
Data rates—IMA	192–2304 kbps per pair	–
Aggregate data rate—2-wire, Annexes A and B	192–2034 kbps	192–2034 kbps
Aggregate data rate—4-wire, Annexes A and B	384–4608 kbps	384–4608 kbps
Aggregate data rate—2-wire, Annexes F and G	768–5696 kbps	768–5696 kbps
Aggregate data rate—4-wire, Annexes F and G	1536–11392 kbps (768–5696 kbps per pair)	1536–11392 kbps
Aggregate data rate—m-pair, Annexes F and G (m = 3)	2304–12288 kbps (768–4096 kbps per pair)	–
Aggregate data rate—m-pair, Annexes F and G (m = 4)	3072–16384 kbps (768–4096 kbps per pair)	–

Q. Do the G.SHDSL HWICs comply with G.hs?

A. G.hs is an integral part of G.992.1, the standard that the HWICs comply with, so the G.SHDSL HWICs do comply with G.hs, also known as G.994.1.

Q. Which DSLAMs interoperate with the G.SHDSL HWICs?

A. The G.SHDSL HWICs interoperate with the following DSLAMs :

- Alcatel ASAM 7300 (12-port Conexant-based line card)
- ECI HiFocus SAM 480 (16-port Infineon-based line card)
- Lucent Stinger FS (48- and 72-port Conexant-based line cards)

Q. Is network timing reference (NTR) supported?

A. No, NTR is currently not supported on the G.SHDSL HWICs.

Q. Is T1/E1 mode supported on the G.SHDSL HWICs?

A. No, T1/E1 mode is not supported on the G.SHDSL HWICs.

Q. What is dying gasp, and is this feature supported on the G.SHDSL HWICs?

A. Dying gasp (power status bit) allows a customer's customer premises equipment (CPE) router to automatically notify the service provider DSLAM if a power failure occurs. The CPE sends a low-level embedded operations channel (EOC) message, dying gasp, to the central-site DSLAM, which identifies that a line was lost because of loss in CPE power. It allows service providers to conclude that a connectivity loss is beyond their responsibilities. The 4-pair G.SHDSL HWIC (HWIC-4SHDSL) does not support dying gasp, but the 2-pair G.SHDSL HWIC (HWIC-2SHDSL) does.

Q. What is wetting current, and is the ability to terminate wetting current supported on the G.SHDSL HWICs?

A. Wetting current is a small amount of electrical current sent from the central office over the copper pair to the CPE to prevent the corrosion of the copper wires. Some service providers also use wetting current as a method for identifying cable pairs, and they therefore need to recognize and receive wetting current. Additionally, wetting current can be used to power devices such as repeaters and low power routers; remote powering is not possible with the G.SHDSL HWICs. The G.SHDSL HWICs can terminate the wetting current feature. This feature needs to be supported by DSLAM for the CPE to support it.

Q. Are new commands available to configure and query status for the G.SHDSL HWICs?

A. Yes, there are new commands to configure and report the status for the G.SHDSL HWICs. Please refer to the configuration manual for the HWICs for specific commands.

Q. Do the G.SHDSL HWICs work in central-office mode (back-to-back connection without a DSLAM)?

A. Currently only the HWIC-4SHDSL supports both CPE and central-office modes for diagnostic purposes. The mode of operation can be set only from the ROM Monitor environment. CPE is the default mode of operation.

Q. Is the EOC function supported?

A. Yes, the G.SHDSL HWICs support the EOC function.

Q. What EOC messages are supported?

A. The G.SHDSL HWICs comply with ITU-T specification G.991.2 to provide proper responses to DSLAM EOC requests.

Q. Do the G.SHDSL HWICs support symmetric DSL (SDSL) or high-data-rate DSL 2 (HDSL2)?

A. No. Only G.SHDSL signaling is supported. However, note that in Europe SHDSL is often termed SDSL because proprietary SDSL never gained popularity in Europe.

Ordering Information

Q. What are the product numbers and descriptions?

A. Refer to Table 5.

Table 5. Part Numbers of the G.SHDSL HWICs

Product Number	Description
HWIC-2SHDSL, HWIC-2SHDSL=	2-pair G.SHDSL HWIC (spare & system)
CISCO1841-2SHDSL	1841 2 -pair G.SHDSL bundle, HWIC-2SHDSL, IP Base, 64F/128D
C2801-2SHDSL/K9	2801 2–pair G.SHDSL bundle, HWIC-2SHDSL, SP Services, 64F/192D
C2811-2SHDSL/K9	2811 2–pair G.SHDSL bundle, HWIC-2SHDSL, SP Services, 64F/256D
HWIC-4SHDSL, HWIC-4SHDSL=	4-pair G.SHDSL HWIC with IMA (spare & system)
CISCO1841-4SHDSL	1841 4–pair G.SHDSL bundle, HWIC-4SHDSL, IP Base, 64F/128D
C2801-4SHDSL/K9	2801 4–pair G.SHDSL bundle, HWIC-4SHDSL, SP Services, 64F/192D
C2811-4SHDSL/K9	2811 4–pair G.SHDSL bundle, HWIC-4SHDSL, SP Services, 64F/256D
C2821-4SHDSL/K9	2821 4–pair G.SHDSL bundle, HWIC-4SHDSL, SP Services, 64F/256D

Q. What type of cable should a customer use when installing G.SHDSL HWICs?

A. Cisco recommends you use the cable supplied with the G.SHDSL HWICs. Inserting an RJ-11 connector into the 4-pair G.SHDSL HWIC port may deform pins 1 and 8, possibly preventing solid contact between the connector and plug in subsequent connections. If solid contact is prevented, line-1 tip and line-3 ring does not work properly. Each HWIC is shipped with a cable, and the cables can be ordered as spares from Cisco; part numbers are indicated in Table 6.

Table 6. Part Numbers of the G.SHDSL HWICs Spare Cables

Spare Cable for	Part Number
HWIC-2SHDSL	CAB-ADSL-RJ11
HWIC-4SHDSL	CAB-RJ45-2RJ11

Q. How are the cable pairs assigned in multiwire modes?

A. Two-port G.SHDSL HWIC: Pin assignments for the RJ-11 connector used are shown in Table 7 and illustrated in Figures 1 and 2. Figure 2 shows how to design a cable that connects the Cisco 2-Pair G.SHDSL HWIC with a DSLAM that supports two RJ-11 cable connections.

Figure 1. 2-pair G.SHDSL HWIC Connector Front View Pinout

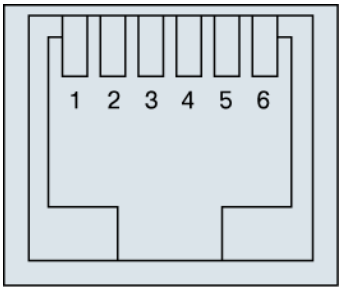
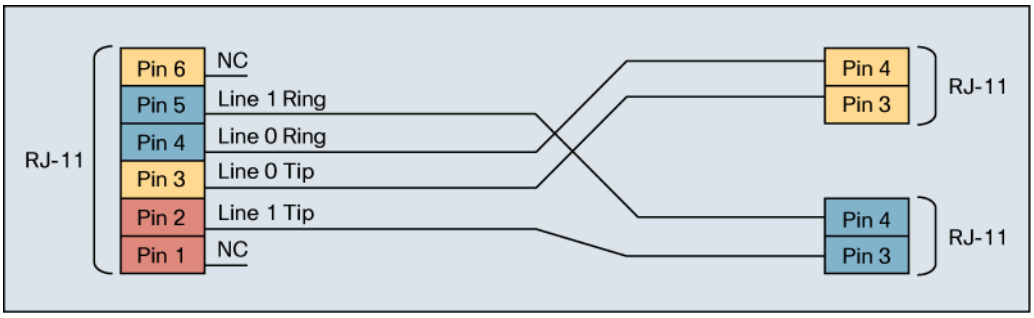


Table 7. 2-pair G.SHDSL HWIC (HWIC-2SHDSL) Pin Assignment

Pin	Signal
0 line	3 tip
0 line	4 ring
1 line	2 tip
1 line	5 ring

Figure 2. Standard RJ-11 Connector to Two Standard RJ-11 Connectors



4-pair G.SHDSL HWIC: Pin assignments for the RJ-45 connector are shown in the Table 8 and illustrated in the Figures 3 and 4. Figure 4 shows how to design a cable that connects the Cisco 4-Pair G.SHDSL HWIC (HWIC-4SHDSL) with a DSLAM that supports four RJ-11 cable connections.

Figure 3. HWIC-4SHDSL Connector Front View Pinout

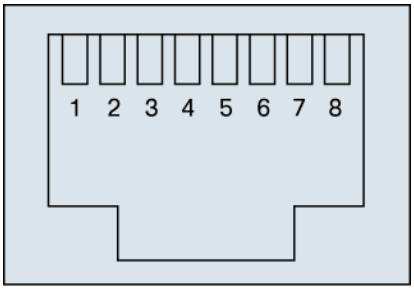
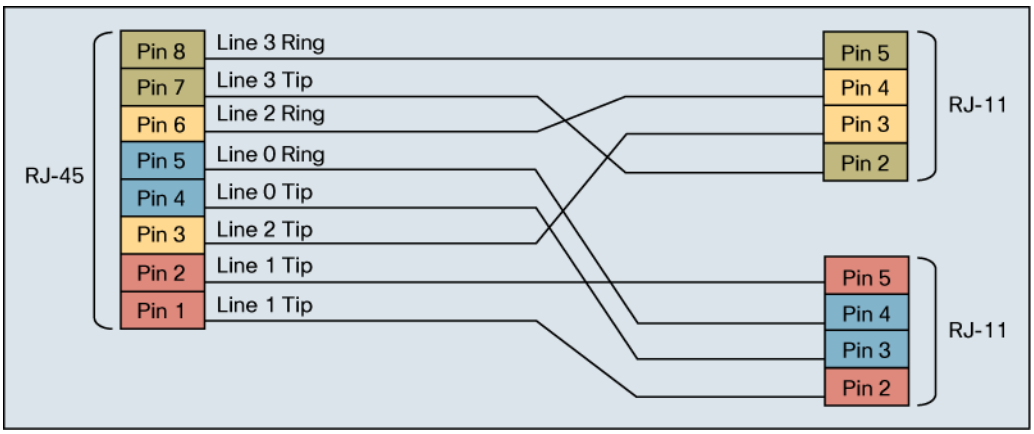


Table 8. Four-pair G.SHDSL HWIC Pin assignment

Pin	Signal
1 line	1 tip
2 line	1 ring
3 line	2 tip
4 line	0 tip
5 line	0 ring
6 line	2 ring
7 line	3 tip
8 line	3 ring

Figure 4. Standard RJ-45 Connector to Four Standard RJ-11 Connectors



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