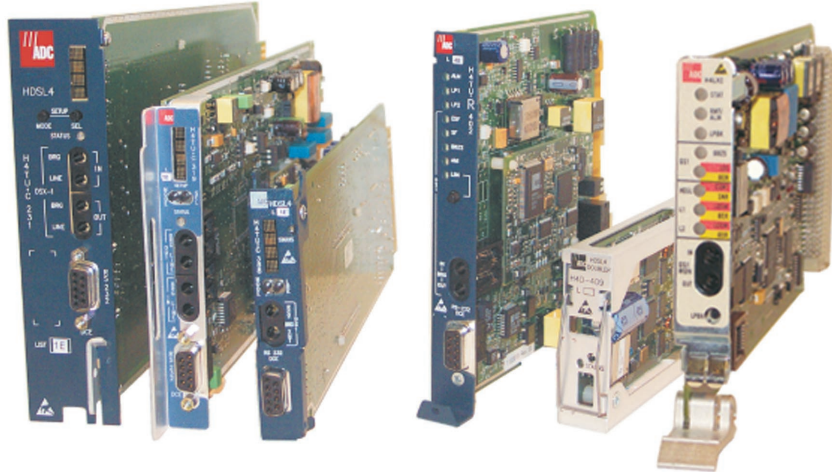


# HDSL4

## DS-1 Service Modules



Extending DS-1 reach while maintaining spectral compatibility with xDSL services poses challenges for service providers. Crosstalk interference between copper pairs in the same bundle limits deployment of popular ADSL services to the Carrier Service Area (CSA) range of 12kft. Still, customers want more bandwidth and more service – while demanding increased reliability and performance. Add-in regulatory concerns in leasing unbundled copper, and service providers clearly require a solution that transcends HDSL and HDSL2 technology.

Soneplex/HiGain HDSL4 from ADC offers both extended range and spectral compatibility with such services as ADSL. The result is cost savings and improved utilization of local loop bandwidth.

### Benefits:

- Spectral compliance. HDSL4 is the only DS-1 transport technology that is spectrally compatible with ADSL when deployed beyond 12kft on 24 AWG.
- Extended range *without repeaters*. HDSL4 extends spectrally compatible DS-1 service beyond CSA range to 16kft on 24 AWG.
- Extended range *with repeaters*. With two repeaters, HDSL4 extends spectrally compatible DS-1 service range to 46kft on 24 AWG.
- Cost savings. Fewer repeaters reduce equipment, installation and maintenance costs.
- Improved customer satisfaction. Spectral compliance ensures improved circuit performance and reliability.

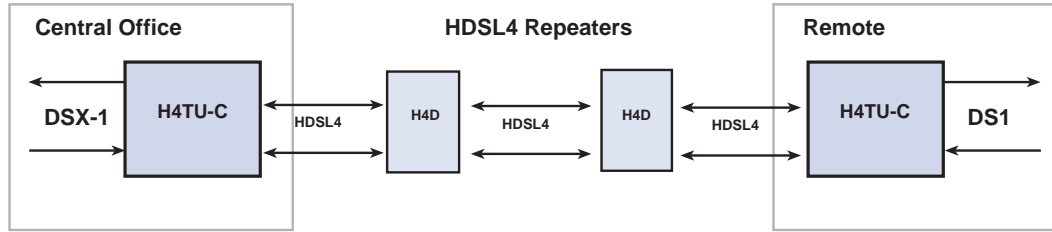


# HDSL4 DS-1 Service Modules

## Description

### Soneplex/HiGain HDSL4

Soneplex/HiGain HDSL4 is the latest addition to ADC's industry-leading solutions for DS-1 deployment. Soneplex/HiGain HDSL4 is designed for applications that require span lengths beyond Carrier Service Area (CSA) range of 12kft. Based upon the Spectrum Management (SM) standard T1.417, Issue 2, Soneplex/HiGain HDSL4 promotes interoperability and spectral compatibility with ADSL and other DSL technologies in the same cable bundle.



HDSL4 expands the capabilities of traditional HDSL and HDSL2 deployment offerings. It is the latest high-bit-rate digital subscriber line technology specifically developed to transmit DS-1 signals. It offers measurable advantages over HDSL and HDSL2.

The first advantage is extended reach. HDSL4 can be deployed beyond CSA range without interfering with ADSL or other xDSL technologies. It enables a CSA reach increase of 25% to 16kft (24 AWG) without the use of repeaters. In addition, HDSL4 requires fewer repeaters in long loop applications – which means more customers are accessible without installation of additional outside plant repeaters. For example, a 46kft HDSL4 application (24 AWG) requires two repeaters while HDSL technology requires three repeaters. The result is fewer points of failure in the network as well as reduced first costs and ongoing maintenance costs. As compared to traditional HDSL and HDSL2 technologies, HDSL4 increases the CSA reach per span, as shown below.

	HDSL/HDSL2	HDSL4
<b>A Single Span Reach</b>		
26 AWG/0.4 mm	9.0 kft	11.5 kft
24 AWG/0.51 mm	12.3 kft	16.0 kft
22 AWG/0.61 mm	16.0 kft	22.0 kft
19 AWG/0.91 mm	22.0 kft	30.0 kft



# HDSL4 DS-1 Service Modules

## Spectral Compatibility

The second major advantage of HDSL4 is spectral compatibility. HDSL4 is designed to limit crosstalk interference with other xDSL technologies, especially with ADSL. HDSL4 significantly reduces data rate degradation, bit errors, dropped service, noise, and intermittent trouble calls suffered by other xDSL services deployed in the same binder – problems which are especially significant in repeated deployments. The data below shows ADSL downstream data rates at various loop lengths in the presence of 24 disturbers deployed with mid-span repeaters. The last column shows the minimum ADSL data rate that compliant technologies must allow at that range.

ADSL Downstream Rate (Mbps) With 24 Disturbers				
ADSL Deployment Length	HDSL4 Disturbers	HDSL Disturbers	HDSL2 Disturbers	SM Standard
12kft	3.2	1.4	1.0	2.9
14kft	1.4	0.1	0	1.3

Since 1989, ADC has been the market leader in deployment of HDSL and HDSL2 technologies. Clearly, HDSL4 is the technology choice for DS-1 transport beyond the 12kft CSA range. However, it does not eliminate deployment of HDSL and HDSL2 for DS-1 transport. HDSL4 is a complementary technology, offering service providers another choice for the unique DS-1 and xDSL requirements of each CSA.

### Features:

- Transmission at DS-1 rate (1.554 Mbps) beyond CSA reach over two unconditioned copper pairs up to a maximum reach of 47db at 196kHz or 16kft (24 AWG)
- Spectral compatibility with xDSL technologies
- Extended reach to 16kft (24 AWG) without use of repeaters
- Extended reach to 46kft (24 AWG) with two repeaters
- Fully NEBS compliant
- Simple, compact design promotes easy installation and connections

### Ordering Information

Description	Catalog Number
HDSL4 3192 mechanics central office module	H4TU-C-319-L1
HDSL4 220 mechanics central office module	H4TU-C-231-L1
HDSL4 DDM+ mechanics central office module	H4TU-C-388-L1
HDSL4 200 mechanics remote module	H4TU-R-402-L1
HDSL4 239 mechanics doubler module	H4D-409-L1
HDSL4 central office module for Soneplex systems	SPX-H4LXCA1

# HDSL4 DS-1 Service Modules

## Specifications

<b>Line Powering:</b>	0, -185, $\pm 123$ Vdc (simplex over Loop 1 and Loop 2)
<b>CO Supply:</b>	-48 Vdc nominal (-42.5 Vdc to -56.5 Vdc)
<b>Operating Temperature:</b>	-40°F to +149°F (-40°C to +65°C)
<b>Operating Humidity:</b>	5% to 95%, non-condensing
<b>HDSL4 Line Code:</b>	784 kbps PAM on each pair, ANSI T1.418 Issue 2
<b>Transmission:</b>	Full Duplex
<b>Line Impedance:</b>	135 $\Omega$
<b>Maximum Insertion Loss:</b>	Span 1 = 47 dB at 196 kHz; Span 2 and Span 3 = 43 dB at 196 kHz
<b>DS1 Line Impedance:</b>	100 $\Omega$
<b>DS1 Line Code:</b>	AMI or B8ZS
<b>DS1 Line Rate:</b>	1.544 Mbps $\pm 200$ bps
<b>Frame Format:</b>	ESF, SF and unframed
<b>One Way DS1 Delay:</b>	<700 $\mu$ sec
<b>Wander:</b>	Meets MTIE T1.101 requirements
<b>Wideband Jitter:</b>	<0.2 UI
<b>Narrow Band Jitter:</b>	<0.1 UI
<b>H4TU-C-319-L1</b>	
<b>Dimensions (HxWxD):</b>	4.75" x 0.63" x 10.0" (12.10 x 1.59 x 25.40 cm)
<b>Weight:</b>	0.5 lbs (0.23 kg)
<b>Pulse Output:</b>	6V pk-pk pre-equalized for 0 to 655 feet
<b>Input Level:</b>	+1.5 to -7.5 dB DSX
<b>H4TU-C-231-L1</b>	
<b>Dimensions (HxWxD):</b>	5.9" x 1.4" x 10.0" (15.0 x 3.5 x 25.4 cm)
<b>Weight:</b>	0.5 lbs (0.23 kg)
<b>Pulse Output:</b>	6V pk-pk pre-equalized for 0 to 655 feet
<b>Input Level:</b>	+1.5 to -7.5 dB DSX
<b>H4TU-C-388-L1</b>	
<b>Dimensions (HxWxD):</b>	3.5" x 0.72" x 10.25" (8.0 x 1.8 x 26.0 cm)
<b>Weight:</b>	0.5 lbs (0.23 kg)
<b>Pulse Output:</b>	6V pk-pk pre-equalized for 0 to 655 feet
<b>Input Level:</b>	+1.5 to -7.5 dB DSX
<b>H4TU-R-402-L1</b>	
<b>Dimensions (HxWxD):</b>	5.6" x 0.7" x 5.6" (14.2 x 1.7 x 14.2 cm)
<b>Weight:</b>	0.5 lbs (0.23 kg)
<b>Pulse Output:</b>	0 dB, -7.5 dB and -15 dB
<b>Input Level:</b>	>-22.5 dB
<b>H4D-409-L1</b>	
<b>Dimensions (HxWxD):</b>	2.6" x 0.75" x 6.5" (6.6 x 1.9 x 16.5 cm)
<b>Weight:</b>	0.8 lbs (0.36 kg)
<b>SPX-H4LXCA1</b>	
<b>Power Consumption:</b>	32 W with two H4D units, 12 W without doublers
<b>Line Power Output:</b>	33 W
<b>Electrical Protection:</b>	Secondary surge and power cross-protection on all HDSL4 ports (requires external primary protection)
<b>Mounting:</b>	Soneplex Broadband or Loop Extender Chassis
<b>HDSL4 Output:</b>	+14.1 dBm $\pm 0.5$ dBm, 135 $\Omega$
<b>Maximum Provisioning Loss:</b>	45 dB at 196 kHz, 135 $\Omega$
<b>DS-1 Line Code:</b>	AMI, B8ZS, AUTO
<b>DS-1 Pulse Output:</b>	6V pk-pk, 0 to 533 feet in 133-ft increments
<b>DS-1 Input Level:</b>	-15 dB
<b>Dimensions (HxWxD):</b>	4.6" x 0.7" x 9.5" (11.7 x 1.7 x 24.1 cm)
<b>Weight:</b>	0.56 lbs (0.25 kg)



### Web Site: [www.adc.com](http://www.adc.com)

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