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Broadband Exchange Line Service
Interface and Performance Specifications

Technical
Reference

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BROADBAND EXCHANGE LINE SERVICE
INTERFACE & PERFORMANCE SPECIFICATIONS

CONTENTS

BROADBAND EXCHANGE LINE SERVICE
INTERFACE & PERFORMANCE SPECIFICATIONS

1. General

This document describes the Network Interface specifications for Broadband Exchange Line (BBEL) Service. Broadband Exchange Line is an intraLATA access methodology to be used exclusively in conjunction with BellSouth Telecommunications, Inc. (BST) broadband services. This family of services include Frame Relay Service, Connectionless Data Service (CDS) and ATM−based services. BBEL Service is a physical layer connection between the customer premises broadband equipment and the serving wire center. It is provided at data rates of 56/64 kbit/s, 128 − 768 kbit/s, 1.536 Mbit/s (DS1) and 44.210 Mbit/s (DS3) over electrical interfaces and 149.760 Mbit/s (OC−3) and 599.04 Mbit/s (OC−12) over optical interfaces.

Network Interfaces have been established based upon existing American National Standards Institute (ANSI) standards. This document articulates BST variations from the standards and clarifies ambiguous portions of the standards. This provides the reader with a clear understanding of the BST interface specifications. A performance section provides performance parameters and objectives for BBEL service.

This Technical Reference is being reissued to add the 128 − 768 kbit/s data rates over an electrical interface and the 149.760 Mbit/s and 599.040 Mbit/s rates over optical interfaces.

2. 56/64 kbit/s Interface

This section defines the 56/64 kbit/s Network Interface (NI) requirements. It denotes existing documentation which details electrical and signal specifications. The physical layer of the 56/64 kbit/s NI is defined in the following specification:

ANSI *Carrier−to−Customer Metallic Interface − Digital Data at 64 kbit/s*
T1.410−1992 *and Subrates [6]*

Of the circuit rates described in T1.410−1992, BBEL uses only the 56 and 64 kbit/s rates. An illustration of the 56/64 kbit/s NI is shown in Figure 1.

2.1 Variations and Clarifications

2.1.1 Loop Loss

The deployment of a BBEL in the local loop is limited by the one−way two−wire local loop insertion loss. Insertion loss limits are specified at a unique frequency for each different access line rate. This frequency is one−half the line rate (sometimes referred to as the Nyquist frequency) terminated into 135 ohms. The insertion loss frequency for the 56 kbit/s line rate is 28 kHz and the insertion loss frequency for the 64 kbit/s line rate is 36 kHz (loop rate of a 64 kbit/s access line is 72 kbit/s, see T1.410). The maximum allowable insertion loss for both line rates is 40 dB.

2.1.2   Bridged Tap Limits

The local loop facility used to deliver 56/64 kbit/s level BBEL is non−loaded and has maximum acceptable bridged tap lengths which customer equipment is required to accommodate. The maximum acceptable bridged tap is 1000 feet, with a maximum single tap length of 750 feet. However, if the loop facility meets the BST Carrier Serving Area (CSA) guidelines, the maximum cumulative bridged tap is 2500 feet, with a maximum single tap of 2000 feet. A CSA designed loop can contain two gauges of cable and is length limited (including bridged tap) to 12 kft for 24, 22 and 19 gauge cable and 9 kft for 26 gauge cable. Multi−gauge designs with 26 gauge cable are restricted in total length to $12 - [3L/(9 - BT)]$ kft, where L is the total length of 26 gauge and BT is the sum of all bridged taps. There are no restrictions concerning the location of bridged taps.

2.1.3   Mechanical Interface

Interconnection at the 56/64 kbit/s NI is through one of two Universal Service Order Code (USOC) Connectors, RJ48S and RJ48T, as specified in Part 68 of FCC Rules and Regulations. The RJ48S jack is used for single 56/64 kbit/s line installations and the RJ48T jack may be used for multiple circuit installations.

2.1.4   Customer Responsibility

The customer is required to provide network protection, signal recovery and test access functionality. These functions are normally included in a device called a Channel Service Unit (CSU). A typical customer installation also includes Data Service Unit (DSU) functionality, including timing recovery, zero code suppression, and the Data Circuit−Terminating Equipment/Data Terminal Equipment (DCE/DTE) interface. Timing will be recovered by the customer from the incoming network signal.

2.1.5   Maintenance

The customer equipment must respond to the mandatory channel loopback test signal, as described in Section 10.3.1 of T1.410−1992. In addition, it is highly desirable that the customer equipment also respond to the latching loopback code as described in Section 10.3.2.2 of T1.410−1992.

3.   128 kbit/s Interface

This section defines the 128 kbit/s Network Interface (NI) requirements. It denotes existing documentation which details electrical and signal specifications. The physical layer of the 128 kbit/s NI is defined in the following specification:

ANSI   *Integrated Services Digital Network (ISDN) Basic Access Interface*
T1.601−1992   *for Use on Metallic Loops for Application on the Network Side of*
                    the NT (Layer 1 Specifications) [8]

This methodology was used to provide a 128 kbit/s interface only. This architecture will be replaced by the architecture described in Section 4 which provides for interface rates of 128 kbit/s to 768 kbit/s.

3.1   Variations and Clarifications

3.1.1   Data Format

128 kbit/s access is provided over two wires using the 2B1Q line code. The user−data bit stream is comprised of two 64 kb/s B−channels and a 16 kbit/s D−channel. For 128 kbit/s BBEL service, the D−channel will not be used. Time slot sequence integrity (TSSI) between the two B−channels is utilized to accomplish the 128 kbit/s bit stream.

3.1.2   Mechanical Interface

Interconnection at the 128 kbit/s NI is through the Universal Service Order Code (USOC) Connector − RJ49C. The RJ49C jack is a modular 8−pin jack, connecting pins 4 and 5 with the T and R leads of the loop.

3.1.3   Maintenance

The customer equipment must respond to the channel loopback functionality of either data channel using the protocol, functions and messages for point−to−point embedded operations channels as specified in the following document:

> TR−TSY−000829   *Operations Technology Generic Requirements (OTGR): "Generic Operations Interfaces − Embedded Operations Channels",*[15]

4.   128 − 768 kbit/s Interface

This section defines the 128 − 768 kbit/s Network Interface (NI) requirements. It denotes existing documentation which details electrical and signal specifications. The physical layer of the 128 − 768 kbit/s NI is defined in the following specifications:

> TA−NWT−001210   *Generic Requirements for High−Bit−Rate Digital Subscriber Lines, [16]*
>
> FA−NWT−001211   *Generic Network Operations Requirements for High−Bit−Rate Digital Subscriber Lines, [17]*
>
> T1 TR No. 28   *A Technical Report on High−Bit−Rate Digital Subscriber Lines (HDSL), [18]*

4.1   Variations and Clarifications

4.1.1   Data Format

This BBEL will provide data rates of 128 kb/s through 768 kb/s in increments of 128 kb/s and will deliver these rates via the optional Single Loop 784 kb/s operation of an HDSL system. This is accomplished using a 2B1Q line code consisting of 768 kb/s of payload, 8 kb/s of framing and 8 kb/s of HDSL overhead over a two−wire copper facility.

4.1.2   Loop Loss

The two−wire local loop facility used to deliver 128 − 768 kbit/s level BBEL is non−loaded and has maximum acceptable bridged tap lengths which customer equipment is required to accommodate. Systems used to provide this BBEL rate are designed to operate over copper pairs conforming to CSA guidelines.

4.1.3   Maintenance

The customer equipment must respond to the latching loopback code as described in Section 10.3.2.2 of T1.410−1992 with a loopback select code (LSC) of N1000001 sent in the primary DS0 of the circuit.

5.   1.536 Mbit/s Interface

This section defines the requirements for 1.536 Mbit/s access transported over a DS1 Network Interface (NI). It denotes existing documentation which details electrical and signal specifications. The physical layer of the DS1 NI is specified in the following specification:

ANSI T1.403−1995   *Network−to−Customer Installation − DS1 Metallic Interface* [4]

An illustration of the DS1 NI is shown in Figure 2.

5.1   Variations and Clarifications

5.1.1   Framing Format

The DS1 signal shall be framed and have the Extended Superframe Format (ESF) structure described in ANSI T1.403 and specified in ANSI T1.107−1995 [3].

5.1.2   BST Signal at Network Interface

These specifications describe the DS1 signals delivered by BST to the NI. The signal requirements will be met at the signal regenerator output nearest the NI. An isolated pulse will have a peak−to−base amplitude of between 2.25 and 3.6 volts. At the NI, the pulse characteristics will be those of this BST standard pulse transmitted through a cable pair with a loss in the range of 0 to 16.5 dB at 772 kHz between 100 ohm terminations as shown in Figure 2.

5.1.3   Customer Installation Signal

The signal requirements will be met at the output of the customer Network Channel Terminating Equipment (NCTE) when its Line Buildout (LBO) is set to 0 dB. An isolated pulse shall have a peak−to−base amplitude of between 2.4 and 3.6 volts. At the NI, the pulse characteristics shall be those of a standard pulse transmitted through a cable pair with a loss in the range of 0 to 5.5 dB at 772 kHz between 100 ohm terminations as shown in Figure 2. When additional customer attenuation is required, it may be inserted by selecting the appropriate LBO setting in the NCTE. It is the responsibility of BST to advise the customer of the required LBO setting (0, 7.5 or 15.0 dB). It is the customer's responsibility to properly option the NCTE to provide the required LBO setting. Failure to provide the specified LBO will jeopardize the performance of the customer's service and has the potential to adversely impact the performance of other BST provided services.

5.1.4   Mechanical Interface

Interconnection at the DS1 NI is through one of four Universal Service Order Code (USOC) Connectors, RJ48C, RJ48X, RJ48M and RJ48H, as shown in ANSI T1.403 and Part 68 of the FCC Rules and Regulations as revised by Public Notice Numbers 4609 (September 21, 1988) and 4752 (October 3, 1988). The RJ48C or RJ48X jack is used for single DS1 line installations and the RJ48M (8 DS1s) or RJ48H (12 DS1s) jack may be used for multiple circuit installations.

5.1.5 Customer Responsibility

The customer is required to provide network protection, signal recovery, line buildout (as specified by BST) and test access functionality. These functions are normally included in a device called a Channel Service Unit (CSU). Timing will be recovered by the customer from the incoming network signal.

It is important to note that Synchronous Optical Network (SONET) facilities may be used to transport DS1 BBEL service. SONET facilities may introduce DS1 phase transients as a results of pointer adjustments. Characteristics of these phase transients at the network interface have been addressed in the latest version of T1.403. Customer equipment must be capable of accommodating these phase transients. Further information about phase transients due to SONET pointer adjustments is contained in T1.403.

5.1.6 Maintenance

The customer shall provide ANSI T1.403 ESF capabilities to support improved in−service performance monitoring and testing. In addition, the customer equipment should respond to NCTE loopbacks.

6. 44.210 Mbit/s Interface

This section defines the requirements for 44.210 Mbit/s access transported over a DS3 Network Interface (NI). It denotes existing documentation which details electrical and signal specifications. At the NI, the electrical requirements for the BST and the customer signal are the same. The physical layer of the DS3 NI is specified in the following specification:

ANSI T1.404−1994   *Network−to−Customer Installation − DS3 Metallic Interface Specification* [5]

An illustration of the DS3 NI is shown in Figure 3.

6.1   Variations and Clarifications

6.1.1   Framing Format

The DS3 signal shall be framed utilizing the DS3 C−bit parity frame structure described in ANSI T1.404−1994 and specified in ANSI T1.107−1995, *Digital Hierarchy − Formats Specifications (DS3 Format Applications)*. BST supports the C−Bit Parity − unchannelized application which can be used to transport a payload of 44.210 Mbit/s. This application preserves the M, F, P, X, and C bits described in T1.404 to assure compatibility with DS3 equipment and transmission facilities. The X−bit channel shall be used to transmit defects from the far end to the near end of the system. The C−Bit Parity assignments for the 21 C−bits contained within the DS3 M−frame are defined in ANSI T1.107. The third C−bit in M−subframe 1 provides a far−end alarm and control (FEAC) signal. For DS3 unchannelized applications, the FEAC codewords for embedded DS1s are unassigned.

6.1.2   Mechanical Interface

Interconnection at the DS3 NI is through Universal Service Order Code (USOC) Connector, SJA 44, as shown in ANSI T1.404−1994. The SJA 44 is a 75−ohm plug and jack coaxial connector meeting the requirements listed in MIL−C−39012 [13] and MIL−STD−202 [14].

6.1.3   Customer Responsibility

The customer is required to provide network protection, signal recovery, line buildout and test access functionality. These functions are normally included in a device called a Channel Service Unit (CSU). Timing will be recovered by the customer from the incoming loop signal.

6.1.4   Maintenance

The customer signal shall provide C−bit parity capabilities to support maintenance of the DS3 BBEL.

7.   149.760 Mbit/s Interface

This section defines the requirements for 149.760 Mbit/s access transported over a SONET OC−3 Network Interface (NI). It denotes existing documentation which details optical specifications. At the NI, the optical requirements for the BST and customer signal are the same. The physical layer of the OC−3 NI is specified in the following:

ANSI T1.646−1995   *Broadband ISDN − Physical Layer Specification for*
                          User−Network Interfaces Including DS1/ATM [9]

7.1   Variations and Clarifications

7.1.1   Overhead Bytes Active across NI

The function of the overhead bytes active across the NI shall be consistent with the specifications contained in GR−253−CORE [12] and ANSI T1.105−1995 [1]. Transport and Path overhead bytes active across the interface are summarized in the Table below.

	Transport Overhead			Path Overhead
Section Overhead	Framing A1	Framing A2	Section Trace J0	Path Trace J1
	Section BIP−8 B1			BIP−8 B3
				Signal Label C2
Line Overhead	Pointer H1	Pointer H2	Pointer Action H3	Path Status G1
	Line BIP−8 B2			
	M1 STS−3 Line REI			

Table 7−1. Overhead Bytes Active Across the NI

The overhead bytes in Table 7−1 are the ones that are active or potentially active across the interface. Some of the overhead bytes specified in GR−253−CORE and ANSI T1.105 are not required to be active across the interface. For this reason, receiving equipment must be capable of ignoring their content. Any future utilization of those overhead bytes will be consistent with SONET industry standards.

7.1.2 Payload Compatibility

For payloads terminated within the BST network, payload compatibility must be assured. Payloads mappings for Synchronous Payload Envelopes (SPEs) terminated in the BST network are defined in ANSI T1.105.02−1995 [2]and currently limited to the following:

- ATM cells mapped into STS−3c SPE

7.1.3 Physical Media Characteristics

The customer's equipment shall meet the physical media characteristics defined in ANSI T1.646−1995 and ATM Forum, af−phy−0046.000 [10], for Short Reach (SR) and Intermediate Reach (IR), OC−3 applications. These applications are for Light Emitting Diode (LED) and Multi−Longitudinal Mode (MLM) sources operating in the 1310 nm window. The optical parameters for these applications are summarized below in Table 7−2. Definitions of these optical parameters are give in Section 10. The customer's fiber optic cable between the NI and his equipment must be accounted for when determining the characteristics at the NI.

Parameter	SR	IR−1	Units
Laser Source	MLM/LED	MLM	n/a
$\lambda_{Tmin} - \lambda_{Tmax}$	1261−1360	1274−1356	nm
$\Delta\lambda_{rms}$	14.5/35	4	nm
P_{Tmax}	−8	−8	dBm
P_{Tmin}	−15	−15	dBm
$r_{e\ min}$	8.2	8.2	dB
D_{SRmax}	13/14	96	ps/nm
Attenuation	0−7	0−12	dB
P_{Rmax}	−8	−8	dBm
P_{Rmin}	−23	−28	dBm
P_O	1	1	dB

Table 7−2. OC−3 Optical Parameters

7.1.4 Fiber Transmission Media

The optical interface shall use conventional single−mode fiber (C−SMF) with a nominal zero dispersion wavelength of 1310 nanometers (nm). This fiber shall meet the requirements detailed in Bellcore GR−20−CORE [11], Generic Requirements for Optical Fiber and Optical Fiber Cables.

7.1.5 Optical Connector at NI

At the NI, duplexable SC type (EIA/TIA SCFOC/2.5) plug and jack type connectors will be used to support transmission over single mode fiber. BST will install the two connector jacks at the NI, as shown in Figure 4. BST and the customer must each provide a connector plug to terminate the 2 fibers (2 individual fibers) at the NI. The connector plug will contain 2 fibers, one for each direction of transmission. The connector is the demarcation point between BST and the customer interface.

7.1.6 Powering Arrangement

Powering shall not be provisioned across the NI by either BST or the customer.

8. 599.040 Mbit/s Interface

This section defines the requirements for 599.040 Mbit/s access transported over a SONET OC−12 Network Interface (NI). It denotes existing documentation which details optical specifications. At the NI, the optical requirements for the BST and customer signal are the same. The physical layer of the OC−12 NI is specified in the following:

ANSI T1.646−1995 *Broadband ISDN − Physical Layer Specification for User−Network Interfaces Including DS1/ATM*

ATM Forum af−phy−0046.000 *622.08 Mbps Physical Layer Specification*

8.1 Variations and Clarifications

8.1.1 Overhead Bytes Active across NI

The function of the overhead bytes active across the NI shall be consistent with the specifications contained in GR−253−CORE and ANSI T1.105−1995. Transport and Path overhead bytes active across the interface are summarized in the Table below.

	Transport Overhead			Path Overhead
Section Overhead	Framing A1	Framing A2	Section Trace J0	Path Trace J1
	Section BIP−8 B1			BIP−8 B3
				Signal Label C2
Line Overhead	Pointer H1	Pointer H2	Pointer Action H3	Path Status G1
	Line BIP−8 B2			
	M1 STS−N Line REI			

Table 8−1. Overhead Bytes Active Across the NI

The overhead bytes in Table 8−1 are the ones that are active or potentially active across the interface. Some of the overhead bytes specified in GR−253−CORE and ANSI T1.105−1995 are not required to be active across the interface. For this reason, receiving equipment must be capable of ignoring their content. Any future utilization of those overhead bytes will be consistent with SONET industry standards.

8.1.2 Payload Compatibility

For payloads terminated within the BST network, payload compatibility must be assured. Payloads mappings for Synchronous Payload Envelopes (SPEs) terminated in the BST network are defined in ANSI T1.105.02−1995 and currently limited to the following:

● ATM cells mapped into STS−12c SPE

8.1.3 Physical Media Characteristics

The customer's equipment shall meet the physical media characteristics defined in ANSI T1.646−1995 and ATM Forum, af−phy−0046.000, for Short Reach (SR) and Intermediate Reach, OC−12 applications. These applications are for Light Emitting Diode (LED) and Multi−Longitudinal Mode (MLM) sources operating in the 1310 nm window. The optical parameters for these applications are summarized below in Table 8−2. Definitions of these optical parameters are give in Section 10. The customer's fiber optic cable between the NI and his equipment must be accounted for when determining the characteristics at the NI.

Parameter	SR	IR−1	Units
Laser Source	MLM/LED	MLM	n/a
$\lambda_{Tmin} - \lambda_{Tmax}$	1261−1360	1274−1356	nm
$\Delta\lambda_{rms}$	14.5/35	4	nm
P_{Tmax}	−8	−8	dBm
P_{Tmin}	−15	−15	dBm
$r_{e\ min}$	8.2	8.2	dB
D_{SRmax}	13/14	96	ps/nm
Attenuation	0−7	0−12	dB
P_{Rmax}	−8	−8	dBm
P_{Rmin}	−23	−28	dBm
P_O	1	1	dB

Table 8−2. OC−12 Optical Parameters

8.1.4 Fiber Transmission Media

The optical interface shall use conventional single−mode fiber (C−SMF) with a nominal zero dispersion wavelength of 1310 nanometers (nm). This fiber shall meet the requirements detailed in Bellcore GR−20−CORE, Generic Requirements for Optical Fiber and Optical Fiber Cables.

8.1.5 Optical Connector at NI

At the NI, duplexable SC type (EIA/TIA SCFOC/2.5) plug and jack type connectors will be used to support transmission over single mode fiber. BST will install the two connector jacks at the NI, as shown in Figure 4. BST and the customer must each provide a connector plug to terminate the 2 fibers (2 individual fibers) at the NI. The connector plug will contain 2 fibers, one for each direction of transmission. The connector is the demarcation point between BST and the customer interface.

8.1.6 Powering Arrangement

Powering shall not be provisioned across the NI by either BST or the customer.

9. Performance

The performance of a BBEL service defines the physical layer performance of a portion of an end−to−end connection of a higher layer service, such as Frame Relay or CDS. Frame Relay Service and CDS performance objectives are contained in BST Technical References 73587 [10] and 73581 [9], respectively. While there is not a direct relationship between performance at the physical layer and the higher layers of a protocol, the performance of a BBEL is considered when determining the performance of higher layer services.

The performance of BBEL Service is specified in terms of two parameters; errored seconds and severely errored seconds.

An errored second (ES) is defined as a one−second interval during which one or more bit errors has occurred.

A severely errored second (SES) is defined as a one−second interval during which the bit error rate was worse than 1×10^{-3}.

BBEL Service, under normal conditions, will perform at an average level equal to or greater than the objectives in Table 9−1. The values in Table 9−1 were derived from long−term (i.e., 30 or more days) accuracy performance objectives in ANSI T1.510−1994 [7].

	%ES	%SES
56/64 kbit/s	0.10	0.010
DS1	0.25	0.010
DS3	0.50	0.010

Table 9−1 BBEL Performance Objectives

10. Optical Parameter Definitions

The following definitions apply to the parameter values listed in Table 7−2 and 8−2.

LED	Light Emitting Diode
MLM	Multi−Longitudinal Mode laser
λ_{Tmin}, λ_{Tmax}	The range of central operating wavelengths − minimum and maximum central operating wavelengths, under worst−case variations due to manufacturing, temperature, aging, and reflections.
$\Delta\lambda_{rms}$	Root−mean−square (rms) spectral width under worst−case variations due to manufacturing, temperature, aging, and in the presence of worst case reflections.
P_{Tmax},P_{Tmin}	The maximum and minimum coupled transmitter power at point S in Figure 4, with a pseudo−random data sequence.
r_{emin}	The minimum value of the extinction ratio − ratio of the average optical energy in a logic one level to a logic zero level, under fully modulated conditions in the presence of worst−case reflections.
D_{SRmax}	The maximum dispersion between points S & R in Figure 4.
P_{Rmax},P_{Rmin}	The maximum and minimum receiver power at point R in Figure 4 for 1×10^{-10} BER.
P_O	Optical path power penalty between points S and R in Figure 4.

11. References

[1] ANSI T1.105−1995   *Synchronous Optical Network (SONET) − Basic Description including Multiplex Structure, Rates, and Formats*

[2] ANSI T1.105.02−1995   *Synchronous Optical Network (SONET) − Payload Mappings*

[3] ANSI T1.107−1995   *Digital Hierarchy − Electrical Interfaces*

[4] ANSI T1.403−1995   *Network−to−Carrier Installation − DS1 Metallic Interface*

[5] ANSI T1.404−1994   *Network−to−Carrier Installation − DS3 Metallic Interface Specification*

[6] ANSI T1.410−1992   *Carrier−to−Customer Metallic Interface − Digital Data 64 kbit/s and Subrates*

[7] ANSI T1.510−1994   *Network Performance Parameters for Dedicated Digital Services − Specifications*

[8] ANSI T1.601−1992   *Integrated Services Digital Network (ISDN) Basic Access Interface for Use on Metallic Loops for Application on the Network Side of the NT (Layer 1 Specifications)*

[9] ANSI T1.646−1995   *Broadband ISDN − Physical Layer Specification for User−Network Interfaces Including DS1/ATM*

[10] ATM Forum af−phy−0046.000   *622.08 Mbps Physical Layer Specification*

[11] GR−20−CORE   *Generic Requirements for Optical Fiber and Fiber Optic Cable*

[12] GR−253−CORE   *Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria*

[13] MIL−C−39012   *Connectors−Coaxial Radio Frequency*

[14] MIL−STD−202   *Test Methods for Electronic and Electrical Components*

[15] TR−TSY−000829   *Operations Technology Generic Requirements (OTGR): "Generic Operations Interfaces − Embedded Operations Channels"*

[16] TA−NWT−001210   *Generic Requirements for High−Bit−Rate Digital Subscriber Lines*

[17] FA−NWT−001211   *Generic Network Operations Requirements for High−Bit−Rate Digital Subscriber Lines*

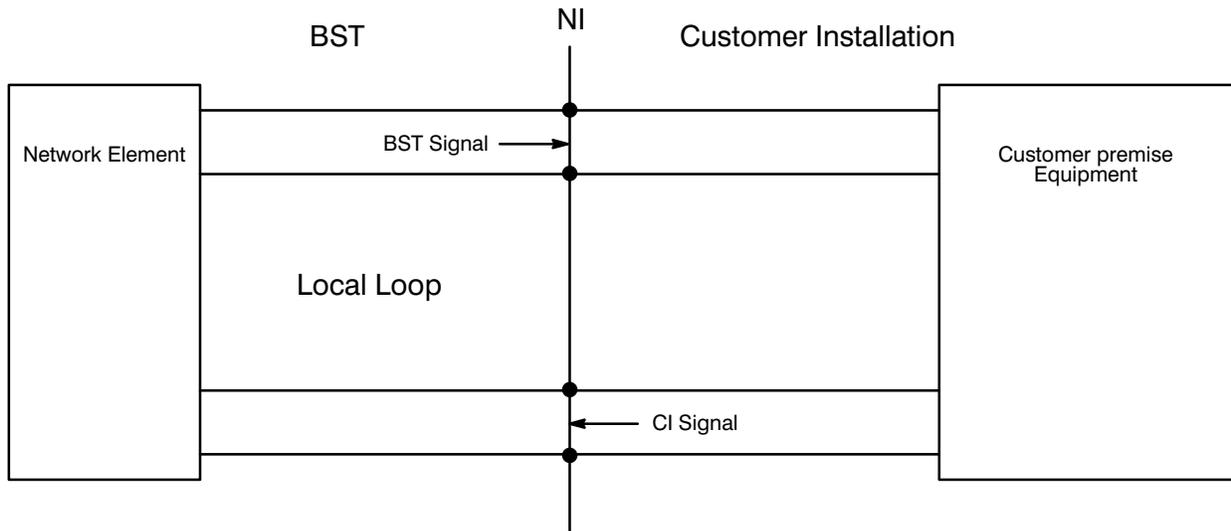[18] ANSI T1 TR No. 28   *A Technical Report on High−Bit−Rate Digital Subscriber Lines (HDSL)*

BST   NI Customer Installation

Network Element

BST Signal

Local Loop

Customer premise
Equipment

CI Signal

Figure 1 − 56/64 kbit/s Network Interface

BST   NI Customer Installation

Standard Pulse

BST Signal

Standard Pulse attenuated
by 0 − 22 dB
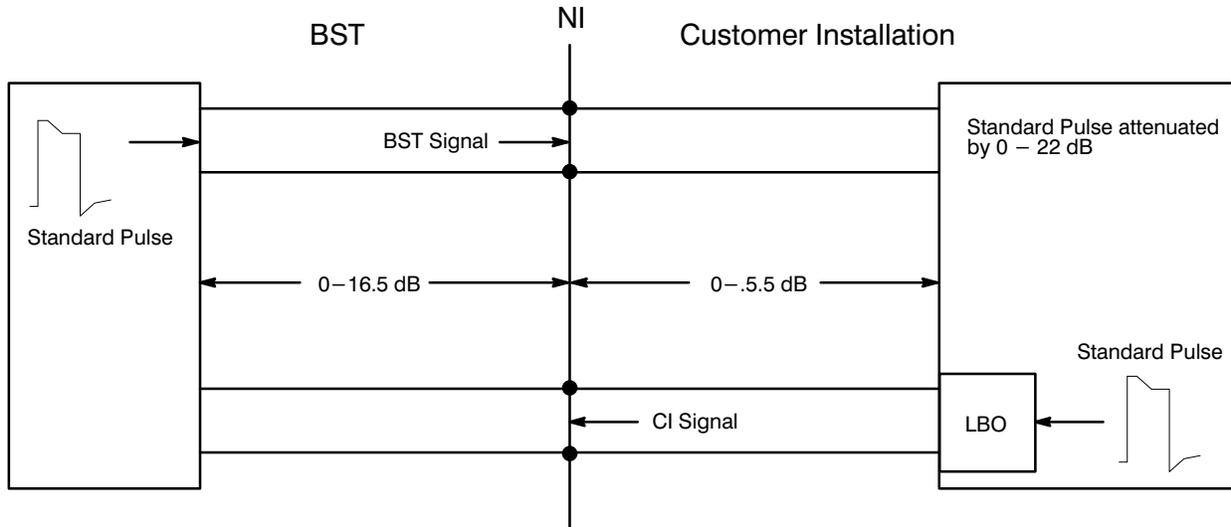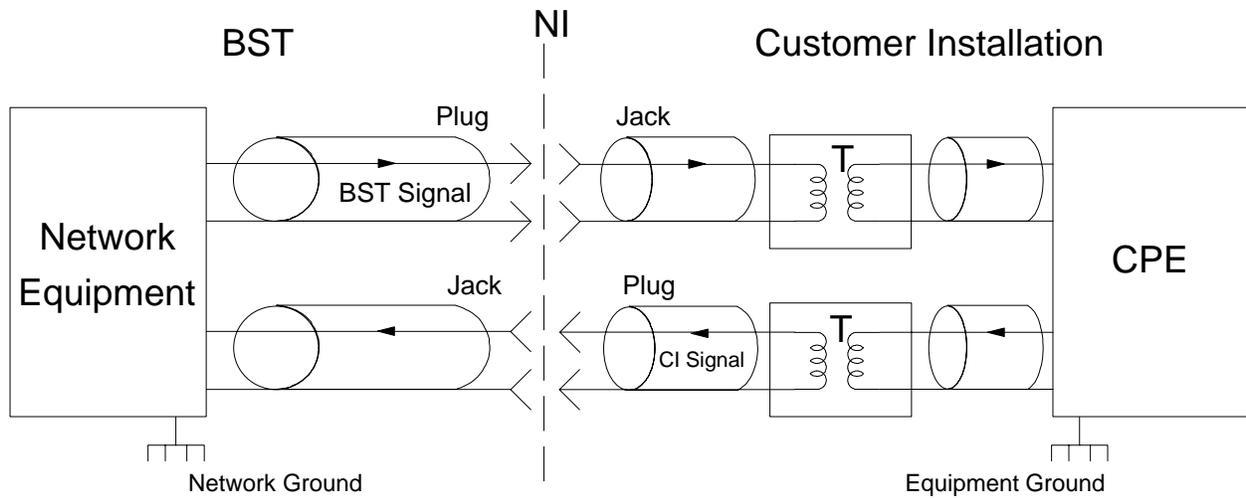
0−16.5 dB   0−.5.5 dB

Standard Pulse

LBO

CI Signal

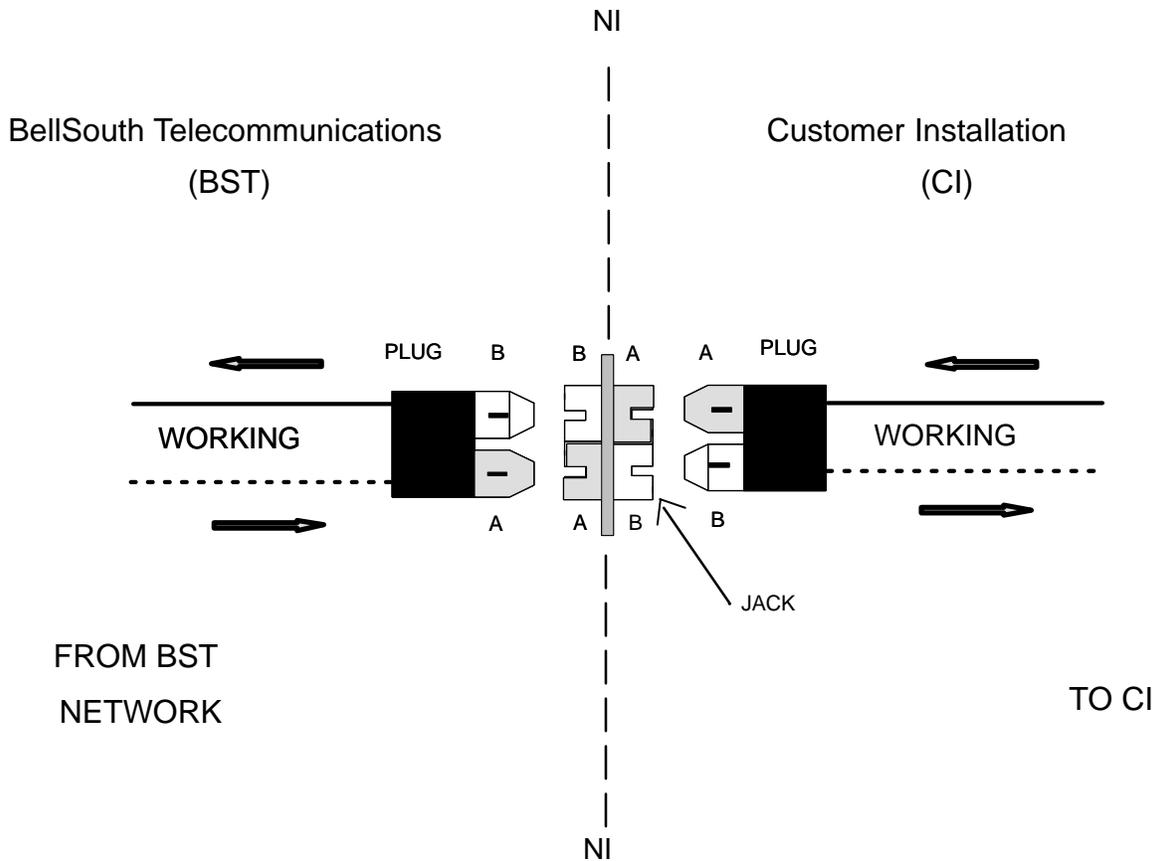**Figure 2 − DS1 Network Interface**

1) This diagram indicates signal continuity arrangements.

2) Equipment grounding should follow appropriate installation practices consistent with existing safety standards.

3) T – optional wideband transformers to mitigate ground currents.

Figure 3 − DS3 Network Interface

NI

BellSouth Telecommunications
(BST)

Customer Installation
(CI)

PLUG   B   B   A   A   PLUG

WORKING

WORKING

A   A   B   B

JACK

FROM BST
NETWORK

TO CI

NI

NOTES:

1 LIGHT LEAVES "A" PLUG AND ENTERS "A" JACK

2 LIGHT LEAVES "B" JACK AND ENTERS "B" PLUG

3 JACK AT NI PROVIDED BY BST (OPTIONALLY MAY BE PART OF NETWORK EQUIPMENT)

4 A SINGLE FIBER IS USED FOR EACH DIRECTION OF TRANSMISSION

     DIRECTION OF LIGHT

Figure 4 − Optical Mechanical Network Interface

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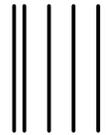
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