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Unbundled Loop

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NOTICE

This document describes CenturyLink's Unbundled Loop offering that provides unbundled Voiceband Channels, Digital Channels and xDSL loops. The Unbundled Loop extends from an interface at a CenturyLink Central Office to an End-User's premises interface located within the serving area of that Central Office. The Central Office must be one where a Carrier has established Physical or Virtual Collocation arrangements. This Unbundled Network Element is available to Competitive Local Exchange Carriers from CenturyLink. Network Channel and Network Channel Interface codes are included to describe and order the transport channels.

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Table

1. Introduction

1.1 General

This document describes CenturyLink's Unbundled Loop offering that provides unbundled Voiceband Loops, Digital Loops and xDSL Loops.

The Unbundled Loop extends from an interface at a CenturyLink Central Office to an End-User's premises interface located within the serving area of that Central Office. The Central Office must be one where a carrier has established Physical or Virtual Collocation arrangements. The Unbundled Loop offering provides:

- A voice band transmission path of approximately 3 kHz of usable bandwidth between the End-User's premises Network Interface and the CenturyLink Central Office Network Interface.
- A digital transmission path between the End-User's premises Network Interface and the CenturyLink Central Office Network Interface supporting the following, standard signals:
  - Digital Data Service Transport that provides bi-directional transmission paths in the range from 2.4 kbit/s to 64 kbit/s.
  - An Unbundled Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) Capable Loop that provides a bi-directional, 160 kbit/s, 2B+1D transmission path. This product may also be referred to a Unbundled ISDN BRI Capable Loop or Unbundled ISDN Digital Subscriber Line (DSL) Channel in other chapters of this Technical Publication and the Network Channel (NC) code is the same (AD--)
  - An xDSL-I DSL that provides a bi-directional, 160 kbit/s (144 kbit/s, full-payload) transmission path.
  - Unbundled DS1 Capable Loop that provides a bi-directional, 1.544 Mbit/s transmission path.
  - Unbundled DS3 Capable Loop that provides a bi-directional, 44.736 Mbit/s transmission path.
- An xDSL transmission path between the End-User's premises Network Interface and the CenturyLink Central Office Network Interface where a Competitive Local Exchange Carrier (CLEC) may apply the standardized signals listed in Section 3.8.3.

1.2 Reason for Reissue

A general clean-up of all chapters of the Technical Publication that does not change the product or process as follows:

- Changes as result of negotiations
- Rebrand Qwest to CenturyLink
- Remove the word “Interconnection”; this also will encompass a name change for this Technical Publication
- Change the use of the term “Interconnector” to “carrier”
- Update Product names to reflect the current Product names, e.g., ISDN BRI
- Removal of all references to the SONET product, including removal of Technical Publications associated with SONET
- Removal of version numbers and date references on CenturyLink Tech Pubs
- Updates to more consistently use the acronyms NC and NCI throughout the document once they have been initially defined
- Change the use of the term “channel” to “loops” or another appropriate term
- Change the reference from “metallic” to “copper” as appropriate
- Change the term “non-loaded” to “free of load coils”
- Change the reference to ATIS document NC-CL-IN-008 to now refer to ATIS 0300223.2009
- Removal of unnecessary and outdated information regarding CenturyLink employee access to Technical Publications
- Updates to the Table of Contents as appropriate
- Update of Copyright information

1.3 Scope

The intent of this document is to provide End-Users (EU’s), service providers, and equipment manufacturers with a description of CenturyLink’s Unbundled Loop, its operational characteristics and available interfaces. CenturyLink has responsibility for providing each individual unbundled element as described in this and other referenced publications. CenturyLink assures that each individual unbundled element will function as described herein.

The carrier ordering these unbundled elements has responsibility for correctly designing the total end-to-end service. The carrier may request CenturyLink to concatenate individual unbundled elements. However, CenturyLink can not assure that the combination of elements will work in the manner the carrier desires.

1.4 Unbundled Voiceband Loops

Unbundled Voiceband Loops are transmission paths capable of carrying analog voice frequency signals between the Network Interface (NI) on an EU’s premises (EU-NI) and a CenturyLink Central Office Network Interface (CO-NI). Unbundled Voiceband Loops may be provided using a variety of transmission technologies including but not limited to copper wire, copper wire based digital loop carrier and fiber optic fed digital carrier systems. Such technologies are used singularly or in tandem in providing Unbundled Voiceband Loops. Direct Current (DC) continuity is not inherent in this offering.

1.5 Unbundled Digital Loops

Unbundled Digital Loops are transmission paths capable of carrying specifically formatted and line coded digital signals between the Network Interface on an EU's premises and a CenturyLink Central Office Network Interface. Unbundled Digital Loops may be provided using a variety of transmission technologies including but not limited to copper wire, copper wire based digital loop carrier and fiber optic fed digital carrier systems. Such technologies are used singularly or in tandem in providing service. Direct Current continuity is not inherent in this service.

1.6 Unbundled xDSL Loops

Unbundled xDSL Loops are transmission paths (2-wire and 4-wire copper Loops and Subloops) capable of carrying American National Standards Institute (ANSI) defined digital subscriber line signals between the Network Interface on an EU's premises and a CenturyLink Central Office Network Interface. Unbundled xDSL Loops use only copper wire facilities free of load coils. These facilities shall be free of faults, such as opens, grounds, shorts and foreign volts. The loops will also be conditioned as requested by the CLEC. CenturyLink has the responsibility to provision the best available loop. CenturyLink will take into account the NC code and the NCI code when assigning, maintaining and repairing facilities for xDSL. Conditioning is available for xDSL Capable Loops.

1.7 Document Organization

Table 1-1 describes how this document is organized.

Table 1-1 Document Organization

Chapter	Title	Contents
1	Introduction	General information about this document
2	Service Description	Description of the service
3	Network Channel and Network Channel Interface Specifications	Explanation of interface codes and valid code combinations
4	Technical Specifications - Unbundled Voiceband Loops	Technical issues and operational characteristics of available Unbundled Voiceband Loops
5	Technical Specifications - Unbundled Digital Loops	Technical issues and operational characteristics available Unbundled Digital Loops
6	Technical Specifications - Unbundled xDSL Capable Loops	Technical issues and operational characteristics of Unbundled xDSL Capable Loops
7	Maintenance	Customer and CenturyLink Responsibilities
8	Definitions	Acronyms and glossary of terms
9	References	List of references with ordering instructions and a list of Trademarks

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Chapter and Section **Page**

2. Description of Service

2.1 Unbundled Voiceband Loops

An Unbundled Voiceband Loop is a voice band transmission path that runs from a CenturyLink central office (CO) building (from a main distribution frame or other suitable frame called the Central Office Network Interface [CO-NI]) to an End-User Network Interface (EU-NI). The EU-NI is located at the EU's designated premises within the serving area of the CenturyLink CO. The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements. Technical Publication 77386, *Expanded Interconnection and Collocation for Private Line Transport and Switched Access Services*, provides technical information about Interconnection and Collocation.

Characteristics associated with an Unbundled Voiceband Loop as defined above are in accord with the following interfaces:

- 2-Wire analog interfaces supporting loop-start signaling with a transmission path designed to carry analog voice frequency signals nominally between 300 and 3000 Hz.
- 2-Wire analog interfaces supporting ground-start signaling with a transmission path designed to carry analog voice frequency signals nominally between 300 and 3000 Hz.
- 2-Wire analog interfaces supporting reverse battery signaling with a transmission path designed to carry analog voice frequency signals nominally between 300 and 3000 Hz.
- 2-Wire analog interfaces with no signaling functions provided by CenturyLink and a transmission path designed to carry analog voice frequency signals nominally between 300 and 3000 Hz.
- 4-Wire analog interfaces with no signaling functions provided by CenturyLink. Its associated transmission path will carry analog voice frequency signals, nominally between 300 and 3000 Hz, using separate transmit and receive paths.

2.2 Unbundled Digital Loops

An Unbundled Digital Loop is a digital transmission path that runs from a CenturyLink central office (CO) building (from a main distribution frame, DSX or other suitable frame called the Central Office Network Interface [CO-NI]) to an End-User Network Interface (EU-NI). The EU-NI is located at the EU's designated premises within the serving area of the CenturyLink CO. The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements. Technical Publication 77386, *Expanded Interconnection and Collocation for Private Line Transport and Switched Access Services*, provides technical information about Interconnection and Collocation. The following sections describe the types of available Digital Loops.

2.2.1 Unbundled Digital Data Services Loop

An Unbundled Digital Data Services (DDS) Loop is based on ANSI Standard T1.410, *Carrier-to-Customer Metallic Interface - Digital Data at 64kbps and Subrates*, and operates at 64 kbit/s and subrates of 2.4, 4.8, 9.6, 19.2, and 56 kbit/s. It is a digital transmission path that runs from a CenturyLink Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the CenturyLink CO. Secondary digital transmission paths may be transmitted with any subrate. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements

Characteristics associated with an Unbundled DDS Loop interface as defined are 4-wire, conform to ANSI T1.410, and are nominally 2.4, 4.8, 9.6, 19.2, 56, and 64 kbit/s.

2.2.2 Unbundled ISDN BRI Capable Loop

An Unbundled ISDN BRI Capable Loop is a digital transmission path that runs from a CenturyLink Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the CenturyLink CO. This transmission path will transport a standard, 160 kbit/s payload with interfaces conforming to ANSI Standard T1.601, Telecommunications -*Integrated Services Digital Network (ISDN) - Basic Access Interface for Use on Metallic Loops for Application on the Network side on the NT (Layer 1 Specification).* It transports a nominal 144 kbit/s of customer useable data. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements.

Characteristics associated with an Unbundled ISDN BRI Capable Loop as defined above are in accord with the following interfaces:

- 2-Wire digital interface supporting basic rate ISDN (BRI) with 2B1Q line code, nominally 160 kbit/s, with the Network Termination (NT) function.
- 2-Wire digital interface supporting basic rate ISDN (BRI) with 2B1Q line code, nominally 160 kbit/s, with the Line Termination (LT) function.

2.2.3 Unbundled DS1 Capable Loop

An Unbundled DS1 Capable Loop is a digital transmission path that runs from a CenturyLink Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the CenturyLink CO. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements. It is a transmission path between a Central Office Network Interface at a DSX-1 panel or equivalent in a CenturyLink Central Office and at the End-User's premises Network Interface. The DS1 Capable Loop transports bi-directional DS1 signals with a nominal transmission rate of 1.544 Mbit/s.

Characteristics associated with an Unbundled Digital Loop as defined above are in accord with the following interfaces:

- 4-Wire digital interfaces supporting Bipolar Alternate Mark Inversion (AMI) line code, nominally 1.544 Mbit/s, over a transmission path to an EU's premises. Frame format may be Super Frame, ANSI Extended Super Frame or Non-ANSI Extended Super Frame.
- 4-Wire digital interfaces supporting Binary, Eight Zero Substitution (B8ZS) line codes, nominally 1.544 Mbit/s, over a transmission path to an EU's premises. Frame format may be Free Framed, Super Frame, ANSI Extended Super Frame or Non-ANSI Extended Super Frame.

2.2.4 Unbundled DS3 Capable Loop

An Unbundled DS3 Capable Loop is a digital transmission path that runs from a CenturyLink Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the CenturyLink CO. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements. It is a transmission path between a Central Office Network Interface at a DSX-3 panel or equivalent in a CenturyLink Central Office and at the End-User's premises Network Interface. The DS3 Capable Loop transports a bi-directional a high capacity transmission path for the transmission of 44.736 Mbit/s isochronous serial data having a line code of Bipolar Three Zero Substitution (B3ZS).

Characteristics associated with an Unbundled Digital Loop as defined above are in accord with the following interfaces:

- 4-Wire digital interface supporting Binary, Three Zero Substitution (B3ZS) line code, nominally 44.736 Mbit/s, over a transmission path to an EU's premises. Frame format is M-framed.
- 4-Wire digital interface supporting Binary, Three Zero Substitution (B3ZS) line code, nominally 44.736 Mbit/s, over a transmission path to an EU's premises. Frame format is M-framed with C-bit Parity.

2.3 Unbundled xDSL Capable Loops

"xDSL Capable Loop" refers to 2-wire and 4-wire copper Loop(s) and copper Subloop(s) that transmit the digital signals needed to provide xDSL Service. Unbundled digital loops may be provided using a variety of transmission technologies pursuant to the CLEC's interconnection agreement. "xDSL Capable Loops" is used to refer specifically to Loops and Subloops used to provide narrowband or broadband services (or both) to customers served by copper Loops and Subloops (including those that are in active service and those that are deployed in the network as spares). These facilities shall be free of faults, such as opens, grounds, shorts, and foreign volts. The loops will also be conditioned when requested by the CLEC. CenturyLink has responsibilities to provision the best available loop Characteristics associated with an Unbundled xDSL Capable Loop are in accord with the following interfaces:

- 2-Wire and 4-Wire interfaces conforming to signal characteristics specified as acceptable for the loop lengths as specified in ANSI Standard T1.417, *Spectrum Management for Loop Transmission Systems.* These loops would be used for Advanced Digital Transport services.

- 2-Wire digital interfaces supporting with Two Binary One Quaternary (2B1Q) line code, nominally 160 kbit/s. The payload may be channelized or un-channelized with 144 kbit/s of customer useable data.
- 2-Wire HDSL interface conforming to signal characteristics of Accredited Standards Committee on Telecommunications, T1, and within the Technical Subcommittee T1E1, Network Interfaces, Technical Report Number 28 and ANSI T1.418a-2004 High bit rate Digital Subscriber Line - 2nd Generation (HDSL2/HDSL4), Issue 2
- 4-Wire HDSL interface conforming to signal characteristics of Accredited Standards Committee on Telecommunications, T1, and within the Technical Subcommittee T1E1, Network Interfaces, Technical Report Number 28 and ANSI T1.418a-2004 High bit rate Digital Subscriber Line - 2nd Generation (HDSL2/HDSL4), Issue 2
- 2-Wire SHDSL interface conforming to signal characteristics of ANSI Standard, T1.426-2004 *Enhanced Single-Pair High-Speed Digital Subscriber Line (E-SHDSL) Transceivers*.
- 2-Wire ADSL interface using Carrierless Amplitude Phase Modulation (CAP), conforming to signal characteristics of ANSI Standard, T1.413, *Network and Customer Installation Interfaces - Asymmetrical Digital Subscriber Line (ADSL) Metallic Interface*.
- 2-Wire ADSL using Discrete Multi-Tone (DMT), conforming to signal characteristics of ANSI Standard, T1.413, *Network and Customer Installation Interfaces - Asymmetrical Digital Subscriber Line (ADSL) Metallic Interface*.
- 2-Wire ADSL2+ using Discrete Multi-Tone (DMT), conforming to signal characteristics of ITU-T Standard, G.992.5, *Asymmetric digital subscriber line 2 transceivers (ADSL2)-Extended bandwidth ADSL2 (ADSL2plus).*
- 2-Wire VDSL2 using Discrete Multi-Tone (DMT), conforming to signal characteristics of ITU-T Standard, G.993.2, *Very high speed digital subscriber line transceivers 2 (VDSL2)*.

2.4 Applied Power Level

The applied power level of any transmitted signal must comply with American National Standards Institute (ANSI) specifications T1.401-1993 and Bellcore's Generic Requirements 1089-CORE, *Electromagnetic compatibility and Electrical Safety Generic Criteria for Network Telecommunications Equipment*. Continuous idle-state voltages applied to the CO-NI and EU-NI must fall within the range of 0 to 105 volts DC with respect to ground potential.

The signals applied at the NIs of the Advanced Digital Transport Loop must be one that conforms to the specifications of Spectrum Management for Loop Transmission Systems, ANSI Standard T1.417.

2.5 High Voltage Protection

Whenever High Voltage Protection is required, additional tariffed charges shall be applied to any Unbundled Loop order. High Voltage Protection is often required at EU sites such as power sub-stations and other sites where a potential exists for dangerous voltage conditions. Each situation needs analysis and in some cases may trigger an Individual Case Basis (ICB) request for special construction.

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3. Network Channel and Network Channel Interface Specifications

3.1 General

Network Channel (NC) codes describe, in standard format, the characteristics of the service transmission path. Network Channel Interface (NCI) codes provide the means to define the physical and electrical characteristics at the handoff or termination of a channel. The ANSI standard document ATIS- 0300223.2009 as ratified and/or updated describes these coding schemes. As technologies and industry standards change over time NC/NCI/SEC NCI may be added or revised and will be available to the CLEC.

3.2 Network Channel (NC) Code Function

Service considerations are encoded into NC codes. The Carrier or End-User specifies the NC Code to advise CenturyLink of the required service connection of the transmission path and of any applicable Central Office (CO) functions.

3.3 NC Code Components and Format

An NC code is a four-character code with two data elements:

- Channel Code
- Optional Feature Code

Figure 3-1 illustrates NC code format.

Network Channel Code

Data Element	Channel Code		Optional Feature Code	
Character Position	1	2	3	4
Character Key	X	X	X or -	X or -

X = Alphanumeric
\- = Hyphen

Figure 3-1 Format Structure for NC Codes

The **Channel Code** (character positions 1 and 2) is a two character alpha or alphanumeric code that describes the channel service in an abbreviated form. The channel code will frequently, but not always, be the service code of special service circuits or the transmission grade of message trunk circuits. The NC channel code field is always filled.

The **Optional Feature Code** (character positions 3 and 4) is a two character alpha or alphanumeric or hyphen code that represents the option codes available for each channel code. Varying combinations of this code will allow the customer to enhance the technical performance of the requested channel, or to further identify the type of service. It can also specify options such as data conditioning, bridging, etc. The NC optional code field is always filled.

3.4 Unbundled Loop NC Codes

3.4.1 Unbundled Voiceband Loop NC Codes

For Unbundled Voiceband Loops, the first two characters are LX. The third and fourth characters are hyphens to denote no additional service features.

Table 3-1 contains the available CenturyLink NC codes for Unbundled Voiceband Loops.

Table 3-1 Available CenturyLink Voiceband Loop NC Codes

Network Channel Code	Point-to-Point Analog Loop Description
Analog Loop	
LX--	Dedicated Facility (without equipment)

The term “without equipment” indicates only that electronics for circuit conditioning or basic functionality are not normally required at either the Central Office or End User Interfaces as part of this service. It does not eliminate the use of derived facilities such as subscriber loop carrier in providing this Unbundled Loop service.

3.4.2 Unbundled Digital Loop NC Codes

For Unbundled Digital Loops, the first two characters indicate the requested family of digital services. The third and fourth characters provide further service features as needed. For readability, there are two tables of NC Codes. The first table lists those Digital Loops above the 64 kbit/s level. The second table lists Digital Loops up to and including the 64 kbit/s level.

Table 3-2 contains the available NC codes for Unbundled Digital Loops of 160 kbit/s and above.

Table 3-2 Available CenturyLink Digital Loop NC Codes

Network Channel Code	Point-to-Point Digital Loop Description
160 kbit/s Digital Subscriber Line (DSL)	
AD--	Digital Subscriber Line (DSL), nominally 160 kbit/s (144 kbit/s, 2B+D channelized payload) per TR-NWT-000393
ADU-	Digital Subscriber Line (DSL), nominally 160 kbit/s (144 kbit/s, un-channelized payload). Assured payload bit integrity, per TR-NWT-000397
Digital Signal Level 1 (1.544 Mbit/s)	
HC--	SF FORMAT PER TR-NPL-000342, AMI
HCD-	ANSI ESF, AMI
HCE-	ANSI ESF, B8ZS
HCF-	NON-ANSI ESF, AMI,
HCG-	NON-ANSI ESF, B8ZS
HCJ-	FREE FRAMING AND B8ZS
HCZ-	SF FORMAT PER TR-NPL-000342, B8ZS
Digital Signal Level 3 (44.736 Mbit/s)	
HF--	DS3 M- frame structured signal. Unchannelized per ANSI T1.107-1995
HFC-	DS3 M- frame structured signal and C-Bit Parity application. Unchannelized per ANSI T1.107-1995.

Table 3-3 contains the available NC codes for Unbundled Digital Loops up to and including 64 kbit/s.

Table 3-3 Available CenturyLink NC Codes for Digital Data Service (DDS) Loop up to and including 64 kbit/s

Network Channel Code	Point-to-Point Digital Data Service Transmission Path Description
Digital Data Service Transmission Path	
LX-N	Digital Data Service Transmission Path SVC DA1, 2.4 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA1,with secondary channel, 2.4 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA2, 4.8 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA2,with secondary channel, 4.8 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA3, 9.6 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA3,with secondary channel, 9.6 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA5, 19.2 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA5,with secondary channel, 19.2 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA4, 56 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA4,with secondary channel, 56 kbit/s
LX-N	Digital Data Service Transmission Path SVC DA6, 64 kbit/s

3.4.3 Unbundled xDSL Capable Loop NC Codes

For Unbundled xDSL Capable Loop the first two characters indicate the requested family of services. The third and fourth characters provide further service features as needed.

The following table contains available CenturyLink NC codes for Unbundled xDSL Capable Loops.

Table 3-4 Available CenturyLink Unbundled xDSL Capable Loop NC Codes

Network Channel Code	Point-to-Point xDSL Capable Description
xDSL Capable Loop	
LX-N	Dedicated Facility (without equipment), Copper portion of facility contains no loading coils.
LXR-	Dedicated Facility (without equipment), Copper portion of facility contains no loading coils and conforms to Revised Resistance Design (RRD) Engineering Rules.

. The customer specifies the NCI codes to communicate to CenturyLink the character of the signals the customer is connecting to the network at each end-point of the copper circuit. CenturyLink will take into account the NC code and the NCI code when assigning, maintaining and repairing facilities for xDSL. The associated NC codes require that the service use copper facilities free of load coils. Those facilities shall be free of faults, such as opens, grounds, shorts and foreign volts. The loops will also be conditioned when requested by the CLEC. CenturyLink has responsibilities to provision the best available loop.

3.5 NCI Code Function

The NCI code is an encoded representation used to identify five interface elements located at a Point Of Termination (POT) at the CO or at the EU's location. The interface elements are physical conductors, protocol, impedance, protocol options and Transmission Level Points (TLPs). Only the first four components are used for Unbundled Loop service.

3.6 NCI Code Components and Format

Technical specifications for an interface are encoded into NCI codes. An NCI code tells a CenturyLink engineer and the circuit design system, of specific technical, customer requirements at a Network Interface.

This section gives a brief description of the NCI code format. Specific technical information about the NCI codes may be found in the appropriate technical publication. Some additional information may be found later in this document in the chapters describing the specific unbundled network element.

3.6.1 NCI Format

An NCI code is a maximum twelve-character code that consists of five (5) data elements:

Total Conductors
Protocol

Impedance
Protocol Options
Transmission Level Point(s) (TLP)

For xDSL Capable Loops, the first four data elements are required. For other Unbundled Loops, the first three data elements are required. The last two are generally optional but may be required in certain situations. Only the first four components are used for Unbundled Loops. The format is illustrated in Figures 3-2 and 3-3.

Total Conductors (character positions 1 and 2) is a two-character numeric code that represents the total number of physical conductors (e.g., wires or fibers) required at the interface.

Protocol (character position 3 and 4) is a two-character alpha code that defines requirements for the interface regarding signaling/transmission.

Impedance (character position 5) is a one-character alpha or numeric code representing the nominal reference impedance, presented toward the network, that will terminate the transmission path for the purpose of evaluating transmission performance. Values are listed in Table 3-6

Network Channel Interface Code

Total Conductors		Protocol		Impedance	Delimeter	Protocol Options			Delimiter	TLP Level	
										Transmit	Receive
1	2	3	4	5	6	7	8	9	10	11	12
N	N	A	A	X	•	X	X	X	•	X or -	X or -

A = Alpha
N = Numeric
X = Alphanumeric
• = Delimiter (normally a period)
- = Hyphen

Figure 3-2 Format Structure for NCI Codes

Table 3-5 NCI Impedance Values

Impedance in Ohms (Character Position 5)			
Data Value	**Code**	**Data Value**	**Code**
110	0	124	7
150	1	Variable	8
600	2	100	9
900	3 *	Fiber	F
1200	4	Radio	Z
135	5	50 Coaxial	C
75	6	Multi-Impedance	M

* Except for interface code 04DD3, the impedance character 3, when used with a 4-wire voice-frequency path at the POT, denotes a historical customer (Interexchange Carrier) provided transmission termination rather than a 900 ohm impedance. Such terminations were provided by customers in accordance with FCC Docket No. 20099 settlement Agreement and by Automatic Transmission Test and Control Circuit used in the previous provisioning process.

Protocol Options (character positions 7, 8, and 9) is a one to three character alpha, numeric, or alphanumeric code that describes additional features (e.g., bit rate or bandwidth) on the Protocol to be used. It is a conditional data element (based on the loop type) that is always left justified.

Transmission Level Point(s) (character positions 8 through 12) is assigned one or two-character alpha code corresponding to a value for Transmission Level Point(s) (TLPs)

from either the Exchange Carrier/service provider or customer end. This NCI function does not apply to Unbundled Loop transport.

3.6.2 Example

A compatible NCI code for the NC code LX-- is 02QC3.OOD. The “02” indicates that there are two (2) conductors (copper wires in this case). The “QC” describes the interface as "Manual Cross-Connect DS0/Voice Termination" (See reference publications for further information). The impedance value of “3” indicates 900 ohms (Table 3-5). The option codes “OOD” Loop Start, Loop Signaling, Open End. Detailed description of the functions at the interface are as described in reference publications, particularly Telcordia's GR-334-CORE.

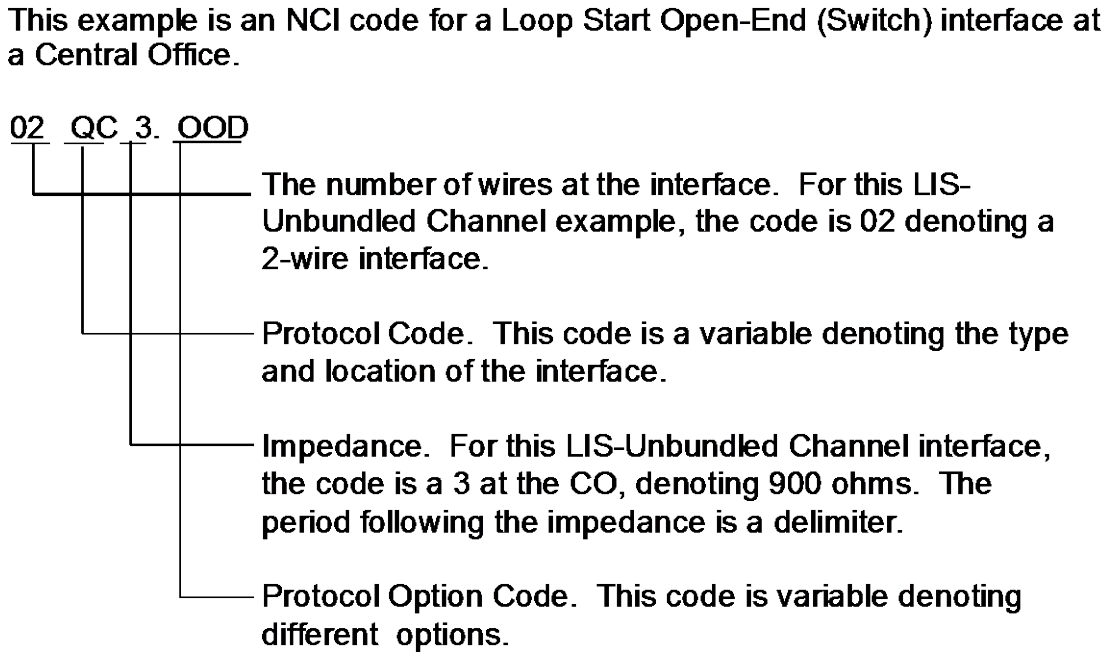

Figure 3-3 NCI Code Components

3.7 Unbundled Loop Available NCI Codes

This Section provides the available CenturyLink NCI Codes to use when establishing an Unbundled Loop.

3.7.1 Available CenturyLink Voiceband Loop - NCI Codes

Table 3-6 CenturyLink Voiceband Loop NCI Protocol and Protocol Option Codes

Protocol		Definition *
Code 3 4	Option 7 8 9	
Q C		Central Office Manual Cross-Connect DS0/Voice Termination
	O O B	Ground Start Loop Signaling, open end
	O O D	Loop Start Loop Signaling, open end
	O O F	Transmission only, no signaling
	R V O	Reverse Battery Originating: Loop closure provided by the Access Customer (AC) to the Access Provider (AP); Battery provided by AP to AC. *
	R V T	Reverse Battery Terminating: Loop closure provided by the AP to the AC; Battery Provided by AC to AP. *
G O		Ground-start signaling -- open end (switch) function presented by Access Customer at interface to CenturyLink Access Service.
G S		Ground-start signaling -- closed end (station) function presented by Access Customer or End-user at interface to CenturyLink Access Service.
L O		Loop-start loop signaling -- open end (switch) function presented by customer at interface to CenturyLink Access Service.
L S		Loop-start signaling -- closed end (station) function presented by the customer at the interface to CenturyLink access service.
N O		Connects customer to an Access Service suitable for voice transmission with no signaling provided by CenturyLink
R V		Reverse battery (Trunk signaling) at interface
	O	Loop closure provided by Access Customer to CenturyLink; Battery provided by CenturyLink to Access Customer
	T	Loop closure provided by CenturyLink to End-User; Battery provided by End-User to CenturyLink

* The standard definitions defined in the reference documents should be modified to fit the Unbundled application. For example, the term “Interconnector” or "Alternate Exchange Carrier" should be substituted for “IC-POT” or “IC” in the standard definitions. The Access Provider (AP) is CenturyLink. The Access Customer (AC) is the carrier (or their customer).

3.7.2 Available CenturyLink Digital Loop - Electrical NCI Codes

Table 3-7 CenturyLink Digital Loop Electrical NCI Protocol and Protocol Option Codes

Protocol Code 3 4	Protocol Option 7 8 9	Definition
Q B		Central Office Manual Cross-Connect Termination with No Subrating Capability
	0 0	MDF Cross-Connect
	1 1	DS1 to DS1, This code may or may not meet DS1 Signal Levels as specified by ANSI T1.102-1999
	3 3	DS3 to DS3, This code may or may not meet DS3 Signal Levels as specified by ANSI T1.102-1999
	L L	Fiber Cross-Connect on Fiber Distribution Bay
Q C		Central Office Manual Cross-Connect Termination DS0/Voice Termination
	O O S	Basic Rate ISDN, LT Function Presented to Service Provider
	O O V	Basic Rate ISDN, NT Function Presented to Service Provider
D S		Digital Hierarchy Interface
	4 4 A	44.736 Mbit/s, DS3 M-frame structured signal with C-bit Parity application. It is an unchannelized signal application, supporting a user payload of 44.210 Mbit/s per ANSI T1.107-1995.
	4 4 R	44.736 Mbit/s, DS3 M-frame structured signal. It is an unchannelized signal application, supporting a user payload of 44.210 Mbit/s per ANSI T1.107-1995.
D U		End User Digital Access Interface
	1 K N	1,544 Mbit/s, ANSI Extended Super Frame (ESF), Alternate Mark Inversion (AMI), without Line Power.
	1 K X	1,544 Mbit/s, ANSI Extended Super Frame (ESF), Alternate Mark Inversion (AMI), without Line Power, DSX-1 Interface.
	1 S N	1,544 Mbit/s, ANSI ESF, Binary 8-Zero Substitution (B8ZS), without Line Power
	1 S X	1,544 Mbit/s, ANSI ESF, Binary 8-Zero Substitution (B8ZS), without Line Power, DSX-1 Interface.
	A N	1,544 Mbit/s, Free Framing, B8ZS, without Line Power.
	A X	1,544 Mbit/s, Free Framing, B8ZS, without Line Power, DSX-1 Interface.
	B N	1,544 Mbit/s, Super Frame (SF) Format per GR-54-CORE, AMI, without Line Power.
	B X	1,544 Mbit/s, Super Frame (SF) Format per GR-54-CORE, AMI, without Line Power, DSX-1 Interface.
	C N	1,544 Mbit/s, Non-ANSI ESF, AMI, without Line Power.
	C X	1,544 Mbit/s, Non-ANSI ESF, AMI, without Line Power, DSX-1 Interface.

Table 3-7 CenturyLink Digital Loop Electrical NCI Protocol and Protocol Option Codes (Continued)

Protocol Code 3 4	Protocol Option 7 8 9	Definition
	D N	1,544 Mbit/s, SF, B8ZS, without Line Power.
	D X	1,544 Mbit/s, SF, B8ZS, without Line Power, DSX-1 Interface.
	S N	1,544 Mbit/s, Non-ANSI ESF, B8ZS, without Line Power.
	S X	1,544 Mbit/s, Non-ANSI ESF, B8ZS, without Line Power, DSX-1 Interface.
I S		2B1Q Signaling Format - U interface per ANSI T1.601, e.g., Basic Rate ISDN, Digital Subscriber Line (DSL)
	L	Basic Rate ISDN, Customer Provides LT Function Presented to Service Provider
	N	Basic Rate ISDN, Customer Provides NT Function Presented to Service Provider

DS1 Capable Loops are provided to Carrier's and to End-User's (EU's) premises. The Network Interface (NI) at a Carrier premises will be at the end of a DSX-1 jumper wire or cable with signal characteristics described in Technical Publication 77375.

The NI at an EU customer premises may be either a DSX-1 interface or a conventional interface. Signal characteristics, limitations, and the physical means of connection at the NI for each interface are described in Technical Publication 77375. Conventional interfaces use one of the Registration Jacks described by the three Universal Service Ordering Codes (USOC) RJ48C, RJ48M and RJ48H. End-User, DSX-1 interfaces are available where the end user’s premises are served by an on-site, optic terminal. In those situations, conventional interfaces are not available.

Additional information on the physical DS1 and DSX-1 NI configurations may be found in Technical Publication 77375.

3.7.3 Available CenturyLink xDSL Capable and Advanced Digital Transport Loop - NCI Codes

The CenturyLink xDSL and Advanced Digital Transport NCI codes listed below are available.

Table 3-8 Available CenturyLink xDSL and Advanced Digital Transport NCI Protocol and Protocol Option Codes

Protocol		Definition
Code 3 4	Option 7 8 9	
D U		Digital Access Interface
	0 0 F	HDSL4, Technology Specific, Transmission System Per ANSI Standard T1.417
	0 0 G	G.shdsl, Technology Specific, Transmission System Per ANSI Standard T1.417
	0 0 S	2B1Q SDSL, Technology Specific, Transmission System Per ANSI Standard T1.417
	0 0 1	Spectrum Management Class 1, Per ANSI Standard T1.417
	0 0 2	Spectrum Management Class 2, Per ANSI Standard T1.417
	0 0 3	Spectrum Management Class 3, Per ANSI Standard T1.417
	0 0 4	Spectrum Management Class 4, Per ANSI Standard T1.417
	0 0 5	Spectrum Management Class 5, Per ANSI Standard T1.417
	0 0 6	Spectrum Management Class 6, Per ANSI Standard T1.417
	0 0 7	Spectrum Management Class 7, Per ANSI Standard T1.417
	0 0 8	Spectrum Management Class 8, Per ANSI Standard T1.417
	0 0 9	Spectrum Management Class 9, Per ANSI Standard T1.417

Table 3-8 Available CenturyLink xDSL and Advanced Digital Transport NCI Protocol and Protocol Option Codes (Continued)

Protocol		Definition
Code 3 4	Option 7 8 9	
D U		Digital Access Interface
	0 0 A	ADSL Using Discrete Multi-Tone (DMT) Format, per ANSI T1.413
	0 1 A	One POTS Transmission Path and ADSL Using Discrete Multi-Tone (DMT) Format, per ANSI T1.413
	0 0 C	ADSL Using Carrierless Amplitude Phase Modulation (CAP) Format, per ANSI T1.413
	0 1 C	One POTS Transmission Path and ADSL Using Carrierless Amplitude Phase Modulation (CAP) Format, per ANSI T1.413
	0 0 H	High-Bit-Rate Digital Subscriber Line (HDSL) per ANSI T1.E1 Report Number 28
I S		2B1Q Signaling Format - U interface per ANSI T1.601, e.g., Basic Rate ISDN, Digital Subscriber Line (DSL)
	N	Basic Rate ISDN, Customer Provides NT Function Presented to Service Provider
Q B		Central Office Manual Cross-Connect Termination with No Subrating Capability
	0 0 F	HDSL4, Technology Specific, Transmission System Per ANSI Standard T1.417
	0 0 G	G.shdsl, Technology Specific, Transmission System Per ANSI Standard T1.417
	0 0 S	2B1Q SDSL, Technology Specific, Transmission System Per ANSI Standard T1.417
	0 0 1	Spectrum Management Class 1, Per ANSI Standard T1.417
	0 0 2	Spectrum Management Class 2, Per ANSI Standard T1.417
	0 0 3	Spectrum Management Class 3, Per ANSI Standard T1.417
	0 0 4	Spectrum Management Class 4, Per ANSI Standard T1.417
	0 0 5	Spectrum Management Class 5, Per ANSI Standard T1.417
	0 0 6	Spectrum Management Class 6, Per ANSI Standard T1.417
	0 0 7	Spectrum Management Class 7, Per ANSI Standard T1.417
	0 0 8	Spectrum Management Class 8, Per ANSI Standard T1.417
	0 0 9	Spectrum Management Class 9, Per ANSI Standard T1.417
	0 0 A	ADSL Using Discrete Multi-Tone (DMT) Format, per ANSI T1.413
	0 1 A	One POTS Transmission Path and ADSL Using Discrete Multi-Tone (DMT) Format, per ANSI T1.413
	0 0 C	ADSL Using Carrierless Amplitude Phase Modulation (CAP) Format, per ANSI T1.413
	0 1 C	One POTS Transmission Path and ADSL Using Carrierless Amplitude Phase Modulation (CAP) Format, per ANSI T1.413
	0 0 H	High-Bit-Rate Digital Subscriber Line (HDSL) per ANSI T1.E1 Report Number 28
Q C		Central Office Manual Cross-Connect Termination DS0/Voice Termination
	O O S	Basic Rate ISDN, LT Function Presented to Service Provider

3.8 Compatible NC and NCI Code Combinations

This section provides CenturyLink code combinations used to order Unbundled Loop interfaces and services of the following types:

- Unbundled Voiceband Loops
- Unbundled Digital Loops
- Unbundled xDSL Capable Loops including Advanced Digital Transport Loops

3.8.1 Unbundled Voiceband Loop NC/NCI Codes

The following table shows the currently available NC/NCI code combinations for CenturyLink Unbundled Voiceband Loop.

Table 3-9 CenturyLink Unbundled Voiceband Loops NC/NCI Code Combinations

NC Code	NCI Code		DESCRIPTION
	CenturyLink CO-NI	End-User EU-NI	
VOICEBAND LOOPS			
LX--	02QC3.OOD	02LS2	Loop Start (LS) Signaling: Open End (LO) at CO
LX--	02QC3.OOB	02GS2	Ground Start(GS) Signaling: Open End (GO) at CO
LX--	02QC3.RVT	02RV2.O	Reverse Battery(RV): Loop closure provided by the End User
LX--	02QC3.RVO	02RV2.T	Reverse Battery(RV): Reverse Battery provided by the End User
LX--	02QC2.OOF	02NO2	No Signaling: Transmission Only (NO)
LX--	04QC2.OOF	04NO2	No Signaling: Transmission Only (NO)

3.8.2 Unbundled Digital Loop NC/NCI Codes

Table 3-10 lists CenturyLink NC/NCI Code combinations for Unbundled Digital Loops

Table 3-10 CenturyLink Unbundled Digital Loop NC/NCI Code Combinations

NC Code	NCI Code		DESCRIPTION
	CenturyLink CO-NI	End-User EU-NI	
ISDN BRI/xDSL-I 160 KBIT/S DIGITAL SUBSCRIBER LINE (DSL)			
AD--	02QC5.OOS	02IS5.N	Digital Subscriber Line with 2B1Q Signaling Format, NT function at EU
AD--	02QC5.OOV	02IS5.L	Digital Subscriber Line with 2B1Q Signaling Format, LT function at EU
ADU-	02QC5.OOS	02IS5.N	xDSL-I, 2B1Q Signaling Format, NT function at EU
ADU-	02QC5.OOV	02IS5.L	xDSL-I, 2B1Q Signaling Format, LT function at EU
UNBUNDLED DS1 CAPABLE LOOP (ALSO SEE 77200 & 77375)			
HC--	04QB9.11	04DU9.BN 04DU9.BX	SF Format PER TR-NPL-000342, AMI
HCD-	04QB9.11	04DU9.1KN 04DU9.1KX	ANSI ESF, AMI
HCE-	04QB9.11	04DU9.1SN 04DU9.1SX	ANSI ESF, B8ZS
HCF-	04QB9.11	04DU9.CN 04DU9.CX	Non-ANSI ESF, AMI
HCG-	04QB9.11	04DU9.SN 04DU9.SX	Non-ANSI ESF, B8ZS
HCJ-	04QB9.11	04DU9.AN 04DU9.AX	Free Framing, B8ZS
HCZ-	04QB9.11	04DU9.DN 04DU9.DX	SF, B8ZS

Table 3-10 CenturyLink Digital Loop NC/NCI Code Combinations (Continued)

NC Code	NCI Code		DESCRIPTION
	CenturyLink CO-NI	End-User EU-NI	
UNBUNDLED DS3 CAPABLE LOOP (ALSO SEE 77324)			
HF--	04QB6.33	04DS6.44R	DS3 M-frame structured signal. It is an unchannelized signal application.
HFC-	04QB6.33	04DS6.44A	DS3 M-frame structured signal with C-bit Parity application. It is an unchannelized signal application.

The following table shows the currently available NC/NCI code combinations for Digital Data Service.

Table 3-11 CenturyLink Point-to-Point Digital Loop, DDS NC and NCI Code Combinations

NC Code	NCI Code		DESCRIPTION: APPLICATION OF CENTURYLINK'S UNBUNDLED LOOP
	CenturyLink CO-NI	End-User EU-NI	
DIGITAL DATA SERVICE TRANSPORT			
LX-N	04QB5.00	04DU5.24	2.4 kbit/s, **not** DS0A Level signal
LX-N	04QB5.00	04DU5.24S	2.4 kbit/s, with secondary chan., **not** DS0A Level signal
LX-N	04QB5.00	04DU5.48	4.8 kbit/s, **not** DS0A Level signal
LX-N	04QB5.00	04DU5.48S	4.8 kbit/s, with secondary chan., **not** DS0A Level signal
LX-N	04QB5.00	04DU5.96	9.6 kbit/s, **not** DS0A Level signal
LX-N	04QB5.00	04DU5.96S	9.6 kbit/s, with secondary chan., **not** DS0A Level signal
LX-N	04QB5.00	04DU5.19	19.2 kbit/s, **not** DS0A Level signal
LX-N	04QB5.00	04DU5.19S	19.2 kbit/s, with secondary chan., **not** DS0A Level signal
LX-N	04QB5.00	04DU5.56	56.0 kbit/s, **not** DS0A Level signal
LX-N	04QB5.00	04DU5.56S	56.0 kbit/s, with secondary chan., **not** DS0A Level signal
LX-N	04QB5.00	04DU5.64	64.0 kbit/s, **not** DS0A Level signal

3.8.3 Unbundled xDSL Capable and Advanced Digital Transport Loop NC/NCI Codes

Table 3-8 lists available CenturyLink NC/NCI code combinations for Unbundled xDSL Capable and Advanced Digital Transport Loops.. The customer specifies the NCIs to communicate to CenturyLink the character of the signals the customer is connecting to the network at each end-point of the copper circuit. CenturyLink will take into account the NC code and the NCI code when assigning, maintaining and repairing facilities for xDSL. The associated NC codes require that the service use copper facilities without load coils. Those facilities shall be free of faults. The customer has the option to inspect the character of the facilities, e.g. gauge, length, etc. The loops will also be conditioned when requested by the CLEC. CenturyLink has responsibilities to provision the best available loop.

Table 3-12 CenturyLink Unbundled xDSL Capable Loop NC/NCI Code Combinations

NC Code	NCI Code		DESCRIPTION: APPLICATION OF CENTURYLINK'S UNBUNDLED LOOP
	CenturyLink CO-NI	End-User EU-NI	
ADVANCED DIGITAL TRANSPORT – SPECTRUM MANAGEMENT CAPABLE			
LX-N	02QB5.001	02DU5.001	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 1
LX-N	02QB5.002	02DU5.002	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 2
LX-N	02QB5.003	02DU5.003	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 3
LX-N	04QB5.003	04DU5.003	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 3
LX-N	02QB5.004	02DU5.004	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI T Standard, 1.417 Spectrum Management Class 4
LX-N	02QB9.005	02DU9.005	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard T1.417 Spectrum Management Class 5

NC Code	NCI Code		DESCRIPTION: APPLICATION OF CENTURYLINK'S UNBUNDLED LOOP
	CenturyLink CO-NI	End-User EU-NI	
LX-N	02QB9.006	02DU9.006	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 6
LX-N	02QB5.007	02DU5.007	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 7
LX-N	02QB5.008	02DU5.008	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 8
LX-N	02QB9.009	02DU9.009	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management Class 9
LX-N	04QB5.00F	04DU5.00F	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management HDSL4, Technology Specific, Transmission System Per ANSI Standard T1.417
LX-N	02QB5.00G	02DU5.00G	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management G.shdsl, Technology Specific, Transmission System Per ANSI Standard T1.417
LX-N	04QB5.00G	04DU5.00G	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management G.shdsl, Technology Specific, Transmission System Per ANSI Standard T1.417
LX-N	02QB5.00S	02DU5.00S	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management 2B1Q SDSL, Technology Specific, Transmission System Per ANSI Standard T1.417
LX-N	04QB5.00S	04DU5.00S	Advanced Digital Transport Loop, Signals at interfaces conform to ANSI Standard, T1.417 Spectrum Management 2B1Q SDSL, Technology Specific, Transmission System Per ANSI Standard T1.417

Table 3-13 CenturyLink Unbundled xDSL Loop NC/NCI Code Combinations (Continued)

NC Code	NCI Code		DESCRIPTION: APPLICATION OF CENTURYLINK'S UNBUNDLED LOOP
	CenturyLink CO-NI	End-User EU-NI	
DIGITAL SUBSCRIBER LINE (BASIC RATE ISDN -- DSL) CAPABLE			
LX-N	02QC5.OOS	02IS5.N	Digital Subscriber Line with 2B1Q Signaling Format Capable Loop
HIGH-BIT-RATE DIGITAL SUBSCRIBER LINE (HDSL) CAPABLE			
LX-N	02QB9.00H	02DU9.00H	HDSL Capable Loop, Copper Facility ONLY per ANSI T1E1 Technical Report Number 28
LX-N	04QB9.00H	04DU9.00H	HDSL Capable Loop, Copper Facility ONLY per ANSI T1E1 Technical Report Number 28
ASYMMETRIC DIGITAL SUBSCRIBER LINE (ADSL) CAPABLE			
LXR-	02QB9.00A	02DU9.00A	Revised Resistance Design (RRD)n Non-Loaded Loop with ANSI T1.413 DMT Signaling Format
LXR-	02QB9.01A	02DU9.01A	RRD, Non-Loaded Loop with ANSI T1.413 DMT Signaling Format and one POTS Channel
LXR-	02QB9.00C	02DU9.00C	RRD, Non-Loaded Loop with CAP Signaling Format
LXR-	02QB9.01C	02DU9.01C	RRD, Non-Loaded Loop with CAP Signaling Format and one POTS Channel

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Tables

Figures

4. Technical Specifications Unbundled Voiceband Loop

4.1 General

This chapter details the technical characteristics; available configurations; signaling capabilities (if any); and transmission performance parameter limits for each of the Unbundled Loop compatible NCIs listed in Table 3-6. For those loops using traditional, switched network interfaces, i.e., loop start, ground start and reverse battery, they shall function corresponding to the Class 5 switch expectations of SR-2275, Telcordia *Notes on the Networks*, Issue 4.

Loops exceeding the performance characteristics listed bellow are available in some locations. When these loops are requested and provided: the following specifications shall not apply.

4.2 Transmission Performance Parameters

Transmission performance parameter limits are specified as the (minimum or maximum) measured transmission parameter value permitted at the interfaces.

The parameters assured at new service turn-up include:

- Free of defects, i.e., shorts, grounds, crosses
- Voice Frequency (VF) Continuity
- Measured Loss (1004 Hz)
- C-Message Noise

When an Unbundled Voiceband Loop is provided over carrier derived facilities, transmission performance is evaluated by measuring analog VF parameters on the transmission path between the End-User Network Interface (EU-NI) and the Central Office Network Interface (CO-NI).

4.3 Unbundled Voiceband Loops

Unbundled Voiceband 2-Wire and 4-Wire analog loops provide a voice frequency, transmission path between the EU-NI at a designated premise and CenturyLink's CO-NI. They terminate using analog interfaces. Usable frequencies are nominally 300 to 3000 Hz.

Figure 4-1 illustrates a typical 2-Wire configuration.

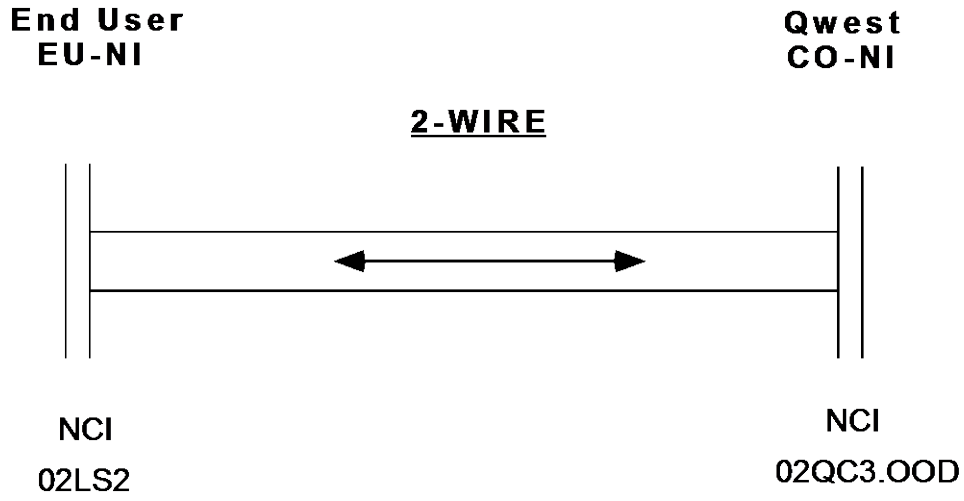

Figure 4-1: Typical Unbundled Voiceband Loop 2-Wire Configuration

Figure 4-2 illustrates a typical 4-Wire configuration.

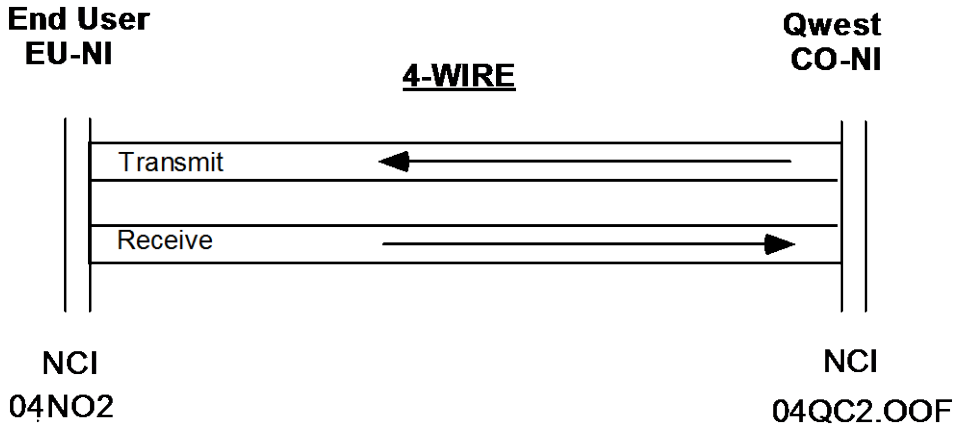

Figure 4-2: Typical Unbundled Voiceband Loop, 4-Wire Configuration

Transmission characteristics of the transmit and receive directions of the 4-Wire configuration may not be identical.

4.3.1 Available Signaling Transport Capability - Unbundled Voiceband Loop

- No signaling (other than customer generated, in-band, multi-state signaling for addressing, etc.).
- Loop-start on the "closed-end" EU-NI to loop-start on the "open-end" at the CO-NI.
- Ground-start on the "closed-end" at the EU-NI to ground-start on the "open-end" at the CO-NI.
- Loop-reverse battery supervision (trunk signaling). Loop closure provided to the end user; end-user provides normal and reverse battery.
- Loop-reverse battery supervision (trunk signaling). End user provides loop closure; normal and reverse battery provided to the end-user.

4.3.2 Available Options

There are no options available for an Unbundled Loop service.

4.3.3 Loss

Insertion Loss at 1004 Hz of an Unbundled Voiceband Loop will generally be within the range of 0.0 dB to 8.5 dB. Loops that exceed 8.5 dB exist in some areas.

Three-Tone Slope Deviation is the loss deviation at 404 Hz and 2804 Hz relative to the Actual Measured Loss (AML) -16 dBm0 signal at 1004 Hz.

Table 4-1: Three-Tone Slope Deviation from Actual Measured Loss (AML)

Frequency	Deviation
404 Hz & 2804 Hz	-1.5/+9.5 dB

Attenuation Distortion is the loss variation measured over the indicated frequency ranges relative to the Actual Measured Loss (AML) -16 dBm0 signal at 1004 Hz.

Table 4-2: Attenuation Distortion from AML

Frequency Band	Deviation
504 Hz to 2504 Hz	-1.5 to +7.5 dB
404 Hz to 2804 Hz	-1.5 to +9.5 dB
304 Hz to 3004 Hz	-2.5 to +11.5 dB

4.3.4 Loop Noise and Foreign Voltage

Noise level will be:

≤ 30 dBrnC, Metallic
≤ 90 dBrnC, Longitudinal

≤ 45 dBrnC-Notched, Only circuits provisioned over facilities where there are active electronics are candidates for C-Notched noise requirements.

Balance will be ≥ 50 dB.

Open circuit, AC voltage, measured with Tip and Ring shorted and grounded at far end will be < 50 V rms.

Leakage resistance will be ≥ 10,000 Ohms and foreign battery will be ≤ 8 Volts DC.

4.3.5 Unbundled Voiceband Loop Transmission Level Point (TLP) Ranges at the Network Interfaces

The TLP is a point in a transmission system at which the ratio, expressed in decibels, of the power of a test signal at that point to the power of the test signal at a reference point is specified. The zero transmission level point (0 TLP) is an arbitrarily established point in an Unbundled Loop circuit to which all relative levels at other points in the circuit are referred.

Regardless of the TLP, the maximum signal power that may appear at the CO-NI is -13 dBm.

Table 4-3 shows the allowable TLP ranges at the EU-NI.

Table 4-3: Transmission Level Point Ranges at the EU-NI

Protocol Code	Transmit	Receive
LS , GS, NO	0.0 dB	-8.5 to 0.0 dB

Table 4-4 shows the allowable TLP ranges at the CO-NI.

Table 4-4: Transmission Level Point Ranges at the CO-NI

Protocol	Transmit	Receive
LO, GO, NO	0.0 dB	-8.5 to 0.0 dB

4.3.6 Resistance to Ground

For copper facilities it is important that there not be excessive leakage to ground. The following Table 4-5 shows minimum resistance to ground for unbundled loops.

Table 4-5: Resistance to Ground Objectives

Parameter	Minimum
Tip to Ground	3.3 Mega Ohms
Ring to Ground	3.3 Mega Ohms

4.3.7 Conductor Loop Resistance

Wire based, physical facilities from CO-NIs to EU-NIs have been built consistent with available CO switch capabilities and engineering design rules applied at the time of their construction. Depending upon the situation, maximum conductor loop resistance requirements have ranged from 1300 Ohms to 3600 Ohms. Facilities for traditional switched services with a conductor loop resistance $\geq$ 1501 Ohms shall have Range Extension with Gain (REG) units provided. The REG units are central office based, active electronics that compensate for the resistance and loss of loops that exceed that particular central office's capabilities.

Recent and current design rules specify that the maximum-engineered loop resistance is 2800 Ohms. This includes allowances for DC resistance of a telephone set, station wiring, drop wire, CO wiring and ancillary CO equipment to enable proper function of a typical CO line. However, Unbundled Loops may be available in some locations using facilities designed to earlier standards.

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5. Technical Specifications Unbundled Digital Capable Loops

5.1 General

An Unbundled Digital Capable Loop is a digital transmission path that runs from a CenturyLink central office (CO) building (from a main distribution frame, DSX or other suitable frame called the Central Office Network Interface [CO-NI]) to an End-User Network Interface (EU-NI). The EU-NI is located at the EU's designated premises within the serving area of the CenturyLink CO. The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment.

Integrated Services Digital Network Basic Rate Interface Capable Unbundled Loop (ISDN BRI Capable Loop) and Unbundled Local Loop Digital Subscriber Line - Integrated Services Digital Network (xDSL-I Capable Loop) refer to the same physical facility capabilities. The terms ISDN BRI Capable Loop and xDSL-I Capable Loop may be used interchangeably in the context of loop qualification or facility capabilities. Likewise, the loop make-up information in the Raw Loop Data (RLD) Tool will indicate the same physical make-up for ISDN BRI or xDSL-I requests. The difference between ISDN BRI and xDSL-I is that each can require specific transmission equipment in the central office to generate the appropriate signal. Although the facilities offer the same payload (144 kbps), the equipment causes the distinction in the signal (i.e., ISDN = 2B+D channelized signal vs. x-DSL-I = full payload unchannelized signal). ISDN BRI Capable Loops and xDSL-I Capable Loops will be conditioned when requested by the CLEC, consistent with the CLEC's interconnection agreement.

5.2 Unbundled Digital Data Services (DDS) Capable Loop

An Unbundled Digital Data Services (DDS) Capable Loop is based on ANSI Standard T1.410, *Carrier-to-Customer Metallic Interface - Digital Data at 64kbps and Subrates,* and operates at 64 kbit/s and subrates of 2.4, 4.8, 9.6, 19.2, and 56 kbit/s. It is a digital transmission path that runs from a CenturyLink Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the CenturyLink CO. Secondary channels may be transmitted with any subrate. A carrier gains access to these unbundled services at the CenturyLink CO through established Physical or Virtual Collocation arrangements

Characteristics associated with an Unbundled DDS Capable Loop interface as defined are 4-wire, conform to ANSI T1.410, and are nominally 2.4, 4.8, 9.6, 19.2, 56, and 64 kbit/s. See Technical Publication 77204, *Digital Data Service Product Description, Applications, and Interface Combinations* for performance, testing and additional details. Figure 5-1 illustrates a typical DDS Capable Loop configuration.

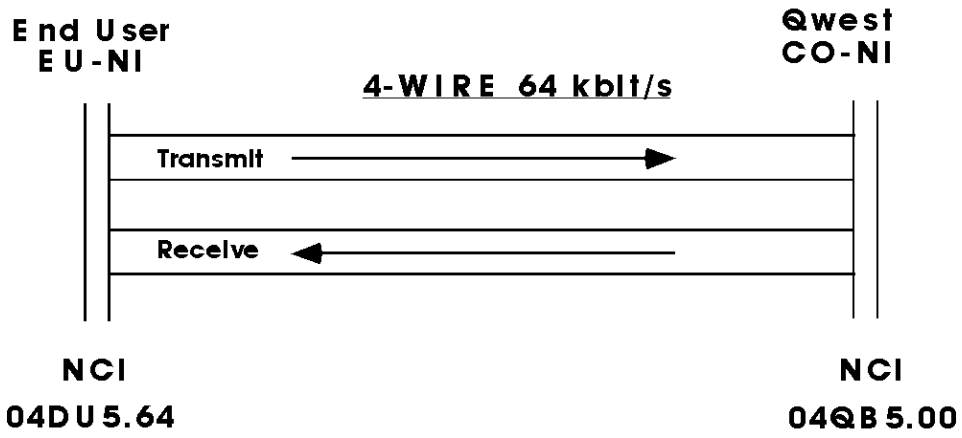


Figure 5-1: Typical Unbundled DDS Capable Loop

5.3 Unbundled Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) Capable Loop

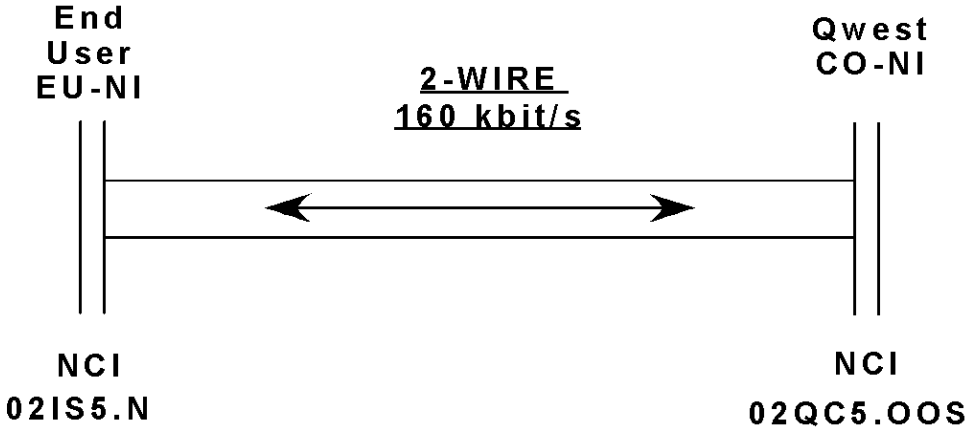
The ISDN BRI Capable Loop is a CenturyLink facility with two-wire interfaces that provides connectivity from the CenturyLink serving Central Office Network Interface (CO-NI), generally a Distributing Frame (DF) to a Network Interface at the end user's location (EU-NI). The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. This loop will meet the design requirements for ISDN BRI standards of 144 kbps customer useable data capacity that is channelized as 2B + D. The transmission path's facility is consistent with Bellcore Technical Reference, TR-TSY-00393, *ISDN Basic Access Digital Subscriber Lines and ANSI T1.601.1992, Telecommunications - Integrated Services Digital Network (ISDN) Basic Access Interface for Use on Metallic Loops for Application on the Network Side of the NT (Layer 1 Specification).* The ISDN BRI Capable Loop may be conditioned when requested by the CLEC. They terminate using digital interfaces.

The ISDN BRI Capable Loop shall have one of the following configurations:

- Copper loop free of load coils that is technically qualified for ISDN BRI transmission without the need for additional equipment. A loop is qualified when its Expected Measured Loss (EML) is less than or equal to 40 dB at 40 kHz and its Actual Measured Loss (AML) is less than or equal to 42 dB at 40 kHz. Loss measurements will use 135 Ohm terminations.
- A Central Office based range extension unit with a long, copper loop free of load coils.
- A combination of a long, copper loop free of load coils, a mid-span regenerator and Central Office power unit.
- A combination of Subscriber Loop Carrier transmission paths and a qualified copper loop free of load coils.

There are some end user locations served by loop facilities and transmission equipment that are not compatible with the ISDN BRI technical requirements. CenturyLink shall process requests for ISDN BRI loop to these locations on an Individual Case Basis.

Figure 5-2 illustrates a typical 2-Wire, Unbundled ISDN BRI Capable Loop configuration.



NC Code = AD--

Figure 5-2: Typical Unbundled ISDN BRI Capable Loop

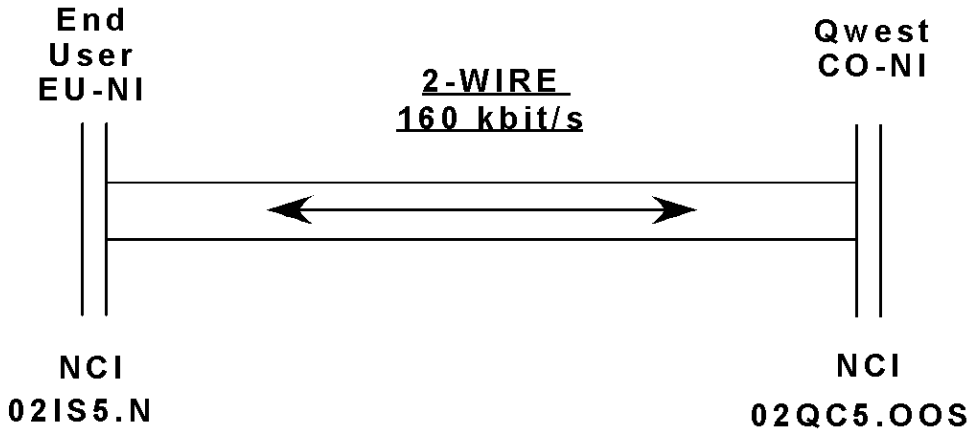
5.4 Unbundled xDSL-I Capable Loop

The xDSL-I Capable Loop is a CenturyLink facility with two-Wire interfaces that provides connectivity from the CenturyLink serving Central Office Network Interface (CO-NI), generally a Distributing Frame (DF) to a Network Interface at the end user's location (EU-NI). The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. This loop will meet the design requirements for Digital Subscriber Loop standards of 144 kbps customer useable data capacity that is not channelized. The transmission path's facility is consistent with Bellcore Technical Reference, TR-TSY-00393, *ISDN Basic Access Digital Subscriber Lines and ANSI T1.601.1992, Telecommunications - Integrated Services Digital Network (ISDN) Basic Access Interface for Use on Metallic Loops for Application on the Network Side of the NT (Layer 1 Specification).* The xDSL-I Capable Loop may be conditioned when requested by the CLEC. Additionally, the facility is consistent with Bellcore Technical Reference, TR-NWT-000397. *ISDN Basic Access Transport System Requirements*, with the exception of all forms of access and use of the M1, M2 and M3 overhead bits. xDSL-I Capable Loops terminate using digital interfaces.

The xDSL-I Capable Loop shall have one of the following configurations:

- xDSL-I capable copper loop free of load coils that is technically qualified for BRI ISDN transmission without the need for additional equipment.
- A combination of a long xDSL-I capable copper loop free of load coils, a mid-span regenerator and Central Office power unit.
- A combination of Subscriber Loop Carrier transmission path and a qualified xDSL-I capable copper loop free of load coils.

There are some end user locations served by loop facilities and transmission equipment that are not compatible with the xDSL-I technical requirements. CenturyLink shall process requests for xDSL-I Capable Loop to these locations on an Individual Case Basis.
Figure 5-3 illustrates a typical 2-Wire, x DSL-I Capable Loop configuration.



NC Code = ADU-

Figure 5-3: Typical Unbundled xDSL-I Capable Loop

5.5 Testing Unbundled ISDN BRI Capable Loop) and Unbundled xDSL-I Capable Loop

These tests are done for bringing a circuit into service, either on completion of a new installation (acceptance) or after repair activity (repair verification). These are intrusive, out-of-service tests. In addition to tests that assure the facility is trouble free; an Actual Measured Loss (AML) test at 40 kHz shall be made.

The circuit under test shall be properly designed, having an Expected Measured Loss (EML) that is equal to or less than 40 dB at 40 kHz. The Actual Measured Loss (AML) at 40 kHz shall be less than or equal to 42 dB.

5.6 Unbundled DS1 Capable Loop

The Unbundled DS1 Capable Loop is a transmission path between a CO Network Interface at a DSX-1 panel or equivalent in a CenturyLink serving Central Office and the Network Interface at the end user location. The Unbundled DS1 Capable Loop transports bi-directional DS1 signals with a nominal transmission rate of 1.544 Mbit/s.

Unbundled DS1 Capable Loop will typically have one of the following configurations:

- Copper based span with HDSL or T-1 equipment.
- Transmission path of a fiber based system
- Combination of both fiber and copper based facilities.

There are some end user locations served by facilities and transmission equipment that are not compatible with DS1 transport technical requirements. CenturyLink shall process requests for Unbundled DS1 Capable Loop for these locations on an Individual Case Basis.

End User Network Interfaces shall be as described in Technical Publication 77375. The CO Network Interface at a DSX-1 panel may not be the physical, demarcation interface to the collocated Competitive Local Exchange Carrier (CLEC). The DSX-1 cross-connect may be the "Design-To" point as detailed in Technical Publication 77386, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services*. The NCI code applied at the point of demarcation is 04QB9.11. An Interconnection Distribution Frame (ICDF) is commonly the point of demarcation. See Technical Publication 77386 for details. This code indicates that the signal is not necessarily a templated signal per ANSI T1.102. It may be attenuated, in one direction, by the length of cable from the CenturyLink DSX-1 and, in the other direction, by the length of cable from the CLEC's equipment. Performance shall meet end-to-end accuracy and availability objectives stated in ANSI Document T1.510-1999, *Network Performance Parameters for Dedicated Digital Services.*

Figure 5-4 illustrates a typical Unbundled DS1 Capable :Loop configuration.

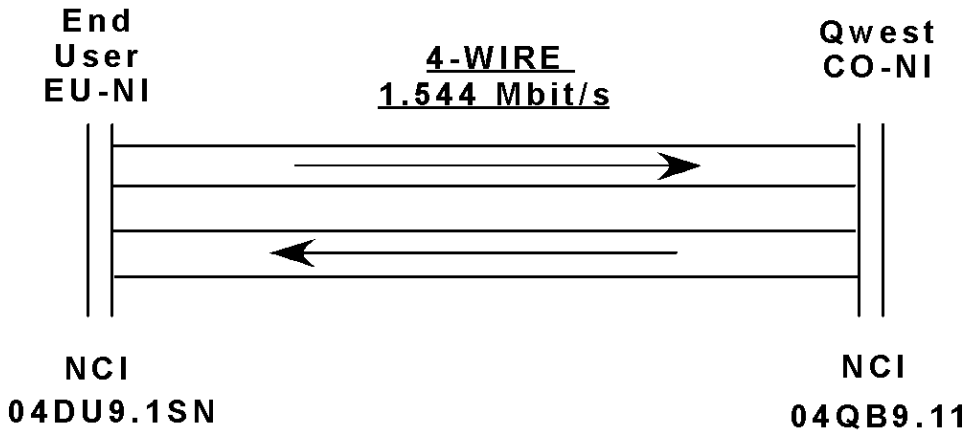


Figure 5-4: Typical Unbundled DS1 Capable Loop.

5.7 Unbundled DS3 Capable Loop

The Unbundled DS3 Capable Loop is a transmission path between a CO Network Interface at a DSX-3 panel or equivalent in a CenturyLink serving Central Office and the Network Interface at the end user location. The Unbundled DS3 Capable Loop transports bi-directional DS-3 signals with a nominal transmission rate of 44.736 Mbit/s. CenturyLink will deliver the DS3 service to the End User's network interface consistent with Technical Publication 77324.

Unbundled DS3 Capable Loops will typically have the following configuration:

- Channel of a fiber based system

There are some end user locations served by loop facilities and transmission equipment that are not compatible with DS3 transport technical requirements. CenturyLink shall process requests for Unbundled DS3 Capable Loop for these locations on an Individual Case Basis.

Network Interfaces shall be as described in Technical Publication 77324. The CO Network Interface at a DSX-3 panel may not be the physical, demarcation interface to the collocated Competitive Local Exchange Carrier (CLEC). The DSX-3 cross-connect may be the "Design-To" point as detailed in Technical Publication 77386, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services*. The NCI code applied at the point of demarcation is 04QB6.33. An Interconnection Distribution Frame (ICDF) is commonly the point of demarcation. See Technical Publication 77386 for details. This code indicates that the signal is not necessarily a templated signal per ANSI Standard T1.102. It may be attenuated, in one direction, by the length of cable from the CenturyLink DSX-3 and, in the other direction, by the length of cable from the CLEC's equipment. Performance shall meet end-to-end accuracy and availability objectives stated in ANSI Standard T1.510, *Network Performance Parameters for Dedicated Digital Services.*

Figure 5-5 illustrates a typical Unbundled DS3 Capable Loop configuration.

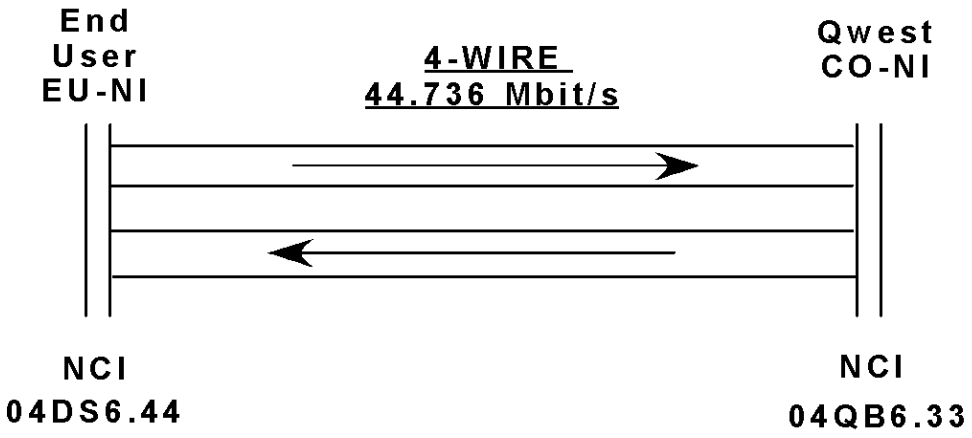


Figure 5-5: Typical Unbundled DS3 Capable Loop.

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Figures

Tables

6. Technical Specifications Unbundled xDSL Capable Loops

6.1 General

This chapter details the technical characteristics, available configurations and transmission performance parameter limits for the Unbundled xDSL Capable Loop. This includes Advanced Digital Transport Capable Loops, conforming to ANSI T1.417.

Unbundled xDSL Loops are transmission paths (2-wire and 4-wire copper Loops and Subloops) capable of carrying American National Standards Institute (ANSI) defined digital subscriber line signals between the Network Interface on an EU's premises and a CenturyLink Central Office Network Interface. Unbundled xDSL Loops use only copper wire facilities free of load coils. These facilities shall be free of faults, such as opens, grounds, shorts and foreign volts. CenturyLink has the responsibility to provision the best available loop. CenturyLink will take into account the NC code and the NCI code when assigning, maintaining and repairing facilities for xDSL.

Each digital service and the specific transport equipment applied by the Competitive Local Exchange Carrier (CLEC) have its own tolerance to loop loss and bridged-tap. The CLEC may determine whether any available loop satisfies their service requirements. A CLEC may use any method to make such a determination such as available raw loop data or by ordering and reviewing a CenturyLink provided Design Layout Record (DLR). The DLR provides information to the CLEC on items such as loop gauge make-up, bridged tap and the loop's total length. . See Table 3-9 for compatible CenturyLink NCI codes.

Conditioning is available for xDSL Capable Loops (e.g., LX-N, LXR- and ADU-). Upon CLEC approval of Conditioning and only if Condition is necessary, CenturyLink will dispatch personnel to Condition the Loop. CLEC may request Conditioning when submitting a trouble report.

6.2 Performance Parameter Tests

Transmission performance parameter limits are specified as the (minimum or maximum) measured transmission parameter value permitted at the interfaces.

Table 6-1 does not represent an exhaustive list. CenturyLink will conduct performance parameter tests as needed to deliver a properly working xDSL Unbundled Loop and/or fully resolve trouble on an xDSL Unbundled Loop. If CenturyLink conducts other tests for itself or its retail customers when performing testing and repairs, CenturyLink will also conduct those tests for CLEC. When lack of access to CLEC's central office equipment precludes CenturyLink from performing the same tests that CenturyLink performs for itself or its retail customers, CenturyLink will perform comparable tests for CLEC. Other testing may be needed to repair an xDSL Unbundled Loop so that it performs consistent with industry standards for the type of xDSL Service deployed. If the trouble is not resolved, CLEC may escalate directly to its CenturyLink service manager, who will immediately escalate internally to ensure needed testing is identified and conducted to resolve the trouble. Tests to be performed after escalation may include, for example, wideband noise and impulse noise if not performed earlier as part of the testing outlined in Table 6-1.

TABLE 6-1: Performance Parameter Tests

Required Tests	Expected Field Measurement Results	Notes
Loop Length	Actual (Capacitive)	
Load Coils	None	
Opens	None	
Grounds	None	
Shorts	None	
Bridge Tap	LX-N Maximum: Total Length <2500 ft Single Tap Length < 2000ft No Near End /Far End BT(>1000 ft) LXR- Maximum: Total Length <2500 ft Single Tap Length < 2000 ft No Near End /Far End BT(>1000 ft) Remove All Maximum: None	For specific Conditioning guidelines refer to your ICA.
1004 Hz Loss	< -8.5dBm	

196 kHz Loss	Actual Measured Loss (AML): Maximum AML = EML + 5 dB	For specific dB Loss thresholds refer to your ICA
40 kHz Loss	ISDN BRI <40.dB	
Insulation Resistance	Tip – Ground > 3.3 Meg Ohms Ring – Ground > 3.3 Meg Ohms Tip – Ring > 3.3 Meg Ohms	
Foreign Voltage - DC	Tip – Ground < 8 VDC Ring – Ground < 8 VDC Tip – Ring < 8 VDC	
Required Tests	Expected Field Measurement Results	Notes
Foreign Voltage - AC	Tip – Ground <50VAC Ring to Ground <50VAC	
Noise (C – Message)	< 23 dBrnC Far end 600 Ohm Termination	< 20 dBrnC Acceptable, >20 < 30 dBrnC Marginal, > 30 Unacceptable
Noise (C – Notch)	< 45 dB	1004 Hz, 0 dBm Transmit
Line Balance	< to 10%	The length of the Tip side of the line compared to the length of the Ring to 10% difference
Longitudinal Balance	965 Type Meter <= 50 dB @ 196khz Other Meters <= 40 dB @ 196khz	
Power Influence	<=90 dBnc	
D-Mark Tagged	Yes	

6.3 Unbundled ISDN BRI Capable Loop

Figure 6-1 illustrates a typical 2-Wire, ISDN BRI Capable Loop configuration.

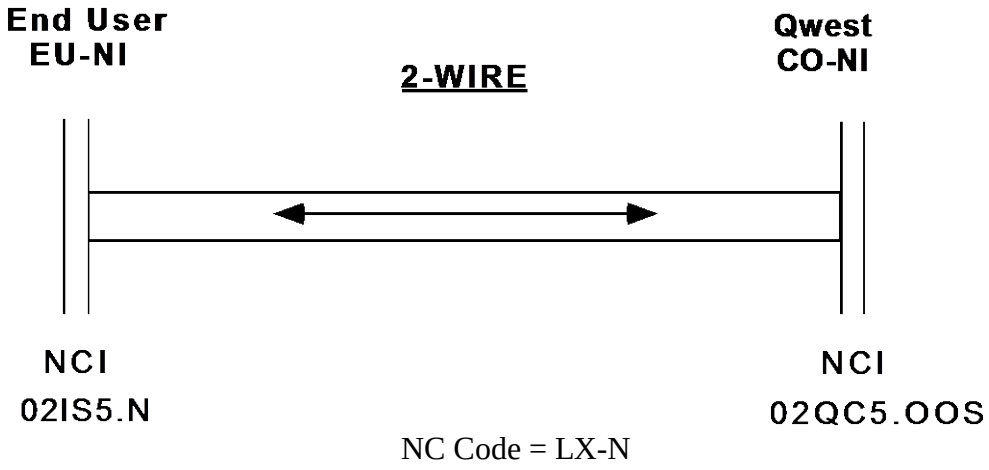

Figure 6-1 Typical Unbundled ISDN BRI Capable Loop

The Unbundled Integrated Digital Network (ISDN) Basic Rate Interface (BRI) Capable Loop is a CenturyLink facility with two-Wire interfaces that provides connectivity from the CenturyLink serving Central Office Network Interface (CO-NI), generally a Distributing Frame (DF) to a Network Interface at the end user's location (EU-NI). The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. The customer specifies the NCIs to communicate to CenturyLink the character of the signals the customer intends to connect to the network at the end-points of the copper circuit. For Unbundled ISDN BRI Capable Loops, the NCI codes may affect transport designs or performance. The associated NC code of LX-N requires that the service use copper facilities free of load coils. These facilities shall be free of faults, such as opens, grounds, shorts and foreign volts. The loops will also be conditioned when requested by CLEC. CenturyLink has responsibilities to provision the best available loop The customer has the option to inspect the character of the facilities, e.g. gauge, length, bridged tap, etc. These loops terminate using digital interfaces.

The Unbundled Integrated Digital Network (ISDN) Basic Rate Interface (BRI) Capable Loop shall have the following configuration:

- Copper loop without load coils for 160 kbit/s, 2-binary, 1-Quaternary, DSL transmission without additional equipment.

There are some end user locations served by loop facilities free of load coils that may not be compatible with the DSL equipment installed by the CLEC. In those situations, an Unbundled ISDN BRI Capable Loop may be considered. See Chapter 5 for details.

6.4 Unbundled High-Bit Rate Digital Subscriber Line (HDSL)) Capable Loop

Figure 6-2 illustrates a typical 4-Wire, HDSL Capable Loop configuration.

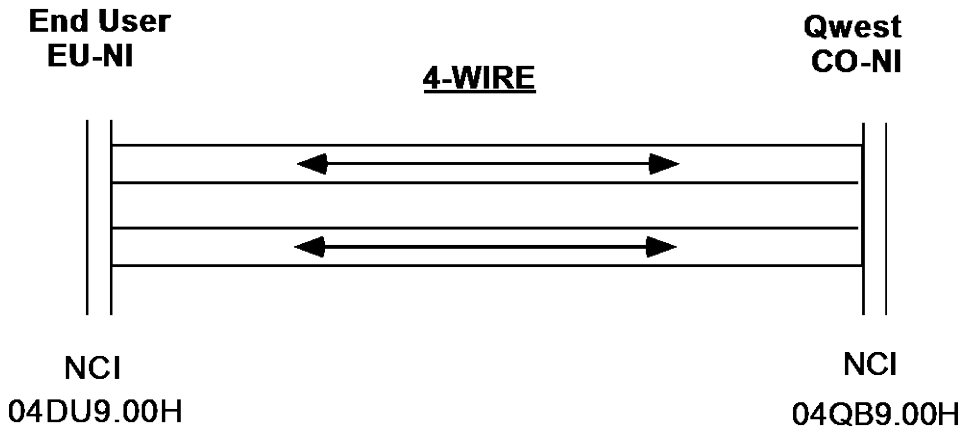

Figure 6-2 4-Wire Typical Unbundled HDSL Capable Loop

A 2-Wire and 4-Wire Unbundled Capable Loop for HDSL provides copper transmission path between the EU-NI at a designated premises and CenturyLink's CO-NI. They terminate using digital interfaces. There are no active electronic elements provided by CenturyLink.

An Unbundled HDSL Capable Loop is a CenturyLink provided copper facility from the CenturyLink serving central office distributing frame to the network interface at the End-user's designated premises. It is comprised of copper, wire cable pairs free of load coilsThe customer specifies the NCIs to communicate to CenturyLink the character of the signals the customer intends to connect to the network at the end-points of the copper circuit. For HDSL Capable Loops, the NCI codes may affect transport designs or performance. The associated NC code requires that the service is free of loads. These facilities shall be free of faults, such as opens, grounds, shorts, and foreign volts. The loops will also be conditioned when requested by CLEC. CenturyLink has responsibilities to provision the best available loop.

6.5 Unbundled Asymmetric Digital Subscriber Line (ADSL) Capable Loop

Figure 6-3 illustrates a typical Unbundled ADSL Capable Loop configuration.

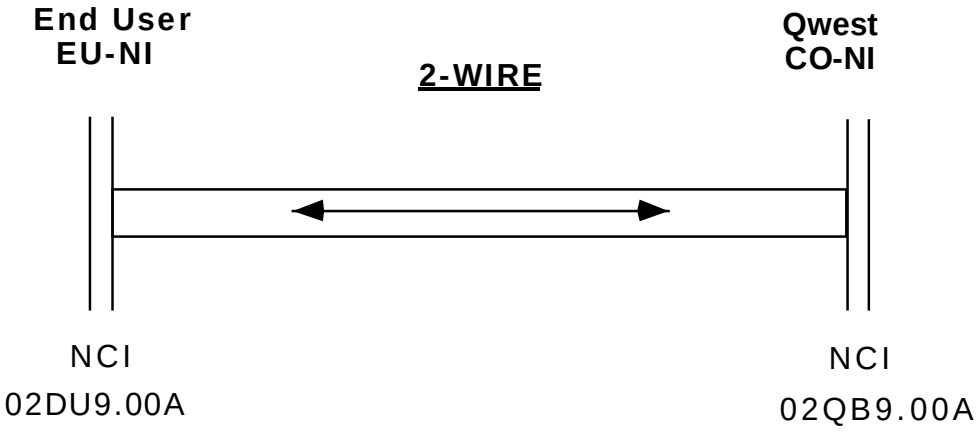

Figure 6-3 Typical Unbundled ADSL Capable Loop.

The Unbundled ADSL Capable Loop is a transmission path between a CO Network Interface, typically at the DF, in a CenturyLink serving Central Office and the Network Interface at the end user location. The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. The ADSL Capable Loop is for the transport of asymmetric, digital bi-directional signals. This offering requires that the maximum data rate is arranged for the downstream direction. That is from the CO-NI to the EU-NI.

The ADSL transport may be either Discrete Multi-Tone (DMT) or Carrierless Amplitude Phase Modulation (CAP). The ADSL Capable Loop may also support a customer's provisioned subscriber POTS transmission path. The ADSL signal must be one that complies with the Standard developed by the Accredited Standards Committee on Telecommunications, T1, Working Group T1E1.4. That Standard is ANSI Standard T1.413. A customer's choice of appropriate Network Channel Interface codes of Table 3-13 will specify the particular application.

The customer specifies the NCIs to communicate to CenturyLink the character of the signals the customer intends to connect to the network at the end-points of the copper circuit. For ADSL Capable Loops, the NCI codes may affect transport designs or performance. The associated NC code requires that the service is free of loads. These facilities shall be free of faults, such as opens, grounds, shorts, and foreign volts. The loops will also be conditioned when requested by CLEC. CenturyLink has responsibilities to provision the best available loop.

6.6 Unbundled Advanced Digital Transport Capable Loop

Figure 6-4 illustrates a typical Unbundled Advanced Digital Transport Capable Loop configuration.

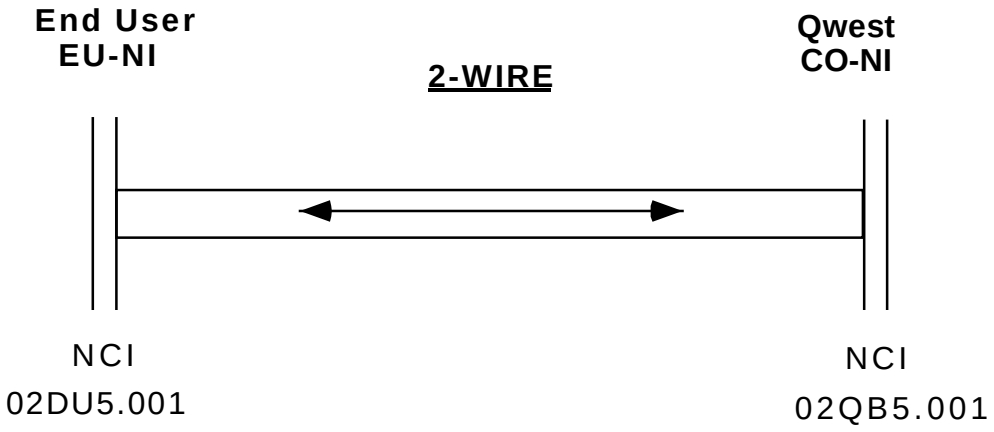

Figure 6-4 Typical Unbundled Advanced Digital Transport Capable Loop.

The Unbundled Advanced Digital Transport Capable Loop is a transmission path between a CO Network Interface, typically at the DF, in a CenturyLink serving Central Office and the Network Interface at the end user location. The EU-NI is typically a Network Interface Device or NID. The NID divides the CenturyLink facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. The Advanced Digital Transport Capable Loop is for the transport of asymmetric or symmetric digital, bi-directional signals.

The applied signal must comply with the Spectral Compatibility Standard developed by the Accredited Standards Committee on Telecommunications, T1, Working Group T1E1.4. That Standard is ANSI Standard T1.417. A customer's choice of appropriate Network Channel Interface codes of Table 3-13 will specify the particular application.

The customer specifies the NCIs to communicate to CenturyLink the character of the signals the customer intends to connect to the network at the end-points of the copper circuit. For Advanced Digital Transport Capable Loops, the NCI codes may affect transport designs or performance. The associated NC code requires that the service is free of loads. These facilities shall be free of faults, such as opens, grounds, shorts, and foreign volts. The loops will also be conditioned when requested by CLEC. CenturyLink has responsibilities to provision the best available loop.

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7. Maintenance

7.1 Customer Responsibilities

The customer is responsible for all equipment and cable on the EU and Interconnector sides of Network Interfaces (NIs).

The customer or their responsible agent must sectionalize trouble conditions and verify that the trouble is not in EU or customer owned equipment or cabling before calling the applicable CenturyLink Repair Center. The customer must provide CenturyLink with this information before CenturyLink will dispatch to repair.

CenturyLink will furnish the customer a trouble reporting telephone number.

If the trouble is isolated to EU owned equipment or cable, the EU is responsible for clearing the trouble and restoring the service to normal.

Joint testing between the customer and CenturyLink may occasionally be necessary to isolate trouble.

The customer and EU are responsible for obtaining and providing equipment compatible with Unbundled Loop service.

7.2 CenturyLink Responsibilities

CenturyLink is responsible for all equipment and cable between the CenturyLink CO-NI and the EU-NI.

Upon receipt of a trouble report, CenturyLink will initiate actions as specified in the Service Interval Guide to clear the trouble.

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8. Definitions

8.1 Acronyms

AML	Actual Measured Loss
ANSI	American National Standards Institute
CFA	Carrier Facility Assignment
CLEC	Competitive Local Exchange Carrier
CLLI™	COMMON LANGUAGE Location Identification
CO	Central Office
CO-NI	Central Office Network Interface
dB	Decibel
DS0	Digital Signal Level 0 (64 kbit/s)
DS1	Digital Signal Level 1 (1.544 Mbit/s)
DS3	Digital Signal Level 3 (44.736 Mbit/s)
DSL	Digital Subscriber Line
EI	Electrical Interface
EML	Estimated Measured Loss
EU	End-User
HDSL	High-Data Rate Digital Subscriber Line
IDSL	ISDN Digital Subscriber Line
Mbit/s	Megabits per Second (1,000,000 bit/s)
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
POT	Point Of Termination
RSDSL	Rate Adaptive Digital Subscriber Line
SDSL	Symmetric Digital Subscriber Line
SHDSL	Singe-Pair High Speed DSL
TLP	Transmission Level Point
VDSL	Very High Speed Digital Subscriber Line
VF	Voice Frequency
xDSL	Digital Subscriber Loop carrier, type x
xDSL-I	Digital Subscriber Line carrier, type ISDN

8.2 Glossary

Bandwidth

Analog - The range of frequencies that contain most of the energy or power of a signal; also, the range of frequencies over which a circuit or system is designed to operate.

Digital - The amount of information that a signal can carry over a fixed time interval. A system with a high bandwidth can carry more information over a fixed time interval than a low bandwidth system.

Binary *n*- Zero Substitution (B*n*ZS)

Binary *n*- Zero Substitution is an application of BPRZ, and is an exception to the Alternate Mark Inversion (AMI) line-code rule. It is one method for providing bit independence for digital transmission, by providing a minimum 1's density of 1 in *n*-bits. For DS3, *n*=3; for DS1, *n*=8; for 56 kbit/s service, *n*=7, and for subrates, *n*=6. The rule of B*n*ZS is:

- Successional binary 1s (Marks) will be of opposite polarity (AMI) unless they are separated by n consecutive binary zeros, in which case the n 0s will be replaced by an n-bit byte containing 1s, having or causing, an intentional bipolar violation (bpv).
- For example in B6ZS, if the preceding binary 1 was +, then binary 100000011 is transmitted as signal voltage values: -000+0+-+ (the B6ZS byte is underlined). Assume the leftmost bit is transmitted first.
- In the decoding process, the B*n*ZS signature is recognized and replaced by an all zero *n*-bit byte.

Bit (Binary Digit)

A binary unit of information. It is represented by one of two possible conditions, such as the value 0 or 1, on or off, high potential or low potential, conducting or not conducting, magnetized or demagnetized. A Bit is the smallest unit of information, by definition.

Bridged Tap

Multiple connections of a cable to more than one location are called "bridged taps". At any one time, only one customer is connected and the other taps are left open. As customers connect and disconnect service, these bridged tap appearances allow an operating company flexibility in the use of their cable.

Central Office (CO)

A local switching system (or portion thereof) and its associated equipment located at a wire center.

Channel

An electrical or photonic (in the case of fiber optic based transmission systems) communications path between two or more points of termination.

Decibel (dB)

The logarithmic unit of signal power ratio most commonly used in communications. It is used to express the relationship between two signal powers, usually between two acoustic, electrical, or optical signals; it is equal to ten times the common logarithm of the ratio of the two signal powers. For reference purposes, the output and input signal power is related to a specific level called a dBm, where zero dBm (Log 1 = 0) equals 1 milliwatt (mW) at a specified impedance.

End-User (EU)

The term "End-User" denotes any customer of telecommunications service that is not a carrier; except that a carrier shall be deemed to be an "End-User" to the extent that such carrier uses a telecommunications service for administrative purposes, without making such service available to others, directly or indirectly. The term is frequently used to denote the difference between a carrier interface and an interface subject to unique regulatory requirements at non-carrier customer premises (Federal Communications Commission Part 68, etc.).

Extended Superframe (ESF) Format

An Extended Superframe consists of twenty-four consecutive DS1 frames. Bit one of each frame (the F-bit) is time shared during the 24 frames to describe a 6 bit frame pattern, a 6 bit Cyclic Redundancy Check (CRC) remainder, and a 12 bit data link. The transfer rate of each is 2 kbit/s, 2 kbit/s, and 4 kbit/s respectively.

Load Coil

An inductive element that is placed at regular intervals on some cable pairs to improve voiceband transmission. Inductive loading of cable pairs reduces attenuation in the voiceband and makes impedance, delay and attenuation uniform throughout the passband of the loading system. Frequencies outside the passband of the system are essentially eliminated.

Multi-State Signaling

Any of the multifrequency pulsing systems (two-out-of-five, two-out-of-six, or two-out-of-eight) which are suitable for transmitting numerical address signals.

Network Channel (NC) Code

The Network Channel (NC) code is an encoded representation used to identify both switched and non-switched channel services. Included in the code set are customer options associated with individual channel services, or feature groups and other switched services.

Network Channel Interface (NCI) Code

The Network Channel Interface (NCI) code is an encoded representation used to identify five (5) interface elements located at a Network Interface at a customer location. The Interface code elements are: Total Conductors, Protocol, Impedance, Protocol Options, and Transmission Level Points (TLP).

Network Interface (NI)

The point of demarcation on the End-User's premises at which the CenturyLink's responsibility for the provision of Access or Non-Access service ends.

Protocol Code

The Protocol (character positions 3 and 4 of the NCI Code) is a two-character alpha code that defines requirements for the interface regarding signaling and transmission.

Superframe Format (SF)

A superframe consists of 12 consecutive DS1 frames. Bit one of each frame (the F-bit) is used to describe a 12-bit framing pattern during the 12 frames.

Transmission Level Point (TLP)

A point in a transmission system at which the ratio, usually expressed in decibels, of the power of a test signal at that point to the power of the test signal at a reference point is specified. For example, a zero transmission level point (0 TLP) is an arbitrarily established point in a communications circuit to which all relative levels at other points in the circuit are referred.

xDSL Capable Loop

Refers to 2-wire and 4-wire copper Loop(s) and copper Subloop(s) that transmit the digital signals needed to provide xDSL Service. Unbundled digital Loops may be provided using a variety of transmission technologies pursuant to the CLEC's interconnection agreement. "xDSL Capable Loops" is used to refer specifically to Loops and Subloops used to provide narrowband or broadband services (or both) to customers served by copper Loops and Subloops (including those that are in active service and those that are deployed in the network as spares). These facilities shall be free of faults, such as opens, grounds, shorts, and foreign volts. The loops will also be conditioned when requested by the CLEC. CenturyLink has responsibilities to provision the best available loop

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9. References

9.1 American National Standards Institute Documents

ANSI Technical Report 28	*High-Bit-Rate Digital Subscriber Line (HDSL)*, February 1994 -
ANSI T1.418a-2004	*High bit rate Digital Subscriber Line - 2nd Generation (HDSL2/HDSL4), Issue 2*
ANSI Technical Report 60	*Unbundled Voicegrade Analog Loops)*, July 1999 -
ANSI T1.102-1993 (R 1999)	*Telecommunications - Digital Hierarchy - Electrical Interfaces*
ANSI T1.107-1995	*Telecommunications - Digital Hierarchy - Formats Specifications*
ANSI T1.223-1997	*Information Interchange - Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*
ANSI T1.231-1997	*Telecommunications - Digital Hierarchy - Layer 1 In-service Digital Transmission Performance Monitoring*
ANSI T1.401-1993	Telecommunications - *Interface between Carriers and Customer Installations - Analog Voicegrade Switched Access Lines Using Loop-Start and Ground-Start Signaling.*
ANSI T1.403-1995	*Telecommunications - Carrier to Customer Installation, DS1 Metallic Interface*
ANSI T1.404-1994	*Telecommunications - Carrier-to-Customer Installation-DS3 Metallic Interface Specifications*
ANSI T1.426-2004	*Enhanced Single-Pair High-Speed Digital Subscriber Line (E-SHDSL) Transceivers.*

ANSI T1.410-1992	*Telecommunications - Carrier to Customer Interface - Digital Data at 64kbps and Subrates*
ANSI T1.417-2001	*Telecommunications – Spectrum Management for Loop Transmission Systems*
ANSI T1.510-1999	*Telecommunications - Network Performance Parameters for Dedicated Digital Services -- Specifications*
ANSI T1.601-1992	Telecommunications -*Integrated Services Digital Network (ISDN) - Basic Access Interface for Use on Metallic Loops for Application on the Network side on the NT (Layer 1 Specification).*
ANSI T1.605-1991	Telecommunications -*Integrated Services Digital Network (ISDN) -Basic Access Interface for S and T Reference Points (Layer 1 Specification).*
ANSI/IEEE 820-1984 (Reaffirmed 1993)	*IEEE Standard Telephone Loop Performance Characteristics.*

9.2 Institute of Electrical and Electronics Engineers Publications

IEEE Std 100-1992	*The New IEEE Standard Dictionary of Electrical and Electronics Terms [Including Abstracts of All Current IEEE Standards]*. Institute of Electrical and Electronics Engineers, Inc. Copyright © 1993.
IEEE Std 743-1984 (Reaffirmed 1992)	*IEEE Standard Methods and Equipment for Measuring the Transmission Characteristics of Analog Voice Frequency Circuits.* Institute of Electrical and Electronics Engineers, Inc.

9.3 International Telecommunication Union Recommendations

G.701	*Vocabulary of Digital Transmission, Multiplexing and Pulse code Modulation (PCM) Terms*
I.411	*ISDN User-Network Interfaces -Reference Configurations*
G.992.5	*Asymmetric digital subscriber line 2 transceivers (ADSL2)- Extended bandwidth ADSL2 (ADSL2plus)*
G.993.2	*Very high speed digital subscriber line transceivers 2 (VDSL2)*

9.4 CenturyLink Publications

Service Interval Guide	Updated twice yearly. This is also available through the Interconnect Services Center.
PUB 77200	*DS1 Service and Qwest DS1 Rate Synchronization Service*PUB 77204 *Digital Data Service Product Description, Applications, and Interface Combinations*
PUB 77310	*Private Line Voice Grade Analog Channels for Access Service*
PUB 77311	*Analog Channels for Non-Access Service*
PUB 77324	*DS3 Service*
PUB 77375	*1.544 Mbit/s Channel Interfaces*
PUB 77386	*Expanded Interconnection and Collocation for Private Line Transport and Switched Access Services*

9.5 Federal Communications Commission Documents

Code of Federal Regulations 47, Part 68.

9.6 Telcordia Documents

GR-54-CORE	Telcordia, *High-Capacity Digital Service (1.544 Mb/s) Interface Generic Requirements for End Users.*
GR-334-CORE	Telcordia, *Switched Access Service: Transmission Parameter Limits and Interface Combinations.*
GR-335-CORE	Telcordia, *Voice Grade Special Access Services: Transmission Parameter Limits and Interface Combinations.*
GR-342-CORE	Telcordia, *High-Capacity Digital Special Access Service: Transmission Parameter Limits and Interface Combinations.*

GR-499-CORE	Telcordia, *Transport Systems Generic Requirements (TSGR): Common Requirements.*
GR-1089-CORE	Telcordia, *Electromagnetic compatibility and Electrical Safety Generic Criteria for Network Telecommunications Equipment.*
SR-STS-000307	Telcordia, *Industry Support Interface (ISI): NC/NCI Code Dictionary*, Issue 4, February 1993.
SR-2275	Telcordia *Notes on the Networks*, Issue 3, December 1997.
TR-NWT-000393	Telcordia, *ISDN Basic Access Digital Subscriber Lines*.
TR-NWT-000397	Telcordia, *ISDN Basic Access Transport System Requirements*.

9.7 Ordering Information

All documents are subject to change and their citation in this document reflects the most current information available at the time of printing. Readers are advised to check status and availability of all documents.

Ordering Information for those who are not CenturyLink employees:

For American National Standards Institute (ANSI) documents contact:

American National Standards Institute
Attn.: Customer Service
11 West 42nd Street
New York, NY 10036
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Fax: (212) 302-1286
HTTP URL: http://www.ansi.org/

ANSI has a catalog available that describes their publications.

For Telcordia documents contact:

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Piscataway, NJ 08854-4156
Fax: (908) 336-2559
Phone: (800) 521-CORE (2673) (U.S. and Canada)
Phone: (908) 699-5800 (Others)
HTTP URL: http://www.telcordia.com/

For IEEE documents contact:

Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street
New York, NY 10017-2394
HTTP URL: http://www.ieee.org

For International Telecommunications Union documents contact:

International Telecommunications Union
General Secretariat
Place des Nations, CH-1211
Geneva 20, Switzerland
HTTP URL: http://www.itu.ch

For CenturyLink Technical Publications go to:

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For Federal Communications Commission (FCC) documents contact:

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9.8 Trademarks