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Interconnection - Unbundled Loop

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NOTICE

This document describes QWEST's Interconnection - Unbundled Loop offering that provides unbundled Voiceband Channels, Digital Channels and xDSL loops. The Unbundled Loop extends from an interface at a QWEST 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 an Interconnector has established Physical or Virtual Collocation arrangements. This Unbundled Network Element is available to Competitive Local Exchange Carriers from QWEST. 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 QWEST's Interconnection - Unbundled Loop offering that provides unbundled Voiceband Channels, Digital Channels and xDSL loops.

The Unbundled Loop extends from an interface at a QWEST 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 an Interconnector has established Physical or Virtual Collocation arrangements. The Unbundled Loop offering provides:

- A voiceband transmission path of approximately 3 kHz of usable bandwidth between the End-User's premises Network Interface and the QWEST Central Office Network Interface.
- A digital transmission path between the End-User's premises Network Interface and the QWEST 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.
    - A Basic Rate ISDN, Digital Subscriber Line (DSL) that provides a bi-directional, 160 kbit/s, 2B+1D transmission path.
    - An xDSL-I, DSL that provides a bi-directional, 160 kbit/s (144 kbit/s, full-payload) transmission path.
    - DS1 Loop that provides a bi-directional, 1.544 Mbit/s transmission path.
    - DS3 Loop that provides a bi-directional, 44.736 Mbit/s transmission path.
    - SONET Loop that provides an STS-3, STS-12, STS-48 or STS-192 transmission path.
- An xDSL transmission path between the End-User's premises Network Interface and the QWEST Central Office Network Interface, where a Competitive Local Exchange Carrier (CLEC) may apply the following standardized signals:
    - Digital Subscriber Line (DSL) compatible loop with bi-directional transmission interfaces of 160 kbit/s, conforming to ANSI Standard T1.601.
    - High-Bit-Rate Digital Subscriber Line (HDSL) compatible loop with bi-directional transmission interfaces conforming to ANSI T1E1, Technical Report Number 28.
    - Asymmetric Digital Subscriber Line (ADSL) compatible loop with bi-directional transmission interfaces conforming to ANSI Standard T1.413.
    - Advanced Digital Transport compatible loop with transmission interfaces conforming to Spectrum Management guidelines of ANSI Standard T1.417.

1.2 Reason for Reissue

This issue introduces Spectrum Management compatible loops for Advanced Digital Transport.

1.3 Scope

The intent of this document is to provide End-Users (EU's), service providers, and equipment manufacturers with a description of QWEST's Unbundled Loop, its operational characteristics and available interfaces. QWEST has responsibility for providing each individual unbundled element as described in this and other referenced publications. QWEST 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 QWEST to concatenate individual unbundled elements. However, QWEST can not assure that the combination of elements will work in the manner the carrier desires.

1.4 Unbundled Voiceband Channels

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

1.5 Unbundled Digital Channels

Unbundled Digital Channels are transmission paths capable of carrying specifically formatted and line coded digital signals between the Network Interface on an EU's premises and a QWEST Central Office Network Interface. Unbundled Digital Loops may be provided using a variety of transmission technologies including but not limited to metallic wire, metallic 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 capable of carrying American National Standards Institute (ANSI) defined digital subscriber line signals between the Network Interface on an EU's premises and a QWEST Central Office Network Interface. Unbundled xDSL Loops use only non-loaded, metallic wire facilities. Direct Current continuity is expected with this offering.

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	Channel and Interface Specifications	Explanation of interface codes and valid code combinations
4	Technical Specifications - Unbundled Voiceband Channels	Technical issues and operational characteristics of available Unbundled Voiceband Channels
5	Technical Specifications - Unbundled Digital Channels	Technical issues and operational characteristics available Unbundled Digital Channels
6	Technical Specifications - Unbundled xDSL Loops	Technical issues and operational characteristics of xDSL Loops
7	Maintenance	Customer and QWEST 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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2. Description of Service

2.1 Interconnection -- Unbundled Voiceband Channels

An Interconnection -- Unbundled Voiceband Channel is a voice band transmission path that runs from a QWEST 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 QWEST CO. The EU-NI is typically a Network Interface Device or NID. The NID divides the QWEST facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements. QWEST 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 Channel 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 QWEST 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 QWEST. Its associated transmission channel will carry analog voice frequency signals, nominally between 300 and 3000 Hz, using separate transmit and receive paths.

2.2 Interconnection -- Unbundled Digital Channels

An Interconnection -- Unbundled Digital Channel is a digital transmission path that runs from a QWEST 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 QWEST CO. The EU-NI is typically a Network Interface Device or NID. The NID divides the QWEST facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements. QWEST 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 Channels.

2.2.1 Interconnection -- Unbundled Digital Data Services Channel

An Interconnection - Unbundled Digital Data Services (DDS) Channel 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 QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. Secondary channels may be transmitted with any subrate. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements

Characteristics associated with an Unbundled DDS Channel 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 Interconnection -- Unbundled Digital Subscriber Line (DSL) Channel

An Interconnection - Unbundled Digital Subscriber Loop (DSL) Channel is a digital transmission path that runs from a QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. This transmission path will transport a standard, 160 kbit/s DSL channel 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. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements.

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

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

2.2.3 Interconnection -- Unbundled DS1 Channel

An Interconnection - Unbundled DS1 Channel is a digital transmission path that runs from a QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. An Interconnector gains access to these unbundled services at the QWEST 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 QWEST Central Office and at the End-User's premises Network Interface. The DS1 Channel transports bi-directional DS1 signals with a nominal transmission rate of 1.544 Mbit/s.

Characteristics associated with an Unbundled Digital Channel 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 Interconnection -- Unbundled DS3 Channel

An Interconnection - Unbundled DS3 Channel is a digital transmission path that runs from a QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. An Interconnector gains access to these unbundled services at the QWEST 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 QWEST Central Office and at the End-User's premises Network Interface. The DS3 Channel transports a bi-directional a high capacity channel 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 Channel 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.

2.2.5 Interconnection -- Unbundled SONET Channel

An Interconnection - Unbundled SONET Channel is a digital transmission path that runs from a QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements. It is a transmission path between a Central Office Network Interface at a Fiber Distribution Panel (FDP) or equivalent in a QWEST Central Office and an FDP at the End-User's premises. The SONET Channel transports a bi-directional a high capacity SONET signals of OC-3, OC-12, OC-48 or OC-192 rates. They will generally conform to ANSI Standard 105.06, Telecommunications- *Synchronous Optical Network (SONET): Physical Layer Specifications* and ANSI T1.105, Telecommunications- *Synchronous Optical Network (SONET): Basic Description including Multiplex Structure, Rates, and Formats*. Equipment has been placed in service over an extended period of time that encompasses an evolution of the specifications.

Characteristics associated with an Unbundled SONET Channel as defined above are in accord with the following interfaces:

- 4-fiber digital interface supporting an OC-3, SONET Optic signal of nominal rate of 155.52 Mbit/s over a transmission path to an EU's premises.
- 4-fiber digital interface supporting an OC-12, SONET Optic signal of nominal rate of 622.08 Mbit/s over a transmission path to an EU's premises.
- 4-fiber digital interface supporting an OC-48, SONET Optic signal of nominal rate of 2.488 Gbit/s over a transmission path to an EU's premises.
- 4-fiber digital interface supporting an OC-192, SONET Optic signal of nominal rate of 9.865 Gbit/s over a transmission path to an EU's premises.

2.3 Interconnection -- xDSL Loops

An Interconnection - Unbundled xDSL Loop is a metallic transmission path that runs from a QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. This metallic path is a non-loaded metallic facility. See Chapter 6 for detailed technical characteristics. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements.

Characteristics associated with an Unbundled xDSL Loop as defined above 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.
- 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
- 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*.

2.4 Applied Power Level

The applied power level of any transmitted signal must comply with American National Standards Institute (ANSI) specifications T1.401-1993 and Telcordia'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. Channel and Interface Specifications

3.1 General

Network Channel (NC) codes describe, in standard format, the characteristics of the service channel. Network Channel Interface (NCI) codes describe the physical and electrical Unbundled xDSL Loop NC/NCI Code Combinations characteristics of the Network Interface (NI). Telcordia document, MC-CL-IN-008, *Common Language Network Channel and Channel Interface Codes (NC/NCI Codes)*, describes these coding schemes.

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 QWEST of the required service connection of the channel 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 Channel NC Codes

For Unbundled Voiceband Channels, 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 NC codes for Unbundled Voiceband Channels.

Table 3-1 Available Voiceband Channel Network Channel 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 Channel NC Codes

For Unbundled Digital channels, 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 Network Channel Codes. The first table lists those Digital Channels above the 64 kbit/s level. The second table lists Digital Channels up to and including the 64 kbit/s level.

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

Table 3-2 Available Digital Channel Network Channel Codes

Network Channel Code	Point-to-Point Digital Loop Description
Digital Subscriber Line (DSL) Loop	
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. It may or may not be channelized with the M23 Multiplex format per ANSI T1.107-1995 and Bellcore TR-INS-000342
HFC-	DS3 M- frame structured signal and C-Bit Parity application. It may or may not be channelized with the M23 Multiplex format per ANSI T1.107-1995 and Bellcore TR-INS-000342.
SONET	
OBB-	OC-3 SONET Point-to-Point, External Timing
OBBR	OC-3 SONET Point-to-Point, External Timing, STS3c Payload
ODB-	OC-12 SONET Point-to-Point, External Timing
ODBR	OC-12 SONET Point-to-Point, External Timing, STS12c Payload
OFB-	OC-48 SONET Point-to-Point, External Timing
OF-R	OC-48 SONET Point-to-Point, STS48c Payload
OGB-	OC-192 SONET Point-to-Point, External Timing

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

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

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

3.4.3 Unbundled xDSL Loop NC Codes

For Unbundled xDSL Loop channels 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 NC codes for Unbundled xDSL Loops.

Table 3-4 Available Unbundled xDSL Loop Network Channel Codes

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

For Unbundled Loop LX-N and LXR-, Network Channel (NC) codes, the Network Channel Interface (NCI) codes are informative to QWEST. The customer specifies the NCIs to communicate to QWEST the character of the signals the customer is connecting to the network at each end-point of the metallic circuit. The NCIs do not affect transport designs or performance. The associated NC codes require that the service use non-loaded, metallic facilities. Those facilities shall be free of faults. The customer has responsibilities to inspect the character of the facilities, e.g. gauge, length, etc., and determine that it is appropriate for their application.

3.5 Network Channel Interface (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 QWEST 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)

The first three fields 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 channel 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 an optional field 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 (metallic 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.

This example is an NCI code for a Loop Start Open-End (Switch) interface at a Central Office.

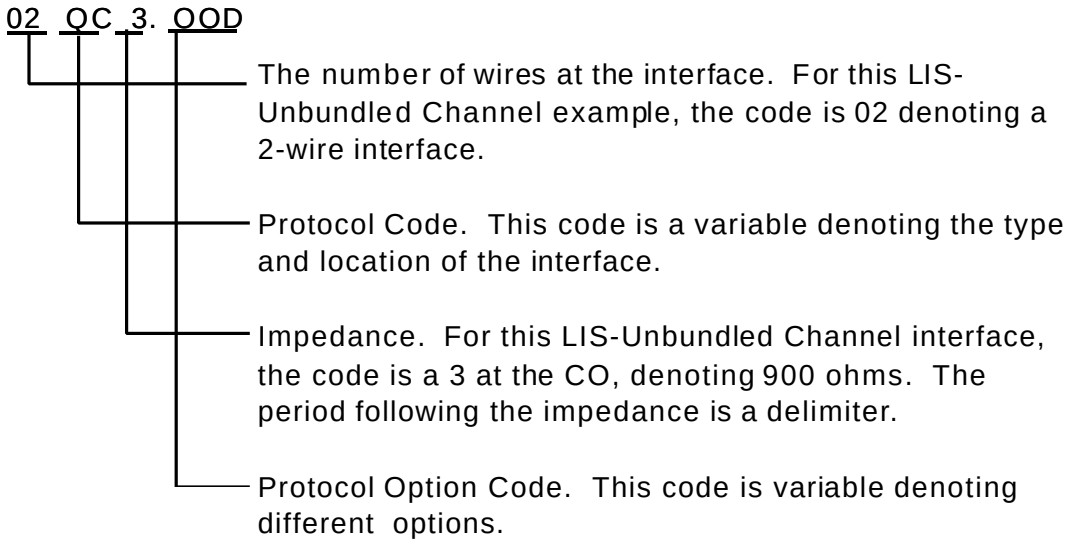

Figure 3-3 NCI Code Components

3.7 Unbundled Loop Available NCI Codes

This Section provides the available Network Channel Interface Codes to use when establishing an Unbundled Loop.

3.7.1 Available Voiceband Channel - NCI Codes

Table 3-6 Voiceband Channel NCI Protocol and Protocol Option Codes

Protocol		Definition *
Code 34	Option 789	
QC		Central Office Manual Cross-Connect DS0/Voice Termination
	OOB	Ground Start Loop Signaling, open end
	OOD	Loop Start Loop Signaling, open end
	OOF	Transmission only, no signaling
	RVO	Reverse Battery Originating: Loop closure provided by the Access Customer (AC) to the Access Provider (AP); Battery provided by AP to AC. *
	RVT	Reverse Battery Terminating: Loop closure provided by the AP to the AC; Battery Provided by AC to AP. *
GO		Ground-start signaling -- open end (switch) function presented by Access Customer at interface to QWEST Access Service.
GS		Ground-start signaling -- closed end (station) function presented by Access Customer or End-user at interface to QWEST Access Service.
LO		Loop-start loop signaling -- open end (switch) function presented by customer at interface to QWEST Access Service.
LS		Loop-start signaling -- closed end (station) function presented by the customer at the interface to QWEST access service.
NO		Connects customer to an Access Service suitable for voice transmission with no signaling provided by QWEST
RV		Reverse battery (Trunk signaling) at interface
	O	Loop closure provided by Access Customer to QWEST; Battery provided by QWEST to Access Customer
	T	Loop closure provided by QWEST to End-User; Battery provided by End-User to QWEST

* 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 QWEST. The Access Customer (AC) is the Interconnector (or their customer).

3.7.2 Available Digital Channel - Electrical NCI Codes

Table 3-7 Digital Channel Electrical NCI Protocol and Protocol Option Codes

Protocol		Definition
Code 3 4	Option 7 8 9	
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	44.736 Mbit/s, DS3 M-frame structured signal with M23 Multiplex format and 28 DS1 Channels application per ANSI T1.107-1995.
	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 I	44.736 Mbit/s, DS3 M-frame structured signal with C-Bit Parity application and 28 DS1 Channels 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.

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

Code 3 4	Option 7 8 9	Definition
D U		End User Digital Access 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.
	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 QWEST
	N	Basic Rate ISDN, Customer Provides NT Function Presented to QWEST

DS1 channels 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 QWEST 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 QWEST 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 is 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 QWEST Technical Publication 77375.

3.7.3 Available Digital Channel - Optical NCI Codes

The SONET optical NCI codes listed below are available.

Table 3-8 Optical Interface (SONET) NCI Protocol and Protocol Option Codes

Protocol		Definition
Code 3 4	Option 7 8 9	
S O		SONET / SDH Optical Interface
	B	ANSI LR1-SLM (Long Reach - Single-Longitudinal Mode)
	D	ANSI IR1-SLM (Intermediate Reach - Single - Longitudinal Mode)
	F	ANSI SR-MLM (Short Reach - Multi--Longitudinal Mode)

Notes: Not all interfaces are available for every SONET rate.

3.7.4 Available xDSL and Advanced Digital Transport Loop - NCI Codes

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

Table 3-9 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 3-9 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 channel 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 channel 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 channel and ADSL Using Discrete Multi-Tone (DMT) Format, per ANSI T1.413

Table 3-9 xDSL and Advanced Digital Transport NCI Protocol and Protocol Option Codes (Continued)

Protocol		Definition
Code 3 4	Option 7 8 9	
Q B		Central Office Manual Cross-Connect Termination with No Subrating Capability
	0 0 C	ADSL Using Carrierless Amplitude Phase Modulation (CAP) Format, per ANSI T1.413
	0 1 C	One POTS channel 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 Network Channel and Network Channel Interface Code Combinations

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

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

3.8.1 Unbundled Voiceband Channel NC/NCI Codes

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

Table 3-10 Unbundled Voiceband Channels NC/NCI Code Combinations

NC Code	NCI Code		DESCRIPTION
	QWEST CO-NI	End-User EU-NI	
VOICEBAND CHANNELS			
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 Channel NC/NCI Codes

Table 3-11 lists NC/NCI Code combinations for Digital Channel Unbundled Loops

Table 3-11 Digital Channel Unbundled Loop NC/NCI Code Combinations

NC Code	NCI Code		DESCRIPTION
	QWEST CO-NI	End-User EU-NI	
160 kbit/s DIGITAL SUBSCRIBER LNE (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
1.544 Mbit/s DS1 (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 3-11 Digital Unbundled Loop NC/NCI Code Combinations (Continued)

NC Code	NCI Code		DESCRIPTION
	QWEST CO-NI	End-User EU-NI	
44.736 Mbit/s DS3 (ALSO SEE 77324)			
HF--	04QB6.33	04DS6.44R	DS3 M-frame structured signal. It is an unchannelized signal application.
HF--	04QB6.33	04DS6.44	DS3 M-frame structured signal with M23 Multiplex format and 28 DS1 Channels application.
HFC-	04QB6.33	04DS6.44A	DS3 M-frame structured signal with C-bit Parity application. It is an unchannelized signal application.
HFC-	04QB6.33	04DS6.44I	DS3 M-frame structured signal with C-Bit Parity application and 28 DS1 Channels.
SONET (ALSO SEE 77346)			
OBB-	04QBF.LL	04SOF.*	OC-3 SONET Point-to-Point, External Timing
OBBR	04QBF.LL	04SOF.*	OC-3 SONET Point-to-Point, External Timing, STS3c Payload
ODB-	04QBF.LL	04SOF.*	OC-12 SONET Point-to-Point, External Timing
ODBR	04QBF.LL	04SOF.*	OC-12 SONET Point-to-Point, External Timing, STS12c Payload
OFB-	04QBF.LL	04SOF.*	OC-48 SONET Point-to-Point, External Timing
OF-R	04QBF.LL	04SOF.*	OC-48 SONET Point-to-Point, STS48c Payload
OGB-	04QBF.LL	04SOF.*	OC-192 SONET Point-to-Point, External Timing

Note: For SONET, EU NCI's a Protocol option code (*) is also required. See table below for description of available codes (F, D, and B).

Table 3-12 Optical Interface NCI Protocol Option Codes (SONET)

SONET PROTOCOL OPTION CODE	DESCRIPTION	Application
F	SR-MLM (Short Reach - Multi--Longitudinal Mode)	Digital fiber optic interface: OC-3 and OC-12
D	IR1-SLM (Intermediate Reach - Single - Longitudinal Mode)	Digital fiber optic interface: OC-3, OC-12 and OC-48
B	LR1-SLM (Long Reach - Single-Longitudinal Mode)	Digital fiber optic interface: OC-3, OC-12, OC-48 and OC-192

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

Table 3-13 Point-to-Point Digital Channel, DDS NC and NCI Code Combinations

NC Code	NCI Code		DESCRIPTION: APPLICATION OF QWEST'S UNBUNDLED LOOP
	QWEST 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 and Advanced Digital Transport Loop NC/NCI Codes

Table 3-8 lists available NC/NCI code combinations for Unbundled xDSL and Advanced Digital Transport Loops. For Unbundled Loop LX-N and LXR-, Network Channel (NC) codes, the Network Channel Interface (NCI) codes are informative to QWEST. The customer specifies the NCIs to communicate to QWEST the character of the signals the customer is connecting to the network at each end-point of the metallic circuit. The NCIs do not affect transport designs or performance. The associated NC codes require that the service use non-loaded, metallic facilities. Those facilities shall be free of faults. The customer has responsibilities to inspect the character of the facilities, e.g. gauge, length, etc., and determine that it is appropriate for their application.

Table 3-14 Unbundled xDSL Loop NC/NCI Code Combinations

NC Code	NCI Code		DESCRIPTION: APPLICATION OF QWEST'S UNBUNDLED LOOP
	QWEST CO-NI	End-User EU-NI	
ADVANCED DIGITAL TRANSPORT – SPECTRUM MANAGEMENT COMPATIBLE			
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

Table 3-14 Unbundled xDSL Loop NC/NCI Code Combinations (Continued)

NC Code	NCI Code		DESCRIPTION: APPLICATION OF QWEST'S UNBUNDLED LOOP
	QWEST CO-NI	End-User EU-NI	
ADVANCED DIGITAL TRANSPORT – SPECTRUM MANAGEMENT COMPATIBLE			
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 3-14 Unbundled xDSL Loop NC/NCI Code Combinations
(Continued)

NC Code	NCI Code		DESCRIPTION: APPLICATION OF QWEST'S UNBUNDLED LOOP
	QWEST CO-NI	End-User EU-NI	
DIGITAL SUBSCRIBER LINE (BASIC RATE ISDN -- DSL) COMPATIBLE *			
LX-N	02QC5.OOS	02IS5.N	Digital Subscriber Line with 2B1Q Signaling Format Compatible Loop
HIGH-BIT-RATE DIGITAL SUBSCRIBER LINE (HDSL) COMPATIBLE *			
LX-N	02QB9.00H	02DU9.00H	HDSL Compatible Loop, Metallic Facility ONLY per ANSI T1E1 Technical Report Number 28
LX-N	04QB9.00H	04DU9.00H	HDSL Compatible Loop, Metallic Facility ONLY per ANSI T1E1 Technical Report Number 28
ASYMMETRIC DIGITAL SUBSCRIBER LINE (ADSL) COMPATIBLE *			
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

* NOTE: These Code combinations are transitioning to Advanced Digital Transport - Spectrum Management Compatible Loops. Customers ordering xDSL loops should use an equivalent Spectrum Management Code combination.

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4. Technical Specifications Unbundled Voiceband Channels

4.1 General

This chapter details the technical characteristics; available configurations; signaling capabilities (if any); and transmission performance parameter limits for each of the Interconnection - 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.

Channels exceeding the performance characteristics listed bellow are available in some locations. When these channels 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 Channel is provided over carrier derived facilities, transmission performance is evaluated by measuring analog VF parameters on the channel between the End-User Network Interface (EU-NI) and the Central Office Network Interface (CO-NI).

4.3 Unbundled Voiceband Channels

Unbundled Voiceband 2-Wire and 4-Wire analog channels provide a voice frequency, transmission path between the EU-NI at a designated premise and QWEST'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.

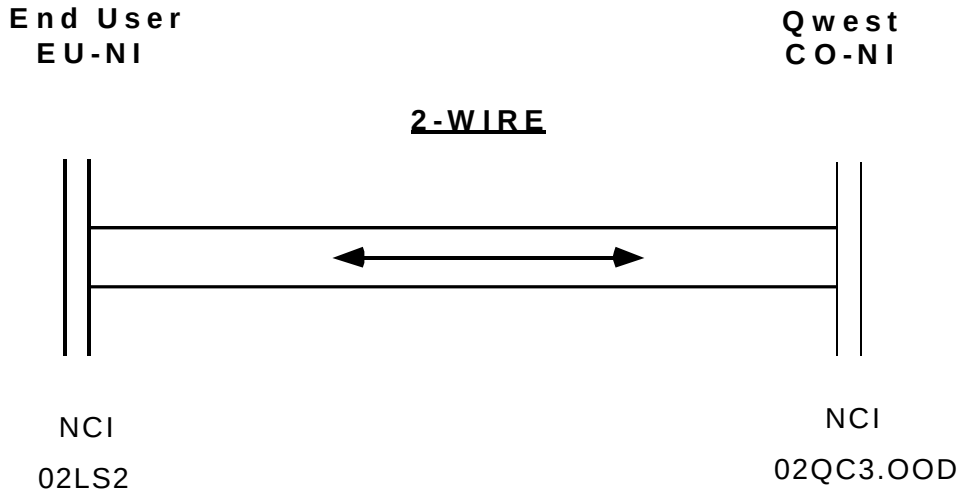

Figure 4-1: Typical Unbundled Voiceband Channel 2-Wire Configuration

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

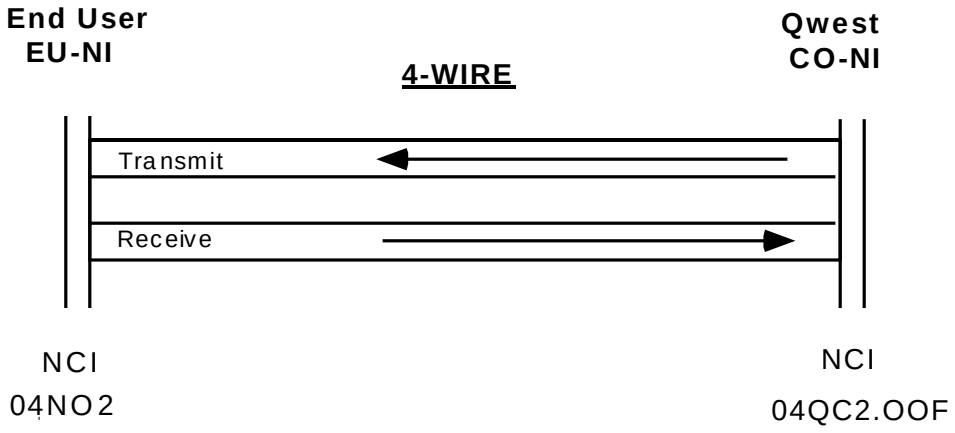

Figure 4-2: Typical Unbundled Voiceband Channel, 4-Wire Configuration

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 Channel

- 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 Channel will generally be within the range of 0.0 dB to 8.5 dB. Channels 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 Channel 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 metallic facilities it is important that there not be excessive leakage to ground. The following Table 4-5 shows minimum resistance to ground for unbundled channels.

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 Loop channels may be available in some locations using facilities designed to earlier standards.

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Figures

5. Technical Specifications Unbundled Digital Channels

5.1 General

An Interconnection -- Unbundled Digital Channel is a digital transmission path that runs from a QWEST 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 QWEST CO. The EU-NI is typically a Network Interface Device or NID. The NID divides the QWEST facility and the EU's customer installation, i.e., inside wiring and customer premises equipment.

5.2 Unbundled Digital Data Services (DDS) Channel

An Interconnection - Unbundled Digital Data Services (DDS) Channel 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 QWEST Central Office, CO-NI to the EU-NI located at the EU's designated premises within the serving area of the QWEST CO. Secondary channels may be transmitted with any subrate. An Interconnector gains access to these unbundled services at the QWEST CO through established Physical or Virtual Collocation arrangements

Characteristics associated with an Unbundled DDS Channel 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, *QWEST Digital Data Service Product Description, Applications, and Interface Combinations* for performance, testing and additional details. Figure 5-1 illustrates a typical DDS Channel configuration.

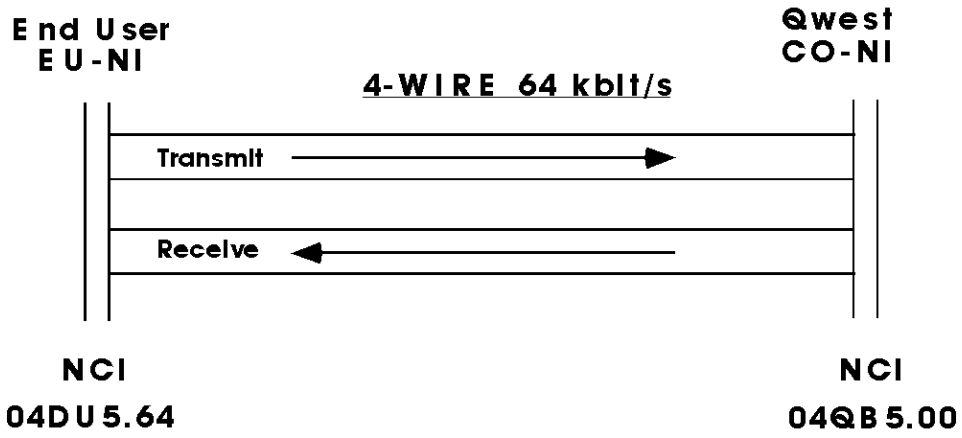

Figure 5-1: Typical Unbundled DDS Channel

5.3 Unbundled 160 kbit/s Digital Subscriber Line (DSL) Channel

The 160 kbit/s Digital Subscriber Line Channel is a QWEST facility with two-Wire interfaces that provides connectivity from the QWEST 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 QWEST facility

and the EU's customer installation, i.e., inside wiring and customer premises equipment. This loop will meet the design requirements for Basic Rate (BRI) ISDN standards of 144 kbps customer useable data capacity that is channelized as 2B + D. The transmission path's facility is consistent with Telcordia Technical Reference, TR-TSY-00393, *ISDN Basic Access Digital Subscriber Lines and ANSI T1.601-1999, 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)*. They will not have excessive bridged tap. They terminate using digital interfaces.

The BRI ISDN Channel shall have one of the following configurations:

- Non loaded metallic loop that is technically qualified for BRI ISDN 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, non-loaded metallic loop
- A combination of a long, non-loaded metallic loop, a mid-span regenerator and Central Office power unit.
- A combination of Subscriber Loop Carrier channels and a qualified non-loaded metallic loop.

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

Figure 5-2 illustrates a typical 2-Wire, DSL configuration.

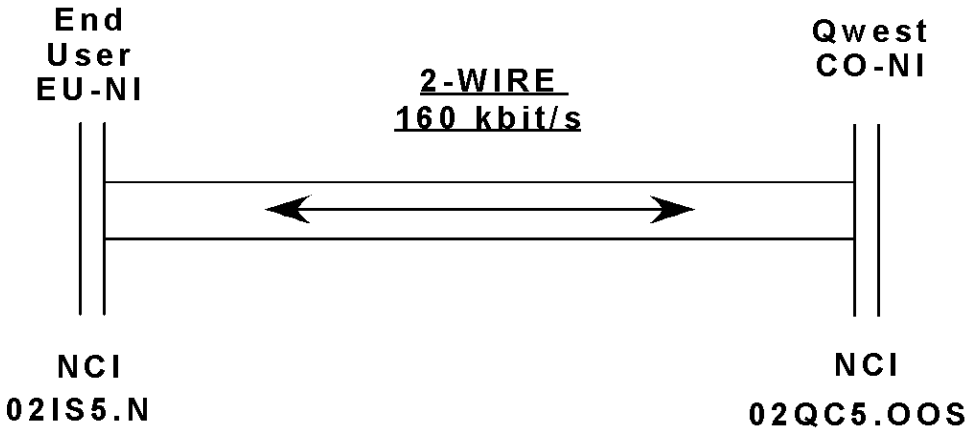

Figure 5-2: Typical Unbundled DSL Channel

5.4 Unbundled xDSL-I Channel

The xDSL-I Channel is a QWEST facility with two-Wire interfaces that provides connectivity from the QWEST 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 QWEST 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 Telcordia Technical Reference, TR-TSY-00393, *ISDN Basic Access Digital Subscriber Lines and ANSI T1.601-1999, 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)*. They will not have excessive bridged tap. 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 Channels terminate using digital interfaces.

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

- Non loaded metallic loop that is technically qualified for BRI ISDN transmission without the need for additional equipment.
- A combination of a long non-loaded metallic loop, a mid-span regenerator and Central Office power unit.
- A combination of Subscriber Loop Carrier channels and a qualified non-loaded metallic loop.

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

Figure 5-3 illustrates a typical 2-Wire, x DSL-I Channel configuration.

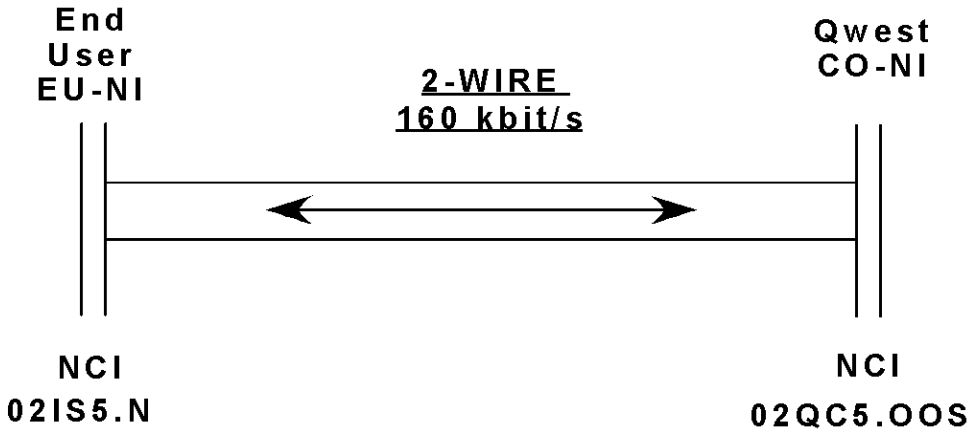

Figure 5-3: Typical Unbundled xDSL-I Channel

5.5 Testing Unbundled DSL and xDSL-I Channels

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 Channel

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

DS1 Channel will typically have one of the following configurations:

- Metallic based span with HDSL or T-1 equipment.
- Channel of a fiber based system
- Combination of both fiber and metallic based facilities.

There are some end user locations served by facilities and transmission equipment that are not compatible with DS1 transport technical requirements. QWEST shall process requests for DS1 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 QWEST 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 DS1 Channel configuration.

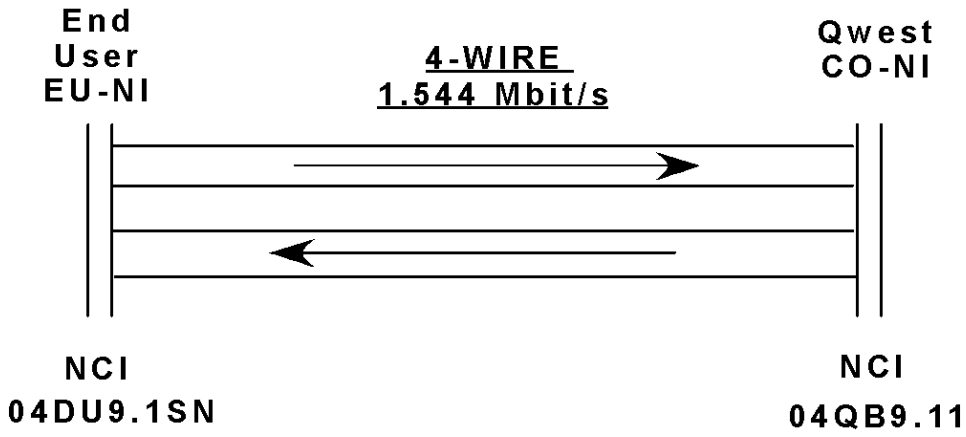

Figure 5-4: Typical DS1 Unbundled Channel.

5.7 Unbundled DS3 Channel

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

DS3 Channels 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. QWEST shall process requests for DS3 Channel 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 QWEST 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 DS3 Channel configuration.

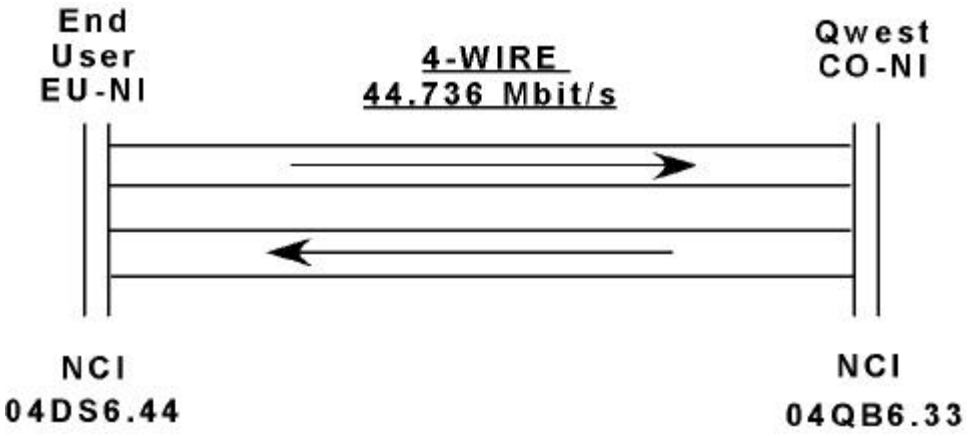

Figure 5-5: Typical DS3 Unbundled Channel.

5.8 Unbundled SONET Channel

The SONET Channel is a transmission path between a CO Network Interface at a Fiber Distribution Panel (FDP) or equivalent in a QWEST serving Central Office and an FDP or equivalent, Network Interface at the end user location. The SONET Channel transports bi-directional SONET signals of the Standard STS-3, STS-12, STS-48 or STS-192 rates. QWEST will deliver the SONET Channel to the End User's network interface consistent with Technical Publication 77346.

SONET Channels will typically have the following configuration:

- Channel of a fiber based, SONET system

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

Network Interfaces shall be as described in Technical Publication 77346, *Synchronous Service Transport (Synchronous Optical Transport)*. The CO Network Interface at an FDP to the collocated Competitive Local Exchange Carrier (CLEC) is as detailed in Technical Publication 77386, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services*. Performance shall meet end-to-end accuracy and availability objectives stated in ANSI Standard T1.514, *Network Performance Parameters for Dedicated Digital Services -- SONET Bit Rates*.

Figure 5-6 illustrates a typical SONET Channel configuration.

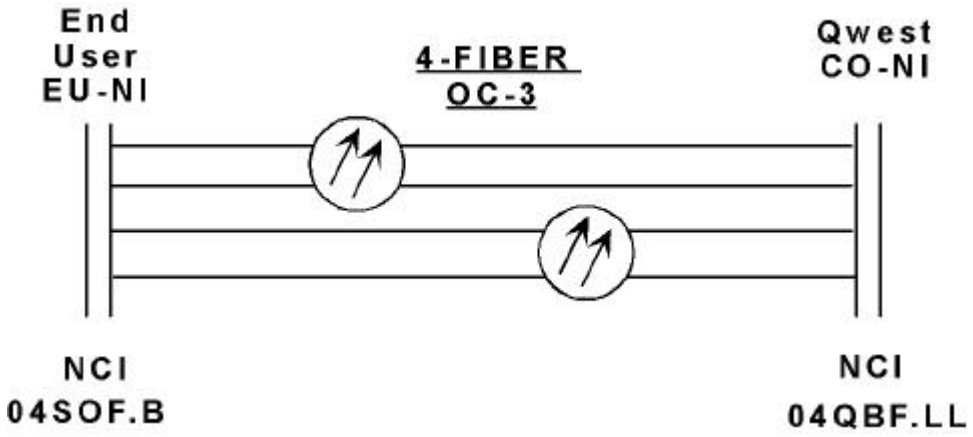

Figure 5-6: Typical SONET Unbundled Channel.

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Tables

6. Technical Specifications Unbundled x DSL Loops

6.1 General

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

Unbundled xDSL Loop, 2 or 4-Wire, provides a transmission path between the QWEST's Central Office (CO)-Network Interface (NI) and the End User (EU)-NI at a designated premises within the serving area of the QWEST CO. They terminate at the EU-NI and at the CO-NI using digital interfaces of the same digital hierarchical level.

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 shall determine whether the 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 QWEST 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. CLEC personnel shall determine if the available loop falls within the technical requirements of the service they intend to transport over the loop. For this unbundled service the NCI's are informative to QWEST and shall not affect the QWEST transport designs or performance. See Table 3-9 for compatible NCI codes.

If QWEST loop inventory records do not identify any non-loaded, metallic loops: the CLEC has the options of requesting to unload an available loop or order a finished transport, private line service. The CLEC must clearly specify the type of conditioning that needs to occur. Such conditioning would include loading coil removal and specific bridged tap removal.

QWEST reserves the right to make some cables unavailable to CLECs based on Spectrum Management considerations.

It is unlikely but remotely possible that some CLEC's service offerings may be incompatible with existing services on the QWEST network. QWEST reserves the right to identify CLEC services that interfere with other network services and disconnect them if necessary. In these situations the CLEC would be notified.

An Unbundled xDSL Loop provides a non-loaded, metallic transmission path between the EU-NI at a designated premises and QWEST's CO-NI. Digital transport systems require facilities of this type to function. They terminate using digital interfaces. There are no active electronic elements provided by QWEST.

The Unbundled xDSL loop has the following characteristics:

- Metallic facilities only -- no carrier segments
- No loading coils or build out capacitance, may have bridged tap
- Loop may be comprised of mixed gauges of cable
- Transmission characteristics of the two pairs making up the 4-wire facility may not be identical

6.2 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:

- Voice Frequency (VF) Continuity
- Measured Loss (1004 Hz)
- C-Message Noise, Noise Metallic

6.2.1 Loss

Insertion Loss at 1004 Hz of an Unbundled xDSL loop will generally be within the range of 0.0 dB to 8.5 dB. When an Unbundled xDSL loop is the result of requested conditioning, such as the removal of loading coils or is an area that where facilities are normally loaded but it exists due to prior application requirements, it should be expected that the 1004 Hz loss will higher than 8.5 dB. Loops that exceed 8.5 dB exist in some areas. No attenuation distortion objectives apply to this service.

6.2.2 Loop Noise and Foreign Voltage

Noise level will be:

$\leq$ 30 dBrnC, Metallic
$\leq$ 90 dBrnC, Longitudinal

Balance will be $\geq$ 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 $\geq$ 10,000 Ohms and foreign battery will be $\leq$ 8 Volts DC.

6.2.3 Resistance to Ground

For metallic facilities it is important that there not be excessive leakage to ground. The following Table 6-1 shows minimum resistance to ground for unbundled loops.

Table 6-1 Resistance to Ground Objectives

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

6.2.4 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.

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 xDSL Loops may be available in some locations using facilities designed to earlier standards.

6.3 Unbundled Digital Subscriber Line (DSL) Loop

Figure 6-1 illustrates a typical 2-Wire, DSL Loop configuration.

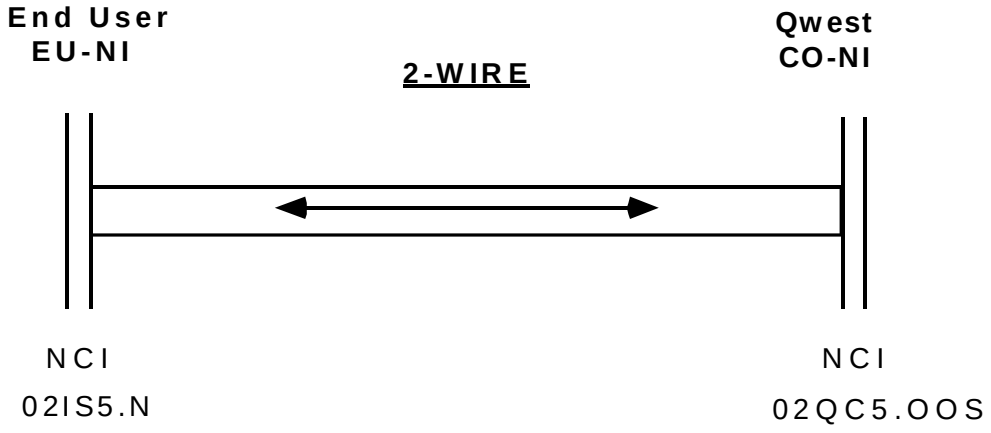

Figure 6-1 Typical Unbundled Digital Subscriber Line (DSL) Loop

The DSL Non-Loaded Loop is a QWEST facility with two-Wire interfaces that provides connectivity from the QWEST 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 QWEST facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. The Non-Loaded Loop, Network Channel Interface (NCI) codes are informative to QWEST. The customer specifies the NCIs to communicate to QWEST the character of the signals the customer intends to connect to the network at the end-points of the metallic circuit. For Non-Loaded Loops, the NCIs do not affect transport designs or performance. The associated NC code requires that the service use non-loaded, metallic facilities. Those facilities shall be free of faults. The customer has responsibilities to inspect the character of the facilities, e.g. gauge, length, bridged tap, etc., and determine that it is appropriate for their application and compatible with their installed equipment. These loops terminate using digital interfaces.

The DSL Non-Loaded Loop shall have the following configuration:

- Non-loaded metallic loop for 160 kbit/s, 2-binary, 1-Quaternary, DSL transmission without additional equipment.

There are some end user locations served by non-loaded loop facilities that may not be compatible with the DSL equipment installed by the CLEC. In those situations, an ISDN Digital Channel may be considered. See Chapter 5 for details.

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

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

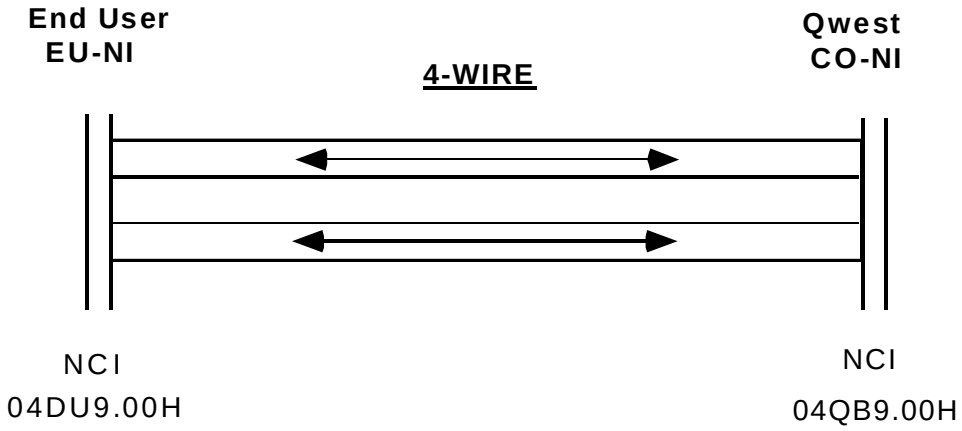

Figure 6-2 Typical Unbundled HDSL Loop

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

A non-loaded 4-wire loop is a QWEST provided 4-wire facility from the QWEST serving central office distributing frame to the network interface at the End-user's designated premises. It is comprised of two metallic, wire cable pairs with no loading coils. With the variety of HDSL equipment available QWEST gives no assurance that a loop ordered and provisioned will work with the CLEC's equipment. It is the CLEC's responsibility to evaluate the facilities provided and determine that they will function when connected to their HDSL terminals.

The non-loaded 4-wire loop has the following characteristics:

- Metallic facilities only -- no carrier segments
- No loading coils or build out capacitance, may have bridged tap
- Loop may be comprised of mixed gauges of cable
- Transmission characteristics of the two pairs making up the 4-wire facility may not be identical

6.5 Unbundled Asymmetric Digital Subscriber Line (ADSL) Loop

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

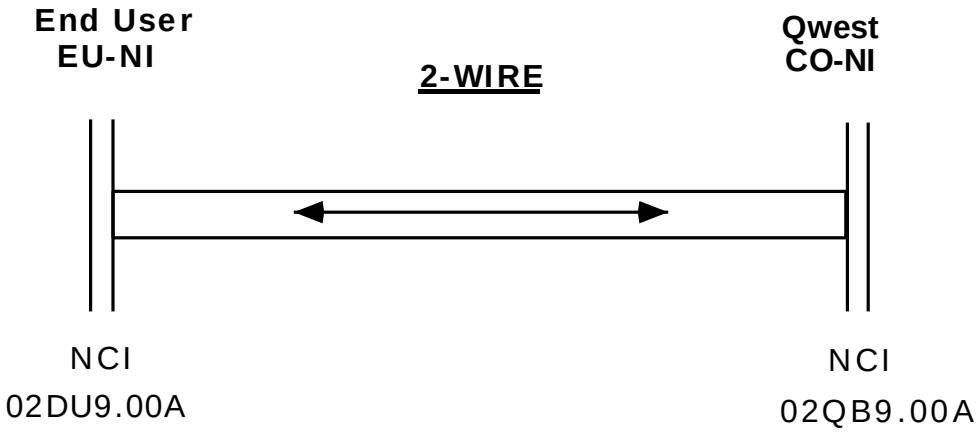

Figure 6-3 Typical ADSL Unbundled Loop.

The ADSL Loop is a transmission path between a CO Network Interface, typically at the DF, in a QWEST 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 QWEST facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. The ADSL 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 loop may also support an Interconnector's provisioned subscriber channel (POTS). 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. An Interconnector's choice of appropriate Network Channel Interface codes of Table 3-13 will specify the particular application.

ADSL Loops are:

- Metallic, exchange cable facilities without QWEST active or passive equipment
- Facilities without loading coils or build out capacitance
- Possibly of mixed gauges of cable
- Facilities that may have bridged tap

Factors that can affect an ADSL loop's maximum data rate capabilities include:

- Central Office wiring from the CO-NI to an Interconnector's equipment.
- EU's customer installation, including premises wiring, quantity and type of equipment.
- Loop loss, an ADSL loop that is close to its loss threshold has less capability than one with very low loss.
- The specific variant of ADSL equipment installed by an Interconnector.

QWEST cannot ensure that typical ADSL interfering signals, e.g., T1 repeatered lines or BRI ISDN lines, are not or will not be in the same or adjacent cable binder groups as an ADSL Loop.

There are end user locations served by loop facilities and transmission equipment that are not compatible with ADSL transport technical requirements. This means that there are sites where ADSL is not technically feasible using the transport currently serving that location.

6.5 Unbundled Advanced Digital Transport Loop

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

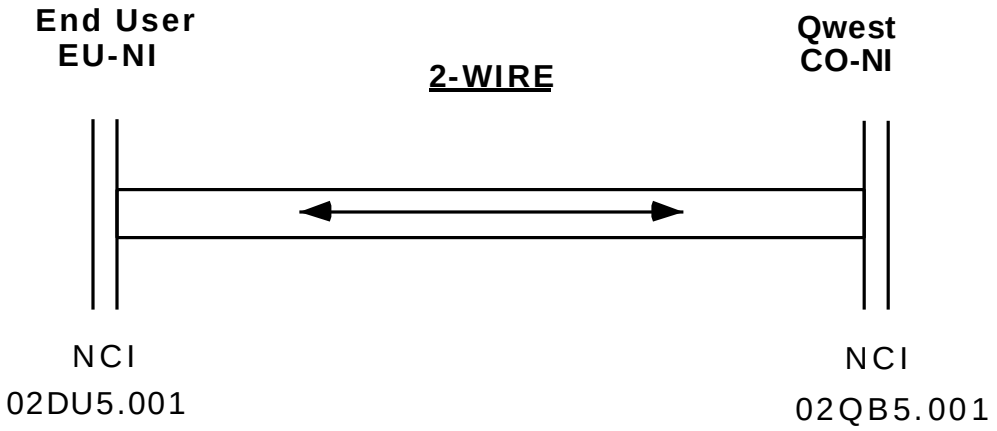

Figure 6-4 Typical Advanced Digital Transport Loop.

The Advanced Digital Transport Loop is a transmission path between a CO Network Interface, typically at the DF, in a QWEST 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 QWEST facility and the EU's customer installation, i.e., inside wiring and customer premises equipment. The Advanced Digital Transport 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. An Interconnector's choice of appropriate Network Channel Interface codes of Table 3-13 will specify the particular application.

Advanced Digital Transport Loops are:

- Metallic, exchange cable facilities without QWEST active or passive equipment
- Facilities without loading coils or build out capacitance
- Possibly of mixed gauges of cable
- Facilities that may have bridged tap

QWEST cannot ensure that typical ADSL interfering signals, e.g., T1 repeatered lines or BRI ISDN lines, are not or will not be in the same or adjacent cable binder groups as an ADSL Loop.

There are end user locations served by loop facilities and transmission equipment that are not compatible with Advanced Digital Transport technical requirements. This means that there are sites where it is not technically feasible using the transport currently serving that location.

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7. Maintenance

7.1 Interconnector Responsibilities

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

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

QWEST will furnish the Interconnector 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 Interconnector and QWEST may occasionally be necessary to isolate trouble.

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

7.2 QWEST Responsibilities

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

Upon receipt of a trouble report, QWEST 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)
EI	Electrical Interface
EU	End-User
Mbit/s	Megabits per Second (1,000,000 bit/s)
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
POT	Point Of Termination
TLP	Transmission Level Point
VF	Voice Frequency
xDSL	Digital Subscriber Loop carrier, type x

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 QWEST Communications International Inc.'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.

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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*

9.4 QWEST Publications

Service Interval Guide	Updated twice yearly. This is also available through the Interconnect Services Center.
PUB 77200	*QWEST DS1 Service and QWEST DS1 Rate Synchronization Service*, Issue F, September 2001
PUB 77204	*QWEST Digital Data Service Product Description, Applications, and Interface Combinations, Issue E, September 2001*
PUB 77310	*Private Line Voice Grade Analog Channels for Access Service, Issue C, September 2001*
PUB 77311	*Analog Channels for Non-Access Service, Issue D, September 2001*
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Code of Federal Regulations 47, Part 68.

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GR-334-CORE	Telcordia, *Switched Access Service: Transmission Parameter Limits and Interface Combinations.*
GR-342-CORE	Telcordia, *High-Capacity Digital Special Access Service: Transmission Parameter Limits and Interface Combinations.*

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TR-NWT-000393	Telcordia, *ISDN Basic Access Digital Subscriber Lines*.
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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.

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For American National Standards Institute (ANSI) documents contact:

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ANSI has a catalog available that describes their publications.

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