# QWEST Corporation
# Technical Publication

# Unbundled Network Element Combinations Including Enhanced Extended Loop (EEL) and Loop Mux Combinations (LMC)

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## 1.      Introduction

### 1.1     General

This publication describes the QWEST service Unbundled Network Element Combinations including Enhanced Extended Loop (EEL) and Loop Mux Combinations (LMC).  These are available to Competitive Local Exchange Carriers to be used in providing service to their customers.  The publication includes technical information about EEL and LMC as well as the Network Channel and Network Channel Interface Codes used in specifying these services.

### 1.2     Reason for Reissue

Update DS0 EEL Network Channel Codes, see chapters 3 and 4..

### 1.3     Document Organization

This document is organized as follows:

**Chapter      Contents**

1          Introduction:  General information about the document's contents.

2          Service Overview:  Description of UNE Combinations.

3          Network Channel/Network Channel Interface Codes:  General information about the codes and a summary of codes used in the publication.

4          DS0/Voice UNE Services:  Description of DS0 and Voice level UNE services.

5          DS1 EEL/LMC Services: Description of DS1 level UNE services.

6          DS3 EEL/LMC Services: Description of DS3 level UNE services.

7          EEL with Concentration Ability.

8          Definitions:  Acronyms and Glossary.

9          References:  List of publications mentioned in this document with ordering instructions.  Also contains a list of Trademark information.

### 1.4     Document Scope

This document provides an overview of the EEL and LMC services including a technical description of the service and its options.  References are included to other QWEST Technical Publications that give additional technical parameters of the various types of EEL and LMC channels and interfaces.  Lists of Network Channel and Network Channel Interface codes are included.  These codes are to be used to order EEL and LMC.

Full ordering information and other administrative information is beyond the scope of this publication.  Appropriate contracts should be consulted for availability and other non-technical information.

## CONTENTS

## 2.    Service Description

### 2.1    Enhanced Extended Loop (EEL) and Loop Mux Combination (LMC) General Description

The Enhanced Extended Loop (EEL) is a private line, interoffice transport service available to Competitive Local Exchange Carriers (CLECs).  EELs are delivered to the CLEC in the QWEST wire center where the CLEC's equipment is collocated or to the CLEC's Point of Presence.  In this document, the CLEC's Point of Presence is identified as the CLEC's Wire Center.

EELs and LMCs are available only where permitted by contract or regulatory order.

The EEL is available in two configurations: the Point-to-Point EEL and the Multiplexed EEL.  Both are described as follows.

When no Interoffice transport segments are needed, the Loop Mux Combination (LMC) provides Co-providers with the ability to access end users and aggregate DS1 or DS0 loops to a higher bandwidth via a DS1 or DS3 multiplexer all in the same Wire Center.   There is no loop or interoffice transport between the multiplexer and the collocation, Central Office NI with Loop Mux Combinations.

#### 2.1.1   Point-to-Point EEL Configuration

Figure 2-1 illustrates the basic concept of a Point-to-Point EEL of any level.

## Enhanced Extended Loop (EEL)
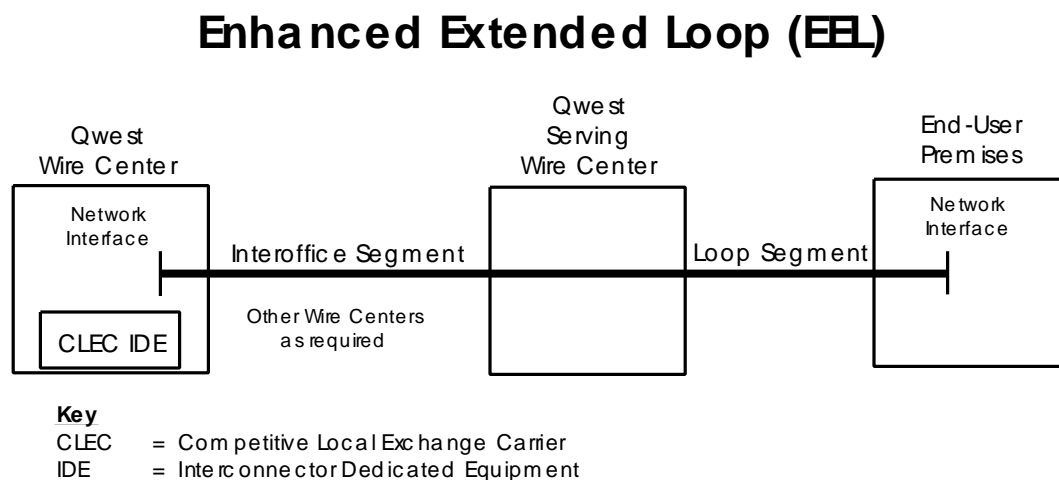


**Figure 2-1**  Point-to-Point EEL Concept

The Point-to-Point EEL consists of a loop segment connected to an interoffice transport segment.  The loop goes from a Network Interface (NI) at an End-User premises to the Serving Wire Center.  There it is cross-connected to an interoffice transport channel going to another wire center.  The latter wire center is the location where a CLEC has collocated transmission equipment called

Interconnector Dedicated Equipment (IDE).  The EEL may go through one or more intermediate wire centers.

In those cases where the CLEC Wire Center is located within the geographical Serving Area of the QWEST Wire Center, an EEL may connect the CLEC to an End-User without a segment that goes through other QWEST Wire Centers.  Figure 2-2 illustrates that situation.

# Enhanced Extended Loop (EEL)
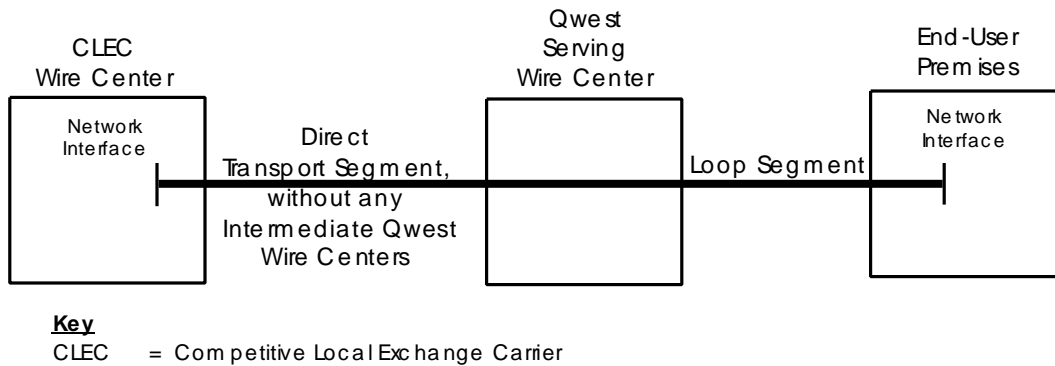


**Figure 2-2** Point-to-Point EEL Concept, without QWEST Interoffice Links

Network Interfaces are available at voiceband, DS1 or DS3 signal levels.  SONET EEL channels are available through a special request process.  Information regarding QWEST SONET services is in Technical Publication 77346, *Synchronous Service Transport.*

### 2.1.2   Multiplexed EEL and LMC Configurations

The Multiplexed EEL is generally an interoffice segment with an attached multiplexer in the QWEST Serving Wire Center.  Figure 2-3 illustrates the concept.  The Multiplexed EEL has no loop segment.  As illustrated in Figure 2-2, it is possible to have a Multiplexed EEL without going through intermediate, QWEST Wire Centers.

# Enhanced Extended Loop (EEL)

Qwest
Wire Center

Qwest
Serving
Wire Center

End-User
Premises

Network
Interface

Interoffice Segment

Multiplexer

Loop Segment

CLEC IDE

Other Wire Centers
as required

**Key**
CLEC    = Competitive Local Exchange Carrier
IDE      = Interconnector Dedicated Equipment
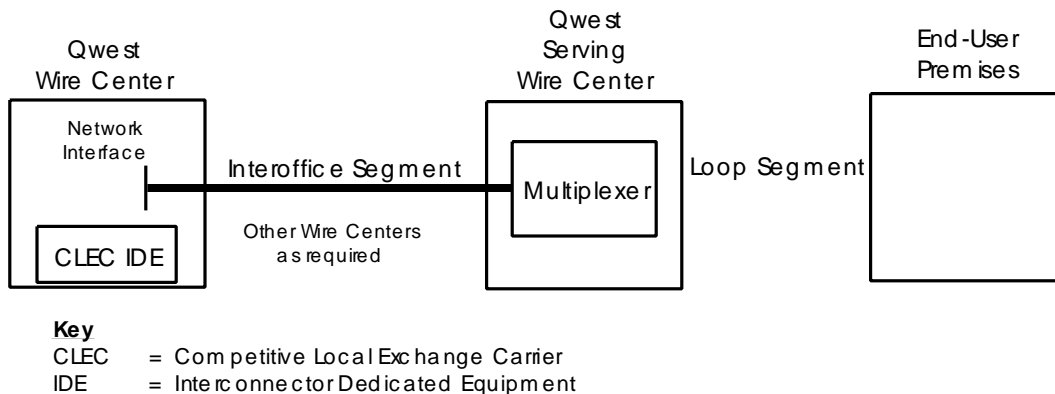
**Figure 2-3** Multiplexed EEL Concept

Lower level EEL loops may be ordered and transported on the higher level EEL between the multiplexer location and the wire center where the CLEC is collocated.  The order must include Carrier Facility Arrangement (CFA) information to assign the lower level EEL loops to the proper channel on the higher level Multiplexed EEL.

When no Interoffice transport segments are needed, the Loop Mux Combination

## Loop Mux Combination

QWEST Wire Center with Collocated CLEC

Intraoffice Cable

Network
Interface

NC = HCEG

Network
Interface

1/0
Mux

NCI = 04QB9.11

NCI = 02LS2

CLEC IDE

DS1

CFA
Required

DS0
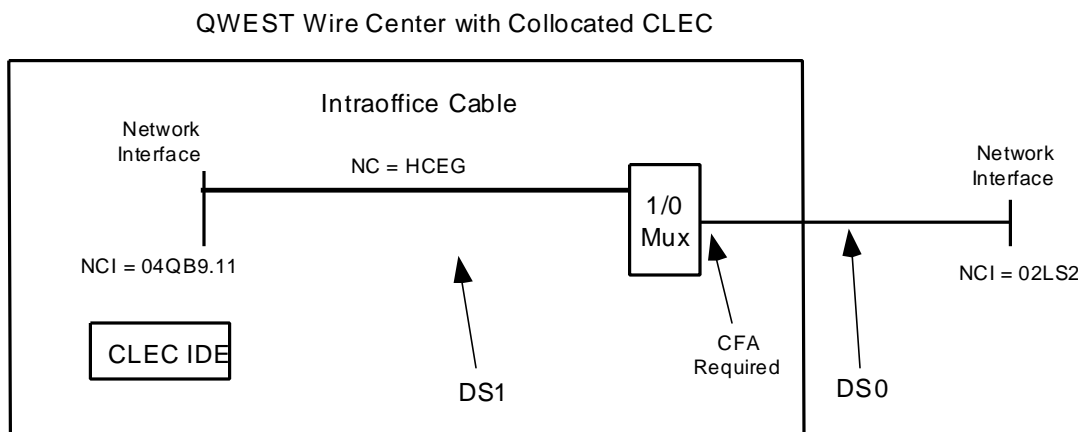
**Key**
CFA   = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
LMC   = Loop Mux Combination
Mux   = Multiplexer

(LMC) provides Co-providers with the ability to access end users and aggregate DS1 or DS0 loops to a higher bandwidth via a DS1 or DS3 multiplexer all in the same Wire Center.   There is no loop or interoffice transport between the multiplexer and the collocation, Central Office NI with Loop Mux Combinations.

**Figure 2-4** Loop Mux Combination Concept

### 2.1.3   Additional Information

Further information about IDE, ICDFs and collocation may be found in PUB 77386, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services.*

Additional information about EELs and LMC may be found in the contract between the CLEC and QWEST.

### 2.2    EEL Features and Functions

EELs are available at many levels or bandwidths:  DS3 (44.736 Mbit/s), DS1 (1.544 Mbit/s) and DS0/analog voice grade.

EELs and their features and functions are described in detail later in this publication. Chapter 4 describes DS0/analog voice grade EELs.  Chapters 5 and 6 describe the DS1 and DS3 EELs respectively.

### 2.3    LMC Features and Functions

LMC is available to multiplex 24 DS0/analog voice band signals into a channelized DS1 that is delivered to the CLEC's collocation interface in the same Wire Center building.  LMC is also available to multiplex 28 DS1 channels into a channelized DS3 that is delivered to the CLEC's collocation interface in the same Wire Center building.

### 2.4    Building a Network Using  UNE Combinations

The CLEC may order DS0/voice, DS1 or DS3 EELs as point-to-point circuits from each End-User location to the collocation wire center to meet their demand.

Alternatively, the CLEC may order DS3 or DS1 Multiplexed EELs to collect (multiplex) lower level channels for transport back to their IDE or physical location.  Then the lower-level channels may be ordered.  These lower-level channel orders must include instructions (i.e., the CFA) as to which channel of the higher level system should be used to transport the lower level channel.  SONET multiplexing is available through the Special Request Process.

Loop Mux Combinations enable CLECs to multiplex unbundled loops at DS0/analog voice band into a DS1 channel to ride their network. Similarly, unbundled DS1 loops can be aggregated into the DS3 level to interface the CLEC network.

## Loop Mux Combination

QWEST Wire Center with Collocated CLEC

Key
CFA  = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EU   = End User
LMC  = Loop Mux Combination
IDE  = Interconnector Dedicated Equipment
Mux  = Multiplexer
NC   = Network Channel
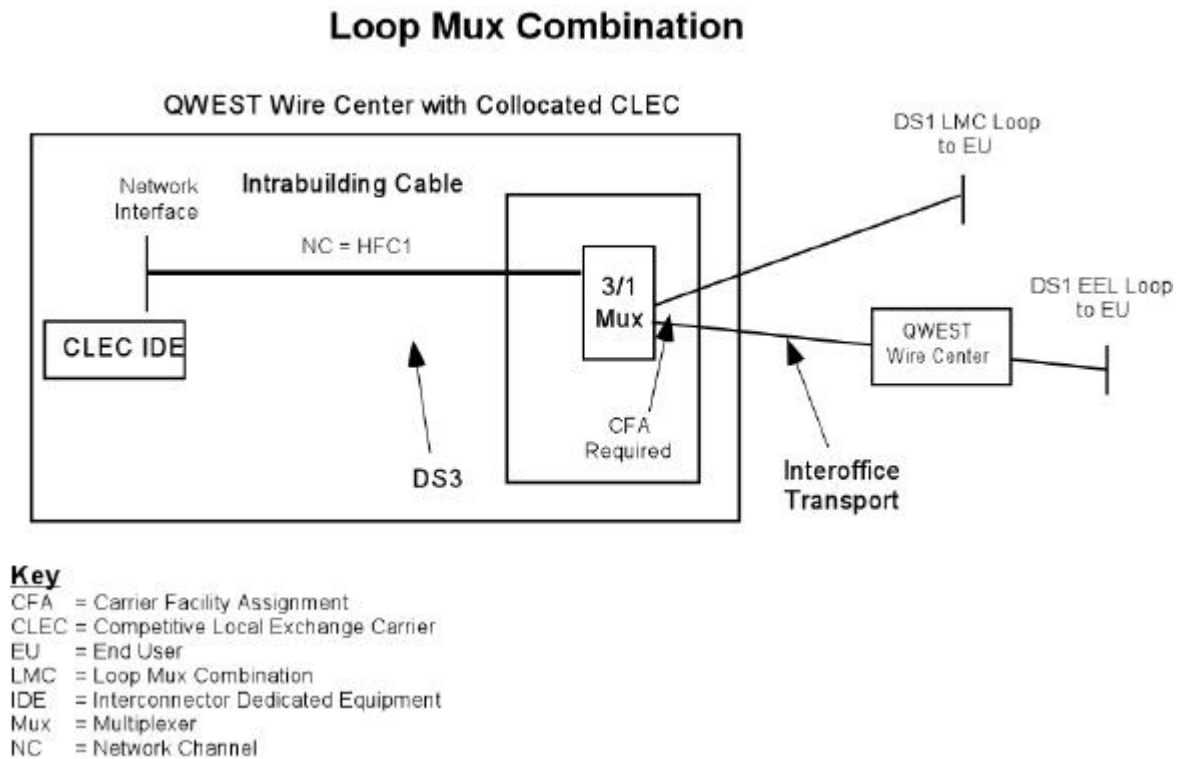
**Figure 2-5** LMC Network Example

While EELs may be used for many applications, the primary application will permit a CLEC to serve customers out of several wire centers without establishing collocation in all of the wire centers. The CLEC could, for example, establish collocation in one (or more) QWEST wire centers within a metropolitan area and then feed distant customers from this central location.

Figure 2-6 illustrates a situation where three DS1 EEL loops from three different End-User premises are multiplexed together in the Serving Wire Center onto a previously ordered, Multiplexed DS3 EEL.  The DS3 then transports the three DS1s to the wire center with the CLEC presence.

**EEL-Based Network Example**

3 DS1s Transported on a Multiplexed DS3

Qwest
Wire Center

DS3 with 3
multiplexed
DS1s

Qwest
Serving
Wire Center

Three
End-User
Premises

DS3
Network
Interface

DS1 Network
Interfaces

DS3

DS1
DS1
DS1

DS3
Multiplexer

DS1

DS1

DS1

CLEC IDE

Interoffice Segment

Loop Segments

**Key**
CLEC    = Competitive Local Exchange Carrier
IDE     = Interconnector Dedicated Equipment

**Figure 2-6** EEL Network Example

# CONTENTS

**3.      Network Channel/Network Channel Interface Codes**

**3.1      Network Channel (NC) Codes**

### 3.1.1   General

Network Channel (NC) codes are a part of the Telcordia COMMON LANGUAGE®
code set.  The NC code is used to identify a channel used with the service. Telcordia
document, MC-CL-IN-008, *Common Language Network Channel and Channel Interface
Codes (NC/NCI Codes)*, describes these coding schemes. This section identifies the
available channels and their NC codes.

### 3.1.2   Format

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

    Channel Code
    Optional Feature Code

The format is illustrated in Figure 3-1.

**N e t w o r k   C h a n n e l   C o d e**

| D a t a   E l e m e n t | C h a n n e l   C o d e | | O p t i o n a l   F e a t u r e   C o d e | |
|---|---|---|---|---|
| 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 specified as the service code of the
special service circuits or the transmission grade of the message trunk circuit.  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 is also used to specify options such as conditioning, effective
4-wire, multiplexing, etc.  The NC optional code field is always filled.

Further information about NC Codes may be found in ANSI T1.223-1997,
*Information Interchange — Structure and Representation of Network Channel (NC) and*

*Network Channel Interface (NCI) Codes for the North American Telecommunications System.*

### 3.1.3   Available Network Channel Codes

Table 3-1 lists the available Network Channel (NC) codes for Enhanced Extended Loop (EEL) and Loop Mux Combinations (LMC) at the DS0/voice level. Table 3-2 lists the codes for DS1 and DS3 EELs and LMC.

**Table 3-1**  Available DS0/Voice Network Channel Codes - Summary

| NC Code Point-to-Point | Channel Description | Description In Chapter |
|---|---|---|
| L Y - - | Voice, Loop Start, Ground Start, Reverse Battery, or Transmission Only | 4 |
|  |  |  |

**Table 3-2** Available DS1, DS3 Network Channel Codes - Summary

| Network Channel Code | | Channel | Description |
|---|---|---|---|
| Point-to-Point | With Multiplexing | Description | in Section |
| | | **DS1** | |
| HC-- | HC-G | SF and AMI | 5.2, 5.3 |
| HCD- | HCDG | ANSI ESF and AMI | 5.2, 5.3 |
| HCE- | HCEG | ANSI ESF and B8ZS | 5.2, 5.3 |
| HCF- | HCFG | Non-ANSI ESF and AMI | 5.2, 5.3 |
| HCG- | HCGG | Non-ANSI ESF and B8ZS | 5.2, 5.3 |
| HCJ- | N.A. | Free Framing and B8ZS | 5.2, 5.3 |
| HCZ- | HCZG | SF and B8ZS | 5.2, 5.3 |
| HF-- | | **DS3**<br><br>M2/3 Multiplex Format | 6.2 |
| | | | |
| | HF-4 | M2/3 Multiplex Format, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS Line Code | 6.3 |
| | HF-7 | M2/3 Multiplex Format, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS Line Code | 6.3 |
| | HFZM | M2/3 Multiplex Format, B8ZS is the line code for the individual DS1s riding within the DS3, Central Office Multiplexer | 6.3 |
| | HF-M | M2/3 Multiplex Format (DS1 Clear Channel Capability optioning capability not specified) | 6.3 |
| HFC- | | M2/3 Multiplex Format, C-Bit Parity | 6.2 |
| | HFC1 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for one (1) DS1 Clear Channel at a time using B8ZS Line Code | 6.3 |
| | HFC4 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS Line Code | 6.3 |
| | HFC7 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS Line Code | 6.3 |
| | HFCM | M2/3 Multiplex Format, C-Bit Parity (DS1 Clear Channel Capability optioning capability not specified) | 6.3 |

Key:  AMI    = Alternate Mark Inversion
      ANSI   =American National Standards Institute
      B8ZS   = Bipolar 8 Zero Substitution
      ESF    = Extended Superframe
      N.A.   = Not Applicable
      SF     = Superframe

### 3.2    Network Channel Interface (NCI) Codes

#### 3.2.1    General

Network Channel Interface (NCI) codes are a part of the COMMON LANGUAGE®
code set.  The NCI code is used to identify a network interface of a service in our
mechanized systems.

#### 3.2.2    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 optional.  The format is
illustrated in Figure 3-2.

<div align="center">Network Channel Interface Code</div>

| 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

**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 that will terminate the channel for the purpose of evaluating transmission performance. Values are listed in Table 3-4

**Table 3-3** 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 | Multiple | 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 (IC) 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. Values are listed in Table 3-4.

The convention for TLP Levels is as follows:

- Transmitting TLP Level signifies the TLP transmit signal level at the QWEST interface when transmitting to the customer.

- Receiving TLP Level signifies the TLP transmit signal level at the QWEST interface when receiving from the customer.

Table 3-4 NCI Transmission Levels

| Transmission Level Point Code (Character Positions 11 and 12) | |
| --- | --- |
| Data Value | Code |
| -16.0 | A |
| -15.0 | B |
| -14.0 | C |
| -13.0 | D |
| -12.0 | E |
| -11.0 | F |
| -10.0 | G |
| -9.0 | H |
| Fractional TLPs | I |
| -8.0 | J |
| -7.0 | K |
| -6.0 | L |
| -5.0 | M |
| -4.0 | N |
| None This Direction (One-way Service) | O |
| -3.0 | P |
| -2.0 | Q |
| -1.0 | R |
| 0.0 | S |
| +1.0 | T |
| +2.0 | U |
| +3.0 | V |
| +4.0 | W |
| +5.0 | X |
| +6.0 | Y |
| +7.0 | Z |
| QWEST Specified | - |
| Recommended | (Blank) |

Further information about NCI Codes may be found in ANSI T1.223-1997.

### 3.2.3   Available Network Channel Interface Codes

Tables 3-5 through 3-7 list a summary of NCI codes (positions 3 and 4) and options (positions 7, 8 and 9) valid for EELs at different locations.  The full NCI codes and further information are listed in the appropriate chapter later in this publication. See the listed QWEST Technical Publication listed in the last column for further information about the Network Interface (NI).

**Table 3-5** Summary of Available NCI Codes- CLEC End

| Protocol | | Definition | See QWEST PUB* |
|---|---|---|---|
| Code 3 4 | Option 7 8 9 | | |
| DS | | Digital Hierarchical Interface | |
| | 15 | 1.544 Mbit/s (DS1) Superframe (SF) Format and Alternate Mark Inversion (AMI) per GR-342-CORE | 77375 |
| | 15B | 1.544 Mbit/s (DS1) SF Format and B8ZS Clear Channel Capability (CCC) per GR-342-CORE | 77375 |
| | 15J | 1.544 Mbit/s (DS1) Freeframing Format | 77375 |
| | 15K | 1.544 Mbit/s (DS1) Non-ANSI Extended Superframe (ESF) Format  and AMI per GR-342-CORE | 77375 |
| | 15S | 1.544 Mbit/s (DS1) Non-ANSI Extended Superframe (ESF) Format  and B8ZS CCC per GR-342-CORE | 77375 |
| | 1K | 1.544 Mbit/s (DS1) ANSI ESF and AMI per GR-342-CORE | 77375 |
| | 1S | 1.544 Mbit/s (DS1) ANSI ESF and B8ZS per GR-342-CORE | 77375 |
| GO | | Ground Start Signaling Open-End (Switch) Function Presented by IC/CLEC at Interface to QWEST Access Service | 77310 |
| LO | | Loop Start Signaling Open-End (Switch) Function Presented by the customer at Interface to QWEST Access Service | 77310 |
| QB | | Manual Cross-Connect Termination with no Subrating Capability | |
| | 11 | DS1 to DS1.  This code may or may not meet DS1 signal levels as specified by GR-342-CORE | 77386 |
| | 33 | DS3 to DS3.  This code may or may not meet DS1 signal levels as specified by GR-342-CORE | 77386 |
| | LL | Fiber Cross-Connect on fiber distribution bay | 77386 |

\*    PUB titles may be found in Chapter 9.

**Table 3-6** Summary of Available NCI Codes - End-User End

| Protocol | | Definition | See QWEST PUB* |
|---|---|---|---|
| Code 3 4 | Option 7 8 9 | | |
| DU | | **End-User Locations** | |
| | | Digital Access Interface (at End-User location) | |
| | 1KN | DS1, ANSI ESF, AMI, without Line Power | 77375 |
| | 1KX | DS1, ANSI ESF, AMI, without Line Power, DSX-1 Interface | 77375 |
| | 1SN | DS1, ANSI ESF,B8ZS, without Line Power | 77375 |
| | 1SX | DS1, ANSI ESF, B8ZS, without Line Power, DSX-1 Interface | 77375 |
| | AN | DS1, Freeframing Format per PUB 41451 | 77375 |
| | AX | DS1, Freeframing Format per PUB 41451, DSX-1 Interface | 77375 |
| | BN | DS1, SF Format and AMI, without Line Power | 77375 |
| | BX | DS1, SF Format and AMI, without Line Power, DSX-1 Interface | 77375 |
| | CN | DS1, Non-ANSI ESF, AMI, without Line Power | 77375 |
| | CX | DS1, Non-ANSI ESF,AMI, without Line Power, DSX-1 Interface | 77375 |
| | DN | DS1, SF with B8ZS, without Line Power | 77375 |
| | DX | DS1, SF with B8ZS, without Line Power, DSX-1 Interface | 77375 |
| | SN | DS1, Non-ANSI ESF Format with B8ZS , without Line Power | 77375 |
| | SX | DS1, Non-ANSI ESF Format with B8ZS, DSX-1 Interface | 77375 |
| GS | | Ground Start Signaling Closed-End (Station) Function Presented by IC/CLEC or End-User at Network Interface (NI) to QWEST Access Service | 77310 |
| LS | | Loop Start Signaling Closed-End (Station) Function Presented by the Customer at NI to QWEST Access Service | 77310 |
| RV | | Reverse Battery (Trunk Signaling) at NI | |
| | T | Loop Closure provided by QWEST to End-User; Battery Provided by End-User to QWEST | 77310 |

\*    PUB titles may be found in Chapter 9.

**Table 3-7** Summary of Available NCI Codes - Either End

| Protocol | | Definition | See QWEST PUB* |
|---|---|---|---|
| Code 3 4 | Option 7 8 9 | | |
| DS | | **Central Office or End-User Locations**<br><br>Digital Hierarchical Interface | |
| | 44 | 44.736 Mbit/s (DS3), M2/3 Format, 28 DS1 Channels | 77324 |
| | 44A | 44.736 Mbit/s (DS3), unchannelized application and C-Bit Parity.  Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995 | 77324 |
| | 44I | 44.736 Mbit/s (DS3), M2/3 Format and C-Bit Parity, 28 DS1 Channels | 77324 |
| | 44R | 44.736 Mbit/s (DS3), unchannelized application.  Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995 | 77324 |
| NO | | Connects Customer to an channel for Voice Band Transmission with No Signaling Provided by QWEST | 77310 |

\* PUB titles may be found in Chapter 9.

## 3.3     Valid Network Channel/Network Channel Interface Combinations

Valid combinations of NC and NCI codes are included in the appropriate chapter.

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**Tables**

**4.      DS0/Voice EEL/LMC Services**

## 4.1      General

The Enhanced Extended Loop (EEL) and Loop Mux Combination (LMC) services are available at the DS0-analog voice grade level.  This chapter includes descriptive information about these loops, including valid Network Channel (NC) and Network Channel Interface (NCI) Codes and their valid combinations.  References to other publications are included to further describe these services.

Henceforth, in this document DS0-analog voice grade EEL/LMC loops will be referred to as voice grade EEL/LMC loops.  The voice grade EEL- is available in a point-to-point configuration.  Both EEL and LMC voice grade loops may be connected to a DS1 multiplexer.

## 4.2      DS0-Analog Voice Grade EEL/LMC

The DS0 voice grade EEL/LMC loops are voiceband analog channels similar to the voice grade services described in PUB 77310, *Private Line Voice Grade Analog Channels for Access Service.*  Only options listed in this document are available with EEL and LMC.

CLECs desiring other options listed in PUB 77310 should order the appropriate Voice Grade Access Service from the appropriate tariff.

Usable frequencies are nominally 300 to 3000 Hz.  Four signaling options are available.  They include Loop Start, Ground Start, Reverse Battery, and No Signaling.

### 4.2.1   Loop Start Signaling

 EEL/LMC with Loop Start Signaling is suitable for the access segment of voice line-type switched special service circuits such as Plain Old Telephone Service (POTS) circuits.  The service is suitable for the station or closed-end at the End-User.

The valid NC code is —LY--.  The valid NCI code at the End-User Network Interface (NI) is 02LS2.  Several NCI codes are valid at the CLEC NI including DS0/voice, DS1 and DS3 level interfaces.  These codes, and their valid combinations, are summarized the Tables 4-1 through 4-3.

### 4.2.2   Ground Start Signaling

EEL/LMC with Ground Start Signaling is suitable for the access segment of voice, Private Branch Exchange (PBX) trunk-type circuits.  The service is suitable for the closed-end at the End-User.

The valid NC code is —LY--.  The valid NCI code at the End-User Network Interface (NI) is 02GS2.  Several NCI codes are valid at the CLEC NI including DS0/voice, DS1 and DS3 level interfaces.  These codes, and their valid combinations, are summarized the Tables 4-1 through 4-3.

### 4.2.3   Reverse Battery Signaling

EEL/LMC with Reverse Battery Signaling is suitable for the access segment of voice trunk-type circuits.

The valid NC code is —LY--.  The valid NCI code at the End-User Network Interface (NI) is 02RV2.T.  Several NCI codes are valid at the CLEC NI including DS1 and DS3 level interfaces.  These codes, and their valid combinations, are summarized the Tables 4-1 through 4-3.

### 4.2.4   No Signaling

EEL/LMC with no signaling is suitable for the access segment of many types of voiceband and voiceband data private line services.

The valid NC code is —LY--.  The valid NCI code at the End-User Network Interface (NI) are 02NO2 and 04NO2.  Several NCI codes are valid at the CLEC NI including DS0/voice, DS1 and DS3 level interfaces.  These codes, and their valid combinations, are summarized the Tables 4-1 through 4-3.

### 4.3      Technical Parameters and Options

The technical parameters of EEL and LMC loops are the same as those of Voice Grade services.  The options available are those identified by the NC and NCI code combinations of Table 4-3.

Detailed Technical Parameters are in TR-NWT-000335, *Voice Grade Special Access Service - Transmission Parameter Limits and Interface Combinations.*

### 4.4      Available NC and NCI Codes

Tables 4-1 and 4-2 identify the available NC and NCI Codes respectively.  The access customer in the tables is the CLEC.  The access provider is QWEST.

**Table 4-1** Voice Grade EEL/LMC Loops - NC Codes

| NC Code | Description |
|---------|-------------|
| L Y - - | Unbundled Dedicated Facility with equipment, copper loops with nominal 1004 Hz transducer loss of 8dB |
|         |             |

**Table 4-2** Voice Grade EEL/LMC Loops - NCI Codes

| NCI Code* | Description |
|---|---|
| 02GO2 ** 04GO2 | Ground start Signaling Open-End (switch) function presented by CLEC at interface to QWEST facilities |
| 02GS2 | Ground start Signaling Closed-End (station) function presented by End-User at interface to QWEST facilities |
| 02LO2 ** 04LO2 | Loop-Start Signaling-Open-End (switch) function presented by the customer at the interface to QWEST facilities |
| 02LS2 | Loop-Start Signaling-Closed-End (station) function presented by the customer at the interface to QWEST facilities |
| 02NO2 ** 04NO2 | Connects customer to an access service suitable for voice transmission with no signaling provided by QWEST |
| 02RV2.T | Reverse Battery (trunk signaling) at interface.  Loop closure provided by QWEST to the customer; battery provided by the customer to QWEST. |

* Transmission Level Points (TLPs) will default to QWEST specified values.
** Two-wire Interfaces at the CLEC end should be avoided. The additional 4-to-2 and 2-to-4 wire conversions may degrade the signal.

## 4.5    Valid NC/NCI Code Combinations

Table 4-3 lists valid NC and NCI code combinations.  Combinations of the NC, LY- - with  NCI codes in the same rows are compatible.  For example,  the NCI code 02LS2 at the End-User NI is compatible with 04LO2, any DS1 code, or any compatible digital signal.  The DS1 and DS3 codes are identified in Chapters 5 and 6, respectively.

**Table 4-3** Voice Grade EEL / LMC Loops- Valid NC / NCI Combinations

| NC Code | CLEC Network Interface | | End-User NCI Code |
|---|---|---|---|
| | Level | NCI Code | |
| L Y - - | DS0/voice | 04LO2 02LO2 * | 02LS2 |
| | DS1 | Any DS1 | |
| L Y - - | DS0/voice | 04GO2 02GO2 * | 02GS2 |
| | DS1 | Any DS1 | |
| | DS1 | Any DS1 | 02RV2.T |
| L Y - - | DS0/voice | 04NO2 | 02NO2 |
| | DS1 | Any DS1 | 04NO2 |

\* Two-wire Interfaces at the CLEC end should be avoided if the CLEC intends to transport the DS0 EEL on a derived channel.  The additional 4-to-2 and 2-to-4 wire conversions may degrade the signal.

## 4.6    Configurations Used for Multiplexed EEL/LMC Delivery

Voice grade EEL and LMC loops can be delivered to the CLEC at the DS1 level with multiplexing.  The level is identified by the NCI code at the CLEC end of the EEL or LMC.

NCI codes at the DS1 level associated with voice grade EEL and LMC loops mean that the CLEC has ordered a DS1 EEL or LMC with multiplexing to transport the voice grade EEL or LMC loops.  For example, if voice grade EEL/LMC loops are ordered with DS1 NCI codes, the CLEC must have already ordered a DS1 EEL or LMC with multiplexing as described in Chapter 5.  The CLEC must provide a Carrier Facility Assignment (CFA) when ordering voice grade EEL or LMC loops to tell QWEST which channel on the multiplexed DS1 to place the voice grade loop.

Figure 4-1 illustrates the arrangement meeting at the DS0/voice level.  The NC and NCI codes are the ones that would be used to order an analog voice grade EEL with Loop Start signaling (Section 4.2.1).

## Sample NC/NCI Code Usage for Typical EELs

### DS0 with Loop Start Signaling Two-Point EEL
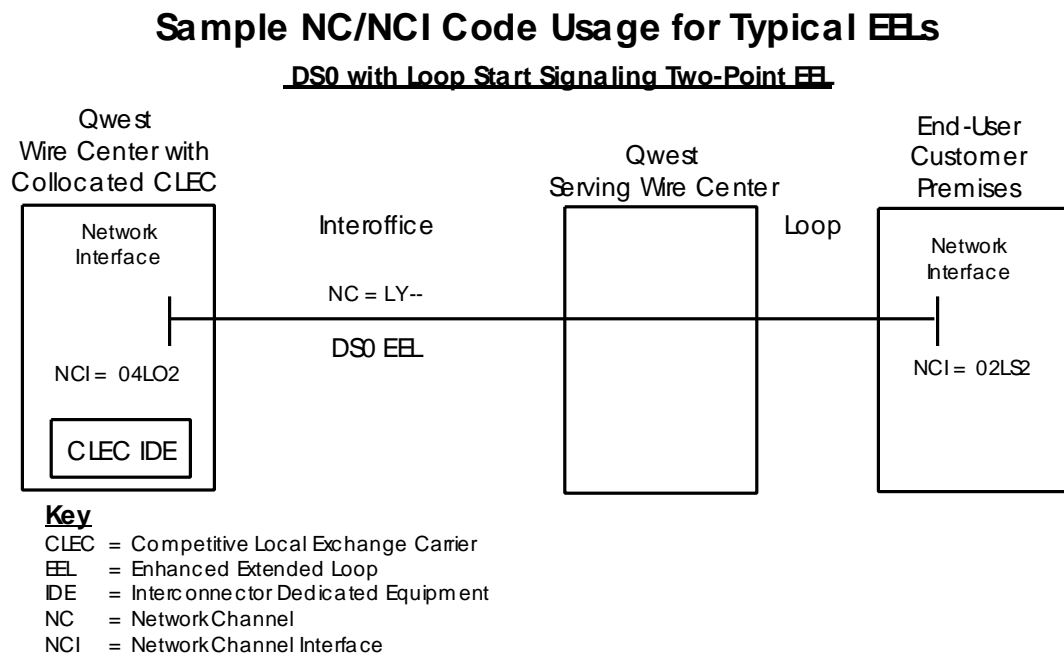


**Figure 4-1**  Illustration of NC and NCI Code Usage - Point to Point Voice Grade EEL

Figure 4-2 illustrates DS1 arrangements (with proper NC/NCI codes) used to order a voice grade EEL with Loop Start signaling (Section 4.2.1).  The drawing shows a DS1 EEL with Central Office Multiplexing carrying  an EEL loop with Loop Start Signaling. The higher level multiplexed EEL must be ordered prior to ordering the lower level EELs.

# Sample NC/NCI Code Usage for Typical EELs

**DS1 EEL with Multiplexing and DS0 with Loop Start Signaling Two-Point EEL**
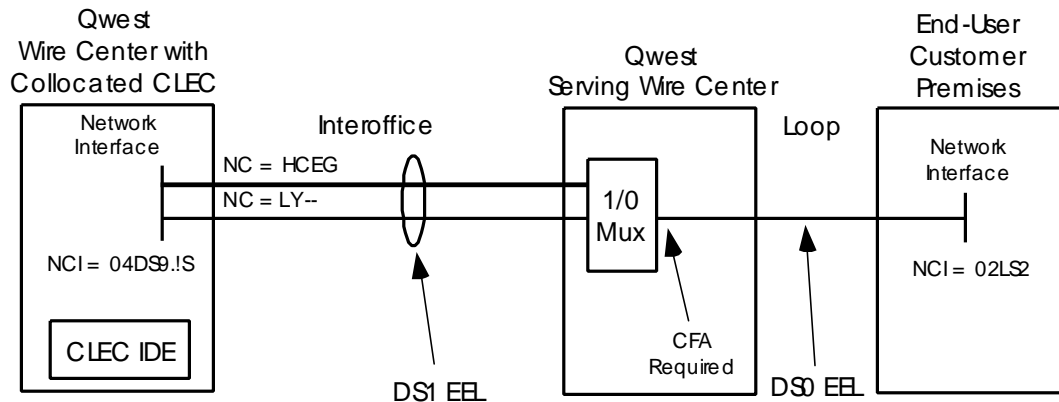


**Figure 4-2** Illustration of NC and NCI Code Usage - Multiplexed DS0 EEL

Multiplexed LMC with LMC loops can be used when no interoffice transport segments are needed. The LMC provides Co-providers with the ability to access end users and aggregate DS0 loops to a higher bandwidth via a DS1 multiplexer all in the same Wire Center.   There is no loop or interoffice transport between the multiplexer and the collocation, Central Office NI with Loop Mux Combinations.  The loops can be within the serving area of that Wire Center or distant.  Figure 4-3 illustrates several applications.

## Loop Mux Combination
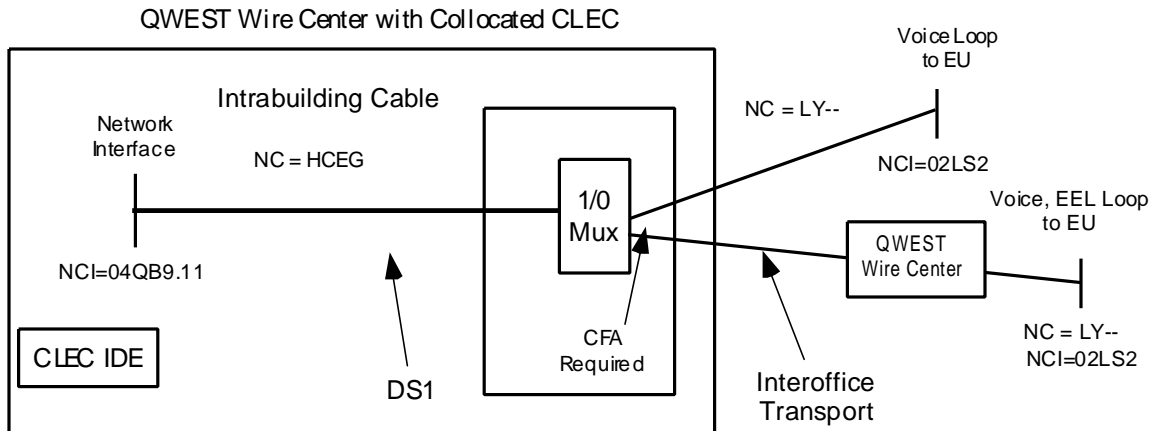
QWEST Wire Center with Collocated CLEC

Intrabuilding Cable

Network Interface

NC = HCEG

NCI=04QB9.11

CLEC IDE

DS1

1/0 Mux

CFA Required

NC = LY--

Voice Loop to EU

NCI=02LS2

QWEST Wire Center

Voice, EEL Loop to EU

NC = LY--
NCI=02LS2

Interoffice Transport

**Key**

CFA   = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EU    = End User
LMC   = Loop Mux Combination
IDE   = Interconnector Dedicated Equipment
Mux   = Multiplexer
NC    = Network Channel
NCI   = Network Channel Interface Code

**Figure 4-3** Illustration of NC and NCI Code Usage – LMC

## CONTENTS

## 5.     DS1 UNE Services

### 5.1     General

The Enhanced Extended Loop (EEL) and Loop Mux Combination (LMC) services at the DS1 (1.544 Mbit/s) level include:
- Point-to-point (loop plus interoffice) -- EEL
- Multiplexed (interoffice with multiplexing) -- EEL
- A DS1 from a Co-provider's collocation equipment to a multiplexer in the same QWEST Wire Center – LMC
- A DS1 LMC/EEL loop connected to a DS3 multiplexed LMC/EEL facility.

Configurations are discussed in Chapter 2.  The DS1 Unbundled Network Element (UNE) Combinations of EELs and LMCs may be ordered by a Competitive Local Exchange Carrier (CLEC).

Technical parameters for these DS1 UNEs are described in PUB 77200, *QWEST DS1 Service and Rate Synchronization Service,* and PUB 77375, *1.544 Mbit/s Channel Interfaces.*

DS1 EELs and LMCs are available with various line codes and frame formats.  The NC and NCI code lists in the remainder of this chapter identify available options.  The above two publications should be consulted for further information about these codes and formats.

### 5.2     Point-To-Point DS1 EELs

Figure 2-1 illustrates the basic concept of the point-to-point EEL.  This section lists the options available with the EEL.

#### 5.2.1   Network Channel (NC) Codes

Table 5-1 lists the valid NC codes for the point-to-point DS1 EEL

**Table 5-1**  DS1 Point-to-Point EEL - Valid NC Codes

| Network Channel | Channel Description * | |
|---|---|---|
| Code | Frame Format | Line Code |
| HC-- | SF | AMI |
| HCD- | ANSI ESF | AMI |
| HCE- | ANSI ESF | B8ZS |
| HCF- | Non-ANSI ESF | AMI |
| HCG- | Non-ANSI ESF | B8ZS |
| HCJ- | Free Framing | B8ZS |
| HCZ- | SF | B8ZS |

\* HC is described as a High Capacity DS1 (1.544 Mbit/s) Channel

Key:  AMI   = Alternate Mark Inversion
      ANSI  =American National Standards Institute
      B8ZS  = Bipolar 8 Zero Substitution
      ESF   = Extended Superframe
      SF    = Superframe

### 5.2.2   Network Channel Interface (NCI) Codes

Table 5-2 lists the valid NCI codes for the point-to-point DS1 EEL

The "DS" NCI codes in the table provides a standard "Templated" ANSI signal (or as defined in GR-342-CORE).  The "QB" NCI code may not provide the same signal. The level is determined by the arrangement in specified wire centers.  See PUB 77386, Chapter 16 for further information.

**Table 5-2** DS1 Point-to-Point EEL  - Valid NCI Codes

| Description | | NCI Code | |
|---|---|---|---|
| Frame Format | Line Code | CLEC End * | End-User End** |
| SF | AMI | 04DS9.15<br>04QB9.11 | 04DU9.BN<br>04DU9.BX |
| ANSI ESF | AMI | 04DS9.1K<br>04QB9.11 | 04DU9.1KN<br>04DU9.1KX |
| ANSI ESF | B8ZS | 04DS9.1S<br>04QB9.11 | 04DU9.1SN<br>04DU9.1SX |
| Non-ANSI ESF | AMI | 04DS9.15K<br>04QB9.11 | 04DU9.CN<br>04DU9.CX |
| Non-ANSI ESF | B8ZS | 04DS9.15S<br>04QB9.11 | 04DU9.SN<br>04DU9.SX |
| Free Framing | B8ZS | 04DS9.15J<br>04QB9.11 | 04DU9.AN<br>04DU9.AX |
| SF | B8ZS | 04DS9.15B<br>04QB9.11 | 04DU9.DN<br>04DU9.DX |

\*     DS is defined as a Digital Hierarchical Interface.  Per GR-54-CORE.
      04QB9.11 is defined as Manual Cross-Connect Termination with no Subrating Capability, DS1 to DS1.

\*\*    DU is defined as a Digital Access Interface.  The N denotes without line Power.  Per GR-54-CORE

### 5.2.3   Valid NC and NCI Code Combinations

Table 5-3 lists the valid NC and NCI code Combinations for the point-to-point DS1 EEL

**Table 5-3** Valid DS1 Point-to-Point EEL NC/NCI Combinations

| NC Codes | Frame Format & Line Code | CLEC Network Interface | | End-User NCI Code |
|---|---|---|---|---|
| | | Level | NCI Code ** | |
| HC-- | SF & AMI | DS1 | 04DS9.15<br>04QB9.11 | 04DU9.BN<br>04DU9.BX |
| | | DS3 | Any DS3 | |
| HCD- | ANSI ESF & AMI | DS1 | 04DS9.1K<br>04QB9.11 | 04DU9.1KN<br>04DU8.1KX |
| | | DS3 | Any DS3 | |
| HCE- | ANSI ESF & B8ZS | DS1 | 04DS9.1S<br>04QB9.11 | 04DU9.1SN<br>04DU9.1SX |
| | | DS3 | Any DS3 with CCC* | |
| HCF- | Non-ANSI ESF & AMI | DS1 | 04DS9.15K<br>04QB9.11 | 04DU9.CN<br>04DU9.CX |
| | | DS3 | Any DS3 | |
| HCG- | Non-ANSI ESF & B8ZS | DS1 | 04DS9.15S<br>04QB9.11 | 04DU9.SN<br>04DU9.SX |
| | | DS3 | Any DS3 with CCC* | |
| HCJ- | Free Framing | DS1 | 04DS9.15J<br>04QB9.11 | 04DU9.AN<br>04DU9.AX |
| | | DS3 | Any DS3 with CCC* | |
| HCZ- | SF & B8ZS | DS1 | 04DS9.15B<br>04QB9.11 | 04DU9.DN<br>04DU9.DX |
| | | DS3 | Any DS3 with CCC* | |

\*      CCC means DS1 Clear Channel Capability (i.e., with B8ZS).

\*\*     See Chapter 6 for DS3 NCI code definitions.

Key: AMI        = Alternate Mark Inversion
     ANSI       =American National Standards Institute
     B8ZS       = Bipolar 8 Zero Substitution
     ESF        = Extended Superframe
     SF = Superframe

## 5.3    Multiplexed DS1 EEL and LMC

Multiplexed DS1 EEL or LMC is available with the same line code and frame format options as the point-to-point EEL with the exception of the Free Framing frame format. Free Framing is not available with multiplexing.

The multiplexer located in the QWEST wire center will be a 24 channel D4-type of channel bank commonly used in the industry.  The multiplexer will be externally synchronized to a source traceable to a Stratum I clock as discussed in PUB 77386.

### 5.3.1   NC Codes

Table 5-4 lists the valid NC codes for the DS1 multiplexed EEL or LMC.

**Table 5-4**  DS1 Multiplexed EEL/LMC - Valid NC Codes

| Network Channel Code | Channel Description * | |
|---|---|---|
| | Frame Format | Line Code |
| HC-G | SF | AMI |
| HCDG | ANSI ESF | AMI |
| HCEG | ANSI ESF | B8ZS |
| HCFG | Non-ANSI ESF | AMI |
| HCGG | Non-ANSI ESF | B8ZS |
| HCZG | SF | B8ZS |

\*   HC is described as a High Capacity DS1 (1.544 Mbit/s) Channel.  The G in the fourth position denotes a multiplexer for voice or data.

Key:  AMI  = Alternate Mark Inversion
      ANSI =American National Standards Institute
      B8ZS = Bipolar 8 Zero Substitution
      ESF   = Extended Superframe
      SF     = Superframe

### 5.3.2 NCI Codes

Table 5-5 lists the valid NCI codes for the DS1 multiplexed EEL and LMC.

**Table 5-5** DS1 Multiplexed EEL/LMC - Valid UNE Codes

| Description | | NCI Code |
| --- | --- | --- |
| Frame Format | Line Code | CLEC End * |
| SF | AMI | 04DS9.15<br>04QB9.11 |
| ANSI ESF | AMI | 04DS9.1K<br>04QB9.11 |
| ANSI ESF | B8ZS | 04DS9.1S<br>04QB9.11 |
| Non-ANSI ESF | AMI | 04DS9.15K<br>04QB9.11 |
| Non-ANSI ESF | B8ZS | 04DS9.15S<br>04QB9.11 |
| SF | B8ZS | 04DS9.15B<br>04QB9.11 |

\*    DS is defined as a Digital Hierarchical Interface.  Per GR-54-CORE
     QB is defined as Manual Cross-Connect Termination with no Subrating Capability.

 Key:  AMI = Alternate Mark Inversion
        ANSI       =American National Standards Institute
        B8ZS = Bipolar 8 Zero Substitution
        ESF   = Extended Superframe
        SF    = Superframe

### 5.3.3   Valid NC and NCI Code Combinations

Table 5-6 lists the valid NC and NCI code Combinations for the Multiplexed, point-to-point DS1 EEL

**Table 5-6** Valid DS1 Multiplexed UNE NC/NCI Combinations

| NC Codes | Frame Format & Line Code | CLEC Network Interface | | End-User NCI Code |
|---|---|---|---|---|
| | | Level | NCI Code ** | |
| HC-G | SF & AMI | DS1 | 04DS9.15 04QB9.11 | Not Used |
| | | DS3 | Any DS3 | |
| HCDG | ANSI ESF & AMI | DS1 | 04DS9.1K 04QB9.11 | Not Used |
| | | DS3 | Any DS3 | |
| HCEG | ANSI ESF & B8ZS | DS1 | 04DS9.1S 04QB9.11 | Not Used |
| | | DS3 | Any DS3 with CCC* | |
| HCFG | Non-ANSI ESF & AMI | DS1 | 04DS9.15K 04QB9.11 | Not Used |
| | | DS3 | Any DS3 | |
| HCGG | Non-ANSI ESF & B8ZS | DS1 | 04DS9.15S 04QB9.11 | Not Used |
| | | DS3 | Any DS3 with CCC* | |
| HCZG | SF & B8ZS | DS1 | 04DS9.15B 04QB9.11 | Not Used |
| | | DS3 | Any DS3 with CCC* | |

\*    CCC means DS1 Clear Channel Capability (i.e., with B8ZS).

\*\*    See Chapter 6 for DS3 NCI code definitions.

Key: AMI       = Alternate Mark Inversion
      ANSI      =American National Standards Institute
      B8ZS      = Bipolar 8 Zero Substitution
      ESF       = Extended Superframe
      SF        = Superframe

## 5.4    EEL and LMC Loops

### 5.4.1   NC Codes

Table 5-7 lists the valid NCI codes for the DS1 multiplexed EEL and LMC.

**Table 5-7**  DS1 EEL and LMC Loops - Valid NC Codes

| Network Channel Code | Channel Description * | |
|---|---|---|
| | Frame Format | Line Code |
| HC-- | SF | AMI |
| HCD- | ANSI ESF | AMI |
| HCE- | ANSI ESF | B8ZS |
| HCF- | Non-ANSI ESF | AMI |
| HCG- | Non-ANSI ESF | B8ZS |
| HCJ- | Free Framing | B8ZS |
| HCZ- | SF | B8ZS |

* HC is described as a High Capacity DS1 (1.544 Mbit/s) Channel

Key:  AMI   = Alternate Mark Inversion
      ANSI  =American National Standards Institute
      B8ZS  = Bipolar 8 Zero Substitution
      ESF   = Extended Superframe
      SF    = Superframe

## 5.4.2   NCI Codes

**Table 5-8** DS1 EEL and LMC Loops  - Valid NCI Codes

| Description | | NCI Code | |
|---|---|---|---|
| Frame Format | Line Code | CLEC End | End-User End** |
| SF | AMI | Any DS3 | 04DU9.BN<br>04DU9.BX |
| ANSI ESF | AMI | Any DS3 | 04DU9.1KN<br>04DU9.1KX |
| ANSI ESF | B8ZS | Any DS3 with CCC* | 04DU9.1SN<br>04DU9.1SX |
| Non-ANSI ESF | AMI | Any DS3 | 04DU9.CN<br>04DU9.CX |
| Non-ANSI ESF | B8ZS | Any DS3 with CCC* | 04DU9.SN<br>04DU9.SX |
| Free Framing | B8ZS | Any DS3 with CCC* | 04DU9.AN<br>04DU9.AX |
| SF | B8ZS | Any DS3 with CCC* | 04DU9.DN<br>04DU9.DX |

\*     CCC means DS1 Clear Channel Capability (i.e., with B8ZS).

\*\*    See Chapter 6 for DS3 NCI code definitions.

\*\*\*   DU is defined as a Digital Access Interface.  The N denotes without line Power.  Per GR-54-CORE

### 5.4.3   NC and NCI Code Combinations

**Table 5-9** Valid DS1 EEL and LMC Loops  NC/NCI Combinations

| NC Codes | Frame Format & Line Code | CLEC Network Interface | | End-User NCI Code |
|---|---|---|---|---|
| | | Level | NCI Code ** | |
| HC-- | SF & AMI | DS3 | Any DS3 | 04DU9.BN 04DU9.BX |
| HCD- | ANSI ESF & AMI | DS3 | Any DS3 | 04DU9.1KN 04DU8.1KX |
| HCE- | ANSI ESF & B8ZS | DS3 | Any DS3 with CCC* | 04DU9.1SN 04DU9.1SX |
| HCF- | Non-ANSI ESF & AMI | DS3 | Any DS3 | 04DU9.CN 04DU9.CX |
| HCG- | Non-ANSI ESF & B8ZS | DS3 | Any DS3 with CCC* | 04DU9.SN 04DU9.SX |
| HCJ- | Free Framing | DS3 | Any DS3 with CCC* | 04DU9.AN 04DU9.AX |
| HCZ- | SF & B8ZS | DS3 | Any DS3 with CCC* | 04DU9.DN 04DU9.DX |

*    CCC means DS1 Clear Channel Capability (i.e., with B8ZS).

**   See Chapter 6 for DS3 NCI code definitions.

Key: AMI      = Alternate Mark Inversion
     ANSI     =American National Standards Institute
     B8ZS     = Bipolar 8 Zero Substitution
     ESF      = Extended Superframe
     SF = Superframe

### 5.5    Typical Configurations Used for EEL and LMC Applications

DS1 EELs can have many configurations to meet CLEC needs.  They can be delivered to the CLEC at the DS1 or DS3 level.   A basic DS1 EEL is a Point-to-Point DS1 using interoffice and loop facilities.

Figure 5-1 illustrates a Point-to-Point DS1 EEL with ESF and B8ZS.

## NC/NCI Code Usage for a Typical EEL Application
### DS1 Point-to-Point EEL
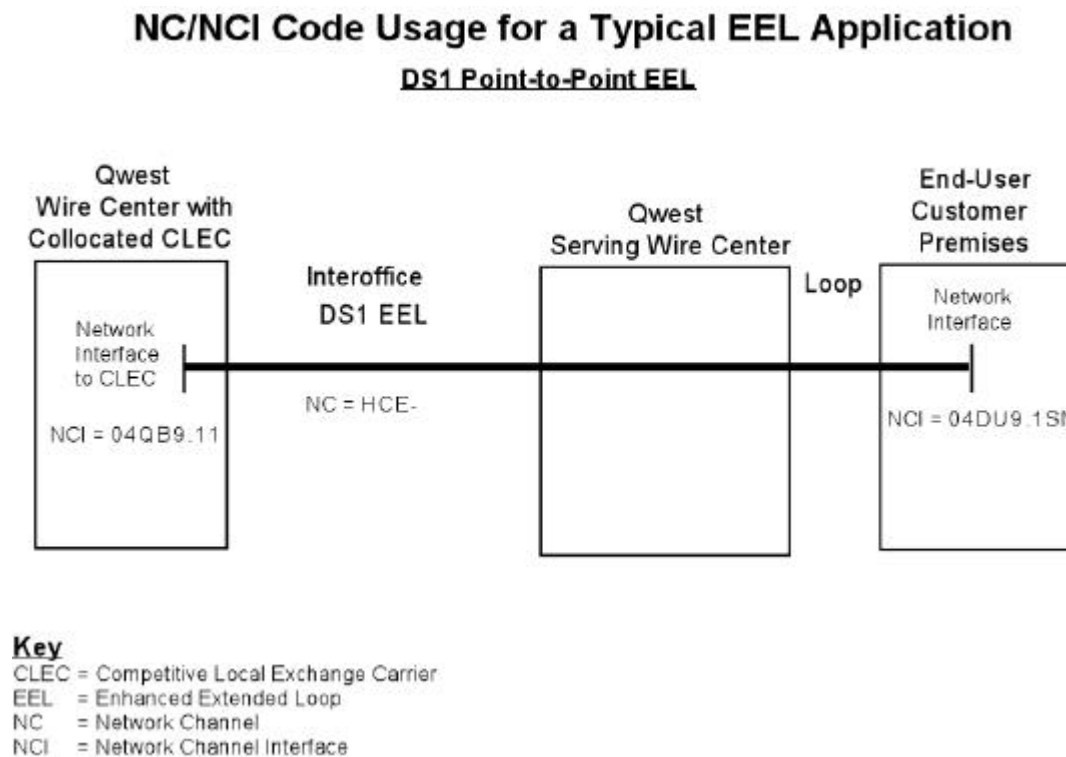
**Figure 5-1** Illustration of NC and NCI Code Usage – Point-to-Point DS1 EEL

NCI codes above the DS1 level encountered with DS1 EEL-/LMC loops communicate that the CLEC has ordered a DS3 EEL or LMC with multiplexing to carry the DS1 EEL/LMC loop. For example, if DS1 EEL-or LMC loops are ordered with DS3 NCI codes, the CLEC must have already ordered a DS3 EEL or LMC with multiplexing as described in Chapter 6. The CLEC must provide a Carrier Facility Assignment (CFA) when ordering the DS1 EEL/LMC loop to tell QWEST which channel on the multiplexed DS3 to place the DS1.

Figure 5-2 illustrates a typical DS3 arrangement (with proper NC/NCI codes) used to order a DS1 EEL with ESF and B8ZS. The DS3 EEL has C-Bit parity.

## NC/NCI Code Usage for a Typical EEL Application

### DS3 EEL with Multiplexing carrying a DS1 EEL Loop

Qwest Wire Center with Collocated CLEC

Interoffice DS3 EEL

Qwest Serving Wire Center

End-User Customer Premises

Network Interface to CLEC

NC = HFC1

NC = HCE-

3/1 Mux

Loop

Network Interface

NCI = 04DS6.44I

CFA Required

NCI = 04DU9.1SN

DS3 EEL

DS1 EEL Loop

**Key**

CFA = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EEL = Enhanced Extended Loop
Mux = Multiplexer
NC = Network Channel
NCI = Network Channel Interface

**Figure 5-2** Illustration of NC and NCI Code Usage - DS1 on Multiplexed DS3 EEL

A Multiplexed DS1 LMC consists of a DS1 from a CLEC's collocation equipment in the same Serving Wire Center as the DS1 to Voice multiplexer. Figure 3 illustrates this situation.

## NC/NCI Code Usage for a Typical EEL Application

### DS1 EEL with Loop Mux Combination
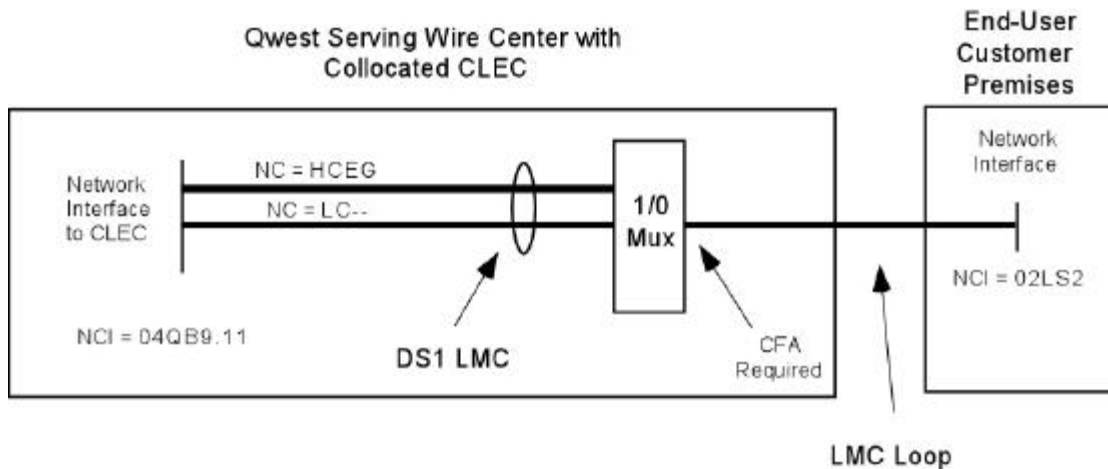
Qwest Serving Wire Center with
Collocated CLEC

End-User
Customer
Premises

Network
Interface
to CLEC

NC = HCEG

NC = LC--

1/0
Mux

Network
Interface

NCI = 04QB9.11

DS1 LMC

CFA
Required

NCI = 02LS2

LMC Loop

### Key

CFA  = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EEL  = Enhanced Extended Loop
LMC  = Loop Mux Combination
Mux  = Multiplexer
NC   = Network Channel
NCI  = Network Channel Interface

**Figure 5-3** Illustration of NC and NCI Code Usage - DS1 Loop Mux Combination.

A DS1 EEL with interoffice segments and multiplexing to DS0/Voice is another available configuration.  It is shown in Figure 5-4.

## NC/NCI Code Usage for Typical EEL Application

### DS1 EEL with Multiplexing and DS0 Voice Grade EEL Loop with Loop Start Signaling

Qwest
Wire Center with
Collocated CLEC

Interoffice

Qwest
Serving Wire Center

Loop

End-User
Customer
Premises

Network
Interface
to CLEC

NC = HCEG
NC = LC--

1/0
Mux

Network
Interface

NCI = 04DS9.1S

DS1 EEL

CFA
Required

NCI = 02LS2

Voice Grade
EEL Loop

**Key**
CFA  = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EEL  = Enhanced Extended Loop
Mux  = Multiplexer
NC   = Network Channel
NCI  = Network Channel Interface

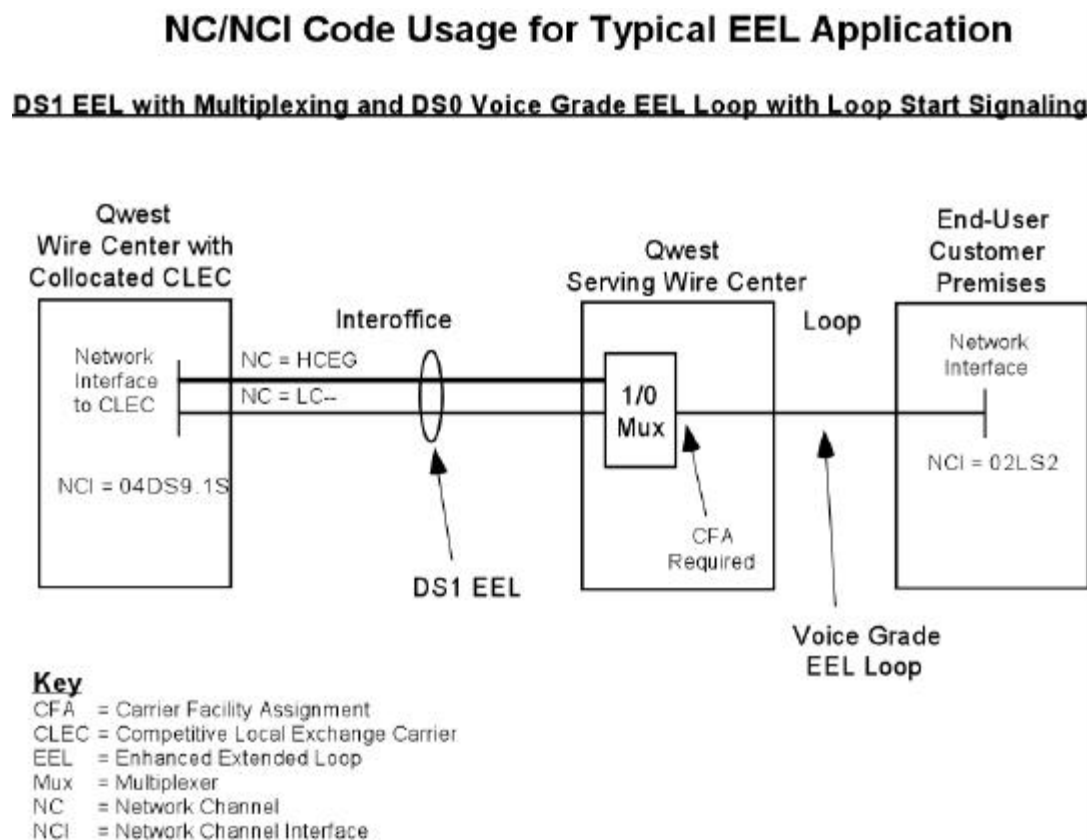**Figure 5-4**  Illustration of NC and NCI Code Usage – DS0/Voice on Multiplexed DS1 EEL

## CONTENTS

## 6.    DS3 UNE Combination Services

### 6.1    General

The Enhanced Extended Loop (EEL) and Loop Mux Combination (LMC) services at the DS3 (44.736 Mbit/s) level include:

- Point-to-point (loop plus interoffice) -- EEL

- Multiplexed (interoffice with multiplexing) -- EEL

- A DS3 from a Co-provider's collocation equipment to a multiplexer in the same QWEST Wire Center -- LMC

Configurations are discussed in Chapter 2.  The DS3 Unbundled Network Element (UNE) Combinations of EELs and LMCs may be ordered by a Competitive Local Exchange Carrier (CLEC).

Technical parameters for these DS3 UNE Combinations are described in PUB 77324, *QWEST DS3 Service.*

DS3 UNE Combinations are available with various frame format applications.  The NC and NCI code lists in the remainder of this chapter identify available options.  The above publication should be consulted for further information about these codes and formats.

### 6.2    Point-to-Point DS3 EELs

Figure 2-1 illustrates the basic concept of the point-to-point EEL.  This section lists the options available with the EEL.

#### 6.2.1   Network Channel (NC) Codes

Table 6-1 lists the valid NC codes for the point-to-point DS3 UNE

**Table 6-1**  DS3 Point-to-Point EEL - Valid NC Codes

| Network Channel Code | Channel Description * |
|----------------------|------------------------|
| HF-- | DS3 M-Frame structured signal.  It may or may not be channelized with the M2/3 Multiplex format. |
| HFC- | DS3 M-Frame structured signal and C-Bit Parity.  It may or may not be channelized with the M2/3 Multiplex format. |

 * HF is described as a High Capacity DS3 (44.736 Mbit/s) Channel

#### 6.2.2   Network Channel Interface (NCI) Codes

Table 6-2 lists the valid NCI codes for the point-to-point DS3 EEL.  The "DS" NCI codes in the table provide a standard "Templated" ANSI signal as defined in ANSI T1.404-1994.  The "QB" NCI code may not provide the same signal.  The level

is determined by the arrangement in specified wire centers.  See PUB 77386, Chapter 16 for further information.

**Table 6-2** DS3 Point-to-Point  EEL - Valid NCI Codes

| NCI Code | Definition* |
|---|---|
| 04DS6.44 | 44.736 Mbit/s (DS3), M2/3 Format. |
| 04DS6.44A | 44.736 Mbit/s (DS3), Unchannelized Application and C-Bit Parity. Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995. |
| 04DS6.44I | 44.736 Mbit/s (DS3) and C-Bit Parity, M2/3 Format - 28 DS1 Channels. |
| 04DS6.44R | 44.736 Mbit/s (DS3), Unchannelized Application.  Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995. |
| 04QB6.33 | Manual Cross-Connect Termination with no Subrating Capability, DS3 to DS3.  This code may or may not meet DS3 signal levels as specified by ANSI T1.102.  (See PUB 77386, Chapter 16, for further information.) |

\* Note:  This Table reflects recently approved NCI code changes and will not match other documents until those documents are updated.

### 6.2.3   Valid NC/NCI Combinations

Table 6-3 lists the valid NC/NCI code combinations for DS3 point-to-point EELs.

**Table 6-3** DS3 Point-to-Point EEL - Valid NC/NCI Combinations

| Network Channel Code | Network Channel Interface Code | |
|---|---|---|
| | CLEC End | End-User End |
| HF-- | 04DS6.44 04DS6.44R 04QB6.33 * | 04DS6.44 04DS6.44R |
| HFC- | 04DS6.44I 04DS6.44A 04QB6.33 * | 04DS6.44I 04DS6.44A |

\*        See PUB 77386, Chapter 16 for further information.

### 6.3    Multiplexed DS3 EEL

The Multiplexed DS3 EEL will connect to DS1 EEL Loops.  The DS1 ports on DS3 EEL Multiplexer are EEL available with the same line code and frame format options as DS1 point-to-point EELs.  See Table 6-4 for DS1 line code options.   However, not all options are available in all locations.

The multiplexer located in the QWEST wire center will be a 28 channel multiplexer or equivalent device as commonly used in the industry.  The multiplexer will be

externally synchronized to a source traceable to a Stratum I clock as discussed in PUB 77386.

### 6.3.1   NC Codes

Table 6-4 lists the valid NC codes for the DS3 multiplexed ELL.

**Table 6-4** DS3 Multiplexed EEL Valid NC Codes

| Network Channel Code | Channel Description |
|---|---|
| | |
| HF-4 | M2/3 Multiplex Format, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS Line Code |
| HF-7 | M2/3 Multiplex Format, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS Line Code |
| HF-M | M2/3 Multiplex Format (DS1 Clear Channel Capability optioning capability not specified) |
| HFZM | M2/3 Multiplex Format, B8ZS is the line code for the individual DS1s riding within the DS3, Central Office Multiplexer |
| HFC1 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for one (1) DS1 Clear Channel at a time using B8ZS Line Code |
| HFC4 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS Line Code |
| HFC7 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS Line Code |
| HFCM | M2/3 Multiplex Format, C-Bit Parity (DS1 Clear Channel Capability optioning capability not specified) |

### 6.3.2   NCI Codes

Table 6-5 lists the valid NCI codes for the DS3 multiplexed EEL.

**Table 6-5**  DS3 Multiplexed EEL - Valid NCI Codes

| NCI Code | Definition* |
|---|---|
| 04DS6.44 | 44.736 Mbit/s (DS3), M2/3 Format. |
| 04DS6.44A | 44.736 Mbit/s (DS3), Unchannelized Application and C-Bit Parity. Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995. |
| 04DS6.44I | 44.736 Mbit/s (DS3) and C-Bit Parity, M2/3 Format - 28 DS1 Channels. |
| 04DS6.44R | 44.736 Mbit/s (DS3), Unchannelized Application.  Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995. |
| 04QB6.33 | Manual Cross-Connect Termination with no Subrating Capability, DS3 to DS3.  This code may or may not meet DS3 signal levels as specified by ANSI T1.102.  (See PUB 77386, Chapter 16, for further information.) |

* Note:  This Table reflects recently approved NCI code changes and will not match other documents until those documents are updated.

### 6.3.3   Valid NC/NCI Combinations

Table 6-6 lists the valid NC and NCI combinations for the DS3 Multiplexed EEL. The channel will be channelized with M2/3 Multiplex Format.

**Table 6-6** DS3 Multiplexed EEL Valid NC/NCI Combinations

| Network Channel Code | Network Channel Interface Code | |
|---|---|---|
| | CLEC End | Multiplexed End |
| HF-M<br>HF-4<br>HF-7<br>HFZM | 04DS6.44<br>04DS6.44R<br>04QB6.33 * | Not used |
| HFCM<br>HFC4<br>HFC7 | 04DS6.44A<br>04DS6.44I<br>04QB6.33 * | Not used |

*        See PUB 77386, Chapter 16 for further information.

**6.4     Loop Mux Combination DS3**

The Multiplexed DS3 Loop Mux Combination will connect to DS1 LMC or EEL Loops. The DS1 ports on DS3 LMC Multiplexer are EEL available with the same line code and frame format options as DS1 point-to-point EELs.  See Table 6-7 for DS1 line code options.    However, not all options are available in all locations.

The multiplexer located in the QWEST wire center will be a 28 channel multiplexer or equivalent device as commonly used in the industry.  The multiplexer will be externally synchronized to a source traceable to a Stratum I clock as discussed in PUB 77386.

**6.4.1    NC Codes**

Table 6-7 lists the valid NC codes for the DS3 LMC.

**Table 6-7** DS3 LMC Valid NC Codes

| Network Channel Code | Channel Description |
|---|---|
| HF-4 | M2/3 Multiplex Format, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS Line Code |
| HF-7 | M2/3 Multiplex Format, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS Line Code |
| HF-M | M2/3 Multiplex Format (DS1 Clear Channel Capability optioning capability not specified) |
| HFZM | M2/3 Multiplex Format, B8ZS is the line code for the individual DS1s riding within the DS3, Central Office Multiplexer |
| HFC1 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for one (1) DS1 Clear Channel at a time using B8ZS Line Code |
| HFC4 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS Line Code |
| HFC7 | M2/3 Multiplex Format, C-Bit Parity, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS Line Code |
| HFCM | M2/3 Multiplex Format, C-Bit Parity (DS1 Clear Channel Capability optioning capability not specified) |

### 6.4.2   NCI Codes

Table 6-8 lists the valid NCI codes for the DS3 LMC.

**Table 6-8**  DS3 LMC EEL - Valid NCI Codes

| NCI Code | Definition* |
|---|---|
| 04DS6.44 | 44.736 Mbit/s (DS3), M2/3 Format. |
| 04DS6.44A | 44.736 Mbit/s (DS3), Unchannelized Application and C-Bit Parity. Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995. |
| 04DS6.44I | 44.736 Mbit/s (DS3) and C-Bit Parity, M2/3 Format - 28 DS1 Channels. |
| 04DS6.44R | 44.736 Mbit/s (DS3), Unchannelized Application.  Supports a user payload of 44.210 Mbit/s per ANSI T1.107-1995. |
| 04QB6.33 | Manual Cross-Connect Termination with no Subrating Capability, DS3 to DS3.  This code may or may not meet DS3 signal levels as specified by ANSI T1.102.  (See PUB 77386, Chapter 16, for further information.) |

\* Note:  This Table reflects recently approved NCI code changes and will not match other documents until those documents are updated.

### 6.4.3   Valid NC/NCI Combinations

Table 6-9 lists the valid NC and NCI combinations for the DS3 LMC.  The channel will be channelized with M2/3 Multiplex Format.

**Table 6-9** DS3 LMC Valid NC/NCI Combinations

| Network Channel Code | Network Channel Interface Code | |
|---|---|---|
|  | CLEC End | Multiplexed End |
| HF-M<br>HF-4<br>HF-7<br>HFZM | 04DS6.44<br>04DS6.44R<br>04QB6.33 * | Not used |
| HFCM<br>HFC4<br>HFC7 | 04DS6.44A<br>04DS6.44I<br>04QB6.33 * | Not used |

\*        See PUB 77386, Chapter 16 for further information.

### 6.5    Illustrative Configurations Used for EEL Delivery

These DS3 EELs are delivered to the CLEC at the DS3 level.

Figure 6-1 illustrates a typical DS3 Point-to-Point arrangement (with proper NC/NCI codes) used to order a DS3 with C-Bit parity.
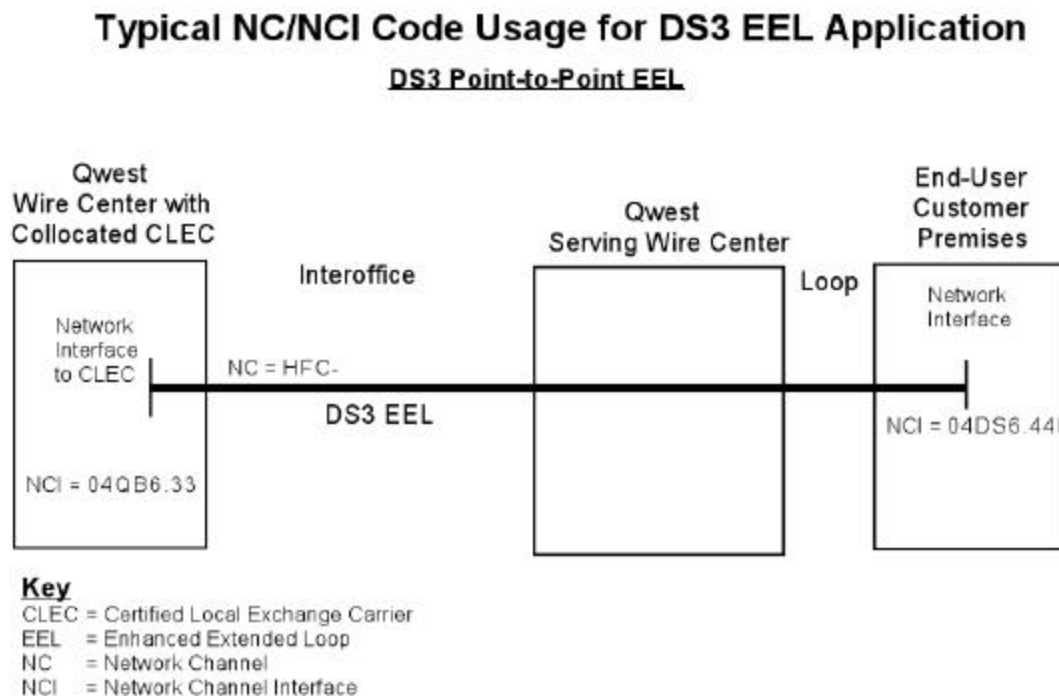


**Figure 6-1**  Illustration of DS3 EEL NC and NCI Code Usage

Figure 6-2 illustrates a typical Multiplexed DS3 arrangement (with proper NC/NCI codes) used to order an M-Framed, DS3.

## NC/NCI Code Usage for a Typical EEL Application

### DS3 EEL with Multiplexing carrying a DS1 EEL Loop
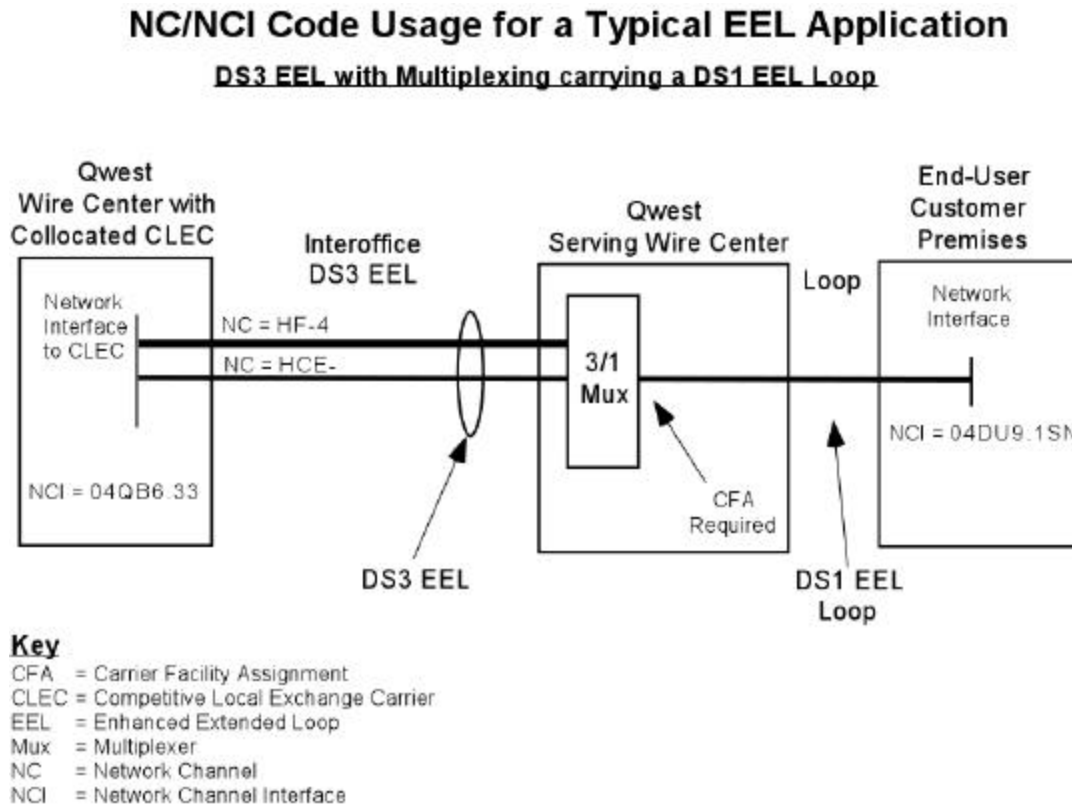


**Figure 6-2** Illustration of NC/NCI usage for DS3 Multiplexed EEL

Figure 6-3 illustrates a typical LMC DS3 arrangement (with proper NC/NCI codes) used to order an M-Framed, DS3.

## NC/NCI Code Usage for a Typical DS3 LMC Application
### DS3 EEL LMC carrying a DS1 LMC Loop

End-User
Customer
Premises

Qwest Serving Wire Center
with Collocated CLEC

Loop

Network
Interface
to CLEC

NC = HF-4

NC = HCE-

3/1
Mux

Network
Interface

NCI = 04QB6.33

NCI = 04DU9.1SN

CFA
Required

DS3 LMC

DS1 LMC
Loop

**Key**
CFA  = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EEL  = Enhanced Extended Loop
LMC  = Loop Mux Combination
Mux  = Multiplexer
NC   = Network Channel
NCI  = Network Channel Interface

**Figure 6-3** Illustration of NC/NCI usage for DS3 LMC with DS1 LMC Loop

## NC/NCI Code Usage for a Typical DS3 LMC Application

### DS3 EEL LMC carrying a DS1 LMC Loop with Interoffice Transport
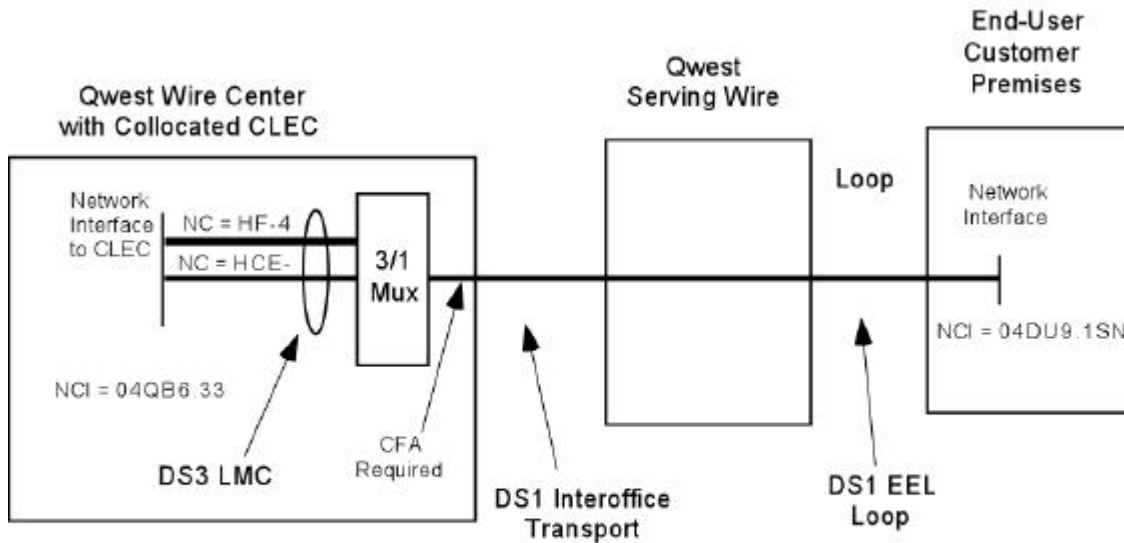
Qwest Wire Center with Collocated CLEC

Network Interface to CLEC

NC = HF-4

NC = H CE-

3/1 Mux

NCI = 04QB6.33

DS3 LMC

CFA Required

Qwest Serving Wire

DS1 Interoffice Transport

Loop

DS1 EEL Loop

End-User Customer Premises

Network Interface

NCI = 04DU9.1SN

**Key**

CFA = Carrier Facility Assignment
CLEC = Competitive Local Exchange Carrier
EEL = Enhanced Extended Loop
LMC = Loop Mux Combination
Mux = Multiplexer
NC = Network Channel
NCI = Network Channel Interface

**Figure 6-4** Illustration of NC/NCI usage for DS3 LMC and a DS1 EEL Loop

**CONTENTS**

## 7.      EEL with Concentration Ability

### 7.1     General

There may be situations when a Competitive Local Exchange Carrier (CLEC) is in an Enhanced Extended Loop (EEL) situation, and desires to use a Digital Loop Carrier (DLC) Remote Terminal (RT) instead of the DS1 Multiplexed (D4 compatible) EEL described in Chapter 5.   For this application, QWEST offers the product *EEL with Concentration Ability*.   This EEL consists of an Interoffice segment and a CLEC specified RT located in a QWEST Central Office building, also called Wire Center.   Loop segments would be ordered separately, perhaps as Unbundled Loops from Technical Publication 77384.

The term *Concentration* comes from the ability of some DLC systems to concentrate channels for transport to their DLC, Central Office Terminal (COT) or Integrated DLC (IDLC) attached to their switch.

This chapter describes the EEL with Concentration Ability (EEL/C) application.

Figure 7-1 illustrates the basic arrangement.

## Concentrated Enhanced Extended Loop (EEL)
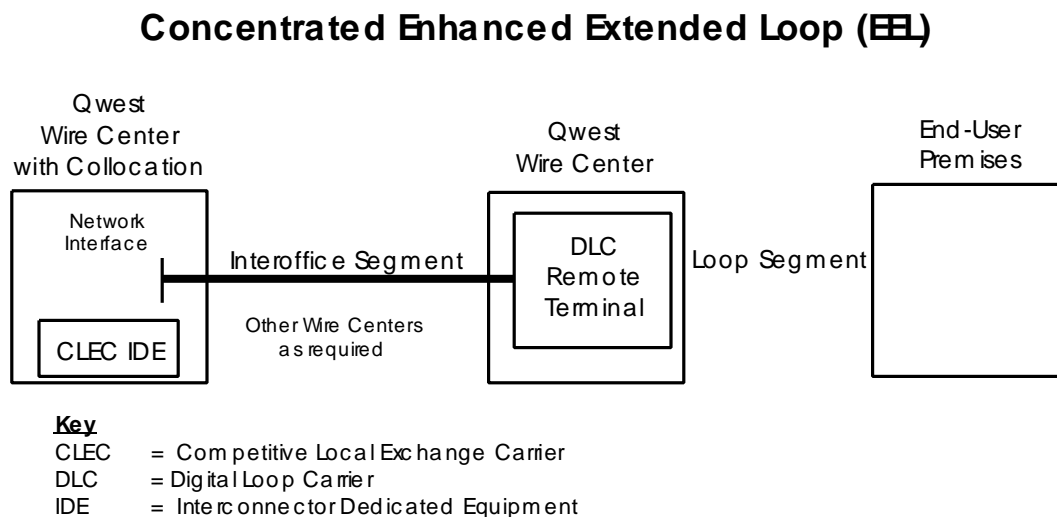


**Figure 7-1** EEL with Concentration Ability-Concept

## 7.2    Technical Description

Technical standards for this arrangement are primarily under CLEC control and influence. QWEST is open to work with any Standard level of transport and any customer requested equipment that is suitable for installation in a Central Office.

These standards along with appropriate Network Channel and Network Channel Interface codes will be provided in future issues of this publication as requests and installation experience provide data.  Specific CLEC requests may require new Common Language codes.  Any requests requiring new Codes will need additional time, beyond engineering time, to secure the new Codes.

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## 8.     Definitions

### 8.1     Acronyms

| | |
|---|---|
| AMI | Alternate Mark Inversion |
| ANSI | America National Standards Institute |
| APOT | Actual Point Of Termination |
| B8ZS | Bipolar with 8 Zero Substitution |
| CFA | Connecting Facility Assignment<br>Carrier Facility Assignment |
| CLEC | Competitive  Local Exchange Carrier |
| CLFI™ | Common Language® Facility Identification |
| CO | Central Office |
| dB | Decibel |
| DS | Digital Signal |
| DS1 | Digital Signal Level 1 (1.544 Mbit/s) |
| DS3 | Digital Signal Level 3 (44.736 Mbit/s) |
| DS0 | Digital Signal Level 0 (64 kbit/s) (1 voice channel) |
| DSX-1 | Digital Signal Level 1 Cross-connect |
| DSX-3 | Digital Signal Level 3 Cross-connect |
| EICT | Expanded Interconnection Channel Termination |
| ESF | Extended Super Frame |
| FDP | Fiber Distribution Panel |
| E-UDIT | Extended-Unbundled Dedicated Interoffice Transport |
| FOC | Firm Order Confirmation |
| Gbit/s | Gigabit per Second |
| Hz | 1 Hertz (formerly 1 cycle per second) |
| ICDF | InterConnection Distribution Frame |
| IDF | Intermediate Distribution Frame |
| ISDN | Integrated Services Digital Network |
| kbit/s | kilobits per second (1,000 bit/s) |
| LASER | Light Amplification by Stimulated Emission of Radiation |

| | |
|---|---|
| LEC | Local Exchange Carrier |
| Mbit/s | Megabit per Second |
| NC | Network Channel |
| NCI | Network Channel Interface |
| NI | Network Interface |
| OC | Optical Carrier |
| OC-3 | Optical Carrier level 1 |
| OC-12 | Optical Carrier level 12 |
| OC-48 | Optical Carrier level 48 |
| OC-192 | Optical Carrier level 192 |
| SF | Superframe Format |
| SONET | Synchronous Optical Network |
| STS-1 | Synchronous Transport Signal level 1 |
| SWC | Serving Wire Center |
| TLP | Transmission Level Point |
| UCCRE | Unbundled Customer Controlled Rearrangement Element |
| UDIT | Unbundled Dedicated Interoffice Transport |
| UNE | Unbundled Network Element |
| µf | Micro Farad |

## 8.2    Glossary

### Alternate Mark Inversion (AMI)

A one (mark) pulse which is the opposite polarity as its predecessor.

### American National Standards Institute (ANSI)

An organization supported by the telecommunications industry to establish performance and interface standards.

### Bandwidth

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

### Bipolar With 8 Zero Substitution (B8ZS)

Bipolar 8 Zero Substitution is an application of BPRZ and is an exception to the Alternate Mark Inversion (AMI) line-code rule.  It is one method of providing bit independence for digital transmission by providing a minimum 1s density of 1 in 8 bits.

### C-Bit Parity

An M-framed application in which the C bits are used for network management and maintenance functions instead of denoting the presence or absence of stuff bits.

### Carrier

An organization whose function is to provide telecommunications services.  Examples are:  Local Exchange Carriers, Interexchange Carriers, Cellular Carriers, etc.

### Central Office (CO)

A local switching system (or a portion thereof) and its associated equipment located at a wire center.  It is also commonly used to refer to the building that houses the equipment.  See Wire Center.

### Competitive Local Exchange Carrier (CLEC)

A Local Exchange Carrier certified to do business in a state.

### Channel

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

**Channelize**

The process of multiplexing-demultiplexing channels using analog or digital techniques.

**Clear Channel Capability (CCC)**

A characteristic of a transmission path in which the bit positions allocated for customer data may represent any combination of zeroes and ones.

**Closed-end**

The end of a switched service which transmits address signals.

**Customer Premises**

Denotes a building or portion(s) of a building occupied by a single customer or End-User either as a place of business or residence.  Adjacent buildings and the buildings on the same continuous property occupied by the customer and not separated by a public thoroughfare, are also considered the same customer's premises.

**Decibel (dB)**

A unit measurement of transmission loss, gain, or relative level.  It is the logarithmic unit of signal power ratio most commonly used in telephony.  It is used to express the relationship between two signal powers, usually between two acoustical, electrical, or optical signals; it is equal to ten times the common logarithm of the ratio of the two signal powers.

**Digital Hierarchy Level**

The level in the digital hierarchy.  The levels and the respective bit rates are:

| Level | Bit Rate | Level | Bit Rate |
|-------|----------|-------|----------|
| DS0 | 64.0 kbit/s | DS3 | 44.736 Mbit/s |
| DS1 | 1.544 Mbit/s | DS4NA | 139.264 Mbit/s |
| DS1C | 3.152 Mbit/s | DS4 | 274.176 Mbit/s |
| DS2 | 6.312 Mbit/s | | |

**DS1 Clear Channel**

Denotes that 1.536 Mbit/s of a 1.544 Mbit/s DS1 facility are available for customer information.  The remaining 8 kilobits, or overhead, are for error correction, framing, and network performance/status/information.

**End Office**

A designation of a QWEST switching system that occupies the lowest level of the public switched network hierarchy.  it is the designation of a switching system that connects lines to lines, and lines to trunks (a local switching system).

**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 (FCC Part 68, etc.)

**Exchange**

A unit established by QWEST for the administration of communications service in a specified geographic area that usually embraces a city, town, or village and its environs.

**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.

**Facilities**

Facilities are the transmission paths between the demarcation points serving customer locations, a demarcation point serving a customer location and a QWEST Central Office, or two QWEST offices.

**Gigabit per Second (Gbit/s)**

One billion (1,000,000,000) bits per second.

**Impedance**

The total opposition offered by an electric circuit to the  flow of an alternating current of a single frequency.  It is a combination of resistance and reactance and is measured in ohms.

**InterConnection Distribution Frame (ICDF)**

The generic name for a cross-connect frame(s) designated as the Network Interface between QWEST and a collocated Certified Local Exchange Carrier.  ICDFs are generally level-specific (e.g., DS0/voice, DS1, DS3 or optical).  These frames typically serve other purposes and normally will have a more specific name depending on usage in a specific location.

**Kilobit/Second (kbit/s)**

One thousand (1000) bits/second

**Local Exchange Carrier (LEC)**

Any company or corporation engaged for hire in providing Access and intraLATA communications services.

**Loop**

The facility which connects the Local Wire Center to the customer's location.

**Loop Signaling**

Loop signaling uses a DC path, or loop, to convey address and supervisory signaling information.

**Meet Point**

A meet point is a point of interconnection between two networks, designated by two telecommunications carriers, at which one carrier's responsibility for service begins and the other carrier's responsibility ends.

**Meet Point Interconnection Arrangement**

A meet point interconnection arrangement is an arrangement by which each local exchange carrier builds and maintains its network to a meet point.

**Megabit per Second (Mbit/s)**

One million (1,000,000) bits per second

**Multiplexer (Mux)**

An equipment unit to multiplex, or do multiplexing: Multiplexing is a technique of modulating (analog) or interleaving (digital) multiple, relatively narrow bandwidth channels into a single channel having a wider bandwidth (analog) or higher bit-rate (digital).  The term Multiplexer implies the demultiplexing function is present to reverse the process so it is not usually stated.

**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 this 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 Point of Termination (POT) at a central office or at the Network Interface at a customer location.  The Interface code elements are:  Total Conductors, Protocol, Impedances, Protocol Options, and Transmission Level Points (TLP).  (At a digital interface, the TLP element of the NCI code is not used.)

**Network Interface (NI)**

The point of demarcation on the customer's premises at which QWEST's responsibility for the provision of service ends.

**Ohm**

The unit of electric resistance.

**Open-end**

The end of a switched service from which dial tone is drawn.

**Optical Carrier (OC)**

Optical carrier; the nomenclature for the line rate of the optical transmission signal described in this document.

**Premises**

Denotes a building or portion(s) of a building occupied by a single customer or End-User either as a place of business or residence.

**Protocol**

The rules for communication system operation which must be followed if communication is to be effected; the complete interaction of all possible series of messages across an interface.  Protocols may govern portions of a network, types of service, or administrative procedures.

**Protocol Code**

The Protocol (character positions 3 and 4 or the Network Channel Interface [NCI] Code) is a two-character alpha code that defines requirements for the interface regarding signaling and transmission.

**Signaling**

The transmission of information to establish, monitor, or release connections and/or provide Network Control.

## SONET

Synchronous Optical Network (SONET): A standard providing electrical and optical specifications for the physical and higher layers, the first stage of which is at 51.84 Mbit/s, the Optical Channel 1 (OC-1) level.  Other rates, defined as OC-n where n=3, 12, 24, 48, or 192.

### SONET Optical Terminal (SOT)

A terminal which uses SONET multiplexing to interleave the lower rate payloads, thereby creating a high rate synchronous signal.

### 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 communication circuit to which all relative levels at other points in the circuit are referred.

### Wire Center

A building in which one or more central offices, used for the provision of local exchange services, are located.  Also, see Central Office.

# CONTENTS

## 9.      References

### 9.1     American National Standards Institute Documents

ANSI Technical          *Unbundled Voicegrade Analog Loops),* July 1999 -
Report 60

ANSI T1.102-1993        *Telecommunications - Digital Hierarchy - Electrical Interfaces*
(R 1999)

ANSI T1.223-1997   *Information Interchange — Structure and Representation of Network
Channel (NC) and Network Channel Interface (NCI) Codes for the North
American Telecommunications System.*

ANSI T1.401-1993        Telecommunications - *Interface between Carriers and Customer
Installations - Analog Voicegrade Switched Access Lines Using
Loop-Start and Ground-Start Signaling.*

ANSI T1.403-1995        *Telecommunications - Carrier to Customer Installation, DS1
Metallic Interface*

ANSI T1.404-1994        *Telecommunications - Carrier-to-Customer Installation-DS3
Metallic Interface Specifications*

ANSI T1.417-2001        *Telecommunications – Spectrum Management for Loop Transmission
Systems*


ANSI T1.510-1999        *Telecommunications - Network Performance Parameters for
Dedicated Digital Services  --  Specifications*

ANSI T1.514-2001        *Telecommunications - Network Performance Parameters for
Dedicated Digital Services  --  SONET Bit Rates*

ANSI T1.601-1992   *Telecommunications - Integrated Services Digital Network (ISDN)
Basic Interface for Use on metallic Loops for Application on the Network
Side of the NT (Layer 2 Specification).*

ANSI/IEEE 820-1984    *IEEE Standard Telephone Loop Performance Characteristics.*
 (Reaffirmed 1993)

### 9.2     Telcordia Documents

MC-CL-IN-008          Telcordia, *Common Language Network Channel and Channel Interface Codes (NC/NCI Codes),* Issue 1, April 2001.

GR-1089-CORE           Telcordia, *Electromagnetic compatibility and Electrical Safety Generic Criteria for Network Telecommunications Equipment.*

TR-NWT-000393      *Generic Requirements for Isdn Basic Access Digital Subscriber Lines.* January 1991.

TR-NWT-000397      *Basic Access Transport System Requirements.*  Issue 3, December 1993.

## 9.3    QWEST Technical Publications

PUB 77200          *Qwest DS1 Service and Qwest DS1 Rate Synchronization Service.*
                   Issue E, December 1998.

PUB 77310          *Private Line Voice Grade Access Service.*  Issue B, October 1998.

PUB 77324          *Qwest DS3 Service.*  Issue C, April 1993.

PUB 77346          *Qwest Synchronous Service Transport.*  Issue G, January 2001.

PUB 77375          *1.544 Mbit/s Channel Interfaces.*  Issue D, October 1995.

PUB 77384          *Qwest Local Interconnection Service - Unbundled Loop.*
                   Issue I, June 2001.

PUB 77386          *Interconnection and Collocation for Transport and Switched Unbundled
                   Elements and Services.*  Issue F, June 2001.

PUB 77389          *Unbundled Dedicated Interoffice Transport.*  Issue E, June 2001.

## 9.4    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.

Those who are not QWEST employees may order;

American National Standards Institute (ANSI) documents from:

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> Web:  web.ansi.org/public/search.asp
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