QWEST Communications International Inc. Technical Publication

Unbundled Dedicated Interoffice Transport

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NOTICE

This publication provides technical information about the Unbundled Network Element *Unbundled Dedicated Interoffice Transport* (UDIT). 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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1. Introduction

1.1 General

This publication provides technical information about the Unbundled Network Element *Unbundled Dedicated Interoffice Transport* (UDIT). 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. Product definitions for UDIT and Extended UDIT (E-UDIT) vary by jurisdiction. See state specific Statement of Generally Available Terms and Conditions (SGAT) for availability.

1.2 Reason for Reissue

This publication is being revised to:

- Add multiplexing options that have become available for some E-UDIT offerings.
- Due to some jurisdictional specific rulings, add detail that some aspects of this offering vary based on the particular jurisdiction.
-

1.3 Related Elements, Services and Supporting Documentation

Competitive Local Exchange Carriers (CLECs) purchasing UDIT will normally use the Unbundled Network Element (UNE) to connect to collocated equipment or other UNEs. Several of these are mentioned in this publication.

This UNE is to be used by the CLEC for the transport of local services and should not be confused with Special Access Private Line Service.

CLECs that choose to collocate QWEST should consult PUB 77386, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services.* This publication describes the technical issues related to collocation and describes connections with other services or UNEs.

QWEST's Unbundled Loop is described in PUB 77384, *Interconnection - Unbundled Loop.* QWEST's Unbundled Switch Elements are described in PUB 77391, *Unbundled Switch Elements.*

1.4 Tariffs, Catalogs and Contracts

Further information about the UDIT UNE may be found in tariffs, catalogs or contracts. Such jurisdiction- or customer-specific descriptions supersede the information in this publication.

Some contracts and state regulatory orders may require that QWEST place the jumpers on the InterConnection Distribution Frame (ICDF) cross-connect frame. The jumpers will be placed when the CLEC orders the Expanded Interconnection Channel Terminations. The text in this technical publication and the attached appendices may not always reflect this situation.

1.5 Document Organization

This document is organized as follows:

Chapter	Contents
1	Introduction
2	General description of the UNEs
3	General information about Network Channel and Network Channel Interface Codes
4	DS3 UDIT UNE
5	DS1 UDIT UNE
6	DS0 UDIT UNE
7	Unbundled Customer Controlled Rearrangement Element
8	OC-n Level UDIT UNE
9	Extended-UDIT, Connections with other carriers
10	Glossary
11	References and Trademarks
Appendix A	Examples of proper Network Channel and Network Channel Interface code usage when combining UNEs
Appendix B	DS1 or DS3 Regeneration for Interconnection

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Figures

2. Element Descriptions

2.1 Unbundled Dedicated Interoffice Transport (UDIT) -- General

UDIT is an Unbundled Network Element (UNE) available to registered Competitive Local Exchange Carriers (CLECs). There are two basic types of UDIT UNEs: the two-point channel and the multiplexer. A third type, a rearrangement element, is described in Chapter 7.

The two-point UDIT UNE provides an unchannelized transport channel between two QWEST wire centers. These interoffice transport channels are available at Optical Carrier, DS3, DS1 and DS0/Voice levels. Optical Carrier includes OC-3 through OC-192 bandwidth and such high capacity transports as evolve over time, where facilities are available.

A UDIT may also go between a QWEST wire center and another Local Exchange Carrier's (LEC) wire center located outside QWEST's exchange area. Section 2.7 contains further information.

A variation, called Extended UDIT, is available to provide a UDIT-like channel between another carrier's wire center located within QWEST's exchange area and an adjacent QWEST wire center. An Extended UDIT and a UDIT can be ordered together. This type of single circuit includes a channel from the CLEC's wire center, through the QWEST serving wire center and on to the CLEC's established collocation in a distant QWEST wire center. See Chapter 9 for further information about Extended UDIT.

Central office multiplexing is also available at similar levels as a UDIT UNE. UDIT multiplexers may be purchased, for example, to enable the CLEC to connect them to a basic UDIT channel.

General information about the UNE described in this publication may be limited or modified in specific jurisdictions as described in tariffs, catalogs or contracts.

2.2 Two-Point UDIT Channel

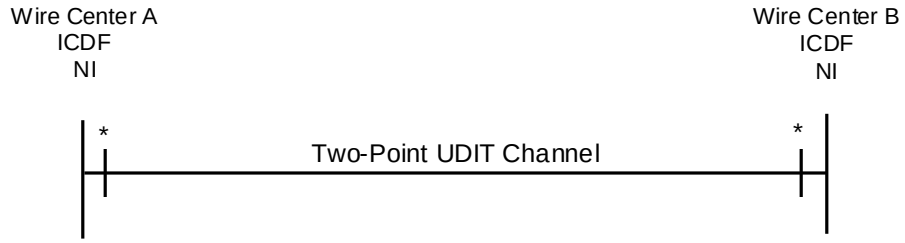
Figure 2-1 illustrates a two-point UDIT channel. The channel connects between two Network Interfaces (NIs) located in different wire centers.

The NI is at the InterConnection Distribution Frame (ICDF) cross-connect frame. The ICDF and the "Design-To" Points are described in PUB 77386. The ICDF serves as the NI between the UDIT channel and the CLEC's Interconnector Designated Equipment or other UNEs. Further information about the NIs may be found in Chapter 3.

The CLEC must use the ICDF identity when ordering UDIT elements. This identity is provided by QWEST when collocation is established on an Actual Point of Termination (APOT) form.

Specific information about the different level UDIT channels may be found in subsequent chapters.

The two-point UDIT UNE is a point-to-point channel between two network sites, generally central office buildings (also known as wire centers). The UNE is transported on any available interoffice facility. No special protection is provided other than what might be included with the facility. Product distinctions for UDIT are described below.



ICDF = Interconnector Distribution Frame
NI = Network Interface
UDIT = Unbundled Dedicated Interoffice Transport

* "Design-To" Point

Figure 2-1: UDIT Two-Point Channel

2.2.1 UDIT-Interoffice Facility: UDIT-IOF

UDIT- Interoffice Facility (UDIT-IOF) provides a single transmission path between QWEST central office buildings in the same LATA and state. UDIT-IOF is a bandwidth-specific interoffice transmission path designed to a DSX panel (or equivalent) in each central office building. The CLEC must have collocation in each QWEST serving wire center and have requested termination capacity through the collocation process. UDIT-IOF is available in DS0, DS1, DS3, OC-3, OC-12, OC48 and such higher capacities as evolve over time where facilities are available. UDIT-IOF is for the sole use of the CLEC. The CLEC can assign channels and transport of its choice of voice or data. It is The CLEC's responsibility to design from the DSX to the demarcation point (and on to whatever connection is planned in the wire center).

UDIT, where Extended UDIT is not available, can be between QWEST central office buildings or between a QWEST central office building and the central office building of a CLEC or an Interexchange Carrier (IXC) Point of Presence (POP).

2.2.2 Extended UDIT: E-UDIT

Extended UDIT (E-UDIT) provides an Unbundled Network Element that is a bandwidth specific transmission path between a QWEST central office building and the central office building of a CLEC or an Interexchange Carrier (IXC) Point Of Presence (POP) within the same QWEST Serving Wire Center area. The interface point distant from the QWEST central office building must be distinct from an End User and within QWEST territory. E-UDIT cannot traverse a QWEST wire center. The location of the other carrier will be considered a carrier wire center only if it meets certain criteria: 1) Its location has V&H coordinates, 2) The wire center contains a device that switches traffic, or a node leading to such a switch, 3) The switch is registered with a CLLI code listed in the LERG.

E-UDIT is available in DS1, DS3, OC-3, OC-12, OC-48, OC-192, and such higher capacities as evolve over time where QWEST facilities exist to carry the desired bandwidth and must be jointly engineered with QWEST. The CLEC will provide space for required terminating equipment at its wire center or the IXC POP. QWEST will provide terminating equipment at its serving wire center and the transmission media to the interface at the CLEC wire center or IXC POP. E-UDIT is a dedicated facility for the sole use of the CLEC. The E-UDIT may be used for voice or data traffic; but may not be used for bypass of toll or access charges. One end of the E-UDIT must terminate in the local, QWEST central office building. This termination will be at the appropriate cross-connect frame. The CLEC must have collocation in the QWEST central office building and have requested termination capacity through the collocation process.

All other procedures and appropriate termination information (e.g., CFA) and NC / NCI codes (Network Channel Codes / Network Channel Interface Codes) remain the same as a UDIT-IOF. The E-UDIT is identical to the UDIT-IOF in specifications, availability, pricing, ordering and maintenance.

2.2.3 Split UDIT: S-UDIT

Spit-UDIT (S-UDIT) enables a CLEC to order a UDIT from their existing collocation space in one QWEST central office building to the collocation space of a different CLEC in a different QWEST central office building in the same LATA. The CLEC must submit a Letter of Authorization (LOA) prior to ordering an S-UDIT. Both the originating and terminating locations must have CLEC collocation established along with proper ICDF terminations, e.g., DS0, DS1, OCN, etc. Both CLECs must submit a letter of authorization to their Account team prior to submitting a request for a Split UDIT. The originating CLEC will subsequently submit an order for an S-UDIT. The order will include remarks notifying QWEST that terminations (e.g., CFA) at one end of the S-UDIT belong to another CLEC and the name of that CLEC.

All other procedures and appropriate termination information (e.g., CFA) and NC / NCI codes (Network Channel Codes / Network Channel Interface Codes) remain the same as a UDIT-IOF. The S-UDIT is identical to the UDIT-IOF in specifications, availability, pricing, ordering and maintenance.

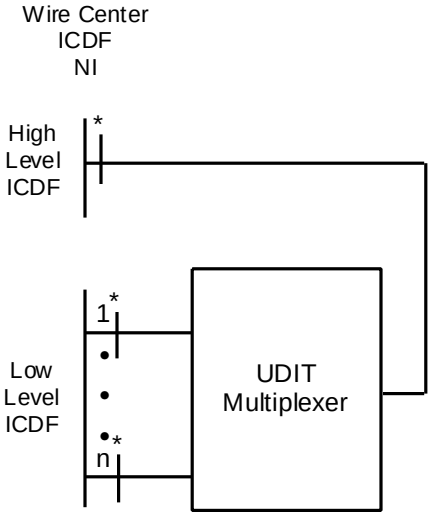
2.2.4 Meet Point UDIT: M-UDIT

Meet Point-UDIT (M-UDIT) provides a network element consisting of a single transmission path between a QWEST central office building and a mutually agreed meet point with another ILEC not in QWEST territory. The CLEC must be collocated in the QWEST central office building and have requested termination capacity through the collocation process. The CLEC orders the UDIT from a local QWEST wire center to another ILEC office not in QWEST territory. QWEST provides the interoffice facility up to the meet point. It is The CLEC's responsibility to design from the DSX to the demarcation point (and on to whatever connection is planned). The CLEC can assign channels and transport its choice of voice or data. M-UDIT does not offer metallic-based facilities.

2.3 UDIT Multiplexer

2.3.1 General Description

Figure 2-2 illustrates the basic UDIT multiplexer arrangement. The UDIT multiplexer is made up of one high-level channel with an attached multiplexer and several (“n”) low-level channels.



ICDF = Interconnector Distribution Frame
NI = Network Interface
UDIT = Unbundled Dedicated Interoffice Transport

* "Design-To" Point

Figure 2-2: UDIT Multiplexer

The value of "n" in the figure depends on the type of multiplexer. A DS3 UDIT Multiplexer, for example, has 28 low-level channels. In this example, the "High Level" would be DS3 and the "Low Level" would be DS1. Each UNE would be terminated on the appropriate ICDF.

Specific information about the different level UDIT multiplexers may be found in subsequent chapters.

2.3.2 High-Level Channel

The connection between the high-level ICDF termination to and including the multiplexer is described as an intraoffice channel with Central Office Multiplexing. The length of this channel is limited to the distance between the ICDF and the multiplexer within the wire center. Specific information as to the length may be obtained from QWEST on a case-by-case basis.

The Network Channel codes are used to describe the arrangement. Network Channel Interface (NCI) codes apply at the high-level ICDF.

This arrangement is the same standard arrangement normally used to describe normal high capacity channels with Central Office Multiplexing. The major difference is that high capacity channels are not normally confined to the wire center.

2.3.3 Low-Level Channel

The connections between the low-level ICDF, through the multiplexer (where several are multiplexed together), and on to the high-level ICDF, are treated as low-level channels as in normal applications. Again, normal applications do not restrict the channels to the wire center.

One other major change between the unbundled UDIT multiplexer and normal QWEST Finished Services is that the CLEC will select the proper lower-level plugs and set their options. This is done by the use of proper Network Channel codes, NCI codes, and other means. This selection and option setting process is required to allow the multiplexers to properly work with the facilities and equipment to which the CLEC connects to the ends of the UDIT UNEs.

Subsequent chapters in this publication will provide generic information about the available low-level plugs, their technical parameters and their options. The actual ordering process is beyond the scope of this publication.

2.4 DS1 or DS3 Regenerators

DS1 and DS3 regenerators may be required when connecting UNEs or Finished Services together. See Appendix B or PUB 77386 for further information about the Regeneration with Interconnection. The CLEC may supply their own regenerators or obtain them from QWEST.

2.5 UDIT Element Applications

A CLEC may use UDIT channels and multiplexers by connecting them together and/or to the CLEC's Interconnector Designated Equipment. These UNEs may be also connected to other UNEs or Finished Services purchased from QWEST.

The overall design of any network formed by these connections is the responsibility of the CLEC. The CLEC also has the responsibility to design the connections and use these UNEs in manner consistent with this and other appropriate technical publications.

2.6 "Design-To" Points and Interconnection Arrangements

PUB 77386, Issue C or later, identifies the ICDF and the Dedicated ICDF Interconnection arrangements. The ICDF is the NI of the UDIT. The dedicated arrangement should not significantly impact the description of the UNEs in this publication. See PUB 77386 for further information.

Figures 2-1 and 2-2 include a "Design-To" point. The "Design-To" point is a cross-connect frame (or the functional equivalent) in the QWEST wire center. This cross-connect frame, for example, will be a DSX-1 or DSX-3 cross-connect frame for DS1 or DS3 UDIT UNEs respectively. **The "Design-To" cross-connect frame and the ICDF NI are frequently the same frame.**

This issue is being raised in this publication to make the distinction when the two frames are not the same. That is, the ICDF at the NI may not be a DSX-1 or DSX-3 frame for DS1 or DS3 UDIT UNEs respectively. This difference may impact how the CLEC designs their end-to-end services.

The connection between the "Design-To" point and the ICDF NI (if not the same frame) consists of tie cable pairs of the appropriate type. CLEC has the responsibility to design the segment from the "Design-To" point to the ICDF and on to the facility or equipment that they connect to the UDIT UNE at the ICDF. QWEST will notify the CLEC as to the length and type of the tie cables.

The CLEC must order ICDF terminations prior to ordering any UDIT UNEs!

Further details on the ICDFs, tie cable pairs, "Design-To" points and responsibilities may be found in PUB 77386.

2.7 Connections with Other Local Exchange Carriers (LECs) using M-UDIT

QWEST has agreements with other LECs to meet these LECs at a "Meet Point" for the purpose of exchanging services. These agreements are called a "Meet Point Agreement." The Meet Point is normally located in or between the adjacent, QWEST and other LEC's wire centers.

A two point UDIT UNE may be ordered between a QWEST and other LEC's wire center as long a Meet Point Agreement exists between the two wire centers for the level of UNE being ordered. This special UDIT arrangement is sometimes called a "Meet Point UDIT."

The specifications of the portion of the UDIT UNE on the other LEC's side of the Meet Point and the NI of the UNE in the other LEC's wire center will be provided as specified by the other LEC. The specifications in this publication do not apply to the portion of the UDIT UNE beyond the Meet Point.

Acceptable NCI codes for UDIT UNEs at the NI in the other LEC's wire center will be specified by the other LEC. Other chapters in this publication usually assume that both wire centers belong to QWEST and may not recognize this distinction.

The CLEC may have to make separate arrangements with both QWEST and the other LEC to meet the CLEC's requirements.

Meet Point UDITs are available at DS1, DS3, and OC-n levels if **both** the Meet Point Agreement **and** the capability of the facilities support the desired UDIT level. The CLEC should be aware that the Meet Point Agreements are specific as to pairs of wire centers and to services offered.

Multiplexing UNEs in the other LEC's wire center will have to be obtained from the other LEC.

2.8 Synchronization

Appropriate transport equipment (e.g., multiplexers) used to provide these UDIT UNEs are normally externally synchronized by an external clock source in accordance with the Building Integrated Timing Supply concept. See PUB 77386 for further information.

2.9 Testing

UDIT s will be tested and will perform according to industry Standards. Digital Services will conform to ANSI Standards T1.514, *Network Performance Parameters for Dedicated Digital Services - SONET Bit Rates, T1.510, Network Performance Parameters for Dedicated Digital Services - Specifications or T1.410, Carrier-to-Customer Metallic Interface -- Digital Data at 64 kbit/s and Subrates.* This includes error and availability performance. Analog interfaced circuits will conform and be tested to the parameters and objectives of Telcordia document, TR-NWT-000335, Voice *Grade Special Access Services - Transmission Parameter Limits and Interface Combinations.*

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Tables

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.

3.1.2 Format

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

Channel Code
Optional Feature Code

The format is illustrated in Figure 3-1.

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 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.*

3.2 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.

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

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 3-1.

Table 3-1: NCI Impedance Values

Impedance in Ohms (Character Position 5)			
Data Value	**Code**	**Data Value**	**Code**
600	2	75	6
900	3	100	9
135	5	Fiber	F

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 a 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 3-2.

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.

Further information about NCI Codes may be found in ANSI T1.223-1991.

Table 3-2: 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
-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	-

3.3 Application of NC and NCI Codes

Figures 3-3 and 3-4 illustrate the application of NC and NCI codes for the Unbundled Dedicated Interoffice Transport two-point and multiplex elements respectively.

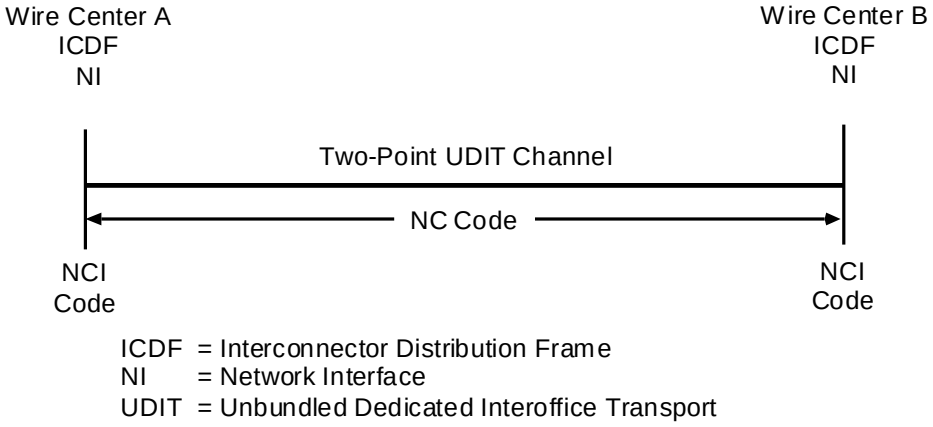

Figure 3-3: Code Application -- Two-Point Element

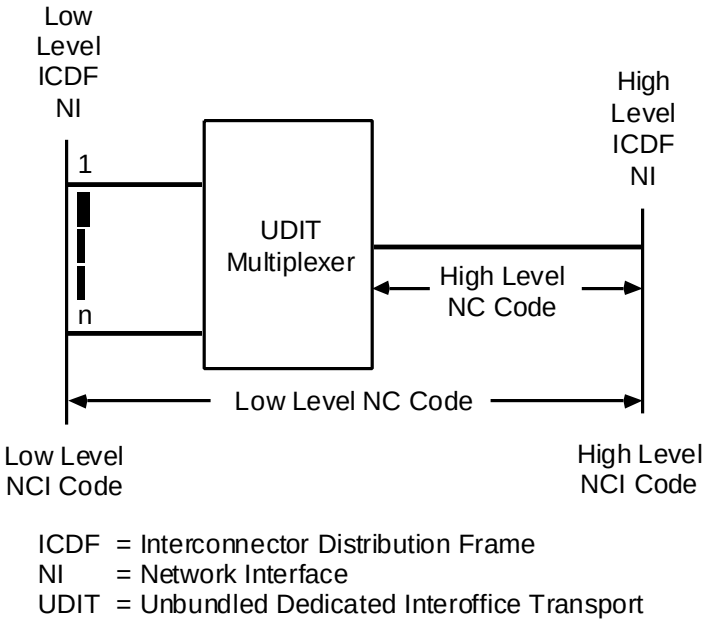

Figure 3-4: Code Application -- Multiplexer Element

3.4 NC and NCI Codes for Jumpers

Under certain circumstances, an Interconnector may have to order jumpers from QWEST. This may be due to contracts, regulatory orders or other circumstances.

These jumpers are connections on a cross-connect frame. These jumpers may be used to connect collocated equipment to Unbundled Network Elements (UNEs), collocated equipment to collocated equipment, UNEs to UNEs or other situations described elsewhere in this publication. Subsequent chapters should be consulted for further information about specific situations.

Unless otherwise stated, the NC and NCI codes listed in Table 3-3 should be used. Tables 3-4 and 3-5 define these NC and NCI codes respectively.

Table 3-3: NC and NCI Codes for Ordering Jumpers

Application	Description	NC Code	NCI Code
DS0/Voice - HDSL *	HDSL	LX--	02QB9.00H
DS0/Voice - Other	64 kbit/s or voice	LX--	02QB2.00
DS1	SF & AMI	HCX-	04QB9.11
	SF & B8ZS	HCXA	
	Non-ANSI ESF & AMI	HCXB	
	Non-ANSI ESF & B8ZS	HCXC	
	ANSI ESF & AMI	HCXD	
	ANSI ESF & B8ZS	HCXE	
	Free Framing & B8ZS	HCXF	
DS3	44.736 Mbit/s	HFX-	04QB6.33
Fiber or Optical	Fiber Jumper for optical	LX--	01QBF.LLX

* High-bit-rate Digital Subscriber Line.

AMI = Alternate Mark Inversion
ANSI = American National Standards Institute
B8ZS = Bipolar with 8 Zero Substitution
ESF = Extended Super Frame
SF = Superframe Format

Table 3-4: NC Code Definitions for Jumpers

NC Code			Description
LX	-	-	Dedicated Facility (Without Equipment)
HC			High Capacity Channel (DS1)
	X		Central Office Cross-Connect, DS1-to-DS1 Intact
		*	* Fourth position defines line code and frame format as shown in Table 6-3.
HF			High Capacity Channel (DS3)
	X		Central Office Cross-Connect
		-	DS3-to-DS3

Table 3-5: NCI Code Definitions for Jumpers

NCI Code					Description
01					One Conductor
02					Two Conductors
04					Four Conductors
	QB				Manual Cross-Connect Termination With No Subrating Capability
		2			600 Ohms
		6			75 Ohms
		9			100 Ohms
		F			Fiber
			00		Main Distribution Frame Cross-Connect *
				H	HDSL
			11		DS1-to-DS1 (This code may or may not meet DS1 signal levels as specified by GR-342-CORE.)
			33		DS3-to-DS3 (This code may or may not meet DS1 signal levels as specified by GR-342-CORE.)
			LL		Fiber Cross-Connect on Fiber Distribution Bay (or equivalent)
				X	Dark Fiber

* Also applies to other DS0 or Voice cross-connect frames including Intermediate Distribution Frame (IDF) and Common System Main Interconnecting Frame (COSMIC®).

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4. DS3 Unbundled Dedicated Interoffice Transport (UDIT)

4.1 Unbundled Network Element (UNE) Description

Unbundled Dedicated Interoffice Transport (UDIT) at the DS3 level provides a two-point DS3 (44.736 Mbit/s) channel between two QWEST wire centers. The Network Interface (NI) is at the DS3 InterConnection Distribution Frame (ICDF) cross-connect frame.

DS3-to-DS1 UDIT multiplexing is available. Several options of signal format are available and are summarized in this chapter.

Full technical information about this DS3 transport service may be found in PUB 77324, *QWEST DS3 Service.* Information about the ICDF may be found in PUB 77386.

4.2 Network Interfaces and Network Channel Interface (NCI) Codes

Network Channel (NC) and Network Channel Interface (NCI) codes are used to define the channels and NIs of the DS3 UDIT Unbundled Network Elements (UNEs), respectively. These codes are used to describe and order the UDIT UNEs. Information, about applicable NC codes will be found in succeeding sections.

Table 4-1 lists the applicable DS3 level NCI codes for the DS3 UDIT. The "QB" Protocol Code denotes a Manual Cross-Connect termination with no subrating capability. The options "33" denote a DS3-to-DS3 cross-connect (which may or may not meet DS3 templated signal levels). The "R" denotes *With Regeneration*.

Table 4-1: Applicable DS3 Network Channel Interface Codes -- DS3 UDIT

Description	NI (ICDF)	"Design-To" Point
DS3 with M2/3 Multiplexer format	04QB6.33	04DS6.44
With Regeneration	04QB6.33R	
DS3 Unchannelized with M Framed format	04QB6.33	04DS6.44R
With Regeneration	04QB6.33R	
DS3 with M2/3 Multiplexer format & C-Bit Parity	04QB6.33	04DS6.44I
With Regeneration	04QB6.33R	
DS3 Unchannelized and C-Bit Parity	04QB6.33	04DS6.44A
With Regeneration	04QB6.33R	

The DS3 UDIT would also involve a "Design-To" Point as described in PUB 77386. This simply means that there is a DSX-3 somewhere on the network side of the NI (i.e., the ICDF). The "Design-To" Point is not a NI, but is a cross-connect frame requiring a templated DS3 signal that must be recognized when designing the DS3 connections. The total distance from the "Design-To" DSX-3, through the ICDF, and on to the equipment on the CLEC side of the NI must be less than 450 feet or less depending on cable type. Regeneration must be provided if this limit is exceeded. See Appendix B for further information. QWEST will provide the cable length between the DSX-3 and the ICDF NI.

The "Design-To Point may be the same frame as the ICDF. This will impact the CLEC's design for the DS3.

The "DS" Protocol Code denotes a Digital Hierarchy Interface and the options ("44", "44A" and "44I") indicate the descriptive information in the table.

Some wire centers may use an Electronic DSX (EDSX) or a Digital Cross-Connect System (DCS) in place of the manual DSX. This will impact the CLEC design. See Appendix B for further information.

4.3 Network Channel (NC) Codes

Table 4-2 lists the applicable Network Channel Codes for the DS3 two-point UDIT and UDIT multiplexer UNEs. The applications are illustrated in the right column.

The third position "C" denotes C-Bit Parity. C-Bit Parity is not available in all locations. "M13" denotes the DS3-to-DS1 UDIT multiplexer.

It is recommended that the NC codes HF-M and HFCM be avoided unless there is never a need to multiplex DS1 channels with Clear Channel Capability (using B8ZS). It could be safer to order one that specified that B8ZS can be ordered and just not order B8ZS DS1s. The risk is that when using the "M" version, a multiplexer without any B8ZS capability may be provided by QWEST.

Most new-vintage multiplexers can designate the need for B8ZS on a channel-by-channel basis (i.e., HF-1 or HFC1). QWEST may substitute these newer multiplexers for the older "by-four", "by-seven" or unspecified types (i.e., HF-4, HFC4, HF-7, HFC7, HF-M or HFCM) since they are compatible. However, the reverse (i.e., old-for-new) substitutions are not compatible and will not be made.

Table 4-2: Applicable DS3 Network Channel Codes -- DS3 UDIT

NC Code	Description	Options	Illustration
HF--	DS3, M2/3 Multiplex	None *	DS3
HF-1	Format	Central Office Multiplexing, Multiplexer can be optioned for one (1) DS1 Clear Channel at a time using B8ZS line code	DS3 M13
HF-4		Central Office Multiplexing, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS line code	DS3 M13
HF-7		Central Office Multiplexing, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS line code	DS3 M13
HF-M		Central Office Multiplexing (DS1 Clear Channel Capability optioning capability not specified)	DS3 M13
HFC-	DS3, M2/3 Multiplex	None *	DS3
HFCM	Format, C-Bit Parity	Central Office Multiplexing (DS1 Clear Channel Capability optioning capability not specified)	DS3 M13
HFC1		Central Office Multiplexing, Multiplexer can be optioned for one (1) DS1 Clear Channel at a time using B8ZS line code	DS3 M13
HFC4		Central Office Multiplexing, Multiplexer can be optioned for four (4) DS1 Clear Channels at a time using B8ZS line code	DS3 M13
HFC7		Central Office Multiplexing, Multiplexer can be optioned for seven (7) DS1 Clear Channels at a time using B8ZS line code	DS3 M13

* M2/3 Format is optional.

4.4 DS3 Two-Point UDIT UNE

Figure 4-1 illustrates a typical two-point DS3 UDIT channel between Wire Center A and Wire Center B. The NC codes, described in Section 4.3, indicate that the DS3 channel is M-Framed with optional M2/3 Multiplexer format and C-Bit Parity. The NCI codes are described in Table 4-1. The asterisks (*) show the “Design-To” Points.

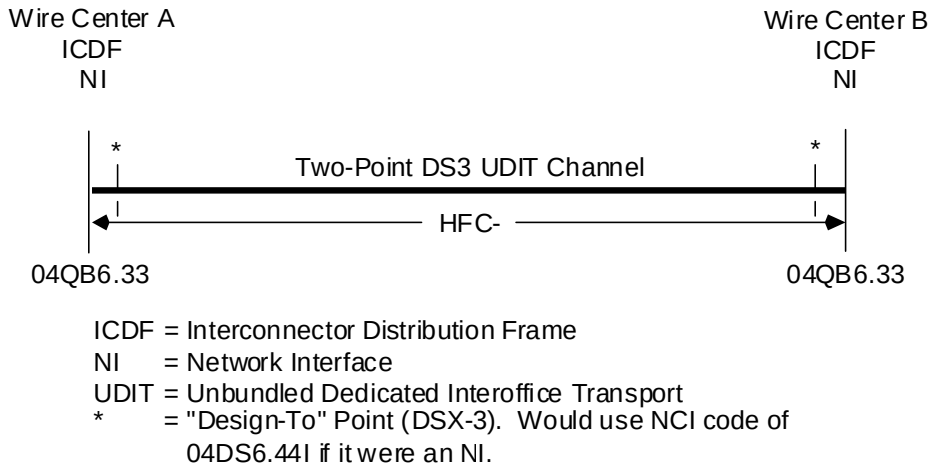


Figure 4-1: Typical DS3 Two-Point UDIT UNE

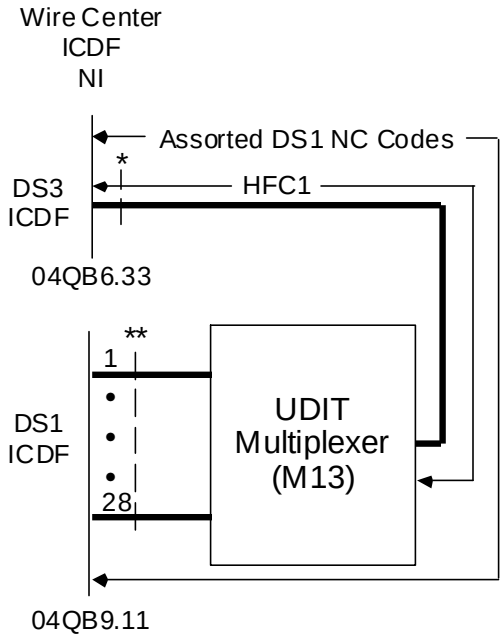
4.5 DS3 UDIT Multiplexer UNE

Figure 4-2 illustrates a typical DS3 UDIT multiplexer UNE without regeneration. The high capacity channel with multiplexer is M-Framed with M2/3 Multiplexer format and C-Bit Parity. The multiplexer can be optioned for one (1) DS1 Clear Channel at a time using B8ZS line code as defined in Table 4-2. The NCI codes are described in Table 4-1. The asterisks (*) show the “Design-To” Points.

The description and ordering process are similar to traditional high capacity with multiplexing services with one major exception. The intraoffice channels with multiplexer (described by the NC code HFC1) are ordered at the same time.

The example in Figure 4-2 does not list the 28 DS1 NC codes or the corresponding NCI codes that could apply at the “Design-To” Point if it were a NI. This information may be found in Chapter 5.

The design rules described in Section 4.2 for DS3 apply to the DS3 channel. Similar design rules apply for the DS1 low-level channels. The difference is that the cross-connect at the “Design-To” Point is a DSX-1 and the total length limitation from DSX-1 to CLEC’s equipment is 655 feet or less depending on cable type. See Appendix B for further information.



ICDF = Interconnector Distribution Frame
NI = Network Interface
UDIT = Unbundled Dedicated Interoffice Transport
* = "Design-To" Point (DSX-3). Would use NCI codes of 04DS6.44I if it were an NI.
** = "Design-To" Point (DSX-1). Would use various NCI codes if it were an NI.

Figure 4-2: Typical DS3 UDIT Multiplexer UNE

QWEST may substitute a 3/1 DCS for the M13 multiplexer in some wire centers. These 3/1 DCSs may not have all the same capabilities as a M13 multiplexer. The CLEC design criteria may also be changed if the DCS is directly connected to the ICDF. See Appendix B for further information.

4.6 Valid NC and NCI Code Combinations

The NC codes with a "C" in the third position (HFC-, HFCM, HFC1, HFC4 and HFC7) are compatible with the NCI code 04DS6.44I (i.e., they have C-Bit Parity).

The other NC codes are compatible with 04DS6.44 (i.e., no C-Bit Parity).

The 04QB6.33 NCI code is silent on the C-Bit Parity option. However, the NC code can be used to designate C-Bit Parity.

4.7 DS1 Low-Level Channels and Options

Table 4-3 lists the DS1 low-level NC and NCI codes for the DS3 UDIT multiplexer. Codes on the same line are compatible.

Table 4-3: Applicable DS1 Level Codes -- DS3 UDIT Multiplexer

Line Code and Frame Format	NCI Codes (NI at ICDF)		Network Channel Codes
	No Regeneration	Regeneration	
SF & AMI	04QB9.11	04QB9.11R	HC--
ANSI ESF & AMI	04QB9.11	04QB9.11R	HCD-
ANSI ESF & B8ZS	04QB9.11	04QB9.11R	HCE-
Non-ANSI ESF & AMI	04QB9.11	04QB9.11R	HCF-
Non-ANSI ESF & B8ZS	04QB9.11	04QB9.11R	HCG-
Free Framing and B8ZS	04QB9.11	04QB9.11R	HCJ-
SF & B8ZS	04QB9.11	04QB9.11R	HCZ-

More information including NC codes and descriptions about the DS1 low-level channels may be found in Chapter 5. Only two-point DS1 NC codes would be valid for this application.

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5. DS1 Unbundled Dedicated Interoffice Transport

5.1 Unbundled Network Element (UNE) Description

Unbundled Dedicated Interoffice Transport (UDIT) at the DS1 level provides a two-point DS1 (1.544 Mbit/s) channel between two QWEST wire centers. The Network Interface (NI) is the InterConnection Distribution Frame (ICDF) cross-connect frame.

DS1-to-DS0/Voice multiplexing is also available. Several options of signal format are available and are summarized in this chapter.

Information about the ICDF and the "Design-To" Point may be found in PUB 77386. Full technical information about the DS1 "Design-To" point may be found in PUB 77375, *1.544 Mbit/s Channel Interfaces.*

Some further descriptive information about the DS1 level channels may be found in PUB 77200, *QWEST DS1 Service and Synchronization Service.* Although PUB 77200 describes the QWEST DS1 Service and not UDIT, information about the Network Channel (NC) codes and related technical information would apply.

5.2 Network Channel (NC) and Network Channel Interface (NCI) Codes

NC and NCI codes are used to define the channels and the NIs of the DS1 UDIT respectively. These codes are used to describe and order the UDIT UNEs. Information about applicable NC codes will be found in succeeding sections.

Table 5-1 lists the applicable NCI codes for the DS1 UDIT.

Table 5-1 Applicable DS1 Network Channel Interface Codes -- DS1 UDIT

Line Code and Frame Format	Network Interface (ICDF)		"Design-To" Point
	No Regeneration	Regeneration	
SF & AMI	04QB9.11	04QB9.11R	04DS9.15
ANSI ESF & AMI	04QB9.11	04QB9.11 R	04DS9.1K
ANSI ESF & B8ZS	04QB9.11	04QB9.11 R	04DS9.1S
Non-ANSI ESF & AMI	04QB9.11	04QB9.11 R	04DS9.15K
Non-ANSI ESF & B8ZS	04QB9.11	04QB9.11 R	04DS9.15S
Free Framing and B8ZS	04QB9.11	04QB9.11 R	04DS9.15J
SF & B8ZS	04QB9.11	04QB9.11 R	04DS9.15B

The DS1 UDIT would also involve a "Design-To" Point as described in PUB 77386. This simply means that there is a DSX-1 somewhere on the network side of the NI (i.e., the ICDF). The "Design-To" Point is not a NI, but is a cross-connect frame requiring a templated DS1 signal that must be recognized when designing the DS1 connections. The total distance from the "Design-To" DSX-1, through the ICDF, and on to the equipment on the CLEC side of the NI must be less than 655 feet or less depending on cable type. Regeneration must be provided if this limit is exceeded. See Appendix B for further information. QWEST will provide the cable length between the DSX-1 and the ICDF NI.

The "Design-To Point may be the same frame as the ICDF. This will simplify the CLEC's DS1 design.

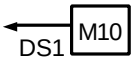
The "DS" Protocol Code denotes a Digital Hierarchy Interface and the options ("15", "1K", etc.) indicate the descriptive information in the table.

The "QB" Protocol Code denotes a Manual Cross-Connect termination with no subrating capability. The options "11" denote a DS1-to-DS1 cross-connect (which may or may not meet DS1 templated signal levels). The "R" denotes *With Regeneration.* The NC code needs to be consulted since the 04QB9.11 NCI code does not describe the frame format and line code.

5.3 DS1 Level Network Channel (NC) Codes

Table 5-2 lists the applicable Network Channel Codes for the DS1 UDIT. The illustrations in the table represent the variations.

Table 5-2 Applicable DS1 Level Network Channel Codes -- DS1 UDIT

Line Code & Frame Format	Two-Point	UDIT Multiplexer 
SF & AMI	HC--	HC-G
ANSI ESF & AMI	HCD-	HCDG
ANSI ESF & B8ZS	HCE-	HCEG
Non-ANSI ESF & AMI	HCF-	HCFG
Non-ANSI ESF & B8ZS	HCG-	HCGG
Free Framing and B8ZS	HCJ-	NA *
SF & B8ZS	HCZ-	HCZG

* A UDIT Multiplexer UNE is not available for the free framing frame format.

Customers ordering Free Framed DS1 must be aware that performance messages, such as Cyclic Redundancy Check (CRC), Slips, Loss of Frame and Out of Frame will not be visible to QWEST. Therefore, the performance messages not be monitored and collected for maintenance purposes. All required testing on such circuits would be intrusive.

5.4 DS1 Two-Point UDIT UNE

Figure 5-1 illustrates a typical two-point DS1 UDIT channel between Wire Center A and Wire Center B. The NC codes, described in Section 5.3, indicate that the DS1 channel is ANSI ESF and B8ZS. The NCI codes are described in Table 5-1. The asterisks (*) show the "Design-To" Points.

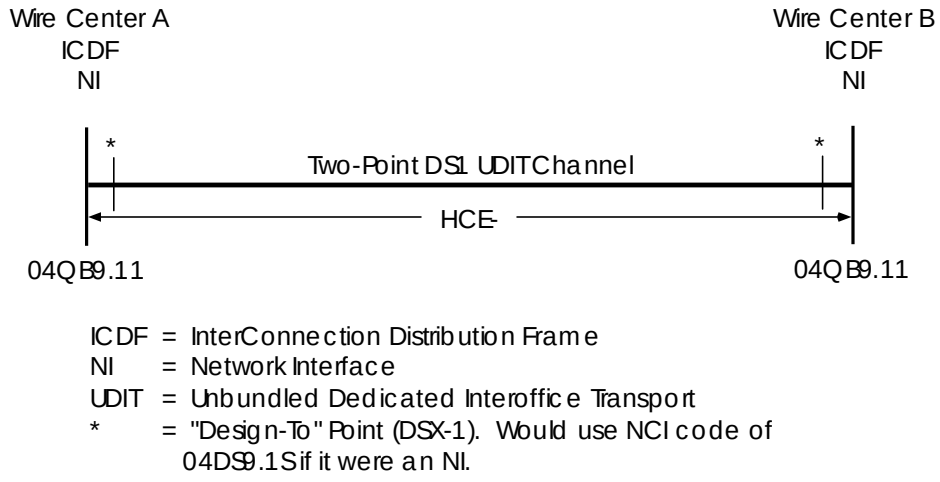


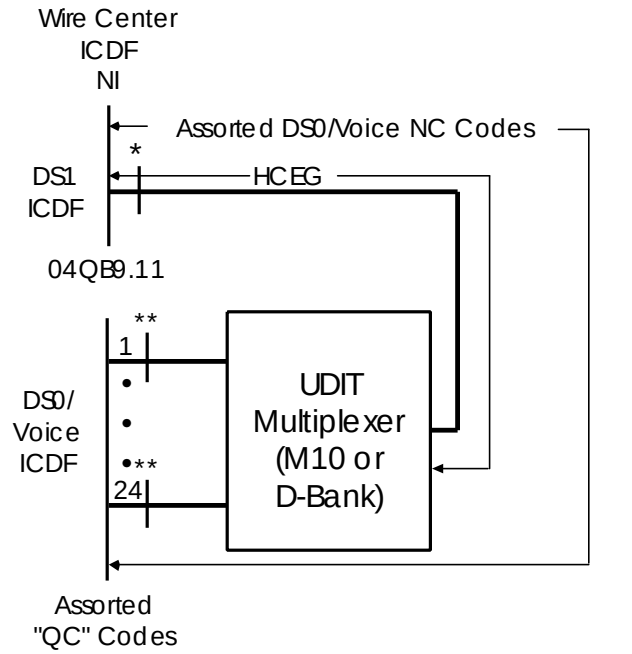
Figure 5-1 Typical DS1 Two-Point UDIT UNE

5.5 DS1 UDIT Multiplexer UNE

Figure 5-2 illustrates a typical DS1 UDIT Multiplexer UNE without regeneration. The high capacity channel with multiplexer is ANSI ESF and B8ZS. The NCI codes are described in Table 5-1. The asterisks (*) show the "Design-To" Points.

The description and ordering process are similar to traditional high capacity with multiplexer orders. The intraoffice channel, described by the NC code HCEG, is ordered. Then the individual DS0 or voice two-point channels are ordered and assigned to the channels in the multiplexer. The example in Figure 5-2 does not list the DS0 or voice NC codes. This information may be found in Section 5.7 or in Chapter 6.

The design rules described in previous sections for DS1 apply to the DS1 channel. Similar design rules apply for the DS0 or voice low-level channels.



ICDF = InterConnection Distribution Frame
NI = Network Interface
UDIT = Unbundled Dedicated Interoffice Transport
* = "Design-To" Point (DSX-1). Would use various 04DS9 NCI codes if it were an NI.
** = "Design-To" Point (Intermediate Distribution Frame)

Figure 5-2 Typical DS1 UDIT Multiplexer UNE

For digital DS0 channels at a DS0-A interface, the difference is that the cross-connect at the “Design-To” Point may be a DSX-0 and the total length limitation from DSX-0 to CLEC’s equipment is 1500 feet. The DSX-0 function may be located on an Intermediate Distribution Frame (IDF) or other frame rather than a separate DSX-0 cross-connect frame. However, the 1500-foot limitation still applies.

For other digital DS0 channels, such as digital data feeding a metallic loop using OCU-DP channel units, the “Design-To” point concept does not apply since the DDS service being transported on the UDIT must be designed by the CLEC to reach the End-User’s location over the metallic loop.

For analog voice channels, the "Design-To" point concept is not significant since the services being transported on the UDIT must be designed by the CLEC on an end-to-end basis. An IDF would be located at the "Design-To" point. See PUB 77386 for further information about analog interconnection.

The 24 channel DS1 UDIT Multiplexer will be a D4-type of channel bank commonly used in the industry. The bank will be externally synchronized to a source traceable to a Stratum I clock as discussed in PUB 77386.

5.6 Valid DS1 NC and NCI Code Combinations

DS1 Level NC and NCI codes listed with the same Description are compatible.

5.7 DS0/Voice Level Channels

An assortment of low level digital DS0 or analog voice channels may be ordered with the DS1 UDIT multiplex UNE. The information includes appropriate NC and NCI codes used to order and provide option settings for the channel units used for the low-level channels. Some channel unit option settings are beyond the capability of the NC and NCI codes and must be provided to QWEST by other means. Further information on the channel units and their options may be found in Section 5.9.

5.7.1 Analog Voice Channels

This section contains some design information to be used in designing a customer's analog voice channels. The DS1 UDIT Multiplexer(s) may make up a part of the voice channel. This information is to be used to select the channel units and their options.

Analog circuit design requires that the signal level into and out of metallic facilities fall within limits to avoid problems such as crosstalk. Table 5-3 lists the Transmission Level Point (TLP) limits. The CLEC must meet these limits when designing and selecting options for the channel units in the DS1 UDIT multiplexer.

Table 5-3 Transmission Level Point Limits

Location	H88-Loaded Facilities		Non-Loaded Facilities	
	Maximum Output To Line (dB)	Minimum Input From Line (dB)	Maximum Output To Line (dB)	Minimum Input From Line (dB)
At wire center	+6	-9	+6	-15
At PBX or other customer premises	+3	-6	+6	-15

The D4-type of channel units used in the DS1 UDIT multiplexer UNE use standard carrier levels of -8.5 dB transmit and +4.0 dB receive. Analog voice channels should be designed in a manner commonly used in the industry. Analog data channels, for example, should be designed 13 dB down from normal TLP levels. More detailed information about the channel units may be found in Section 5.9.

The requirements found in FCC Part 68 must also be met.

Table 5-4 lists the NC and NCI codes used to identify the analog channels. The table also lists the generic type of channel unit that will be provided with these combinations.

Table 5-4 Analog Channel Applications

NC Code	Generic Channel Unit	Low Level NCI *	DESCRIPTION **
LD--	2FXOG	02QC2.OOB 02QC3.OOB	Ground Start - Open End
LD--	2FXSG	02QC2.OOC 02QC3.OOC	Ground Start - Closed End
LC--	2FXOG	02QC2.OOD 02QC3.OOD	Loop Start - Open End
LC--	2FXSG	02QC2.OOE 02QC3.OOE	Loop Start - Closed End
LG--	ETO2G	02QC2.OOF 02QC3.OOF	Transmission Only - No Signaling, 2-wire
LG--	ETO4	04QC2.OOF	Transmission Only - No Signaling, 4-wire
LD--	DPO	02QC3.RVO	Reverse Battery Originating: Loop closure provided by the Access Customer (AC) to the Access Provider (AP); Battery provided by AP to AC. ***
LD--	DPTG	02QC3.RVT	Reverse Battery Terminating: Loop closure provided by the AP to the AC; Battery Provided by AC to AP. ***

* All 12 positions of the NCI code are required to specify the Transmission Level Point (TLP) levels. The DS1 level NCI code is 04QB9.11 for DS1 NI.

** QC is defined as: Manual cross-connect DS0/voice termination. The Description column provides additional options.

*** The Access Provider (AP) is QWEST. The Access Customer (AC) is CLEC (or their customer).

A brief explanation about NCI code usage with Open Ends and Closed Ends might help. Basically, the open end of a channel is the end towards the switch. The closed end is towards the terminal or telephone set and away from the switch. Figure 5-3 illustrates an application where a switch is connected to a UDIT and then to a loop. While actual NCI codes are not shown, the Open Ends and Closed Ends for each segment are marked. Each segment has both an open end and a closed end. However, the switch segment may only identify the closed end and ignore the open end at the switch.

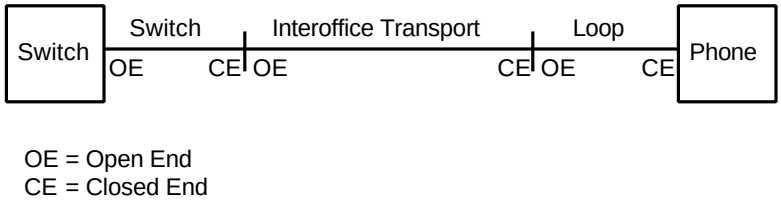


Figure 5-3 Open End -- Closed End

Additional information and details regarding the functioning and technical parameters of these channels can be found in QWEST Technical Publication 77310, *Private Line Voice Grade Analog Channels for Access Service*. Relevant information is related by identical Network Channel Codes. The majority of technical specifications are in Telcordia's TR-NPL-000335, *Voice Grade Special Access Services - Transmission Parameter Limits and Interface Combinations*. Particularly, test limits and robust NCI descriptions are in TR-NPL-000335.

5.7.2 Digital Data Channels

Two types of low-level channels are available for digital data type of channels. One, intended to feed a metallic loop, uses an OCU-DP channel unit. The other, intended to connect to other multiplexers in a back-to-back arrangement, uses a DS0-DP channel unit. Table 5-5 lists the digital data applications.

Central Office Synchronization, described in PUB 77386, must be purchased to successfully use DS0-DP channel unit connections. The DS1 UDIT multiplexer will always by synchronized by a Stratum I-traceable clock source. It is recommended that synchronization be used for connections to OCU-DP also to minimize synchronization problems involving the transmission of digital data channels.

The signal provided by the OCU-DP card is intended to provide a 04DU5 type of NI at the End-User location. The 04QC5 and other NCI codes are defined in PUB 77312, *QWEST Digital Data Service Technical Description*. QC is defined as: Manual cross-connect DS0/voice termination. The Description column provides additional options. The data rate of the channel is identified by both NC and NCI codes.

The channel can be ordered without error correction by replacing the fourth character of the NC code with an "X". For example, a two-point 56 kbit/s channel without error correction would be XH-X. Ordering the channel without an "X" leaves the situation ambiguous.

Table 5-5 Digital Data Channel Applications

NC Code **	Generic Channel Unit	Low Level NCI	Description/Application *
XA--	DS0-DP	04QC5.OOJ	2.4 kbit/s, DS0A Level signal
XA--	OCU-DP	04QB5.00	2.4 kbit/s, **not** DS0A Level signal
XAB-	DS0-DP	04QC5.OOJ	2.4 kbit/s, with secondary channel, DS0A Level signal
XAB-	OCU-DP	04QB5.00	2.4 kbit/s, with secondary channel, **not** DS0A Level signal
XB--	DS0-DP	04QC5.OOK	4.8 kbit/s, DS0A Level signal
XB--	OCU-DP	04QB5.00	4.8 kbit/s, **not** DS0A Level signal
XBB-	DS0-DP	04QC5.OOK	4.8 kbit/s, with secondary channel, DS0A Level signal
XBB-	OCU-DP	04QB5.00	4.8 kbit/s, with secondary channel, **not** DS0A Level signal
XG--	DS0-DP	04QC5.OOL	9.6 kbit/s, DS0A Level signal
XG--	OCU-DP	04QB5.00	9.6 kbit/s, **not** DS0A Level signal
XGB-	DS0-DP	04QC5.OOL	9.6 kbit/s, with secondary channel, DS0A Level signal
XGB-	OCU-DP	04QB5.00	9.6 kbit/s, with secondary channel, **not** DS0A Level signal
XC--	DS0-DP	04QC5.OOM	19.2 kbit/s, DS0A Level signal
XC--	OCU-DP	04QB5.00	19.2 kbit/s, **not** DS0A Level signal
XCB-	DS0-DP	04QC5.OOM	19.2 kbit/s, with secondary channel, DS0A Level signal
XCB-	OCU-DP	04QB5.00	19.2 kbit/s, with secondary channel, **not** DS0A Level signal
XH--	DS0-DP	04QC5.OOP	56.0 kbit/s, DS0A Level signal
XH--	OCU-DP	04QB5.00	56.0 kbit/s, **not** DS0A Level signal
XHB-	DS0-DP	04QC5.OOP	56.0 kbit/s, with secondary channel, DS0A Level signal
XHB-	OCU-DP	04QB5.00	56.0 kbit/s, with secondary channel, **not** DS0A Level signal
XD--	DS0-DP	04QC5.OOQ	64.0 kbit/s, DS0A Level signal
XD--	OCU-DP	04QB5.00	64.0 kbit/s, **not** DS0A Level signal

* QC is defined as: Manual cross-connect DS0/voice termination. The Description column provides additional options

QB is defined as: Manual cross-connect termination with no subrating capability. The option "00" denotes an MDF or DSX-0-like cross-connect.

** These NC codes also available with an "X" in the fourth position. See text for further information.

Default settings (Section 5.9.4) are to use error correction below 56 kbit/s and not to use error correction at 56 kbit/s and above. This choice was made based on the requirement of a second DS0 channel in the UDIT multiplexer and any DS1 channel for the 56 and 64 kbit/s channels using error correction.

It is recommended that the fourth character "X" be used if error correction not desired. Otherwise, error correction will be installed per the default settings.

5.7.3 Basic Rate ISDN Channels

The Basic Rate ISDN (BRI) uses a channel unit that is designed to connect to a 2-wire non-loaded metallic loop and deliver a "U" interface at the customer interface. Table 5-6 lists the applicable NC and NCI codes.

BRI requires the use of three adjacent DS0 channels on the multiplexer and any DS1 transport channels to provide the 2B+D ISDN channel.

Table 5-6 Basic Rate ISDN Channel Applications

NC Code	Channel Unit	Low Level NCI	DESCRIPTION
AD--	ISDN "U"	02QC5.OOS	Basic Rate ISDN (Digital Subscriber Line - DSL), LT function presented to Service Provider
		02QC5.OOV	Basic Rate ISDN (Digital Subscriber Line - DSL), NT function presented to Service Provider

5.8 Application Example

This section provides an example of an application and illustrates NC and NCI code usage. Information about the option settings for the channel units may be found in Section 5.10.

Suppose a CLEC is physically collocated in two wire centers ("A" and "B") and wants to purchase a DS1 UDIT between the two offices plus a UDIT DS1 multiplexer in office A. Assume the DS1 and multiplexer are of the type B8ZS with ANSI ESF. Assume the channels listed in Table 5-7 are requested. Figure 5-4 illustrates the configurations. No jumpers or Interconnector Designated Equipment are shown. This example assumes a 2.0 dB loop and normal design criteria apply in appropriate cases.

5.9 Generic Channel Unit Descriptions

This section provides a generic description of the channel units available with the DS1 UDIT multiplexer UNE. This section assumes that the reader has some basic understanding of the hardware commonly used for channel bank and related design issues.

Table 5-7 DS1 UDIT Example Low Level (DS0) Circuits

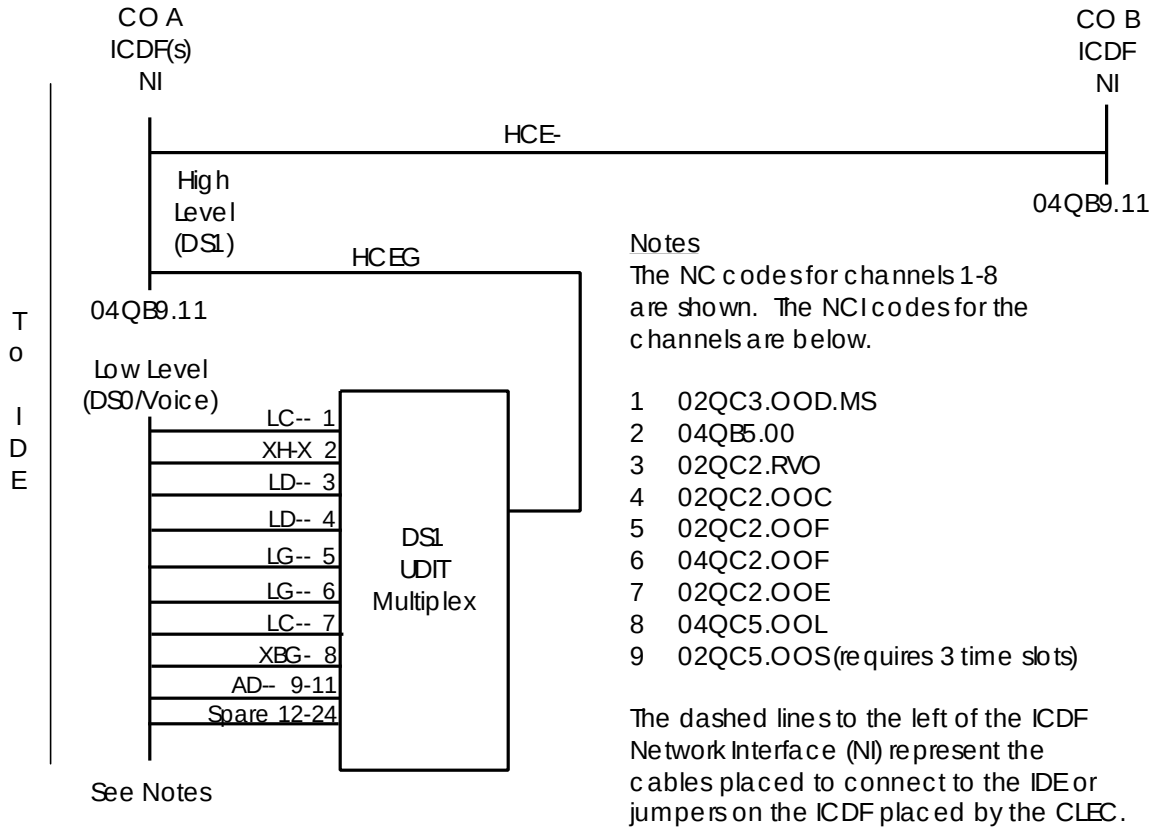
Channel Number	Circuit Type (To Connect to Low Level)	NC Code	NCI Codes		Channel Unit
			Low (DS0)	High (DS1)	
1	POTs line, open end	LC--	02QC3.OOD	04QB9.11	2FXOG
2	56 Kbit/s DDS (non-DS0A) without error correction	XH-X	04QB5.00	04QB9.11	OCU-DP
3	Trunk w/ Reverse Battery Originating	LD--	02QC3.RVO	04QB9.11	DPO
4	Trunk - Ground Start, closed end	LD--	02QC3.OOC	04QB9.11	2FXSG
5	2-wire PL voice, no signaling	LG--	02QC3.OOF	04QB9.11	ETO2G
6	4-wire PL voice, no signaling	LG--	04QC2.OOF	04QB9.11	ETO4
7	POTs line, closed end (normal loop application)	LC--	02QC3.OOE	04QB9.11	2FXSG
8	9.6 kbit/s w/SC DDS	XGB-	04QC5.OOL	04QB9.11	DS0-DP
9-11	Basic Rate ISDN Loop, LT function	AD--	02QC5.OOS	04QB9.11	ISDN “U”
12-24	Future growth			04QB9.11	

This material may suggest applications but makes no claims as to suitability other than the functions listed. These channel units may be of several manufacturers and vintages, and are the units normally used by QWEST in the provisioning of their services.

QWEST will select an appropriate channel unit of the generic type indicated by the NC and NCI codes to fit the channel bank.

Default settings are listed for several options. The channel units will be installed with these default settings. The options may be changed at the direction of the CLEC.

Example of Unbundled Dedicated Interoffice Transport
(CLEC equipment not shown)



CLEC = Certified Local Exchange Carrier
CO = Central Office (i.e., the wire center)
EICT = Expanded Interconnection Channel Termination
ICDF = InterConnection Distribution Frame
IDE = Interconnector Designated Equipment
UDIT = Unbundled Dedicated Interoffice Transport

Figure 5-4 DS1 UDIT Example Configuration

5.9.1 Foreign Exchange (2FXOG, 2FXSG)

The 2-wire FXOG and FXSG channel units provide a connection between the D4-type channel unit and 2-wire circuits. The 2FXOG is for the office (open) end of a circuit. The 2FXSG is for the station (closed) end of a circuit. These units support both Loop Start and Ground Start signaling. Both channel units have Gain Transfer as indicated by the “G”.

Table 5-8 Lists the options available for the 2FXOG and 2FXSG channel units.

These channel units have an internal compromise balancing network of 600/900 ohms plus 1.15 µf. In addition, an internal ground is provided to the make busy lead during trunk processing.

Table 5-8 Typical FXOG/FXSG Channel Unit Options

Option *	Values	Option Setting Instruction Method
Transmit & Receive Attenuators	0 - 6.5 dB loss	Default values: Set FXSG for a 2-dB loop. Set FXOG for a 0.5 dB loop. Otherwise as indicated by CLEC. Values limited to range in Table 5-3 at wire center.
Network Buildout capacitor	0.002 µf 0.004 µf 0.008 µf 0.016 µf 0.032 µf 0.064 µf	Default setting of 0.016 µf unless otherwise instructed. Combinations of the values may be added up to a total value of 0.126 µf.
Signaling	Loop or Ground Start	Based on positions 7 through 9 of NCI code.
2-Wire Impedance	600 or 900	Based on position 5 of NCI code.
Loop length	< 600 ohms or > 600 ohms	Default is < 600 ohms.
Trunk Processing (GS only)	Trunk **not** busy after carrier failure Trunk busy after carrier failure	Default is busy during carrier failure.

* Other options may exist.

5.9.2 Transmission Only (ETO2G, ETO4)

Transmission Only channel units provide a transmission path for analog channels and come in both two and four-wire variety. Signaling, if required, is limited to in-band signaling.

The ETO2G is a unit for use with 2-wire connections. The ETO4 is a 600 ohm unit for use with 4-wire connections.

These channel units have an internal compromise balancing network of 600/900 ohms plus 1.15 µf.

Tables 5-9 and 5-10 list the attenuation, gain, and loss parameters for the ETO2G and ETO4 channel units respectively.

Table 5-9 Typical ETO2G Channel Unit Options

Option	Values	Option Setting Instruction Method
Transmit & Receive Attenuators	0 - 16.5 dB loss	Default values: Set for a 2 dB loop. Otherwise as indicated by CLEC. Values limited to range in Table 5-3 at wire center.
Network Buildout capacitor	0.002 µf 0.004 µf 0.008 µf 0.016 µf 0.032 µf 0.064 µf	Default setting of 0.016 µf unless otherwise instructed. Combinations of the values may be added up to a total value of 0.126 µf.
Sealing Current	Sink or Source	Specified by CLEC. Default is Source (i.e., QWEST provides the sealing current).
2-Wire Impedance	600 or 900	Based on position 5 of NCI code.

Table 5-10 Typical ETO4 Channel Unit Options

Option	Values	Option Setting Instruction Method
Transmit and Receive Attenuators and Gain	0 - 24 dB Transmit 0 - 16.5 dB Receive	Default values: Set for a 2 dB loop. Otherwise as indicated by CLEC. Values limited to range in Table 5-3 at wire center.
Sealing Current	Sink Source Off	Default is Source (i.e., QWEST provides the sealing current). Otherwise, specified by CLEC.

5.9.3 Dial Pulse (DPO, DPTG)

DPO and DPTG channel units are designed to work with metallic loops. These units use Reverse Battery signaling. The DPTG channel units may have Gain Transfer.

These channel units have an internal compromise balancing network of 600/900 ohms plus 1.15 µf.

Table 5-11 lists the DPO/DPTG channel unit options.

Table 5-11 Typical DPO/DPTG Channel Unit Options

Option	Values	Option Setting Instruction Method
Transmit & Receive Attenuators	0 - 6.3 dB loss	Default values: Set DPTG for a 2 dB loop. Set DPO for a 0.5 dB loop. Otherwise as indicated by CLEC. Values limited to range in Table 5-3 at wire center.
Network Buildout capacitor	0.002 µf 0.004 µf 0.008 µf 0.016 µf 0.032 µf 0.064 µf	Default setting of 0.016 µf unless otherwise instructed. Combinations of the values may be added up to a total value of 0.126 µf.
2-Wire Impedance	600 or 900	Based on position 5 of NCI code.
DPO Only		
Signaling	Multifrequency Dial Pulse	Default is Multifrequency. The CLEC must specify if Dial Pulse is required.
Trunk Status During Failure	Trunk Busy (reverse battery) Trunk Not Busy (normal battery)	Default is Trunk Busy.

5.9.4 Office Channel Unit-Data Port (OCU-DP)

Basic information and usage of OCU-DP channel units were discussed in Section 5.7.2. PUB 77312 contains some metallic loop design criteria used with QWEST's Digital Data Service. This information may aid the CLEC in designing their loop application for use with the OCU-DP.

Basically, a normal OCU-DP can be expected to work out to an actual measured loss (AML) of 34 dB at the Nyquist Frequency for distances measured from the OCU-DP out to the customer's Channel Service Unit/Data Service Unit (CSU/DSU).

These OCU-DP units also have an extended range capability for 56 and 64 kbit/s data rates, which can extend the loss beyond 34 dB. A capability of 40 dB AML can be expected although some manufacturer's products may exceed this value. The use of these OCU-DP units for loops over 40 dB AML should be considered permissive.

The OCU-DP channel units provided by QWEST treat both the transmit and the receive side in the extended range mode. Thus the End-User customer does not require a special CSU/DSU with special treatment on the receive side.

Table 5-12 lists the options normally available with OCU-DP channel units along with how they are specified.

Table 5-12 Typical OCU-DP Channel Unit Options

Option	Values	Option Setting Instruction Method
Data Rate	See Table 5-5	Set per NC and NCI codes.
Secondary Channel	Yes or No	Set per NC and NCI code options (Table 5-5)
Error Correction	Yes or No	Fourth position "X" in NC code for No error correction. Other fourth position values may or may not provide error correction. Default values for non-"X": 56 kbit/s and above rates, set to No, otherwise set to Yes. Provide instructions if not using the fourth position "X" and default values are not desired. Note: Error correction at 56 kbit/s data rate and above will require the use of a second adjacent DS0 channel on the multiplexer and DS1 channel.
Type of multiplexer	Various	Set by QWEST to match type of multiplexer
Zero Code Suppression	On or Off	Default value is Off for 64 kbit/s and On for other rates. Specific instructions required if not default.
Latching Loopback	On or Off	Default is On. If latching loopback is not required, provide specific instructions.
Extended Range	On or Off	Applies only to 56 and 64 kbit/s data rates. Default value is off. Provide specific instructions if On is required. *

* Extended Range should be used only for loops exceeding a threshold value of 34 dB Actual Measured Loss measured from OCU-DP to a customer's older model Channel Service Unit/Data Service Unit (CSU/DSU). New CSU/DSUs with improved capabilities require a threshold of up to 43 dB. See ANSI T1.410-1992, *Carrier-to-Customer Metallic Interface -- Digital Data at 64 kbit/s and Subrates,* for further information. The Extended Range option must not be used for shorter loops since cross-talk may be a problem.

5.9.5 Digital Signal Level Zero-Data Port (DS0-DP)

Basic information and usage of DS0-DP channel units were discussed in Section 5.7.2. Synchronization is required for connections to this card. See PUB 77386 for further details. The UDIT Multiplexer will be synchronized by QWEST.

Table 5-13 lists the options normally available with OCU-DP channel units along with how they are specified.

Table 5-13 Typical DS0-DP Channel Unit Options

Option	Values	Option Setting Instruction Method
Data Rate	See Table 5-5	Set per NC and NCI codes.
Error Correction	Yes or No	Fourth position "X" in NC code for No error correction. Other fourth position values may or may not provide error correction. Default values for non-"X": 56 kbit/s and above rates, set to No, otherwise set to Yes. Provide instructions if not using the fourth position "X" and default values are not desired. Note: Error correction at 56 kbit/s data rate and above will require the use of a second adjacent DS0 channel on the multiplexer and DS1 channel.
Type of multiplexer	Various	Set by QWEST to match type of multiplexer
Zero Code Suppression	On or Off	Default value is on for 56 kbit/s and below rates. Specific instructions required if not default. Off is the only value for 64 kbit/s data rate.
Latching Loopback	On or Off	Default is On. If latching loopback is not required, provide specific instructions.

5.9.6 ISDN "U" Interface Channel Unit

These channel units are known by several names frequently based on the term "brite". The cards are designed to feed the Basic Rate ISDN 2B+D signal on a two-wire metallic non-loaded loop.

This channel unit provides an ISDN 2B1Q interface which meets all Layer 1 requirements as specified in ANSI T1.601-1992, *Telecommunications - Integrated Services Digital Network (ISDN) - Basic Access Interface for use on Metallic Loops for Application on the Network Side of the NT (Layer 1 Specification).* Transportation of ISDN Basic Rate 2B+D information over DS1 facilities in the 3-DS0 format is specified in TR-NWT-000397, *ISDN Basic Access Transport System Requirements.*

The ISDN 3-DS0 method of Time Domain Multiplexing (TDM) method of multiplexing does conform to requirements of TR-NWT-000393, *Generic Requirements for ISDN Basic Access Digital Subscriber Lines*. It may not have the additional enhancements for *Universal Data Channel* (UDC) as proposed in Chapter 11 of TR-NWT-397.

These channel units use D4 counting in slot usage. The 2B+D channel uses three time slots on the DS1 and three slots in the channel bank. Thus, the ISDN channel unit **can not** be placed in slots 23 or 24.

Proper operation requires that matching CLEC equipment be synchronized to a clock traceable to a Stratum I source.

Table 5-14 lists the options for this channel unit.

Table 5-14 Typical ISDN "U" Interface Channel Unit Options

Option	Values	Option Setting Instruction Method
Zero Byte Substitution	Disabled Enabled	QWEST will set to match the DS1 facility. Set to Disabled for B8ZS and Enabled for AMI.
Termination Mode	LU/LT * LU/NT	Determined by NCI code.
If Termination Mode is LULT	Adjacent Tandem	DC sealing current is provided. (Default option) DC sealing current is **not** provided.
If Termination Mode is LUNT	Adjacent Tandem	Periodic wake-up tone is not provided. Periodic wake-up tone is provided.

* LU/LT at adjacent-to-customer or tandem office source.
LU/NT at adjacent-to-switch or tandem office sink.
See Figure 5-5 for an illustration.

ISDN "U" type channel units have an option to describe the termination mode. Figure 5-5 is a simplification of a figure from ANSI T1.601-1992, Annex E. NI #1 is located one wire center. The second NI is located in a second wire center. The third NI is located at the customer's location. The ANSI document should be consulted for further information.

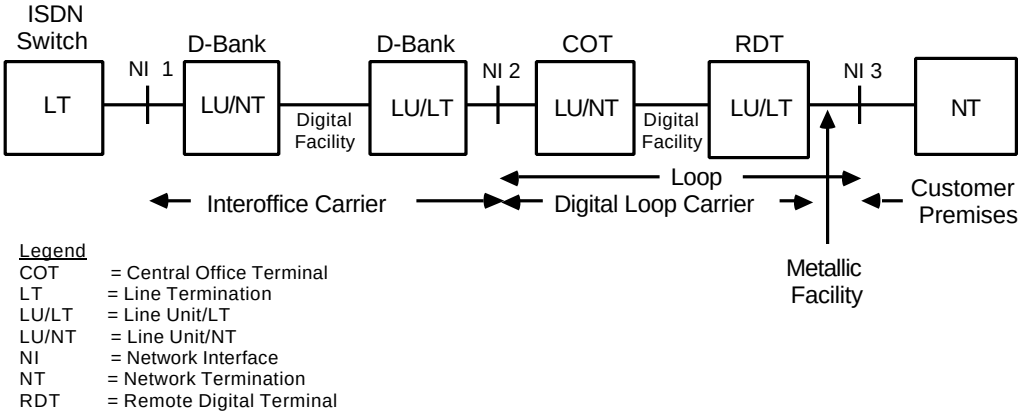


Figure 5-5 Worst Case ISDN Basic Access Configuration

5.10 Application Example -- Continued

Continuing with the example of Section 5.8, the channel unit options are set as follows:

Channel 1

The NC code LC-- identifies that this a voice line. The NCI code 02QC3.OOD indicates that this is the open end of a line using loop start signaling. A 2-wire, 900 ohm, FXOG channel unit would be used.

Table 5-7 contains a listing of the applicable options. The Network Buildout would default to 0.016 μf unless other instructions were provided. The attenuator would be set for a 2 dB loop unless other instructions were provided.

Channel 2

The NC code XH-X (Table 5-5) identifies that this is a 56 kbit/s digital data channel without error correction and no secondary channel. The NCI code 04QB5.00 indicates that this requires an OCU-DP channel unit. The options are listed in Table 5-11.

The options Zero Code Suppression and Latching Loopback will both default to "On" unless specific instructions are provided to QWEST to set them to "OFF".

Similarly, the Extended Range option (which applies at this data rate) will default to "Off" unless otherwise instructed.

Channel 3

The NC code LD-- identifies that this a voice trunk. The NCI code 02QC2.RVO helps select a DPO channel unit. The NCI code position 5 indicates a 900 ohm impedance. Assume that the default values for the network buildout capacitor and other options are acceptable.

Channel 4

The NC code LD-- identifies that this a voice trunk. The NCI code 02QC3.OOC indicates that this is the closed end of a trunk using ground start signaling. A 2-wire, 900 ohm, FXSG channel unit would be used.

Table 5-7 contains a listing of the applicable options. The Network Buildout would default to 0.016 μf unless other instructions were provided.

Channel 5

The attenuator values and impedance are take from the NCI code 02QC3.OOF.JQ. Assuming the default values are acceptable, no additional option settings need be specified.

Channel 6

The attenuator values and impedance are take from the NCI code 04QC2.OOF. Assuming the default values are acceptable, no additional option settings need be specified.

Channel 7

The NC code LG-- identifies that this a voice line. The NCI code 02QC3.OOE indicates that this is the closed end of a line using loop start signaling. A 2-wire, 900 ohm, FXSG channel unit would be used.

Table 5-7 contains a listing of the applicable options. The Network Buildout would default to 0.016 µf unless other instructions were provided.

Channel 8

The NC code XGB- (Table 5-5) identifies this as a 9.6 kbit/s channel with secondary channel. The NCI code 04QC5.OOL denotes that a DS0-DP is required to provide a DS0-A formatted signal. The options are listed in Table 5-12.

The options Zero Code Suppression and Latching Loopback will both default to "On" unless specific instructions are provided to QWEST to set them to "OFF".

The value for Error Correction will be set to "On" unless otherwise instructed.

Channel 9-11

The default values are acceptable. That is, the service level is 2B+D, D4 counting is used, B8ZS applies and the Zero Byte Substitution is disabled, and since it is adjacent to the customer, the default of DC sealing current is provided.

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6. DS0 Unbundled Dedicated Interoffice Transport

6.1 General Description

An Unbundled Dedicated Interoffice Transport (UDIT) Unbundled Network Element (UNE) at the DS0 level provides a two-point voice or DS0 channel between two Qwest wire centers. No multiplexing UNE is available with the DS0 level UDIT.

Figure 6-1 illustrates a DS0 UDIT UNE. The thinner lines represent Qwest infrastructure used to transport the DS0/voice channel between the two wire centers. This is important to the Competitive Local Exchange Carrier (CLEC) since the DS0/voice channel must be ordered in a manner similar to the low-level DS0/voice channels with the DS1 UDIT multiplexer UNE described in Section 5.7

Combinations of Network Channel (NC) and Network Channel Interface (NCI) codes will be used to select channel units.

The NC and NCI codes, along with additional information, will be used to set the options on the channel units. The available channel units and their options are discussed in Section 5.9.

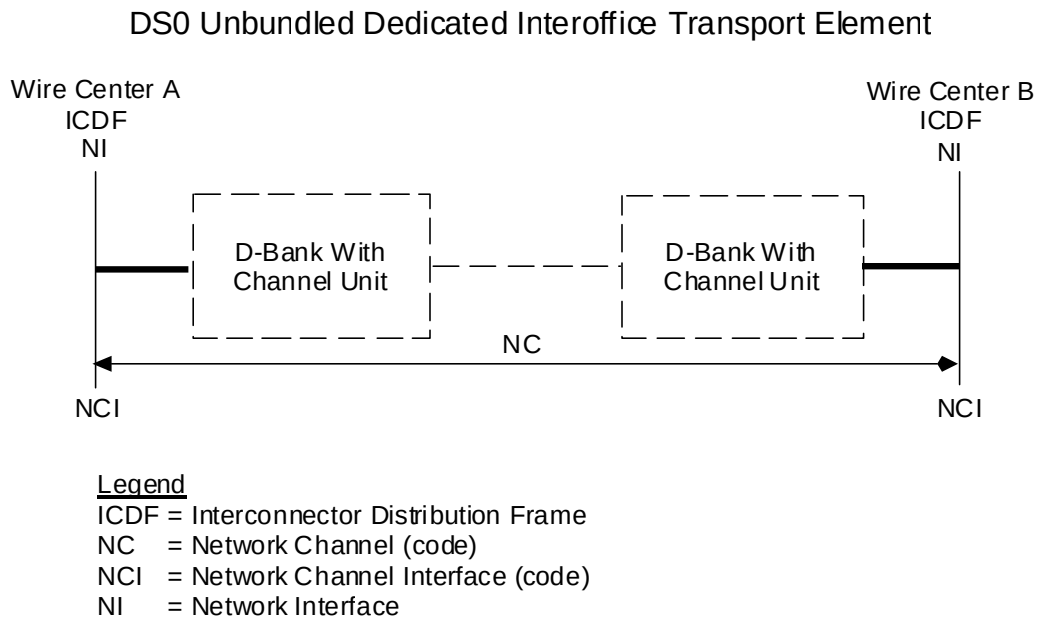

Figure 6-1: DS0 Level UDIT UNE

6.2 Valid Network Channel/Network Channel Interface Combinations

Table 6-1 contains a list of valid NC/NCI code combinations with references to Chapter 5 where further information may be found.

Table 6-1: DS0 UDIT NC / NCI Combinations

Channel Type	NC Code	Compatible NCI Codes		Defining Table	Channel Units	
		A-End **	Z-End **		Type	Section
Voice, Ground Start	LD--	02QC2.OOB	02QC2.OOC	5-4	2FXOG, 2FXSG	5.9.1
Voice, Loop Start	LC--	02QC2.OOD	02QC2.OOE	5-4	2FXOG, 2FXSG	5.9.1
Voice, Transmission Only - 2-Wire	LG--	02QC2.OOF	02QC2.OOF	5-4	ETO2G	5.9.2
Voice, Transmission Only - 4-Wire	LG--	04QC2.OOF	04QC2.OOF	5-4	ETO4	5.9.2
Voice, Reverse Battery	LD--	02QC2.RVO	02QC2.RVT	5-4	DPO, DPTG	5.9.3
Digital data, 2.4 kbit/s	XA--, XA-X *	04QB5.00 04QC5.OOJ 04QC5.OOJ	04QB5.00 04QB5.00 04QC5.OOJ	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 2.4 kbit/s with Secondary Channel	XAB- XABX *	04QB5.00 04QC5.OOJ 04QC5.OOJ	04QB5.00 04QB5.00 04QC5.OOJ	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 4.8 kbit/s	XB--, XB-X *	04QB5.00 04QC5.OOK 04QC5.OOK	04QB5.00 04QB5.00 04QC5.OOK	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 4.8 kbit/s with Secondary Channel	XBB- XBBX*	04QB5.00 04QC5.OOK 04QC5.OOK	04QB5.00 04QB5.00 04QC5.OOK	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 9.6 kbit/s	XG--, XG-X *	04QB5.00 04QC5.OOL 04QC5.OOL	04QB5.00 04QB5.00 04QC5.OOL	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 9.6 kbit/s with Secondary Channel	XGB- XGBX *	04QB5.00 04QC5.OOL 04QC5.OOL	04QB5.00 04QB5.00 04QC5.OOL	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 19.2 kbit/s	XC-- XC-X*	04QB5.00 04QC5.OOM 04QC5.OOM	04QB5.00 04QB5.00 04QC5.OOM	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 19.2 kbit/s with Secondary Channel	XCB-, XCBX *	04QB5.00 04QC5.OOM 04QC5.OOM	04QB5.00 04QB5.00 04QC5.OOM	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 56.0 kbit/s	XH-X *	04QB5.00 04QC5.OOP 04QC5.OOP	04QB5.00 04QB5.00 04QC5.OOP	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 56.0 kbit/s with Secondary Channel	XHBX *	04QB5.00 04QC5.OOP 04QC5.OOP	04QB5.00 04QB5.00 04QC5.OOP	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Digital data, 64.0 kbit/s	XD-X *	04QB5.00 04QC5.OOQ 04QC5.OOQ	04QB5.00 04QB5.00 04QC5.OOQ	5-5	OCU-DP, DS0-DP	5.9.4 5.9.5
Basic Rate ISDN	AD--	02QC5.OOS	02QC5.OOV	5-6	ISDN "U"	5.9.6

* An X in the fourth position denotes no error correction (e.g., XA-X). See Section 5.7.2.
** The reverse combinations (Z-End to A-End) are also valid.

NCI codes on the same line are compatible. Other information is compatible in the same rows. See Section 6.3 for examples on reading the table.

Basic Rate ISDN required three (3) DS0 channels. Error correction for 56.0 and 64.0 kbit/s digital data channels is not available with the DS0 UDIT UNE.

6.3 Application Examples

6.3.1 Analog Voice Example

Suppose an analog voice channel with loop start signaling is required. The second entry in Table 6-1 indicates that the channel would by ordered by the NC code LC-- and the NCI codes 02QC2.OOD and 02QC2.OOE, one at each end (open and closed end respectively). These codes are described in Table 5-4. See Section 5.7.1 for further information.

This combination would order one FXOG and one FXSG channel unit at the indicated end. These units are described in Section 5.9.1. Additional information may be required to set the options as described in Section 5.9.1.

Note that there is only one valid combination of NCI code for voice channels with loop start signaling. A combination of 02QC2.OOD to 02QC2.OOD is not technically valid.

6.3.2 Digital Data Example

Suppose a 9.6 kbit/s digital data DS0 UDIT was desired with the intent of connecting the channel to a metallic loop at one end and a multiplexed transport system requiring a DS0-A signal at the other end. Secondary channel is not required and error correction is optional.

The appropriate row in Table 6-1 shows compatibility for two NC codes (XG-- or XG-X) with three potential NCI code pairs. Since error correction is optional, the NC code XG-- would be selected. See Section 5.7.2 for further information.

The second of the three NCI code pairs, 04QC5.OOL - 04QB5.00, will provide the proper connections to be used for metallic loop and DS0-A respectively as described in Table 5-5. OCU-DP and DS0-DP channel units will be provided at the respective ends. Options will be set as described in Sections 5.9.4 and 5.9.5.

Slightly different circumstances might require the use of other codes. The first of the three NCI code pairs would provide a DS0-DP channel unit at both ends of the DS0-DP channel. The third pair would provide OCU-DP channel units at both ends.

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7. Unbundled Customer Controlled Reconfiguration Element

7.1 Element Description

The Unbundled Customer Controlled Reconfiguration Element (UCCRE) gives a Competitive Local Exchange Carrier (CLEC) the ability to connect elements together into a network and reconfigure the network on a near-real-time basis. UCCRE is a part of the Unbundled Dedicated Interoffice Transport (UDIT) package of Unbundled Network Elements (UNEs).

UCCRE is similar to the QWEST finished service COMMAND A LINK℠. COMMAND A LINK℠ is described in PUB 77371, *COMMAND A LINK℠ Technical Description And Interface Combinations.* Readers will need to review this publication to fully understand the UCCRE product.

The primary difference between UCCRE and COMMAND A LINK℠ is that COMMAND A LINK℠ is an option available only with finished services. UCCRE may be used with UNEs and connections to the CLEC's collocated equipment. Other differences will be identified in this chapter. Further information found in PUB 77371 would apply.

Other Interconnector Designated Equipment (IDE) and QWEST-provided UNEs may be connected at the InterConnection Distribution Frame (ICDF) to the UCCRE Intelligent Network Element, usually a Digital Cross-Connect System (DCS).

The CLEC controls the DCS by means of a Customer Controller. The CLEC accesses the controller via a dial-up line or a QWEST attendant. Additional information about the controller may be found in PUB 77371.

UCCRE is available only in selected wire centers and on selected DCSs in these wire centers. Expansion to additional wire centers or DCSs is done on an inquiry basis.

7.2 Types of Ports

There are three types of UCCRE ports: DS1, DS3 and Virtual. PUB 77371 discusses additional information about the ports. Figure 7-1 illustrates a DS1 or DS3 UCCRE port with the DCS data link connection to the Customer Controller. The port consists of a DS1 or DS3 channel connected to a DS1 or DS3 DCS port. Customer access to control the DCS connections is via the Customer Controller and data link.

The CLEC has the responsibility to order and connect UCCRE ports, other UNEs, and their own equipment that are technically compatible. The primary considerations at the DS1 and DS3 levels are the line code and frame format. See PUB 77371 for further information.

7.3 Types of Digital Cross-Connect Systems

There are two basic types of DCSs used with UCCRE. They are the 1/0 DCS and the 3/1 DCS.

The 1/0 DCS has DS1 ports and the reconfigurations are done at the DS0 level.

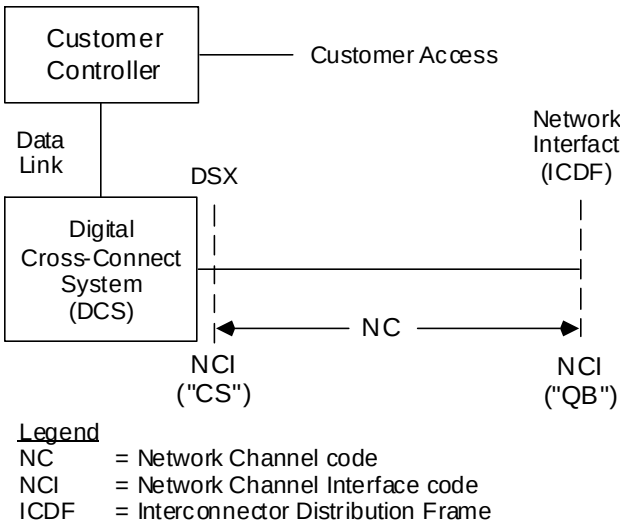

Figure 7-1: Unbundled Customer Reconfiguration Element Port

The 3/1 DCS has both DS1 and DS3 ports. The reconfigurations are done at the DS1 level.

The software system used with the Customer Controller will enable the CLEC to reconfigure groups of channels using a single command. For example, all 24 DS0 channels from a DS1 port may be reconfigured using a single command.

CLECs wishing to reconfigure DS0 level channels transported in a DS3 channel will have to use a two-step configuration. There are two alternatives.

One alternative is to demultiplex the DS3 to DS1 level and then order DS1 ports on a 1/0 DCS. The latter will give the DS0 reconfiguration capability.

The other alternative is to order DS3 and DS1 ports on a 3/1 DCS and then order DS1 ports on a 1/0 DCS. Then the DS1 ports on both DCSs must be connected together at the ICDF. The 1/0 DCS will give the DS0 reconfiguration capability.

Those CLECs requiring the COMMAND A LINK℠ DS0 port functionality will have to build their own. This may be done using UNEs by purchasing a UCCRE DS1 port on a 1/0 DCS and connecting it to either their own DS1 multiplexer or to a DS1 UDIT multiplexer UNE (described in Chapter 5). This combination of UNEs will create the equivalent of 24 DS0-level COMMAND A LINK℠ ports.

7.4 Terminations and Design Issues

The DCS port will be connected to the ICDF frame using tie cables via the appropriate DSX cross-connect frame. This DSX frame serves both as a "Design-To" point and as a Network Interface at the DCS. The CLEC may then connect the UCCRE port to other elements or IDE at the ICDF. Keep in mind that the ICDF may be the "Design-To" Point in some wire centers.

As with other UNEs, the CLEC must design to the "Design-To" point.

One exception to this arrangement is the DS1 ports on a 3/1 DCS. This exception does **not** apply to DS3 ports on 3/1 DCSs or DS1 ports on 1/0 DCSs. These DCS ports will be directly connected from the DS1 port on the 3/1 DCS to the DS1 ICDF with no intervening DSX-1. Since the DCS will be directly connected to the ICDF, the signal at the ICDF will be a templated DS1 signal. The DS1 ICDF in this situation serves as both the Network Interface and the "Design-To" point. See Appendix B or PUB 77386 for further information.

The order interval for the DS1 port on the 3/1 DCS will be longer than for other UCCRE port arrangements and other UNEs. The normal process is that QWEST places tie cables and terminations from the DSX-1 frames used by the UNEs. However, in this situation, DS1 tie cables will have to be placed between the 3/1 DCS and the DS1 ICDF when the UCCRE ports are ordered.

7.5 Applicable Network Channel and Network Channel Interface Codes

7.5.1 DS1 Ports

The Network Channel Interface (NCI) code for the DS1 port appearance on the ICDF (Figure 7-1) is 04QB9.11 as defined in Chapter 5.

The NCI code next to the DCS (Figure 7-1) is 04CS9.10R or 04CS9.31R as described in PUB 77371. This is electrically similar to the 04DS9 NCI code. Specifically, the 10R option indicates that the DS1 channel is connected to a 1/0 DCS with customer reconfiguration capability. Similarly, the 31R option applies to the DS1 port on a 3/1 DCS with customer reconfiguration capability.

The CLEC must treat the 04CS9.11R interface as a DS1 "Design-To" point when designing any DS1 being connected to the port.

The 04CS9.31R code should be used for the 3/1 DCS although there is no DSX-1 frame at the location. At discussed in Section 7.4, the 04QB9.11 NCI describes both the network interface and the "Design-To" point and the signal will meet the templated signal requirements.

There are several Network Channel (NC) codes used depending on the line code and frame format. Not all are available in all locations. Table 7-1 defines the NC Codes.

Table 7-1: DS1 Port Network Channel Codes

Network Channel Code	Description
HC-C	Superframe, Alternate Mark Inversion, and Customer Reconfigurable
HCDC	ANSI T1.403-1995 Extended Superframe, Alternate Mark Inversion, and Customer Reconfigurable.
HCEC	ANSI T1.403-1995 Extended Superframe, B8ZS, and Customer Reconfigurable.
HCFC	Non-ANSI Extended Superframe, Alternate Mark Inversion, and Customer Reconfigurable.
HCGC	Non-ANSI Extended Superframe, B8ZS, and Customer Reconfigurable.
HCZC	Superframe, B8ZS, and Customer Reconfigurable.

7.5.2 DS3 Ports

The NCI code for the DS3 port appearance on the ICDF (Figure 7-1) is 04QB6.33 as defined in Chapter 4.

The NCI code next to the DCS is 04CS6.31R as described in PUB 77371. This is electrically similar to the 04DS6 NCI code. Specifically, the 31R option indicates that the DS3 channel is connected to a DS3 port on a 3/1 DCS with customer reconfiguration capability.

The CLEC must treat this interface as a DS3 "Design-To" point when designing any DS3 being connected to the port.

The only applicable NC code is HF-- as defined in Chapter 4. This code does not explicitly identify the port as "Customer Reconfigurable" as is done with the DS1 port NC codes. However, the option "R" in the 04CS6.31R NCI code at the DCS identifies this as a UCCRE port and not another type of DS3 channel.

7.5.3 Virtual Ports

Virtual ports are used to provide cross-connections between separate customer's networks both appearing on the same DCS. This feature is useful in situations where two customers want to share information. A shared disaster recovery site is a typical application. The customers would connect a circuit to the recovery site via a virtual port.

A partition is set up by QWEST in the Customer Controller between each customer's services when circuits are initially defined. Each customer has access to only one side of the virtual port.

The ports are implemented using software and are controlled by the Customer Controller. Virtual ports are available in all sizes. The virtual port may be thought of as being internal to the DCS and having no direct network interface. The virtual port is accessed only through standard DS3 or DS1 ports into the DCS. That is, the CLEC must have ordered standard DS3 or DS1 ports to get into the DCS. Virtual ports have no external connections.

7.5.4 Summary of NC/NCI codes

Table 7-2 summarizes the compatible NC and NCI codes. Codes in the same row are compatible subject to limitations on the specific DCS. PUB 77371 should be consulted for further information.

7.6 Establishing a Customer Network

The CLEC must arrange to become a UCCRE customer prior to ordering any UCCRE ports to build a customer network using UCCRE. Network, in this context, means a collection of UNEs and the CLEC's own equipment and facilities used to provide services to the CLEC's customers.

A QWEST Customer Controller System Administrator must establish the CLEC in the Customer Controller database. When ports are ordered, the System Administrator will establish the ports in the database and connect initial cross-connects as directed by the CLEC. Once this is done, the CLEC may reconfigure the connections as needed.

The customer makes the reconfigurations by using a dial up data connection to the Customer Controller or by calling a QWEST attendant. Full details will be provided when the customer establishes the database.

Figure 7-2 illustrates a simple UCCRE customer network with three DS1 ports. Port 1 is connected to the CLEC's IDE. Port 2 is connected to an Unbundled DS1 Capable Loop. Port 3 is connected to a DS1 UDIT to a remote wire center. Regenerators are ordered as required. The CLEC intends to connect their equipment alternatively to the loop and the UDIT UNE. UCCRE also would permit the CLEC to connect Port 2 to Port 3 if the CLEC desired.

Table 7-2: Compatible NC and NCI Codes

Port Type	Description Line Code and Frame Format	NC Codes	NCI Codes	
			ICDF	DCS *
DS1	Superframe, Alternate Mark Inversion, and Customer Reconfigurable	HC-C	04QB9.11 04QB9.11R	04CS9.10R 04CS9.11R 04CS9.31R
	ANSI T1.403-1995 Extended Superframe, Alternate Mark Inversion, and Customer Reconfigurable.	HCDC	04QB9.11 04QB9.11R	04CS9.10R 04CS9.11R 04CS9.31R
	ANSI T1.403-1995 Extended Superframe, B8ZS, and Customer Reconfigurable.	HCEC	04QB9.11 04QB9.11R	04CS9.10R 04CS9.11R 04CS9.31R
	Non-ANSI Extended Superframe, Alternate Mark Inversion, and Customer Reconfigurable.	HCFC	04QB9.11 04QB9.11R	04CS9.10R 04CS9.11R 04CS9.31R
	Non-ANSI Extended Superframe, B8ZS, and Customer Reconfigurable.	HCGC	04QB9.11 04QB9.11R	04CS9.10R 04CS9.11R 04CS9.31R
	Superframe, B8ZS, and Customer Reconfigurable.	HCZC	04QB9.11 04QB9.11R	04CS9.10R 04CS9.11R 04CS9.31R
DS3	DS3, M2/3 Multiplex Format	HF--	04QB6.33 04QB6.33R	04CS6.31R 04CS6.33R **

* Not all types of DCS connections are available in a given location. See PUB 77371 for further information about these interfaces.

** The DS3 channel to a 04CS6.33R interface may be unchannelized without M2/3 format.

This customer network is built as follows: First, all IDE is installed and ICDF terminations are ordered.

Second, the CLEC arranges to use UCCRE on the DCS in this wire center. QWEST provides the CLEC with ID and password for the customer controller. Operating instructions are also provided.

Third, the UNEs are ordered as described (in no particular order) in the following paragraphs. Finally, the jumpers are placed on the ICDF to connect everything together.

The three DS1 UCCRE ports are ordered using the NC code HCEC. The CLEC tells the QWEST system administrator how to connect the initial ports together (not shown).

The CLEC has determined that regenerators would not be required to connect to the IDE but would be required to connect the UCCRE ports to the UDIT and Loop. The CLEC choose to order the regenerators as an option on UCCRE port #3 and on the DS1 loop.

The three DS1 UCCRE ports are terminated on the ICDF at locations identified by the numbers 1, 2 and 3. The appropriate NCI codes used to order the three ports are shown. Note that Number 3 has the regenerator.

The DS1 UDIT is terminated at Number 4 with the NCI code 04QB9.11. The NC code used to order this UNE is HCE-.

Unbundled Customer Controlled Reconfiguration Element
Customer Network Example

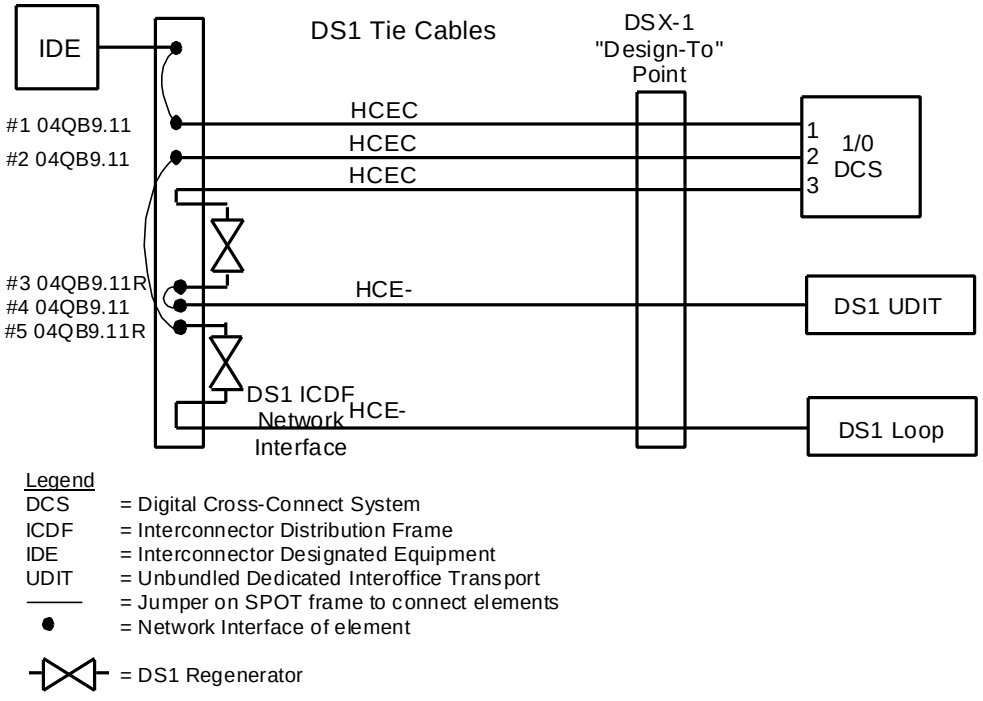

Figure 7-2: Example of Customer Network

The Unbundled DS1 capable loop is terminated at Number 5 with the NCI code 04QB9.11R. The option “R” provided the regenerator. The NC code used to order this UNE is HCE-.

Once the jumpers are connected, the CLEC can reconfigure this network as needed.

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8. OC-n Unbundled Dedicated Interoffice Transport (UDIT)

8.1 General Description

Unbundled Dedicated Interoffice Transport (UDIT) at the Synchronous Optical NETwork (SONET) level provides two-point channels at the Optical Carrier (OC) levels of OC-3 (155.52 Mbit/s), OC-12 (622.08 Mbit/s), OC-48 (2.488 Gbit/s) and OC-192 (9.865 Gbit/s) between two QWEST wire centers. OC-n UDIT is available to Competitive Local Exchange Carriers (CLECs) to provide high bandwidth transport channels between two QWEST wire centers.

OC-n UDIT is based on QWEST's Synchronous Service Transport (SST) Service. Further technical information about SST may be found in PUB 77346. The publication includes more detailed information about the technical characteristics of the SONET signal formats, synchronization issues, performance specifications and maintenance responsibilities. This chapter includes only selected information about the UNE as it applies to OC-n UDIT including the necessary Network Channel (NC) and Network Channel Interface (NCI) codes used in ordering the UNE.

Customers requiring more features than included in the OC-n UDIT offering should consider ordering a Finished Service such as SST.

Additional information about the OC-n UDIT offering may also be found in the appropriate tariff, catalog or contract.

Technical specifications presented in this document apply to OC-n UDIT only. This document does not attempt to describe the various types of transmission equipment used to provide these interfaces.

Due to the semi-custom nature of OC-n UDIT, some joint engineering will be required. Order intervals, pricing and processes may differ from other UDIT UNEs. These non-technical differences are beyond the scope of this publication.

8.2 Network Interfaces and Network Channel Interface (NCI) Codes

OC-n UDIT is available with a number of different Network Interfaces (NIs). Table 8-1 lists the available NIs with each type of OC-n UDIT. Combinations of NIs are available as listed on each row. These NIs are further described in this section.

Table 8-1: OC-n UDIT Network Interface Availability

Interface Type Combinations	OC-n UDIT Transport Capacity			
	OC-3	OC-12	OC-48	OC-192
OC-3	X			
OC-12		X		
OC-48			X	
OC-192				X

Through the purchase of finished services or additional multiplex equipment beyond the UDIT offering, the following interface types may be made available on corresponding transport capacities:

Table 8-2: Interface Combinations

INTERFACE TYPE	TRANSPORT CAPACITY				
	OC-3	OC-3c*	OC-12	OC-48	OC-192
DS1	YES	NO	YES	NO	NO
DS3/STS-1	YES	NO	YES	YES	YES
OC-3	YES	NO	YES	YES	YES
OC-3 with an STS-3c	NO	YES	YES	YES	YES
OC-12	NO	NO	YES	YES	YES
DS1 & DS3/STS-1	YES	NO	YES	NO	NO
DS3/STS-1 & OC-3	NO	NO	YES	YES	YES
OC-3 & OC-12	NO	NO	NO	YES	YES
DS3/STS-1, OC-3 & OC-12	NO	NO	NO	YES	YES
OC-24	NO	NO	NO	YES	YES
OC-48	NO	NO	NO	YES	YES

Notes: * The OC-3c Transport Capacity indicates a single OC-3 containing an STS-3c signal

Figure 8-1 illustrates the optical interface arrangement.

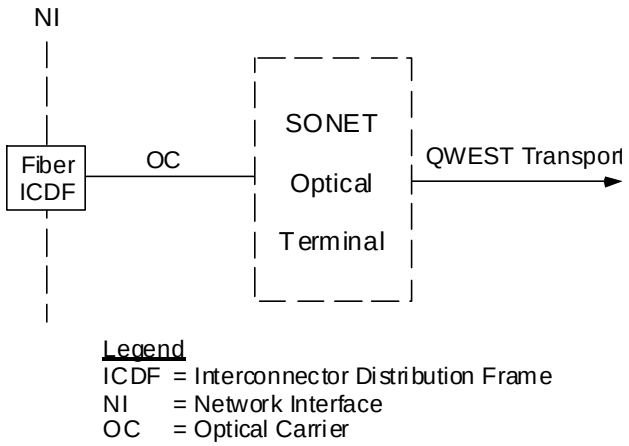


Figure 8-1: Optical Interface Arrangements

8.2.1 Optical Network Interfaces -- General

The Fiber InterConnection Distribution Frame (ICDF) cross-connect bay or frame serves as the optical NI.

The Fiber ICDF is described in PUB 77386. Connections provided will be of the appropriate type for the Fiber ICDF and the specific optical interface ordered. QWEST will notify the CLEC as to the type of connectors so that the CLEC may obtain the appropriate jumpers.

It is the transmitting party's responsibility to achieve the minimum fixed optical power level at the interface as listed in Table 8-3. If available and appropriate, the QWEST LASER will be a short reach optic as defined in GR-253-CORE. Otherwise, an intermediate LASER will be substituted.

Table 8-3: Minimum Fixed Optical Power Point

Interface	Rate	Minimum Fixed Power Point
OC-3	155.52 Mbit/s	- 20 dBm
OC-12	622.08 Mbit/s	- 17 dBm
OC-48	2.488 Gbit/s	- 11 dBm
OC-192	9.865 Gbit/s	- 17 dBm

Connections with OC-n UDIT will require that the customer and QWEST do some joint engineering to communicate technical parameters beyond the capability of the NC and NCI codes.

8.2.2 OC-3 Interface

An OC-3 interface provides a high capacity channel for the bi-directional transmission of 155.52 Mbit/s, using an optical interface, delivered from QWEST owned Line Terminating Equipment. The OC-3 Interface is further described in PUB 77346.

8.2.3 OC-12 Interface

The OC-12 interface provides a high capacity channel for the bi-directional transmission of 622.08 Mbit/s, using an optical interface, delivered from QWEST owned Line Terminating Equipment. The OC-12 Interface is further described in PUB 77346.

8.2.4 OC-48 Interface

An OC-48 interface provides a high capacity channel for the bi-directional transmission of 2.488 Gbit/s, using an optical interface, delivered from QWEST owned Line Terminating Equipment. The OC-48 Interface is further described in PUB 77346.

8.2.5 OC-192 Interface

An OC-192 interface provides a high capacity channel for the bi-directional transmission of 9.865 Gbit/s, using an optical interface, delivered from QWEST owned Line Terminating Equipment. The OC-192 Interface is further described in PUB 77346. Higher bandwidth capacities are available on special request and as facilities are available.

8.2.6 Four Fiber OC-n Interfaces

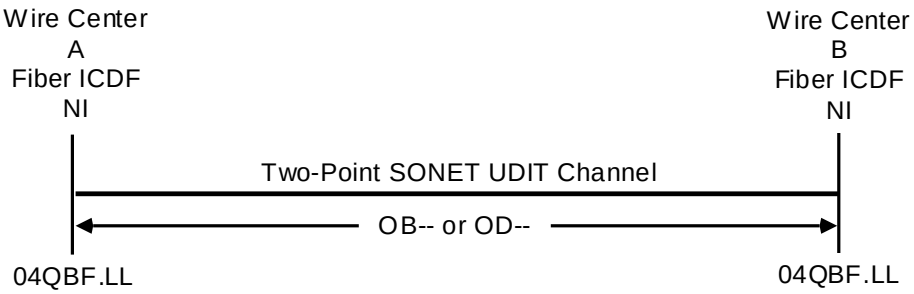
The standard SONET NI is a 4-fiber interface. This NI consists of a pair of fibers for a working channel and a pair for the protection channel. See PUB 787346, ANSI T1.105.01-1995, *Synchronous Optical Network (SONET) -- Automatic Protection*, and ANSI T1.105.06-1996, *Synchronous Optical Network (SONET) --Physical Layer Specifications*, for further information.

8.2.7 Optical “Design-To” Point

The concept of a “Design-To” point cross-connect frame has little meaning at the optical level as discussed in PUB 77386. The optical span between LASER and detector must be designed as a unit.

8.3 OC-n Two-Point UDIT Elements

OC-n two-point UDIT elements are available in OC-3, OC-12 and OC-48 sizes. Figure 8-2 illustrates the arrangement.



ICDF = Interconnector Distribution Frame
NI = Network Interface
UDIT = Unbundled Dedicated Interoffice Transport

Figure 8-2: OC-n Two-Point UDIT Element

The Network Channel (NC) codes and Network Channel Interface (NCI) codes that apply are listed in Tables 8-4 and 8-5 respectively.

Table 8-4: Two-Point OC-n UDIT Network Channel Codes

NC Code	Description
OB--	OC-3 SONET Point-to-Point (No Central Office Multiplexing)
OD--	OC-12 SONET Point-to-Point (No Central Office Multiplexing)
OF--	OC-48 SONET Point-to-Point (No Central Office Multiplexing)
OG--	OC-192 SONET Point-to-Point (No Central Office Multiplexing)

Table 8-5: OC-n UDIT Network Channel Interface Codes

NC Code	Description
04QBF.LL	Manual Cross-Connect Termination With No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay

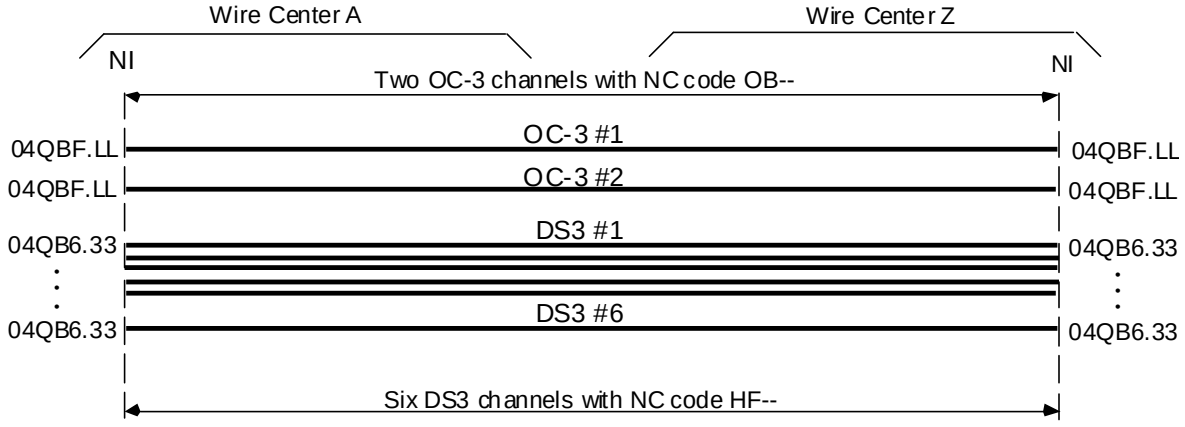
8.4 Protection Configuration

OC-n UDIT has the same traditional SONET protection the normal QWEST SONET network infrastructure provides.

CLECs desiring additional protection may purchase additional UDIT UNEs and/or finished services for the level of protection required. The CLEC may have to provide protection equipment to meet their needs with the UNE alternative. QWEST Finished Services providing enhanced levels of service protection include Self-Healing Network Service (SHNS), SONET Ring Service and others. Further details may be found in appropriate tariffs.

8.5 Application Example

Assume a situation: A CLEC wishes to purchase two OC-3 and six DS3 UDIT channels from QWEST between Wire Center A and Wire Center Z as illustrated in Figure 8-5. The two OC-3 channels are coded with the NC code OB-- (from Table 8-3) and NCI codes 04QBF.LL (from Table 8-4). The six DS3 channels are coded with the NC code HF-- (from Table 4-2) and NCI codes 04QB6.33 (from Table 4-1).



Legend:
NC = Network Channel
NCI = Network Channel Interface
NI = Network Interface
OC = Optical Carrier

Note:
The NI for the 04QBF.LLs is a Fiber Single Point of Termination (SPOT) frame. The NI for the 04QB6.33 is a DS3 SPOT frame.

Figure 8-3: OC-n UDIT Application Example

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9. Extended-UDIT (E-UDIT)

9.1 Introduction

The standard Unbundled Dedicated Interoffice Transport (UDIT) two-point Unbundled Network Element (UNE) provides a dedicated transport channel between two QWEST wire centers or between a QWEST wire center and another Local Exchange Carrier's (LEC's) wire center located outside of the QWEST exchange area.

There may be circumstances when dedicated transport is required to a wire center belonging to another carrier located within QWEST's exchange area. The other carrier may be a Competitive Local Exchange Carrier (CLEC) or an Interexchange Carrier. A UNE is available called *Extended-UDIT* (E-UDIT) to meet this need. In some jurisdictions the UDIT product definition shall include the E-UDIT. See state specific Statement of Generally Available Terms and Conditions (SGAT) for availability.

E-UDIT is available between the other carrier's wire center and the adjacent or *Serving* QWEST wire center. E-UDIT may be connected to another UNE or to the CLEC's Interconnector Designated Equipment (IDE) collocated in the QWEST wire center.

E-UDIT is available only where appropriate spare facilities exist. Arrangements must be made with QWEST for facilities to be built in situations where facilities do not exist. These arrangements may require additional charges, contracts and / or joint engineering. Normal order intervals will be impacted if facilities are not available. Full information about these processes and charges is beyond the scope of this publication.

In the situation where the other carrier is not the CLEC, it will be up to the two carriers to determine who will pay for any additional charges, who will do the joint engineering, etc.

The availability and details of E-UDIT may vary depending on regulatory order, tariffs, contracts, cable wire service termination policies and agreements, and other limitations. Full details of these limitations and differences are beyond the scope of this technical publication.

The remainder of this chapter assumes that these added processes have been completed and that the facilities are in place.

9.2 General Description

E-UDIT provides a two-point dedicated transport channel at the DS1, DS3, or OCn levels. Some levels are not available in some wire center areas.

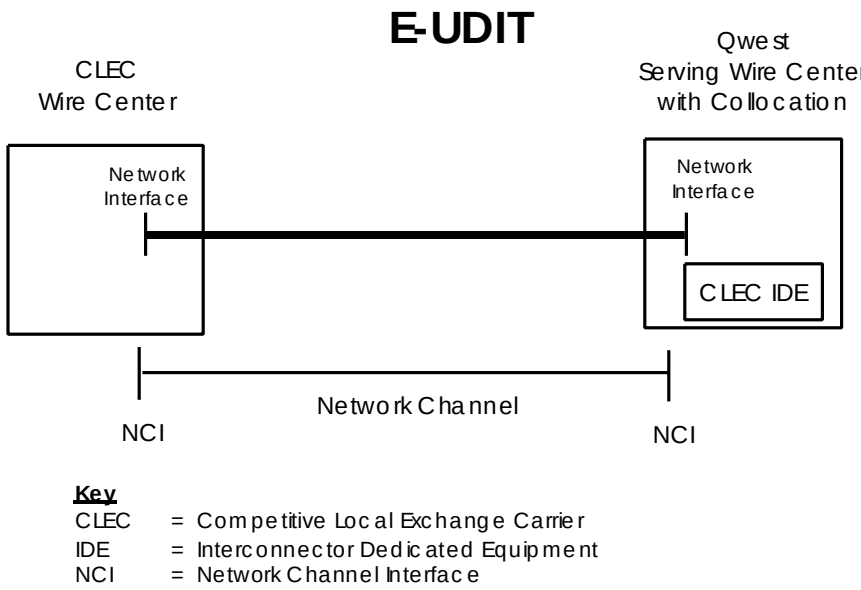

Figure 9-1: Typical E-UDIT Arrangement

There is no E-UDIT multiplexing UNE available. However, the various UDIT multiplexing UNEs will be available in the QWEST wire center as described previously in this publication. QWEST will not place any electronic equipment in the other carrier's wire center. The CLEC will have to arrange with the other carrier for any additional multiplexing or other electronic equipment required or, alternatively, provide the electronic equipment themselves.

The channels available with E-UDIT are generally the same as the DS1 or above channels available with UDIT. The Network Interfaces (NIs) in the QWEST wire center are the same as the NIs available with UDIT. An E-UDIT with UDIT functionality can be established at the same time. The following figure illustrates that type of situation.

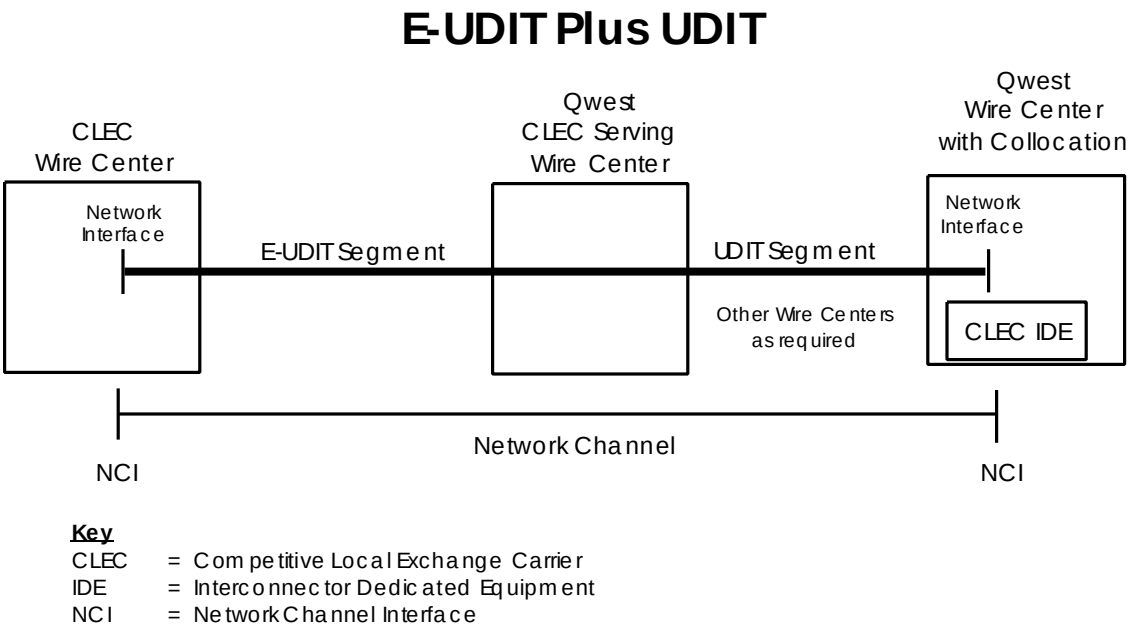

Figure 9-2: Typical E-UDIT Plus UDIT Arrangement

However, the NIs available at the other carrier end will depend on the existing facility and equipment. The Network Channel Interface (NCI) codes listed in this chapter list the potential NIs available along with some additional application information. Some generic information about the facility used to transport the E-UDIT is provided in the next section.

The NI will be located at the other carrier's wire center or at some point between the two wire centers. The location and type of NI is negotiated when the basic transport facility was initially established.

The network interface (NI) inside a building will typically be some form of a jack, connecting block or cross-connect panel. The NI outside a building will typically be a splice.

The other carrier is responsible for all facilities and equipment on their side of the NI.

9.3 Basic Transport Facility

9.3.1 Establishing the Facility

The basic transport facility is the cable, structure and needed equipment to transport channels between the QWEST and other carrier's wire centers. This facility is sometimes known as *infrastructure.*

The facility is established at or above the level of any anticipated services or UNEs. The negotiations occurring to establish the facility normally include a forecast of expected channel types (i.e., services and UNEs) and quantities by the other carrier. Higher level transport with multiplexing is commonly used in the industry to transport multiple lower level channels. This forecast of expected requirements will help determine the type of facility.

DS1 level channels may be transported on metallic or fiber cables. DS3 and above channels are transported on fiber cables.

The other carrier will provide a portion of the facility. The amount is determined during the negotiation process when the basic facility is established.

The part of the facility provided by the other carrier could be as little as mounting space in a frame for a Fiber Distribution Panel (FDP). The other carrier-provided part of the facility could also include part of the cable and supporting structure plus multiplexing and terminal equipment at their end.

The negotiation process will help determine the NI types that will be available at the other carrier's end. The forecasted need for facilities may indicate that a higher level of transport for the base facility be appropriate. The multiplexing and terminal equipment would be provided by QWEST and the other carrier in their respective wire centers.

A discussion about added charges to cover the establishment of the base facility is beyond the scope of this publication.

The following two sections describe the types of NIs available with fiber and metallic cable transport facilities. These descriptions contain some information that applies only to the E-UDIT application. The actual availability of a specific NI (identified by a specific NCI code) is limited by the type of basic transport facility.

9.3.2 Description of Optical Interfaces

The optical NIs are all Synchronous Optical NETwork (SONET) interfaces. The OC level will be determined during the negotiation process.

OC-3 Interface

An OC-3 interface provides a high capacity channel for the transmission of 155.52 Mbit/s channels. This NI requires joint engineering. The physical NI could be a FDP or a splice depending on the location of the NI and negotiations reached when the basic transport facility was installed.

Table 9-1 lists the descriptions of the SONET NIs available. Additional information about this interface may be found in PUB 77346.

Table 9-1: Optical Interface NCI Codes (SONET)

NCI Code	Description	Application
04SOF.F	SR-MLM (Short Reach - Multi-Longitudinal Mode)	Digital fiber optic interface: OC-3 and OC-12 *
04SOF.D	IR1-SLM (Intermediate Reach - Single-Longitudinal Mode)	Digital fiber optic interface: OC-3, OC-12 and OC-48 *
04SOF.B	LR1-SLM (Long Reach - Single-Longitudinal Mode)	Digital fiber optic interface: OC-3, OC-12, OC-48 and OC-192 *

* An NC Code is required in addition to the Optical Interface NCI Code to identify the service application and effective rate of OC-3, OC-12, OC-48 or OC-192. Not all interfaces are available for every SONET rate.

OC-12 Interface

An OC-12 interface provides a high capacity channel for the transmission of 622.08 Mbit/s channels. This NI requires joint engineering. The physical NI could be a FDP or a splice depending on the location of the NI and negotiations reached when the basic transport facility was installed.

Table 9-1 lists the descriptions of the SONET NIs available. Additional information about this interface may be found in PUB 77346.

OC-48 Interface

An OC-48 interface provides a high capacity channel for the transmission of 2.488 Gbit/s channels. This NI requires joint engineering. The physical NI could be a FDP or a splice depending on the location of the NI and negotiations reached when the basic transport facility was installed.

Table 9-1 lists the descriptions of the SONET NIs available. Note that the 04SOF.F NI is not available at this rate. Additional information about this interface may be found in PUB 77346.

OC-192 Interface

An OC-192 interface provides a high capacity channel for the transmission of 9.865 Gbit/s channels. This NI requires joint engineering. The physical NI could be a FDP or a splice depending on the location of the NI and negotiations reached when the basic transport facility was installed.

This NI is available only at the NI with the other carrier and not at the QWEST wire center.

Table 9-1 lists the descriptions of the SONET NIs available. Additional information about this interface may be found in PUB 77346.

9.3.3 Description of DS1 Metallic Interfaces

A DS1 interface provides a high capacity channel for the transmission of 1.544 Mbit/s channels. The DS1 NI available is the "DJ" NI. This NI is described in PUB 77375. Sections of PUB 77375 pertaining to *End-users* **DO NOT** apply to E-UDIT. This section contains excerpts from the pub.

The "DJ" NI requires joint engineering. This NI provides a *Jointly Designed* signal and is not templated. The physical NI is normally a splice or connecting block and can be located remotely from the customer's premises. QWEST will not place regeneration equipment on the customer's premises. The "DJ" NI will work with metallic facilities.

Table 9-2 lists the descriptions of the DS1 NIs available.

Table 9-2: DS1 Metallic NCI Codes

Line Code and Frame Format	NCI Code with Other Carrier
SF & AMI	04DJ9.15
ANSI ESF & AMI	04DJ9.1K
ANSI ESF & B8ZS	04DJ9.1S
Non-ANSI ESF & AMI	04DJ9.15K
Non-ANSI ESF & B8ZS	04DJ9.15S
Free Framing and B8ZS (May not be available in all situations *)	04DJ9.15J
SF & B8ZS	04DJ9.15B

* See PUB 77375 for additional information.

9.3.4 NCI Codes in QWEST Wire Center

Table 9-3 lists the NCI codes available in the QWEST wire center.

Table 9-3: NCI Codes in QWEST Wire Center

Level	Description	NCI Code
OC-192	Manual Cross-Connect Termination With No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay	04QBF.LL
OC-48	Manual Cross-Connect Termination With No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay	04QBF.LL
OC-12	Manual Cross-Connect Termination With No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay	04QBF.LL
OC-3	Manual Cross-Connect Termination With No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay	04QBF.LL
DS3	Manual Cross-Connect Termination with no subrating capability	04QB6.33
	Manual Cross-Connect Termination with no subrating capability with regeneration	04QB6.33R
DS1	Manual Cross-Connect Termination with no subrating capability	04QB9.11
	Manual Cross-Connect Termination with no subrating capability With Regeneration	04QB9.11R

9.3.5 Channel/Interface Level Relationships

The relationship of the level between the channel and the interface is important. The level of the NI must be at least the level of the channel. A DS1 channel, for example, must have at least a DS1 NI.

A NI at a higher level than the channel implies that multiplexing is involved that the customer may have to demultiplex before they can use the channel. If the customer orders DS1 E-UDITs, for example, and the facility has an OC-3 NI, QWEST would multiplex the DS1 E-UDITs together into an OC-3 and transport the OC-3 to the NI. The customer would then take the OC-3 and, assuming they wanted individual DS1s, demultiplex the OC-3 back into DS1s.

This relationship must be considered when selecting Network Channel (NC) and NCI codes from the following sections.

9.4 Compatible NC and NCI Codes

Table 9-4 lists the compatible NC and NCI codes to be used when ordering E-UDIT. The specific NCI code(s) available at the other carrier's NI will be determined by QWEST based on the installed base transport facility to the specific other carrier wire center.

The additional Description column includes information such as line code and frame format. The DS1 level line codes include Alternate Mark Inversion (AMI) and Bipolar with Eight Zero Substitution (B8ZS). The frame formats include Superframe (SF) and Extended Superframe (ESF). ESF has both American National Standards Institute (ANSI) and non-ANSI versions. See the appropriate PUB for further information.

9.5 E-UDIT Parameters

Technical and performance parameters for E-UDIT are the same as UDIT. The Technical Publications mentioned in this chapter also describe other services. However, some performance parameters, guarantees, etc. that apply to these other services do not apply to E-UDIT unless specifically mentioned.

The technical parameters of QWEST's portion of E-UDIT will be as described in this publication. The parameters of the other carrier's portion will depend on their standards.

9.6 Entrance to Other Carrier's Wire Center

In the arrangement where QWEST provides facility into the other carrier's wire center, QWEST will normally provide one entrance facility to one location on the non-QWEST property. Additional entrances may be negotiated as a part of the basic transport facility negotiations. The other carrier will have to arrange for the entrance(s) with the property owner.

Table 9-4: E-UDIT Compatible NC and NCI Codes

Level	Additional Description	NC Code	NCI Codes QWEST's Wire Center	NCI Codes Other Carrier's End	
OC-192	None	OG--	04QBF.LL		04SOF.B
OC-48	None	OF--	04QBF.LL	04SOF.D	04SOF.B
OC-12	None	OD--	04QBF.LL	04SOF.F 04SOF.D	04SOF.B
OC-3	None	OB--	04QBF.LL	04SOF.F 04SOF.D	04SOF.B
DS3	DS3 with M2/3 Multiplexer format	HF--	04QB6.33 *	04SOF.F 04SOF.D	04SOF.B
	DS3 with M2/3 Multiplexer format and C-Bit Parity	HFC-		04SOF.F 04SOF.D	04SOF.B
	DS3 - Unchannelized	HF--		04SOF.F 04SOF.D	04SOF.B
	DS3 - Unchannelized, With C-Bit Parity	HFC-		04SOF.F 04SOF.D	04SOF.B
DS1	AMI and SF	HC--	04QB9.11 *	04SOF.F 04SOF.D	04SOF.B 04DJ9.15 **
	ANSI ESF and AMI	HCD-		04SOF.F 04SOF.D	04SOF.B 04DJ9.1K **
	ANSI ESF and B8ZS	HCE-		04SOF.F 04SOF.D	04SOF.B 04DJ9.1S **
	Non-ANSI ESF and AMI	HCF-		04SOF.F 04SOF.D	04SOF.B 04DJ9.15K **
	Non-ANSI ESF and B8ZS	HCG-		04SOF.F 04SOF.D	04SOF.B 04DJ9.15S **
	Free Framing and B8ZS (May not be available in some locations.)	HCJ-		04SOF.F 04SOF.D	04SOF.B 04DJ9.15J **
	SF and B8ZS	HCZ-		04SOF.F 04SOF.D	04SOF.B 04DJ9.15B **

* Append an "R" to obtain regeneration. See Table 9-3.
** Metallic cable only. The 04SOF NCI codes apply to fiber cable only.

9.7 Example of NC and NCI Code Usage

Assume the CLEC wants to order one OC-3 and two each of DS3 and DS1 E-UDITs. Assume the DS1 is ANSI ESF and B8ZS. Also, assume that the DS3 is M2/3 with C-Bit parity.

QWEST provides only a portion of the facility and equipment between the QWEST wire center and the other carrier's wire center. The remainder of the facility and equipment is provided by the other carrier. The two facilities meet at a mutually agreed point. The facility types and other details are jointly engineered by QWEST and the other carrier.

The NI presented to the other carrier will be the NI negotiated with the other carrier. This NI may be at a higher level than the E-UDIT ordered by the CLEC. QWEST will notify the CLEC as to the NCI code to be used in ordering the QWEST's portion of the E-UDIT.

In this example, the existing basic transport facility between QWEST and the other carrier wire centers is jointly provided with the NI at a splice midway between the two wire centers. For NC and NCI code purposes, it would make no difference if the NI was in the other carrier's wire center.

Assume QWEST and the other carrier have established an OC-12 system with spare capacity for the CLEC's order. Assume the NCI code at the Meet Point is 04SOF.F.

Table 9-5 lists the UNEs ordered by the CLEC. The NC and NCI codes came from Table 9-4.

Table 9-5: UNEs Ordered by CLEC -- Jointly Provided Facility

Quantity	Description	NC Code	NCI Code QWEST End	NCI Code at Meet Point
1	OC-3	OB--	04QBF.LL	04SOF.F
2	DS3 (M2/3, C-Bit)	HFC-	04QB6.33R *	04SOF.F
2	DS1 (ANSI ESF, B8ZS)	HCE-	04QB9.11 **	04SOF.F

* Regeneration required.
** Regeneration not required.

Figure 9-3 illustrates the example. NC and NCI codes are shown. Heavy lines denote facilities provided by QWEST. Thin lines denote facilities provided by the other carrier.

NC and NCI codes for the other carrier's portion are not shown. The other carrier may choose to not place the illustrated FDP and DSX panels at their end.

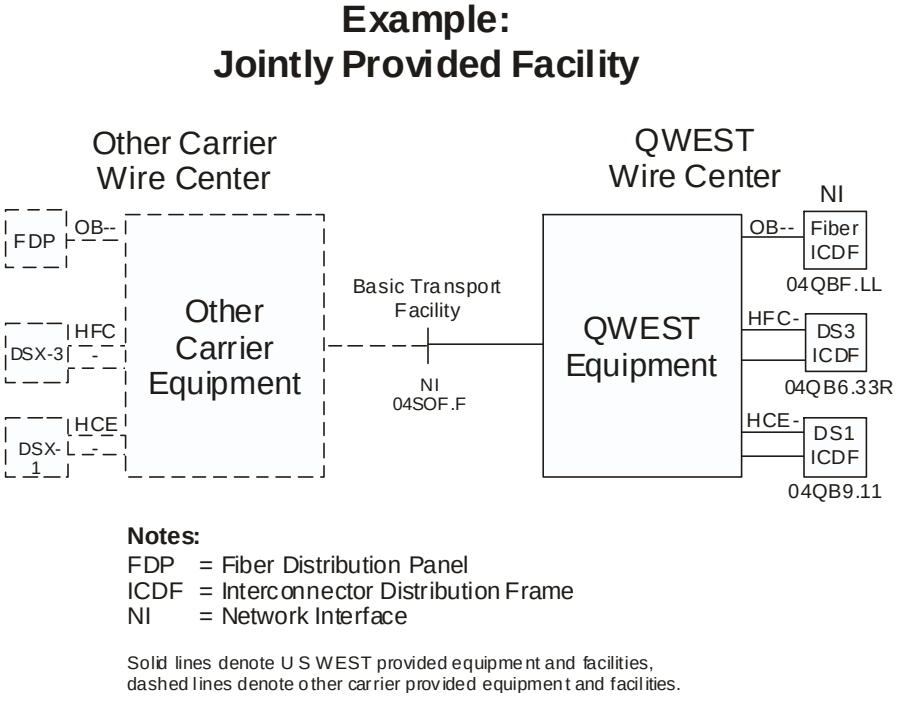

Figure 9-3: Example – Jointly Provided Facility

9.8 SONET Optical Multiplexer Configuration NCI Codes

In some jurisdictions, OC-n UDITs may include SONET Optical Multiplexer capabilities. When multiplexing options require the order specify an NCI code, that determines the configuration of the multiplexer. Table 9-6 lists NCI codes for SONET Optical Multiplexer operating at the OC-3 rate.

Table 9-6 Configuration Network Channel Interface (NCI) Codes - OC-3 SONET Optical Multiplexer or equivalent

CONFIGURATION NCI CODE	QUANTITY OF OC-3's	QUANTITY OF DS3' s/STS-1's	QUANTITY OF DS1's
One Code must be specified for the Multiplexer Site			
04SMF.A3	0	3	0
04SMF.A21	0	2	28
04SMF.A12	0	1	56
04SMF.A03	0	0	84

Table 9-7 lists NCI codes for SONET Optical Multiplexer operating at the OC-12 rate.

Table 9-7 Configuration Network Channel Interface (NCI) Codes - OC-12 SONET Optical Multiplexer or equivalent

CONFIGURATION NCI CODE	QUANTITY OF OC-3's	QUANTITY OF DS3' s/STS-1's	QUANTITY OF DS1's
One Code must be specified for the Multiplexer Site			
04SMF.E0	4	0	0
04SMF.D3	3	3	0
04SMF.D21	3	2	28
04SMF.D12	3	1	56
04SMF.D03	3	0	84
04SMF.C6	2	6	0
04SMF.C51	2	5	28
04SMF.C42	2	4	56
04SMF.C33	2	3	84
04SMF.C24	2	2	112
04SMF.C15	2	1	140
04SMF.C06	2	0	168
04SMF.B9	1	9	0
04SMF.B81	1	8	28
04SMF.B72	1	7	56
04SMF.B63	1	6	84
04SMF.B54	1	5	112
04SMF.B45	1	4	140
04SMF.B36	1	3	168
04SMF.B27	1	2	196
04SMF.B18	1	1	224
04SMF.B09	1	0	252
04SMF.AC	0	12	0

Note: Each OC-3 can provide either three DS3s or three STS-1s but not a combination of DS3s and STS-1s.

Table 9-7 Configuration Network Channel Interface (NCI) Codes - OC-12 SONET Optical Multiplexer (Continued)

CONFIGURATION NCI CODE	QUANTITY OF OC-3's	QUANTITY OF DS3' s/STS-1's	QUANTITY OF DS1's
One Code must be specified for the Multiplexer Site			
04SMF.AB1	0	11	28
04SMF.AA2	0	10	56
04SMF.A93	0	9	84
04SMF.A84	0	8	112
04SMF.A75	0	7	140
04SMF.A66	0	6	168
04SMF.A57	0	5	196
04SMF.A48	0	4	224
04SMF.A39	0	3	252
04SMF.A2A	0	2	280
04SMF.A1B	0	1	308
04SMF.A0C	0	0	336

Note: Each OC-3 can provide either three DS3s or three STS-1s but not a combination of DS3s and STS-1s.

Table 9-8 lists NCI codes for SONET Optical Multiplexer operating at the OC-48 rate.

Table 9-8 Configuration Network Channel Interface (NCI) Codes - OC-48 SONET Optical Multiplexer or equivalent.

CONFIGURATION NCI CODE	QUANTITY OF OC-12's	QUANTITY OF OC-3's	QUANTITY OF DS3's/STS-1's
One Code must be specified for the Multiplexer Site			
04SNF.E	4	0	0
04SNF.D4	3	4	0
04SNF.D31	3	3	3
04SNF.D22	3	2	6
04SNF.D13	3	1	9
04SNF.D04	3	0	12
04SNF.C8	2	8	0
04SNF.C71	2	7	3
04SNF.C62	2	6	6
04SNF.C53	2	5	9
04SNF.C44	2	4	12
04SNF.C35	2	3	15
04SNF.C26	2	2	18
04SNF.C17	2	1	21
04SNF.C08	2	0	24
04SNF.BC	1	12	0
04SNF.BB1	1	11	3
04SNF.BA2	1	10	6
04SNF.B93	1	9	9
04SNF.B84	1	8	12
04SNF.B75	1	7	15
04SNF.B66	1	6	18

Note: Each OC-3 can provide either three DS3s or three STS-1s but not a combination of DS3s and STS-1s.

Table 9-8 Configuration Network Channel Interface (NCI) Codes - OC-48 SONET Optical Multiplexer. (Continued)

CONFIGURATION NCI CODE	QUANTITY OF OC-12's	QUANTITY OF OC-3's	QUANTITY OF DS3's/STS-1's
One Code must be specified for the Multiplexer Site			
04SNF.B57	1	5	21
04SNF.B48	1	4	24
04SNF.B39	1	3	27
04SNF.B2A	1	2	30
04SNF.B1B	1	1	33
04SNF.B0C	1	0	36
04SNF.AG	0	16	0
04SNF.AF1	0	15	3
04SNF.AE2	0	14	6
04SNF.AD3	0	13	9
04SNF.AC4	0	12	12
04SNF.AB5	0	11	15
04SNF.AA6	0	10	18
04SNF.A97	0	9	21
04SNF.A88	0	8	24
04SNF.A79	0	7	27
04SNF.A6A	0	6	30
04SNF.A5B	0	5	33
04SNF.A4C	0	4	36
04SNF.A3D	0	3	39
04SNF.A2E	0	2	42
04SNF.A1F	0	1	45
04SNF.A0G	0	0	48

Note: Each OC-3 can provide either three DS3s or three STS-1s but not a combination of DS3s and STS-1s.

Table 8-9 shows the general structure for determining NCI codes for SONET Optical Multiplexer operating at the OC-192 rate. OC-192 Multiplexers can provide OC-12 through DS3 or STS-1 interfaces. Not all logically possible combinations are available.

Table 9-9 General Configuration Network Channel Interface (NCI) Codes -- OC-192 SONET Optical Multiplexer

CONFIGURATION NCI CODE Positions 1 through 6	QUANTITY OF OC-12's Position 7	QUANTITY OF OC-3's Position 8	QUANTITY OF DS3's/STS-1's Position 9
04SNF.	A = 0	0 = 0	1 = 3
	B = 1	1 = 1	2 = 6
	C = 2	2 = 2	3 = 9
	D = 3	3 = 3	4 = 12
	E = 4	4 = 4	5 = 15
	F = 5	5 = 5	6 = 18
	G = 6	6 = 6	7 = 21
	H = 7	7 = 7	8 = 24
	I = 8	8 = 8	9 = 27
	J = 9	9 = 9	A = 30
	K = 10	A = 10	B = 33
	L = 11	B = 11	C = 36
	M = 12	C = 12	D = 39
	N = 13	D = 13	E = 42
	O = 14	E = 14	F = 45
	P = 15	F = 15	G = 48

Table 9-9 General Configuration Network Channel Interface (NCI) Codes - OC-192 SONET Optical Multiplexer. (Continued)

CONFIGURATION NCI CODE Positions 1 through 6	QUANTITY OF OC-12's Position 7	QUANTITY OF OC-3's Position 8	QUANTITY OF DS3's/STS-1's Position 9
04SNF.	Q = 16	G = 16	H = 60
	°	H = 20	I = 72
	°	I = 24	J = 84
	°	J = 28	K = 96
	°	K = 32	L = 108
	°	L = 36	M = 120
	°	M = 40	N = 132
	°	N = 44	O = 144
	°	P = 48	P = 156
	°	Q = 52	Q = 168
	°	R = 56	R = 180
	°	S = 60	S = 192
	°	T = 64	°

Note: Each OC-3 can provide either three DS3s or three STS-1s but not a combination of DS3s and STS-1s.

Not all combinations of Table 9-9, NCI codes are physically possible or available.

Certain OC-192 nodes can drop OC48, OC12, OC3, and STS-1/DS3 services. The code set SN supports OC12, OC3, and STS-1 services. The SN code set is to be used when number of 0C48s at the Node are zero. The SQ code set is used when dropping OC48s from an Oc192 Node. The following table lists NCI codes for Optical Multiplexer to an OC-192 Path, arranged to support drop rates of OC-48, OC-12, OC-3, and STS-1/DS3. This code shall be only for multiplexers that support ALL of these specified drops. Due to the quantity of possible Position combinations, only the General Format tale is listed.

Table 9-10 General Format (SQ) for Configuration Network Channel Interface (NCI) Codes - OC-192 SONET Path -- Optical Multiplexer

CONFIGURATION NCI CODE Positions 1 through 6	QUANTITY OF OC-48/OC-12's Position 7	QUANTITY OF OC-3's Position 8	QUANTITY OF DS3's/STS-1's Position 9
One Code must be specified for the Multiplexer Site			
04SQF.	A = 1/0	0 = 0	1 = 3
	B = 1/1	1 = 1	2 = 6
	C = 1/2	2 = 2	3 = 9
	D = 1/3	3 = 3	4 = 12
	E = 1/4	4 = 4	5 = 15
	F = 1/5	5 = 5	6 = 18
	G = 1/6	6 = 6	7 = 21
	H = 1/7	7 = 7	8 = 24
	I = 1/8	8 = 8	9 = 27
	J = 1/9	9 = 9	A = 30
	K = 1/10	A = 10	B = 33
	L = 1/11	B = 11	C = 36
	M = 1/12	C = 12	D = 39
	N = 2/0	D = 13	E = 42
	P = 2/1	E = 14	F = 45
	Q = 2/2	F = 15	G = 48
	R = 2/3	G = 16	H = 60

Table 9-10 General Format (SQ) for Configuration Network Channel Interface (NCI) Codes - OC-192 SONET Path -- Optical Multiplexer (Continued)

CONFIGURATION NCI CODE Positions 1 through 6	QUANTITY OF OC-48/OC-12's Position 7	QUANTITY OF OC-3's Position 8	QUANTITY OF DS3's/STS-1's Position 9
One Code must be specified for the Multiplexer Site			
04SQF.	S = 2/4 T = 2/5 U = 2/6 V = 2/7 W = 2/8 X = 3/0 Y = 3/1 Z = 3/2 1 = 3/3 2 = 3/4 3 = 4/0	H = 20 I = 24 J = 28 K = 32 L = 36 M = 40 N = 44 P = 48 Q = 52 R = 56 S = 60 T = 64	I = 72 J = 84 K = 96 L = 108 M = 120 N = 132 O = 144 P = 156 Q = 168 R = 180 S = 192

Note: Each OC-3 can provide either three DS3s or three STS-1s but not a combination of DS3s and STS-1s.

Certain OC192 nodes can drop OC48, OC12, and OC3 services. The code set SP supports OC-48, OC12, and OC3 services. This code set applies only for multiplexers that support ALL of these specified drops. Due to the quantity of possible Position combinations, only the General Format table is listed.

Table 9-11 General Format (SP) for Configuration Network Channel Interface (NCI) Codes - OC-192 SONET Path -- Optical Multiplexer

CONFIGURATION NCI CODE Positions 1 through 6	QUANTITY OF OC-48s Position 7	QUANTITY OF OC-12's Position 8	QUANTITY OF OC-3's Position 9
One Code must be specified for the Multiplexer Site			
04SPF.	A = 0 B = 1 C = 2 D = 3 E = 4	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 6 = 6 7 = 7 8 = 8 9 = 9 A = 10 B = 11 C = 12	1 = 1 2= 2 3= 3 4= 4 5= 5 6= 6 7= 7 8= 8 9= 9 A= 10 B= 11 C= 12 D= 16 E= 20 F= 24 G= 28

Table 9-11 General Format (SP) for Configuration Network Channel Interface (NCI) Codes - OC-192 SONET Path -- Optical Multiplexer (Continued)

CONFIGURATION NCI CODE Positions 1 through 6	QUANTITY OF OC-48s Position 7	QUANTITY OF OC-12's Position 8	QUANTITY OF OC-3's Position 9
One Code must be specified for the Multiplexer Site			
04SPF.			H= 32 I= NA J= 36 K= 40 L= 44 M= 48 N= 52 O= NA P= 56 Q= 60 R= 64

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10. Definitions

10.1 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 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
TLP	Transmission Level Point
UCCRE	Unbundled Customer Controlled Rearrangement Element
UDIT	Unbundled Dedicated Interoffice Transport
UNE	Unbundled Network Element
µf	Micro Farad

10.2 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 Competitive 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 Competitive 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.

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11. References

11.1 American National Standards Institute Documents

ANSI T1.102-1993 *Digital Hierarchy-Electrical Interfaces.*

ANSI T1.105.01-1995 Synchronous Optical Network (SONET) -- Automatic Protection

ANSI T1.105.06-1996 Synchronous Optical Network (SONET) --Physical Layer Specifications.

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

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

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

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

ANSI T1.601-1992 *Telecommunications - Integrated Services Digital Network (ISDN) - Basic Access Interface for use on Metallic Loops for Application on the Network Side of the NT (Layer 1 Specification).*

11.2 Telcordia Documents

GR-253-CORE *Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria.* Issue 2, December 1995.

TR-NWT-000335 *Voice Grade Special Access Services - Transmission Parameter Limits and Interface Combinations.* Issue 3, May 1993.

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

11.3 QWEST Technical Publications

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 Combination.* Issue E, September 2001

PUB 77310 *Private Line Voice Grade Analog Channels For Access Service.* Issue C, September 2001

PUB 77312 *QWEST Digital Data Service Technical Description.* Issue G, September 2001

PUB 77324 *QWEST DS3 Service.* Issue D, September 2001

PUB 77344 *QWEST Diversity and Avoidance.* Issue B, September 2001

PUB 77346 *Synchronous Service Transport (Synchronous Optical Transport).* Issue B, January 2001

PUB 77371 *COMMAND A LINK℠ Technical Description And Interface Combinations.* Issue D, September 2001

PUB 77375 *1.544 Mbit/s Channel Interfaces.* Issue E, September 2001

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

PUB 77386 *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services.* Issue G, November 2001.

11.4 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 should check the status and availability of all documents.

Those who are not QWEST employees may order;

American National Standards Institute (ANSI) documents from:

American National Standards Institute
Attn: Customer Service
11 West 42nd Street
New York, NY 10036
Phone: (212) 642-4900
Fax: (212) 302-1286

ANSI has a catalog available that describes their publications.

Telcordia documents from:

Telcordia Customer Relations
8 Corporate Place, PYA 3A-184
Piscataway, NJ 08854-4156
Fax: (732) 699-2559
Phone: (800) 521-CORE (2673) (U.S. and Canada)
Phone: (908) 699-5800 (Others)
Web: www.telcordia.com

QWEST Technical Publications from:

http://www.QWEST.com/techpub

Federal Communications Commission (FCC) documents may be obtained from:

Superintendent of Documents
Government Printing Office
Washington, D. C. 20402
Phone: 202 783-3238

Employees of QWEST Communications International Inc. should submit form RG 31-0033 to:

Central Distribution Center (CDC)
1005 17th St. S-30
Denver, CO. 80202
Fax # (303)-965-8652

Or view and download from:

http://emedia.uswc.uswest.com/

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Figures

A. Combining Unbundled Network Elements

A.1 General

Co-Carriers or Competitive Local Exchange Carriers (CLECs) will use combinations of various Unbundled Network Elements (UNEs) provided by QWEST along with their own facilities and equipment to provide service to their customers.

This appendix is provided to illustrate proper Network Channel (NC) and Network Channel Interface (NCI) code usage when ordering several UNEs with the intent of combining them into a service. Only the portion of these services provided by QWEST and limited connections provided by the CLEC are included in these illustrative examples. The CLEC is responsible for the end-to-end design of any combination of elements and / or their equipment to ensure that the resulting service meets their customer's needs.

There are a number of UNEs included in these examples. They include:

- Unbundled Loop as described in PUB 77384, *Interconnection - Unbundled Loop.*
- Unbundled Dedicated Interoffice Transport (UDIT) as described in QWEST Tech Pub 77389, *Unbundled Dedicated Interoffice Transport.*
- Interconnection and Collocation as described in this publication.
- Unbundled Switch Ports are described in PUB 77391, *Unbundled Switch Elements.*

These publications should be consulted for further information about the respective UNEs.

PUB 77386, *Interconnection and Collocation for Transport and Switched Unbundled Network Elements and Finished Services,* describes the basic issues related to Interconnection and Collocation.

Another document, PUB 77398, *Local Interconnect Service (LIS),* describes a Finished Service (not a UNE) that may be encountered by a CLEC.

Certain tariffs, catalogs, contracts or regulatory orders may impact the issues related to these services that could modify the following examples. However, the examples should be applicable in most situations. These examples are not intended to provide specific ordering instructions for the UNEs.

The Network Interface (NI) in the QWEST wire center with these UNEs is a cross-connect frame called a InterConnection Distribution Frame (ICDF) frame or a Dedicated ICDF depending on the Interconnection arrangement. See PUB 77386, Chapter 3 for further information. The remainder of this appendix assumes the ICDF Interconnection arrangement is in effect.

The UNEs and their Network Interfaces are described by NC and NCI codes. Some information about the codes used in these examples is included but the appropriate technical publication should be consulted for further information.

These examples omit some detail about the "Design-To" point. See PUB 77386, Chapter 5 for further information on the design requirements related to the "Design-To" point.

A.2 Example 1 -- Loop Only, Connection to Collocated Equipment

Figure A-1 illustrates a situation where the CLEC is collocated in the QWEST wire center and purchases Unbundled Loop elements to reach their customer. It is assumed that there is collocated equipment.

The CLEC has purchased an Unbundled Loop with Loop-Start signaling. The 02QC3.OOD NCI code at the DS0/voice ICDF NI denotes that it is the open end of the Loop-Start channel. The NI at the End-User's location is 02LS2 indicating the standard Loop-Start closed end interface. Further information about the Unbundled Loop may be found in PUB 77384.

A jumper is placed to connect the loop to previously placed cables connecting to their collocated Interconnector Designated Equipment (IDE). Further information about the cable and collocation may be found in PUB 77386, Chapter 3.

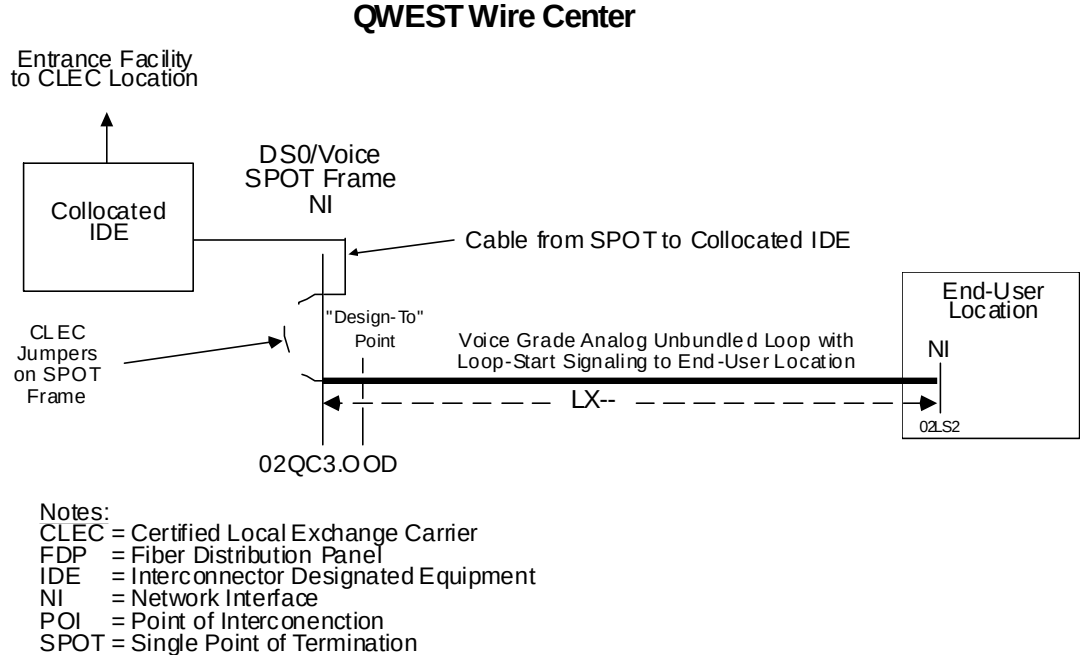

Figure A-1: Unbundled Loop to Collocated Equipment

The entrance facility is probably a Fiber Entrance Facility. This and other types of entrance facilities are described in PUB 77386, Chapter 2.

In this example, the IDE would probably consist of multiplexers and fiber terminal equipment. This equipment is needed to multiplex the loop signal and place it on the fiber cable that would extend the loop to the CLEC's location containing their switch.

A.3 Example 2 -- Non-Loaded Loop Only For DS1 Transport

This example (Figure A-2) is similar to Example 1 in that the CLEC purchases a Non-Loaded Unbundled Loop element from QWEST. The loop, however, is to be used to transport a DS1 to their customer's location using their High-bit-rate Digital Subscriber Line (HDSL) technology. It is assumed that there is collocated IDE.

The NC code LX-N for the Unbundled Loop element denotes a non-loaded Dedicated Facility (without equipment). The two NCI codes denote this facility as being used for HDSL. This designation is used to caution technicians to be aware of higher than normal voltages. Any performance parameters are as described in PUB 77384.

The HDSL equipment is placed by the CLEC in the their IDE space and at the End-User's location on their respective sides of the NIs.

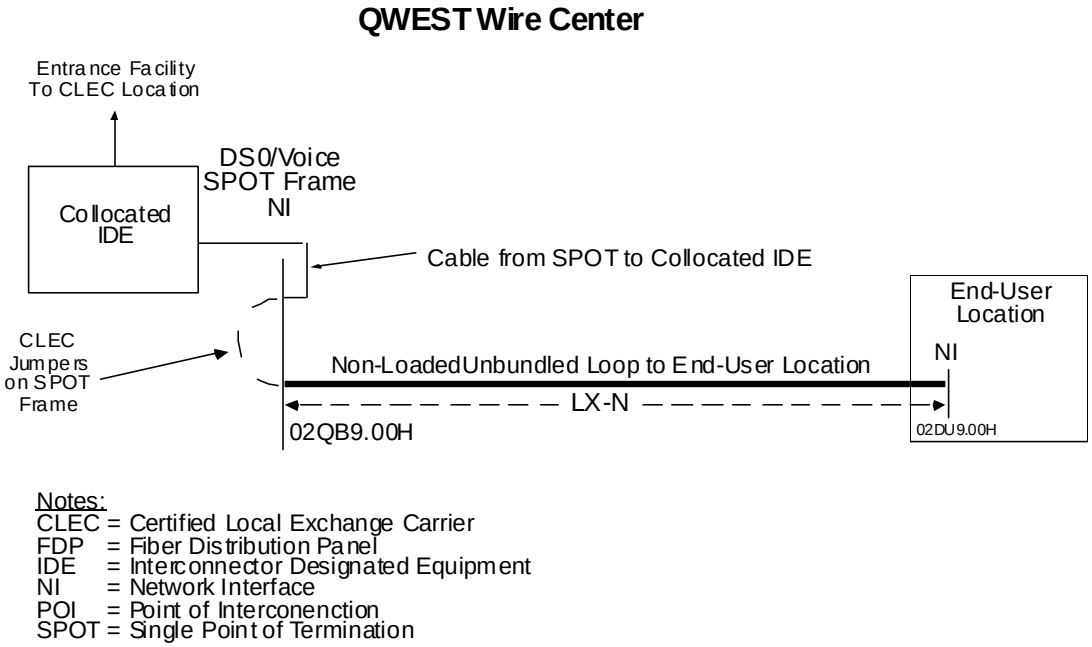

Figure A-2: Unbundled Loop for DS1 and Collocation

A.4 Example 3 -- DS1 Transport, Regenerator and Loop

Figure A-3 illustrates an example where the CLEC orders a DS1 UDIT two-point channel between two wire centers and an Unbundled DS1 loop out to an End-User's location. The CLEC determined that the distance from the "Design-To" point of the UDIT to the "Design-To" point of the loop exceeded 85 feet (See Appendix B). Therefore, they also ordered a DS1 Regenerator option for the Unbundled Loop. The regenerator could alternatively have been added to the UDIT.

A similar analysis at the remote wire center identified the need for a DS1 regenerator at the remote wire center. However, the regenerator and other details at the remote wire center are not shown and are beyond the scope of this example.

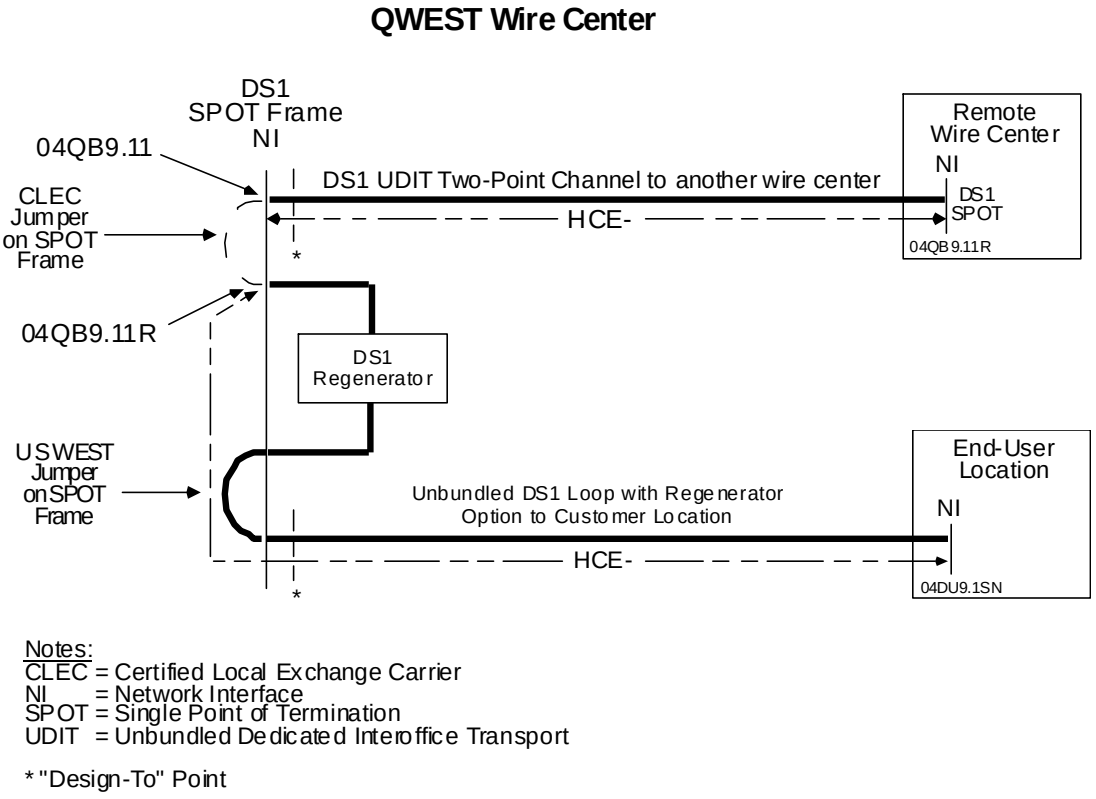

Figure A-3: DS1 Transport, Regenerator and Loop

The DS1 Loop UNE with the regenerator option goes from the End-User NI to the wire center, through the DSX-1 “Design-To” point to the DS1 ICDF. The regenerator option extends this channel through a QWEST-provided jumper to the regenerator and back to the ICDF. The NCI code at the End-User end of this channel is 04DU9.1SN. The NCI code at the other end is 04QB9.11R where “R” denotes “with regenerator”. The NC code of the entire loop is HCE-.

The DS1 UDIT also uses the NC code of HCE-. Note that the line codes and frame formats agree with the Unbundled Loop. The UDIT extends from the DS1 ICDF, through the DSX-1 “Design-To” point, and on to the remote wire center where it passes through the regenerator in a manner similar to that in the local wire center Unbundled Loop arrangement above. The NCI code in the local wire center is 04QB9.11 (no “R” for regenerator). The regenerator in the remote wire center is identified by the “R” in the NCI code 04QB9.11R.

A.5 Example 4 -- Loop and DS1 Transport with Collocation

This example (Figure A-4) is similar to Example 1 except that the CLEC does not have an Entrance facility and cable to their location. Instead, the CLEC has purchased a DS1 UDIT to a remote wire center. However, the regenerator and other details at the remote wire center are not shown and are beyond the scope of this example. Further details at the remote wire center are beyond the scope of this example.

It is assumed that there is some IDE collocated in the wire center. The IDE would probably include DS1 multiplexers to multiplex the analog Unbundled Loop up to the DS1 level.

In this example, the collocated IDE would include multiplexing equipment to channelize the DS3 for the voice channel that the CLEC connects to the Unbundled Analog Loop.

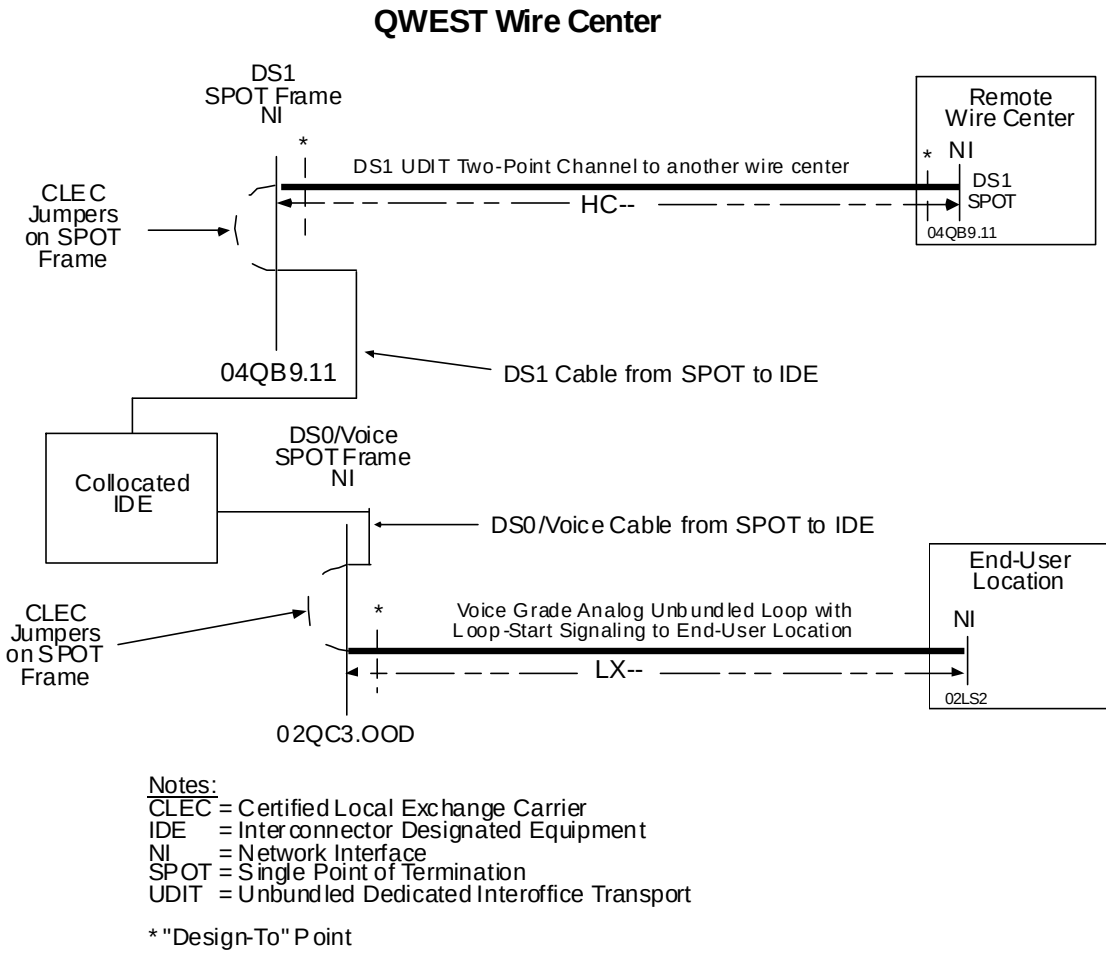

Figure A-4: Unbundled Loop, Collocation and DS1 UDIT

A.6 Example 5 -- Loop, Collocated Equipment and Finished Service

This example, illustrated in Figure A-5, is similar to Example 1 (Section A.2, Figure A-1). The main difference is that the CLEC is using a DS3 Finished Service (PUB 77324) to enter the QWEST wire center instead of an entrance facility. The DS3 service goes from the CLEC-Point Of Termination (POT) out to the customer (i.e., the CLEC) location. The NC code is HF--. The NCI code at the POT is 04DS6.44. The NCI code at the customer location in this example is not shown.

The POT is similar to an Interexchange Carrier-POT except that it is located in the wire center near the collocated IDE or near the ICDF. It is not located on the ICDF.

Since the DS3 is a Finished Service, QWEST has full design responsibility to the POT. The CLEC provides appropriate equipment and cable to connect the DS3 from the POT to their IDE.

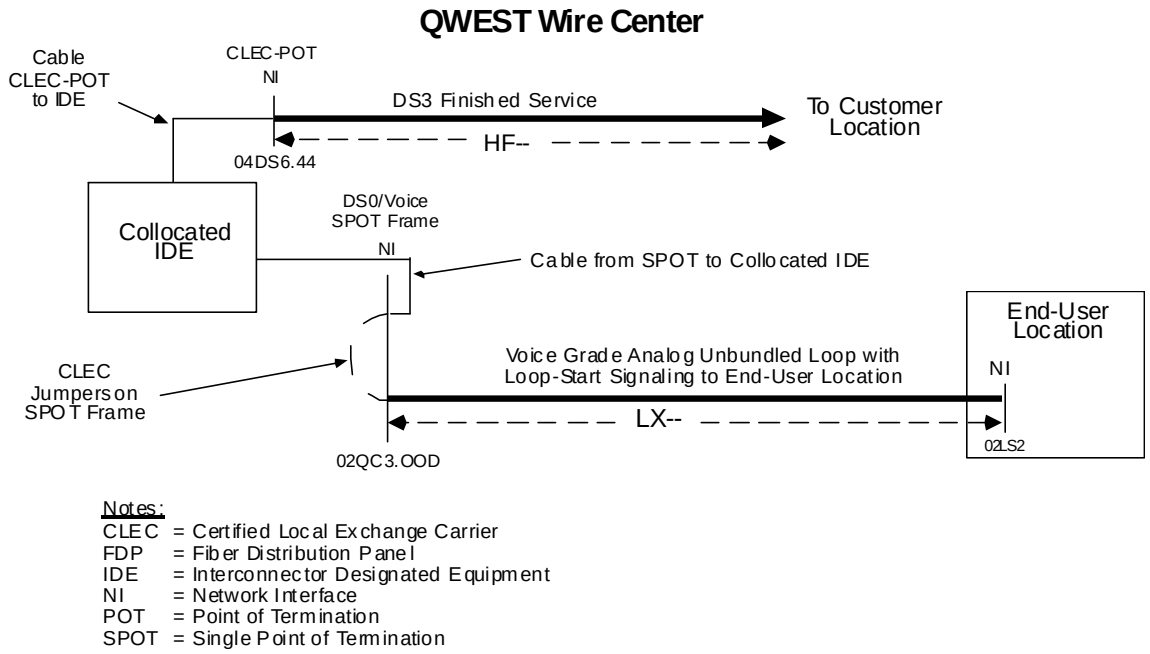

Figure A-5: Connections With Finished Services

A.7 Example 6 -- Loop, Multiplexers and DS3 Transport

Figure A-6 illustrates a situation where the CLEC orders unbundled loops and DS3 level UDIT two-point channels to another QWEST wire center. UDIT multiplexers at both the DS1 and DS3 levels are ordered to multiplex the loops up to the DS3 level. It is assumed that there is also collocated equipment connected to the DS1 channels from the DS3 UDIT Multiplexer.

The unbundled loop is the same as in Example 1. The CLEC wants to connect (using jumper 6) the loop to channel 24 on the DS1 UDIT Multiplexer and issues instructions on channel unit selection, placement and options accordingly.

This low-level channel (slot 24) with the NC code LC-- is described as a Voice Line. The NCI code is 02QC2.OOE (the closed end).

The DS1 UDIT Multiplexer with regenerator is described by the NC code HCEG that denotes a DS1 with Voice and Digital Data Multiplexer. The DS1 is American National Standards Institute Extended Superframe with Bipolar Eight Zero Substitution (i.e., ANSI ESF with B8ZS). The NCI code for the high side of the multiplexer is 04QB9.11R where the "R" denotes the regenerator. Jumper 5, placed by QWEST, connects the regenerator to the high side of the multiplexer.

The description of the DS3 UDIT Multiplexer is similar. The HF-1 NC code denotes a DS3 M-Framed channel with M2/3 Multiplex Format. The DS1 slots may be designated for B8ZS on a per-channel basis. Specifically, the low-level DS1 for channel 28 is designated using the HCE- NC code that indicates the ANSI ESF with B8ZS two-point channel. NCI codes for both DS1 and DS3 levels are as previously described.

Jumper 4 is placed to connect the DS1 UDIT Multiplexer (NCI code 04QB9.11R) to channel 28 of the DS3 UDIT multiplexer (NCI code 04QB9.11). Only one of these NCI codes uses the "R" in the ninth position since only one regenerator is required. The regenerator could have been placed on channel 28 of the DS3 multiplexer rather than on the DS1 multiplexer by reversing the NCI codes.

Jumper 3 connects some DS1 IDE to Channel 1 of the DS3 UDIT Multiplexer. The IDE is used for some unspecified purpose. No DS1 regenerator is required for this connection and the NCI code 04QB9.11 applies for channel 1.

Jumper 1 is placed to connect the DS3 UDIT Multiplexer with regenerator to the DS3 Two-Point UDIT channel. The NCI codes 04QB6.33R and 04QB6.33 apply to the DS3 multiplexer with regenerator and DS3 two-point respectively.

Jumper 2 was place by QWEST to connect the high side of the DS3 multiplexer to the regenerator.

Connections in the remote wire center are not shown.

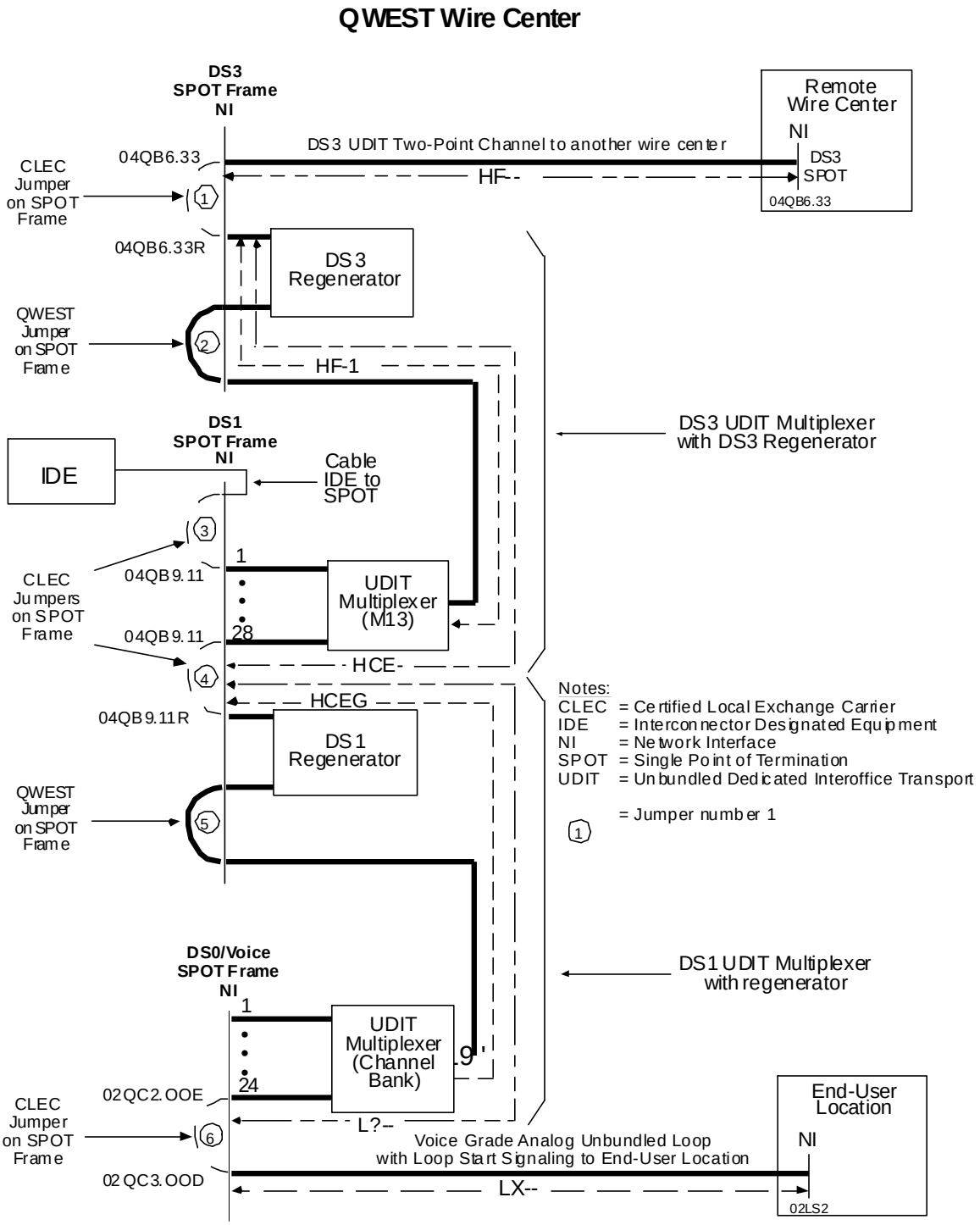

Figure A-6: Loop, Multiplex and DS3 Transport Example

A.8 Example 7 -- Loop, Switch and DS1 Transport

This example illustrates the situation where a CLEC wants to purchase Unbundled Loops and Unbundled Line-side Switch Ports from QWEST. The CLEC also needs to purchase Unbundled DS1 Trunk Ports and DS1 UDIT two-point channel elements to the remote wire center. The trunk port and UDIT requirement is to enable the line-side switch ports to originate calls outside the switch. Similar trunks and UDIT channels are required to other central offices in the same free-calling area but are not included in this example. Custom routing would also be required. It is assumed that there is no collocated equipment and that DS1 regenerators are required on the DS1 UDIT in both wire centers. Figure A-7 illustrates the arrangement. Further details at the remote wire center are beyond the scope of this example.

The two-point UDIT DS1 channel between this wire center and the remote wire center is defined by the NC code HC--. Chapter 5 of this publication defines this DS1 as having Superframe (SF) and Alternate Mark Inversion (AMI). The matching NCI codes, 04QB9.11R, designate that the NIs are Manual Cross-Connect terminations with no subrating capability and that the connections are for DS1-to-DS1 cross-connects. The “R” in both NCI codes further denotes that there is a DS1 regenerator at both ends. The UDIT channel starts at the DS1 ICDF, goes through the DS1 Regenerator, back to the ICDF, through the “Design-To” point and on to the remote wire center. The channel continues in the remote wire center in the reverse manner. The details are not shown in the remote wire center.

The Unbundled DS1 Switch Port is designated by the NC code SNBT. This code denotes the port as a Switched Access Port Termination using 4-wire local transmission parameters and a trunk termination. The 04QB9.11 NCI code applies at the NI. Further information about this port (along with Custom Routing and the line-side port) may be found in PUB 77391.

The dashed lines indicate a CLEC-provided jumper connecting the UDIT DS1 transport (with regenerator) UNE to the DS1 Unbundled DS1 Switch trunk port. It is assumed that further connections will be required at the remote office. The result of this combination of QWEST-provided UNEs and CLEC-provided elements and equipment would be an interoffice trunk group(s) of up to 24 trunks assuming the CLEC ordered multiple trunks.

The situation on the other side of the switch is similar. The NC code SNAL describes an Unbundled Switch Port described as Switched Access Port Termination with 2-wire local transmission parameters with a line termination. The NCI code 02QC3.OOE denotes the NI as a Manual Cross-Connect DS0/Voice termination with the closed end of Loop-Start signaling.

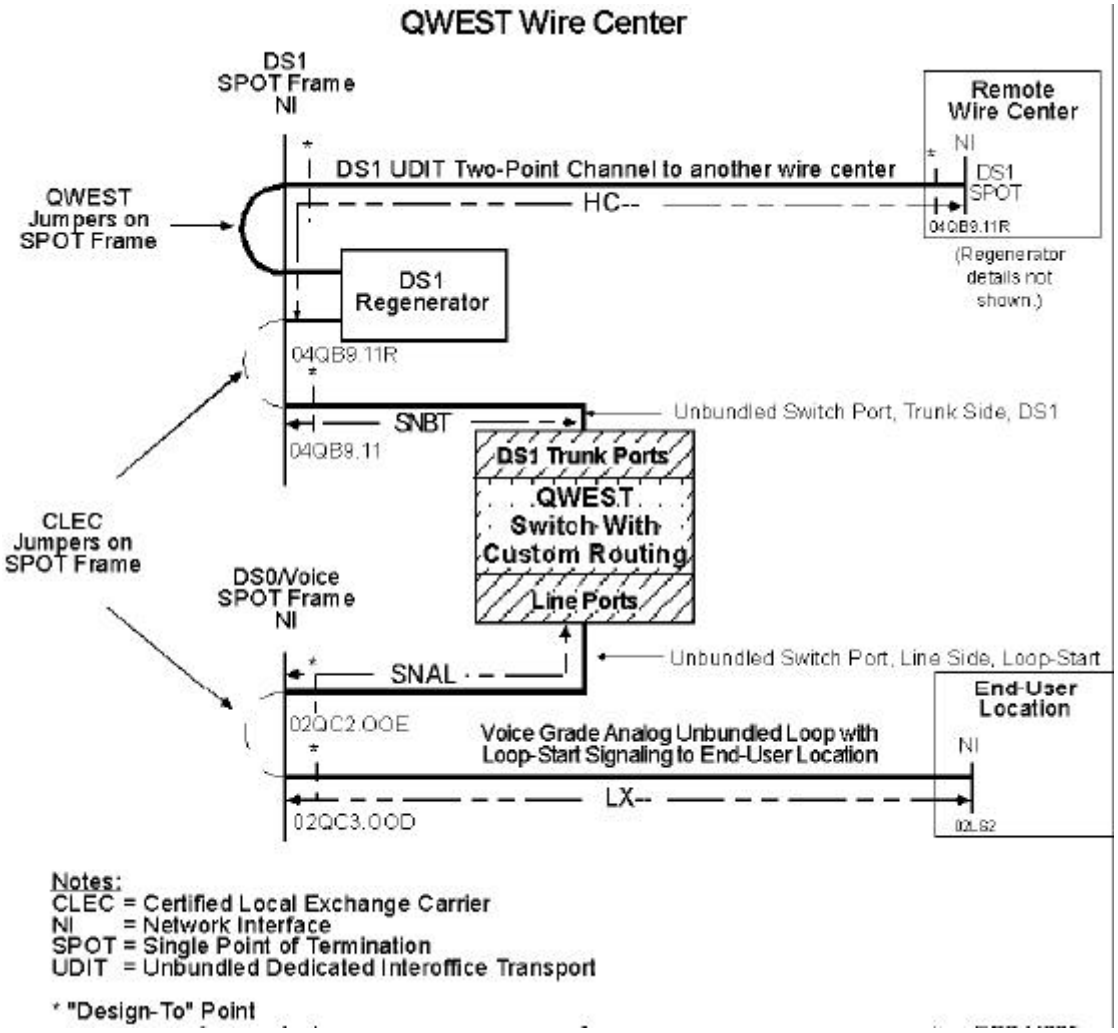

Figure A-7: Loop, Switch and DS1 Transport Example

The CLEC has also purchased an Unbundled Loop with Loop-Start signaling. The 02QC3.OOD is similar to the 02QC3.OOE except that it is the open end. The NI at the End-User's location is 02LS2 indicating the standard Loop-Start closed end interface. Further information about the Unbundled Loop may be found in PUB 77384.

The figure shows the CLEC connecting these two UNEs together to form a standard Plain Old Telephone Service (POTS) line out to their customer.

A.9 Typical Ordering Process -- An Example

A.9.1 General

The process or procedure used to implement a service using combinations of UNEs obtained from QWEST will vary depending on specific situations and normal CLEC processes. This section is intended, by means of an example (with two variations), to illustrate one possible scenario that could be used to implement service to a CLEC customer using UNEs. More detailed information on the specific processes is available during the normal ordering processes.

This example assumes that a CLEC is collocated in a QWEST wire center with a fiber entrance facility connected to transport equipment or IDE. Assume that the CLEC has a small number of customers located in a nearby wire center area wanting DS1 service, but the quantities required are not enough to justify collocating IDE in the nearby wire center.

The solution is to purchase a DS3 two-point UDIT channel between the wire centers, a DS3 UDIT multiplexer in the distant wire center, and DS1 Unbundled Loops as required to meet the demand. The CLEC would connect the DS3 two-point UDIT channel to their collocated IDE at the DS3 level in the collocation wire center.

Since most of the activity takes place in the nearby wire center, designate the wire center containing the collocated IDE as the “Collocation Wire Center”. Figure A-8 illustrates the layout of the arrangement similar to the other examples in this appendix. The entrance facility and IDE are not shown in the collocation wire center. The figure illustrates a DS1 Unbundled Loop using Alternate Mark Inversion (AMI) line code and Superframe (SF) format. This arrangement would allow the CLEC to provide a standard DS1 service to their customer

This example also shows a contrasting method of delivering the DS1 services by placing IDE in both wire centers. In this variation, the DS1 line code and frame format are ANSI Extended Superframe (ANSI ESF) with B8ZS line coding, respectively. Assume the DS3 multiplexing function is provided by the IDE in the nearby wire center. This contrasting example yields the same results, but illustrates slightly different ordering processes and the use of regenerators.

A.9.2 The Steps -- Single Collocation Example

The following steps could be followed to provide service with no IDE in the wire center. The circled numbers in Figure A-8 indicate the step numbers. Similar steps will be required at the collocation wire center where the CLEC is collocated.

1. Order and install any IDE in the collocation wire center.

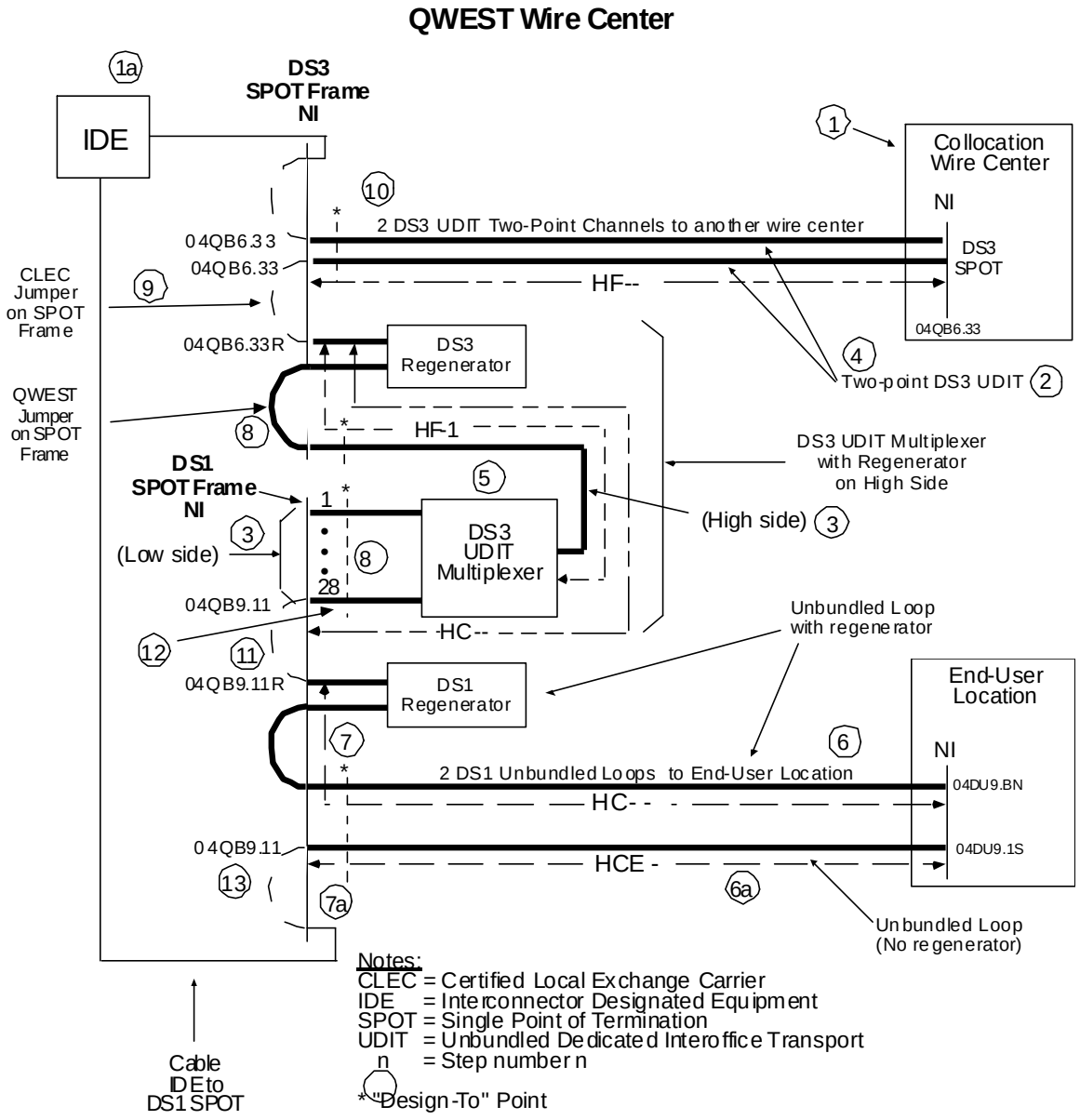

Figure A-8 Typical Ordering Process Example

2. Order the UDIT two-point DS3. The NC code is HF-- and the NCI codes at both ends are 04QB6.33. Order cooperative testing if desired for step 10. Make sure to request a Design Layout Report (DLR) to obtain characteristics and termination information needed by the CLEC to make their jumper connections on the DS3 ICDF.

3. Order the DS3 UDIT multiplexer with regenerator on the high side and all 28 low side DS1 channels. Request DLRs for all 29 orders. Connecting Facility Assignments will specify the multiplexer and identify the channel.

   The high side regenerator is ordered since the 27 foot (jumper rule) will be exceeded (See Appendix B) between the "Design-To" points of the two-point UDIT and the multiplexer. NCI code will be 04QB6.33R and the NC code is HF-1. Order cooperative testing if desired for step 10.

   The 28 low side DS1 channels are ordered with the NC code HC-- (AMI and SF) and no regenerators. Thus, the 28 NCI codes on the DS1 ICDF will all be 04QB9.11. The 28 NCI codes at the DS3 ICDF at the other end of the DS1s will be the same 04QB6.33R NCI code used with the DS3 HF-1 channel. DS1 regenerators, if required, will be ordered with the UNEs to be connected to the low side of the DS3 multiplexer.

4. Receive the Firm Order Confirmation (FOC) for the DS3 UDIT from QWEST with the assigned carrier system identification in the form of a Common Language® Facility Identification (CLFI™) code.

5. Receive information via DLRs about DS3 channels from the multiplexer (high side) with regenerator including characteristics and terminations on DS3 ICDF.

   Receive information via DLRs about the 28 DS1 channels from the multiplexer (low side) including characteristics and terminations on DS1 ICDF.

   The CLEC evaluates the engineering requirements (Appendix B) of the DS1 lengths from DS1 ICDF to the "Design-To" point. Assume for this example that the distance from the "Design-To" point to the ICDF is 110 feet. This exceeds the 85-foot jumper rule so a DS1 regenerator will have to be ordered with any DS1 UNEs to be connected to the low side of the DS3 multiplexer. However, regenerators will not be required when connecting the low side of the multiplexer to DS1 IDEs.

6. Order the DS1 Unbundled Loop element with regenerator and request DLR. The NC code is HC--. The NCI code is 04QB9.11R at the DS1 ICDF and 04DU9.BN at the End-User location. The DLR will provide information needed by the CLEC to make their jumper connections on the DS1 ICDF.

7. Receive information (via a DLR) about Unbundled DS1 Loop with regenerator characteristics and termination on ICDF.

8. QWEST will install DS3 two-point UDIT and DS3 multiplexer UNEs including 28 sets of jumpers on the DSX-1 “Design-To” frame and one set of jumpers on the DSX-3 frame. The jumper connecting the DS3 regenerator to the multiplexer (high side) will be placed. Loop backs will be placed on the 28 DSX-1 “Design-To” frame cross-connects to prevent office alarms until the CLEC completes connections and places a signal on the channels. See Chapter 4 for further information.
9. Jumpers are placed on DS3 ICDF to connect UDIT two-point DS3 transport channel to UDIT DS3 multiplexer (high side).
10. CLEC and QWEST can do cooperative testing to turn up DS3 system end-to-end.
11. Jumpers are placed on DS1 ICDF to connect Unbundled DS1 Loop with regenerator to low-level channel of UDIT multiplexer element.
12. CLEC may request cooperative testing with QWEST to turn up end-to-end DS1 channel. QWEST will remove the loop back from the DSX-1 placed in Step 8 during cooperative testing.

    The CLEC will call QWEST through the trouble report process to remove the loop back if cooperative testing was not requested.

The CLEC will keep records of cross-connections and other information about their end-to-end service. The proper selection of NC and NCI codes will enable the CLEC engineers to achieve compatibility with their equipment for their end-to-end service.

The CLEC ordered the following UNEs in this example:

- DS3 UDIT two-point channel (with DLR) between two wire centers
- DS3 UDIT Multiplexer (high side, with DLR) with regenerator
- Twenty-eight (28) Low side DS1 channels of the UDIT DS3 Multiplexer (with DLRs)
- DS1 Unbundled Loop (with DLR) with regenerator

A.9.3 The Steps -- Collocation in Both Wire Centers Example

This variation of the example assumes that the CLEC chooses to place IDE in both wire centers. The CLEC will order only the DS3 UDIT two-point UDIT channel between the wire centers and the DS1 Unbundled Loop. The additional IDE will provide the DS3 multiplexer function.

The step numbers in the following scenario are reused from the previous variation and appear in Figure A-8. Steps have been added or deleted as required.

1. Order and install any IDE in the collocation wire center.

1a. Order and install the IDE in the other wire center.

2. Order the UDIT two-point DS3. NC code is HF-- and the NCI codes at both ends are 04QB6.33. Order cooperative testing if desired for step 10. Make sure to request a Design Layout Report (DLR) to obtain characteristics and termination information.

4. Receive the Firm Order Confirmation (FOC) for the DS3 UDIT from QWEST with the assigned carrier system identification in the form of a Common Language® Facility Identification (CLFI™) code.

   The CLEC evaluates the engineering requirements (Appendix B) of the DS3 lengths from DS3 ICDF to the "Design-To" point. Assume for this example that the distance from the "Design-To" point to the ICDF is 125 feet. This length added to the length from the ICDF to the IDE is less than 450 feet so regenerators will not be required when connecting to the DS3 IDE.

6a. Order the Unbundled DS1 Loop element with regenerator and a DLR. The NC code is HCE-. The NCI code is 04QB9.11R at the DS1 ICDF and 04DU9.1S at the End-User location.

7a. Receive information (via a DLR) about Unbundled DS1 Loop with regenerator characteristics and termination on ICDF.

8. QWEST will install DS3 two-point UDIT including one set of jumpers on the DSX-3 "Design-To" frame.

9a. Jumpers are placed on DS3 ICDF to connect UDIT two-point DS3 transport channel to their IDE.

10. CLEC and QWEST can do cooperative testing to turn up DS3 system end-to-end.

13. Jumpers are placed on DS1 ICDF to connect Unbundled DS1 Loop to their DS1 IDE.

    CLEC may request cooperative testing with QWEST to turn up end-to-end DS1 channel.

The CLEC will keep records of cross-connections and other information about their end-to-end service. The proper selection of NC and NCI codes will enable the CLEC engineers to achieve compatibility with their equipment for their end-to-end service.

The CLEC ordered the following UNEs in this example:

- DS3 UDIT two-point channel (with DLR)
- DS1 Unbundled Loop (with DLR)

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B. DS1 or DS3 Regeneration for Interconnection

B.1 DSX Design Technical Requirements

Normally, DS1 and DS3 channels will terminate on or be cross-connected on DSX-1 and DSX-3 cross-connect panels. The DS1 or DS3 signal at these DSX panels is a templated signal that may be described by the Network Channel Interface (NCI) codes of the form *04DS9* and *04DS6* respectively. The templated signal permits the changing of cross-connects without redesign work and permits standard testing capabilities. Further information about these signals may be found in PUB 77375 and PUB 77324 respectively and in ANSI T1.102-1993.

DS1 and DS3 electronic equipment is designed to generate and work with these templated signals if proper design is used when connecting the equipment to the DSX panel. This electronic equipment, called an *active element*, contains a Line Build Out (LBO) which electrically "builds out" the connecting cable to a standard length with a standard loss. The LBO is adjusted to electrically match the cable length to the standard value. Some equipment is made with an Automatic LBO (ALBO) which will automatically set the value to the required level.

In this context, the term *active element* should not be confused with the term *Unbundled Network Element* (UNE). The active element is a piece of electronic equipment. The UNE is a portion of the QWEST network consisting of various active and / or passive elements.

Figure B-1 illustrates a typical arrangement with two active elements connected to a DSX cross-connect. A jumper is shown connecting the two active elements together.

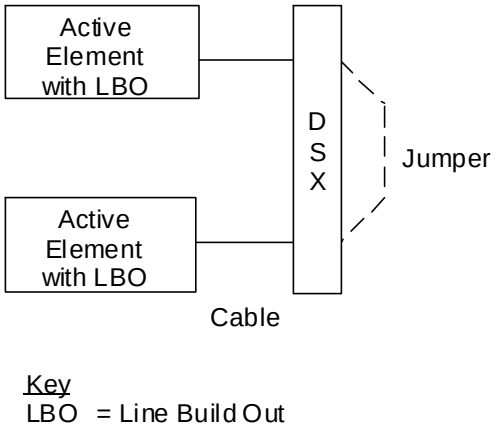

Figure B-1: Typical DSX Arrangement

In this context, a *cable* connects an active element to a termination on a cross-connect frame. A *jumper* connects two cross-connect frame terminations together.

Both the cables and the jumper lengths have maximum lengths depending on the cable type and digital signal level. These maximums are summarized in Table B-1.

Table B-1: DSX-1 and DSX-3 Maximum Cable and Jumper Lengths

Signal Level	Cable Type	Maximum Cable Length Active Element to DSX *	Maximum Jumper Length *
DS1	22 gauge shielded	655 feet	85 feet
	24 gauge shielded	450 feet	
DS3	Type 728 or 734 Coax	450 feet	27 feet
	Type 735 Coax	225 feet	18 feet

* Use for design work. Actual loss may vary by cable manufacturer and type.

Normal QWEST design will insure that the cable between the QWEST-provided active elements and the DSX in Figure B-1 will meet the proper requirements.

In situations where the distances are exceeded, QWEST will place regenerators to extend the signal. A regenerator is also an active element with a LBO or ALBO. Therefore, the regenerator can extend the "reach" by the value of up to the maximum cable length. The actual new distance would depend on the exact placement of the regenerator in the wire center.

B.2 Interconnection Applications

Figure B-2 illustrates a situation where a Competitive Local Exchange Carrier (CLEC) is collocated in a QWEST wire center. The CLEC's Interconnector Designated Equipment (IDE) is cabled over to the InterConnection Distribution Frame (ICDF) or Dedicated ICDF (DICDF) cross-connect frame. Comments about the ICDF in the rest of this appendix also apply to the DICDF. See PUB 77386, Chapter 3 for further information.

Tie cables are placed between the DSX cross-connect frame and the ICDF. The active elements to the left of the DSX are parts of Unbundled Network Elements (UNEs). These may be either switch or transport UNEs. Jumpers are not shown.

The DSX cross-connect in the figure serves as the “Design-To” point.

The DSX cross-connect frame may be the same frame as the ICDF. In this instance, there are no tie cables and the DSX/ICDF is both “Design-To” Point and Network Interface (NI). The combined function arrangement simplifies the design process and reduces the need for regeneration. However, this arrangement may result in multiple ICDFs.

There are three situations that could occur: A UNE may be connected to an IDE, two UNEs may be connected together, or two IDEs may be connected together. These situations are separately analyzed.

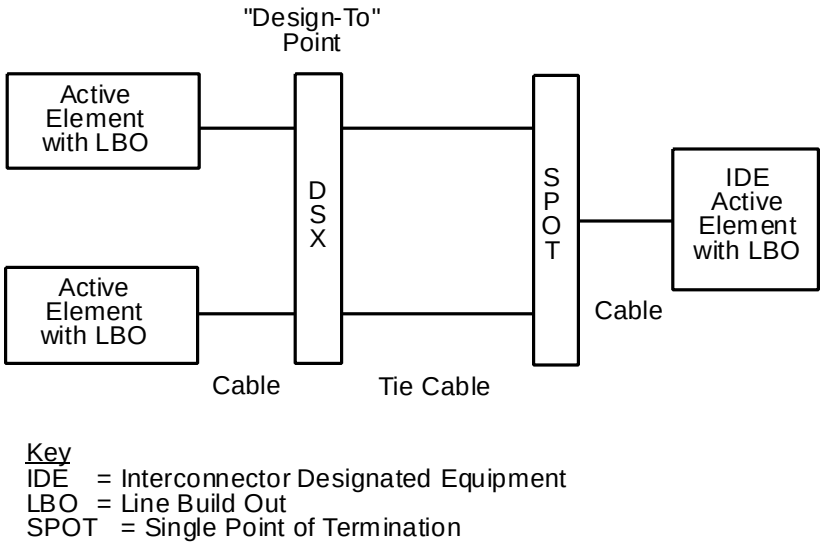

Figure B-2: Interconnection Application

B.2.1 Connecting Unbundled Network Elements to IDE

In the situation where the CLEC wishes to connect their IDE to a UNE, the CLEC must design the facility from the DSX “Design-To” point to their IDE active element. This facility consists of the tie cable between the DSX and the ICDF, the jumper on the ICDF and the cable from the ICDF to the IDE. This loss must meet the requirements of Table B-1 (e.g., 655 feet for 22 gauge at the DS1 rate). If this loss is exceeded, a regenerator must be provided. The CLEC would adjust the LBO on their IDE to match this cable.

The jumper on the DSX must also meet the jumper requirements of Table B-1. However, this should not normally be a problem.

A common arrangement for DS3 ICDFs is to use Type 734 coax for the Tie Cables and Type 735 coax for the cable going to the CLEC's IDE. However, this could vary in different wire centers and ICDF arrangements.

B.2.2 Connecting Two Unbundled Network Elements Together

The situation where the CLEC wishes to connect two UNEs together is significantly different. The facility from the DSX to the ICDF and back to the DSX contains no active element so the DSX jumper rule must be followed (e.g., 85 feet for DS1).

The total path now includes (in order) a jumper on the DSX, the tie cable to the ICDF, a jumper on the ICDF, the tie cable going back to the DSX and a second jumper on the DSX.

The likelihood of this length being less that the Table B-1 maximum jumper values is fair-to-poor for DS1 (85 feet) and unlikely for DS3 (27 feet). A regenerator will probably be required.

However, if the ICDF is the DSX (i.e., no tie cables), regeneration will seldom be required.

B.2.3 Connecting Two IDEs together

This situation involves no QWEST equipment other than the ICDF. The CLEC must design the connection between the two IDE devices to meet their requirements. The cable lengths from the IDE and the ICDF and the jumper on the ICDF must be considered.

Signal levels on the ICDF must not exceed those normally encountered so that they will not interfere with other circuits on the ICDF.

B.3 Obtaining DS1 or DS3 Regenerators

The CLEC has two options available when they have to provide DS1 or DS3 regenerators. They may provide their own and place them in their collocation area or they may order DS1 or DS3 Regenerators from QWEST.

DS1 or DS3 regeneration is an option available with DS1 and DS3 UNEs including Unbundled Dedicated Interoffice Transport (UDIT), Unbundled Loop and Unbundled Trunk-side DS1 Switch Ports.

B.4 DS1 or DS3 Regenerator Option Description

The DS1 or DS3 Regenerator Option consists of an appropriate DS1 or DS3 intraoffice regenerator terminated on the ICDF as illustrated on Figure B-3. These regenerators will be equipped with an ALBO so manual adjustments of a LBO will not be required.

The two sides of the regenerator will be terminated on the same part of the ICDF as the IDE. QWEST will connect one side of the regenerator to the tie cable of the ordered UNE. The CLEC will then cross-connect the other side of the regenerator either to tie cable pairs of the other UNE, or to pairs to IDE as required to meet their needs.

An alternate arrangement has the regenerator wired directly to the cable. This eliminates the need for a QWEST-placed jumper on the frame, but with reduced flexibility. However, both methods of providing regenerators will appear the same to the CLEC for design and provisioning purposes. The only exception to this might be that the regenerators in this arrangement might use a manual LBO. In cases where the LBO is not automatic (i.e., an ALBO), the CLEC will have to provide LBO settings.

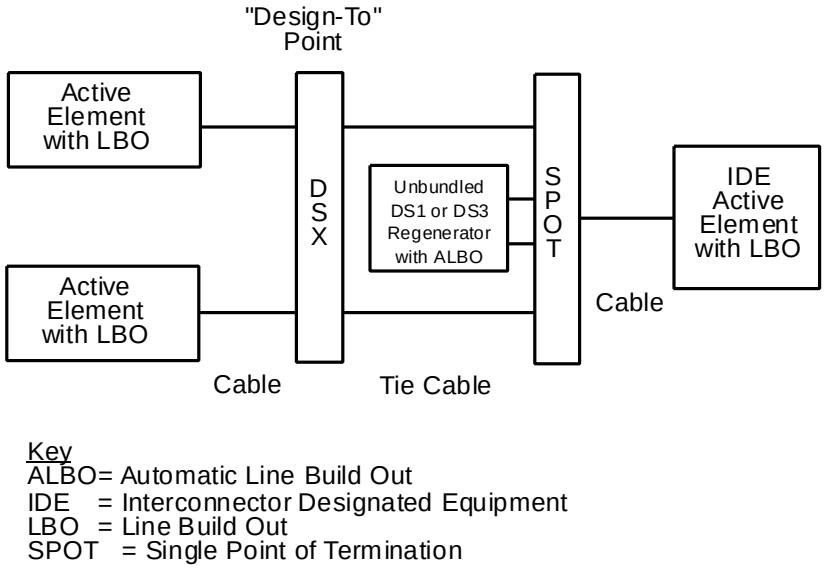

Figure B-3: DS1 or DS3 Regenerator Option Arrangement

B.5 Connections to DS1 or DS3 Finished Services

A Finished DS1 or DS3 Service or other Finished Service with DS1 or DS3 NIs will be delivered to the CLEC Point of Termination (CLEC-POT). The NI will be selected by the CLEC from those available with the DS1 or DS3 Finished Service. The CLEC must design all connections on their side of the NI. The CLEC must provide any regenerators required (Section B.3) to connect the Finished Service and their IDE or to the ICDF if the Finished Service is to be connected to a UNE.

B.6 Network Channel and Network Channel Interface Codes

Table B-2 lists selected Network Channel and Network Channel Interface codes to be used to order various UNEs. The appropriate technical publication for the UNE should be consulted for further information.

Table B-2: Applicable Network Channel and Network Channel Interface Codes

Unbundled Network Element	Network Channel Interface Code	
Digital Signal Level	Without Regeneration	With Regeneration
DS1	04QB9.11	04QB9.11R
DS3	04QB6.33	04QB6.33R

Figure B-4 illustrates an example of NC / NCI code usage for a DS1 regenerator option on a two-point DS1 UDIT. The NC code is typical. This example shows a DS1 channel between two wire centers with a DS1 regenerator at one end. The DS3 version would be similar, but with the 04QB6.33R and 04QB6.33 NCI codes and an "HF" NC code.

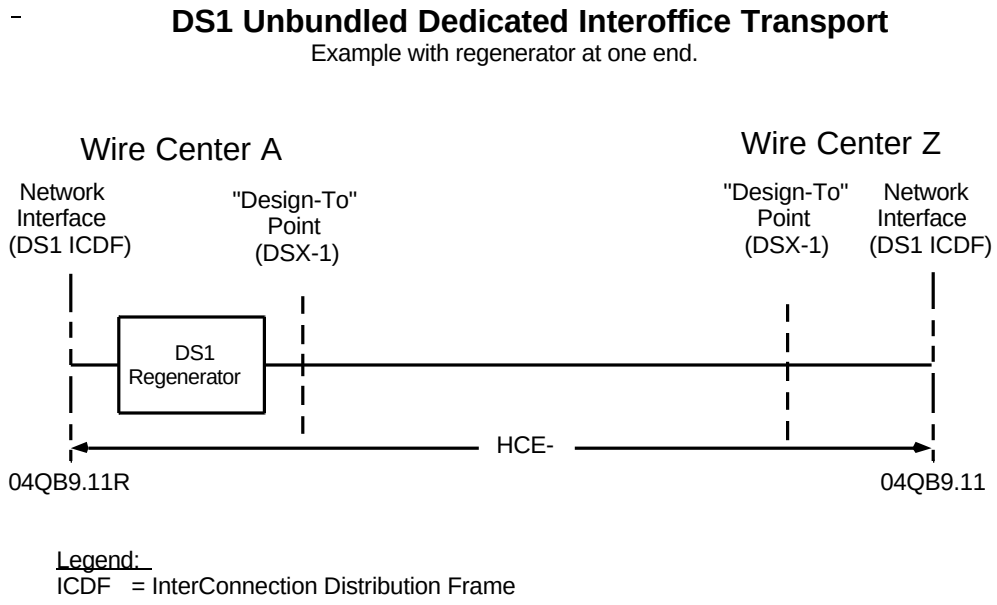

Figure B-4: DS1 Regenerator Option Code Usage Example

B.7 Wire Centers with Electronic Cross-Connects

Some wire centers may use an Electronic DSX (EDSX) or a Digital Cross-Connect System (DCS) in place of a manual DSX. The EDSX and DCS are active elements. Figure B-5 illustrates the arrangement with the regenerator option added to the top UNE.

In this situation, the "Design-To" point meaning is different that with the manual DSX design process.

The EDSX or DCS is directly connected to the ICDF. The material in this section does not apply in situations where the EDSX or DSX is connected to the ICDF via a manual DSX.

Since these devices are active elements, the longer cable length rules apply. QWEST will adjust the LBOs on the EDSX or DCS to present a templated signal at the ICDF if the ICDF falls within the range of the active element (e.g., 655 or 450 feet).

In cases where the distance to the ICDF exceeds the limits, the CLEC must provide a regenerator to make up the added distance.

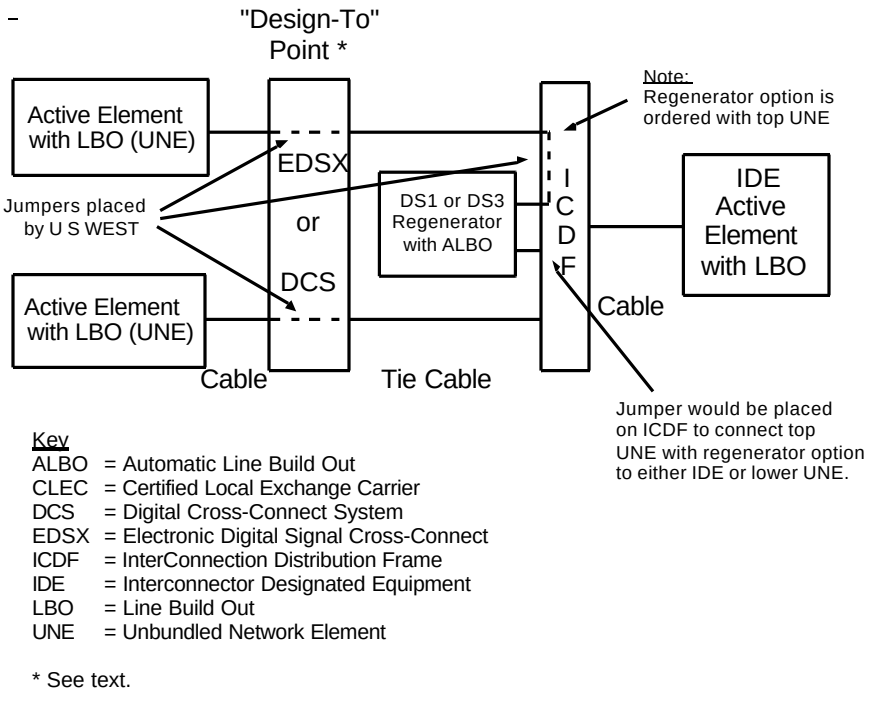

Figure B-5: Electronic Cross-Connect Wire Center