U S WEST, Inc.
Technical Publication

U S WEST DS3 Service

- **Technical Specifications For DS3 Electrical Network Channel Interfaces**
- **Network Channel and Network Channel Interface Codes Describing Interfaces at Customer Premises and at U S WEST, Inc. Central Offices, including Optical and Radio Interfaces**
- **Central Office Multiplexer Options**

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NOTICE

This document describes U S WEST DS3 Service, its technical interface specifications, Network Channel (NC) and Network Channel Interface (NCI) code combinations. This Technical Publication provides sufficient technical details for a customer to select a service to incorporate into an end-to-end communications channel.

It provides the electrical DS3 interface specifications, and their NC and NCI code combinations. Also, it provides code combinations permitting DS3 service to be ordered using higher bit rate channels with Central Office (CO) multiplexing down to the DS3 rate. The latter includes Optical and Radio Network Interfaces. The document describes:

- Required characteristics of DS3 signals at the interface with customers at End-User (EU) and Carrier premises.
- NCI codes used to describe the signal characteristics of the interfaces.
- NC codes used to order DS3 service.

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1. Introduction

1.1 Purpose

This document describes U S WEST DS3 Service, its technical interface specifications, Network Channel (NC) and Network Channel Interface (NCI) code combinations. This Technical Publication provides sufficient technical details for a customer to select a service for incorporation into an end-to-end communications channel.

1.2 Scope

This document provides the electrical DS3 interface specifications, and their NC and NCI code combinations. Also, it provides code combinations permitting DS3 service to be ordered using higher bit rate channels with Central Office (CO) multiplexing down to the DS3 rate. The latter includes Optical and Radio Network Interfaces. The document describes:

- Required characteristics of DS3 signals at the interface with customers at End-User (EU) and Carrier premises.
- NCI codes used to describe the signal characteristics of the interfaces.
- NC codes used to order DS3 service.

1.3 Reason for Reissue

To show U S WEST as the owner of this publication and the one to contact concerning the content.

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2. Description of Service

U S WEST DS3 service consist of a high capacity channel for the transmission of 44.736 Mbit/s isochronous serial data having a line code of Bipolar Three Zero Substitution (B3ZS). U S WEST DS3 service is offered to Carrier and End-User (EU) customers in the following configurations and multiplexing arrangements:

- • Customer Premises-to-Customer Premises DS3 Channel
- • Customer Premises-to-U S WEST Central Office (CO) Hub DS3 Channel
- • U S WEST CO Hub-to-U S WEST CO Hub DS3 Channel
- • U S WEST CO DS3 Multiplexing to DS1

2.1 DS3 Channel Elements

DS3 Channel Elements may consist of one or more of the elements shown in Figure 2-1 below:

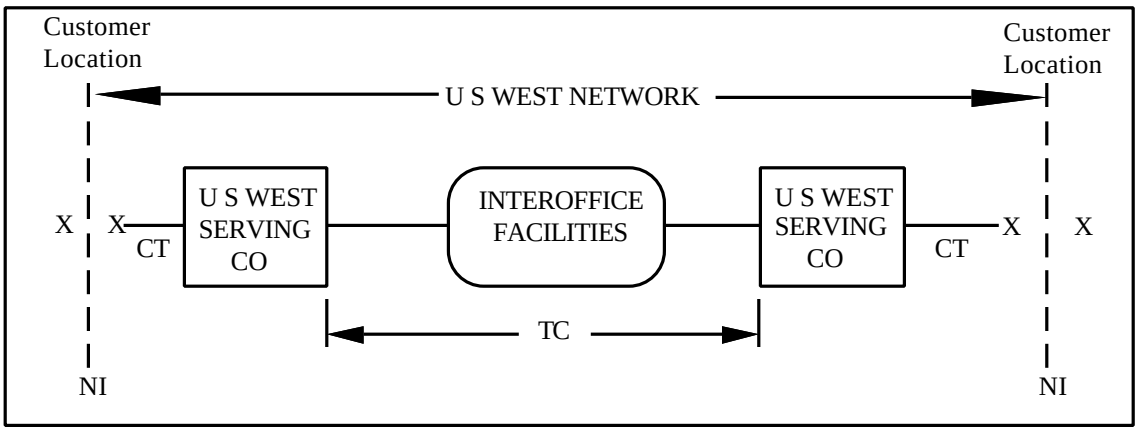

Figure 2-1: DS3 Channel Elements

Where:

- CO = Central Office
- NI = Network Interface
- CT = Channel Termination (NI to serving CO link)
- TC = Transport Channel (Transmission facilities between serving COs, between a serving CO and a U S WEST CO Hub, or between Telephone Company Hubs)

Network Interface (NI) signals may be electrical, optical or radio, as selected by the customer. The electrical interface CT element provides for any quantity of DS3 channels the customer may require, in increments of one. Optical and radio interface CT elements, however, include CO multiplexing of as few as 2 or 3, and as many as 36, DS3 signals to a higher bit-rate signal that will be present in the optical or radio signal at the NI. Each DS3 CT element will terminate on a DSX-3 Cross-connect panel in the serving CO, in a capacity reserved status.

Individual DS3 service is then purchased that utilize the DS3 channels of these capacity CTs. The TCs, and the various DS3 channel configurations and options are described in the following paragraphs.

2.1.1 Electrical Interface CT Capacity

For the Electrical Interface CT Figure 2-2, demultiplexing to the DS3 level is provided by U S WEST at both ends of the element. This differs from radio and optical interface CT's where U S WEST demultiplexing is only provided at the CO end.

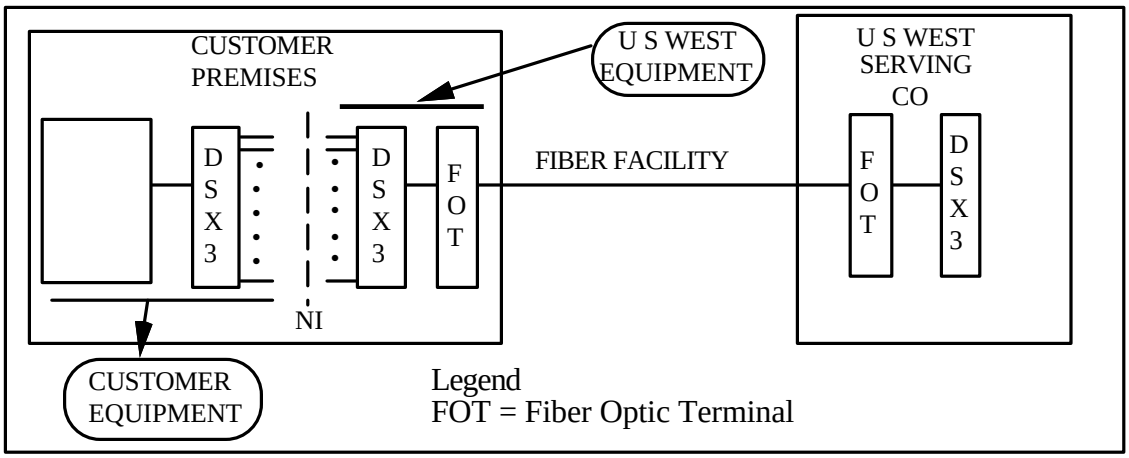

Figure 2-2: Electrical Interface CT Capacity

2.1.2 Optical Interface CT Capacity

The Optical Interface Capacity CT shown in Figure 2-3 interfaces at the customer end on a fiber distribution panel and at the CO end on a DSX-3 panel.

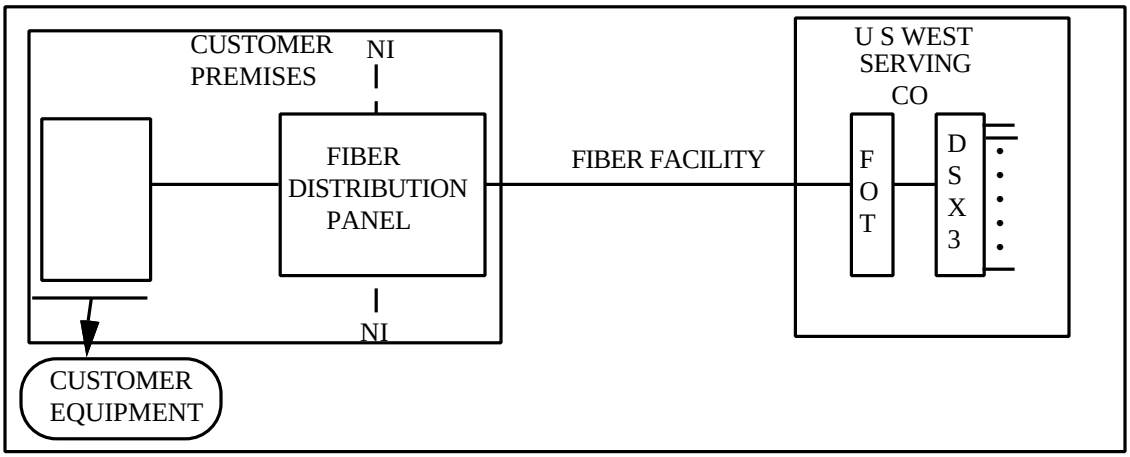

Figure 2-3: Optical Interface Capacity CT

Currently, national standards do not exist for optical interfaces; therefore, joint design between U S WEST and the customer is required when establishing this interface.

2.1.3 Radio Interface CT Capacity

The radio Interface CT Capacity shown in Figure 2-4 (commonly called mid-air meet), interfaces at the faceplate of each transmit/receive antenna.

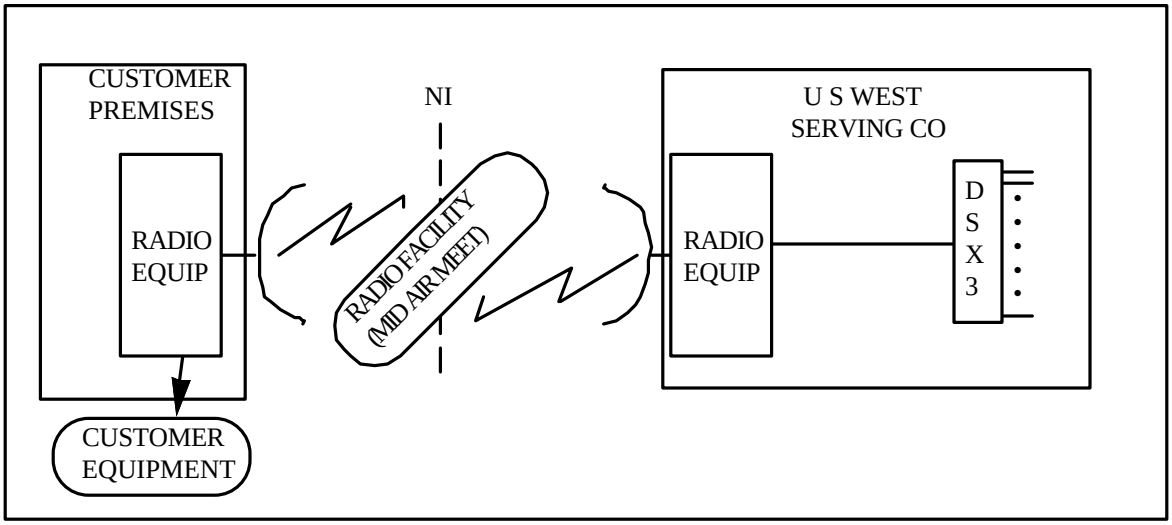

Figure 2-4: Radio Interface Capacity CT

Currently, national standards do not exist for radio interfaces; therefore, joint design between U S WEST and the customer is required when establishing this interface.

2.1.4 TC Element

The TC element, the network transport medium, is chosen by U S WEST. As shown in Figure 2-5, it originates at a DSX-3 panel in one CO and terminates on a DSX-3 panel in another CO. It may transit one or more COs between ends.

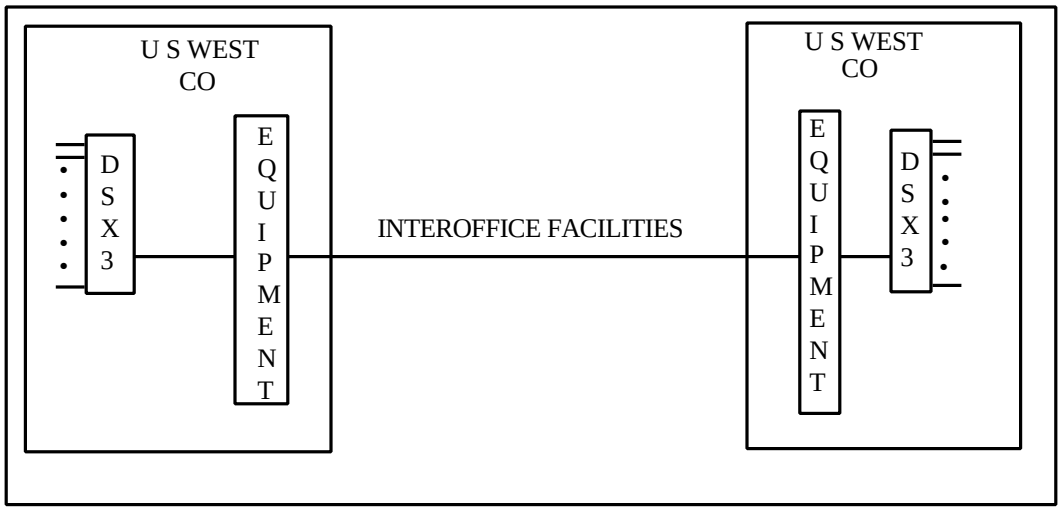

Figure 2-5: Transport Channel Element

2.2 DS3 Service Configurations

2.2.1 Customer Premises-to-Customer Premises Channel

This channel configuration shown in Figure 2-6 will terminate in an NI provided by U S WEST at each customer premises location. The NCI, selected by the customer, may be either electrical, optical, or radio (at either end) as previously described in the paragraphs under subheadings 2.1.1 through 2.1.3. Once the DS3 channel reaches the serving CO, U S WEST will chose the TC medium through it's network as described in the paragraph under subheading 2.1.4. U S WEST will be responsible for maintaining service between NIs.

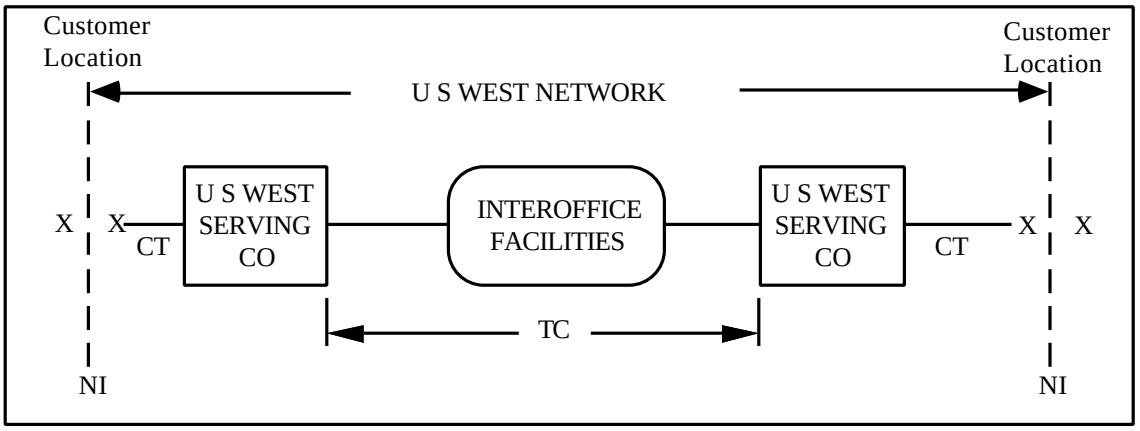

Figure 2-6: Customer Premises-to-Customer Premises Channel

2.2.2 Customer Premises-to-CO Hub Channel

This channel configuration shown in Figure 2-7 will terminate in a NI provided by U S WEST at the customer premises location and a DSX-3 panel or equivalent in a U S WEST CO Hub. The NI, selected by the customer, may be either electrical, optical, or radio (at either end) as previously described in the paragraphs under subheading 2.1.1 through 2.1.3. Once the DS3 channel reaches the serving CO, U S WEST will choose the TC medium through its network as described in the paragraph under subheading 2.1.4. U S WEST will be responsible for maintaining the service from the NI at the customer location to the DSX-3 Cross-connect panel or equivalent in the CO Hub.

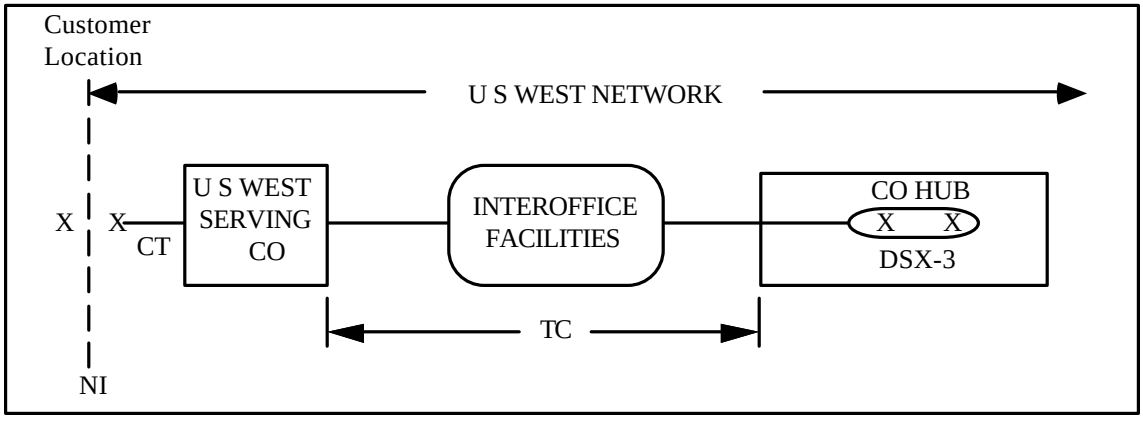

Figure 2-7: Customer Premises-to-CO Hub Channel

2.2.3 CO Hub-to-CO Hub Channel

This channel configuration shown in Figure 2-8 will terminate at both ends on a DSX-3 panel, or equivalent, in a U S WEST CO Hub. U S WEST will be responsible for maintaining service between the DSX-3 Cross-connect panels or equivalent.

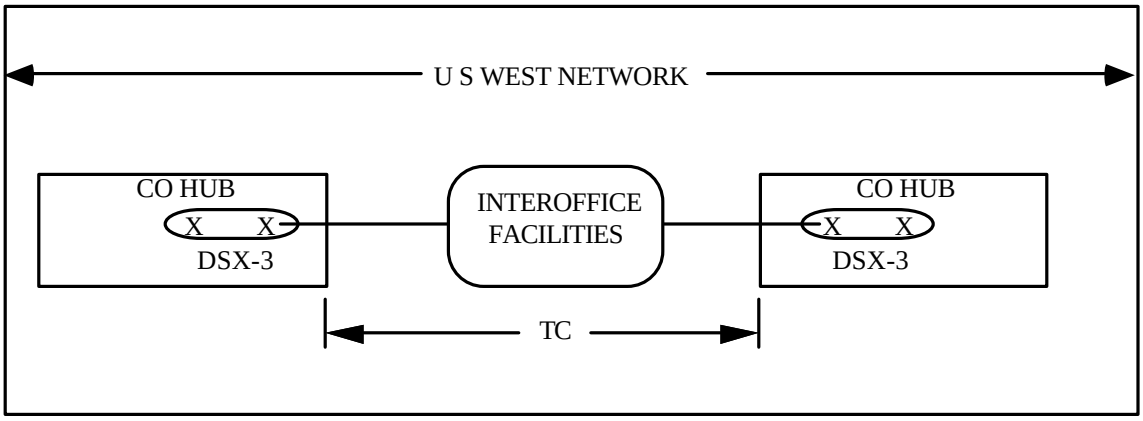

Figure 2-8: CO Hub-to-CO Hub Channel

2.2.4 Hub Multiplexing Feature (CO Multiplexing)

Figure 2-9 depicts an example of Hub Multiplexing Feature. Customers may request DS3 to DS1 multiplexing on DS3 channels that terminate at CO Hubs (Premises-to-CO Hub, and CO Hub-to-CO Hub configuration). The customer may order multiplexing at one or both ends of CO Hub.

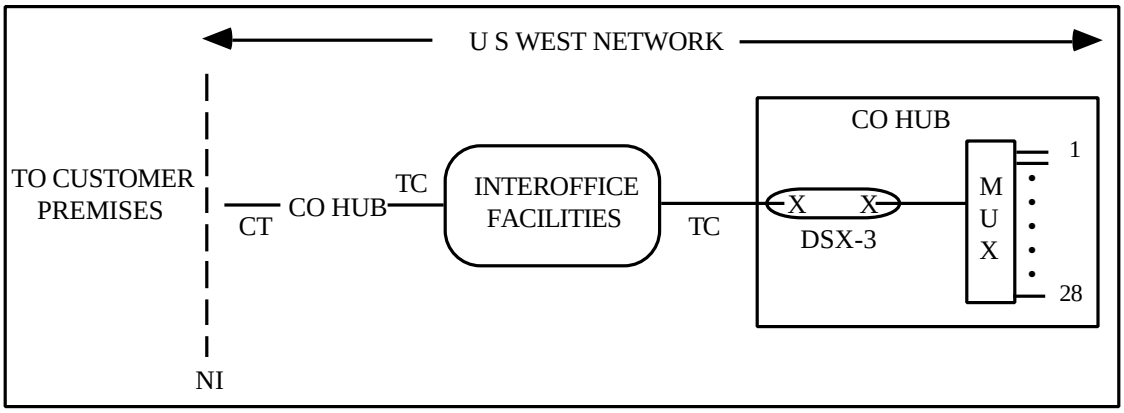

Figure 2-9: Hub Multiplexing Feature

When customers request Hub multiplexing, they sometimes require that the DS1 channels be capable of clear channel operation (for a more detailed explanation of DS1 Clear Channel; consult U S WEST Technical Publication 77375). Since U S WEST DS1 to DS3 multiplexing equipment is comprised of various vendors' products with a variety of vintages, clear channel optioning capability may vary from one vendor's equipment to the next.

2.3 Bipolar With 8-Zero Substitution (B8ZS) Impact on DS3 Multiplex Channel signal

DS1 Clear Channel (DS1 CC) operation is enabled through the use of the B8ZS line code. DS1 circuit packs in DS3 to DS1 multiplexers may or may not be capable of B8ZS. Those that are capable will allow B8ZS selection in-groups of either 7, 4, or 1 DS1 channel(s) at a time. This is also true for the equipment used by most customers served by U S WEST. For this reason in Table 4-4 in Chapter 4, a series of Network Channel (NC) codes provide NC code options permitting the customer to describe the type of clear Channel optioning capability desired (DS1 channel port B8ZS optional in groups of 7, 4, or 1). For technical and administrative reasons, it is important that the customer multiplexer and the U S WEST CO multiplexer should have a matching DS1 CC optioning capability. A multiplexer that can have DS1 ports optioned one-at-a-time, is compatible with one that options in-groups of 4 or 7.

2.3.1 Customer Responsibility When Ordering DS1 CC Hub Multiplexing Feature

The customer is responsible when placing an order involving transport of DS1 CC on DS3 to indicate by their selection of the appropriate NC (provided in Chapter 4 of this document), the capability of their multiplexer. This will ensure that U S WEST will adequately provide for the ordered feature requested by the customer.

Customer requested change to B8ZS, of an existing channel service, will require a new service order.

2.3.2 U S WEST Responsibility for Ordered DS1 CC Hub Multiplexing Feature

U S WEST will provide either a multiplexer matching that of the customer, or one that will provide for transport of DS1 CC on a one-to-one basis.

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3. Description of Interfaces

3.1 DS3 Electrical Interface and Frame Format Applications

DS3 channels are provided to Carrier and End-User (EU) customers. The Network Interface (NI) at a Carrier premises will be at a DSX-3 Cross-connect panel or equivalent with signal characteristics as described in ANSI T1.102-1987, and with the Frame structure as described in ANSI T1.107-1988. Specifically, U S WEST supports the M23 Multiplex Format described in Paragraph 8.2 of ANSI T1.107-1988 and its supplement ANSI T1.107a-1990. The NI at an EU premises will be at a SJA44 connector with signal characteristics as described in ANSI T1.404-1989.

The physical electrical DS3 NI configurations are shown in Figures 3-1 and 3-2 for Carrier premises and EU premises respectively. Carriers have two options at their premises:

- Carrier customers may elect to terminate their cables on the U S WEST DSX-3 Cross-connect panel in the space provided for U S WEST transmission equipment (Figure 3-1, option A).
- They may elect to have U S WEST terminate U S WEST cable on the customer's DSX-3 Cross-connect panel located in the customer's workspace (Figure 3-1, option B).

If Asynchronous M23 multiplex applications and C-Bit Parity applications meet at a network-to-network or network-to-customer premises interface, U S WEST will require an M23 Multiplex format that conforms to the signal characteristics described in the first paragraph under subsection 3.1.

U S WEST does not support DS1 to DS3 CO multiplexing on M23 Multiplex signals with the C-Bit Parity application. Also, U S WEST does not support either DS3-M13 framing format or "DS3 Clear Channel" interfaces.

3.2 Optical Interface for Multiplexed DS3s

The NI for this option will be at a U S WEST provided Fiber Distribution Panel (FDP) at the customer’s premises. The type of connectors to be used will be jointly agreed upon by the customers and U S WEST’s transmission engineers. The customer will provide the fiber optic cable to connect their equipment to the NI. The customers’ equipment will be Cross-connected at the U S WEST provided FDP as shown in Figure 3-3.

There are no industry Standards for Asynchronous lightwave multiplexing and transport equipment. Each manufacturer of fiber optic transmission equipment uses their own proprietary signal format, e.g., 540 Mbit/s. This requires the use of the same manufacturer’s equipment at both ends of a system. U S WEST will identify the equipment types available and the customer will select and provide compatible equipment at their premises.

3.3 Radio Frequency Interface for Multiplexed DS3s

The Radio Frequency (RF) Interface (commonly called a mid-air meet) for a DS3 channel will be at the faceplate of each transmit/receive antenna. Multiplexed Asynchronous DS3s may be transported to an RF interface.

Due to different protocols in use on the line overhead of the radio system, the same type of radio equipment must be used at both ends of the system. U S WEST will identify the equipment types available and the customer will select and provide compatible equipment at their location.

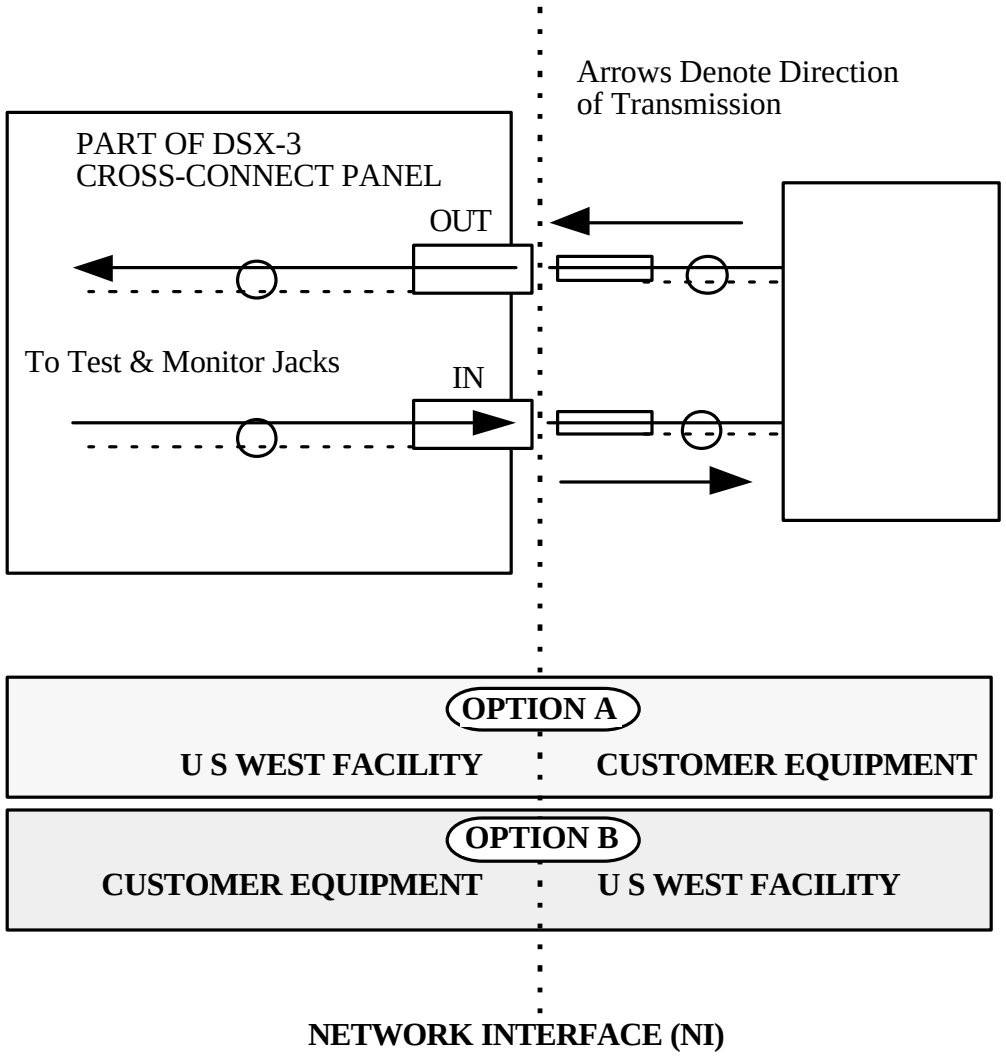
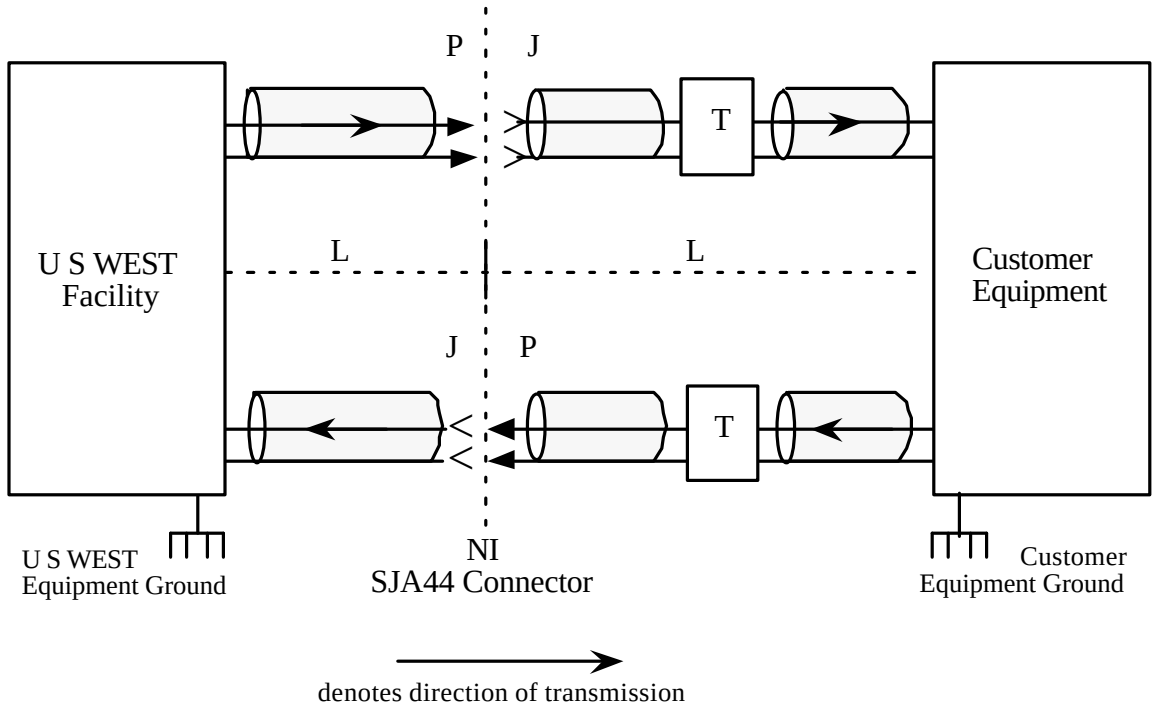


Figure 3-1: Carrier Premises - DSX-3 Cross-connect Panel Interface



Legend:

- T - Optional wideband transformers to mitigate ground currents.
- P - TNC connector plug
- J - TNC connector jack
- L - Maximum cable length to NI - 450 feet of 75? coaxial cable.

Note 1: This diagram indicates signal continuity arrangements and maximum allowable cable lengths.

Note 2: Equipment grounding should follow recommended Carrier / customer installation practices consistent with existing safety standards.

Note 3: If the maximum distance between the DSX-3 Cross-connect panel and the customer equipment exceeds 450 feet a DS3 Regenerator will be required.

Figure 3-2: EU Premises Electrical DS3 - SJA44 Network Interface Connector

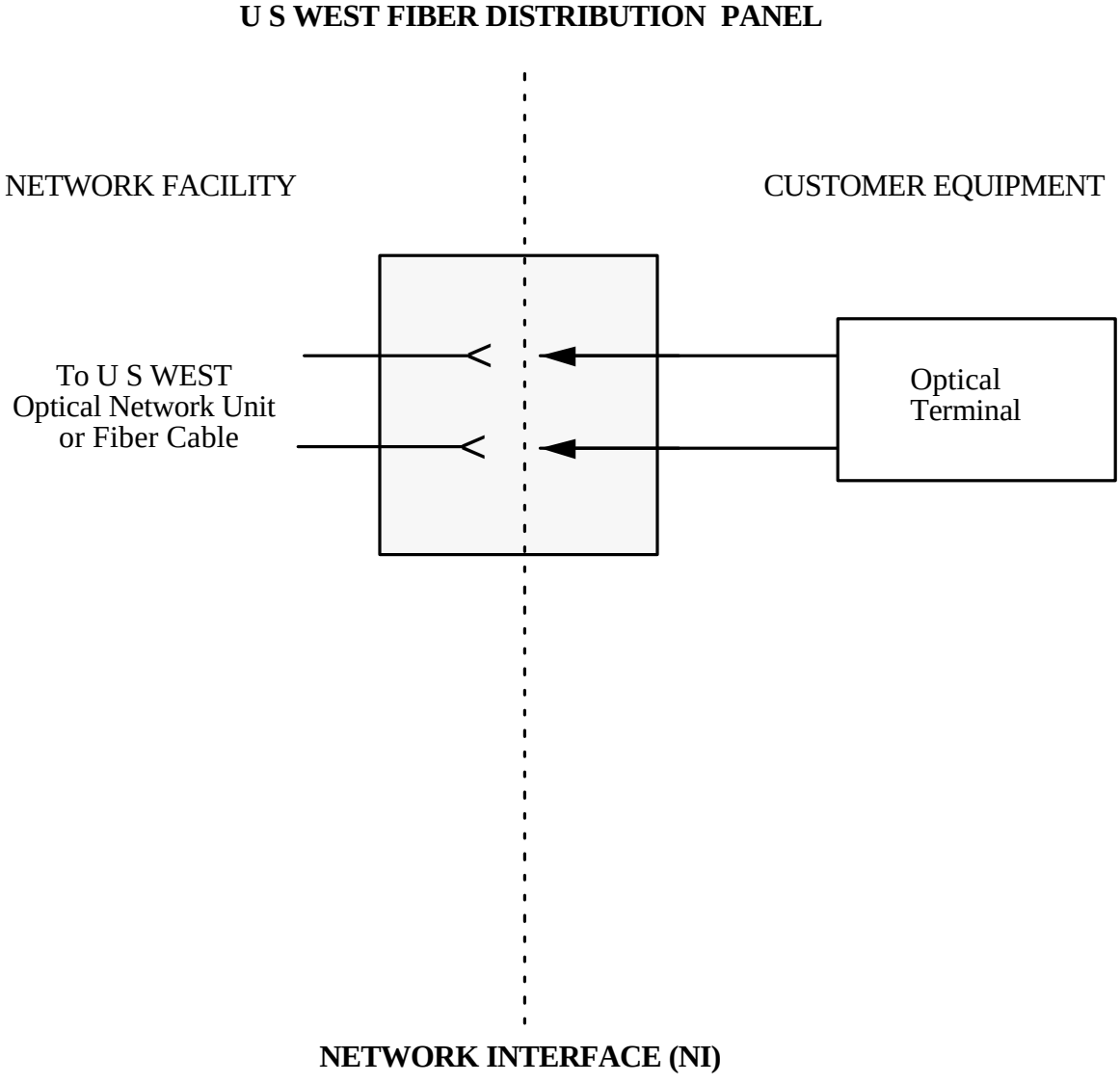


Figure 3-3: Optical Interface for Carriers and EUS

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Tables

4. Network Channel (NC) and Network Channel Interface (NCI) Codes

NC and NCI codes convey service and technical parameters. This chapter explains the codes in a general manner and then it provides specific code combinations to aid in ordering DS3 service. NC and NCI codes are provided by the customer to the U S WEST Service Representative at the time a request for DS3 service is initiated.

4.1 NCI Code Function

Signal specifications information at an interface are encoded into *NCI codes*. For DS3 service, the NCI code may convey capacity. Customers provide an NCI code to U S WEST to advise the Engineer of the specific technical customer requirements at a Network Interface and to convey capacity, given as quantities of DS3.

DS3 NCI options include:

4.1.1 Electrical DS3 Interface NCI Code Options

NCI coding for DS3 interfaces identifies two applications:

- M23 multiplex
- M23 multiplex with C-Bit Parity

Each application has multiple options for capacity, which are outlined in the Tables 4-1 through 4-5. The capacity number indicates the number of DS3 channels reserved by the customer.

As noted in an earlier chapter, U S WEST provides an option for DS3 to DS1 Central Office (CO) multiplexing with the M23 multiplex application.

4.1.2 Optical Interface NCI Code Option

Multiple Asynchronous DS3 channels may be ordered multiplexed and transported within a higher bit-rate bandwidth on fiber optic cable to a fiber optic interface. NCI coding for optical interfaces permits a choice of reserved DS3 capacity.

4.1.3 Radio Interface NCI Code Option

Multiple Asynchronous DS3 channels may be ordered multiplexed and transported within a higher bit-rate bandwidth on a microwave radio channel. The "interface" exists within the radio signal transmission path. NCI coding permits a choice of reserved DS3 capacity and of radio frequency band.

4.2 NCI Code Form and Components

The full NCI code format has fields not used for digital services. Only those fields relevant to DS3 interfaces are discussed here.

4.2.1 NCI Code Form

An NCI code has the form *04DS6.44*. The period between the numbers is a delimiter, which is used for improved clarity. It causes the *Protocol Option Code*, discussed later, to stand-out. An NCI code has no dashes (-).

4.2.2 NCI Code Components

Digital NCI Codes have four components as shown in Figure 4-1 through 4-5. Figure 4-1 provides an example of an electrical DS3 interface NCI code, Figure 4-2 is an example of an optical interface NCI code, and
Figure 4-3 is a radio frequency interface NCI code example.

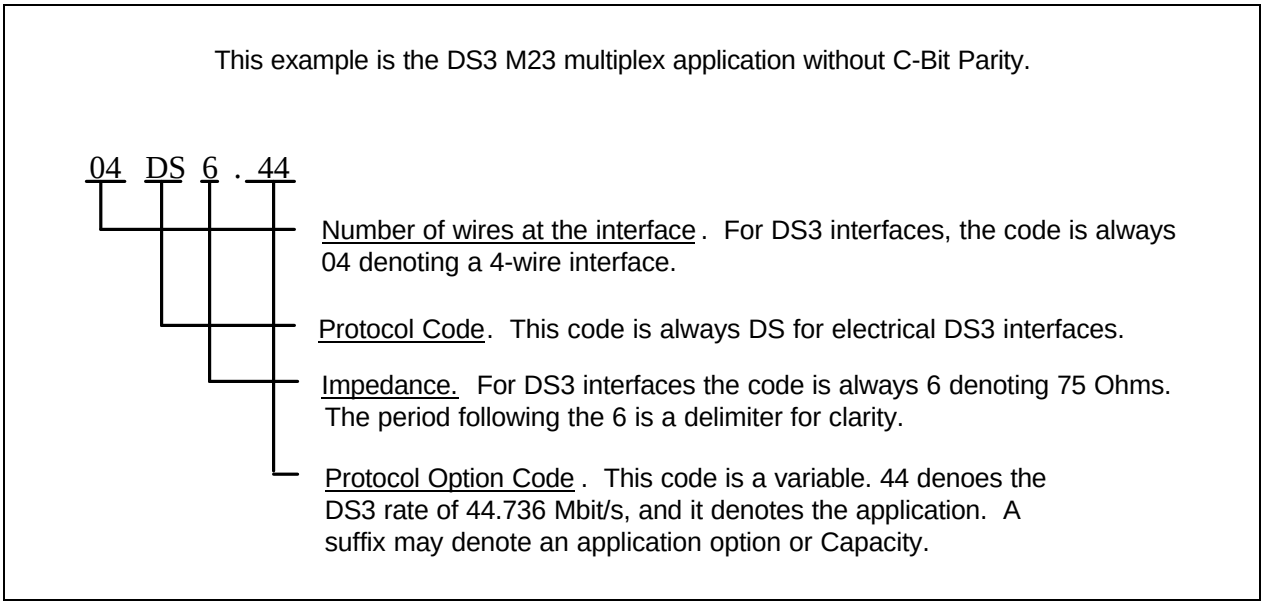
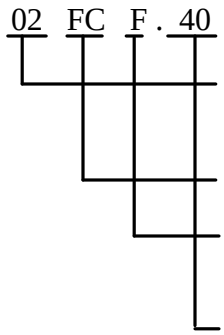


Figure 4-1: Electrical DS3 NCI Code Example

This example is a fiber interface with a capacity of 9 asynchronous DS3's.



Number of fibers at the interface. Current optical interfaces use two fibers, so the code is always 02.

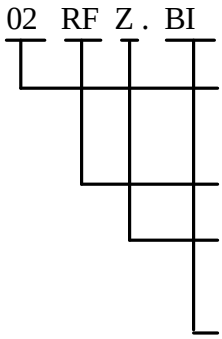
Protocol Code. This code is FC for all optical interfaces.

Impedance. For optical interfaces the code is always F denoting fiber. The period following the F is a delimiter for clarity.

Protocol Option Code. This code is a variable denoting whether the signal is asynchronous or SONET, and what is the capacity. Capacity coding generally identifies the bandwidth, therefore the type, of the high-rate multiplexer delivering the capacity.

Figure 4-2: Optical NCI Code Example

This example is a digital Microwave Radio interface at 11 gHz. with a capacity of 9 asynchronous DS3's.



Number of radio frequencies at the interface. MW radios use 1 transmit and 1 receive frequency, so the code is typically 02.

Protocol Code. This code is RF for all radio frequency interfaces.

Impedance. For radio interfaces the code is always Z denoting radio. The period following the Z is a delimiter for clarity.

Protocol Option Code . This code is a variable denoting the radio frequency band, whether the radio is analog or digital, and the DS3 capacity. The combination generally identifies the type of radio to be used.

Figure 4-3: Radio NCI Code Example

4.3 NC Code Function

Primarily, service considerations are encoded into *NC codes*. Additionally, an NC code may repeat technical information that is contained within the NCI code or missing from the NCI when the NCI is used to convey capacity information. The NC code is specified by the customer to advise U S WEST of the required service connection of the channel.

4.4 NC Code Components and Form

An NC code consists of four alpha/numeric characters, which may include a dash (-). There are neither spaces nor delimiters between the characters.

- For electrical DS3 channel interfaces the first two characters are HF. An example of the form is *H F - 4* .
- Multiplexed Asynchronous DS3 optical interfaces use the electrical DS3 NC codes. See *a.*
- For radio interfaces the first two characters are LY. An example of the form is *L Y D M* .

The third and fourth characters are variable to denote additional interface and service features as described in following sections.

4.5 Codes Used to Order DS3 Service

4.5.1 NC and NCI Codes - General

NC and NCI codes used to order U S WEST DS3 Services are listed in the following tables. Codes for the service desired must be specified by the customer when ordering High Capacity Digital Special Access services.

4.5.2 NC and NCI Code Combinations for Asynchronous DS3 Service

The informational NCI Codes listed in Table 4-1 and the NCI codes listed in Table 4-2 and Table 4-3 below are the codes customers will use when ordering Electrical and Optical Asynchronous DS3 Services. For information regarding other DS3 Services such as U S WEST Self-Healing Network Service (SHNS) and Self Healing Alternate Route Protection (SHARP) refer to Technical Publications 77332 and 77340 respectively.

Table 4-1: Informational NCI Codes Used for Ordering Various Asynchronous DS3 Interfaces

CAPACITY Asynchronous DS3s	NCI Codes for ordering Electrical DS3 Interfaces	NC Codes
1 DS3	04DS6.44A	Use NCI codes with compatible NC codes in Table 4-4
2 DS3	04DS6.44B	
3 DS3	04DS6.44C	
6 DS3	04DS6.44E	
9 DS3	04DS6.44F	
12 DS3	04DS6.44G	
24 DS3	04DS6.44N	
36 DS3	04DS6.44J	

Table 4-2: Multiplexed Asynchronous DS3 Radio Frequency Interfaces - NC and NCI Codes

CAPACITY Asynchronous DS3s	NCI Codes for 6 gHz. Radio	NCI Codes for 11 gHz. radio	NC Code	NC Code char 1 - 2	Definition char 3-4
3 DS3	02RFZ.AC	02RFZ.BC	LYDM	LY Digital Radio	DM Central Office Multiplexer
6 DS3	02RFZ.AF	02RFZ.BF	LYDM		
9 DS3	02RFZ.AI	02RFZ.BI	LYDM		
12 DS3	02RFZ.AL	02RFZ.BL	LYDM		

Table 4-3: NC and NCI Codes for Asynchronous Digital Fiber Interface Channel

Number of DS3s	NCI Codes	NC Code	NC Code char 1 - 3	definition char 4
2 DS3	0 2 F C F . 9 0	H H - M	H H -	M
3 DS3	0 2 F C F . 1 3	H H - M	Digital Fiber	Central Office Multiplexer
6 DS3	0 2 F C F . 2 7	H H - M		
9 DS3	0 2 F C F . 4 0	H H - M		
12 DS3	0 2 F C F . 5 4	H H - M		
18 DS3	0 2 F C F . 8 1	H H - M		
24 DS3	0 2 F C F . 1 2	H H - M		
36 DS3	0 2 F C F . 1 6	H H - M		

Table 4-4: NC Codes for Electrical and Optical Asynchronous DS3 Channels (2 of 2)

NC Code definition	
Characters 1-3	**Character 4**
HF- for individual DS3 **Channels** DS3 signal with M23 Multiplex format per ANSI T1.107a-1990 and Bellcore TR-INS-000342 for individual DS3 Channels	**–** None (customer premises-to-customer premises channel, or customer premises to CO channel terminated on DSX-3 Cross-connect panel)
	M Central Office Multiplexing (DS1 Clear Channel Capability optioning capability not specified)
	Y Central Office Multiplexing from DS3 to DS1 at both the A and Z Central Offices (DS1 Clear Channel Capability optioning capability not specified)
	1 Central Office Multiplexing. Multiplexer can be optioned for <u>one</u> DS1 Clear Channel at a time using B8ZS line code.
	4 Central Office Multiplexing. Multiplexer can be optioned for <u>four</u> DS1 Clear Channel at a time using B8ZS line code.
	7 Central Office Multiplexing. Multiplexer can be optioned for <u>seven</u> DS1 Clear Channel at a time using B8ZS line code.
HFC- for individual DS3 **Channels** DS3 signal with M23 Multiplex format and C-Bit Parity application per ANSI T1.107a-1990 and Bellcore TR-INS-000342	**–** None (Same definition as for "–" above)
HFX- for individual DS3 **Channels** DS3 signal with M23 Multiplex format per ANSI T1.107a-1990 and Bellcore TR-INS-000342 for Central Office Cross-connect	**–** None (customer premises-to-customer premises)

Table 4-4: NC Codes for Electrical and Optical Asynchronous DS3 Channels (2 of 2)

	M Central office Multiplexing (DS1 Clear Channel Capability optioning not specified), and Central Office Cross-connect (i.e. this Service terminates at the DSX-3 panel, or equivalent, in a USW CO)
HH- for **Capacity** transport of DS3 DS3 signal with M23 Multiplex format per ANSI T1.107a-1990 and Bellcore TR-INS-000342	**M** Central Office Multiplexing (Digital Fiber to DS3)

The NCI codes listed in Table 4-5 are the valid technical coding iteration for the Asynchronous DS3 electrical interfaces U S WEST provides. They are not used at this time when ordering U S WEST DS3 service, because U S WEST uses the informational NCI codes listed in Table 4-1 to convey capacity information, which requires a different set of codes. The exception is that the codes in Table 4-5 are used to order physical or virtual, Expanded Interconnect Channel Termination (EICT) for DS3 as documented in U S WEST Service Publication 77201.

Table 4-5: Technical (Non-capacity) DS3 Electrical Interface NCI Codes

NCI	Description
0 4 D S 6 . 4 4	DS3 signal with M23 Multiplex format application per ANSI T1.107a-1990 and Bellcore TR-INS-000342
0 4 D S 6 . 4 4 I	DS3 signal with M23 Multiplex format and C-Bit Parity application per ANSI T1.107a-1990 and Bellcore TR-INS-000342

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Tables

5. Performance Specifications

5.1 Origin of End-to-End Objectives

Because performance varies, objectives must be determine with consideration for the statistical distribution of the components in the individual provider portions. Generally, error performance distributions have two components:

- • A Poison-like distributed background bit error rate
- • Episodes of clustered error events superimposed on the above

The majority of modern digital systems have been engineered such that the poison components is low relative to objectives. The episodic component is difficult to model, but for today's architecture, facilities and equipment, certain statistical properties are observed.

There are large fractions of days which are error free and a wide variation in the number of Errored Seconds (ES) or Severely Errored Seconds (SES) on days with errors. The probability that all provider portions would simultaneously operate at the worst end of their individual performance distribution is low, it follows that the end-to-end performance objectives will be greater than the largest objective among the carrier portions, but less than the linear sum of the objectives of all portions.

5.2 Performance Objectives

Accuracy and availability performance objectives are used as an aid in designing, developing, and maintaining the U S WEST networks providing digital services. For long term performance objectives parameters for dedicated digital services consults ANSI T1. 503-1989. Factors such as technology mix, geographic factors isolated events, etc., may impact individual circuit performance.

5.2.1 Accuracy Objectives

Accuracy performance objectives are established in terms of the parameters provided in Table 5-1 below. It is important to note that long term accuracy objective is stated in 30 days or more. ES and SES characterize the transmission quality of the service and are used to derive the test limits.

Table 5-1: Long Term Accuracy Objectives

SEGMENT	PARAMETER	44.736 MBIT/S
END-TO-END	%ES	1.000
	%SES	0.035
Transit	%ES	0.500
	%SES	0.025
Access	%ES	0.500
	%SES	0.010
NOTE - Actual performance may not meet objectives at all times.		

5.2.2 Availability Objectives

Availability objectives are established in terms of the parameters provided in Table 5-2. Short Interruption Event Count (SIEC) and Percent (%) Availability characterize the usability of the service over time.

A service is assumed to be in the Available state unless a transition to the Unavailable state is observed without a subsequent transition to the available state. The transition between the Available and Unavailable states are:

- • Transition to the Unavailable state occurs either at the beginning of 10 consecutive SESs.
- • Transition to the Available state occurs at the beginning of 10 consecutive seconds none of which is SES.

Table 5-2: Availability Objectives

SEGMENT	PARAMETER	44.736 MBIT/S
END-TO-END	% Service Availability (Annual)	99.830
	% SIEC (Monthly)	Note
Transit	% Service Availability (Annual)	99.930
	% SIEC (Monthly)	Note
Access	% Service Availability (Annual)	99.950
	% SIEC (Monthly)	Note
NOTE - Short Interruption Event (SIE) is a new parameter. These objectives are under study.		

5.3 Acceptance Tests

Loopback acceptance tests should be made using the one-way limits because one direction is likely to be controlling. If these fail, then appropriate one-way tests should be made.

5.4 Service Availability

The availability requirement for U S WEST DS3 Service is 99.93 percent. Unavailability or outage is defined as any one second interval with a line BER equal to or worse than $1X10^{-3}$ BER. The corresponding outage equates to 79 minutes a year.

5.5 Jitter Performance

Timing jitter is defined as the short term variations of the significant instances of a digital signal from their ideal positions in time, where short term implies phase oscillations of frequency greater than or equal to 10 Hertz (Hz).

5.6 Network Interface Timing Jitter Specifications

The limits given in Bellcore Technical Reference TR-NWT-000499 represent the maximum permissible levels of output jitter for Carrier-to-Carrier Network Interfaces. The Carrier-to-End-User Network Interface jitter requirements are addressed in ANSI T1.404-1989. The purpose of these limits is to limit broadband jitter appearing anywhere in the U S WEST Network.

5.7 Automatic Protection Switching

Automatic protection switching is used to improve the availability and reliability performance of U S WEST DS3 service by substituting standby equipment or alternate channels when failure occurs.

The protection switch will operate and switch the U S WEST DS3 channel to the protection system when the BER reaches $1X10^{-6}$ and operates at that BER for 10 seconds or longer.

Once a decision is made to switch to a protection system, the additional time required to complete the switch will not exceed 50 milliseconds.

The protection switch will operate and switch the U S WEST DS3 channel back to the service line after the BER on the service line reaches $1X10^{-7}$. The switch will take place within 200 seconds of the time that the restoral BER is reached.

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6. Maintenance

6.1 Customer Responsibilities

The customer is responsible for all equipment and cable on the customer side of the Network Interface (NI) at their location. This will be at a DSX-3 Cross-connect panel or a SJA44 connector if the service is terminated in an electrical interface. For an optical interface the NI will be at the Fiber Distribution Panel (FDP). The NI for a radio channel will be at the faceplate of the transmit/receive antenna.

The customer or their agent must sectionalize the trouble and verify that the trouble is not in the customer owned equipment or cable before calling the U S WEST Customer Service Center.

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

Joint testing between the customer location and a U S WEST CO may sometimes be necessary to isolate the trouble.

6.2 U S WEST Responsibilities

U S WEST is responsible for all equipment and cable on their side of the NI at the customer location.

U S WEST is responsible for maintaining the transmission facility between customer locations and between the CO Hub and the customer location.

U S WEST will furnish the customer a trouble reporting telephone number.

Upon receipt of a trouble report, U S WEST will initiate action within twenty minutes to clear the trouble.

U S WEST will commit to a one hour maximum service restoral time in the event of a service interruption due to an electronic component failure. If the trouble is caused by a cable failure, the maximum service restoral time will be four hours.

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7. Definitions

7.1 Acronyms

ASR	Access Service Request
B8ZS	Bipolar With 8-Zero Substitution
CO	Central Office
CT	Channel Termination
EICT	Expanded Interconnect Channel Termination
ES	Errored Second
EU	End-User
FDP	Fiber Distribution Panel
LATA	Local Access and Transport Area
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
POT	Point Of Termination
RF	Radio Frequency
SES	Severely Errored Second
SHARP	Self-Healing Alternate Route Protection
SHNS	Self-Healing Network Service
SIE	Short Interruption Event
SIEC	Short Interruption Event Count
SYNTRAN	Synchronous Transmission
TC	Transport Channel

7.2 Glossary

The following provides the meaning of the glossary terms used in this Publication.

Bit (Binary Digit)

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

B8ZS (Bipolar With 8-Zero Substitution)

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 for providing bit independence for digital transmission by providing a minimum 1s density of 1 in 8 bits

Central Office (CO)

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

Channel

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

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.).

Errored Second (ES)

A one second interval with one or more bit errors.

Note - A period of no signal shall be considered a period of errored bits.

Facilities

Facilities are the transmission paths between the demarcation points serving customer locations, a demarcation point serving a customer location and a U S WEST Communications, Inc. Central Office, or two U S WEST Communications, Inc. offices.

Isochronous Transmission

A transmission process in which there is always an integral number of unit intervals between any two significant instants. The transmission is characterized by a constant pulse rate, a constant time interval, or multiples thereof between voltage or electromagnetic field intensity transitions, and a gating by a controlled clock.

Jitter

Random timing distortions of a digital signal, whereby the appearance of a pulse differs from where the pulse should occur relative to time.

Loopback

An out-of-service test procedure applied to a full duplex channel that causes a received signal to be returned to the source.

Multiplex

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 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 U S WEST's responsibility for the provision of service ends.

Protocol Code

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

Severely Errored Second (SES)

A one second interval having a Bit Error Ratio of 10^{-3} or worse

Short Interruption Event (SIE)

An event beginning with the occurrence of a BER of 10^{-2} or worse continuously for three or more consecutive seconds, which can last up to 120 seconds. A SIE clears when 10 consecutive seconds with BER better than 10 occur.

Note - The "10^{-2} BER continuously" over each second implies that all sub-intervals, where the second is divided into at least 10 equal sub-intervals, have a BER of 10^{-2} or worse.

Short Interruption Event Count (SIEC)

A count of the Short Interruption Events in a given time frame (e.g., one month).

Special Access Service

A service that provides a transmission path within a LATA and directly connects a POT to an End-User's premises or to another POT.

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8. References

8.1 U S WEST Documents

Service Publication 77201 *Physical and Virtual Collocation and Associated DS1 and DS3 Expanded Interconnection Channel Terminations*, January 1993, Issue A

Technical Publication 77332 *U S WEST Self-Healing Network Service*, October 1992, Issue E

Technical Publication 77340 *Self-Healing Alternate Route Protection (SHARP),* December 1992, Issue D

Technical Publication 77375 *1.544 Mbit/s Channel Interfaces,* December 1992, Issue A

8.2 Bellcore Documents

TR-INS-000342 *High Capacity Digital Special Access Service*, Issue 1, February 1991

TR-NWT-000499 *Transport Systems Generic Requirements*, Issue 4, Revision 1, April 1992

8.3 American National Standards Institute (ANSI) Documents

ANSI T1.102-1987 *Digital Hierarchy - Electrical Interfaces*

ANSI T1.107-1988 *Digital Hierarchy - Formats Specifications*

ANSI T1.107a-1990 *Digital Hierarchy -Supplement to Formats Specifications*

ANSI T1.404-1989 *Customer Installation to Network, DS3 Metallic Interface Specifications*

ANSI T1.503-1989 *Telecommunications - Network Performance Parameters for Dedicated Digital Service*

8.4 Document Ordering Information

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

Ordering Information for Employees of U S WEST, Inc.

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