

# **QWEST Communications International Inc. Service Publication**

## **QWEST DS1 SERVICE**

**AND**

## **QWEST DS1 RATE SYNCHRONIZATION SERVICE**

**Network Channel and Network Channel Interface  
Code Combinations**

**For**

- **Customer Premises to Customer Premises Channels**
- **Customer Premises to Central Office Channels with DS1-to-Voice and Digital Data Multiplexing and DS1-to-DS0 Multiplexing**
- **Customer Premises to Central Office Channels with Customer Reserved Interfaces**
- **Central Office to Central Office Channels with Optional DS1-to-Voice and Digital Data Multiplexing at Either or Both Central Offices**
- **DS1 Rate Synchronization Channel Interface**

## NOTICE

This document provides information about two QWEST services:

- QWEST DS1 Service
- QWEST DS1 Rate Synchronization Service

For a QWEST DS1 Service, this document provides the Network Channel (NC) Codes and Network Channel Interface (NCI) Codes used to order 1.544 Mbit/s channels and selected Central Office (CO) options. For the QWEST DS1 Rate Synchronization Service, this document provides the NC and NCI Codes used to order the service.

*Service Publication 77200* is to be used with *QWEST Technical Publication 77375*, which is a reference document providing technical interface specifications for all the DS1 NCI codes supported by QWEST. Refer to Chapter 6 of this publication for information on ordering other technical or service publications.

Service Publication 77200 provides:

### QWEST DS1 Service

- *Network Channel (NC)* code definitions associated with these service configurations:
  - Customer premises to customer premises channels;
  - Customer premises to QWEST CO multiplexer;
  - Customer Reserved Channel Interface;
  - CO to CO channels with optional multiplexing at one or both COs.

A channel ordered with a *Customer Reserved* Interface is a channel from a customer premises to a QWEST Central Office (CO), having an interface that is not interconnected to another channel or another CO service, but is held for future assignment by the customer. This may also be known as a *dangling channel or dangling interface*.

- NC and NCI code compatibility tables for ordering the combinations of 1.544 Mbit/s line codes, frame formats, and service options that are the subject of this Service Publication.

Other combinations of NC and NCI codes are possible, and they are described in the QWEST Publication for each particular service.

### QWEST DS1 Rate Synchronization Service

- End User premises NCI and NC Code Combinations to be used when ordering the service.
- Carrier premises NCI and NC Code Combinations to be used when ordering the service.

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## **1. Introduction**

### **1.1 Purpose**

This document provides information about two QWEST services:

- QWEST DS1 Service.
- QWEST DS1 Rate Synchronization Service.

For a QWEST DS1 Service, this document provides the Network Channel (NC) Codes and Network Channel Interface (NCI) Codes used to order 1.544 Mbit/s channels and selected Central Office (CO) Options. For the QWEST DS1 Rate Synchronization Service, this document provides the NC and NCI Codes used to order the service.

*Service Publication 77200* is to be used with *QWEST Technical Publication 77375, 1.544 Mbit/s Channel Interfaces*, which is a reference document providing technical interface specifications for all of the DS1 NCI codes supported by QWEST. Refer to Chapter 6 of this publication for information on ordering other technical or service publications.

### **1.2 Reason for Reissue**

Service Publication 77200 incorporates the following changes in the DS1 Tariffs:

- Removal of Free Framed DS1 restrictions that formerly limited this option to customers who have a National security need to encrypt the DS1 signal.
- Permit span powering to be ordered in conjunction with customer owned fiber optic equipment at high voltage sites.

### **1.3 Scope**

Service Publication 77200 provides:

QWEST DS1 Service

- NC code definitions associated with these service configurations:
  - Customer premises to customer premises channels;
  - Customer premises to QWEST CO multiplexer;
  - Customer Reserved Channel Interface;
  - CO to CO channels with optional multiplexing at one or both COs.

A channel ordered with a *Customer Reserved* Interface is a channel from a customer premises to a QWEST CO, having an interface that is not interconnected to another channel or another CO service, but is held for future assignment by the customer. This may also be known as a *dangling channel* or *dangling interface*.

- NC and NCI code compatibility tables for ordering the combinations of 1.544 Mbit/s line codes, frame formats, and service options that are the subject of this Service Publication.

Other combinations of NC and NCI codes are possible and they are described in the QWEST Publication for each particular service.

QWEST has developed a new interface to meet customer needs at End-User customer premises where the customer location is served by fiber facilities with associated multiplexer. This new interface eliminates the requirement for a customer provided Channel Service Unit. If copper facilities are the only access into your building, fiber facilities must be requested; however, Special Construction Charges will be assessed before the fiber construction can begin.

In order to determine whether this interface is an alternative for your location, please contact your QWEST Marketing Representative or call the QWEST Business Office. For further technical description please refer to QWEST Technical Publication 77375.

#### QWEST DS1 Rate Synchronization Service

- End User premises NCI and NC code Combinations to be used when ordering the service.
- Carrier premises NCI and NC Code Combinations to be used when ordering the service.

### **1.4 Tariff Considerations**

#### **1.4.1 Interstate Service**

Interstate service is purchased out of the FCC 5 Tariff, Section 7. Allowable configurations are as follows:

- Physically IntraLATA and Intrastate, but carrying more than 10% Interstate traffic.
- Physically IntraLATA and Interstate (LATA boundary crosses state boundary).
- Circuit connects to a Carrier for transport across state boundaries.

#### **1.4.2 Intrastate Service**

Intrastate service is purchased from state Private Line tariffs, state Access tariffs, Merged tariffs, or other state specific documents. Allowable configurations are as follows:

- Physically IntraLATA and Intrastate, and carrying less than 10% interstate traffic.
- Physically Intrastate but InterLATA; circuit connects to a Carrier for transport across a LATA boundary and the circuit carries less than 10% Interstate traffic.

## 1.5 Organization of Document

This document is organized as described in Table 1-1.

**Table 1-1** Document Organization

Chapter 1	Introduction	Provides the purpose, scope and organization of the publication.
Chapter 2	NC Codes and NCI Codes - General	Briefly addresses the function and form of Network Channel codes and Network Channel Interface codes as they pertain to this document.
Chapter 3	QWEST DS1 Service - NC and NCI Code Combinations	Provides the compatible NC and NCI code combinations for ordering the services described in the chapter.
Chapter 4	QWEST DS1 Rate Synchronization Service - NC and NCI Code Combinations	Provides the compatible NC and NCI code combinations for ordering the services described in the chapter.
Chapter 5	Definitions	Acronyms and Glossary.
Chapter 6	References	Documents Referenced and Ordering Information.

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## **2. Network Channel (NC) and Network Channel Interface (NCI) Codes - General**

NC and NCI codes convey service and technical parameters. This chapter explains the codes in a general manner to aid in the selection of compatible code combinations as presented in the next chapter. NC and NCI codes are provided by the customer to the QWEST Service Representative at the time the request for 1.544 Mbit/s service is initiated.

### **2.1 Network Channel Interface (NCI) Code Function**

DS1 electrical signal specifications at an Interface are encoded into *NCI codes*. Customers provide an NCI code to QWEST to advise the Engineer of their specific technical requirements at a Network Interface. Technical specifications for NCI codes supported by QWEST are provided in PUB 77375.

Documentation delivered to customers by their Network Channel Terminating Equipment (NCTE) vendor should include either the NCI code to give to the "Telco," or will include the technical elements that can be encoded by the customer.

Optional NCI coding for DS1 interfaces provides the following:

- Frame format - four options
  - Superframe (SF) (the SF code is also used, with an NC code, to obtain the T1DM format)
  - ANSI Extended Superframe (ESF)
  - non-ANSI ESF
  - Free Framing - Note 1
- Line code - two options
  - Alternate Mark Inversion (AMI)
  - AMI with Binary 8 Zero Substitution (B8ZS) - Note 2
- Whether the interface is at a Carrier or End-User premises
  - If the interface is at a Carrier premises, there are two options: NCI Protocol Code DJ or DS.
  - If the interface is at an End-User premises, there is one NCI Protocol Code. DU with two basic options: Conventional interface or DSX-1 interface.
  - Span power may be requested by customers requiring dc line power at the network interface to power optical terminal equipment. Span power will only be provided where customer owned fiber optic equipment is required to ensure adequate ground fault protection at high voltage locations. Span power is permissible with the DU or the DJ NCI protocol code. Span power is not available for customers ordering the DS or the DU NCI protocol code with the DSX-1 interface.

Notes:

1. Free Framing is available to all customers with a need for proprietary DS1 framed format and signal structure.
2. This is usually referred to as B8ZS line code, which may be used with any frame format to achieve DS1 Clear Channel Capability.

## 2.2 NCI Code Form and Components

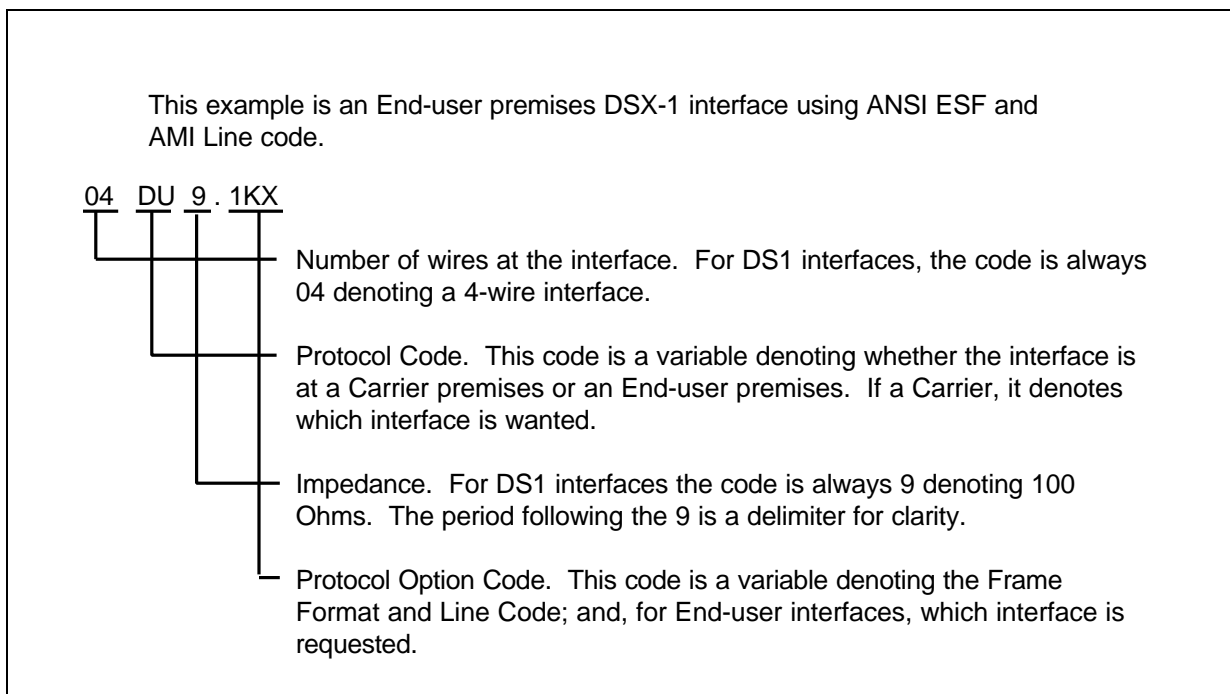
The NCI code format has fields not used for digital services. Only those fields relevant to DS1 interfaces are discussed here.

### 2.2.1 NCI Code Form

A DS1 NCI code has the form *04DU9.1KN*. The period between the 9 and 1 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 hyphens (-).

### 2.2.2 NCI Code Components

A DS1 NCI Code has four components as shown in Figure 2-1



**Figure 2-1** NCI Code Components

### **2.3 Network Channel (NC) Code Function**

Service considerations are encoded into *NC codes*. The NC code is specified by the Carrier or End-User to advise QWEST of the required service connection of the channel and of Central Office features.

### **2.4 NC Code Components**

An NC code consists of four alpha/numeric characters, which may include a hyphen " - ". For DS1 channels the first two characters are HC. The third and fourth characters are variable to denote additional interface and service features as described in the following chapter.

DS1 NC codes convey information already contained in the NCI code. This is because, for some configurations, the NCI code becomes obscured or otherwise unavailable, and the NC code substitutes for it.

### **2.5 NC Code Form**

The form of an NC code is *HCEG*. There are neither spaces nor delimiters between the characters.

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### 3. Compatible NCI and NC Code Combinations

Tables in this chapter provide code combinations to use for ordering DS1 channels and services of the following types:

- Customer Premises to Customer Premises Channels.
- Customer Premises to Central Office (CO) Channels with Customer Reserved Interface.
- Interconnection of two channels with Customer Reserved Interfaces at a QWEST CO.
- Customer Premises to CO channels with DS1-to-Voice and Digital Data multiplexing, and DS1-to-DS0 Multiplexing.
- CO to CO Channels with optional DS1-to-Voice and Digital Data multiplexing at either or both CO's. The inter-CO channel may be within the larger bandwidth of other digital service being provided for the customer.

**Note:** Solely at the discretion of QWEST, when DS1-to-Voice and Digital Data or DS1-to-DS0 multiplexing is ordered, an electronic digital cross-connect system (DCS) may be interpositioned in the DS1 path. The DCS routes individual DS0 channels to their destined Wire Center where the multiplexing will be done. That is, the multiplexing function may be distributed to end-points of the derived channels. This will minimize tandem analog to digital and digital to tandem analog conversions, and equipment optioning and adjustments.

A regulatory distinction is made between interfaces at a Carrier Premises and those at an End-User premises. Also, although QWEST is a Carrier, the term Carrier, as used in this chapter, only denotes a customer of QWEST. This allows a distinction to be made between a channel termination at a QWEST CO and a termination at the premises of another Carrier, who is a customer of QWEST.

#### 3.1 General

##### 3.1.1 NCI Compatibility

Within the tables in this chapter, each row is a compatibility list. Every NCI code in a row is fully compatible with all other NCI codes in the same row and with the NC code in the row.

##### 3.1.2 End-User Network Interface Option

Two End-User premises Network Interfaces are available for NCI Protocol Code DU, as described in Technical Publication 77375. They are the *Conventional interface* and the *DSX-1 interface*. Selection of the Conventional interface is made by using a NCI Protocol Option Code without the X suffix, e.g., *BN*. The DSX-1 interface is selected by appending any option code not having a suffix of N, with an "X"; e.g., *BX*.

### **3.1.3 Carrier Network Interface Option**

Carrier customers have the option of ordering either the DJ or the DS protocol code for their location. The 04DS9.++ provides the Carrier with a DS-1 signal that meets the pulse mask requirements for DSX-1. No direct current (dc) power is supplied across this network interface. Placement of a DSX-1 panel is dependent on the customer location and the type of facilities serving the Carrier customer. Generally, QWEST will supply a DSX-1 panel if the DS-1 facilities are transported via a fiber optic facility. If the transport facility is on copper T1 or HDSL loop transport, the interface to the Carrier will be at a RJ48C, RJ48H or RJ48M connector.

The 04DJ9.++ provides the Carrier with a DS-1 signal that may be attenuated up to 19dB. DC power may be supplied across the network interface to power the Carrier's terminal equipment. The Carrier will ensure that their equipment will not exceed the voltage and current requirements specified under FCC Part 68 Section 15. This section specifies that the Network Channel Terminating Equipment's (NCTE's) total power consumption shall not exceed 4 watts. Normal T1 carrier meet point arrangements don't power terminal equipment. QWEST will only span power the central office end of a fiber optic facility placed in accordance with the requirements specified in Pub 77321, *Special High Voltage Protection*.

### **3.1.4 Channel Service Unit Power**

In the NCI Protocol Option Codes for the End-User premises Conventional interface, a last character of N denotes that QWEST is Not requested to provide dc power for the customer's Channel Service Unit (CSU). DC power for the customer's CSU has not been available for new DS1 services since October 26, 1995.

This option will only be available at locations that involve the placing of customer owned fiber optic equipment at high voltage sites, such as electric power substations and transmission towers. The absence of the N indicates that span power is requested.

Carrier customers should request the 04DJ9.++ network channel interface if they require dc (also known as span power) at these high voltage sites. Additional information on the DJ interface can be found in QWEST Technical Publication 77375. DC power is not available for Carrier customers ordering the 04DS9.++ network channel interface.

### 3.1.5 Using the Tables

The process of selecting compatible NC and NCI codes from the following tables may usually be done in the following manner:

1. Locate the row containing the required equipment options (line code, frame format or free framing) then read across the row to find the NC code.
2. In that row, locate the column for the premises being coded; End-User, Carrier, or QWEST CO.
3. Read the NCI code for the interface at the juncture of the row and column.

### 3.1.6 Coding Exceptions When a DS1 Channel is Transported within a Customer's Higher Bit-Rate Channel

In the tables in this chapter, DS1 NCI codes are provided for various DS1 interfaces. However, when a customer has a higher bit-rate channel with QWEST CO multiplexing, that channel and multiplexer can be used to transport DS1's to the customer premises or inter-CO channel. For example, the customer has DS3 channels with CO multiplexing from DS3 to DS1; this scenario is described in Technical Publication 77324, *QWEST DS3 Service*.

When the higher bit-rate channel is transported to a customer premises, QWEST has no DS1 interface at the customer's premises and special NCI coding is required. QWEST order processes require the NCI code to represent the actual interface at the customer's premises. One such arrangement exists when the customer has a DS3 channel from their premises to a CO with DS3 QWEST CO multiplexing; this arrangement provides 28 DS1 channels assignable by the customer. Another example is where the customer has ordered a much higher bandwidth with an optical interface at their premises and QWEST CO multiplexing at that bit-rate; e.g., 560 Mbit/s.

Another example is when the customer has ordered a much higher bandwidth with an optical interface at their premises and QWEST CO multiplexing at that bit rate; 560 Mbit/s.

With these high bit-rate channel configurations, the customer will not provide QWEST a DS1 NCI code with their DS1 order. Instead, the customer will provide either 04DS6.44++ when the interface is DS3, or 02FCF.++ when the interface is asynchronous optical. The symbol “++” is replaced with the Protocol Option Code of the higher rate interface.

The customer will also provide assignment information to advise QWEST of the channel of the higher bit-rate multiplexer to which the DS1 channel is to be connected. 04DS6.44++ and 02FCF.++ are only examples; other interfaces are possible and they are disclosed in other QWEST publications. When the customer has one of the configurations described previously, they must provide the appropriate NCI code that reflects the actual higher bit-rate interface instead of the NCI found in the tables in this publication.

If the customer wants to interconnect a channel between two higher bit-rate QWEST CO multiplexers, the NC code is vital for the customer to obtain the DS1 options such as the line code and frame format.

### **3.2 Channel Between Two Customer Premises, or Between a Customer Premises and a QWEST CO without Multiplexing**

#### **3.2.1 Channels Between Two EU Premises**

Refer to Table 3-1. In Column A, locate the row having the required equipment options. Obtain the NC code from Column B. Obtain the NCI code for each end of the channel, from Column C. Columns D and E are not used.

Example:

- If the DS1 *frame format* is SF and the *line code* is AMI (Column A), use Row 1. The NC code is HC -- (Column B). Both NCI codes will be taken from Row 1, Column C. For the Conventional interface, the NCI code is 04DU9.BN. If the DSX-1 interface is requested, the NCI code is 04DU9.BX. The absence of the "X" suffix denotes a Conventional interface. Its presence denotes a DSX-1 interface.

**Table 3-1** Codes for Customer Premises to Customer Premises,  
and Customer Premises to CO Customer Reserved Interface, Channels

	A Equipment Frame Format and Line Code	B NC Code	C NCI at End-User premises	D NCI at Carrier premises	E NCI at QWEST Central Office
1	SF & AMI	H C - -	04DU9.BN or BX	04DS9.15 or 04DJ9.15	04DS9.15
2	SF & B8ZS	H C Z -	04DU9.DN or DX	04DS9.15B or 04DJ9.15B	04DS9.15B
3	ANSI ESF & AMI	H C D -	04DU9.1KN or 1KX	04DS9.1K or 04DJ9.1K	04DS9.1K
4	ANSI ESF & B8ZS	H C E -	04DU9.1SN or 1SX	04DS9.1S or 04DJ9.1S	04DS9.1S
5	non-ANSI ESF & AMI	H C F -	04DU9.CN or CX	04DS9.15K or 04DJ9.15K	04DS9.15K
6	non-ANSI ESF & B8ZS	H C G -	04DU9.SN or SX	04DS9.15S or 04DJ9.15S	04DS9.15S
7	Free Framing & B8ZS	H C J -	04DU9.AN or AX	04DS9.15J or 04DJ9.15J	04DS9.15J

### 3.2.2 Channels Between Two Carrier Premises

Refer to Table 3-1. In Column A, locate the row having the required equipment options. Obtain the NC code from Column B. Obtain the NCI code for each end of the channel, from Column D. Columns C and E are not used.

Example:

- If the *frame format* is SF and the *line code* is AMI (Column A), use Row 1. The NC code is HC--(Column B). Both NCI codes are taken from Row 1, Column D. The NCI code at either or both ends may be 04DS9.15 or 04DJ9.15.

### 3.2.3 Channels Between an EU and a Carrier Premises

Refer to Table 3-1. In Column A, locate the row having the required equipment options. Obtain the NC code from Column B. Obtain the NCI code for the EU premises from Column C, and the NCI code for the Carrier premises from Column D. Column E is not used.

Example:

- If the *frame format* is ANSI ESF and the *line code* is AMI (Column A), use Row 3. The NC code is H C D - (Column B). The NCI code for the EU premises is taken from Row 3, Column C, and is 04DU9.1KN or 04DU9.1KX. The NCI code for the Carrier premises is from Row 3, Column D, and may be either 04DS9.1K or 04DJ9.1K.

**3.2.4 Channels Between any Customer Premises and a QWEST CO, with a Customer Reserved Interface**

Refer to Table 3-1. In Column A, locate the row having the required equipment options. Obtain the NC code from Column B. Obtain the NCI code for a EU premises from Column C, or for a Carrier premises from Column D. The NCI code for the interface of the reserved channel in the QWEST CO is from Column E.

Example:

- If the *frame format* is non-ANSI ESF and the *line code* is B8ZS (Column A), use Row 6. The NC code is H C G - (Column B). The NCI code for the QWEST CO is from Row 6, Column E, and is 04DS9.15S.

If the channel is to an End-User premises, the NCI code is taken from Row 6, Column C, and is 04DU9.SN or 04DU9.1SX.

If the channel is to a Carrier premises, the NCI code is taken from Row 6, Column D and may be either 04DS9.15S or 04DJ9.15S.

**3.2.5 Interconnecting the Reserved Interfaces of Two Channels**

Two channels established with compatible Reserved Interfaces may be interconnected at any time using a Central Office Cross Connect (COCC). Coding to establish a COCC is similar to the method of coding a channel between two customer premises. Refer to Table 3-2. In Column A, locate the row having the equipment options of the previously established channels. Obtain the NC code from Column B. Obtain the QWEST CO NCI code for each end of the COCC from Column E.

Example:

If the *frame format* is ANSI ESF and the *line code* is B8ZS (Column A), use Row 4. The NC code is H C X E (Column B). The NCI codes for the ends of the COCC are from Row 4, Column E, and are 04DS9.1S.

**Table 3-2** Codes For Interconnecting Two Reserved Interfaces

	A Equipment Frame Format and Line Code	B NC Code	E NCI at QWEST Central Office
1	SF & AMI	H C X -	04DS9.15
2	SF & B8ZS	H C X A	04DS9.15B
3	ANSI ESF & AMI	H C X D	04DS9.1K
4	ANSI ESF & B8ZS	H C X E	04DS9.1S
5	non-ANSI ESF & AMI	H C X B	04DS9.15K
6	non-ANSI ESF & B8ZS	H C X C	04DS9.15S
7	Free Framing & B8ZS	H C X F	04DS9.15J

### 3.3 Carrier or End-User Premises to CO Channel, with CO Multiplexer

**Note:** QWEST originally used NC Code 4th character *M* to denote *DS1 to voice and digital data multiplexing*, but has changed to *G* to agree with the National coding definition. The National definition for *M* is a subset of *G*, so *M* is no longer offered.

Refer to Table 3-3. In Column A, locate the row having the required equipment options. Obtain the NC code from Column B. Obtain the NCI code for a EU premises from Column C, or for a Carrier premises from Column D.

Examples:

1. If the *frame format* is T1DM (Column A), use Row 0. T1DM is available only with the AMI line code, and it has the same NCI code as SF with AMI. This sharing of an NCI code is unique to SF/T1DM. The NC code clearly distinguishes between the two formats. Refer to Technical Publication 77375 for a technical explanation of SF and T1DM. If the channel is to an End-User premises, the NCI code is taken from Row 0, Column C, and is 04DU9.BN or 04DU9.BX. The absence of the “X” suffix denotes a Conventional interface. Its presence denotes a DSX-1 interface.

If the channel is to a Carrier premises, the NCI code is taken from Row 0, Column D and may be either 04DS9.15 or 04DJ9.15.

2. If the *frame format* is SF and the *line code* is B8ZS (Column A), use Row 2. The NC code is H C Z G (Column B).

If the channel is to an End-User premises, the NCI code is taken from Row 2, Column C, and is 04DU9.DN or 04DU9.DX. The absence of the “X” suffix denotes a Conventional interface. Its presence denotes a DSX-1 interface.



If the channel is to a Carrier premises, the NCI code is taken from Row 2, Column D and may be either 04DS9.15B or 04DJ9.15B.

**Table 3-3** Codes for Customer Premises to CO Channel, with a CO Multiplexer

	<b>A</b> Equipment Frame Format and Line Code	<b>B</b> NC Code see note	<b>C</b> NCI at End-User premises	<b>D</b> NCI at Carrier premises
0	T1DM & AMI	H C - L	04DU9.BN or BX	04DS9.15 or 04DJ9.15
1	SF & AMI	H C - G	04DU9.BN or BX	04DS9.15 or 04DJ9.15
2	SF & B8ZS	H C Z G	04DU9.DN or DX	04DS9.15B or 04DJ9.15B
3	ANSI ESF & AMI	H C D G	04DU9.1KN or 1KX	04DS9.1K or 04DJ9.1K
4	ANSI ESF & B8ZS	H C E G	04DU9.1SN or 1SX	04DS9.1S or 04DJ9.1S
5	non-ANSI ESF & AMI	H C F G	04DU9.CN or CX	04DS9.15K or 04DJ9.15K
6	non-ANSI ESF & B8ZS	H C G G	04DU9.SN or SX	04DS9.15S or 04DJ9.15S

**NOTE:** In Column B, the NC code 4th characters G and L have the following multiplexer (MUX) type definitions:

- G = QWEST CO DS1 to voice and digital data mux.
- L = QWEST CO DS1 to DS0 digital data mux using T1DM frame format. Consult QWEST DDS PUB 77312 for important information about this option.

### 3.4 Inter-CO DS1 Channel and Optional CO Multiplexing at One CO

The channel to which a CO multiplexer is to be connected may be ordered from QWEST. It may also be a DS1 channel within a higher bit-rate channel connected to a CO multiplexer deriving the DS1 rate; this higher bit-rate channel would be separately ordered and customer controlled,

#### 3.4.1 Interoffice DS1 Channel without Multiplexing (Reserved Channel Interface at Both Ends)

Table 3-4 provides the applicable NC and NCI codes that must be specified when ordering this channel. The NC and NCI codes must be identical at both ends.

**Table 3-4** Codes For Inter-CO Facility with a Reserved Channel Interface at Both Ends

	A Equipment Frame Format and Line Code	B NC Code	E NCI at QWEST Central Office
1	SF or T1DM & AMI	H C - -	04DS9.15
2	SF & B8ZS	H C Z -	04DS9.15B
3	ANSI ESF & AMI	H C D -	04DS9.1K
4	ANSI ESF & B8ZS	H C E -	04DS9.1S
5	non-ANSI ESF & AMI	H C F -	04DS9.15K
6	non-ANSI ESF & B8ZS	H C G -	04DS9.15S
7	Free Framing & B8ZS	H C J -	04DS9.15J

**3.4.2 Inter-CO DS1 Channel with Multiplexing at One End**

NC and NCI codes from Table 3-5 must be provided. Additionally, if a DS1 channel within a customer controlled higher bit-rate channel is used, the customer must provide the Connecting Facility Assignment (CFA) for the DS1 channel in the higher bit-rate multiplexer to which the DS1 to Voice and Digital Data multiplexer is connected.

**Table 3-5** Codes For Inter-CO Facility with a Multiplexer at One End

	A Equipment Frame Format and Line Code	B NC Code see note	E NCI at QWEST Central Office
0	T1DM & AMI	H C - L	04DS9.15
1	SF & AMI	H C - G	04DS9.15
2	SF & B8ZS	H C Z G	04DS9.15B
3	ANSI ESF & AMI	H C D G	04DS9.1K
4	ANSI ESF & B8ZS	H C E G	04DS9.1S
5	non-ANSI ESF & AMI	H C F G	04DS9.15K
6	non-ANSI ESF & B8ZS	H C G G	04DS9.15S

**NOTE:** In Column B, the NC code 4th characters G and L have the following multiplexer (MUX) type definitions:

- G = QWEST CO DS1 to voice and digital data mux
- L = QWEST CO DS1 to DS0 digital data mux using T1DM frame format Consult QWEST DDS PUB 77312 for important information about this option.

### 3.5 Inter-CO DS1 Channel with Multiplexing at Both COs

Refer to Table 3-6 for the NC and NCI codes. There are no coding options; the DS1 frame format and line code are non-ANSI ESF and B8ZS. The advantages of ANSI ESF are not required, because each multiplexer independently generates information to its CO; the ANSI ESF Performance Report Message would be redundant. DS1 Clear Channel is provided by B8ZS so there are no limitations on the types of service that can be transported by the DS1 to Voice and Digital Data multiplexers.

#### 3.5.1 Multiplexers Assigned to DS1 Channels in Customer Controlled Higher Bit-rate Channels

The NC and NCI codes from Table 3-6 must be provided. Additionally, the customer must provide the Connecting Facility Assignment (CFA) for the DS1 channel in the higher bit-rate multiplexer to which the DS1 to Voice and Digital Data multiplexers are connected.

#### 3.5.2 Multiplexers Assigned to QWEST Interoffice DS1 Channels

The NC and NCI codes from Table 3-6 must be provided.

**Table 3-6** Codes for CO Multiplexer at Two COs, with an Interconnecting Facility

A Equipment Frame Format and Line Code	B NC Code see note	E NCI at QWEST Central Office
non-ANSI ESF & B8ZS	H C G Y	04DS9.15S

**NOTE:** In Column B, the NC code 4th character Y denotes a DS1 to Voice and Digital Data multiplexer will be used at both ends

### 3.6 Restricted NCI Codes for CSU Power and discontinued codes for ZBTSI Application

Table 3-7 contains restricted availability of NCI codes that were listed discontinued in Issue D of this publication. QWEST continues to support these NCI options for customers who currently have 1.544 Mbit/s channels prior to October 26, 1995. However, if the service is moved to a different premises, the customer shall not keep these options.

End User Customers who purchase DS-1's at locations requiring high voltage protection by the placing of customer owned fiber optic equipment may still have this option. Carrier customers should order the 04DJ9.++ network channel interface for this type of application.

**Table 3-7** Restricted and Discontinued NCI Codes

	QWEST CO Premises Options	Other Carrier Premises Options	End-user Premises Options
Restricted CSU Power Option Effective October 15, 1998	04DS9.15	04DJ9.15	04DU9.B
	04DS9.15B	04DJ9.15B	04DU9.D
	04DS9.15J	04DJ9.15J	04DU9.A
	04DS9.15K	04DJ9.15K	04DU9.C
	04DS9.15S	04DJ9.15S	04DU9.S
	04DS9.1K	04DJ9.1K	04DU9.1K
Discontinued ZBTSI Application Effective December 1, 1995	04DS9.1S	04DJ9.1S	04DU9.1S
	04CS9.15Z	04DJ9.15Z	04DU9.Z
	04DS9.15Z	04DS9.15Z	04DU9.ZN
	04CS9.1Z	04DJ9.1Z	04DU9.ZX
	04DS9.1Z	04DS9.1Z	04DU9.1Z
			04DU9.1ZN
		04DU9.1ZX	

ZBTSI = Zero byte time slot interchange: ref. ANSI T1.107-1988

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## 4. QWEST DS1 Rate Synchronization Service

### 4.1 General

This chapter provides code combinations to use for ordering the QWEST DS1 Rate Synchronization Service interface.

The QWEST DS1 Rate Synchronization (Sync) Interface signal is traceable to a Stratum 1 Clock (a Primary Reference Signal [PRS]) making it suitable for synchronizing customer's clocks. Customers may wish to use this signal to synchronize their Stratum 2 or Stratum 3 Clock at their facility hub.

### 4.2 Availability

This service is available in the limited instance where QWEST is delivering services at the customer premises using SONET transport equipment.

### 4.3 Compatible NCI and NC Code Combinations

Table 4-1 presents the NC and NCI Code combinations to be used by Carrier customers and End User customers when ordering the Synchronization Interface. The NCI codes denote a two-wire interface with the Superframe format and the AMI line code. No options are available for this interface.

**Table 4-1** Compatible Code Combinations for Synchronization Service

	NC Code	NCI Code
Carrier Premises Interface	S Y - A	02DJ9.15
End User Premises Interface	S Y - A	02DU9.BN

### 4.4 Definition of SY-A NC Code

The National definition of the **SY-A** NC Code is:

1.544 Mbit/s Stratum 1 traceable sync signal. The framing format is Superframe with an all 1's payload. The line code is AMI.

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## 5. Definitions

### 5.1 Acronyms

AMI	Alternate Mark Inversion
ANSI	American National Standards Institute
B8ZS	Binary 8 Zero Substitution
CFA	Connecting Facility Assignment
CO	Central Office
COCC	Central Office Cross Connect
CSU	Channel Service Unit
DC	Direct Current
ESF	Extended Superframe
EU	End-User
FCC	Federal Communications Commission
IntraLATA	IntraLocal Access and Transport Area
NC	Network Channel
NCI	Network Channel Interface
NCTE	Network Channel Terminating Equipment
NI	Network Interface
SF	Superframe
ZBTSI	Zero Byte Time Slot Interchange

### 5.2 Glossary

#### **Alternate Mark Inversion (AMI)**

A line-code wherein each binary one (mark) pulse is the opposite polarity as its predecessor.

#### **American National Standard Institute (ANSI)**

An organization which provides procedures for the development and coordination of American National Standards.



### **Channel Service Unit (CSU)**

This unit provides regeneration of the signal received from the network, controls the pulse shape and amplitude for transmission of the signal sent to the network, and possibly provides loop-back. The CSU function is frequently found within a Data Service Unit (DSU).

### **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, and 4 kbit/s respectively.

### **Free Framed (Unframed) Format**

Free framed is also known as *unframed*. This denotes a DS1 signal that uses a proprietary frame format and signal structure. Monitoring of the signal is limited to observing whether a line code violation has occurred. Other signals such as Cyclic Redundancy Check (CRC) with ESF, Slips, Loss of Frame and Out of Frame will not be monitored. Performance monitoring is not available with an unframed signal, and all required testing will be intrusive.

Availability parameters will be applicable to free framed DS1.

### **Local Access and Transport Area (LATA)**

A geographic area for the provision and administration of communications service. It encompasses designated exchanges that are grouped to serve common social, economic and other purposes.

### **Multiplexer**

An equipment unit to multiplex or do multiplexing: Digital multiplexing is a technique of interleaving multiple low bit rate channels into a single channel having a higher bit rate. The term Multiplexer implies the demultiplexing function is present to reverse the process so it is not usually stated.

### **Network Interface (NI)**

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

**Superframe (SF) Format**

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

**Zero Byte Time Slot Interchange (ZBTSI)**

A method of providing DS1 Clear Channel Capability using the Extended Superframe (ESF) format and Alternate Mark Inversion (AMI) line code. See ANSI T1.107-1988.

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## **6. References**

### **6.1 QWEST Technical and Service Publications**

- PUB 77204            QWEST Digital Data Service Product Description, Applications, and Interface Combinations, Issue E, September 2001.
- PUB 77312            QWEST Digital Data Service, Technical Description, Issue G, September 2001.
- PUB 77321            Special High Voltage Protection, Issue A, June 1988.
- PUB 77324            QWEST DS3 Service Intelligent NCTE Protocol for Station Equipment, Issue D, September 2001.
- PUB 77375            1.544 Mbit/s Channel Interfaces Technical Specifications for Network Channel Interface Codes Describing Electrical Interfaces at Customer Premises and at QWEST Central Offices, Issue E, September 2001.

### **6.2 Ordering Information**

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

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