

QWEST Communications International Inc. Technical Publication

QWEST DS1 Radio Service

- **Service Specification**
- **Network Channel and Network Channel Interface
Code Combinations**

NOTICE

This document provides information about QWEST DS1 Radio Service. This technical publication contains the service specification, Network Channel and Network Channel Interface Codes used to order 1.544 Mbit/s channels.

Technical Publication 77380 is to be used with QWEST's Network Disclosure News Document providing the technical interface specifications. For information about ordering this document, refer to Chapter 8. DS1 is used in this document to denote the Digital Signal Level 1 (1.544 Mbit/s) transmission data rate.

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1. Introduction

1.1 Purpose

This document provides information about QWEST DS1 Radio Service. This technical publication contains the service specification, Network Channel and Network Channel Interface Codes used to order 1.544 Mbit/s channels.

Technical Publication 77380 is to be used with QWEST's Network Disclosure News Document providing the technical interface specifications. For information about ordering this document, refer to Chapter 8. DS1 is used in this document to denote the Digital Signal Level 1 (1.544 Mbit/s) transmission data rate.

1.2 Reason For Reissue

To show QWEST Communications International Inc. as the owner of this publication and the one to contact concerning the content.

1.3 Availability

Both End-User and Carrier Customers may order DS1 Radio Service. This service is available in limited instances where the frequency, path, and mounting structures, e.g. towers, are in place. However, in cases where frequency and path are available, but special construction is required, QWEST may then offer the customer the Special Construction option for the service. Special Construction regulations, rates and charges are covered in FCC Tariff No. 2.

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2. Overview of QWEST DS1 Radio Service

2.1 Service Description

QWEST DS1 Radio Service offers wireless transport in the local loop of DS1 channels from a QWEST wire center to a customer premises. The service uses digital radio equipment and provides four DS1 channels in a "single hop" in path lengths up to approximately thirty miles. Customers will be offered bandwidth increments of four DS1 channels, which can be individually activated as separate DS1s. The DS1 channels are then modulated and transported on 10, 18, or 23-GigaHertz (GHz) radio frequency. The radio frequency selected depends upon the frequency that is available in the path between U S WEST's wire center and the customer premises.

2.2 Benefits

The DS1 Radio Service provides several benefits.

- **Provides DS1 Service to Hard-to-Reach Locations**

DS1 Radio Service is a specialized product best suited for locations where traditional cable construction is not feasible. It is designed to easily and quickly connect, for example, Wireless Service Providers to their customers and to their network without Special Construction charges.

- **Cost Effective/Eliminates Capital Outlay**

Traditionally provisioned DS1 Service, which uses fiber optic or wire facilities, sometimes requires significant Special Construction costs to serve remote locations. DS1 Radio Service eliminates the physical route costs and time for constructing facilities. This service may offer capital savings to customers and QWEST in the long run.

- **Provides a Permanent Solution**

There is no need to place temporary radio while facilities are being constructed. With DS1 Radio Service, customers have a permanent solution.

- **Rate Stability**

DS1 Radio Service is offered for contract periods of 36 and 60 months. The rate is locked and protected against increases for the life of the contract. As in the past, rate reductions are automatically passed onto the customer.

- **Proven Power and Precision of DS1 Service**

DS1 Radio Service is essentially QWEST's DS1 Service provisioned over digital microwave radio instead of cable facilities for the local loop. When customers buy DS1 Radio Service, they will enjoy all the benefits of DS1 Private Line Transport Service. DS1 Private Line Transport Service provides reliable, secure and cost-effective transport of bulk communications between two locations within U S WEST's 14-state territory.

- **Bandwidth/Capacity Option**

The Bandwidth/Capacity option in increments of four DS1s allows customers to plan for growth by purchasing the number they need now and to purchase additional DS1's as their business grows.

- **Variety of Frequency Options**

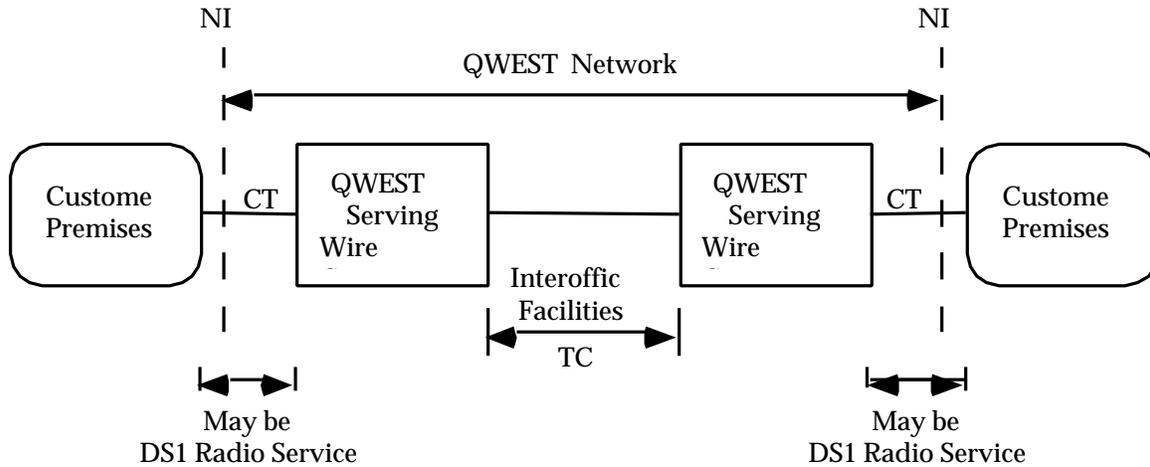
DS1 Radio Service is offered in 10, 18 or 23 GHz. Frequency band selection will be based on radio path engineering considerations to meet availability requirements. For more information about availability requirements, refer to Chapter 5.

- **Flexible Customer Solutions for the Wireless Service Provider**

If the customer is a Wireless Service Provider, DS1 Radio Service now gives the customer the ability to combine Type 2 Interconnection Service and Private Line Transport Service between its Wireless Switching Center and the QWEST Serving Wire Center. The customer may save the cost of maintaining multiple dedicated lines in the local loop. Wireless Service Providers may purchase Type 2 Interconnection authorized under FCC Part 22 or Part 90 Tariff.

2.3 Tariff Elements of DS1 Private Line Service

DS1 Private Line Tariff Elements may consist of one or more of the rate elements shown in Figure 2-1.



- NI = Network Interface
- CT = Channel Termination (the link between the NI to QWEST's serving wire center)
- TC = Transport Channel (Transmission facilities between serving wire centers, a serving wire center and a QWEST Central Office Hub, or Telephone Company Hubs)

Figure 2-1 DS1 Service Tariff Elements

DS1 Radio Service may replace the channel termination(s) described in Figure 2-1. The customer may need to order additional tariff elements to have an end-to-end, private line service.

2.4 DS1 Radio Service Diagram

Figure 2-2 describes QWEST's DS1 Radio Service. This service provides a microwave link from the QWEST Serving Wire Center to the customer premises. This link is a channel represented by a Network Channel Code that terminates at the Network Interface (NI). Refer to Chapter 3 for specific codes to order this service.

Currently, national standards do not exist for radio interfaces. Therefore, joint design between QWEST and the customer is needed when establishing this interface. Additionally, because the network interface is a microwave interface, QWEST will provide the service using radio equipment that has been network disclosed. For information about ordering the Network Disclosure News of DS1 Radio Interface, refer to Chapter 8.

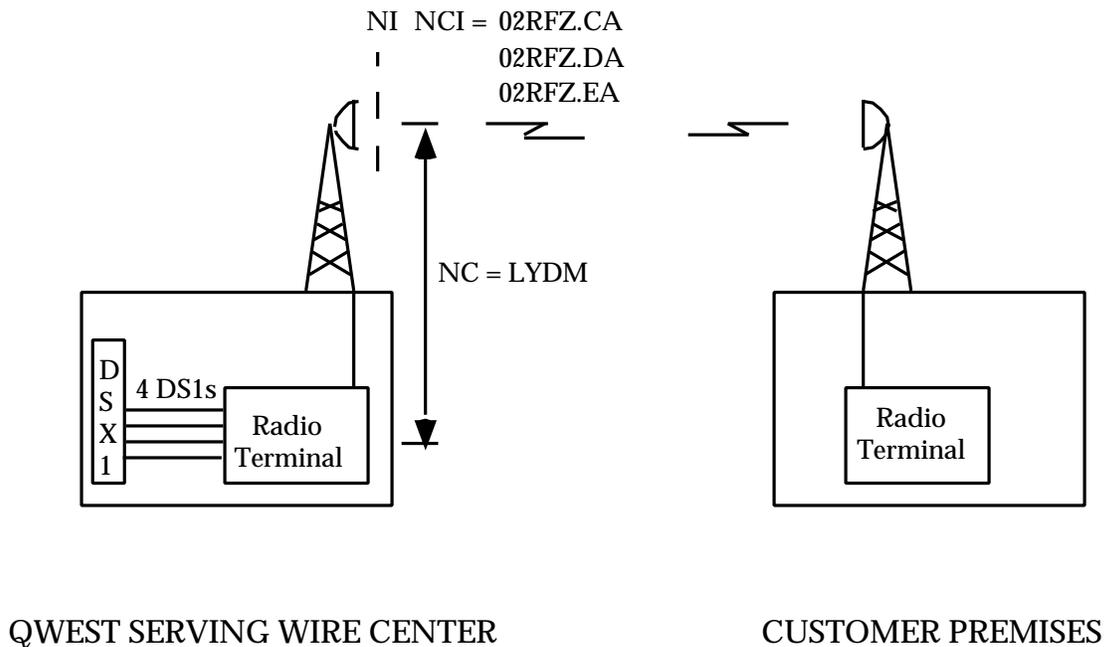


Figure 2-2 DS1 Radio Service

2.5 Optional Features

There are two Quality Packages available with the DS1 Radio Service.

2.5.1 Quality Package 1 - Hot-Standby

When ordering DS1 Radio Service, the customer may choose Quality Package 1 for equipment protection. QWEST would provision this package using a Hot-Standby protection system that provides automatic switching in the event of equipment failure. The protected terminal includes two complete radios: one in service and one on standby. Outages due to equipment failure are minimized with the Monitored Hot-Standby System because a spare terminal can be automatically placed into service if necessary. This improves the availability performance of the service by substituting alternate equipment when failure occurs. The protected terminal used has a mean time between failure of 19.2 years.

Quality Package 1 was designed to protect the customer against equipment failure in the local loop. Protection occurs automatically.

2.5.2 Quality Package 2 - Standard

Customers may choose Quality Package 2, which utilizes a non-protected radio terminal at the QWEST Serving Wire Center. The non-protected terminal used has a mean time between failure of 2.9 years. This package provides savings compared to Quality Package 1. This option is most useful when the customer is considering cost. Quality Package 2 provides the standard reliability equivalent to DS1 Service at an economical price.

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3. FCC Radio Spectrum Allocation and Licensing

All wireless services, or devices, utilizing radio frequencies are subject to some form of regulatory constraints. These constraints may be imposed by the federal government, via the Federal Communications Commission (FCC), by state agencies, or both. State regulations normally emanate from agencies that control public communication services. A standard tariff will offered under FCC jurisdiction. Any intrastate requests will be handled on an Individual Case Basis under Public Service Commissions (PSCs) jurisdiction.

For the purposes of wireless services, as depicted in Table 3-1, the FCC allocates radio spectrum, determines whether a frequency band should be used for private or common carrier purposes, issues radio licenses, establishes certain interconnection policies, and approves rates for interstate services.

Table 3-1 Federal and State Regulatory Jurisdiction

Function	FCC	State
Allocate Radio Spectrum	YES	NO
Issue Radio Licenses	YES	NO
Establish Interconnection Policies	YES	NO
Private or Common Carrier Status	YES	NO
Interstate Interconnection Rates	YES	NO
Intrastate Interconnection Rates	NO	YES
Intrastate User Eligibility	NO	YES
Tariff or Contract Used for Interconnection	NO	YES

A major duty of the FCC is to allocate radio spectrum and establish rules to prevent radio interference between users. Therefore, any radio device in the United States must meet certain FCC Criteria. In some cases, such as consumer products, the rules only apply to the manufacturer. In the case of wireless services, the amount of regulation is usually considerably greater. The applicable rules of the FCC are enumerated in detail in Title 47 of the *Code of Federal Regulations (CFR), Part 101*.

When a customer requests DS1 Radio Service, both the customer and QWEST will need to acquire a license from the FCC. The time required to obtain a license is set by the FCC and sometimes may vary.

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

Network Channel (NC) and Network Channel Interface (NCI) codes convey service and frequency parameters. This chapter explains the codes in a general manner to aid in the selection of compatible code combinations. NC and NCI codes are provided by the customer to the QWEST Service Representative at the time DS1 Radio Service is initiated. These codes describe the channel, the function, and features the customer is requesting. Therefore, QWEST can effectively and efficiently communicate the customer's request to its Engineers through the use of these codes.

4.1 NCI Code Function

DS1 radio signal specifications at the Network Interface are encoded into NCI codes. The interface exists within the radio transmission path. Customers provide an NCI code to QWEST to advise the Engineer of their specific technical requirements at a Network Interface. The NCI code also permits a choice of reserved DS1 capacity and of radio frequency band.

NCI coding for DS1 Radio interfaces provide for the following options:

- DS1 channel capacity - one option:
 - (1) 4 DS1s
- Radio Frequency - three options:
 - (1) 10 GHz
 - (2) 18 GHz
 - (3) 23 GHz

4.2 NCI Code Form and Components

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

4.2.1 NCI Code Form

A DS1 Radio DS1 code has the form *02RFZ.BI*. The period between the Z and B 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 (-).

4.2.2 NCI Code Components

A DS1 Radio NCI Code has four components as shown in Figure 4-1.

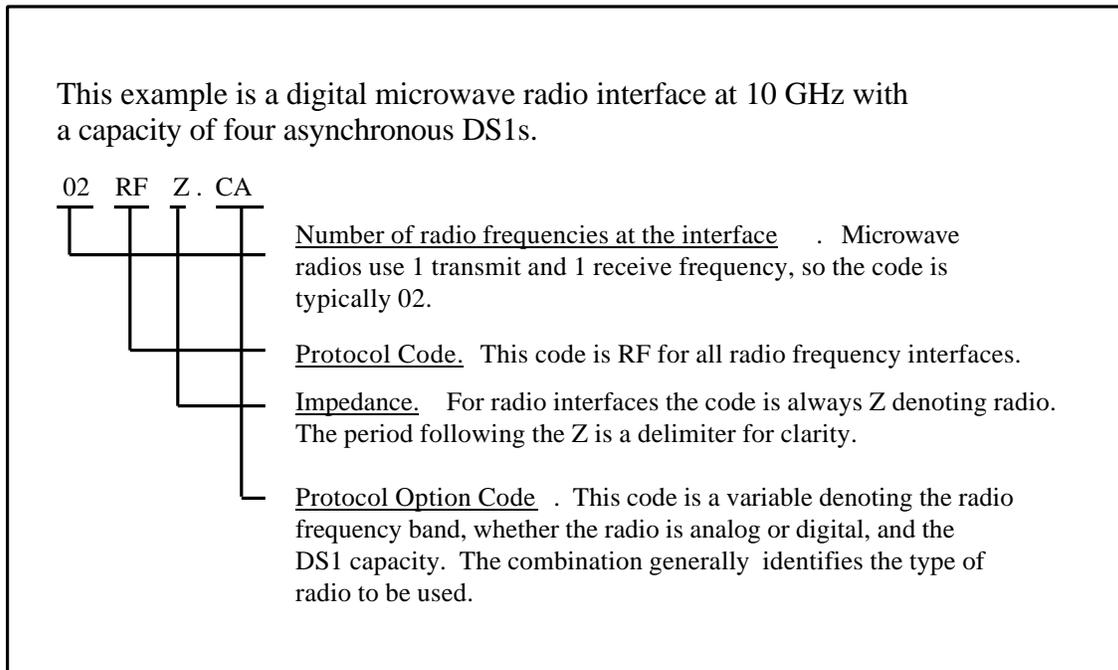


Figure 4-1 NCI Code Components

4.3 NC Code Function

Channel service considerations are encoded into *NC codes*. The NC code is specified by the customer to advise QWEST of the required service connection of the channel.

4.4 NC Code Components

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

4.5 Definition of LYDM NC Code

The standard definition of the **LYDM** NC Code is:

Digital Radio with Central Office Multiplexing.

4.6 Compatible NC and NCI Code Combinations

Table 4-1 presents the NC and NCI Code combinations to be used by Customers when ordering the DS1 Radio Interface.

Table 4-1 Compatible Code Combinations for DS1 Radio Interface

NC Code	NCI Code	NCI Definition
LYDM	02RFZ.CA	4 DS1s on 10 GHz
LYDM	02RFZ.DA	4 DS1s on 18 GHz
LYDM	02RFZ.EA	4 DS1s on 23 GHz

4.7 Protocol Codes

Figure 4-2 depicts the NCI Protocol Codes that may be used with DS1 Radio interface at the QWEST wire center. Protocol *RF* denotes the interface between QWEST and the customer equipment. It is commonly called an *Access Interface*.

Protocol codes *CS* and *DS* provide a signal that conforms to DSX-1, which is part of the North American digital hierarchy for the cross-connect of digital signals. Technically, *CS* and *DS* are identical but, *CS* further denotes that the channel terminates on a QWEST Digital Cross-Connect System (DCS).

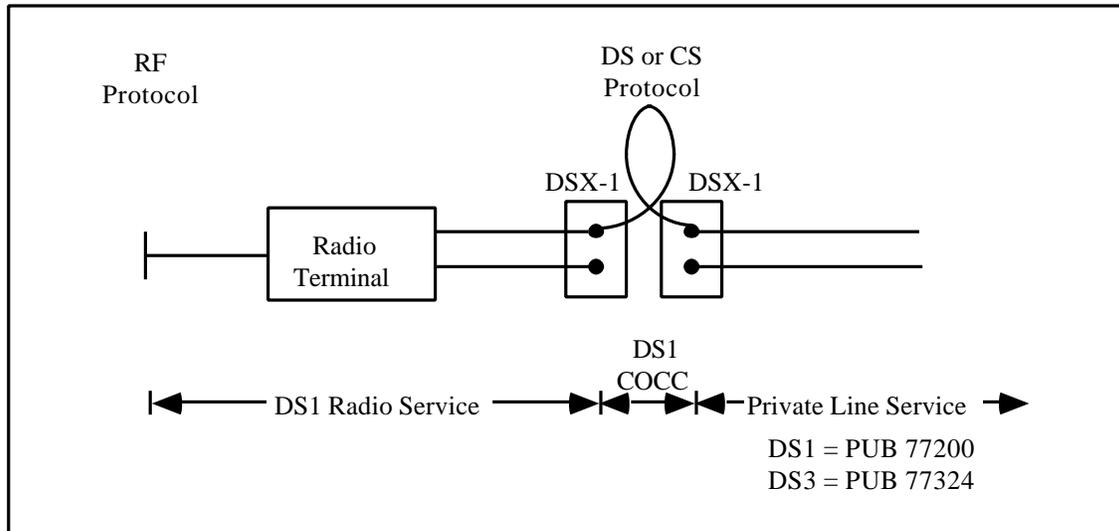


Figure 4-2 NCI Protocol Codes used by QWEST

Should the customer wish to connect DS1 Radio Service to other QWEST Private Line Services, for example DS1 Service with Central Office Connecting Channels (COCC), the customer will need to order these services separately. NC and NCI codes for accomplishing this will be found in PUB 77200 for DS1 and 77324 for DS3. Because DS1 Radio Service terminate at DSX-1 Cross-Connect Panel, establishments of any of these Private Line Services require cross-connecting one DS1 at a time. This is accomplished by ordering a COCC for every DS1 the customer wishes to cross-connect.

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5. Performance Parameters

Table 4-1 provides the Acceptance Limits, Maintenance Limits, Immediate Action Limits, and Performance parameter for QWEST DS1 radio channels.

Table 5-1 Error Free Seconds and Availability Performance Parameter

	Error Free Seconds (Note 1)	Errored Seconds (Note 2)	Availability (Note 3)	
			Standard	HS
System Performance Parameter	= 98.75%	< 1.25%	99.925%	99.980%
Acceptance Limits (Note 4)	-	= 7 ES in 5 min.	-	
Maintenance Limits (Note 4)		>7 and <60 ES in 5 min.		
Immediate Action Limits	-	= 60 ES in 5 min.	-	

Notes:

1. An Error-free second is any second in which no bit-errors are received and it is usually determined for a 24-hour period.
2. An Errored-second is any second in which one or more bit errors are received and it is usually determined for a 24-hour period.
3. A circuit is unavailable when the Bit Error Ratio (BER) is greater than 10^{-3} for a period of 10 consecutive seconds. Also, the availability is expressed as during 12 consecutive months.
4. Errored Seconds = 7 in 5 minutes indicate that no trouble ticket and no action are required. Errored Seconds >7 and <60 in 5 minutes indicate that a trouble ticket is generated and maintenance is required and scheduled.

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6. Maintenance

6.1 Joint Responsibility

The customer and QWEST are jointly responsible for system design, performance, and testing. Initial turn up testing and acceptance will be a joint effort and will include all equipment from DSX-1 signal to the next DSX-1 signal within the QWEST network. All equipment will meet performance parameters before being accepted for service.

6.2 Customer Responsibilities

The customer shall furnish, install, license, operate and maintain the radio equipment at the customer location in accordance with FCC regulations.

6.3 QWEST Responsibility

QWEST shall furnish, install, license, operate and maintain the radio equipment at the QWEST wire center in accordance with FCC regulations. Should service trouble occur, QWEST will furnish the customer a trouble reporting telephone number. Upon receipt of a trouble report, QWEST will initiate action within twenty minutes to clear the trouble. QWEST will commit to a one-hour maximum service restoral time in the event of a service interruption caused by an electronic component failure at the QWEST location. If trouble is caused by a cable failure of associated DS1 service, e.g. the interoffice facility, the maximum service restoral time will be four hours.

6.4 Obstructions

The initial engineering design ensures that a direct radio path is achieved. However in rare instances, well after the service is provisioned, an obstruction interferes with the radio signal in that path, for example a tree. In these scenarios, the party closest to the obstruction is responsible for taking measures to remove the obstruction. This distance is estimated in direct air miles.

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7. Definitions

7.1 Acronyms

ANSI	America National Standards Institute
Bellcore	Bell Communications Research, Inc.
CT	Channel Termination
DS1	Digital Signal Level 1 (1.544 Mbit/s)
ES	Errored Second
FCC	Federal Communications Commission
GHz	GigaHertz
IntraLATA	IntraLocal Access and Transport Area
Mbit/s	Megabit per Second
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
RF	Radio Frequency
TC	Transport Channel

7.2 Glossary

Carrier

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

Channel

A communication path between two or more points of termination.

Customer

Denotes any individual, partnership or corporation who subscribes to the services provided by QWEST customers are divided into two distinct and separate categories: (1) carriers, who provide interexchange services for hire for others, and (2) end-users, who request services only for their own use.

Customer Premises

Denotes a building or portion(s) of a building occupied by a single customer 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.

Customer Provided Equipment (CPE)

Equipment owned and maintained by the customer and located on their side of the End-User Point of Termination (EU-POT) network interface.

DS1

A digital signal at the rate of 1.544 Mbit/s that may be channelized into of 24 channels. This digital signal may also be an unchannelized signal with customer usable bandwidth of 1.536 Mbit/s, also referred to as DS1 Clear Channel.

DS1 Clear Channel

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-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.

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.

Loopback

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

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 at which QWEST's responsibility for the provision of service ends.

Protected Terminal

The protected terminal has multi-functions including integral multiplexing, automatic protection switching, and protected RF conversion unit.

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.

Serving Wire Center

The term "Serving Wire Center" denotes a QWEST Central Office from which dial tone for the Local Exchange Service would normally be provided to the demarcation point on the property at which the customer is served.

Severely Errored Second (SES)

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

Single Hop

A direct radio path from QWEST's Serving Wire Center to the customer premises. No repeater or reflector is used in that path.

Wire Center

The building in which one or more local switching systems are installed and where the outside cable plant is connected to the central office equipment.

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8. References

8.1 American National Standards Institute Documents

- ANSI T1.102-1993 *Digital Hierarchy - Electrical Interfaces*
- ANSI T1.107-1988 *Digital Hierarchy - Formats Specification*
- ANSI T1.403-1994 *Carrier-to-Customer Installation - DS1 Metallic Interface*
- ANSI EIA/TIA-547-1989 *Network Channel Terminating Equipment for DS1 Service*
- ANSI EIA/TIA-594-1991 *Private Digital Network Synchronization.*

8.2 Telcordia Documents

- TR-NPL-000054 *High-Capacity Digital Service (1.544 Mb/s) Interface Generic Requirements for End Users, Issue 1, April 1989*

8.3 Other Publications

- Federal Communications Commission *Code of Federal Regulations 47, Part 101*

8.4 QWEST Documents

- PUB 77200 *QWEST DS1 Service and QWEST DS1 Rate Synchronization Service, Issue F, 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 Communications, Inc. Central Offices, Issue E, September 2001*
- PUB 77324 *QWEST DS3 SERVICE, Issue D, September 2001*

8.5 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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