

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

## **Unbundled Switch Elements**

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## NOTICE

This publication provides technical information about Unbundled Switch Elements available from QWEST. This service provides unbundled line-side and trunk-side port connections to a QWEST End Office switch. This service is available in selected state jurisdictions.

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## 1. Introduction

### 1.1 General

This publication provides technical information about the Unbundled Switch Elements available from Qwest. Unbundled Switch provides an unbundled line-side or trunk-side connection to a Qwest End Office switch and allows for the purchase of individual line-side or trunk-side services. Unbundled Switch Elements provide access to the switching components of Qwest's End Office switch.

### 1.2 Reason For Reissue

This Technical Publication is being re-issued to add a new Chapters 9 and 10, Unbundled STS1 Switch Port and Unbundled OC3 Switch Port. Chapters 9-12 including associated Figures and Tables will be renumbered. Language concerning switch features and functionality is being updated to make consistent with SGAT and PCAT documents. Network Interface language is being updated to reflect Direct Connection availability.

### 1.3 Scope of Document

This document provides a technical description of the Unbundled Switch Elements including available options. Network Channel and Network Channel Interface codes and valid combinations are included.

Ordering instructions and responsibilities are beyond the scope of this publication and may be found in the appropriate tariff.

### 1.4 Document Organization

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

**Table 1-1: Document Organization**

Chapter	Title	Contents
1	Introduction	General information about this document.
2	Service Description	Analog Line Ports
3	Service Description	Message Trunk Ports (Includes Trunk Group and Members)
4	Service Description	DID Trunk Ports
5	Service Description	BRI Line Ports
6	Service Description	PRI Trunk Ports (Under Development)
7	Service Description	GR-303 IDLC
8	Service Description	Analog Trunk Ports
9	Service Description	STS1 Switch Port
10	Service Description	OC3 Switch Port
11	Network Channel/Network Channel Interface Codes and Applications	Explanation of the codes and valid combinations. Includes illustrative application examples.
12	Technical Parameters	Technical issues and references.
13	Definitions	Acronyms and glossary of terms

14	References	List of references with ordering instructions and a list of Trademarks.
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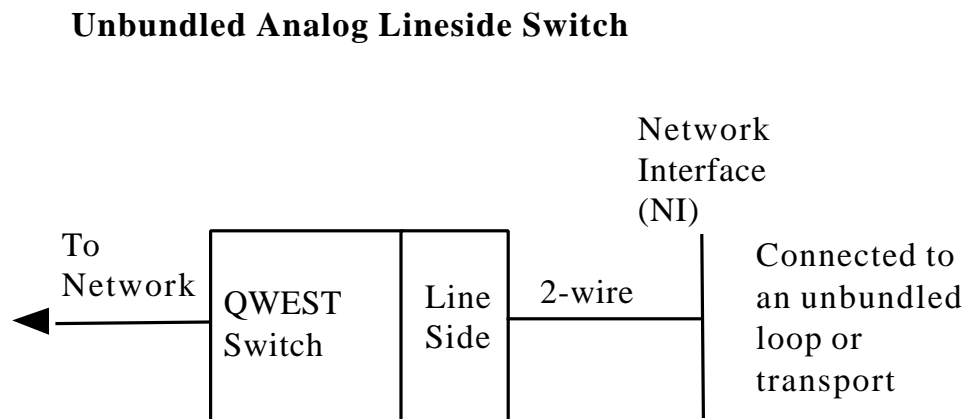
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## 2. Unbundled Analog Line Port Service Description

### 2.1 Introduction

Unbundled Analog Line ports provide access to the basic functionality of an End Office switch, including address digit reception and translations, routing and rating, and call supervision for intra-office switched services. Port switching functions provide for the establishment of a connection between two line ports within the switch (intraoffice) or between an unbundled line port and an unbundled trunk port that connects to another switching entity (interoffice). Analog Line Port functionality is provided by digital end offices. The ports may be used for business or residential lines.

Figure 2-1: Illustrates an Unbundled Analog Line Port.



**Figure 2-1:** Unbundled Analog Line Port

## 2.2 Port Description

The Analog End Office Line Port is a two-wire, Plain Old Telephone Service (POTS) type line-side switch connection. This Port includes standard features (e.g. a telephone number, directory listing, on/off hook detection, dial tone, routing, audible and power ringing, complete dial plan as resident in the switch interLATA Carrier choice (Presubscribed Interexchange Carrier or PIC), access to 911 and operator services and directory assistance, basic or enhanced features, and blocking options). Supervisory signaling options include loop start or ground start.

### 2.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DS0/voice frame located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations MUST be ordered prior to ordering analog line ports, reference *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 2.2.2 Provided Functions

Some of the available functions of an Analog Line Port are:

- Telephone Number
- Directory Listing
- Dial Tone
- On-hook and Off-hook detection
- Digit Reception (Dial Pulse or (DTMF) Dual Tone Multi Frequency)
- Audible Ringing and Power Ringing
- Automatic Message Accounting (AMA) Recording
- Access to 911, Operator Services and Directory Assistance
- Blocking Options, e.g. 900 Services

The CLEC is responsible for providing the E911 database provider with the telephone number and associated end user address information that the CLEC uses in conjunction with Unbundled Network Elements (UNE) in required National Emergency Numbering Administration (NENA) standard format. The CLEC is responsible to have the telephone number and associated end user location information loaded into the E911 database.

Custom Routing is an optional software function of a QWEST End Office switch that provides a routing path between an Unbundled Analog Line Port and a specific Message Trunk Group (see chapter 3 of this publication) via the switching matrix and a customized routing table or tables.

Vertical Features will be offered on an unbundled basis in conjunction with the Unbundled Switch product offering. The Vertical Features will be ordered as separate elements (on the Unbundled Switch LSR). For the features a switch is capable of providing that are not provisioned within the switch, the customer may need to order via the Bona Fide/Special Request Processes.

### **2.2.3 Interoffice Trunking and Facilities**

Separately ordered interoffice trunking and facilities are not included with this service but may be obtained from other services. Access to QWEST's public interoffice trunking network is not included with Unbundled Analog Line Ports.

## **2.3 Interconnecting Services**

Unbundled analog line ports are typically connected to an unbundled loop, which connects to the end user's phone or other device (i.e., to the End-User's customer installation). This loop may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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### 3. Unbundled DS1 Message Trunk Port Service Description

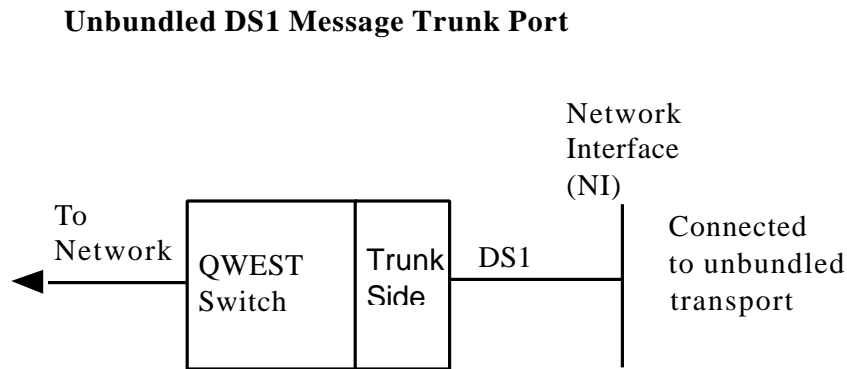
#### 3.1 Introduction

An Unbundled DS1 Message Trunk Port is a DS1 trunk side End Office switch port physically terminating at a common DS1 frame or panel. Each Unbundled DS1 Message Trunk Port includes a subset of 24 DS0 channels capable of supporting local message type traffic. This Unbundled DS1 Message Trunk Port does not support PRI/ISDN or DID, DOD, PBX type of traffic. However PRI/ISDN or DID, DOD, PBX type of traffic is addressed in this document.

Local message type traffic allows communication paths between End Office Switches. A Message Trunk Port provides the switch connection between calling and called parties at the QWEST Wire Center.

A Message Trunk Group is a software feature within an End Office switch that establishes the trunk group number and associated trunk members. Trunk groups may be originating, terminating or 2-way. Signaling attributes are defined at the trunk group level, and are either Multi Frequency (MF) or Signaling System 7 (SS7). Trunk members must occupy individual channels of an Unbundled DS1 Trunk Port.

Figure 3-1 Illustrates an Unbundled DS1 Message Trunk Port.



**Figure 3-1:** Unbundled DS1 Message Trunk Port

## **3.2 Port Description**

The End Office Message Trunk Port is connected to a CLEC 4-wire DS1 metallic interface within the QWEST Central Office (i.e. the End Office switch and interface are in the same QWEST Central Office). The DS1 supports up to 24 channelized trunks. QWEST standard DS1 framing and format options are available.

### **3.2.1 Network Interface**

The QWEST Central Office Network Interface (CO-NI) is a common DS1 frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations **MUST** be ordered prior to ordering Message Trunk Ports, reference *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### **3.2.2 Provided Functions**

Some of the available functions of a DS1 Message Trunk Port are:

- Interoffice connectivity

## **3.3 Interconnecting Services**

Unbundled DS1 Trunk Ports are typically connected to an unbundled DS1. This DS1 may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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## 4. Unbundled DID Trunk Port Service Description

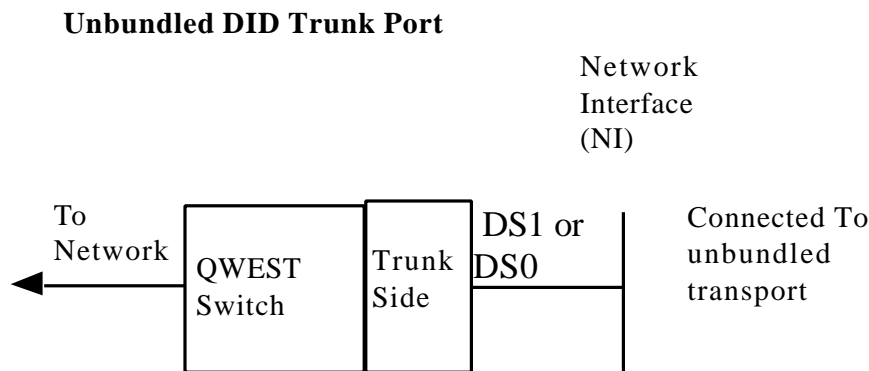
### 4.1 Introduction

The Direct Inward Dialed (DID) Trunk Port is an unbundled switching product that provides a CLEC the ability to physically connect a Private Branch Exchange (PBX) user to/from the trunk side of a QWEST Central Office switch.

DID is a special Private Facilities 2-way trunk with line side treatment that permits incoming calls from the exchange network to reach a specific PBX station directly without attendant assistance. DID trunk ports are capable of a DS1 termination in the digital environment or a single circuit metallic termination in the analog environment.

This product allows the CLEC to order DID numbers in blocks of 20. One primary directory listing is provided for each PBX system. Provisioning of the DID feature type trunks requires the CLEC to subscribe to a sufficient number of trunk facilities to adequately handle the volume of incoming calls.

Figure 4-1 Illustrates an Unbundled DID Trunk Port.



**Figure 4-1:** Unbundled DID Trunk Port

## 4.2 Port Description

DID trunk ports are offered as analog or digital to a Single Point of Termination which will be cross connected to a customer premise DS1 or analog loop.

### 4.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DS1 or DS0/voice frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations **MUST** be ordered prior to ordering DID Trunk Ports, reference *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 4.2.2 Provided Functions

Some of the available functions of a DID Trunk Port are:

- 2-way connectivity from PBX to customer premise DS1
- Block of 20 numbers
- A primary directory listing for each PBX system
- Private facility trunks with line side treatment
- Access to the QWEST exchange network for originating/terminating PBX calls

## 4.3 Interconnecting Services

Unbundled DID Trunk Ports are typically connected to an unbundled DS1 or analog metallic loop. This DS1 or analog metallic loop may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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## 5. Unbundled BRI Line Port Service Description

### 5.1 Introduction

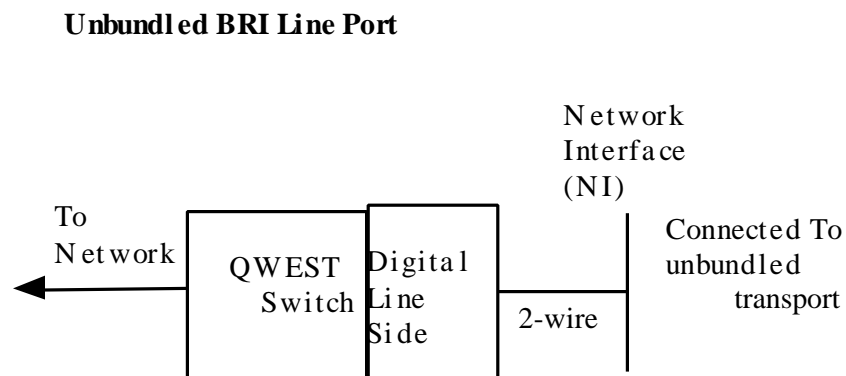
An Unbundled Basic Rate Interface (BRI) Integrated Services Digital Network (ISDN) Port provides a 2-wire electrical interface to a QWEST Central Office Switch for the provision of Basic Rate ISDN capabilities. BRI supports a Digital Subscriber Line comprised of two 56 or 64 kilobits per second (kbps) bearer channels and a single 16 kbps out-of-band signaling channel for data (2B+D). The BRI port provides access to the functions and capabilities of a QWEST Central Office Switch, including ISDN voice capability, and circuit switched data.

BRI provides basic voice and data capabilities, which can be combined on a single ISDN switch port. These basic voice and data capabilities are assigned to one or more terminals connected to the ISDN switch port, and share the QWEST Central Office Switch BRI software common block.

BRI is available in the 2B+D configuration, which provides two B channels and one D channel (for signaling).

Vertical Features will be offered on an unbundled basis in conjunction with the Unbundled Switch product offering. The Vertical Features will be ordered as separate elements (on the Unbundled Switch LSR). For the features a switch is capable of providing that are not provisioned within the switch, the customer may need to order via the Bona Fide/Special Request Processes.

Figure 5-1 Illustrates an Unbundled BRI Line Port.



**Figure 5-1:** Unbundled BRI Line Port

## 5.2 Port Description

ISDN is a switched network capability that supports services that are designed to provide end-to-end digital connectivity for the simultaneous transmission of voice and data. BRI service consists of a 2-wire line side port associated with a QWEST Central Office switch. The BRI interface provides Line Termination (LT) functionality and utilizes the Two-Binary One-Quaternary (2B1Q) line code, operating at 160 kbps as described in Bellcore technical reference TR-NWT-000393[1].

For more detailed information and technical references, please refer to QWEST Network Disclosure Announcement #402.

### 5.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DS0/voice frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations **MUST** be ordered prior to ordering BRI Line Ports, reference *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 5.2.2 Provided Functions

Some of the available functions of a BRI Line Port are:

- Telephone Number and Directory Listing
- QWEST Central Office Switch software common block
- Voice features
- B-Channel Circuit Switched Voice or Data
- D-Channel Call Related Signaling or non-Call related Signaling or Packet Switched Data
- Class Features

## 5.3 Interconnecting Services

Unbundled BRI Line Ports are typically connected to an unbundled Loop. This Loop may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (reference Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).



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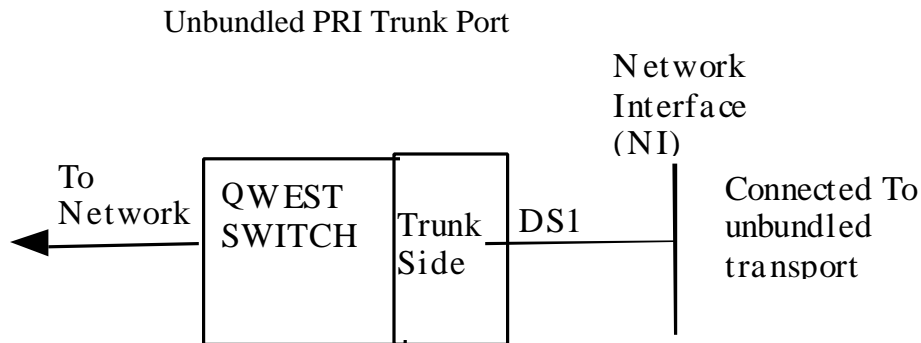
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## 6. Unbundled PRI Trunk Port Service Description

### 6.1 Introduction

An Unbundled Primary Rate Interface (PRI) Integrated Services Digital Network (ISDN) Port provides a DS1 level electrical interface to a QWEST Central Office Switch for the provision of 24 DS0 64Kb/s channels. The base configuration consists of 23 64Kb/s B channels for end user voice and/or data traffic and one 64Kb/s D channel for out of band signaling control of the B channels.

Figure 6-1 Illustrates an Unbundled PRI Trunk Port.



**Figure 6-1:** Unbundled PRI Trunk Port

## 6.2 Port Description

ISDN is a switched network capability that supports services that are designed to provide end-to-end digital connectivity for the simultaneous transmission of voice and data. PRI service consists of a 4-wire DS-1 port associated with a QWEST Central Office switch. PRI ports are DS-1 interfaces that meet the format specifications in ANSI T1.107. PRI service uses B8ZS line code and the Extended Superframe (ESF) format.

PRI is synchronized by the QWEST Central Office switching system that uses timing that is traceable to a stratum one timing supply. The associated Building Integrated Timing Supply (BITS) meets the 3E specifications in ANSI T1.101.

For more detailed information and technical references, please refer to QWEST Network Disclosure Announcement #402.

### 6.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DS1 frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations **MUST** be ordered prior to ordering PRI Trunk Ports, reference *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 6.2.2 Provided Functions

Some of the available functions of a PRI Line Port are:

- Backup D channels (where available)
- Incoming Calling Line Identification
- Channel Configuration (where available)
- Multiple Facility Signaling Control

## 6.3 Interconnecting Services

Unbundled PRI Trunk Ports are typically connected to an unbundled DS1. This DS1 may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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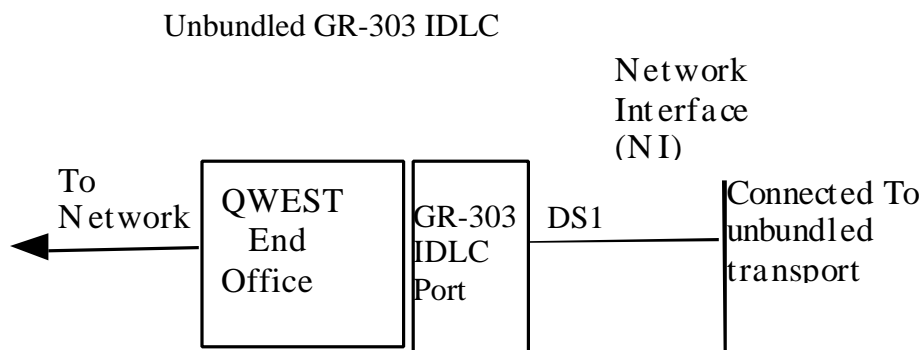
## 7. Unbundled GR-303 IDLC (Integrated Digital Loop Carrier) Service Description

### 7.1 Introduction

An Unbundled GR-303 IDLC (Integrated Digital Loop Carrier) provides an interface to the Qwest Local End Office. Features functions and capabilities are based on GR- 303-CORE, Revision 1, Integrated Digital Loop Carrier Generic Requirements, Objectives and Interface and GR-303-ILR (Issue List Report), Issue 1E, Integrated Digital Loop Carrier Generic Requirements, Objectives and Interface.

This Specific network architecture option for virtual access to the GR-303 interface listed in this section is available via the Special Request Process (SRP). Any request that materially deviates form from the language in this section regarding access to the GR-303 interface must be submitted via the Bona Fide Request (BFR) process.

Figure 7-1 Illustrates an Unbundled GR-303 IDLC.



**Figure 7-1:** Unbundled GR-303

## 7.2 Port Description

Under this architecture a CLEC may deploy any compatible GR-303 remote terminal.

The Qwest central office must have existing GR-303 capacity for use by the CLEC.

Concentration levels will be in keeping with Qwest's current standard of 4:1 at the switch. The specific concentration ratios to be applied to the RT will be determined on a case by case basis.

The TR-057 interface at the RT will be disabled. By disabling the TR-057 interface, Qwest ensures that it retains the physical and logical administration of the GR-303 interface and that security and system integrity are maintained.

All traffic must be delivered at 64kb clear channel (i.e. voice compression will not be allowed).

GR303 was designed for delivery of circuit switched voice traffic, packetized traffic will not be accepted.

### 7.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DS1 frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations must be ordered prior to ordering GR-303 IDLC. See *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 7.2.2 Provided Functions

Some of the available functions of a GR303 Port are:

- Telephone Number
- Directory Listing
- Access to 911, Operator Services and Directory Assistance
- Blocking Options, e.g. 900 Services

## 7.3 Interconnecting Services

Unbundled GR303 Ports are typically connected to an unbundled DS1. This DS1 may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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## 8. Unbundled Analog Trunk Port Service Description

### 8.1 Introduction

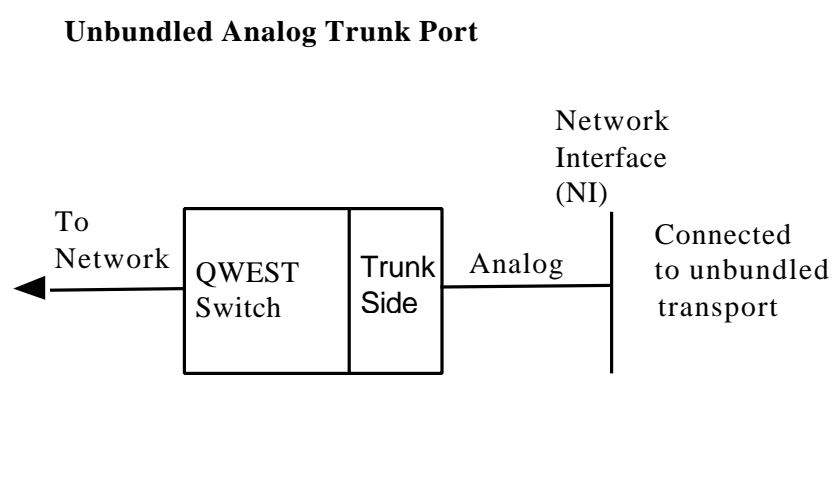
An Unbundled Analog Trunk Port is a Analog trunk side End Office switch port physically terminating at a common DS0/voice frame or panel. Each Unbundled Analog Trunk Port is a DS0 channel capable of supporting local traffic types (e.g. Message, DID, FX, Centrex Private Facility).

An Analog Trunk Port provides the switch connection between calling and called parties at the QWEST Wire Center.

An Analog Trunk Group is a software feature within an End Office switch that establishes the trunk group number and associated trunk members. Trunk groups may be originating, terminating or 2-way. Signaling attributes are defined at the trunk group level.

This Specific network architecture option for virtual access to an Analog Trunk Port interface listed in this section is available via the Special Request Process (SRP). Any request that materially deviates from the language in this section regarding access to the Analog Trunk Port interface must be submitted via the Bona Fide Request (BFR) process.

Figure 8-1 Illustrates an Unbundled Analog Trunk Port.



**Figure 8-1:** Unbundled Analog Trunk Port



## 8.2 Port Description

The End Office Message Trunk Port is connected to a CLEC metallic interface within the QWEST Central Office (i.e. the End Office switch and interface are in the same QWEST Central Office).

### 8.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DS0/voice frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations **MUST** be ordered prior to ordering Message Trunk Ports, reference *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 8.2.2 Provided Functions

Some of the available functions of an Analog Trunk Port are:

- Message Trunks
- DID Trunks
- FX (Foreign Exchange)Trunks
- Centrex Private Facilities Trunks

## 8.3 Interconnecting Services

Unbundled analog trunk ports are typically connected to an unbundled loop This loop may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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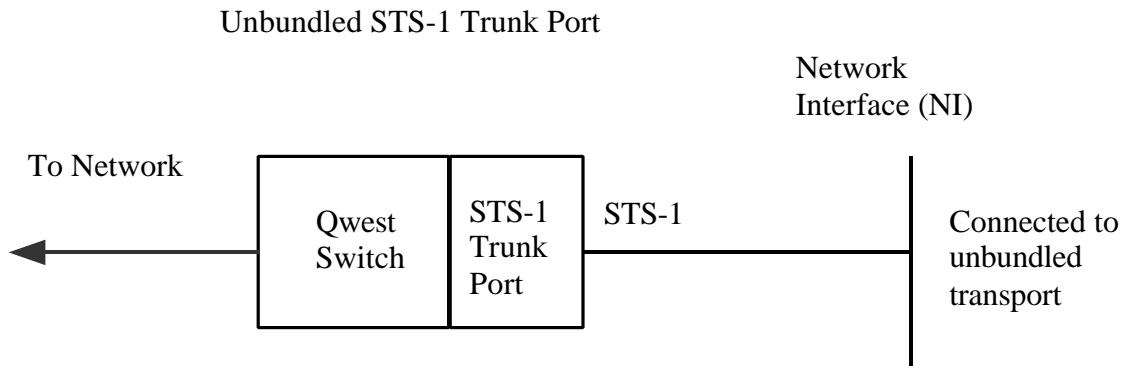
## 9. Unbundled Switch Port STS-1 Service Description

### 9.1 Introduction

An Unbundled STS-1 Switch Port provides an interface to the Qwest Local End Office.

This Specific network architecture option for virtual access to the STS-1 switch port, where available, is requested via the Special Request Process (SRP). Any request that materially deviates from the language in this section regarding access to the STS-1 switch port must be submitted via the Bona Fide Request (BFR) process.

Figure 9-1 Illustrates an Unbundled Switch Port STS-1.



**Figure 9-1:** Unbundled Switch Port STS-1

## 9.2 Port Description

STS-1 switch ports are connected to a CLEC electrical STS-1 interface within the QWEST Central Office (i.e. the End Office switch and interface are in the same QWEST Central Office). The STS-1 supports 672 channelized DS-0s.

The STS-1 interface is a standard SONET interface and is compatible with transmission equipment that supports STS-1 interface and conforms to *GR-253 Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria*, Issue 3, September 2000 and *GR-782 SONET Digital Switch Trunk Interface Criteria*, Issue 1, June 2000.

### 9.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common DSX-3 (STXS-1) frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations must be ordered prior to ordering an STS-1 switch port. See *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 9.2.2 Provided Functions

Some of the available functions of a STS1 Switch Port are:

- Message trunks (MF, DP, SS7) or
- ISDN Primary Rate circuits or
- GR303 remote terminals

## 9.3 Interconnecting Services

Unbundled STS-1 Switch Ports are typically connected to an unbundled STS-1. This STS-1 may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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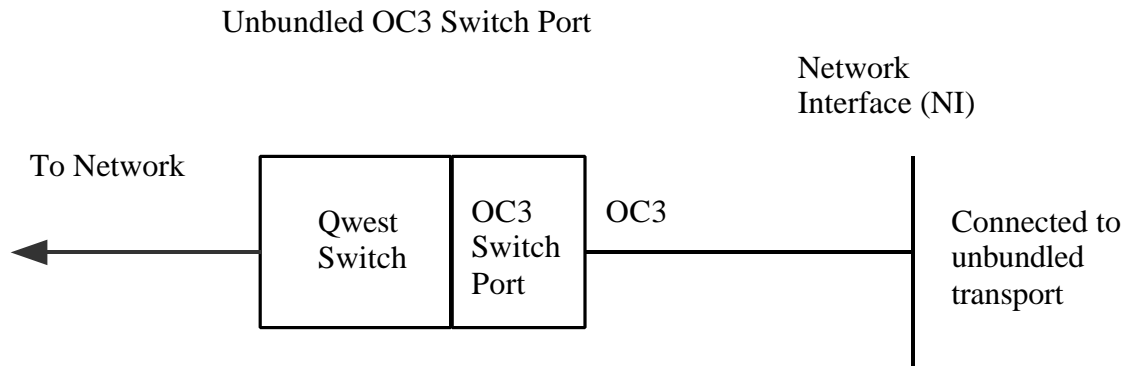
## 10 Unbundled OC3 (Optical Carrier Level 3) Switch Port Service Description

### 10.1 Introduction

An Unbundled OC3 port provides an OC3 interface to the Qwest Local End Office.

This Specific network architecture option for virtual access to the OC3 interface, where available, is requested via the Special Request Process (SRP). Any request that materially deviates from the language in this section regarding access to the OC3 interface must be submitted via the Bona Fide Request (BFR) process.

Figure 10-1 Illustrates an Unbundled OC3 switch port.



**Figure 10-1:** Unbundled OC3 Switch Port

## 10.2 Port Description

OC3 switch ports are connected to a CLEC optical (OC3) interface with in the QWEST Central Office (i.e. the End Office switch and interface are in the same QWEST Central Office). This interface is 1+1 redundant and is utilized to provide high capacity trunking to QWEST end offices. SONET payload mapping may be one of the following:

- DS-3 mapping with integrated M13 multiplexing, or
- VT1.5 mapping for DS-1 (floating asynchronous or floating byte-synchronous), or
- DS-3 M23 applications ( as specified in ANSI T1.107-1995), or
- DS-1 SF (Super Frame) and ESF (Extended Super Frame) formats (must be configured for Asynchronous SONET mapping (VT1.5and M13)).

The OC3 interface is a standard SONET interface and is compatible with transmission equipment that supports OC3 interface and conforms to *GR-253 Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria*, Issue 3, September 2000 and *GR-782 SONET Digital Switch Trunk Interface Criteria*, Issue 1, June 2000.

### 10.2.1 Network Interface

The QWEST Central Office Network Interface (CO-NI) is a common FDP (Fiber Distribution Panel) frame or panel located in the wire center (e.g. Inter Connector Distribution Frame (ICDF) or Direct Connection). Terminations must be ordered prior to ordering an OC3 switch port. See *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386).

### 10.2.2 Provided Functions

Some of the available functions of an OC3 Switch Port are:

- Message trunking (2016 DS-0 channels) or
- PRI trunking

## 10.3 Interconnecting Services

Unbundled OC3 Ports are typically connected to an unbundled OC3. This OC3 may be provided by an Interconnector collocated in QWEST's Wire Center by means of the *Expanded Interconnect and Co-Location for Private Line Transport and Switched Access Services* (Technical Publication 77386) or by QWEST's *Interconnection, Unbundled Loop Service* (Technical Publication 77384).

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## 11. Network Channel/Network Channel Interface Codes and Applications

### 11.1 Network Channel (NC) Codes

#### 11.1.1 General

Network Channel (NC) codes are a part of the Telcordia COMMON LANGUAGE<sup>®</sup> code set. The NC code is used to identify a channel used with the service. This section identifies the available channels and their NC codes.

#### 11.1.2 Format

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

Channel Code  
Optional Feature Code

The format is illustrated in Figure 11-1.

Network Channel Code				
Data Element	Channel Code		Optional Feature Code	
Character Position	1	2	3	4
Character Key	X	X	X or -	X or -

X = Alphanumeric  
- = Hyphen

**Figure 11-1:** Format Structure for NC Codes

The **Channel Code** (character positions 1 and 2) is a two character alpha or alphanumeric code that describes the channel service in an abbreviated form. The channel code will frequently, but not always, be specified as the service code of the special service circuits or the transmission grade of the message trunk circuit. The NC channel code field is always filled.

The **Optional Feature Code** (character positions 3 and 4) is a two character alpha or alphanumeric or hyphen code that represents the option codes available for each channel code. Varying combinations of this code will allow the customer to enhance the technical performance of the requested channel, or to further identify the type of service. It is also used to specify options such as conditioning, effective 4-wire, multiplexing, etc. The NC optional code field is always filled.

Further information about NC Codes may be found in ANSI T1.223-1991, *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System*.

### 11.1.3 Available Network Channel Codes

Table 11-1 lists the available Network Channel (NC) codes for Unbundled Switch Elements. The description “Local Transmission Parameters” denotes the technical parameters in this publication and in the referenced documents.

**Table 11-1:** Available Network Channel Codes

Network Channel Code	Description
SNAL	Switched Access Port Termination, 2-wire local Transmission Parameters, Line Termination
SNAI	Switched Access Port Termination, 2-wire local Transmission Parameters, Line Termination, Basic Rate ISDN
SNBT	Switched Access Port Termination, 4-wire local Transmission Parameters, Trunk Termination
SNBW	Switched Access Port Termination, 4-wire local Transmission Parameters, Trunk Termination with Line Treatment, originating.
SNBX	Switched Access Port Termination, 4-wire local Transmission Parameters, Trunk Termination with Line Treatment Terminating.
HC-D	Super Frame (SF) and Alternate Mark Inversion (AMI)
HCDD	ANSI Extended Super Frame (ESF) and Alternate Mark Inversion (AMI)
HCED	Extended Super Frame (ESF) and B8ZS Bipolar with 8-Zero Substitution per ANSI Standard T1.403.1989, DS1 with switch multiplexing
HCEI	Extended Super Frame (ESF) and B8ZS Bipolar with 8-Zero Substitution per ANSI Standard T1.403.1989, Primary Rate ISDN 23 B+D
HCFD	Non-ANSI Extended Super Frame (ESF) and Alternate Mark Inversion (AMI)
HCGD	Non-ANSI Extended Super Frame (ESF) and B8ZS Bipolar with 8-Zero Suppression
HCGI	Non-ANSI Extended Super Frame (ESF) and B8ZS Bipolar with 8-Zero Suppression, Primary Rate ISDN 23 B+D
HCLA	DS1 ESF/B8ZS <sup>1</sup> with time slot 12 for EOC <sup>2</sup> & time slot 24 for TMC <sup>3</sup>
HCLB	DS1 ESF/B8ZS <sup>1</sup>
JIA-	SONET Electrical STS-1 <sup>2</sup> , 51.84 Mbps – VT1 Structured (This STS-1 Envelope Capacity is structured into 7 Virtual Tributary Groups (VTGs). Each of these VTGs support 4 VT1.5s, and each VT1.5 may transport a DS1; i.e., 7X4=28
OB-P	SONET, OC3 <sup>3</sup> , 155.520 Mbps, Point-to-Point channel and no further Parameters-, Optical Termination on a Switch

1. ESF/B8ZS Extended Super Frame/Bipolar 8 Bit Zero Substitution
2. Embedded Operations Channel
3. Time-Slot Management Channel
4. STS-1 Synchronous Transport Signal level 1

5. OC3 Optical Carrier level 3

## 11.2 Network Channel Interface (NCI) Codes

### 11.2.1 General

Network Channel Interface (NCI) codes are a part of the COMMON LANGUAGE<sup>®</sup> code set. The NCI code is used to identify a network interface of a service in our mechanized systems. This chapter defines the NCI codes used with voice grade services.

### 11.2.2 Format

An NCI code is a maximum twelve-character code that consists of five (5) data elements:

- Total Conductors
- Protocol
- Impedance
- Protocol Options
- Transmission Level Point(s) (TLP)

The first three fields are required; the last two may be optional depending of the service. The format is illustrated in Figure 11-2.

**Network Channel Interface Code**

Total Conductors		Protocol		I m p e d a n c e	D e l i m i t e r	Protocol Options			D e l i m i t e r	TLP Level	
1	2	3	4	5	6	7	8	9	10	11	12
N	N	A	A	X	•	X	X	X	•	X or -	X or -

- A = Alpha
- N = Numeric
- X = Alphanumeric
- = Delimiter (normally a period)
- = Hyphen

**Figure 11-2:** Format Structure for NCI Codes

**Total Conductors** (character positions 1 and 2) is a two-character numeric code that represents the total number of physical conductors (e.g., wires or fibers) required at the interface.

**Protocol** (character position 3 and 4) is a two-character alpha code that defines requirements for the interface regarding signaling/transmission.

**Impedance** (character position 5) is a one-character alpha or numeric code representing the nominal reference impedance that will terminate the channel for the purpose of evaluating transmission performance.

**Protocol Options** (character positions 7, 8, and 9) is a one to three character alpha, numeric, or alphanumeric code that describes additional features (e.g., bit rate or bandwidth) on the Protocol to be used. It is an optional field that is always left justified when less than three characters are specified.

**Transmission Level Point(s)** (character positions 8 through 12) is assigned one or two character alpha code corresponding to a value for Transmission Level Point(s) (TLPs) from either the Exchange Carrier/service provider or customer end.

Further information about NCI Codes may be found in ANSI T1.223-1991, *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System*.

### 11.2.3 Available Network Channel Interface Codes

Table 11-2 lists the NCI codes available for Unbundled Switch. Table 11-3 lists other NCI codes used in this publication pertaining to related services.

**Table 11-2:** Available Unbundled Switch NCI Codes

Protocol		Definition
Code 3 4	Option 7 8 9	
QB		Manual Cross-connect Termination w/no Subrating Capability
	1 1	DS1 to DS1; this code may or may not meet DS1 signal levels as specified by TR-TSY-000342
	11R	DS1 to DS1 with regenerator; this code may or may not meet DS1 signal levels as specified by TR-TSY-000342
QC		Manual Cross-connect, Voice Termination
	OOC	Ground Start Loop Signaling, Closed End
	OOE	Manual Cross-connect, Voice Termination
	OOS	Basic Rate ISDN

**Table 11-3: Other NCI Codes**

Protocol		Definition
Code	Option	
3 4	7 8 9	
QC		Manual Cross-connect, Voice Termination
	OOB	Ground Start Loop Signaling, Open End
	OOD	Loop Start Loop Signaling, Open End
	OOS	Basic Rate ISDN

**11.3 Valid Network Channel/Network Channel Interface Combinations**

Table 11-4 describes valid combinations of NC and NCI codes. Codes on horizontal rows are compatible.

**Table 11-4: Valid NC/NCI Combinations**

Signaling Description	NC Code	NCI Code
Ground Start Loop Signaling, Closed End	SNAL	02QC3.00C
Loop Start Loop Signaling, Closed End	SNAL	02QC3.00E
Unbundled BRI Line Port	SNAI	02QC5.00S
Unbundled DS1 Trunk Port	HC*D HCEI HCGI SNBT SNBW SNBX	04QB9.11
Unbundled DS1 Trunk Port	HC*D HCEI HCGI SNBT SNBW SNBX	04QB9.11R
Unbundled Message Trunk	SNBT	06QC2.E1A 08QC2.E2A
Unbundled Message Trunk	SNBW	04QC2.RVO
Unbundled Message Trunk	SNBX	04QC2.RVT
Unbundled DS1 GR-303-IDLC Port	HCLA	04QB9.11
Unbundled DS1 GR-303-IDLC Port	HCLB	04QB9.11R

Unbundled STS-1 Switch Port	JIA-	04ST6.A
Unbundled OC3 Switch Port	OB-P	04SOF.B 04SOF.D 04SOF.F

\*= Refer to table 11-1 for available options of character 3

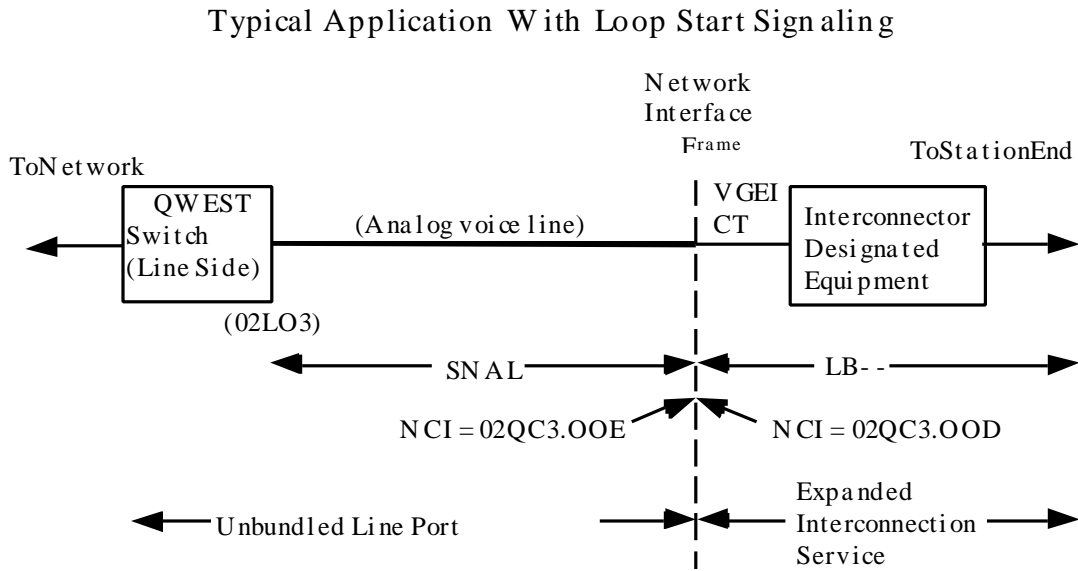
### 11.4 Voice Network Interface Applications

Voice interfaces use the “QC” NCI codes for the Network Interface (NI). Connections can be made to either a collocated Interconnector using Expanded Interconnection as described in PUB 77386, Chapter 6.

#### 11.4.1 Connection to Collocated Interconnector

Figure 11-3 illustrates a typical application where an Unbundled Line port is connected to a collocated Expanded Interconnection Service. The loop out to the station end is provided by the Interconnector. Table 11-5 lists the applicable NC and NCI codes for both services. Other NC codes could apply for the Interconnectors service. The NCI codes would change for ground start signaling applications.

Interconnectors may or may not use NC and NCI codes for their own purposes. Values illustrated on the Interconnector side of the Network Interface in Figure 11-3 may not apply.



VG EICT = Voice Grade Expanded Interconnection Channel Termination (A tariff rate element) NCI = Network Channel Interface Code

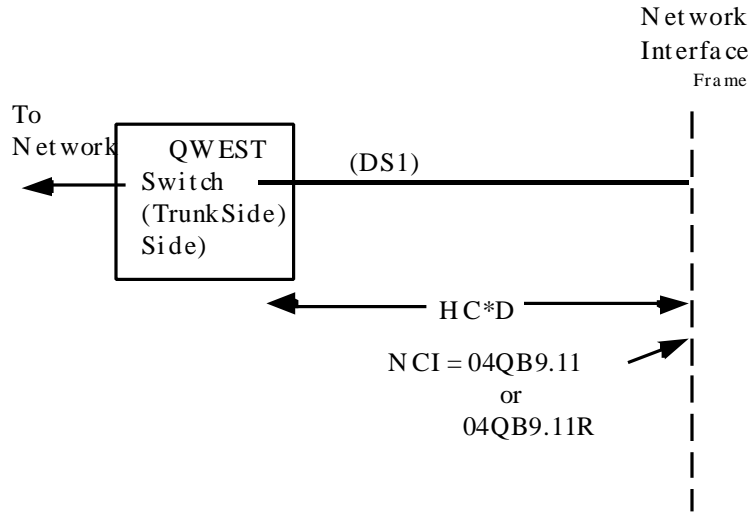
**Figure 11-3:** Typical Unbundled Analog Line Application



**Table 11-5:** Typical Connection to Collocated Interconnector Application

Line Signaling Type	Unbundled Analog Line		Collocated Expanded Interconnection Service	
	NC Code	NCI Code	Typical NC Code	NCI Code
Ground Start	SNAL	02QC3.OOC	LB--	02QC3.OOB
Loop Start	SNAL	02QC3.OOE	LB--	02QC3.OOD

Typical Unbundled DS1 Trunk Port Application



NCI = Network Channel Interface Code

**Figure 11-4:** Typical Unbundled DS1 Trunk Port Application

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## **12. Technical Parameters**

### **12.1 General**

The Unbundled Switch Network Elements includes the functions and features described in Chapters 2 through 10.

### **12.2 Applicable Technical References**

Requirements contained in the following publications would apply unless specific exception is made in a QWEST publication or tariff. See Chapter 14 for issue dates and ordering information.

- ANSI-T1.101 Telecommunications – Synchronization interface standards for digital networks.
- ANSI-T1.107 Telecommunications – Digital hierarchy –Formats specifications.
- ANSI T1.401-1993, Interface Between Carriers and Customer Installations - Analog Voicegrade Switched Access Lines Using Loop-Start and Ground-Start Signaling.
- ANSI/IEEE Std 820-1984, Standard Telephone Loop Performance Characteristics. This publication has recently been reaffirmed.
- FR-64, LATA Switching Systems Generic Requirements (LSSGR).
- SR-TSV-002275, BOC Notes on the LEC Networks - 1994.
- GR-303-CORE, Integrated Digital Loop Carrier Generic Requirements, Objectives and Interface.
- GR-303-ILR, (Issue List Report), Integrated Digital Loop Carrier Generic Requirements, Objectives and Interface.
- GR-253 Synchronous Optical Network (SONET) Transport systems: Common Generic Criteria.
- GR-782 SONET Digital Switch Trunk Interface Criteria.
- TR-057 (TR-NWT-000057), Functional Criteria for Digital Loop Carrier Systems.

### **12.3 Interference**

Any connections to Unbundled Switch Network Elements must not physically, electrically, or inductively interfere with other QWEST services or those of QWEST's other customers.

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## 13. Definitions

### 13.1 Acronyms

AMA	Automatic Message Accounting
ANSI	America National Standards Institute
CO	Central Office
DTMF	Dual Tone Multifrequency
EICT	Expanded Interconnection Channel Termination
EU	End-User
Hz	1 Hertz (formerly 1 cycle per second)
ICDF	Inter-Connector Distribution Frame
IDLC	Integrated Digital Loop Carrier
IntraLATA	IntraLocal Access and Transport Area
kHz	Kilohertz (1,000 Cycles Per Second)
LATA	Local Access and Transport Area
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
POTS	Plain Old Telephone Service
SWC	Serving Wire Center
TLP	Transmission Level Point

### 13.2 Glossary

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

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

#### **Carrier**

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

### **Central Office (CO)**

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

### **Channel**

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

### **Closed End**

The end of a switched service which transmits address signals.

### **Customers**

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 services for hire for others, and (2) End-Users, who request services only for their own use.

### **Dial Pulse (DP)**

A means of signaling consisting of regular momentary interruptions of a direct or alternating current path at the sending end in which the number or interruptions corresponds to the value of a digit or character. The interruptions are usually produced by a rotary telephone dial, but may be produced by a sender switching system.

### **Dual tone Multifrequency Signaling (DTMF)**

A signaling method that employs signals consisting of two sinusoidal voice frequency components, one from a group of four low frequencies and the other from a group of four high frequencies.

### **End Office**

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

### **End Office Switch**

The term "End Office Switch" denotes a QWEST switching system where local exchange services are terminated for purposes of interconnection to other exchange services or trunks. Included are Remote Switching modules and Remote Switching Systems served by a host office in a different wire center. See also "Local Switching System".

### **End-User (EU)**

The term "End-User" denotes any customer of telecommunications service that is not a carrier, except that a carrier shall be deemed to be an "End-User" to the extent that such carrier uses a telecommunications service for administrative purposes without making such service available to others, directly or indirectly. The term is frequently used to denote the difference between a Carrier interface and an interface subject to unique regulatory requirements at non-Carrier customer premises (FCC Part 68, etc.)

### **Facilities**

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

### **Impedance**

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

### **Interconnectors**

Customers, who have transmission equipment in a QWEST wire center through some type of collocation agreement for interconnection to QWEST's Private Line Transport or Switched Access Services, will be termed "Interconnectors."

### **Line-Side Connection**

Denotes a connection of a transmission path to the dial tone side of a switching system.

### **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.

### **Local Exchange Carrier (LEC)**

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

### **Local Wire Center**

The Wire Center which normally provides service to a customer.

### **Loop**

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

### **Loop Signaling**

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

### **Network**

The interconnected telecommunications equipment and facilities.

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

The Network Channel (NC) code is an encoded representation used to identify both switched and non-switched channel services. Included in this code set are customer options associated with individual channel services, or feature groups and other switched services.

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

The Network Channel Interface (NCI) code is an encoded representation used to identify five (5) interface elements located at a Point of Termination (POT) at a central office or at the Network Interface at a customer location. The Interface code elements are: Total Conductors, Protocol, Impedance's, Protocol Options, and Transmission Level Points (TLP). (At a digital interface, the TLP element of the NCI code is not used.)

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

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

### **Ohm**

The unit of electric resistance.

### **Off-Hook**

The supervisory state indicative of the active (in use) condition.

### **On-Hook**

The supervisory state indicative of the idle condition.

### **Open End**

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

### **Premises**

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



### **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.

### **Signaling**

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

### **Stored Program Control (SPC)**

A switching system comprised of a set of instructions within computer memory specifying operations to be performed which expands the capability of the system to selectively route traffic.

### **Transmission Level Point (TLP)**

A point in a transmission system at which the ratio, usually expressed in decibels, of the power of a test signal at that point to the power of the test signal at a reference point, is specified. For example, a zero transmission level point (OTLP) is an arbitrarily established point in a communication circuit to which all relative levels at other points in the circuit are referred.

### **Transmission Path**

Denotes a path capable of transporting signals within the range of the service offering. A transmission path is comprised of physical or derived facilities consisting of any form or configuration of plant typically used in the telecommunications industry.

### **Voice Band**

Relating to the frequency spectrum from 300 to 3000 Hz.

### **Wire Center**

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

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## 14. References

### 1214.1 American National Standards Institute Documents

- ANSI T1.101 - 1994      *Telecommunications – Synchronization interface standards for digital networks*
- ANSI –T1.107 - 1995      *Telecommunications – Digital hierarchy –Formats specifications.*
- ANSI T1.223-1991      *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*
- ANSI T1.401-1993      *Interface Between Carriers and Customer Installations - Analog Voicegrade Switched Access Lines Using Loop-Start and Ground-Start Signaling.*
- ANSI/IEEE Std 820-1984      *Standard Loop Performance Characteristics.* This publication has been reaffirmed in 1993.

### 14.2 Telcordia Documents

- FR-64      *LATA Switching Systems Generic Requirements (LSSGR).* Issue 95, January 1995.
- SR-TSV-002275      *BOC Notes on the LEC Networks - 1997.* Issue 3, December 1997.
- GR-303-CORE      *Integrated Digital Loop Carrier Generic Requirements, Objectives and Interface.*
- GR-303-ILR (Issue List Report)      *Integrated Digital Loop Carrier Generic Requirements, Objectives and Interface.*
- GR-253      *Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria,* Issue 3, September 2000
- GR-782      *SONET Digital Switch Trunk Interface Criteria,* Issue 1, June 2000
- TR-057 (TR-NWT-000057)      *Functional Criteria for Digital Loop Carrier Systems.*
- BR-795-403-100      *COMMON LANGUAGE® Network Channel and Channel Interface Codes (NC/NCI™ Codes).* Issue 13 11/1/2001
- BR-795-403-101      *COMMON LANGUAGE® Network Channel and Channel Interface Codes Compatibility Guide.* Issue 7 11/1/2000

### 1214.3 QWEST Technical Publications

- PUB 77346      *Qwest Synchronous Service Transport* Issue H, March 2002

PUB 77384            *QWEST Interconnection - Unbundled Loop.* Issue K, March 2002.

PUB 77386            *Expanded Interconnection and Collocation For Private Line Transport  
and Switched Access Service.* Issue G, November 2002.

#### **14.4 Federal Communications Commission Documents**

Code of Federal Regulations, Section 47, Part 68, Connection of Terminal  
Equipment to the Telephone Network.

## 14.5 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.

Those who are not QWEST employees may order:

American National Standards Institute (ANSI) documents from:

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

ANSI has a catalog available which describes their publications.

Telcordia documents from:

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QWEST Technical Publications from:

<http://www.qwest.com/techpub>

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## 14.6 Trademarks

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**History Log**  
**Technical Publication 77391**  
**Unbundled Switch Elements**

Line #	Issue	Issue Date (mm-yyyy)	Change			Reason/Level	CR or Notice #
			Chapter Number	Chapter Name	Update Activity		
1	F	06-2002		Table of Contents	<ul style="list-style-type: none"> <li>Add Chapters 9 and 10 renumber subsequent chapters.</li> </ul>	Product Life cycle / Level 2	N. A.
2	F	06-2002	1	Introduction	<ul style="list-style-type: none"> <li>Add Chapters 9 and 10 renumber subsequent chapters.</li> </ul>	Product Life cycle / Level 2	N. A.
3	F	06-2002	2	Unbundled Analog Line Port	<ul style="list-style-type: none"> <li>Remove reference to exclusive use of ICDF</li> <li>Clarify vertical features availability</li> <li>Clarified Network Interface</li> </ul>	Product Life cycle / Level 2	N. A.
4	F	06-2002	3	Unbundled DS1 Message Trunk Port	<ul style="list-style-type: none"> <li>Clarified Message Trunk</li> <li>Remove reference to exclusive use of ICDF</li> <li>Clarified Network Interface</li> <li>Reference Technical Publication 77386</li> </ul>	Product Life cycle / Level 2	N. A.
5	F	06-2002	4	Unbundled DID Trunk Port	<ul style="list-style-type: none"> <li>Remove reference to exclusive use of ICDF</li> <li>Clarified Network Interface</li> <li>Reference Technical Publication 77386</li> </ul>	Product Life cycle / Level 2	N. A.
6	F	06-2002	5	Unbundled BRI Line Port	<ul style="list-style-type: none"> <li>Remove reference to exclusive use of ICDF</li> <li>Clarify vertical features availability</li> <li>Clarified Network Interface</li> <li>Reference Technical Publication 77386</li> </ul>	Product Life cycle / Level 2	N. A.
7	F	06-2002	6	Unbundled PRI Trunk Port	<ul style="list-style-type: none"> <li>Remove reference to exclusive use of ICDF</li> <li>Clarified Network Interface</li> <li>Reference Technical Publication 77386</li> </ul>	Product Life cycle / Level 2	N. A.
8	F	06-2002	7	Unbundled GR-303 IDLC	<ul style="list-style-type: none"> <li>Remove reference to exclusive use of ICDF</li> <li>Clarified Network Interface</li> <li>Reference Technical Publication 77386</li> </ul>	Product Life cycle / Level 2	N. A.
9	F	06-2002	8	Unbundled Analog Trunk Port	<ul style="list-style-type: none"> <li>Remove reference to exclusive use of ICDF</li> <li>Clarified Introduction and Network Interface</li> <li>Add Provided Functions and Interconnecting Services</li> </ul>	Product Life cycle / Level 2	N. A.
10	F	06-2002	9	Unbundled STS-1 Switch Port	<ul style="list-style-type: none"> <li>New Chapter</li> </ul>	Product Life cycle / Level 2	N. A.
11	F	06-2002	10	Unbundled OC3 Switch Port	<ul style="list-style-type: none"> <li>New Chapter</li> </ul>	Product Life cycle / Level 2	N. A.
12	F	06-2002	11	NC/NCI Codes and Applications	<ul style="list-style-type: none"> <li>Renumber</li> <li>Table 11-1 add NC JIA- and OB-P</li> <li>Table 11-4 correct GR-303 add STS-1 and OC3 switch ports</li> </ul>	Product Life cycle / Level 2	N. A.
13	F	06-2002	12	Technical Parameters	<ul style="list-style-type: none"> <li>Renumber</li> <li>Remove superfluous loop information</li> <li>Add ANSI T1.101 and ANSI T1.107</li> <li>Add GR-263 and GR-782</li> </ul>	Product Life cycle / Level 2	N. A.
14	F	06-2002	13	Definitions	<ul style="list-style-type: none"> <li>Renumber</li> <li>Remove Bellcore</li> </ul>	Product Life cycle / Level 2	N. A.
15	F	06-2002	14	References	<ul style="list-style-type: none"> <li>Renumber</li> <li>Add ANSI T1.101 and ANSI T1.107</li> <li>Add GR-263 and GR-782</li> <li>Add Technical Publication 77346</li> </ul>	Product Life cycle / Level 2	N. A.