QWEST Communications International, Inc. Technical Publication

SERIAL DIGITAL VIDEO SERVICE (SDVS)

77401
Issue D
October 2007

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1. Introduction

1.1 General

This technical publication describes the Serial Digital Video Service (SDVS) offered by Qwest to its customers for Interstate Access and Intrastate Non-access Services.

1.2 Reason for Reissue

This technical publication has been reissued to indicate the addition of two new service offerings, 19.4Mbps Synchronous Serial Interface (SSI) and 1.485Gbps High Definition-Serial Digital Interface (HD-SDI), to the existing Serial Digital Video Service (SDVS) offering of 270Mbps; Serial Digital Interface (SDI) or Digital Video Broadcasting-Asynchronous Serial Interface (DVB-ASI).

1.3 Scope of Document

Serial Digital Video Service (SDVS) is typically used by network television broadcasters, production studios and other video customers that require very high quality video signals. Qwest SDVS provides transmission of 19.4Mbps (SSI per SMPTE 310M), 270Mbps (SDI per SMPTE 259M, or DVB-ASI per ISO 13818-1), or 1.485Gbps (HD-SDI per SMPTE 292) video signals in point to point configurations. SDI is also referred in the industry as D1, however for the sake of uniformity it will not be referenced in this document.

This document covers distinguishing service features, technical specifications and defines valid interfaces. The customer will use this document to understand the technical features of this service offering. This document will aid the customer in ordering the service and provide an understanding of the technical specifications of signals at the network interface to the customer, as well as system performance parameters and responsibilities for the service by Qwest and the customer.

1.4 Document Organization

This document is organized in a manner so that the reader will understand what is being delivered to the customer.

- Chapter 1, Introduction
- Chapter 2, Service Description
- Chapter 3, Network Channels and Interfaces
- Chapter 4, Technical Requirements (Note: Service performance parameters are shown in this chapter)
- Chapter 5, Maintenance of Service
- Chapter 6, Definitions of Terms and list of Acronyms
- Chapter 7, References to all related technical documents and ordering procedures

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2. Service Description

2.1 General Application

Serial Digital Video Service (SDVS) is a one-way, point-to-point digital video transport solution. SDVS is provided over standard fiber optic facilities for transporting digital video signals that have been encoded to 19.4Mbps, 270 Mbps, or 1.485Gbps. The service and interface options available for SDVS are as follows:

- 19.4 Mbps service utilizes a Synchronous Serial Interface (SSI), discussed in 2.1.1
- 270Mbps service has two interface options:
  1) Serial Digital Interface (SDI), discussed in Section 2.1.2
  2) Digital Video Broadcast - Asynchronous Serial Interface (DVB-ASI), discussed in Section 2.1.3
- 1.485Gbps service utilizes a High Definition – Serial Digital Interface (HD-SDI), discussed in Section 2.1.4

2.1.1 Synchronous Serial Interface (SSI)

SSI is standardized by The Society of Motion Picture and Television Engineers' SMPTE 310M *Synchronous Serial Interface for MPEG-2 Digital Transport Stream.* Technical specifications of SSI are defined within SMPTE 310M. The equipment deployed for this service operates according to specifications set forth within SMPTE 310M. The customer may also include ancillary data (for audio and data services) in this transport stream that will be passed transparently and not appear separately at the network interface in accordance with the SMPTE 310M standard.

2.1.2 Serial Digital Interface (SDI)

SDI is standardized as SMPTE 259M/C *Television -- 10-Bit 4:2:2 Component and* $4f_{sc}$ *Composite Digital Signals -- Serial Digital Interface* and EBU tech. 3267, and is defined for both component and composite convention video signals, including embedded digital audio. The SDI interface is in conformance with NTSC System M (525 lines and 60 fields per second) digital television equipment.

The equipment deployed for this service operates according to specifications of the standard document SMPTE 259M. The customer may also include ancillary data (for audio and data services) in this transport stream that will be passed transparently and not appear separately at the network interface. The customer will perform their own coding of the 525 lines / 60 fields per second 4:2:2 component signal and any ancillary data into a 270 Mbit/s video signal.

Application examples include transport for an inter-production studio, venue to studio, venue to carrier point-of-presence (POP), studio to master broadcast antenna and studio to satellite uplink site.

2.1.3 Digital Video Broadcast - Asynchronous Serial Interface (DVB-ASI)

DVB-ASI is a standard 270 Mb/s transport of single or multiple MPEG2 transport streams as defined in ISO 13818-1. The customer demarcation point shall operate in accordance with European Standard, (EN 50083-9). DVB-ASI uses 8b/10b coding of each word from a lookup table before serialization and is polarity sensitive (i.e., cannot be inverted). Unlike 270 Mb/s SDI signals, DVB-ASI does not contain timing reference signals (TRS) to indicate start of active video (SAV) and end of active video (EAV).

Typical use of the DVB-ASI signals in the broadcast market is for compressed HDTV at 19.38Mb and in the cable market for multiple 3-4Mb MPEG streams for video on demand (VOD). The customer is responsible to combine multiple MPEG2 signals to a single DVB-ASI stream. The single signal stream should be handed to Qwest on a 75 ohm coaxial cable.

2.1.1 High Definition – Serial Digital Interface (HD-SDI)

HD-SDI is standardized by The Society of Motion Picture and Television Engineers' SMPTE 292 *1.5 Gb/s Signal/Data Serial Interface*. Technical specifications of HD-SDI are defined within SMPTE 292. The equipment deployed for this service operates according to specifications set forth within SMPTE 292. The customer may also include ancillary data (for audio and data services) in this transport stream that will be passed transparently and not appear separately at the network interface in accordance with the SMPTE 292 standard.

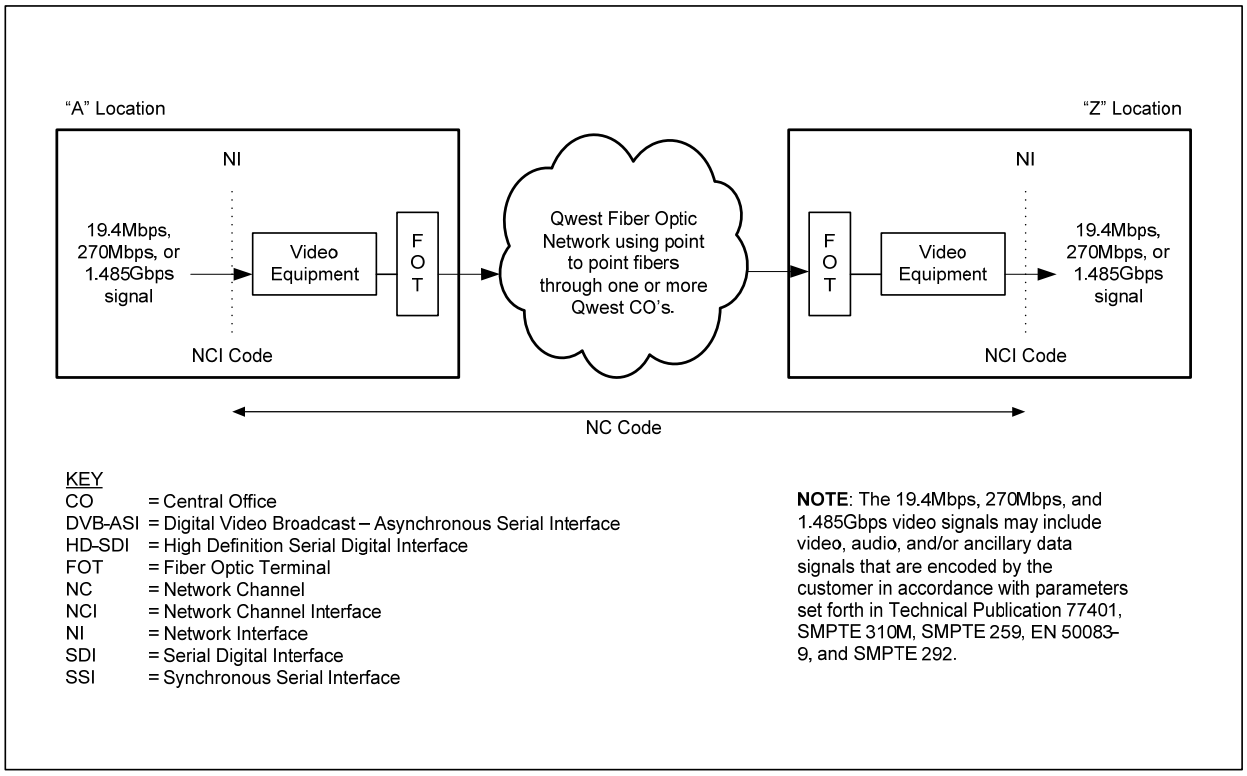
The transmission specifications are outlined in Chapter 4, Technical Requirements, of this document. Further details can be obtained from the standard document for the respective interface.

2.2 Service Architecture

2.2.1 Transmission Equipment and Facilities Configuration

Qwest will provide an electrical interface and physical channel connection as described in this publication. The transport facilities will use fiber optic transmission facilities between the end-user or carrier premises and the serving Qwest Central Office. Fiber Optic facilities will also be used for the signal transport in case multiple Central Offices are involved. See Figure 2-1 for a general view of the configuration.

Figure 2-1 Configuration of Serial Digital Video Service



2.2.2 Technical Characteristics of a Component Video Signal

It is important to understand the basic technical characteristics of a component video signal and how the bit rate of this video signal is determined.

A "4:2:2" component video signal is originated at the customer source by a color television camera or video tape recorder and retained in that format for best quality. The mathematical expression 4:2:2 is shorthand notation used in the television industry to indicate a component signal that makes use of the primary color signals red, green and blue (RGB). A color television camera delivers a component signal that is also depicted as Y for luminance and B-Y and R-Y for color difference signals. The number "4" refers to the luminance signal which has a sampling frequency that is approximately four times the NTSC color subcarrier frequency (3.58 MHz), or 13.5 MHz (the actual computed value is 14.3 MHz but 13.5 MHz was chosen to arrive at a compatible international standard). Each of the numbers "2" are also referred to as color difference components and have a sampling frequency that is one-half the luminance frequency or 6.75 MHz. The total of the component frequencies yields a total sampling frequency of 27 MHz. Table 2-1 shown below summarizes this information.

Table 2-1 Parameters of a Component Video Signal 4:2:2

Component Signal	Component Indicator	Component Numeral	Sampling Frequency, MHz
Luminance	Y	4	13.5
Color Difference	B-Y	2	6.75
Color Difference	R-Y	2	6.75
Total of Components	----------	----------	27.0

The total bit rate for each SDI video signal is then determined. The signal sampling frequency, 27 MHz, is multiplied by the standard encoding rate, 10 bits per Hz, and the result is 270 Mbit/s.

2.2.3 Technical Characteristics of a DVB-ASI

The DVB-ASI signal comprises of multiple video streams compress used MPEG2 scheme. The quality of the signals depends on the compression factor. The customer will be responsible for compression and encoding of the multiple video streams while Qwest will provide transport without making any changes to the content of the signal.

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3. Network Channel/Network Channel Interface Codes

3.1 Network Channel (NC) Codes

3.1.1 General

Network Channel (NC) codes are a part of the Bellcore COMMON LANGUAGE® 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.

3.1.2 Format

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

Channel Code
Optional Feature Code

The format is illustrated in Figure 3-1.

Figure 3-1 Format Structure for NC Codes

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

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 is frequently, but not always, 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.*

3.1.3 Available Network Channel Codes

Table 3-1 lists the available Network Channel (NC) codes for Serial Digital Video Service (SDVS).

Table 3-1 Available Network Channel Codes – SDVS

Network Channel Code	Description	NC/NCI Table
TB--	Video, 19.39 Mbps Synchronous Serial MPEG-2 Video Transport per SMPTE-310M-1998 (Note 1)	3-4
TD--	Component Serial Digital Video - Uncompressed (e.g., 270 Mbit/s) (Note 2)	3-4
TDA-	DVB-ASI (Digital Video Broadcasting-Asynchronous Serial Interface) is a standard 270 Mb/s transport of single or multiple MPEG2 transport. [Note 3]	3-4
TM--	Video, Uncompressed Digital Video up to 1.5 Gbps for HDTV per SMPTE Standard 292M (Note 4)	3-4

Note 1. Refer to SMPTE 310M

Note 2. Refer to ANSI/SMPTE 259M

Note 3. Refer to EN 50083-9

Note 4. Refer to SMPTE 292

3.2 Network Channel Interface (NCI) Codes

3.2.1 General

Network Channel Interface (NCI) codes are a part of the COMMON LANGUAGE® code set. The NCI code is used to identify a network interface of a service in our mechanized systems. This chapter defines the NCI codes used with 19.4Mbps Synchronous Serial Interface (SSI), 270Mbps options; Serial Digital Interface (SDI) and Digital Video Broadcast - Asynchronous Serial Interface (DVB-ASI), and 1.485Gbps High-Definition – Serial Digital Interface (HD-SDI).

3.2.2 Format

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

Total Conductors
Protocol
Impedance

Protocol Options
Transmission Level Point(s) (TLP)

The first three fields are required. The last two are optional. The format is illustrated in Figure 3-2.

Figure 3-2 Format Structure for NCI Codes

Network Channel Interface Code

Total Conductors		Protocol		Impedance	Delimeter	Protocol Options			Delimiter	TLP Level	
										Transmit	Receive
1	2	3	4	5	6	7	8	9	10	11	12
N	N	A	A	X	•	X	X	X	•	X or -	X or -

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

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. For SDVS there are four protocol codes and options defined as follows.

- Protocol Code TB = 19.39 Mbps Mpeg-2 One-Way Video Channel, Per SMPTE 310M Compliant
- Protocol Code TD = Component Digital Video
- Protocol Code TH = DVB-ASI for single or multiple MPEG2 transport signals and embedded related digital audio signals
- Protocol Code TM = Uncompressed Digital Video up to 1.5 Gbps per SMPTE Standard 292M

Impedance (character position 5) is a one-character alpha or numeric code representing the nominal reference impedance that will terminate the channel for the purpose of evaluating transmission performance. Values are listed in Table 3-2.

Table 3-2 NCI Impedance Values

Impedance in Ohms (Character Position 5)	
Data Value	**Code**
75	6

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

Transmission Level Point(s) (character positions 11 and 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. However for video services, such as SDVS, the TLP field refers to direction of the circuit and the fact that the transmission level is specified by Qwest at both transmit and receive ends. Values are listed in Table 3-3.

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

Table 3-3 NCI Transmission Levels

Transmission Level Point Code (Character Positions 11 and 12)	
Data Value	**Code**
None This Direction (One-way Service)	O
Qwest Specified	-

3.3 Valid Network Channel/Network Channel Interface Combinations

Table 3-4 lists applicable SDVS code combinations for a typical one way point-to-point channel**.** The directionality of the circuits can be represented by adding "O-" and "-O" for transmit and receive, respectively. For example 02TD6.E.O- and 02TD6.E.-O will represent transmit and receive Component Digital Video, respectively. A detailed explanation of the table elements is appropriate now. The Television Channel Service

indicator, SDVS (along with interface option), is shown with its related NC Codes; TB--, TD--, TDA-, and TM--. The set shows service as transmitted from one end-user or Carrier premises and received at another end-user or Carrier premises, or read as from third column to fourth column (reading left to right).

Table 3-4 NC/NCI Code Combinations - SDVS

Television Channel Service	NC Code	Transmit NCI Code at End-user or Carrier premises	Receive NCI Code at End-user or Carrier premises
SDVS; SSI	TB--	02TB6..O-	02TB6..-O
SDVS; SDI	TD--	02TD6.E.O-	02TD6.E.-O
SDVS; DVB-ASI	TDA-	02TH6.O-	02TH6.-O
SDVS; HD-SDI	TM--	02TM6.20A.O-	02TM6.20A.-O

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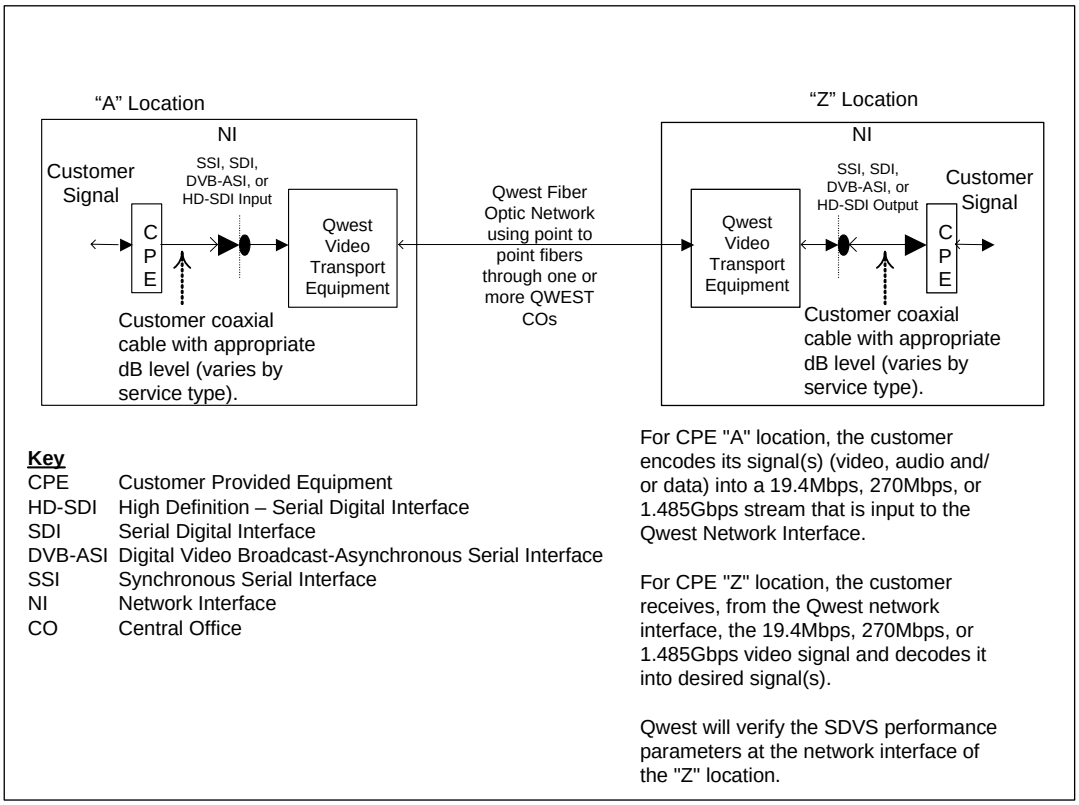
4. Technical Requirements

4.1 General

This chapter defines the Network Interfaces (NI) for Serial Digital Video Service. A pictorial representation of the architecture is given in Fig 4-1. 19.4Mbps service includes a single interface option; Synchronous Serial Interface (SSI), 270Mbps service includes two interface options; Serial Digital Interface (SDI) or Digital Video Broadcast – Asynchronous Serial Interface (DVB-ASI), and 1.485Gbps service includes a single interface option; High Definition – Serial Digital Interface (HD-SDI). The physical and electrical interface applications are provided in sections 4.2 and 4.3 respectively. The performance parameters are given in sections 4.4 followed by environmental requirements in section 4.5.

Figure 4-1 Configuration of Physical and Electrical Interfaces for SDVS.



4.2 Physical Interface Specifications

The physical connection is a 75 ohm unbalanced coaxial cable using a standard BNC (Bayonet) connector and shall be useable for frequencies up to 850 MHz. The coaxial connector (jack and plug) shall meet the performance requirements listed in MIL-C-39012 and the interface dimensions for coaxial connectors in MIL-STD-3484A.

4.3 Electrical Interface Specifications

The customer shall provide a standard electrical input signal using the appropriate cable connection to the Qwest network equipment as outlined in the subsequent sections. The Qwest HD-SDI, SDI, and DVB-ASI video equipment shall present 75 ohms impedance with a return loss of at least 15 dB at frequencies in the range of 5 MHz to the clock frequency of the signal being transmitted. Qwest SSI video equipment shall present 75 ohms impedance with a return loss of at least 30 dB at frequencies in the range of 100 kHz to the interface clock frequency.

4.3.1 SSI Input Signal Specifications

The customer shall provide a 19.4Mbps SSI video signal at the input to the Qwest video transport equipment. The signal shall conform to the parameters defined within SMPTE 310M. Samples of the SMPTE 310M signal levels and specifications are as follows:

- The peak-to-peak signal amplitude shall be 800 mV ± 10%.
- The rise and fall times, determined between the 20% and 80% amplitude points shall be no less than 0.4 ns and no greater than 5.0 ns and shall not differ by more than 1.6 ns.
- The jitter in the timing of the interface signal transitions shall not exceed 2 ns p-p, measured over a bandwidth of 1 Hz to 1/100 of the interface clock frequency.

The customer signal format shall also be based on the channel coding and related parameters outlined in SMPTE 310M.

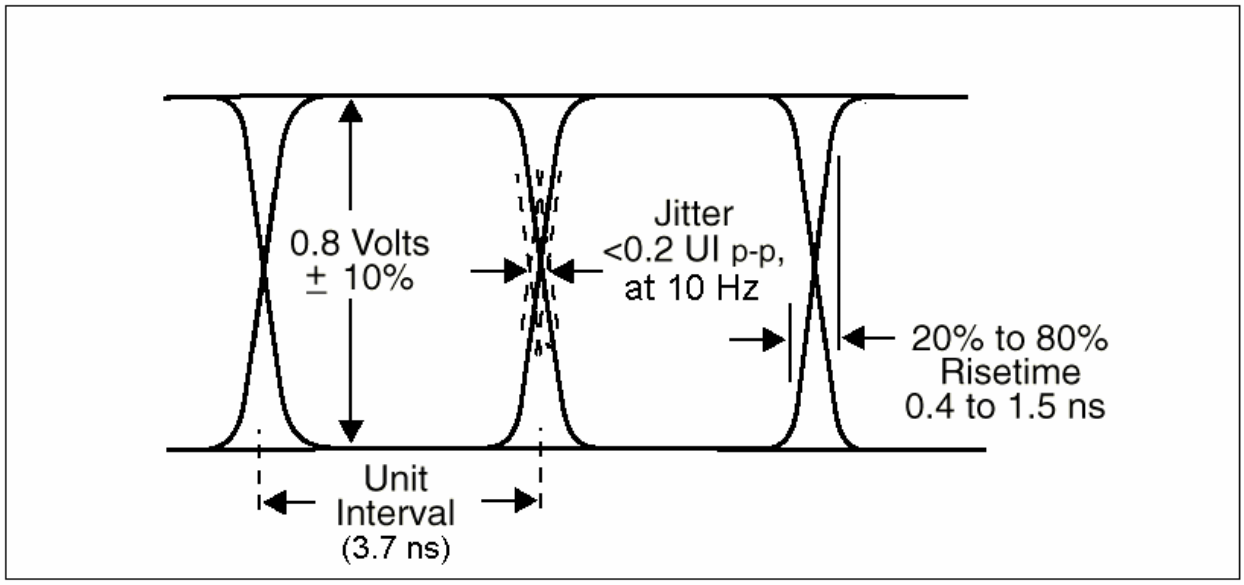
4.3.2 SDI Input Signal Specifications

The customer shall provide a 270Mbps SDI video signal at the input to the Qwest video transport equipment. This signal shall meet the parameters given in this section, and as shown, in Serial Digital Waveform Eye Pattern for 270Mbps SDI Video Signal in Figure 4-2. The eye pattern has a unit interval (UI) of 3.7 ns for a 525-line/60 field per second component signal. These requirements can be measured using standard test equipment.

- Peak-to-peak signal amplitude = 800 mV ± 10% or a range of 720 mV to 880 mV
- Rise and fall times, determined between the 20% and 80% amplitude points of the waveform = values between 0.4 ns and 1.50 ns and differ by no more than 0.5 ns.
- Signal waveform jitter shall be less than 0.2 UI or 500 ps peak-to-peak at 10 Hz

The customer signal format shall also be based on the channel coding and related parameters outlined in SMPTE 259M.

Figure 4-2 Serial Digital Waveform Eye Pattern for 270Mbps SDI Video Signals.



4.3.3 DVB-ASI Input Signal Specifications

The customer shall provide compressed signals conforming to DVB-ASI specifications under the parameters stated in EN50083-9. These parameters are as follows;

- Peak-to-peak signal amplitude = 800 mV ± 10% or a range of 720 mV to 880 mV
- Maximum Rise and fall times determined between the 20% and 80% amplitude points of the waveform = 1 and 2 ns respectively
- Deterministic Jitter (DJ) and Random Jitter (RJ) = 10% and 8% respectively

It should be noted that Qwest will provide a 270Mbps transport pipe to the DVB-ASI signal. The compression and encoding of video signals will be the customer's responsibility.

4.3.4 HD-SDI Input Signal Specifications

The customer shall provide a 1.485Gbps HD-SDI video signal at the input to the Qwest video transport equipment. The signal shall conform to the parameters defined within SMPTE 292. Samples of the SMPTE 292 signal levels and specifications are as follows:

- The peak-to-peak signal amplitude shall be 800 mV ± 10%...
- The rise and fall times, determined between the 20% and 80% amplitude points shall be no greater than 270 ps and shall not differ by more than 100 ps.

- The jitter in the timing of the transitions of the data signal shall be measured in accordance with SMPTE RP 184.

The customer signal format shall also be based on the channel coding and related parameters outlined in SMPTE 292.

4.3.5 Customer Cable Connection Specifications

In order to ensure proper signal strength and characteristics of the input signal to the Qwest network interface, the customer shall use coaxial cable that has an attenuation value of less then or equal to 26 dB at 270 MHz or as specified by the receiver manufacturer. Depending on the type of coaxial cable used, this may equal a maximum cable length of approximately 200 meters. This same requirement shall be met at the output of the system, as the cable attenuation shall not exceed 26 dB (or as specified by the receiver manufacturer) or an approximate maximum length of 200 meters, depending on the type of coaxial cable used. The customer shall adhere to this guideline for its coaxial cable to ensure proper conversion of the SDVS transport signals to their applicable video or MPEG signal.

4.4 Performance Parameters of SDVS

Qwest shall provide the customer at the network interface a 19.4Mbps (SSI), 270 Mbps (SDI or DVB-ASI), or 1.485Gbps (HD-SDI) video signal that meets the requirements outlined in Section 4.3. In addition, an Error Detection and Handling (EDH) process is used *under test* to determine the number of errors of SDVS provided to the customer. EDH is based on making Cyclic Redundancy Check (CRC) calculations for each field of video, addressing the active picture (AP) area. This measurement is performed in accordance with SMPTE RP 165-1994, *Error Detection Checkwords and Status Flags for Use in Bit-Serial Digital Interfaces for Television*.

4.5 Environmental Requirements

- Environmental (typically at a customer premises location)
  - Ambient temperature, 40 to 100°F
  - Humidity, 20 to 55%
- Power: At the Network Interface, the End-User, Inter-exchange Carrier or Local Exchange Carrier shall provide local power at these nominal values:
  - 60 Hz 120 VAC (preferred) or
  - - 48 VDC

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5. Maintenance

5.1 Customer Responsibilities

The customer is responsible for all equipment and cable on the customer side of the network interface in accordance with the procedures outlined in this document.

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

If the trouble is isolated to the customer owned equipment or cable, the customer is responsible for clearing the trouble and restoring the service to normal. Qwest will not be responsible for clocking or synchronization of any customer service applied to this interface.

5.2 Qwest Responsibilities

Qwest is responsible for all equipment and cable on its side of the network interface at the customer's location. The performance parameters for this service are based on the specifications for different types of the service as indicated in Chapter 4 of this document.

Qwest is responsible for maintaining the transmission facility between customer locations that may include an interoffice facility.

Qwest will furnish the customer a trouble reporting number and will initiate action to clear customer trouble within a period of twenty (20) minutes after receiving the trouble report.

Qwest is committed to a four (4) hour maximum service restoration time in the event of a service interruption due to an electronic component failure, with a two (2) hour objective. If the trouble is caused by a cable failure, the maximum restoration time is eight (8) hours.

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6. Definitions

6.1 Acronyms

ac	alternating current
AC	Access Customer
ANSI	American National Standards Institute
AP	Active Picture
BIT	Binary Digit
BNC	Bayonet Coaxial Connector, meeting Interface Dimensions for Coaxial-connectors in MIL-STD-3484A
bps	Bits Per Second (Now bit/s)
BSCL	Bell System Common Language®
BW	Bandwidth
CO	Central Office
COE	Central Office Equipment
CRC	Cyclic Redundancy Check
dB	Decibel
dBm	Decibel reference to one milliwatt
dc	Direct Current
DVB-ASI	Digital Video Broadcast – Asynchronous Serial Interface
EFS	Error Free Seconds
EIA	Electronic Industries Association
EU	End User
FOT	Fiber Optic Terminal
Gbit/s	Gigabit per Second
GHz	Gigahertz
HD-SDI	High Definition – Serial Digital Interface
IEC	Interexchange Carrier (or IC)
IEEE	Institute for Electrical and Electronic Engineers
kbit/s	kilobits per second (1,000 bit/s)
LATA	Local Access and Transport Area

Mbit/s	Megabit per Second
mV	Millivolt
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
NRZI	Non-Return to Zero Inverted
ns	Nanosecond
NTSC	National Television Systems Committee
POP	Point Of Presence
ps	Picosecond
SDI	Serial Digital Interface
SSI	Synchronous Serial Interface
SMPTE	Society of Motion Picture and Television Engineers
TIA	Telecommunications Industry Association
TLP	Transmission Level Point
TOC	Table of Contents
UI	Unit Interval

6.2 Glossary

Access Customers

Any of the companies that provide telecommunications service between LATAs and/or order from the Access Tariffs. Includes Interexchange Carriers.

Acronym

A word formed from the first (or first few) letters of a series of words.

Active Picture (AP)

This is the live video area of a composite NTSC signal that is framed in the first field between horizontal lines 21 and 262 and in the second field between horizontal lines 284 and 525. For component NTSC video, the active picture is the region bounded by the start of active video and end of active video and by the vertical blanking area.

American National Standards Institute (ANSI)

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

Amplitude Response versus Frequency

The amplitude response of a channel over the bandwidth provided. It is often called frequency response, and commonly is referred to as a single frequency within the passband.

Availability

The relative amount of time that a service is "usable" by a customer, represented as a percentage over a consecutive 12 month period.

Bandwidth

The range of frequencies that contain most of the energy or power of a signal; also, the range of frequencies over which a circuit of system is designed to operate.

Bit (Binary Digit)

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

Bits/second (bit/s)

Bits per second, e.g., 1200 bit/s. In data transmission, it is the number of binary zero and one bits transmitted in 1 second. Modern terminology uses "bit/s" e.g., 1200 bit/s.

Carrier

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

Central Office

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.

CODEC

Equipment that converts an analog signal into a digital signal (binary format) and which may compress the information content so that less bandwidth is required for transmission compared to the original signal format. Conversely, the decoder part converts the digital signal back into an analog signal and may provide for expansion of the signal.

Customer Premises

Denotes a building or portion(s) of a building occupied by a single customer or End-User either as a place of business or residence. Adjacent buildings and the buildings on the same continuous property occupied by the customer and not separated by a public thoroughfare are also considered the same customer's premises.

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.

Customers

Denotes any individual, partnership or corporation who subscribes to the services provided by U S WEST. 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.

Cyclic Redundancy Check (CRC)

A method of checking the integrity of received data, where the check uses a polynomial algorithm based on the content of the data.

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.).

Error Free Second (EFS)

A one-second interval which does not contain any bit-errors. Usually expressed as a percent over a consecutive 24-hour period. Note - A period of no signal shall be considered a period of errored bits.

D1

Digital video recording standard format, on 19 mm magnetic tape, for video component signals, according to the specifications of ITU-R BT.601/656. The term D1 is commonly used by the television industry to indicate component digital video, although its use is incorrect.

dBm

A decibel in which the reference power is one milliwatt. Decibel reference to one milliwatt.

Decibel (dB)

A unit measurement of transmission loss, gain, or relative level. It is the logarithmic unit of signal power ratio most commonly used in telephony. It is used to express the relationship between two signal powers, usually between two acoustical, electrical, or optical signals; it is equal to ten times the common logarithm of the ratio of the two signal powers.

Demarcation Point

See Network Interface

Digital Video Broadcasting-Asynchronous Serial Interface (DVB-ASI)

Digital Video Broadcasting-Asynchronous Serial Interface (DVB-ASI) is a standard 270 Mb/s transport of single or multiple MPEG2 transport streams as defined in ISO 13818-1. The customer demarcation point shall operate in accordance with European Standard, EN 50083-9 (V2:03/98). DVB-ASI uses 8b/10b coding of each word from a lookup table before serialization and is polarity sensitive (i.e., cannot be inverted). Unlike 270 Mb/s SDI signals, DVB-ASI does not contain timing reference signals (TRS) to indicate start of active video (SAV) and end of active video (EAV).

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.).

Fiber Optic Terminal (FOT)

The terminating or originating portion of a fiber optic system that performs both an electrical to optical conversion and a multiplexing function.

Gigabit per Second (Gbit/s)

One billion (1,000,000,000) bits per second.

High Definition – Serial Digital Interface (HD-SDI)

High Definition – Serial Digital Interface (HD-SDI) is a physical interface used to transmit High Definition digital video signals at a bit rate of 1.485Gbps. See standard SMPTE 292 for additional information.

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.

Interexchange Carrier (IC)/(IEC) or Interexchange Common Carrier

Any individual, partnership, association, joint-stock company, trust, governmental entity or corporation engaged for hire in interexchange, interstate or foreign communication by wire or radio.

Interface Code

See Network Channel Interface

IRE Unit

A unit equal to 1/140 of the peak-to-peak amplitude of the video signal, which is typically one volt. IRE is an acronym for Institute of Radio Engineers, the organization that defined the unit.

Jitter

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

Kilobit/Second (kbit/s)

One thousand (1000) bits/second

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.

Megabit per Second (Mbit/s)

One million (1,000,000) bits per second.

Millivolt (mV)

One thousandth of one volt.

Nanosecond (ns)

One billionth of one second.

National Television Systems Committee (NTSC) Signal

The standard North American television transmission signal format intended for the transmission of 525 line/60 field color or monochrome video and associated audio signals.

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, Impedances, Protocol Options, and Transmission Level Points (TLP). (At a digital interface, the TLP element of the NCI code is not used.)

Network Interface (NI)

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

Non-Return to Zero Inverted (NRZI)

A binary encoding scheme that inverts the signal on a “one” and leaves the signal unchanged for a “zero”. Where a change in the voltage signals a “one” bit, and the absence of a change denotes a “zero” bit value. Also called transition coding.

Ohm

The unit of electric resistance.

Picosecond (ps)

One trillionth of one second

Point-To-Point

A circuit connecting two (and only two) points.

Premises

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

Protocol

The rules for communication system operation which must be followed if communication is to be effected; the complete interaction of all possible series of messages across an interface. Protocols may govern portions of a network, types of service, or administrative procedures.

Protocol Code

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

Return Loss

Denotes a measure of the similarity between the two impedances at the junction of two transmission paths. The higher the return loss, the higher the similarity.

Route

The physical path established through a network for a particular circuit.,

Serial Digital Interface (SDI)

Serial Digital Interface (SDI) is a physical interface used to transmit digital video signals at bit rates of 143Mbps, 270Mbps, or 360Mbps (Note: Qwest utilizes a bit rate of 270Mbps in its offering). See standard SMPTE 259M for additional information.

Service Code (A COMMON LANGUAGE® code set)

A coded designation by which a particular Special Service Circuit may be identified. This designation must be unique, in a form that is readable and understandable, and be acceptable for both manual and mechanized procedures. [Special Service, as used by COMMON LANGUAGE®, may be called "Private Line", "Private Line Transport", "Switched Specials", "Dedicated Access", "Special Access", etc. in various tariffs and technical publications. Special Service is actually: COMMON LANGUAGE® Circuit Identification - Special Service, (abbreviated CLCI™ - S/S).]

Society of Motion Picture and Television Engineers (SMPTE)

An organization supported by the motion picture and television industry to establish television related performance and interface standards.

Synchronous Serial Interface (SSI)

Synchronous Serial Interface (SSI) is a physical interface used to transmit MPEG-2 digital video signals at a bit rate of 19.4Mbps (38.8Mbps max). See standard SMPTE 310M for additional information.

Transmission Level Point (TLP)

A point in a transmission system at which the ratio, usually expressed in decibels, of the power of a test signal at that point to the power of the test signal at a reference point, is specified. For example, a zero transmission level point (0 TLP) is an arbitrarily established point in a communication circuit to which all relative levels at other points in the circuit are referred.

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.

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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7. References

7.1 American National Standards Institute Documents

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.*

7.2 Bellcore Documents

SR-STS-000307 *NC/NCI Code Dictionary.* Issue 8, April, 1997 (issued yearly).

7.3 Society of Motion Picture and Television Engineers Documents

SMPTE 259M-2006 *for Television -- 10-Bit 4:2:2 Component and $4f_{sc}$ Composite Digital Signals -- Serial Digital Interface*

SMPTE 292-2006 *1.5 Gb/s Signal/Data Serial Interface*

SMPTE 310M-2004 *for Television -- Synchronous Serial Interface for MPEG-2 Digital Transport Stream*

SMPTE RP 165-1996 *Error Detection Checkwords and Status Flags for Use in Bit-Serial Digital Interfaces for Television*

7.4 Ordering Information

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

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QWEST Technical Publications from:

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Society of Motion Picture and Television Engineers (SMPTE) documents may be obtained from:

http://www.smpte.org/smpte_store/standards

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

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