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Serial Component Video Service 270 Network Interface Specifications Addendum for Digital Video Broadcasting - Asynchronous Serial Interface (DVB-ASI 270), Serial Data Transport Interface (SDTI - SMPTE 305M), SCVS SMPTE 259M with audio embedding and HD Video Transport Service

Abstract:

Broadcast Digital Video Interface Specifications

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22 - State

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Reason For Current Issue

Issue Number	Date	Description	Published By
5	05/06/10	Add multiple DVB-ASI streams to Optical Handoff Options	rh4979

INTRODUCTION

This technical publication describes the Digital Video Broadcasting - Asynchronous Serial Interface, Serial Data Transport Interface and HD Video Transport Service for IntraLATA Services.

1. Scope of Document

DVB/ASI service is typically used by cable TV operators and others that require single (SPTS) or multi-channel per transport stream (MPTS) for MPEG2 or MPEG4-AVC/H.264 compatible transport at all rates up to 214 Mbps carried on a 270 Mbps bearer. This service will only be available on a two-point basis, including hubs where available. ASI is a physical interface for transporting an MPEG2 or MPEG4-AVC/H.264 video transport stream at a common 270 Mbps rate regardless of TS rate. ASI is defined in EN50083-9 European Standard document.

SDTI service is used for transporting data in the active picture region of a SMPTE 259M-2008 signal. The specifics are defined in SMPTE 305M-2005. No specific protocols are defined. The data stream uses the digital television active line for payload. Ancillary data packets, defined by SMPTE 291M in the horizontal blanking interval are used to identify the payload application. Payload data rates up to (approximately) 200 Mbps exist for a 270 Mbps SDI system.

HD Video Transport Service is used to transport uncompressed HD video from a HD source compliant with SMPTE 292-2008 at a 1.485 Gbps rate, to transport HD video compressed by the customer to a transport stream compliant with SMPTE 310M-2004 at a 19.39 Mbps rate, to transport Serial Digital Interface video compliant with SMPTE 259M-2008 at a 270 Mbps rate, to transport Serial Data Transport Interface video compliant with SMPTE 305M-2005 at a 270 Mbps rate and to transport Digital Video Broadcast - Asynchronous Serial Interface video compliant with European Standard EN 50083-9 at a 270 Mbps rate.

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 AT&T Inc and the customer.

Both SMPTE 305M-2005 and SMPTE 259M-2008 can be provisioned with external audio embedding and disembedding. Both analog and AES/EBU digital audio are available.

1.1. Document Organization

This document is organized as follows:

- Chapter 1 - Scope of Document
- 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 - Contact List
- Chapter 7 - References to all related technical documents and ordering procedures
- Chapter A1 - Document Specific Acronyms
- Chapter A2 - Acronyms Dictionary
- Chapter A3 - Glossary

2. Service Description

2.1. General Application

The Digital Video Broadcasting - Asynchronous Serial Interface 270 Mbps (DVB-ASI) offered by AT&T is designed for one-way, two-point applications (hubbing where available) initially. This service is provided over standard fiber optic facilities for transporting a video signal(s) that has been processed to 270 Mbps.

The Serial Data Transport Interface 270 Mbps (SDTI) offered by AT&T Inc is designed for one-way, two point applications (hubbing where available) initially. This service is provided over standard fiber optic facilities for transport of digital video or other data, that has been processed to 270 Mbps.

The Serial Digital Video Interface SMPTE 259M-2008 (SDI) offered by AT&T is designed for one-way, two point applications (hubbing where available). This service is provided over standard fiber optic facilities for transport of digital video and audio signals. The data rate is 270 Mbps.

The HD Video Transport Service offered by AT&T is designed for one-way, two point applications (hubbing where available). This service is provided over standard fiber optic facilities for transporting digital video signals that have been processed to 1.485 Gbps, 270 Mbps or 19.39 Mbps.

Transcoding is offered by AT&T as an optional feature of Serial Component Video Service (SCVS). Two types of transcoding is available, 310M Digital Interface - SCVS, SMPTE 310M-2004, 19.39 Mbps, to DVB-ASI, 270 Mbps and NTSC Analog Interface, NTSC analog video with up to four 20 KHz analog audio channels to SMPTE 259M-2008 (SDI), 270 Mbps.

2.1.1. Digital Video Broadcast - Asynchronous Serial Interface (DVB-ASI)

DVB-ASI is a standard 270 Mbps transport of single or multiple MPEG2 or MPEG4-AVC/H.264 transport streams as defined in ISO/IEC 13818-1/AMD2:2008. 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 Mbps 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 is for transporting compressed HDTV at 19.39 Mbps transport stream (ATSC/SMPTE 310M) and in the cable market for multiple 3-4 Mbps MPEG program transport streams for video on demand (VOD) or trunking. For the AT&T service the customer is responsible to combine multiple MPEG2 or MPEG4-AVC/H.264 signals to a transport stream and encapsulate this into a 270 Mbps ASI format. The transmission specifications to be used by the AT&T service are outlined in Chapter 4, Technical Requirements, of this document. Further details can be obtained from the standards document for the respective interface.

2.1.2. Serial Data Transport Interface (SDTI)

SDTI is defined in SMPTE 305M-2005 and looks like the physical layer of a SMPTE 259M-2008 signal at 270 Mbps. The data stream uses the digital television active line for the payload. Ancillary data packets defined by SMPTE 291M in the horizontal blanking interval are used to identify the payload application. Payload data rates are up to 200 Mbps for 270 Mbps SDI systems.

The transport protocol is undefined, however the payload data may be organized in fixed length or variable length blocks. The key here is that the information must be organized so that it resembles a SMPTE 259M-2008 data stream with active picture and ancillary data space which is in compliance with SMPTE 291M-1998. While SDTI may be used to carry a compressed SMPTE 292-2008 signal, this is not the only data that can be transported. Compression of HDTV signals is not a part of this reference or service.

2.1.3. Serial Component Video Service, SMPTE 259M-2008 with embedded or separate audio interfaces (SCVS)

SCVS is based on SMPTE 259M-2008 transport with either embedded or separate analog or digital audio interfaces. These interfaces are in SMPTE 272M-2004 and ANSI S.4.40 for physically separate analog or digital audio interfaces.

2.1.4. HD Video Transport Service (HDVT)

HD Video Transport Service is based on SMPTE 292-2008, uncompressed digital video format signals at 1.485 Gbps, SMPTE 259M-2008 uncompressed digital video format signals at 270 Mbps, SMPTE 305M-2005 digital video format signals at 270 Mbps, EN 50083-9 digital video format signals at 270 Mbps and SMPTE 310M-2004, compressed digital video format signals at 19.39 Mbps.

2.1.5. Transcoding Option of SCVS

The Transcoding option of SCVS is available in two forms, 310M Digital Interface, SMPTE 310M-2004, compressed digital video format signals at 19.39 Mbps, transcoded to DVB-ASI, EN 50083-9 digital video format signals at 270 Mbps or NTSC Analog Interface, NTSC analog video with up to four 20 KHz analog audio channels (Telcordia GR-338-CORE) to SMPTE 259M-2008 uncompressed digital video format signals at 270 Mbps.

2.2. Service Architecture

2.2.1. Transmission Equipment and Facilities Configuration

AT&T will provide an electrical or optical 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 AT&T Central Office. Fiber Optic facilities will also be used for the signal transport in case multiple Central Offices are involved. As the specifications for optical transport in the referenced documents for ASI are for intra-facility links with optical budgets as low as 6dB using multimode optical fiber, the SMPTE 297-2006 specification covering the transport of 270 Mbps for inter-facility applications is used. This specification provides for 30dB optical budgets using single mode optical fiber. SDTI follows the AT&T specifications for SDI or SMPTE 259M-2008.

2.2.2. Technical Characteristics of DVB-ASI

The DVB-ASI signal is comprised of multiple digital video streams compressed using MPEG2/MPEG4-AVC/H.264 techniques. 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 AT&T will provide transport without making any changes to the content of the signal.

Where facilities are available, AT&T may design transport streams to deliver multiple SCVS or HDVT circuits in the same OC-3c or OC-12c, to or from a customer. Currently this design is only available for DVB-ASI services. It is understood

that the aggregated bandwidth will not exceed the OC-3c or OC-12c Optical Handoff specifications described in paragraph 4.4.

2.2.3. Technical Characteristics of SDTI

The SDTI signal is comprised of different payloads. The active picture payload and the Ancillary data space payload. Since this transport interface is often used for the transport of compressed HDSDI signals, the customer will be responsible for compression and encoding of the HDSDI signal and the subsequent decoding. The AT&T network will provide transport without making any changes to the content of the signal.

2.2.4. Technical Characteristics of SCVS Transport

The SCVS signal is comprised of multiple payloads. The active picture payload and the ancillary data space payload. This is a SMPTE 259M-2008 signal operating at 270 Mbps. Included in the ancillary data space payload are the AES/EBU audio packets. SMPTE 272M-2004 defines the formatting for television of AES/EBU audio. Also see ANSI S4.40. The AES/EBU packets are arranged in groups of four. Generally, the Telco will only be using Group one for audio embedding of four analog channels or two AES/EBU channel stereo pairs. Audio sampled at 48 Khz and clock locked is the preferred implementation. Minimum or default operation supports 20 bits of audio data. It is possible to have one end of the audio circuit analog with a 600 ohm balanced input with 20 KHz of bandwidth, with the other end of the circuit digital 110 ohm balanced with 20 KHz of bandwidth.

2.2.5. Technical Characteristics of HD Video Transport

HD Video Transport provides for the transport of digital video streams at bit rates of 1.485 Gbps, 270 Mbps or 19.39 Mbps. The SMPTE standard 292-2008 defines the formatting of a digital video stream operating at 1.485 Gbps. Both active picture and ancillary data space payloads are included. SMPTE 299M-2004 defines the formatting of AES/EBU digital audio data that may be embedded by the customer in the 1.485 Gbps digital video stream. If an OC3c/OC12c optical handoff is requested, JPEG 2000 compression is used. ISO/IEC standard 15444-1:2004, Information technology - JPEG 2000 image coding system: Core coding system, defines JPEG 2000 compression. For digital video streams operating at 270 Mbps, see paragraph 2.2.2. for DVB-ASI, 2.2.3. for SDTI and 2.2.4. for SCVS. SMPTE 310M-2004 defines the formatting of a digital video stream operating at 19.39 Mbps. All audio must be embedded/de-embedded by the customer.

2.2.6. Technical Characteristics of the Transcoding Option of SCVS

The Transcoding option of SCVS provides for two types of transcoding:

310M Digital Interface, SMPTE 310M-2004, compressed digital video format signals at 19.39 Mbps, transcoded to DVB-ASI, EN 50083-9 digital video format signals at 270 Mbps. Transcoding is provided in one direction only, SMPTE 310M-2004 to DVB-ASI.

NTSC Analog Interface, NTSC analog video with up to four 20 KHz analog audio channels (Telcordia GR-338-CORE) to SMPTE 259M-2008 (SDI) uncompressed digital video format signals at 270 Mbps. Transcoding is provided in either direction, NTSC analog video to SMPTE 259M-2008 (SDI), or SMPTE 259M-2008 (SDI) to NTSC analog video.

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 Telcordia® 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

Data Element	Channel Code	Channel Code	Optional Feature 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 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.

3.1.3. Available Network Channel Codes

Table 3-1 lists the available Network Channel (NC) codes for Digital Video Service at 270 Mbps (SCVS-270) and HD Video Transport Service.

Table 3-1

Network Channel Code	Optional Feature Code	Description	NC/ NCI Table
TD	--	Video, Serial Digital Video up to 270 Mbps - Uncompressed SD-SDI per SMPTE 259M	3-4
	A-	Video, Serial Digital Video up to 270 Mbps - DVB-ASI, Digital Video Broadcasting - Asynchronous Serial Interface per EN 50083-9	3-4
	AS	Video, Serial Digital Video up to 270 Mbps - DVB-ASI, Digital Video Broadcasting - Asynchronous Serial Interface per EN 50083-9, CO Switched	3-4
	-S	Video, Serial Digital Video up to 270 Mbps - Uncompressed SD-SDI per SMPTE 259M - CO Switched	3-4
	G-	Video, Serial Digital Video up to 270 Mbps - Flexible Transport of video services including SD-SDI (SMPTE 259M), SDTI (SMPTE 305M), or DVB-ASI (Standard EN 50083-9)	3-4
	GS	Video, Serial Digital Video up to 270 Mbps - Flexible Transport of video services including SD-SDI (SMPTE 259M), SDTI (SMPTE 305M), or DVB-ASI (Standard EN 50083-9) - CO Switched	3-4
TR	B-	Video, Flexible Rate - Flexible Transport of video services including SMPTE 310M - 19.39 Mbps, SMPTE 292 - 1.485 Gbps, SMPTE 259M - SDI, SMPTE 305M - SDTI, DVB-ASI	3-4
	BS	Video, Flexible Rate - Flexible Transport of video services including SMPTE 310M - 19.39 Mbps, SMPTE 292 - 1.485 Gbps, SMPTE 259M - SDI, SMPTE 305M - SDTI, DVB-ASI - CO Switched	3-4

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 SCVS 270 Mbps Flexible Video Interface (SD-SDI, SDTI, and DVB-ASI) and HD Video Transport Service.

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.

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 SCVS-270 and HD Video Transport Service the protocol code and options are defined as follows.

Protocol Code TB = 19.39 Mbps MPEG-2 One-Way Video Channel, Per SMPTE 310M Compliant

Protocol Code TG = Flexible Video Interface, Auto-Sensing port accommodates a number of video interface types as designated in the protocol options. (The customer may change video type without notifying the provider).

Protocol Code TR = Flexible Video Interface, Auto-Sensing port accommodates a number of video interface types as designated in the protocol options. (The customer may change video type without notifying the provider).

Protocol Code TV = Television Interface

Protocol Code SO = SONET/SDH Optical Interface

Figure 3-2

Total Conductors		Protocol		Impe-dance	De-limit-er	Protocol Options			De-limit-er	TLP Trans-mit	TLP 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

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

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

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. The audio impedances are not included in this table as it is secondary to the video. They will be specified elsewhere in this document.

Option A - Serial Digital 270 Mbps service including SD-SDI (SMPTE 259M), SDTI (SMPTE 305M), or DVB-ASI (Standard EN 50083-9) on a single Coaxial interface.

Option B - HD Video Transport Service including SMPTE 310M - 19.39 Mbps, SMPTE 292 - 1.485 Gbps, SD-SDI (SMPTE 259M), SDTI (SMPTE 305M), or DVB-ASI (Standard EN 50083-9) on a single Coaxial interface.

Option E - Embedded Ancillary [Note: Either one of the following scenarios apply: Four AES/EBU Audio groups (each Audio group = two AES/EBU Data channels = one 20 kHz Stereo set), or Any ancillary data (as in proposed SMPTE 291M-1998, from SMPTE 291M-1996).]

Option 3 - OC3 Optical (this code was created for use with non-SONET channels with SONET handoffs where the specific OC rate must be specified)

Option 12 - OC12 Optical (this code was created for use with non-SONET channels with SONET handoffs where the specific OC rate must be specified)

Option 20A - Video Channel Plus One, Two, Three or Four 2-Wire 20kHz Audio Channels

Option 20D - Video Plus 1 though 4 2-Wire 20 kHz linearly represented digital audio (i.e. AES/EBU)

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 SDI, DVB-ASI, SDTI or HDVT the TLP field refers to direction of the circuit and the fact that the transmission level is specified by AT&T at both transmit and receive ends. Values are listed in Table 3-3.

Further information about NCI Codes may be found in ANSI T1.223-2004

Table 3-3

Transmission Level Point Code (Character Positions 11 and 12)	
Data Value	**Code**
None This direction (One-way Service)	O
AT&T Specified	-

3.2.3. Valid Network Channel/Network Channel Interface Combinations

Table 3-4 lists applicable code combinations for SCVS and HDVT for a typical one way point-to-point or switched channel. The directionality of the circuits can be represented by adding "O-" and "-O" for transmit and receive, respectively. For example 02TG6.A.O- and 02TG6.A.-O will encompass transmit and receive Flexible Video up to 270 Mbps codes, respectively. A detailed explanation of the table elements is appropriate now. 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

Television Channel Service	NC Code	Transmit NCI Code at End-user or Carrier premises	Receive NCI Code at End-user or Carrier premises
NTSC, Transcode to SDI Video + 2 AES digital pairs, De-embed Rx	TD--	10TV6.20A.O-	06TD6.20D.-O
SDI Video + 2 AES digital pairs, Embed Tx, De-embed Rx	TD--	06TD6.20D.O-	06TD6.20D.-O
SDI Video + 2 AES digital pairs, Embed Tx	TD--	06TD6.20D.O-	02TD6.E.-O

SDI Video + 2 AES digital pairs, De-embed Rx	TD--	02TD6.E.O-	06TD6.20D.-O
SDI Video + 2 AES digital pairs, Transcode to NTSC	TD--	06TD6.20D.O-	10TV6.20A.-O
NTSC, Transcode to SDI Video + 4 analog audio channels, De-embed Rx	TD--	10TV6.20A.O-	10TD6.20A.-O
SDI Video + 4 analog audio channels, Embed Tx, De-embed Rx	TD--	10TD6.20A.O-	10TD6.20A.-O
SDI Video + 4 analog audio channels, Embed Tx	TD--	10TD6.20A.O-	02TD6.E.-O
SDI Video + 4 analog audio channels, De-embed Rx	TD--	02TD6.E.O-	10TD6.20A.-O
SDI Video + 4 analog audio channels, Transcode to NTSC	TD--	10TD6.20A.O-	10TV6.20A.-O
SDI Video + 2 AES digital pairs, Embed Tx, 4 anal De-embed Rx	TD--	06TD6.20D.O-	10TD6.20A.-O
SDI Video + 4 analog audio channels, Embed Tx, 2 AES digital pairs De-embed Rx	TD--	10TD6.20A.O-	06TD6.20D.-O
SDI Video with Embedded Audio, Transcode to NTSC	TD--	02TD6.E.O-	10TV6.20A.-O
NTSC, Transcode to SDI Video with Embedded Audio	TD--	10TV6.20A.O-	02TD6.E.-O
SDI Video + 2 AES digital pairs, Embed Tx, Switched	TD-S	06TD6.20D.O-	02TD6.E.-O
SDI Video + 2 AES digital pairs, De-embed Rx, Switched	TD-S	02TD6.E.O-	06TD6.20D.-O
SDI Video + 4 analog audio channels, Embed Tx, Switched	TD-S	10TD6.20A.O-	02TD6.E.-O
SDI Video + 4 analog audio channels, De-embed Rx, Switched	TD-S	02TD6.E.O-	10TD6.20A.-O
SDI Video with Embedded Audio, Transcode to NTSC, Switched	TD-S	02TD6.E.O-	10TV6.20A.-O
NTSC, Transcode to SDI Video with Embedded Audio, Switched	TD-S	10TV6.20A.O-	02TD6.E.-O
SMPTE 310M Video, Transcode to SDI Video with Embedded Audio	TDA-	02TB6..O-	02TG6.A.-O
SMPTE 310M Video, Transcode to SDI Video with Embedded Audio, Switched	TDAS	02TB6..O-	02TG6.A.-O
Flexible Transport of Video up to 270 Mbps	TDG-	02TG6.A.O-	02TG6.A.-O
Flexible Transport of Video up to 270 Mbps, Tx OC-3c	TDG-	01SOF.3.O-	02TG6.A.-O

Flexible Transport of Video up to 270 Mbps, Rx OC-3c	TDG-	02TG6.A.O-	01SOF.3.-O
Flexible Transport of Video up to 270 Mbps, Tx OC-12c	TDG-	01SOF.12.O-	02TG6.A.-O
Flexible Transport of Video up to 270 Mbps, Rx OC-12c	TDG-	02TG6.A.O-	01SOF.12.-O
Flexible Transport of Video up to 270 Mbps, Switched	TDGS	02TG6.A.O-	02TG6.A.-O
Flexible Transport of Video up to 270 Mbps, Switched, Tx OC-3c	TDGS	01SOF.3.O-	02TG6.A.-O
Flexible Transport of Video up to 270 Mbps, Switched, Rx OC-3c	TDGS	02TG6.A.O-	01SOF.3.-O
Flexible Transport of Video up to 270 Mbps, Switched, Tx OC-12c	TDGS	01SOF.12.O-	02TG6.A.-O
Flexible Transport of Video up to 270 Mbps, Switched, Rx OC-12c	TDGS	02TG6.A.O-	01SOF.12.-O
Flexible Transport of Video up to 1.485 Gbps	TRB-	02TR6.B.O-	02TR6.B.-O
Flexible Transport of Video up to 1.485 Gbps, Tx OC-3c	TRB-	01SOF.3.O-	02TR6.B.-O
Flexible Transport of Video up to 1.485 Gbps, Rx OC-3c	TRB-	02TR6.B.O-	01SOF.3.-O
Flexible Transport of Video up to 1.485 Gbps, Tx OC-12c	TRB-	01SOF.12.O-	02TR6.B.-O
Flexible Transport of Video up to 1.485 Gbps, Rx OC-12c	TRB-	02TR6.B.O-	01SOF.12.-O
Flexible Transport of Video up to 1.485 Gbps, Switched	TRBS	02TR6.B.O-	02TR6.B.-O
Flexible Transport of Video up to 1.485 Gbps, Switched, Tx OC-3c	TRBS	01SOF.3.O-	02TR6.B.-O
Flexible Transport of Video up to 1.485 Gbps, Switched, Rx OC-3c	TRBS	02TR6.B.O-	01SOF.3.-O
Flexible Transport of Video up to 1.485 Gbps, Switched, Tx OC-12c	TRBS	01SOF.12.O-	02TR6.B.-O
Flexible Transport of Video up to 1.485 Gbps, Switched, Rx OC-12c	TRBS	02TR6.B.O-	01SOF.12.-O

4. Technical Requirements

4.1. General

This chapter defines the Network Interface (NI) for DVB-ASI and SDTI Service at 270 Mbps and High Definition Video Transport. A pictorial representation of the architecture is given in Fig 4-1 and 4-1a, Digital Video Broadcast - Asynchronous Serial Interface (DVB-ASI), Fig 4-1b, 310M Digital Interface - SCVS Transcoding, Fig 4-2, SDI with external analog or AES/EBU audio, Fig 4-2a NTSC Analog Interface - SCVS Transcoding and Fig 4-3 and 4-3a, HDVT. The physical and electrical/optical interface specifications are provided in sections 4.2. 4.3 and 4.4 respectively. The performance parameters are given in sections 4.5 through 4.9, followed by environmental requirements in section 4.10.

Figure 4-1 Configuration of the Physical and Electrical Interfaces for DVB-ASI and SDI with embedded audio

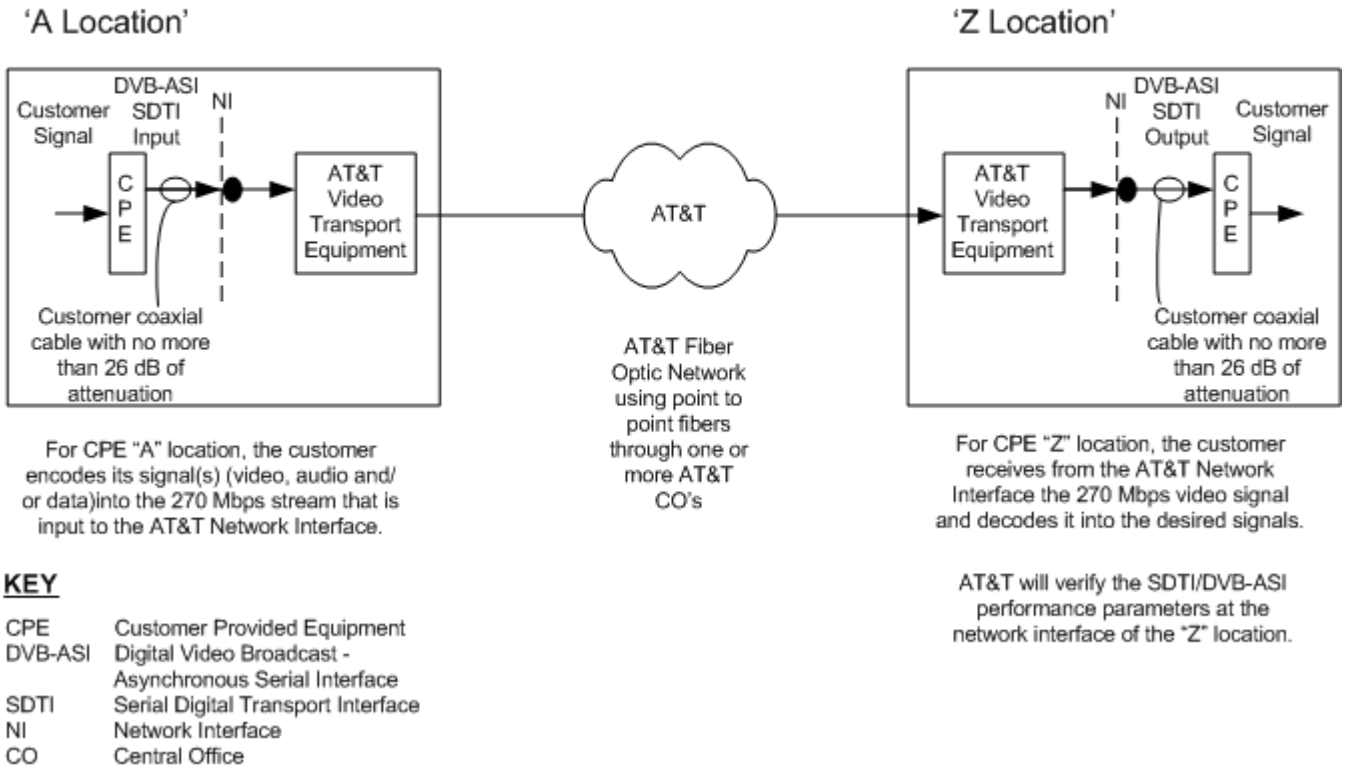
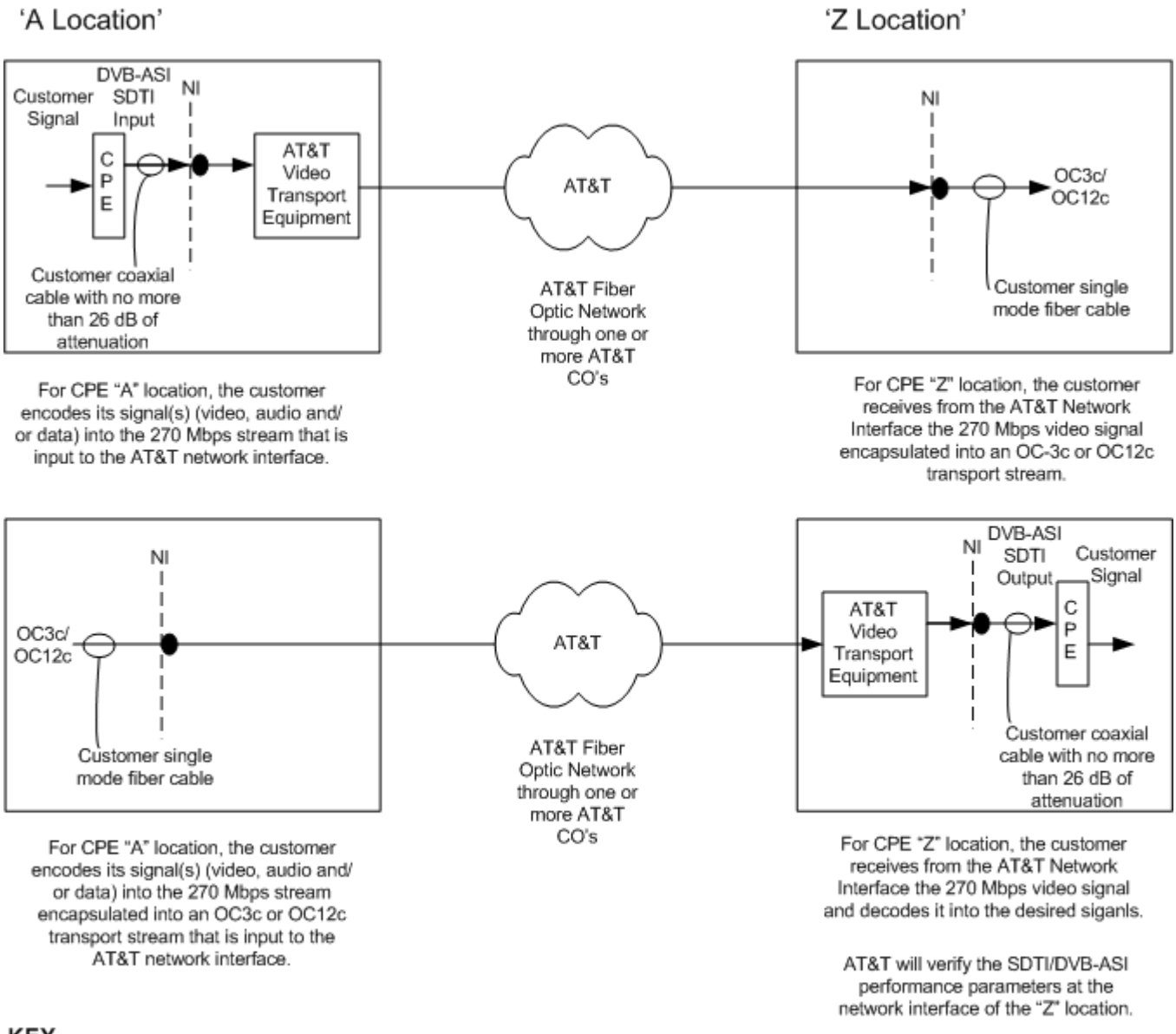


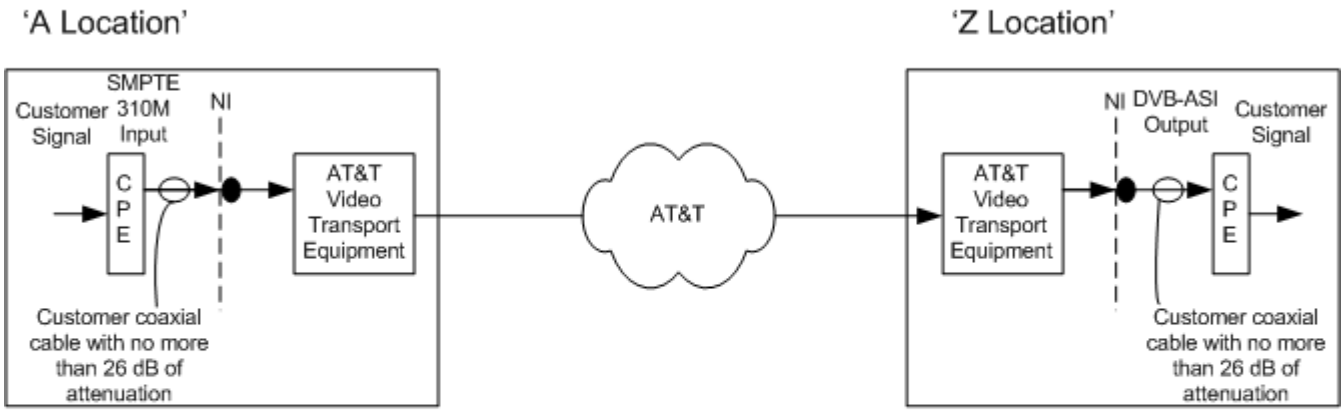
Figure 4-1a Configuration of the Physical and Electrical/Optical Interfaces for DVB-ASI and SDI with embedded audio



KEY

CPE	Customer Provided Equipment
DVB-ASI	Digital Video Broadcast - Asynchronous Serial Interface
SDTI	Serial Digital Transport Interface
NI	Network Interface
CO	Central Office

Figure 4-1b Configuration of the Physical and Electrical Interfaces for Transcoding
310M Digital Interface - SCVS



For CPE "A" location, the customer encodes its signal(s) (video, audio and/ or data) into the 19.39 Mbps stream that is input to the AT&T network interface.

AT&T Fiber Optic Network using point to point fibers through one or more AT&T CO's

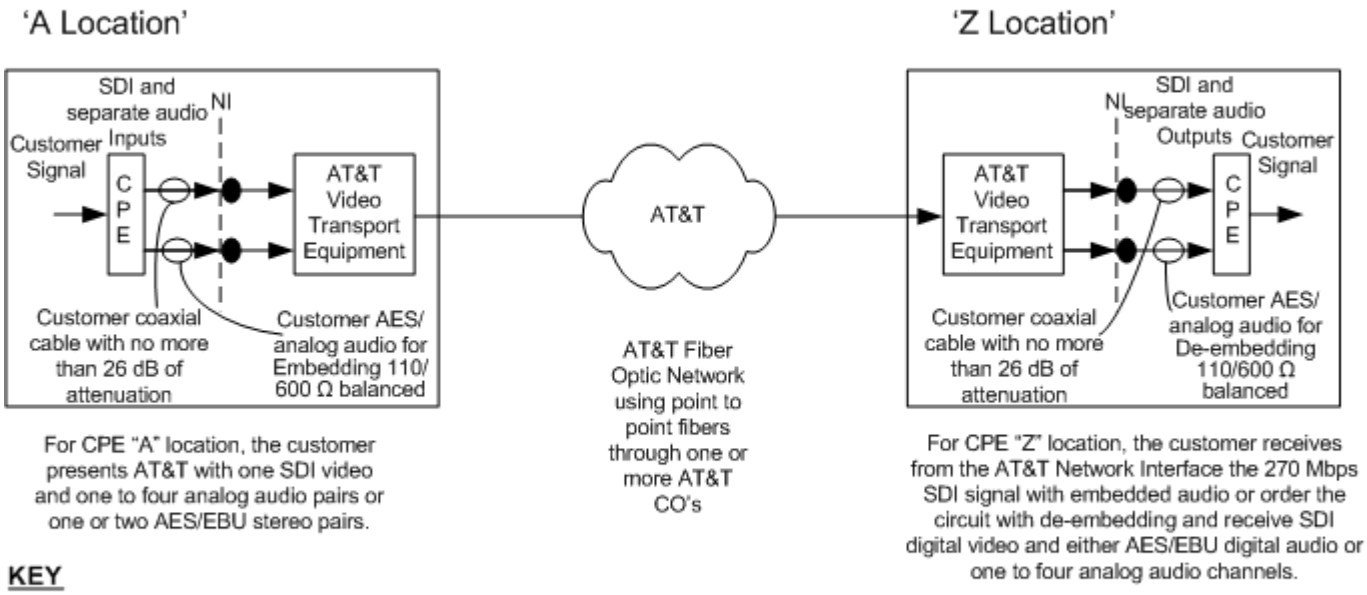
For CPE "Z" location, the customer receives from the AT&T Network Interface the 270 Mbps video signal and decodes it into the desired signals.

AT&T will verify the DVB-ASI performance parameters at the network interface of the "Z" location.

KEY

CPE	Customer Provided Equipment
DVB-ASI	Digital Video Broadcast - Asynchronous Serial Interface
NI	Network Interface
CO	Central Office

Figure 4-2 Configuration of the Physical and Electrical Interfaces for SDI with external analog or AES/EBU audio



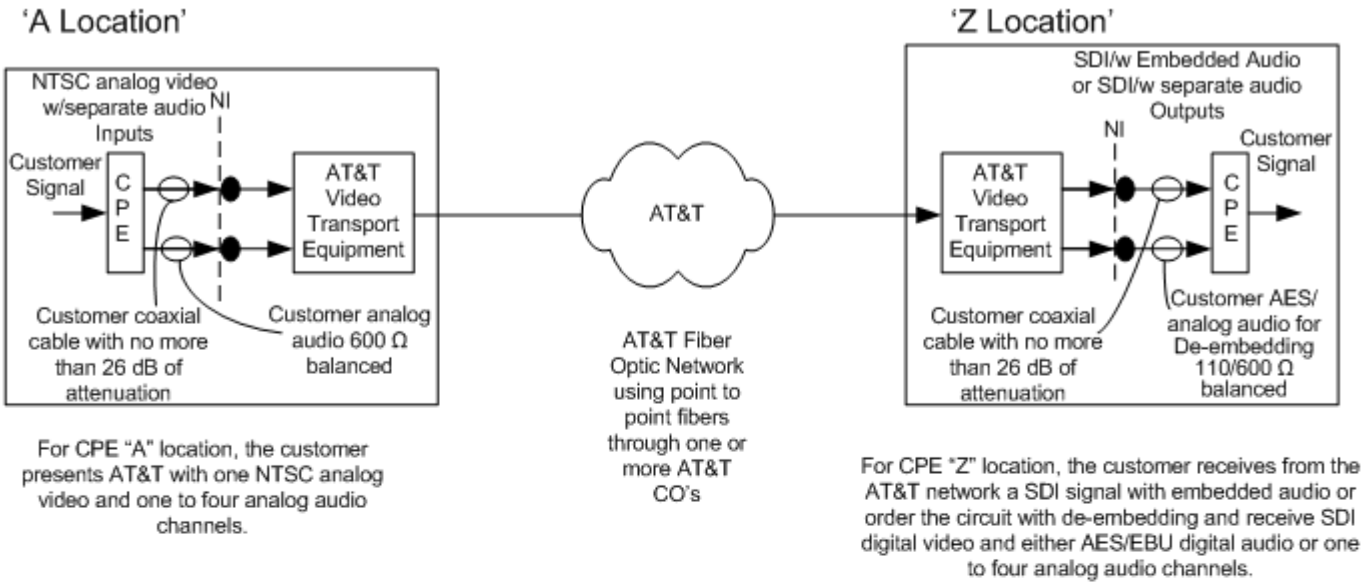
For CPE "A" location, the customer presents AT&T with one SDI video and one to four analog audio pairs or one or two AES/EBU stereo pairs.

For CPE "Z" location, the customer receives from the AT&T Network Interface the 270 Mbps SDI signal with embedded audio or order the circuit with de-embedding and receive SDI digital video and either AES/EBU digital audio or one to four analog audio channels.

KEY

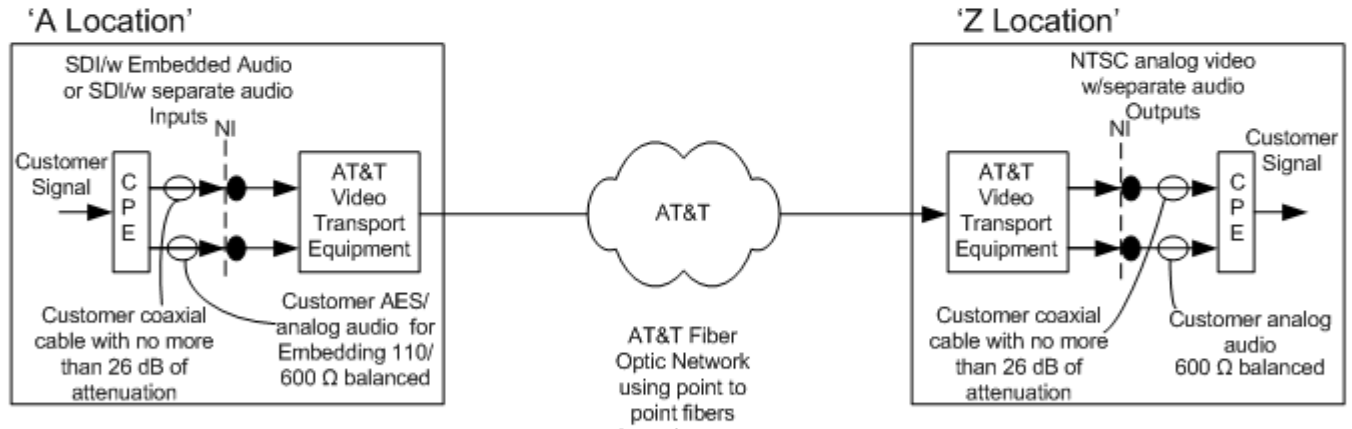
CPE	Customer Provided Equipment
SDI	Serial Digital Interface
AES/EBU	Digital Audio Interface
Analog	Analog Audio Interface
NI	Network Interface
CO	Central Office

Figure 4-2a Configuration of the Physical and Electrical Interfaces for Transcoding NTSC Analog Interface - SCVS



For CPE "A" location, the customer presents AT&T with one NTSC analog video and one to four analog audio channels.

For CPE "Z" location, the customer receives from the AT&T network a SDI signal with embedded audio or order the circuit with de-embedding and receive SDI digital video and either AES/EBU digital audio or one to four analog audio channels.



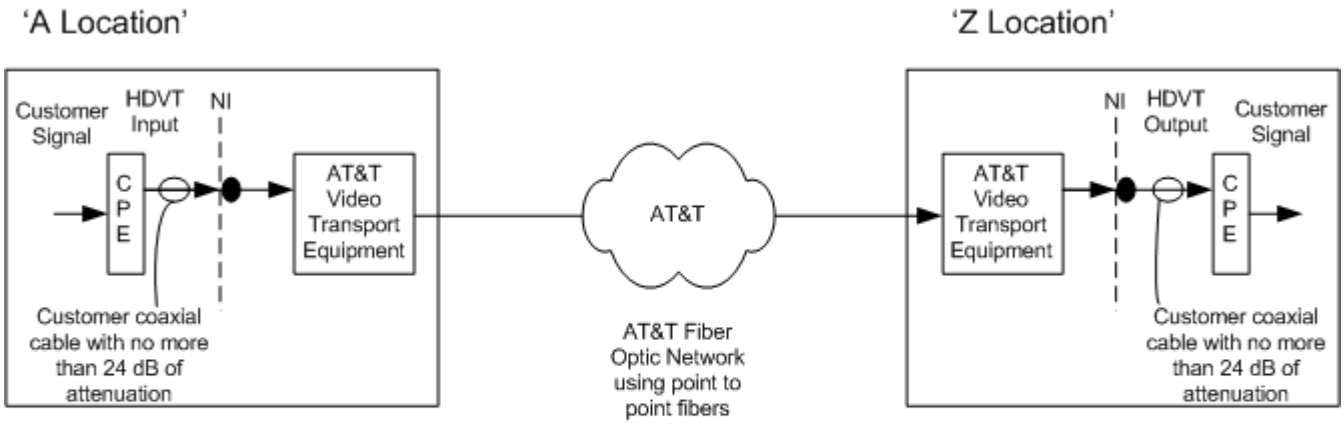
For CPE "A location, the customer presents AT&T with one SDI video signal with embedded audio or one SDI video with one to four analog audio channels or one or two AES/ EBU digital audio stereo pairs.

For CPE "Z" location, the customer receives from the AT&T network one NTSC analog video and one to four analog audio channels.

KEY

CPE	Customer Provided Equipment
SDI	Serial Digital Interface
AES/EBU	Digital Audio Interface
Analog	Analog Audio Interface
NTSC	National Television Standard Committee
NI	Network Interface
CO	Central Office

Figure 4-3 Configuration of the Physical and Electrical Interfaces for HDVT



For CPE "A" location, the customer encodes its signal(s) (video, audio and/ or data) into the 1.485 Gbps, 270 Mbps or 19.39 Mbps stream that is input to the AT&T network interface.

AT&T Fiber Optic Network using point to point fibers through one or more AT&T CO's

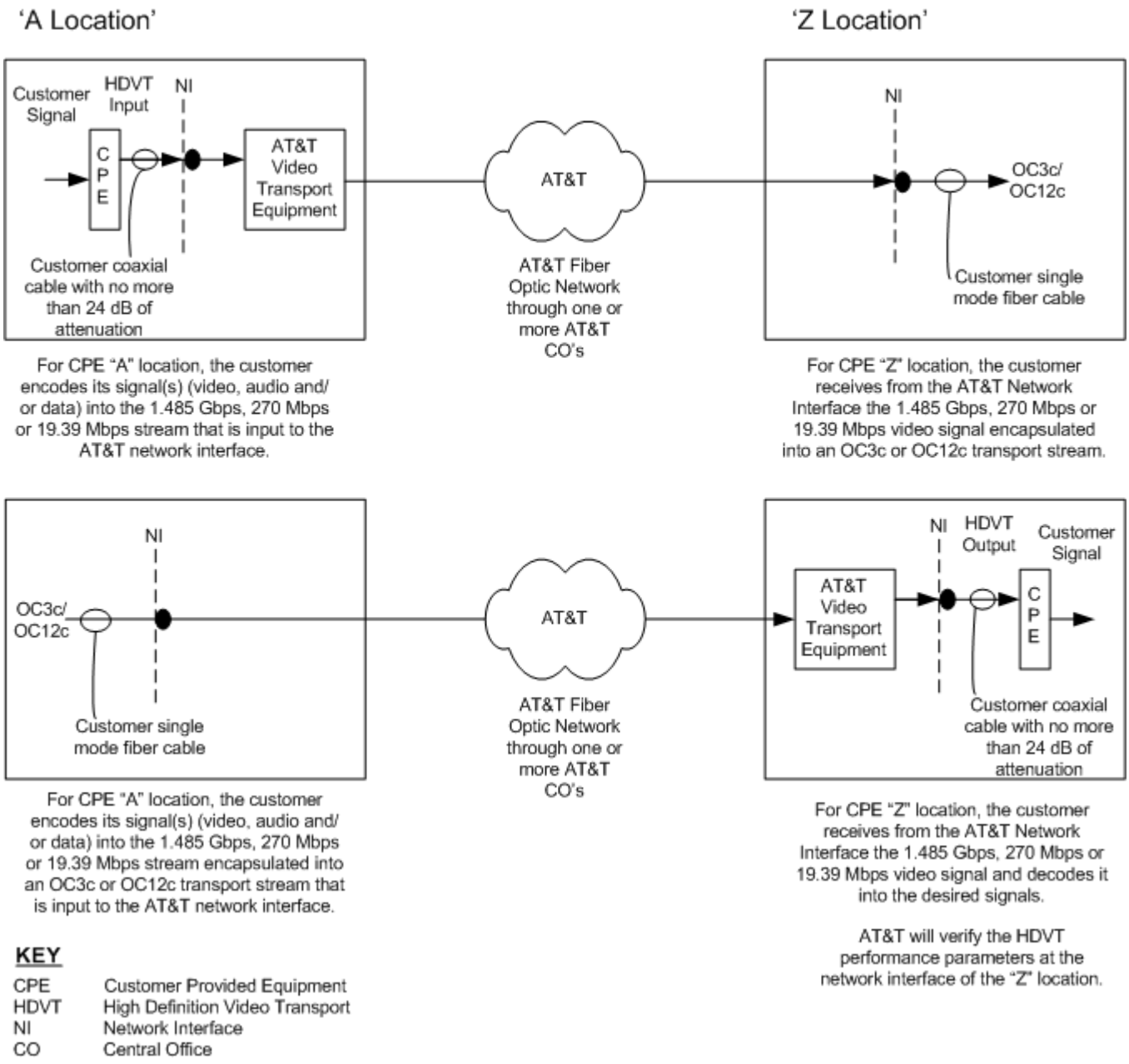
For CPE "Z" location, the customer receives from the AT&T Network Interface the 1.485 Gbps, 270 Mbps or 19.39 Mbps video signal and decodes it into the desired signals.

AT&T will verify the HDVT performance parameters at the network interface of the "Z" location.

KEY

CPE	Customer Provided Equipment
HDVT	High Definition Video Transport
NI	Network Interface
CO	Central Office

Figure 4-3a Configuration of the Physical and Electrical/Optical Interfaces for HDVT



KEY

CPE	Customer Provided Equipment
HDVT	High Definition Video Transport
NI	Network Interface
CO	Central Office

Figure 4-4 Transmitter Eye Diagram for jitter DVB-ASI 270 Mbps Video Signal

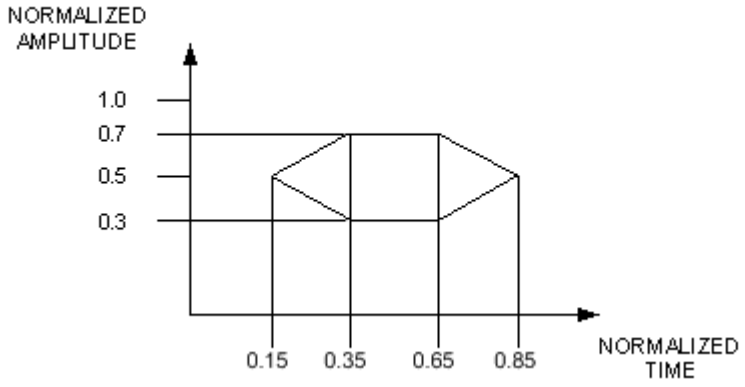


Figure 4-5 Serial Digital Waveform Eye Pattern for SCVS (SMPTE 259M and SDTI (SMPTE 305M)

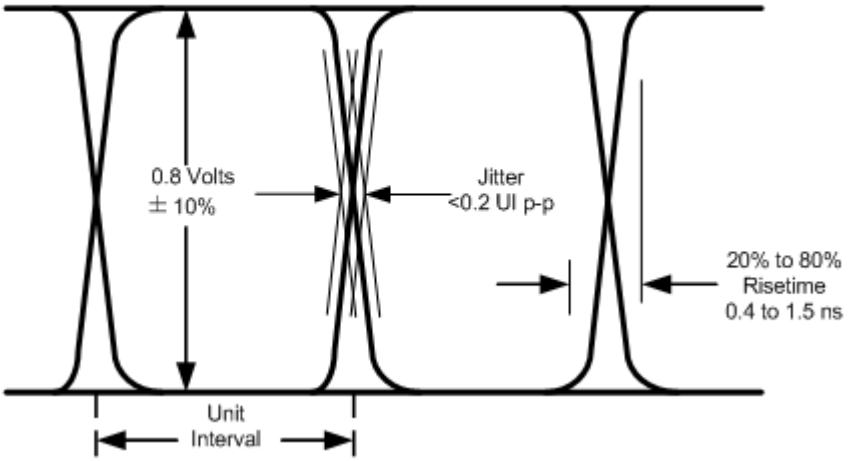
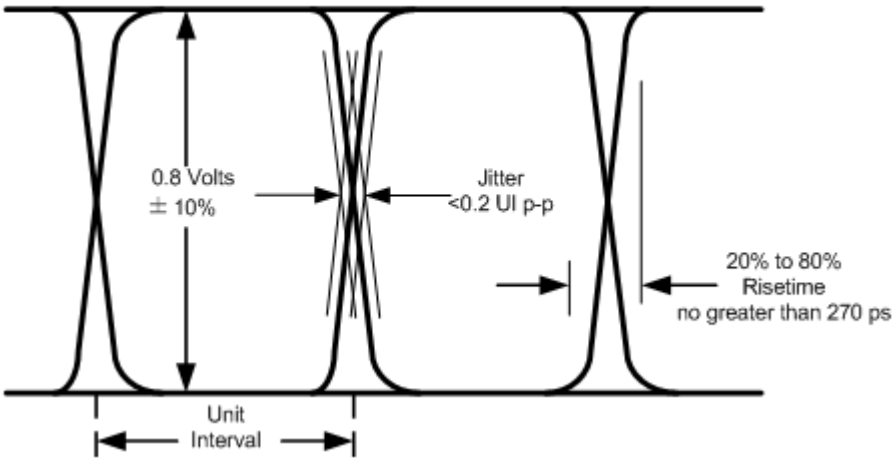


Figure 4-6 Serial Digital Waveform Eye Pattern for HDVT (SMPTE 292)



4.2. Physical Interface Specifications

The electrical physical connection is a 75 ohm unbalanced coaxial cable using a standard BNC (Bayonet) connector and shall be usable for frequencies up to 1.485 GHz. The coaxial connector (jack and plug) shall meet the performance requirements listed in MIL-C-39012.

The optical physical connection is a single mode fiber using a single position SC connector. The SC fiber connector shall meet the performance requirements listed in AT&T AM-TR-NIS-000111, section 6.

4.3. Electrical Interface Specifications

4.3.1. Customer Input Signal Specifications

The customer shall provide a standard electrical input signal using the appropriate cable connection to the AT&T network equipment as outlined in the subsequent sections. The AT&T 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 1.485 GHz.

4.3.2. DVB-ASI and SDTI Input Signal Specifications

The customer shall provide an electrically presented 270 Mbps bearer with encapsulated transport streams conforming to DVB-ASI specifications under the parameters stated in EN50083-9. The physical interface 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 AT&T will provide a 270 Mbps transport pipe for the DVB-ASI signal. The compression, encoding, and error recovery of video signals will be the customer's responsibility. Transport stream analysis is available to do out of service testing and some in service testing.

4.3.3. SCVS with or without separate audio embedding Input Signal Specifications

The customer shall provide an electrical signal compliant with SMPTE 259M-2008 or SMPTE 305M-2004. This is an amplitude of 800 mV +/- 10% or 720 mV to 880 mV. Maximum rise and fall times between the 20% and 80% amplitude points is 1 or 2 ns respectively. Externally embedded audio shall follow SMPTE 272M- 2004 as well as ANSI S4.40. See performance standards 4.7 below for specific details.

4.3.4. Transcoding Option of SCVS Input Signal Specifications

For 310M Digital Interface - SCVS

The customer shall provide an electrical signal compliant with SMPTE 310M-2004. The peak-to-peak signal amplitude shall be 800 mV +/- 10% or 720 mV to 880 mV. Maximum rise and fall times 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.

For NTSC Analog Interface - SCVS

The customer shall provide an electrical signal compliant with Telcordia GR-338-CORE. The peak-to-peak signal amplitude shall be 140 IRE (sync tip to reference white) or 1 volt peak-to-peak.

4.3.5. HDVT Input Signal Specifications

The customer shall provide an electrical signal compliant with SMPTE 292-2008 or SMPTE 259M-2008 or SMPTE 305M-2004 or European Standard EN50083-9:2003 or SMPTE 310M-2004. For signals compliant with SMPTE 292-2008, the amplitude shall be 800 mV +/- 10% or 720 mV to 880 mV. The maximum rise and fall times between the 20% and 80% amplitude points shall be no greater the 270 ps and not differ by more than 100 ps. For signals compliant with the other standards listed, see paragraphs 4.3.2 and 4.3.3.

4.3.6. Customer Cable Connection Specifications

In order to ensure proper signal strength and characteristics of the input signal to the AT&T network interface at the 270 Mbps rate, the customer shall use coaxial cable that has an attenuation value of less than or equal to 26 dB at 270 MHz. 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 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 SDI, SDTI and DVB-ASI transport signals to their applicable video or MPEG signal, respectively.

In order to ensure proper signal strength and characteristics of the input signal to the AT&T network interface at the 1.485 Gbps rate, the customer shall use coaxial cable that has an attenuation value of less than or equal to 24 dB at 1.485 GHz. Depending on the type of coaxial cable used, this may equal a maximum cable length of approximately 100 meters. This same requirement shall be met at the output of the system, as the cable attenuation shall not exceed 24 dB or an approximate maximum length of 100 meters, depending on the type of coaxial cable used.

4.4. Optical Interface Specifications

The OC-3 optical interface is a concatenated OC-3c with a single concatenated STS-3c channel. When a single DVB-ASI stream is transported, the maximum bit rate may not exceed 108 MBps. When multiple DVB-ASI streams are transported, the total aggregate bit rate may not exceed 146.4 MBps.

The OC-12 optical interface is a concatenated OC-12c with a single concatenated STS-12c channel. When a single DVB-ASI stream is transported, the maximum bit rate may not exceed 214 MBps. When multiple DVB-ASI streams are transported, each stream may not exceed 214 MBps.

4.5. Performance Parameters for DVB-ASI

AT&T shall provide the customer at the network interface a 270 Mbps DVB/ASI video signal that meets the requirements outlined in Section 4.3 and Figure 4-1. Also see 4.7, SDI performance specs.

4.6. Performance Parameters for SDTI

Since the protocol is unspecified beyond what is defined in SMPTE 305M-2005, the performance will be similar to the SDI service offering (AM-TR-NIS-000137).

4.7. Performance Parameters for SDI

Digital Video with multiplexed (embedded) audio, machine control and time code. Component Signal Transmission 4:2:2 as described in ANSI/SMPTE 125M-1995 Appendix G and ANSI/SMPTE 259M-2008. In general the input and output impedance is 75 Ohms Unbalanced to ground with a return loss greater than 15 dB over the range of 5 MHz to 270 MHz. ANSI/SMPTE 259M-2008 has a complete list of performance parameters.

Once the number of conductors in table 3-4 exceeds 2, this is an indication that audio is being embedded or de-embedded via four separate 600 ohm analog inputs/outputs or two 110 ohm digital AES/EBU stereo pairs. Normally this audio is found in group 1.

Figure 4-7

See SMPTE 272M-2004

Transmit End of Circuit

Serial Digital Input	
Input serial data signal	SDI Specifications SMPTE 259M-2008
Input impedance	75 Ohms
Input return loss	Greater than 15 dB 5 MHz to 250 MHz
Input circuit cable compensation	Automatic better than 250M @ 270 MHz for Belden 8281 cable
Connector	BNC 75 ohm
AES/EBU Input	
Number	2 x 48 KHz sync/async, 20 bit audio packets (also accepts 32 KHz and 44.1 KHz rates)
Impedance	110 ohm balanced
Connector	3 pin XLR
Analog Audio Input	
Number	4 (left 1/right 1, left 2/right 2)
Impedance	600 ohm balanced
Input Level	0 dBFS = +18 dBm
Connector	3 pin XLR

Receive End of Circuit

Serial Digital Output	
Output level	800 mV +/- 10% into 75 ohms
Output impedance	75 Ohms
Output return loss	> 15 dB from 5 MHz to 250 MHz
Output rise time	< 1.0 ns, (700 ps typically)
Residual Jitter	< 200ps at 270 Mbps
Connector	BNC 75 ohm

Figure 4-8

AES/EBU Outputs
Balanced

Output impedance	110 Ohms
Signal Amplitude	5 V +/- 1 Vp-p
Balance	> 30 dB (DC to 6 MHz)
Rise and Fall times	10ns typical
Data Jitter	< +/- 20ns
Connector	3 pin XLR

Figure 4-9

Analog Audio Outputs

Impedance (balanced)	600 Ohms
Output level	0 dBFS = +18 dBm
SNR unweighted	-90 dBFS
Frequency response	0.5 dB (20 Hz to 20 KHz)
THD	.05% (20 Hz to 20 KHz at 0 dBFS)
IMD	.05% SMPTE at +4 dBm
Crosstalk between channels	95 dB
Connector	3 pin XLR

4.8. Performance Parameters for Transcoding Option of SCVS

310M Digital Interface - SCVS

AT&T shall provide the customer at the network interface a 270 Mbps DVB/ASI video signal that meets the requirements outlined in Section 4.3 and Figure 4-1b

NTSC Analog Interface - SCVS

AT&T shall provide the customer at the network interface a 270 Mbps SDI video signal that meets the requirements outlined in Section 4.7 or a NTSC analog video signal with up to four 20 KHz analog audio channels as outlined in Telcordia GR-338-CORE and Figure 4-2a.

4.9. Performance Parameters for HDVT

AT&T shall provide the customer at the network interface a 1.485 Gbps, 270 Mbps or a 19.39 Mbps video signal or OC3c/ OC12c transport stream that meets the requirements outlined in Section 4.3, Section 4.4 and Figures 4-3 and 4-3a.

4.10. 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 or - 48 VDC

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 AT&T Broadcast 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. AT&T will not be responsible for clocking or synchronization of any customer service applied to this interface.

5.2. AT&T Responsibilities

AT&T 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.

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

AT&T will furnish the customer a trouble reporting number and will initiate action to clear customer trouble after receiving the trouble report.

6. Contact List

Name	ATTUID	Phone #	Department / Responsibility
Ted Bickley	tb2531	+1 (330) 384-3238	Global Service Assurance
Russell Lundsgaard	rl2357	+1 (312) 845-3176	Advanced Technical Support

7. References

7.1. American National Standards Institute Documents

ANSI T1.223-2004 Information Interchange - Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for information exchanges.

ISO/IEC 13818-1/AMD2:2008 Information technology - Generic coding of moving pictures and associated audio information (FOREIGN STANDARD)

ISO/IEC 15444-1:2004 Information technology - JPEG 2000 image coding system: Core coding system

7.2. Telcordia® Documents

GR-338-CORE Television Special Access and Local Channel Services - Transmission Parameter Limits and Interface Combinations, Issue 1, December 1995

SR-307 Common Language® NC/NCI™ Dictionary, Issue 07, Sept 2008 (issued yearly).

7.3. Society of Motion Picture and Television Engineers Documents

SMPTE 125M-1995 Television - Component Video Signal 4:2:2 - Bit-Parallel Digital Interface

SMPTE 259M-2008 Television - SDTV Digital Signal/Data - Serial Digital Interface

SMPTE 272M-2004 Television - Formatting AES/EBU Audio and Auxiliary Data into Digital Video Ancillary Data Space

SMPTE 292-2008 - 1.5 Gb/s Signal/Data Serial Interface

SMPTE 297-2006 Television - Serial Digital Fiber Transmission System for SMPTE 259M, SMPTE 344M, SMPTE 292 and SMPTE 424M Signals

SMPTE 299M-2004 Television - 24-Bit Digital Audio Format of SMPTE 292 Bit-Serial Interface

SMPTE 305M-2005 Television - Serial Data Transport Interface (SDTI)

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

7.4. Military Standards Documents

MIL-C-30912/1 Connectors, Plug, Electrical, Coaxial, Radio Frequency, (Series N (cabled), Pin Contact, Class2)

7.5. European Standards Documents

EN-50083-9:2002 Cable networks for television signals, sounds signals and interactive services, Part 9: Interfaces for CATV/SMA TV headends and similar professional equipment for DVB/MPEG2 transport streams.

7.6. 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 AT&T employees may order:

American National Standards Institute (ANSI) documents from:

American National Standards Institute

Attn: Customer Service

25 West 43rd Street

New York, NY 10036

Phone: (212) 642-4900

Fax: (212) 3398-0023

http://webstore.ansi.org/ansidocstore/default.asp

ANSI has a catalog available which describes their publications.

Telcordia® documents from:

Customer Service Center

Telcordia Technologies, Inc.

One Telcordia Drive, RRC-1B-180

Piscataway, NJ 08854-4156

Fax: (732) 336-2226

Phone: (732) 699-5828

http://www.telcordia.com

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

SMPTE

3 Barker Ave.

5th Floor

Whiteplains, NY 10601

Phone: (914) 761-1100

Fax: (914) 761-3115

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

Federal Communications Commission (FCC) documents from:

U.S. Government Printing Office

732 N Capitol St NW

Washington, D.C. 20401

Phone: (202) 512-1800

http://bookstore.gpo.gov

Military standards documents (MIL) from:

http://global.ihs.com/

European standards documents from CENELEC organization at:

http://www.cenelec.org/Cenelec/Homepage.htm

7.7. Trademarks

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AT&T® Registered Trademark of AT&T, Inc.

To view the Document Revision Log prior to February 4, 2009, click the following link.

oldrevisionlog003.xls
You may download this file from the online version of this document.
Note: You must have the proper application in order to open the file.

Revision Log

Issue Number	Date	Description	Published By
5	05/06/10	Add multiple DVB-ASI streams to Optical Handoff Options	rh4979
4	11/05/09	Add Transcoding option to SCVS: 310M Digital Interface - SCVS and NTSC Analog Interface - SCVS	rh4979
3	07/14/09	Add OC-3 and OC-12 optical handoff option to SCVS and HDVT	rh4979

Acronyms

A.1. Document Specific Acronyms

ac	alternating current
AC	Access Customer
ANSI	American National Standards Institute
AP	Active Picture
BIT	Binary Digit
BNC	Bayonet Coaxial Connector
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
Gbps	Gigabit per Second
GHz	Gigahertz
IEC	Interexchange Carrier (or IC)
IEEE	Institute for Electrical and Electronic Engineers
IRE	Institute of Radio Engineers
Kbps	Kilobits per second (1,000 bit/s)
LATA	Local Access and Transport Area

Mbps	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
SDH	Synchronous Digital Hierarchy
SDI	Serial Digital Interface
SDTI	Serial Data Transport Interface
SMPTE	Society of Motion Picture and Television Engineers
SONET	Synchronous Optical NETwork
TIA	Telecommunications Industry Association
TLP	Transmission Level Point
TOC	Table of Contents
UI	Unit Interval

A.2. Acronyms Dictionary

Refer to ATT-000-000-020, Acronyms Dictionary.

A.3. 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.
American National Standards Institute (ANSI)	An organization supported by the telecommunications industry to establish performance and interface standards.
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 28 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 (bps)	Bits per second, e.g., 1200 bps. In data transmission, it is the number of binary zero and one bits transmitted in 1 second. Modern terminology uses "bps" e.g., 1200 bps.
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 AT&T 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.
dBm	A decibel in which the reference power is one milliwatt. Decibel reference to one milliwatt.
Decibel (dB)	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
DVB-ASI (Digital Video Broadcasting-Asynchronous Serial Interface)	DVB-ASI (Digital Video Broadcasting-Asynchronous Serial Interface) 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 Mbps 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.).
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.
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 (Gbps)	One billion (1,000,000,000) bits per second.
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 analog video signal which is typically one volt.
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 (Kbps)	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 (Mbps)	One million (1,000,000) bits per second.
Millivolt (mV)	One thousandth of one volt.

Nanosecond (ns)	One billionth of one second.
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 AT&T'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 or Two-Point Service	A circuit connecting two (and only two) points, Customer premise to Customer premise or Customer premise to wire center for connection with other Network services either on a direct connected basis or through a Hub where multiplexing functions are performed.
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.
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 ANSI recognized standards body supported by the motion picture and television industry to establish television related performance and interface standards.
Transmission Level Point (TLP)	A point in a transmission system at which the ratio, usually expressed in decibels, of the 33 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.