

U S WEST
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Technical Publication

Audio Service

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U S WEST
Communications, Inc.
Technical Publication

Audio Service

NOTICE

This document provides a brief description for the U S WEST Audio Service for both Access and Non-Access applications. Network Channel and Network Channel Interface codes are provided. Much of this material was formerly found in PUB 77365, *Network Channel and Network Channel Interface Combinations*, PUB 77311, *Analog Channels for Non-Access Service*, and TR-NPL-000337, *Program Audio Special Access and Local Channel Services*.

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1. Introduction

1.1 General

This document provides a brief description for the U S WEST Audio Service for both Access and Non-Access applications. Network Channel and Network Channel Interface codes are provided. Much of this material was formerly found in PUB 77365, *Network Channel and Network Channel Interface Combinations*, PUB 77311, *Analog Channels for Non-Access Service*, and TR-NPL-000337, *Program Audio Special Access and Local Channel Services*.

1.2 Reason For Reissue

This is a new publication. If it is reissued, the reason will be noted in this paragraph.

1.3 Scope of Document

This publication provides a list of Network Channel and Network Channel Interface codes that may be used to order Audio Service. Network Channel and Network Channel Interface combinations are also included. This information is to be used to order these services. A list of references is provided for those who need a complete description of the Network Interfaces and additional information about the services.

This publication provides some of the technical specifications of the Audio Service. Other specifications may be found in TR-NPL-000337. Users of this service might also have to comply with Federal Communications Commission (FCC) Rules and Regulations or other regulations.

1.4 Document Organization

This publication is organized as follows:

<u>Chapter</u>	<u>Contents</u>
1	General Information about this publication.
2	Service Description, Technical Specifications
3	Network Channel and Network Channel Interface Codes
4	Network Interface Descriptions
5	Network Channel/Network Channel Interface Code Combinations
6	Definitions.
7	References.

1.5 Music Distribution Service

Some state jurisdictions offer a similar service for non-broadcast applications called Music Distribution Service. The technical parameters for this service are similar, but not the same as the Audio Service. Further information on Music Distribution Service may be found in PUB 77320, *Private Line Services*.

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2. Service Description

2.1 General

U S WEST Audio Services are one-way, full- or Part-time communication services between an Interexchange Carrier Point of Termination (IC-POT) and an End-User POT, or between POTs of the same or different End-Users. The service is provided on any form or configuration of physical plant capable of transmitting the complex signals of broadcast quality speech or music. Unless otherwise stated, parameter specifications pertain to the audio analog interface at the POT. Specifications apply to both full- and part-time services, which may be for such purposes as the following:

- Radio broadcasting
- Audio recording
- Television audio
- Audio teleconferencing

Further information about the technical specifications of this service may be found in TR-NPL-000337, *"Program Audio Special Access and Local Channel Services."*

Services for broadcasting are obtained from the Federal Communications Commission (FCC) Tariff #5. Non-broadcast services are obtained from the state tariffs or catalogs. These services may not be available in all jurisdictions.

2.2 Access Services AP1 - AP4

The Audio Program Services AP1 through AP4 are available in several frequency bandwidths and with several options.

2.2.1 Bandwidths

The Audio Access Services, AP1 - AP4, differ by the bandwidth or nominal passband. The values are summarized in Table 2-1.

Table 2-1 Access Services Bandwidths

AP1 Service	AP2 Service	AP3 Service	AP4 Service
200 - 3500 Hz	100 - 5000 Hz	50 - 8000 Hz	50 - 15,000 Hz

2.2.2 Gain Conditioning

With the addition of optional gain conditioning, the actual measured loss at initiation of service will be 0 dB \pm 0.5 dB. Otherwise, the maximum actual measured loss for each service will be as specified in Section 2.5.

2.2.3 Central Office Bridging

Central office bridging to provide multipoint service is available with all Audio Services. This option provides one input and multiple outputs.

2.2.4 Stereo-Type Service

Stereo-type service can be provided by employing two AP4 services. The optional stereo feature requires that both AP4 channels be of equal electrical length and have amplitude response versus frequency characteristics (frequency response) within 0.5 dB of each others across the frequency band. The frequency response and phase difference are controlled by using cable pairs, amplifiers, and equalizers of identical design in the same cable, or where carrier is employed, the same channel bank for each stereo pair.

2.3 APC Service

The Audio Services Customized (APC) category is designed to accommodate unusual circuit arrangements and interfaces. APC is available for both InterLATA and IntraLATA applications. The limit of frequency bandwidth is determined by the NCI codes selected. However, the highest bandwidth provided by APC is 50 to 50,000 Hz. Service requested under APC may be one way, two way, two-point or multipoint.

The facility may be metallic or carrier derived at the option of U S WEST. Direct current continuity is not inherent in this service.

Due to the custom nature of the APC service, no NC/NCI Code combinations are provided. However, any combination of interface codes will be considered.

2.4 AP31, AP32, AP33 and AP34 Services

The AP31, AP32, AP33 and AP34 services are designed to provide a non-broadcast grade of service in a non-access application. Generally, the AP31 service is non-equalized and the other three services are equalized. A very limited number of jurisdictions may offer some of the services in both equalized and non-equalized versions. Check the appropriate state tariff or catalog for further details.

Transmission parameters are the same as traditionally found on end-to-end services. The service is available with Central Office Bridging and Gain/Equalization or Gain Conditioning. Bridging is available only in selected Central Offices.

The facility may be metallic or carrier derived at the option of U S WEST. Direct current continuity is not inherent in this service.

2.5 Technical Specifications

2.5.1 General

There are a number of important audio parameters including distortion, noise, crosstalk and bandwidth (frequency response). The Federal Communications Commission requirements specify studio-to-transmitter limits. The specifications for Audio Service are an allocated portion of these limits.

The speech and music signal is complex and aperiodic. Values of voltage and current vary with time in an irregular fashion. An empirical parameter called a volume unit (vu) has been devised to allow useful measurements and specifications. Volume is not mathematically definable, but is simply the reading of an audio signal in a specified way on a standard volume indicator, popularly called a "vu meter". The vu meter readings bear the same relation to each other as do decibel (dB) measurements.

It is convenient to relate the levels within a transmission system to an arbitrary zero transmission level point (0 TLP). This point defines the gains and losses (in dB) within the system in a way that is independent of signal level. Thus, if a known level test tone is applied at a known TLP, the expected level of that tone is defined at each TLP in the system.

The technical specifications for the Audio Service are based on TR-NPL-000337 and material formerly found in PUB 77311. However, some additional informative information may be found in ANSI T1.505-1989, *Advanced Digital Program Audio Services - Analog Interface and Performance Specifications*.

2.5.2 Transmission Levels

A program level of +8 vu (averaged over one second) is the maximum permitted at a 0 TLP. This level is a compromise that provides an improved signal-to-noise ratio without introducing harmful crosstalk into the network. This value is higher than allowed for other services and is permissible only because of the relatively small percentage of circuits used for Audio Service. Levels lower than +8 vu are encouraged.

The levels at the Network Interface (NI) are:

- The transmit level towards the Central Office (CO) is 0 TLP.
- The receive level from the CO is 0 TLP if the Gain Conditioning option has been ordered. In cases without Gain Conditioning, the value will not be lower than -32 TLP for AP1 through AP4 or -12 TLP for AP31 through AP34 services. This loss (32 dB or 12 dB) is measured at 1004 Hz.

The loss may vary over time. Variations of ± 0.5 dB are permitted in a 5 second interval and variations of ± 1.0 dB in a one hour interval. In the case of AP31 through AP34 services, an additional variation of ± 4.0 dB is permitted over the life of the service.

U S WEST normally applies an alignment and test tone of 0 dBm at 0 TLP. This is abbreviated as 0 dBm0. Nonlinear distortion, such as harmonic distortion, can be measured at such levels, but unacceptable nonlinear distortion that may occur on normally occurring instantaneous peaks of program material will not be revealed. The difference (in dB) between the operating level and the level at which overload occurs is often called "headroom." The circuit design recognizes that such peaks occur and must be transmitted without exceeding the specifications for nonlinear distortion. These peaks are assumed to be 10 dB higher than the average program level as read on a vu meter.

2.5.3 Attenuation Distortion

Attenuation Distortion or Gain/Frequency Distortion is limited by various values depending on the service and if it is equalized.

The values for the AP1 service are -10 to +3 dB where a negative value corresponds to a loss and a positive value corresponds to a gain over the base 1004 Hz frequency.

The values for the AP2, AP3 and AP4 service are illustrated in Figure 2-1.

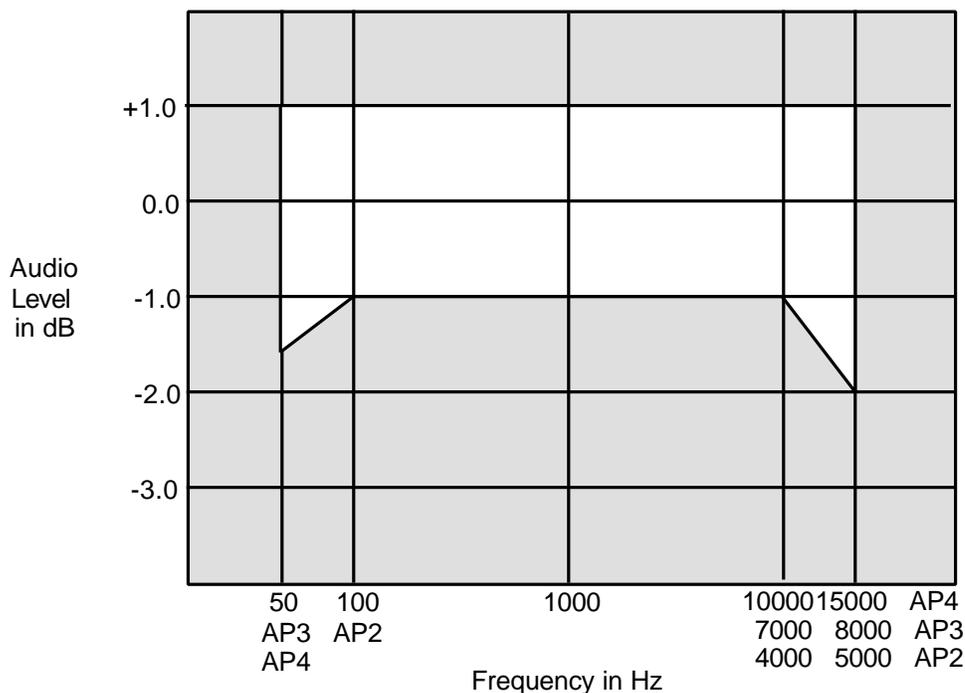


Figure 2-1 Attenuation Distortion Limits for AP2, AP3 and AP4 Services

The values for the AP31, AP32, AP33, and AP34 services depend on the type and if it is equalized or not. The values are listed in Table 2-2.

Table 2-2 Attenuation Distortion for AP31, AP32, AP33 and AP34 Services

NCI Code *	02PG2.3 (AP31)	02PG2.5 (AP32)	02PG2.8 (AP33)	02PG2.1 (AP34)
Non Equalized	-3.0 to +10.0 dB	-3.0 to +20.0 dB	-3.0 to +20.0 dB	-3.0 to +20.0 dB
Equalized	-1.0 to +1.0 dB			

* Negative values denote loss, positive values denote gain compared to the 1004 Hz reference @ 0 dBm.

2.5.4 Noise and Crosstalk

Noise specifications are usually stated as a signal-to-noise ratio in the broadcast industry. The telecommunications industry, however, measures and expresses noise in terms of dB_rn which has a zero reference of -90 dBm. That is, 0 dBm equals -90 dB_rn.

The signal-to-noise measurements are referenced to a maximum peak audio signal of +18 dBm₀. The resulting noise limits are listed in Table 2-3.

An absolute measurement of noise level is made at the receiving NI. The TLP of this NI was established when designing and installing the service. The noise measurement, in dBm or dB_rn converted to dBm, is translated to an equivalent reading at the 0 TLP by adding the loss or subtracting the gain of the actual TLP relative to 0.

For example, in the case of a 02PG2.1 type of NI (AP34 or AP4), assumes a TLP of -12 dB at the NI. If the 15 kHz flat-weighted noise measured at the NI were 5 dB_rn, the noise translated to the 0 TLP would be 5 dB_rn + 12 dB or 17 dB_rn (-73 dB_rn). This meets the specifications for noise listed in Table 2-3 for this application. Any higher noise measurement would not meet the specifications.

The crosstalk requirement is that no audible conversation, bits of conversation or tones are detectable in the monitor receiver of the noise measuring set. The monitoring tests should be made during heavy traffic periods by listening for at least 10 minutes. A single-source disturber usually reflects either a violation of the established levels for the disturbing service or an unbalanced termination.

2.5.5 Phase Difference for Stereo

Proper phasing between channels used for stereo is necessary to maintain channel separation on stereo equipment and frequency response on monophonic equipment. The phase difference can be measured using an oscillator with a resistance-splitting network and a phase meter, or a test set specifically designed for measuring the phase difference between stereo channels. Figure 2-2 illustrates the specifications for Stereo Conditioning Phase Difference.

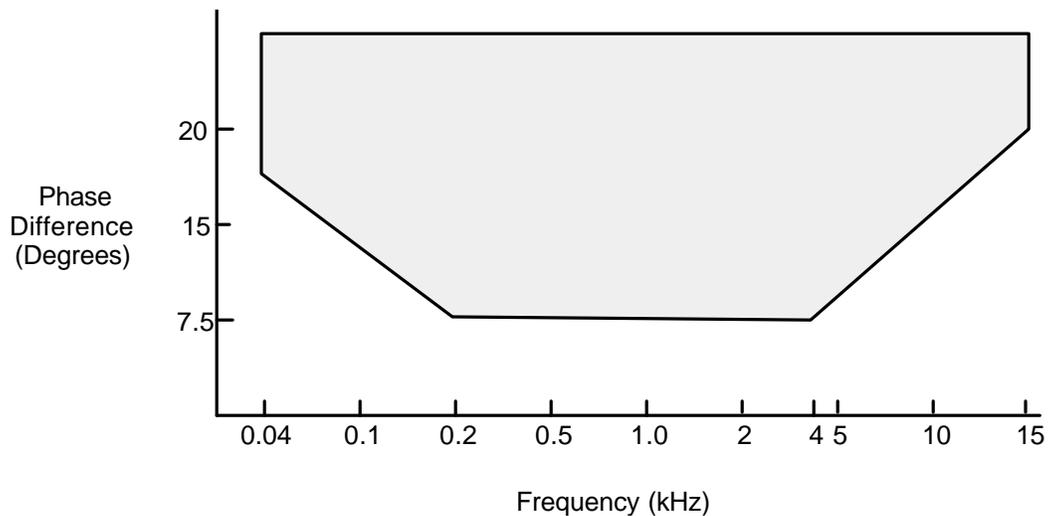


Figure 2-2 Stereo Conditioning Phase Difference

2.5.6 Test Tones

The maximum continuous test tone power (averaged over one second) that may be applied to the transmitting NI is as follows:

- +8 dBm0 between 50 and 404 Hz
- 0 dBm0 between 405 and 15,000 Hz

These limits apply for channels involving metallic cable and/or pre-equalized carrier systems. There is no pre-equalization in systems with equalization below the frequency 404 Hz.

These restrictions permit the use of test equipment in which program material is simulated by the use of a sine wave whose level is pulsed between high and low levels as a function of time, PROVIDED, the power averaged over one second is within the limits specified and the peak level is reduced to take into account any pre-equalization in the circuit. Total distortion will be within the service limits based on the type of service.

An exception to these limits is permitted for measurement of total harmonic distortion plus noise.

2.5.7 Total Harmonic Distortion Plus Noise

Nonlinear Distortion is caused by the nonlinear characteristics of amplifiers or similar equipment. Harmonic Distortion is the type of nonlinear distortion most commonly measured on audio circuits and may be specified with or without noise. The Audio Service specifications are stated with noise. This is sometimes called "total distortion" since the noise component may include spurious tones.

Total harmonic distortion plus noise is measured by a test set with a tunable narrowband filter to remove the fundamental of the test tone. Anything remaining in the passband of the test instrument is considered harmonic distortion and is summed and related to the amplitude of the fundamental. Thus, the result obtained with this type of test equipment includes any noise in the passband of the test instrument because everything outside of the nulled frequency is measured.

Measurements of harmonic distortion without noise are also possible, but more complicated. TR-NPL-000337, Section 4.5.1, should be consulted for further information.

Distortion should be measured at a level corresponding to the peak load-carrying capacity of the circuit. However, continuous high-level tones may cause crosstalk and interfere with other services in multi-pair cables or on carrier systems. To minimize this problem, the test frequency is chosen in the 400 Hz range. When levels higher than those in Section 2.5.6 are absolutely necessary, the maximum test-tone level permitted is +18 dBm₀, which corresponds to the peak load-carrying capacity of services AP1 through AP4. The permitted application interval is four (4) seconds or less. Repetition of this test is subject to concurrence of U S WEST. The preceding does not permit program levels exceeding +8 vu.

Measurements of audio circuits should be made with all amplifiers, equalizers, coils, etc., in place and aligned for service. The measurements are made at the receiving NI and should be on a 600 ohms balanced basis. Measurements should be made using a fundamental tone of 404 Hz. The Total Harmonic Distortion of the oscillator should be at least 10 dB better than the service specifications. An oscillator meeting the requirements of ANSI/IEEE 743-1994 (R1993), *Analog Voice Frequency Circuits, Standard Methods and Equipment for Measuring the Transmission Characteristics of*, should be satisfactory.

2.5.8 Summary

Table 2-3 summarizes the Technical Specifications for the Audio Service. This material is from Table 4-1 of TR-NPL-000337, which is referenced in some tariffs, and from PUB 77311.

Table 2-3 Summary of Technical Specifications

SERVICE	AP1	AP31	AP2	AP32	AP3	AP33	AP4	AP34
NCI CODE	02PG2.3		02PG2.5		02PG2.8		02PG2.1	
Loss Limit (AML)	32 dB#	12 dB	32 dB	12 dB	32 dB	12 dB	32 dB	12 dB
Loss Variation								
• Short Term	± 0.5 dB		± 0.5 dB		± 0.5 dB		± 0.5 dB	
• Long Term	± 1.0 dB		± 1.0 dB		± 1.0 dB		± 1.0 dB	
• Life of service	na	±4.0 dB	na	±4.0 dB	na	±4.0 dB	na	±4.0 dB
Highest Program Level	+ 8 vu		+ 8 vu		+ 8 vu		+ 8 vu	
Bandwidth (Hz)	200 - 3500	200 - 3000	100 - 5000		50 - 8000		50 - 15,000	
Attenuation Distortion †								
• Non Equalized	na	-3 to +10 dB	na	-3 to ** +20 dB	na	-3 to ** +20 dB	na	na
• Equalized	-10 to +3 dB	-1 to ** +1 dB	Fig 2-1	-1 to +1 dB	Fig 2-1	-1 to +1 dB	Fig 2-1	-1 to +1 dB
Total Harmonic Distortion + Noise *	3.5 %		2.5 %		2.0 %		1.0 %	
Weighted Random Noise								
• dB _r n0	43		44		46		37	
• dB _m 0	- 47		- 46		- 44		- 53	
Weighting	C Message		15 kHz flat		15 kHz flat		15 kHz flat	
Stereo								
• Gain Difference	na		na		na		±0.5dB	na
• Phase Difference							Fig 2-2	

AML Actual Measured Loss

na Not applicable.

† Negative values correspond to losses; positive values to gains. 1004 Hz reference @ 0 dBm.

Some state tariffs may limit this value to 10 dB.

* AP31 - AP34 Services: +13 dB_m0,
AP1 - AP4 Services: +18 dB_m0

All services at 404 Hz with a maximum application time of 4 seconds.

** Generally not applicable. See Section 2.4.

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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.

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

X = Alphanumeric
 - = Hyphen

Figure 3-1 Format Structure for NC Codes

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

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

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

3.1.3 Available Network Channel Codes

Table 3-1 lists the available Network Channel (NC) codes for Audio Services.

Table 3-1 Available Network Channel Codes - Audio Services

Network Channel Code	Description	NC/NCI Table
<u>Audio Program One (AP1) Service</u>		
PE--	No Options	5-1
PE-B	Central Office Bridging	5-2
PEP-	Gain Conditioning	5-3
PEPB	Gain Conditioning & Central Office Bridging	5-4
<u>Audio Program Two (AP2) Service</u>		
PF--	No Options	5-5
PF-B	Central Office Bridging	5-6
PFP-	Gain Conditioning	5-7
PFPB	Gain Conditioning & Central Office Bridging	5-8
<u>Audio Program Three (AP3) Service</u>		
PJ--	No Options	5-9
PJ-B	Central Office Bridging	5-10
PJP-	Gain Conditioning	5-11
PJPB	Gain Conditioning & Central Office Bridging	5-12
<u>Audio Program Four (AP4) Service</u>		
PK--	No Options	5-13
PK-B	Central Office Bridging	5-14
PK-K	Central Office Bridging and Stereo	5-15
PK-S	Stereo	5-13
PKP-	Gain Conditioning	5-16
PKPB	Gain Conditioning & Central Office Bridging	5-17
PKPK	Gain Conditioning and Central Office Bridging and Stereo	5-17
PKPS	Gain Conditioning and Stereo	5-16
<u>Audio Program Custom (APC) Service</u>		
PQ-Z	Customized	na

Table 3-1 Available Network Channel Codes - Audio Services (Continued)

Network Channel Code	Description	NC/NCI Table
<u>Program Audio (Non-Broadcast) Service (AP31 - AP34)</u>		
UE--	No Options	5-18
UE-B	Central Office Bridging	5-19
UEP-	Gain Conditioning	5-20
UEPB	Gain Conditioning & Central Office Bridging	5-21
<u>Program Audio (Non-Broadcast) Service Custom (APC)</u>		
UP-Z	Customized	na

3.1.4 Historical Network Channel Codes

There are a number of NC codes formerly used to define IntraLATA Audio Services AP1 - AP4. These codes are no longer valid. Only the current NC codes listed in Table 3-1 shall be used for AP1 - AP4 services. The IntraLATA nature of the service can be identified by modifiers in the CLCI™-S/S code used to identify the service. Table 3-2 lists these historical NC codes.

Table 3-2 Historical Network Channel Codes

Network Channel Code	Description	Use NC Code
<u>Audio Program One (AP1) Service</u>		
PE1- PE5-	IntraLATA IntraLATA and Gain Conditioning	PE-- PEP-
<u>Audio Program Two (AP2) Service</u>		
PF1- PF5-	IntraLATA IntraLATA and Gain Conditioning	PF-- PFP-
<u>Audio Program Three (AP3) Service</u>		
PJ1- PJ5-	IntraLATA IntraLATA and Gain Conditioning	PJ-- PJP-
<u>Audio Program Four (AP4) Service</u>		
PK1- PK1S PK5- PK5S	IntraLATA IntraLATA and Stereo IntraLATA and Gain Conditioning IntraLATA and Gain Conditioning and Stereo	PK-- PK-S PKP- PKPS

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 voice grade services.

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.

Network Channel Interface Code

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

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

Figure 3-2 Format Structure for NCI Codes

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

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

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

Table 3-3 NCI Impedance Values

Impedance in Ohms (Character Position 5)			
Data Value	Code	Data Value	Code
600	2	75	6
135	5	100	9

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

Transmission Level Point(s) (character positions 8 through 12) is assigned one or two character alpha code corresponding to a value for Transmission Level Point(s) (TLPs) from either the Exchange Carrier/service provider or customer end. Values are listed in Table 3-3.

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

Table 3-4 NCI Transmission Levels

Transmission Level Point Code (Character Positions 11 and 12)	
Data Value	Code
None This Direction (One-way Service)	O
0.0	S
U S WEST Specified	-
Recommended	(Blank)

3.2.3 Available Network Channel Interface Codes

Table 3-4 lists the NCI codes used with Audio Service. Higher level digital interfaces may apply. These may be used in place of the DS1 interfaces in the combination tables in Chapter 5.

Table 3-5 Available NCI Codes

Protocol		Definition
Code 3 4	Option 7 8 9	
AH		Analog High Capacity interface, (The NCI codes 04AH5.B, 04AH6.C and 04AH6.D represent the WA1, WA2 and WA2A level of Wideband Special Access NCI codes respectively. These analog interfaces may be used where available and where the "DS" protocol code appears in the compatibility tables in Chapter 5.)
	B	60 kHz to 108 kHz (12 channels)
	C	312 kHz to 552 kHz (60 Channels)
	D	564 kHz to 3084 kHz (600 Channels)
BP		Central Office Bridging Audio Program
DJ		Carrier to carrier DS1 interface specification that is the result of joint engineering.
DS		Digital Hierarchy Interface at DS1 rate (or higher)
	15E	8-bit Pulse Code Modulation (PCM) encoded in one 64 kbit/s channel of the DS1 signal.
	15F	8-bit PCM encoded in two 64 kbit/s channel of the DS1 signal.
	15G	8-bit PCM encoded in three 64 kbit/s channel of the DS1 signal.
	15H	14/11-bit PCM encoded in six 64 kbit/s channel of the DS1 signal. (Several protocol options may be ordered as listed in PUB 77375, <i>1.544 Mbit/s Channel Interfaces</i> . Only selected NCI code options uniquely used with Audio Service are listed here.)
PG		Program Transmission - No Direct Current signaling
	1	Nominal frequency range from 50 Hz to 15,000 Hz
	2	Non-Equalized
	3	Nominal frequency range from 200 Hz to 3500 Hz
	5	Nominal frequency range from 100 Hz to 5000 Hz
	8	Nominal frequency range from 50 Hz to 8000 Hz

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4. Network Interface Descriptions

4.1 General

This chapter contains the descriptions of the Network Interfaces (NIs) used with Audio Service. Descriptions of the analog "AH" interfaces may be found in TR-NPL-000337.

4.2 02BP2

Application: Central Office Bridging Arrangement

Physical description: Two-wire (T, R)

Service: AP1, AP2, AP3, AP4, AP31, AP32, AP33, AP34 or APC *

Electrical Features of Interface

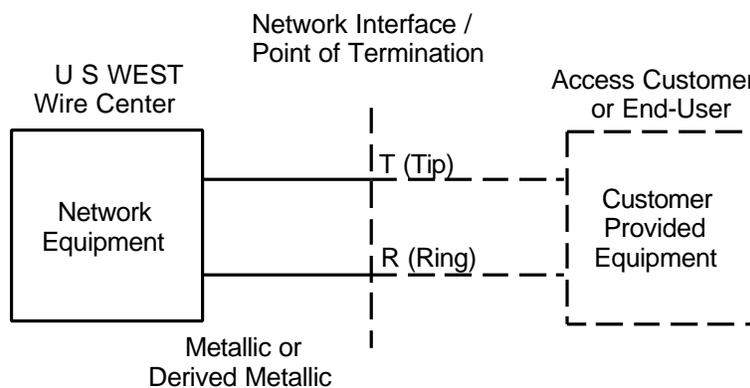
Impedance: 600 ohms

Levels: Audio levels into and out of the bridge will be controlled by U S WEST.

Bandwidth: See specific customer NI

References: TR-NPL-000337

Illustration:



* U S WEST does not use this NCI code in all jurisdictions.

4.3 04DS9.15E

Application: Audio service AP1, eight-bit Pulse Code Modulation (PCM) encoded in one 64 kbit/s digital signal. Channel assignment must be provided by the customer.

Physical description: DSX-1 frame, or equivalent.

Service: AP1

Electrical Features of Interface

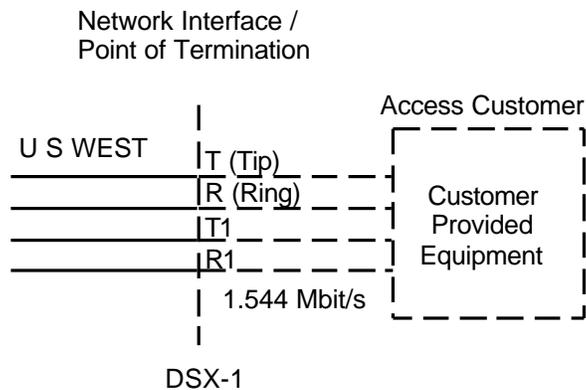
Impedance: 100 ohms balanced

Levels: Templated digital, see PUB 77375, *1.544 Mbit/s Channel Interfaces*

Speed: 1.544 Mbit/s

References: PUB 77375

Illustration:



4.4 04DS9.15F

Application: Audio service AP2, eight-bit PCM encoded in two 64 kbit/s digital signals. Channel assignment must be provided by the customer. The channels required must be separated by 12 time slots, i.e., 2 and 14, 3 and 15, etc.

Physical description: DSX-1 frame, or equivalent.

Service: AP2 or APC

Electrical Features of Interface

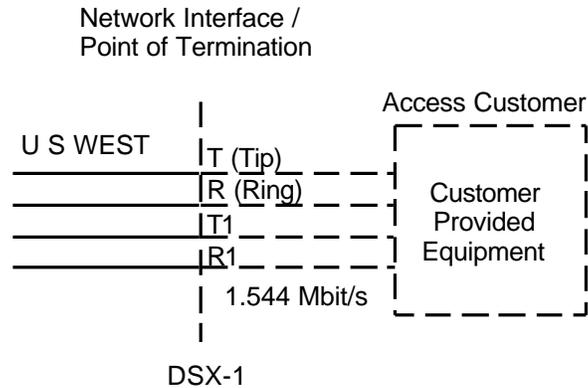
Impedance: 100 ohms balanced

Levels: Templated digital, see PUB 77375

Speed: 1.544 Mbit/s

References: PUB 77375

Illustration:



4.5 04DS9.15G

Application: Audio service AP3, eight-bit PCM encoded in three 64 kbit/s digital signals. Channel assignment must be provided by the customer. The three channels required must be separated by 8 time slots, i.e., 2, 10, and 18, or 3, 11, and 19, etc.

Physical description: DSX-1 frame, or equivalent.

Service: AP3 or APC

Electrical Features of Interface

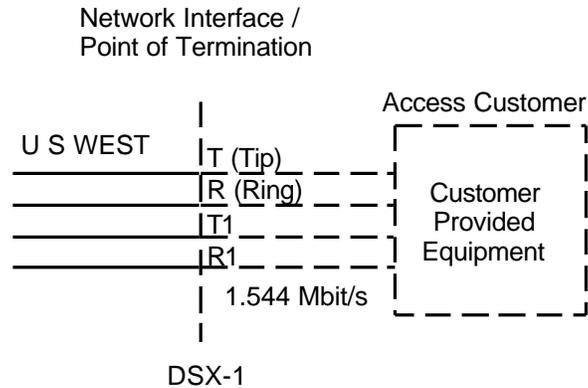
Impedance: 100 ohms balanced

Levels: Templated digital, see PUB 77375

Speed: 1.544 Mbit/s

References: PUB 77375

Illustration:



4.6 04DS9.15H

Application: Audio service AP4, 14/11-bit PCM encoded in six 64 kbit/s digital signals. Channel assignment must be provided by the customer. Normally, any six adjacent channel time slots may be assigned. Channels 1 and 24 are assumed to be adjacent for this purpose. However, under some circumstances, the six-channel set starting with slots 11, 12, 23 or 24 may not be used. This limitation is due to the physical limitations of channel units used with the D4-type multiplexer used with the DS1 service. Customers wishing to use the six-channel sets starting with these four slots must verify the capability with U S WEST.

Physical description: DSX-1 frame, or equivalent.

Service: AP4 or APC

Electrical Features of Interface

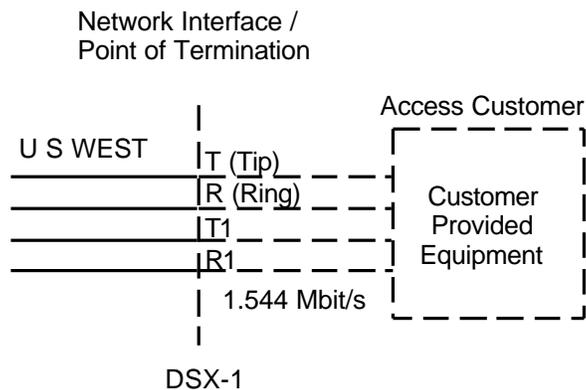
Impedance: 100 ohms balanced

Levels: Templated digital, see PUB 77375

Speed: 1.544 Mbit/s

References: PUB 77375 and TR-TSY-000431, *15 kHz Digital Audio Terminal for Program or Television Requirements and Objectives.*

Illustration:



4.7 02PG2.1

Application: Connects customer NI to U S WEST program facilities for transmission of audio signals composed of speech and/or music.

Operating mode: Part- or full-time transmission of audio signals

Physical description: Two-wire (T, R)

Service: AP4, AP34 or APC

Electrical Features of Interface

Nominal Impedance: 600 ohms balanced

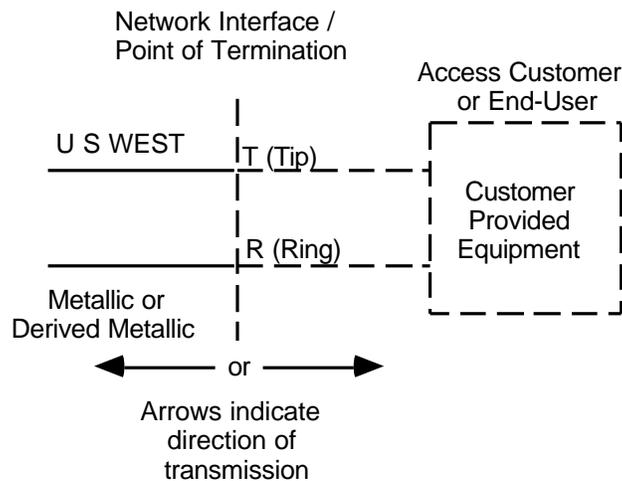
Levels: + 8 vu (maximum) at transmitting NI
- 24 vu (minimum) at receiving NI

Bandwidth: Nominal 15 kHz

Frequency Range 50 Hz to 15,000 Hz

References: TR-NPL-000337

Illustration:



4.8 02PG2.3

Application: Connects customer NI to U S WEST program facilities for transmission of audio signals composed of speech and/or music.

Operating mode: Part- or full-time transmission of audio signals

Physical description: Two-wire (T, R)

Service: AP1 or AP31

Electrical Features of Interface

Nominal Impedance: 600 ohms balanced

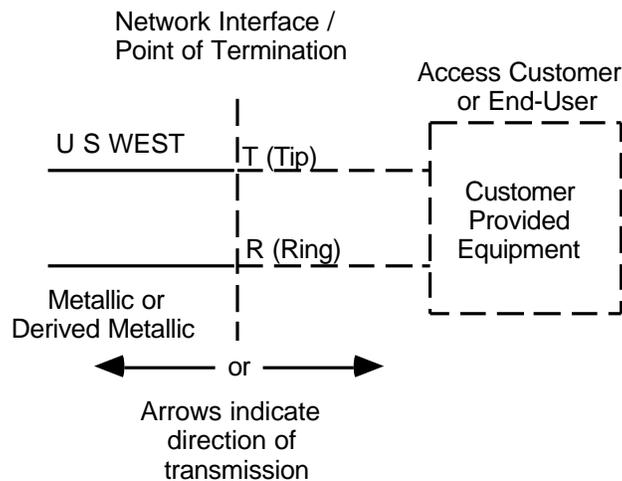
Levels: + 8 vu (maximum) at transmitting NI
- 24 vu (minimum) at receiving NI

Bandwidth: Nominal 4 kHz

Frequency Range 200 Hz to 3500 Hz

References: TR-NPL-000337

Illustration:



4.9 02PG2.5

Application: Connects customer NI to U S WEST program facilities for transmission of audio signals composed of speech and/or music.

Operating mode: Part- or full-time transmission of audio signals

Physical description: Two-wire (T, R)

Service: AP2, AP32 or APC

Electrical Features of Interface

Nominal Impedance: 600 ohms balanced

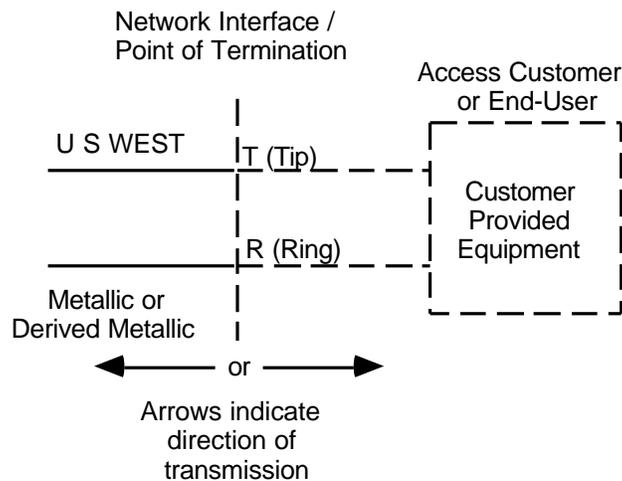
Levels: + 8 vu (maximum) at transmitting NI
- 24 vu (minimum) at receiving NI

Bandwidth: Nominal 5 kHz

Frequency Range 100 Hz to 5000 Hz

References: TR-NPL-000337

Illustration:



4.10 02PG2.8

Application: Connects customer NI to U S WEST program facilities for transmission of audio signals composed of speech and/or music.

Operating mode: Part- or full-time transmission of audio signals

Physical description: Two-wire (T, R)

Service: AP3, AP33 or APC

Electrical Features of Interface

Nominal Impedance: 600 ohms balanced

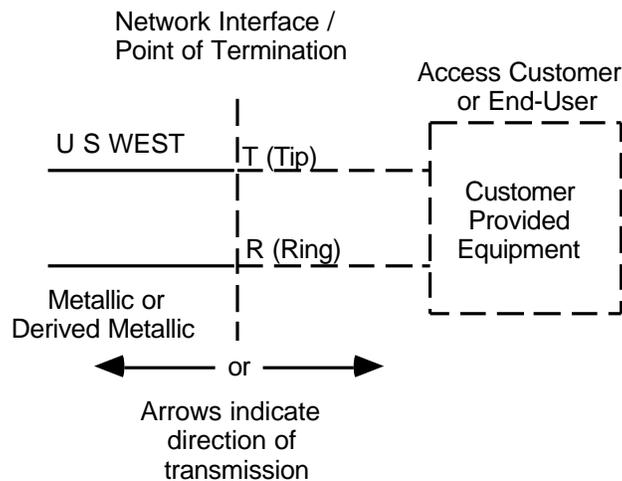
Levels: + 8 vu (maximum) at transmitting NI
- 24 vu (minimum) at receiving NI

Bandwidth: Nominal 8 kHz

Frequency Range 50 Hz to 8000 Hz

References: TR-NPL-000337

Illustration:



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5. Network Channel/Network Channel Interface Combinations

5.1 Audio Program One (AP1)

Frequency Range: 200 to 3500 Hz.

5.1.1 AP1 Service - PE--

Table 5-1 AP1 Service - PE--

NC/NCI Combinations		
NC = PE-- No Options		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.3		02PG2.3
02PG2.3.-O		02PG2.3.OS
02PG2.3.OS		02PG2.3.-O
04DS9.15E *		02PG2.3 02PG2.3.OS 02PG2.3.-O

* DJ may be substituted for DS at an Access Customer Network Interface.

5.1.2 AP1 Service - PE-B

Table 5-2 AP1 Service - PE-B

NC/NCI Combinations		
NC = PE-B Bridging		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.3 02PG2.3.-O 02PG2.3.OS	02BP2	
04DS9.15E *	02BP2	
	02BP2	02PG2.3 02PG2.3.-O 02PG2.3.OS
	02BP2 %	

* DJ may be substituted for DS at an Access Customer Network Interface.

% Bridge to Bridge application (Mid Link).

5.1.3 AP1 Service - PEP-

Table 5-3 AP1 Service - PEP-

NC/NCI Combinations		
NC = PEP- Gain Conditioning		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.3.OS		02PG2.3.SO
04DS9.15E *		02PG2.3.SO

* DJ may be substituted for DS at an Access Customer Network Interface.

5.1.4 AP1 Service - PEPB

Table 5-4 AP1 Service - PEPB

NC/NCI Combinations		
NC = PEPB Gain Conditioning and Bridging		
Access Customer	U S WEST Central Office Bridge	End-User
	02BP2	02PG2.3.SO

5.2 Audio Program Two (AP2)

Frequency Range: 100 to 5000 Hz.

5.2.1 AP2 Service - PF--

Table 5-5 AP2 Service - PF--

NC/NCI Combinations		
NC = PF-- No Options		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.5		02PG2.5
02PG2.5.-O		02PG2.5.OS
02PG2.5.OS		02PG2.5.-O
04DS9.15F *		02PG2.5 02PG2.5.-O 02PG2.5.OS

* DJ may be substituted for DS at an Access Customer Network Interface.

5.2.2 AP2 Service - PF-B

Table 5-6 AP2 Service - PF-B

NC/NCI Combinations		
NC = PF-B Bridging		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.5 02PG2.5.-O 02PG2.5.OS	02BP2	
04DS9.15F *	02BP2	
	02BP2	02PG2.5 02PG2.5.-O 02PG2.5.OS
	02BP2 %	

* DJ may be substituted for DS at an Access Customer Network Interface.

% Bridge to Bridge application (Mid Link).

5.2.3 AP2 Service - PFP-

Table 5-7 AP2 Service - PFP-

NC/NCI Combinations		
NC = PFP- Gain Conditioning		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.5.OS		02PG2.5.SO
04DS9.15F *		02PG2.5.SO

* DJ may be substituted for DS at an Access Customer Network Interface.

5.2.4 AP2 Service - PFPB

Table 5-8 AP2 Service - PFPB

NC/NCI Combinations		
NC = PFPB Gain Conditioning and Bridging		
Access Customer	U S WEST Central Office Bridge	End-User
	02BP2	02PG2.5.SO

5.3 Audio Program Three (AP3)

Frequency Range: 50 to 8000 Hz.

5.3.1 AP3 Service - PJ--

Table 5-9 AP3 Service - PJ--

NC/NCI Combinations		
NC = PJ-- No Options		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.8		02PG2.8
02PG2.8.-O		02PG2.8.OS
02PG2.8.OS		02PG2.8.-O
04DS9.15G *		02PG2.8 02PG2.8.-O 02PG2.8.OS

* DJ may be substituted for DS at an Access Customer Network Interface.

5.3.2 AP3 Service - PJ-B

Table 5-10 AP3 Service - PJ-B

NC/NCI Combinations		
NC = PJ-B Bridging		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.8 02PG2.8.-O 02PG2.8.OS	02BP2	
04DS9.15G *	02BP2	
	02BP2	02PG2.8 02PG2.8.-O 02PG2.8.OS
	02BP2 %	

* DJ may be substituted for DS at an Access Customer Network Interface.

% Bridge to Bridge application (Mid Link).

5.3.3 AP3 Service - PJP-

Table 5-11 AP3 Service - PJP-

NC/NCI Combinations		
NC = PJP- Gain Conditioning		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.8.OS		02PG2.8.SO
04DS9.15G *		02PG2.8.SO

* DJ may be substituted for DS at an Access Customer Network Interface.

5.3.4 AP3 Service - PJPB

Table 5-12 AP3 Service - PJPB

NC/NCI Combinations		
NC = PJPB		
Access Customer	U S WEST Central Office Bridge	End-User
	02BP2	02PG2.8.SO

5.4 Audio Program Four (AP4)

Frequency Range: 50 to 15,000 Hz.

5.4.1 AP4 Service - PK--, PK-S

Table 5-13 AP4 Service - PK--, PK-S

NC/NCI Combinations		
NC = PK-- No Options		
NC = PK-S Stereo		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.1		02PG2.1
02PG2.1.-O		02PG2.1.OS
02PG2.1.OS		02PG2.1.-O
04DS9.15H *		02PG2.1 02PG2.1.-O 02PG2.1.OS

* DJ may be substituted for DS at an Access Customer Network Interface.

5.4.2 AP4 Service - PK-B

Table 5-14 AP4 Service - PK-B

NC/NCI Combinations		
NC = PK-B Bridging		
Access Customer	U S WEST Central Office Bridge	End-User
02PG2.1 02PG2.1.-O 02PG2.1.OS	02BP2	
04DS9.15H *	02BP2	
	02BP2	02PG2.1 02PG2.1.-O 02PG2.1.OS
	02BP2 %	

* DJ may be substituted for DS at an Access Customer Network Interface.

% Bridge to Bridge application (Mid Link).

5.4.3 AP4 Service - PK-K

Table 5-15 AP4 Service - PK-K

NC/NCI Combinations		
NC = PK-K Bridging and Stereo		
U S WEST Central		
Access Customer	Office Bridge	End-User
02PG2.1 02PG2.1.-O 02PG2.1.OS	02BP2	
04DS9.15H *	02BP2	
	02BP2	02PG2.1 02PG2.1.-O 02PG2.1.OS

* DJ may be substituted for DS at an Access Customer Network Interface.

5.4.4 AP4 Service - PKP-, PKPS

Table 5-16 AP4 Service - PKP-, PKPS

NC/NCI Combinations		
NC = PKP- Gain Conditioning		
NC = PKPS Gain Conditioning and Stereo		
U S WEST Central		
Access Customer	Office Bridge	End-User
02PG2.1.OS		02PG2.1.SO
04DS9.15H *		02PG2.1.SO

* DJ may be substituted for DS at an Access Customer Network Interface.

5.4.5 AP4 Service - PKPB, PKPK

Table 5-17 AP4 Service - PKPB, PKPK

NC/NCI Combinations		
NC = PKPB	Gain Conditioning and Bridging	
NC = PKPK	Gain Conditioning and Bridging and Stereo	
U S WEST Central Office		
Access Customer	Bridge	End-User
	02BP2	02PG2.1.SO

5.5 Non-Access Audio Program (Non-Broadcast) Service (AP31 - AP34)

5.5.1 AP31 - AP34 Services - UE--

Table 5-18 AP31 - AP34 Services - UE--

NC/NCI Combinations				
NC = UE--	No Options			
Frequency Range (Hz)	Service	Central Office Bridge	End-User	End-User
200 - 3000	AP31		02PG2.3	02PG2.3
			02PG2.3.OS	02PG2.3.-O
100 - 5000	AP32		02PG2.5	02PG2.5
			02PG2.5.OS	02PG2.5.-O
50 - 8000	AP33		02PG2.8	02PG2.8
			02PG2.8.OS	02PG2.8.-O
50 - 15,000	AP34		02PG2.1	02PG2.1
			02PG2.1.OS	02PG2.1.-O

5.5.2 AP31 - AP34 Services - UE-B

Table 5-19 AP31 - AP34 Services - UE-B

NC/NCI Combinations				
NC = UE-B Bridging				
Frequency Range (Hz)	Service	Central Office Bridge	End-User	End-User
200 - 3000	AP31	02BP2		02PG2.3 02PG2.3.OS 02PG2.3.-O
100 - 5000	AP32	02BP2		02PG2.5 02PG2.5.OS 02PG2.5.-O
50 - 8000	AP33	02BP2		02PG2.8 02PG2.8.OS 02PG2.8.-O
50 - 15,000	AP34	02BP2		02PG2.1 02PG2.1.OS 02PG2.1.-O
Any of above		02BP2 %		

% Bridge to Bridge application (Mid Link).

5.5.3 AP31 - AP34 Services - UEP-

Table 5-20 AP31 - AP34 Services - UEP-

NC/NCI Combinations				
NC = UEP- Gain/Equalization				
Frequency Range (Hz)	Service	Central Office Bridge	End-User	End-User
200 - 3000	AP31		02PG2.3	02PG2.3
			02PG2.3.OS	02PG2.3.SO
100 - 5000	AP32		02PG2.5	02PG2.5
			02PG2.5.OS	02PG2.5.SO
50 - 8000	AP33		02PG2.8	02PG2.8
			02PG2.8.OS	02PG2.8.SO
50 - 15,000	AP34		02PG2.1	02PG2.1
			02PG2.1.OS	02PG2.1.SO

5.5.4 AP31 - AP34 Services - UEPB

Table 5-21 AP31 - AP34 Services - UEPB

NC/NCI Combinations				
NC = UE--	Gain/Equalization and Bridging			
Frequency Range (Hz)	Service	Central Office Bridge	End-User	End-User
200 - 3000	AP31	02BP2		02PG2.3 02PG2.3.OS 02PG2.3.SO
100 - 5000	AP32	02BP2		02PG2.5 02PG2.5.OS 02PG2.5.SO
50 - 8000	AP33	02BP2		02PG2.8 02PG2.8.OS 02PG2.8.SO
50 - 15,000	AP34	02BP2		02PG2.1 02PG2.1.OS 02PG2.1.SO

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6. Definitions

6.1 Acronyms

0 TLP	Zero Transmission Level Point
AML	Actual Measured Loss
ANSI	American National Standards Institute
AP	Audio Program
Bellcore	Bell Communications Research, Inc.
CLCI™-S/S	Common Language® Circuit Identification - Special Service
CO	Central Office
dB	Decibel
dBm	Decibel referenced to one milliwatt
dBm	Decibel noise referenced to one picowatt (-90 dBm)
dc	Direct Current
DS1	Digital Signal Level 1 (1.544 Mbit/s)
DS3	Digital Signal Level 3 (44.736 Mbit/s)
EU	End-User
FCC	Federal Communications Commission
Hz	1 Hertz (formerly 1 cycle per second)
IC	Interexchange Carrier
IEEE	Institute for Electrical and Electronic Engineers
kbit/s	kilobits per second (1,000 bit/s)
kHz	Kilohertz (1,000 Cycles Per Second)
LATA	Local Access and Transport Area
Mbit/s	Megabit per Second
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
PCM	Pulse Code Modulation
TLP	Transmission Level Point
vu	Volume Unit

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.

Access Providers

Any of the telephone companies licensed by the appropriate utility commission to provide local telecommunication service within a LATA. This includes Bell Operating Companies, Information Distribution Companies, Non-Bell Operating Companies and other Local Exchange Carriers.

Actual Measured Loss (AML)

The actual measured insertion loss of a circuit at a given frequency.

American National Standards Institute (ANSI)

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

Attenuation Distortion

The change in attenuation with frequency relative to the attenuation at a reference frequency; the reference frequency is 1004 Hz unless otherwise specified.

Audio Transmission

Denotes the transmission of speech or music within the audible spectrum.

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 or system is designed to operate.

Bridging (MULTIPOINT-SERVICE)

Denotes the process of connecting three or more customer locations.

C-Message

A frequency-weighting characteristic used for measuring noise in voice frequency communications circuits and designed to weight noise frequencies in proportion to their perceived effect in telephone service.

Carrier

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

Central Office (CO)

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

Channel

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

Customer Interface

The interface with a customer at a point of termination.

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.

dBm

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

dB_{rn}

A unit used to express noise power relative to one picowatt (-90 dBm).

dB_{rn} 15 kHz

Noise power is dB_{rn} weighted according to a 15 kHz flat weighting network defined in ANSI/IEEE Standard 743-1984.

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.

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.)

End-User POT (EU-POT)

The Network Interface at the End-User's premises at which U S WEST Communication, Inc.'s responsibility for the provision of service ends.

Equalization

The process of correcting frequency and/or phase distortion of a circuit by the introduction of networks to compensate for the difference in attenuation and or time delay at the various frequencies in the transmission band.

Headroom

The difference, in dB, between the operating level and the overload level.

Hub

A U S WEST designated serving wire center at which bridging and multiplexing functions are performed.

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 or Interexchange Common Carrier

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

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.

Megabit per Second (Mbit/s)

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

Multiplexer (Mux)

Equipment used to multiplex, or do multiplexing: Multiplexing is a technique of modulating (analog) or interleaving (digital) multiple, relatively narrow bandwidth channels into a single channel having a wider bandwidth (analog) or higher bit-rate (digital). The term Multiplexer implies the demultiplexing function is present to reverse the process so it is not usually stated.

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.

Ohm

The unit of electric resistance.

Phase Difference, Stereo

The phase difference at a given frequency between one channel of a stereo pair, used as a reference, and the other.

Point of Termination (POT)

The physical telecommunications interface that establishes the technical interface, the test point(s), and the point(s) of operational responsibility. (See Network Interface).

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.

Pulse Code Modulation (PCM)

A type of modulation wherein the waveform of each channel is sampled many times per second in sequence. The amplitude of each sample is then encoded into a binary code and transmitted to the distant end where the pulse train is decoded and distributed to each channel in the exact time sequence to reproduce the original waveform of the channel.

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).]

Signal-To-Noise Ratio (S/N Ratio)

The ratio of the signal power to the noise power at a given point in a given system (usually expressed in decibels).

Synchronous Transmission

A transmission process such that between any two significant instants in the overall bit-stream there is always an integral number of unit intervals.

Tip, ring, ground

The conductive paths between a central office and a station. The tip and ring leads constitute the circuit that carries a balanced speech or data signal. The ground path in combination with the conductor is used occasionally for signaling.

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.

Volume Unit (vu)

The unit of measurement for electrical speech power and other complex waveforms as measured by a volume indicator meeting IEEE Standard 152 and read in accordance with that standard. On sine waves, 0 vu = 0 dBm. (NOTE: The volume indicator is commonly bridged across the transmission circuit with 8 dB loss. This is made up of 4 dB bridging loss in the volume indicator with series resistor and 4 dB loss in an external attenuator. In this configuration, a 0 reading on the meter corresponds to a transmission level of + 8 vu.)

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.*
- ANSI T1.505-1989 *Advanced Digital Program Audio Services - Analog Interface and Performance Specifications.*
- ANSI/IEEE 152-1992 *Audio Program Level Measurements.*
- ANSI/IEEE 743-1984
(Reaffirmed 1993) *Analog Voice Frequency Circuits, Standard Methods and Equipment for Measuring the Transmission Characteristics of,*

7.2 Bellcore Documents

- TR-NPL-000337 *Program Audio Special Access and Local Channel Services. Issue 1, July, 1987.*
- TR-TSY-000431 *15 kHz Digital Audio Terminal for Program or Television Requirements and Objectives. Issue 1, October, 1987.*

7.3 U S WEST Technical Publications

- PUB 77200 *U S WEST DS1 Service and U S WEST DS1 Rate Synchronization Service. Issue D, October, 1995.*
- PUB 77311 *Analog Channels For Non-Access Service. Issue C, March, 1991.*
- PUB 77320 *Private Line Services. Issue B, October 1989.*
- PUB 77375 *1.544 Mbit/s Channel Interfaces. Issue D, October, 1995.*

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 U S WEST employees may order;
American National Standards Institute (ANSI) documents from:

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