QWEST Communications International Inc.
Technical Publication

Analog Channels for Non-Access Service

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1.   Introduction

This publication describes Analog Intrastate, IntraLATA service. The term IntraLATA is used to denote a service interconnecting two or more locations wholly within one Local Access and Transport Area (LATA). The description covers channel performance, optional features and functions, and valid interface combinations.

Related Technical References are listed in Chapter 11.

1.1   General

Non-Access Analog Service is split into two major categories. The first is Voice Grade (VG) and the second is non-broadcast Audio Services (AP).

Non-Access Voice Grade services have been further divided into five Voice Grade subcategories. In addition to the five VG services described, two subcategories of Audio Services are also described.

Analog Services

VG	32	Voice Line	(UC)
VG	33	Voice Trunk	(UD)
VG	36	Analog Data	(UG)
VGB		Basic Voice	(UZ)
VGC		Voice Grade Custom	(UQ)
AP		Audio Services (Non-Broadcast)	(UE)
APC		Audio Services Custom (Non-Broadcast)	(UP)

Voice Grade service provides channels for voice frequency transmission in the nominal frequency range of 304 to 3004Hz. Audio Service channels provide wider bandwidth and enhanced quality for closed circuit (non-broadcast) systems. Both the Voice Grade and Audio Service channels may be provided between customer designated premises, or between a customer designated premises and a QWEST Central Office (CO) termination.

Most Analog service channels have optional features, which can be added to the standard channel to modify the channel for enhanced services. The following chart shows which features are available with each Voice Grade and Audio Services channel.

Not all services or options are available in each state covered by QWEST. Check state tariffs in QWEST for specific offerings.

Summary Table for Optional Features and Functions
Available with Technical Specifications Package
ANALOG SERVICE

	Voice Grade					Audio Services	
	32	**33**	**36**	**B**	**C**	**AP**	**APC**
Bridging							
- Voice	X				X		
- Transfer Arrangement	X	X	X		X		
- Bridge Lifter	X				X		
- Data			X		X		
- Data Select-A-Station			X		X		
- Split Frequency			X		X		
- Audio Services						X	X
Conditioning							
- Type C1			X		X		
- Type C2			X		X		
- Type C4			X		X		
- Type D1			X		X		
Combine any C Conditioning With D1 Conditioning			X		X		
Data Enhancement	X	X			X		
Data Channel Terminating Equipment					X		

(X) Means Feature or Function is available with category.

A complete Analog Service channel is described by three codes. The first is the Network Channel (NC) Code and the other two codes describe the two ends of the channel. These last two codes are called the Network Channel Interface (NCI) codes.

A typical example of a VG 32 channel follows:

NC = UC --

NCI   NCI
02LA2   Central Office   02LS2

O--------+----------------------O----------------------+--------O

Customer   (2-Wire)   (2-Wire)   Customer
Equipment   Equipment
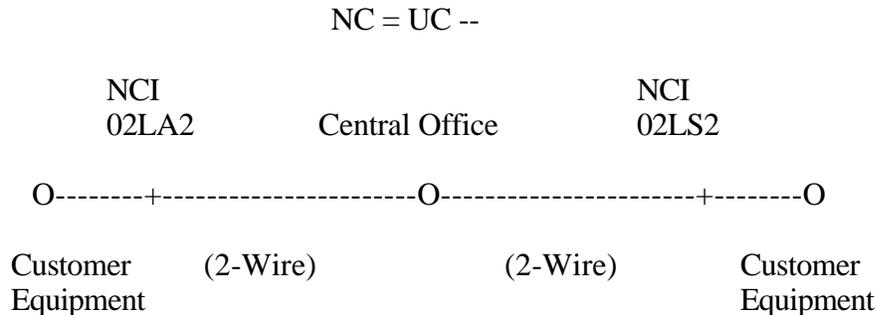
The Network Channel (NC) Code is an encoded representation used to identify both switched and non-switched channel services. Included in this code set are customer options associated with individual channel services, or feature groups and other switched services.

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 customer location. The Interface elements are: Total Conductors, Protocol, Impedance, Protocol Options, and Transmission Level Points (TLP).

The Protocol Code (character positions 3 and 4 of the NCI Code) is a two-character alpha code that defines requirements for the interface regarding signaling and transmission.

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2.   Voice Grade 32

2.1   Channel Performance

Voice Grade 32 (VG 32) channels are designed to provide a grade of service equal to the historical "Line" type. Transmission parameters are the same as traditionally found on end-to-end line services.

The Service Code for VG 32 is "UC". The full NC Code is shown in the following table. Based on the type of NCI selected, some limits to VG 32 channels may apply. The Network Channel Interfaces for VG 32 services, are discussed in Para. 2.6.

Network Channel Code: VG 32

Network Channel		
Service Code	**Options**	**Remarks**
1-2	3-4	
UC	--	Standard
	-A	Effective 4-Wire [1]
	-B	CO Bridging
	D-	Data Enhancement
	DB	Data Enhancement + CO Brdg

Note:
1. Effective 4-Wire is a tariffed offering in Iowa, Minnesota and Nebraska.

2.2   Standard Channel Features and Functions

VG 32 can be viewed as a building block service. Such features as Data Enhancement and Multipoint services can be added to VG 32 service. The following information describes VG 32 basic channel parameters, transmission limits, and interface specifications. Enhanced features are listed by category as well.

Features and Options: VG 32		
Category	**Standard Channel**	**Options**
Configuration	2 Point	Multipoint Bridge Lifter Resistive Bridge Transfer Arrangement
Channel	2-Wire/4-Wire	
Interface	2-Wire/4-Wire	
Signaling	No Signaling	Loop Start Auto Ringdown Code Select Ring Manual Ringdown
Attenuation Distortion 404-2804 Hz 304-3004 Hz	-2 to +11.5dB -3 to +12dB [1]	-1 to + 6dB -3 to +12dB [1, 3]
Impedance Balance	2-Wire ERL = 5dB SRL = 2.5dB	
Noise Measurement	[2]	[2]
Impulse Noise (=15 Counts in 15 Min.)	Threshold Setting 71dBrnc0	Threshold Setting 71dBrnc0
Interface Levels	TLVR 0 dB (From Customer) TLVT 0 to -16 dB (To Customer)	See Table in Para. 2.7
Expected Loss	=10dB at 1004Hz See Table in Para. 2.7	See Table in Para. 2.7
Actual Variation	±4.0dB at 1004Hz	Same
Envelope Delay Distortion [3]	None	804 to 2604Hz 1250 uSEC.
Phase Jitter Limits [3]	None	4 to 304Hz =12 Degrees
Intermodulation Distortion (Also Known as Non-Linear Distortion) Ratio to Fundamental [3]	None	Second Order = 28dB Third Order = 35 dB

Notes continued on next page.

Notes:
1. "+" means more loss and "-" means less loss compared to actual loss at 1004Hz.
2. C - Message Noise:
   Local Loop   36 dBrnC
   Digital Cxr.   40 dBrnC0
   C - Notched Noise with -13 dBm0 Holding Tone:
   Noise   45 dBrnC0
   S/N Ratio   32 dB
3. The "Data Enhancement" option provides improved attenuation distortion requirements and establishes limits for envelope delay distortion, phase jitter and intermodulation distortion.

2.3   Optional Features and Functions

Optional Feature Available by Signaling Type. The following table shows the relationship between the various features available with each signaling type:

	Loop Start	Auto Ring	Man. Ring	Code Sel.	No Sig.
2-Wire	X	X	X	X	X
4-Wire			X	X	X
2 Point	X	X			X
Multipoint	X	X	X	X	X
Bridge Type:					
Resistive			X	X	X
Transfer	X	X	X	X	X
Bridge Lifter	X				
Data Enhancement	X				

2.4   Bridging: VG 32

Three types of CO bridging are used on Multipoint circuits.

*   Resistive Bridges (BR) are used to tie 3 or more locations together continuously. A signal originated on one leg will be sent to the other legs simultaneously.

*   Transfer Bridges (BT) are used to rearrange circuits in a central office via customer control. Night transfer and alternate circuits are examples of the transfer arrangement. Note: Control of transfer bridge is provided by a separate Low-Speed Data channel.

*   Bridge Lifters (BL) are used to provide Multipoint loop start services such as PBX off-premises stations.

    BR   Voice Resistive Bridge (BR) required when circuit extends to 3 or more customer locations on a non-transfer basis. Does not apply to Dial Services.

    BT   Transfer Bridge (BT) required when circuit is periodically rearranged in Central Office under customer control.

    BL   Bridged Lifters (BL) required when Dial Service is connected to 2 or more customer premises.

2.5   Data Enhancement

VG 32 Loop start services may be conditioned to transport data signals as well as voice. When the "Data Enhancement" option is ordered, the channel will be aligned to data performance specifications.

2.6   Compatible Interface Code Combinations

The following table summarizes VG 32 optional features by signaling type. Both 2 Point and Multipoint services are addressed, where appropriate. Note that two NCI codes are listed together; these are the only valid compatible interface codes for VG 32. Other combinations may be requested under VG Custom described in Chapter 6.

Interface Code Combinations: VG 32			
Optional	NCI Code		
Features	EU-A	EU-Z	Data Enhancement
2 Point			
No Signaling	02NO2	02NO2	- -
	04DS9.15 [2]	02NO2	- -
	04DS9.15 [2]	04NO2	- -
	04NO2	02NO2	- -
	04NO2	04NO2	- -
	O4DS9.NO [2]	04DS9.NO	- -
Loop-Start Signaling	04DS9.15 [2]	02LS2	04DS9.15 - 02LS2.DB
	04DS9.LO	04DS9.LS	- -
	02LA2	04DS9.15 [2]	02LA2.DB - 04DS9.15
	02LA2	02LS2	02LA2.DB - 02LS2.DB
	02LB2	04DS9.15 [2]	02LB2.DB - 04DS9.15
	02LB2	02LS2	02LB2.DB - 02LS2.DB
	02LC2	04DS9.15 [2]	02LC2.DB - 04DS9.15
	02LC2	02LS2	02LC2.DB - 02LS2.DB
	02LG2	02LS2	02LG2.DB - 02LS2.DB
	02LG2	04DS9.15 [2]	02LG2.DB - 04DS9.15
	02LO2	04DS9.15 [2]	02LO2.DB - 04DS9.15
	02LO2	02LS2	02LO2.DB - 02LS2.DB
	02LO3	04DS9.15	02LO3.DB - 04DS9.15
	02LO3	02LS2	02LO3.DB - 02LS2.DB
Auto Ringdown	04DS9.15	02LR2	- -
	02LR2	02LR2	
Multipoint CO Bridging			
Resistive Bridge Manual Ringdown [1]	04BR2.CF	02AC2	- -
	04BR2.CF	04AC2	- -
Code-Select Ringdown [1]	04BR2.CF	02AC2.R	- -
	04BR2.CF	04AC2.R	- -
No Signaling	04BR2.CF	02NO2	- -
	04BR2.CF	04NO2	- -
Bridge-To-Bridge	04BR2.CF	04BR2.CF	- -
Bridge-To-Transfer	04BR2.CF	04BT2	- -
Bridge-To-DS1	04BR2.CF	04DS9.15 [2]	- -

Interface Code Combinations: VG 32			
Optional	**NCI Code**		
Features	**EU-A**	**EU-Z**	**Data Enhancement**
Transfer Arrangement Manual Ringdown [1]	04BT2	02AC2	- -
	04BT2	04AC2	- -
Code-Select Ringdown [1]	04BT2	02AC2.R	- -
	04BT2	04AC2.R	- -
Loop-Start Signaling	02LA2	02BT2	02LA2.DB - 02BT2
	02LB2	02BT2	02LB2.DB - 02BT2
	02LC2	02BT2	02LC2.DB - 02BT2
	02LG2	02BT2	02LG2.DB - 02BT2
	02LO2	02BT2	02LO2.DB - 02BT2
	02LO3	02BT2	02LO3.DB - 02BT2
	02LS2	02BT2	02LS2.DB - 02BT2
Auto Ringdown	02BT2	02LR2	- -
No Signaling	02BT2	02NO2	- -
	04BT2	02NO2	- -
	04BT2	04NO2	- -
Transfer-To-Transfer	02BT2	02BT2	- -
	04BT2	04BT2	- -
Transfer-To-DS1	02BT2	04DS9.15	- -
	04BT2	04DS9.15	- -
Bridge Lifter Loop-Start Signaling	02BL2	02LA2	- -
	02BL2	02LB2	- -
	02BL2	02LC2	- -
	02BL2	02LG2	- -
	02BL2	02LO2	- -
	02BL2	02LO3	- -
	02BL2	02LS2	- -
Bridge Lifter-To-DS1	02BL2	04DS9.15	- -

Notes:
1. Ringing generator and talk battery provided by customer at each location.
2. Substitute 04CS9.15 for Command A Link service, but not with Data Enhancement.

2.7   Transmission Levels: VG 32

The NCI code describes the number of wires, protocol code, options, and levels at the Network
Interface to the EU. See Appendix A for a complete description of the NCI code. In VG 32 some
Transmission Level Value Transmit (TLVT) levels can be specified by the customer within a
limited range. This table relates the NCI code with the default level and ranges for TLVT
(Transmit) and TLVR (Receive).

NCI Code	Permissible Customer Specified TLP Values at the Network Interface: VG 32 [1]	
	Transmit Level Out from the CO (dB) TLVT	Receive Level Into the CO (dB) TLVR
02AC2 02AC2.R	-10.0 (-10.0 to -4.0)	0.0
04AC2 04AC2.R	-10.0 (-10.0 to -4.0)	0.0
02BL2 [2, 3]	-	-
04BR2 [2, 3]	-	-
02BT2 [2, 3] 04BT2 [2, 3]	- -	- -
04CS9 [4]	-	-
04DS9 [4]	-	-
02LA2 02LB2 02LC2 02LG2	-5.0 (-5.0 to -4.0)	0.0
02LO2 02LO3	-5.0 (-7.0 to -4.0)	0.0
02LS2	-5.0 (-7.0 to -3.0)	0.0
02LR2	-10.0 (-10.0 to -3.0)	0.0
02NO2	-10.0 (-10.0 to 0.0)	0.0
04NO2	-16.0 (-16.0 to -10.0)	0.0

Notes:
1. The levels shown are the permissible values for each interface. The default value is given
    followed by optional range (in parenthesis) when available, in one-dB steps.
2. This interface is a termination in a QWEST CO.
3. Levels that are dashed out (-); default to QWEST equipment levels.
4. Digital interface (DS1); levels are dashed out (-).

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3.   Voice Grade 33

3.1   Channel Performance

Voice Grade 33 (VG 33) channels are designed to provide a grade of service equal to the historical "trunk" type. Transmission parameters are the same as traditionally found on end-to-end trunk services and PBX tie lines.

The Service Code for VG 33 is "UD". The full NC Code is shown in the following table. Based on the type of NCI selected, some limits to VG 33 channels may apply. The NCI's for VG 33 services are discussed in Para. 3.4.

Network Channel Code : VG 33

Network Channel		
Service Code	**Options**	**Remarks**
1-2	3-4	
UD	--	Standard
	-B	CO Bridging
	D-	Data Enhancement
	DB	Data Enchmt + CO Brdg

3.2   Standard Channel Features and Functions

VG 33 can be viewed as a building block service. Such features as Data Enhancement and Multipoint services can be added to VG 33 service. The following information describes VG 33 standard channel parameters, transmission limits, and interface specifications. Enhanced features are listed by category as well.

Features and Options: VG 33		
Category	**Standard Channel**	**Options**
Configuration	2 Point	Multipoint
Channel	2-Wire/4-Wire	Transfer Arrangement
Interface	2-Wire/4-Wire	
Signaling	No Signaling	Ground Start E&M Signaling
Attenuation Distortion 404-2804Hz 304-3004Hz	IAL -2 to + 6dB -3 to +12dB [1]	ML -1.5 to +5dB -3 to +12dB [1, 3]

Features and Options: VG 33		
Category	**Standard Channel**	**Options**
Impedance Balance	4-Wire ERL =18dB SRL =12dB	2-Wire ERL = 5dB ERL = 2.5dB
Noise Measurement	[2]	[2]
Impulse Noise (=15 Counts in 15 Min.)	Threshold Setting 71dBrnc0	Threshold Setting 71dBrnc0
Interface Levels	TLVR 0 to -6.0dB (From Customer) TLVT 0 to -5dB (To Customer)	See Table in Para. 3.5
Expected Loss	See Table in Para. 3.5	See Table in Para. 3.5
Actual Variation	±4.0dB at 1004Hz	Same
Envelope Delay [3]	None	1250 uSEC
Phase Jitter Limits [3]	None	4 to 304Hz = 12 Degrees
Intermodulation Distortion (Also known as Non-Linear Distortion) Ratio to Fundamental [3]	None	Second Order = 48dB Third Order = 50dB

Notes:
1. "+" means more loss and "-" means less loss compared to actual loss at 1004Hz.
2. C - Message Noise: Immediate Action Limit (IAL)
    Local Loop   36 dBrnC
    Digital Cxr.   40 dBrnC0
    C - Notched Noise with -13 dBm0 Holding Tone: (IAL)
    Noise   45 dBrnC0
    S/N Ratio   32 dB
3. The "Data Enhancement" option provides improved attenuation distortion requirements and
    establishes limits for envelope delay distortion, phase jitter and intermodulation distortion.

3.3   Optional Features and Functions

• Optional Feature Available by Signaling Type

  The following table shows the relationship between the various features available with each signaling type:

	Ground Start	E&M Signaling	No Sig.
2-Wire	X	X	X
4-Wire		X	Std.
2 Point	X	X	X
Multipoint	X	X	X
Transfer Arrangement	X	X	X
Data Enhancement	X	X	-

• Bridging: VG 33

  Transfer Bridges (BT) are used to rearrange circuits in a central office via customer control. Night transfer and alternate circuits are typical examples of the transfer arrangement.

  BT   Transfer relay (BT) required when circuit periodically rearranged in CO under customer control.

• Data Enhancement : VG 33

  Ground start and E&M Signaling services may be conditioned to transport data signals as well as voice. When the "Data Enhancement" option is ordered, the channel will be aligned to data performance specifications.

3.4   Compatible Interface Code Combinations

The following table summarizes VG 33 optional features by signaling type. Both 2 Point and Multipoint services are addressed, where appropriate. Note that two NCI codes are listed together; these are the only valid compatible interface codes for VG 33. Other combinations may be requested under VG Custom described in Chapter 6.

Interface Code Combinations: VG 33					
Optional Features	**NCI Code**		**Data Enhancement**		
	EU-A	**EU-Z**			
2 Point					
E&M Signaling [2]	02CT3 [1]	02CT3 [1]	02CT3.DD -	-	02CT3.DD
	02CT3 [1]	04DS9.15	02CT3.DD	-	04DS9.15
	02CT3 [1]	04EA2.*	02CT3.DD	-	04EA2.*DD
	02CT3 [1]	06EA2.*	02CT3.DD	-	06EA2.*DD
	02CT3 [1]	06EB2.*	02CT3.DD -	-	06EB2.*DD
	02CT3 [1]	08EB2.*	02CT3.DD	-	08EB2.*DD
	04CT2.[1]	04CT2 [1]	04CT2.DD	-	04CT2.DD
	04CT2.[1]	04DS9.15	04CT2.DD	-	04DS9.15
	04CT2.[1]	04EA2.*	04CT2.DD	-	04EA2.***
	04CT2.[1]	06EA2.*	04CT2.DD	-	06EA2.***
	04CT2.[1]	06EB2.*	04CT2.DD	-	06EB2.***
	04CT2.[1]	08EB2.*	04CT2.DD	-	08EB2.***
	04DS9.15 [3]	04EA2.*	04DS9.15	-	04EA2.*DD
	04DS9.15 [3]	06EA2.*	04DS9.15	-	06EA2.*DD
	04DS9.15 [3]	06EB2.*	04DS9.15	-	06EB2.*DD
	04DS9.15 [3]	08EB2.*	04DS9.15	-	08EB2.*DD
	04EA2.*	04EA2.*	04EA2.*DD	-	04EA2.*DD
	04EA2.*	06EA2.*	04EA2.*DD	-	06EA2.*DD
	04EA2.*	06EB2.*	04EA2.*DD	-	06EB2.*DD
	04EA2.*	08EB2.*	04EA2.*DD	-	08EB2.*DD
	06EA2.*	06EA2.*	06EA2.*DD	-	06EA2.*DD
	06EA2.*	06EB2.*	06EA2.*DD	-	06EB2.*DD
	06EA2.*	08EB2.*	06EA2.*DD	-	08EB2.*DD
	06EB2.*	06EB2.*	06EB2.*DD	-	06EB2.*DD
	06EB2.*	08EB2.*	06EB2.*DD	-	08EB2.*DD
	08EB2.*	08EB2.*	08EB2.*DD	-	08EB2.*DD
	04DS9.EA	04DS9.EA		- -	

Interface Code Combinations: VG 33					
Optional	NCI Code		Data		
Features	EU-A	EU-Z	Enhancement		
2 Point					
Ground-Start	02GO2	02GS2	02GO2.DD	-	02GS2.DD
	02GO2	04DS9.15 [3]	02GO2.DD	-	04DS9.15
	02GO3	02CT3 [1]	02GO3.DD	-	02CT3.DD
	02GO3[1]	02GS2	02GO3.DD	-	02GS2.DD
	02GO3[1]	04DS9.15	02GO3.DD	-	04DS9.15
	04DS9.15 [3]	02GS2	04DS9.15	-	02GS2.DD
	04DS9.EA	04DS9.GO	- -		
No Signaling	04NO2	04NO2	- -		
	04DS9.15 [3]	04NO2	- -		
	04DS9.NO [3]	04DS9.NO	- -		
Reverse Battery	02RV3.0	02RV2.T	- -		
	02RV3.0	04DS9.15	- -		
	04DS9.15	04RV2.T	- -		
	04DS9.EA	04DS9.EA	- -		
Multipoint					
Transfer Arrangement	02BT2	02GO2	02BT2	-	02GO2.DD
	02BT2	02GS2	02BT2	-	02GS2.DD
	04BT2	04EA2.*	04BT2	-	04EA2.*DD
	04BT2	06EA2.*	04BT2	-	06EA2.*DD
	04BT2	06EB2.*	04BT2	-	06EB2.*DD
	04BT2	08EB2.*	04BT2	-	08EB2.*DD
	04BT2	04NO2			
	02CT3 [1]	04BT2	02CT3.DD	-	04BT2
	04CT2 [1]	04BT2	04CT2.DD	-	04BT2
	02GO3 [1]	04BT2	02GO2.DD	-	02BT2
Transfer-To-DS1	02BT2	04DS9.15	- -		
	04BT2	04DS9.15	- -		
Bridge Lifter	02BL2	02GS2	- -		
	02BL2	04DS9.15	- -		

Notes:
1. This interface is a termination in QWEST CO.
2. The "*" can be replaced with E or M lead originate.
3. Substitute 04CS9.15 for Command A Link Service, but not with Data Enhancement.

3.5   Transmission Levels: VG 33

The NCI code describes the number of wires, protocol code, options, and levels at the network interface to the end user. See Appendix A for a complete description of the NCI code. In VG 33 some Transmission Level Value Transmit (TLVT) levels can be specified by the customer within a limited range. This table relates the NCI code with the default level and ranges for TLVT (Transmit) and TLVR (Receive).

NCI Code	Permissible Customer Specified TLP Values at the Network Interface: VG 33 [1]		
	Transmit Level Out from the CO (dB) TLVT	Receive Level Into the CO (dB) TLVR	Remarks
02BT2 [2, 3] 04BT2 [2, 3]	- -	- -	CO Bridges
02CT3 [2]	-5.0 (-5.0 to -2.0)	0.0	CO Switch (Trunk Ckt.)
04CT2	-5.0 (-5.0 to -3.0)	0.0	CO Switch (Trunk Ckt.)
04CS9 [4]	-	-	
04DS9 [4]	-	-	
04EA2.E 04EA2.M	-3.0 (-5.0 to -2.0) +7.0	-2.0 -16.0	TL11M/E,11TTMB VCA(CDQ2X)
06EA2.E 06EA2.M	-3.0 (-5.0 to 2.0) +2.0 (-1.0 to +2.0) +7.0	-2.0 -6.0 -16.0	TL31M/E,31TLMB TC31M/E VCA (CDQ4X)
06EB2.E 06EB2.M	-3.0 (-5.0 to -2.0) +7.0	-2.0 -16.0	TL12M/E,12TTMB VCA (CDQ2W)

NCI Code	Transmit Level Out from the CO (dB) TLVT	Receive Level Into the CO (dB) TLVT	Remarks
Permissible Customer Specified TLP Values At The Network Interface: VG 33 [1]			
08EB2.E 08EB2.M	-3.0 (-5.0 to -2.0)	-2.0	TL32M,32TTMB TL32E,32TTEG
	+2.0 (-1.0 to +2.0)	-6.0	TC32M/E
	+7.0	-16.0	32TTMB VCA (CDQ4W)
02GO2 02GO3 02GS2	-5.0 (-5.0 to -3.0) [5]	0.0	
02RV2 02RV3	-5.0 (-5.0 to -3.0)	0.0	[6]
04NO2	-5.0 (-16.0 to -5.0)	0.0	

Notes:
1. The levels shown are the permissible values for each interface. The default value is given followed by optional range (in parenthesis) when available, in one-dB steps.
2. This interface is a termination in a QWEST CO.
3. Levels that are dashed out (-); default to QWEST equipment levels.
4. Digital interface (DS1); levels are dashed out (-).
5. QWEST may provide higher TLVT depending upon facility type and loss.
6. Reverse Battery option is available to Foreign Exchange DIDs and Radio Common Carriers (RCC) tariffed for DID trunks.

CONTENTS

4.   Voice Grade 36

4.1   Channel Performance

Voice Grade 36 (VG 36) channels are designed to provide a grade of service equal to the historical type for the "analog data". Transmission parameters are the same as traditionally found on end-to-end analog data services.

The Service Code for VG 36 is "UG". The full NC Code is shown in the following table. Based on the type of NCI selected, different parameters will apply. The NCI's for VG 36 services, are discussed in Para. 4.6 and in Appendix A.

Network Channel Code: VG 36

Network Channel		
Service Code 1-2	**Options 3-4**	**Remarks**
UG	--	Standard Channel
	-B	Bridging
	C-	C Conditioning
	CB	C Cond + Bridging
	D-	D Conditioning (2 Point)
	E-	C + D Cond (2 Point)
	FB	Split Freq. Bridging
		Data Select-A-Station
	XB	DSAS Brdg - Addressable
	XY	DSAS Brdg - Sequential

4.2   Standard Channel Features and Functions

VG 36 can be viewed as a building block service. Such features as Multipoint services and special data conditioning can be added to VG 36 service. C and D conditioning are discussed in Para. 4.5. The following information describes VG 36 standard channel parameters, transmission limits, and interface specifications. Enhanced features are listed in the third column.

Features and Options: VG 36		
Category	**Standard Channel**	**Options**
Arrangement	2 Point	Multipoint • Resistive Bridge Conference Split Path • Select-A-Station • Split Freq. • Transfer Arrangement • DDS Off Net. Ext. (Subrate Analog) [Note 3 for Definitions]
Channel	2-Wire/4-Wire	
Interface	2-Wire/4-Wire	
Attenuation Distortion 504-2504Hz 404-2804Hz 304-3004Hz	-2 to +8dB -2 to +10dB -3 to +12dB [1]	See Conditioning Table (Para.4.5)
Impedance Balance	2-Wire ERL =5 dB SRL = 2.5dB	
Noise Measurement	[2]	[2]
Impulse Noise (=15 Counts in 15 Min.)	Threshold setting 71dBrnc0	Threshold setting 71dBrnc0
Interface Levels	TLVR +13 dBm (From Customer) TLVT -3 dBm (To Customer)	TLVR +13 dBm (From Customer) TLVT -3 dBm (To Customer)
Expected Measured Loss (EML)	16 dB at 1004Hz	See Table in Para. 4.7
Actual Measured Loss (AML)	±4.0 dB at 1004Hz	±4.0 dB at 1004Hz
Envelope Delay Distortion	804 to 2604Hz 1750 uSEC.	See Conditioning Table (Para. 4.5)
Phase Jitter Limits	4 to 304Hz =15 Degrees	4 to 304Hz =15 Degrees
Intermodulation Distortion (Also Known as Non-Linear Distortion) Ratio to Fundamental D1 Conditioning	Second Order =27dB Third Order =32dB	Second Order =27dB Third Order =32dB Second Order =35dB Third Order =40dB

Notes continued on next page.

Notes:

1. "+" means more loss and "-" means less loss compared to actual loss at 1004Hz.

2. C - Message Noise: (IAL)

Local Loop	36 dBrnC
Digital Cxr.	40 dBrnC0

   C - Notched Noise with -13 dBm0 Holding Tone: (IAL)

Noise	45 dBrnC0
S/N Ratio	32 dB
D1 Cond.	49/28

3. Definitions
   Resistive Bridge Conference - is a 4-Wire resistor network distributing voice frequency signals to several legs. The equipment is located in a QWEST CO.

   Resistive Bridge Split Path - is composed of 2- or 4-Wire resistor networks, one for transmit signals and the other for receive, located in a QWEST CO

   Select-A-Station - is a feature where one master poles a large number of slave ports in rapid sequence. The equipment is located in a QWEST CO

   Split Frequency Bridge - is a 4-Wire master port, 2-Wire slave port, active data bridge. Simultaneous bi-directional transmission of up to 300 baud is possible. The equipment is located in a QWEST CO

   Transfer Bridge - is a relay under control of the customer, located in a QWEST CO.

   DDS Off Network Extension - is an analog data extension from a digital facility or hub used when digital facilities are unavailable.

4.3   Optional Features and Functions

Optional Features Available. The following table shows the relationship between various Features available with each option:

	DATA (DCTE)	TRFR BRDG	CONF BRDG (DCTE)	SPLIT PATH BRDG (DCTE)	SELECT -A- STATION	SPLIT FREQ (DCTE)	DDS OFF NET. EXT. (DCTE)
2-Wire	C, D		C	C	X	X	
4-Wire	C, D	X	C	C	C2	XX	
6-Wire	C, D		C	C			X
2 Point	C, D						
Multipoint	X	X	C	C	C2	XC	

Notes:

DCTE = Data Channel Terminating Equipment (loop back) interface available

X = Feature or Option available

C = Feature or Option available with or without C1, C2, or C4 conditioning

D = D1 conditioning available with feature (2 Point Only)

C2 = C2 conditioning must be ordered for midlinks and four wire primary station leg

4.4   Bridging: VG 36

Five types of CO bridging are used on VG 36 Multipoint circuits. The following list gives a brief description of each of the five bridging categories available in VG 36.

BD   Digital Data Systems (DDS). These are analog extensions to be used where DDS digital channel is unavailable.

BF   Split Frequency Bridge (BF)

BR   Resistive Bridge (BR) required when circuit extends to 3 or more customer locations on a non-transfer basis.

BS   Data Select-A-Station Bridge (BS)

BT   Transfer Relay (BT) required when circuit periodically rearranged in CO under customer control. Control of this bridge is provided by a separate Low-Speed Data Channel.

4.5   Data Conditioning: VG 36

Standard data conditioning is applied to all VG 36 services whether it is a 2 Point or a Multipoint circuit. This standard conditioning can be enhanced by the addition of "C" conditioning or "D" conditioning or a combination of both "C" and "D" conditioning (if the circuit is a 2 Point service). The following table lists the specific parameters and limits for Standard and "C" conditioning. (For "D" conditioning, available on 2 Point circuits, see Para. 4.3.)

Conditioning Table		
Conditioning	**Attenuation Distortion by Frequency Band Limits**	**Envelope Delay Distortion by Frequency Band Limits**
2 Point (EU to EU) Standard	504-2504Hz -2 to +8 404-2804Hz -2 to +10 304-3004Hz -3 to +12	804-2604Hz < 1750uSec.
C1	1004-2404Hz -1 to +3 304-2704Hz -2 to +6 2704-3004Hz -3 to +12	1004-2404Hz <1000uSec. 804-2604Hz <1750uSec
C2	504-2804Hz -1 to +3 304-3004Hz -2 to +6	1004-2604Hz < 500uSec. 604-2604Hz <1500uSec. 504-2804Hz <3000uSec.
C4	504-3004Hz -2 to +3 304-3204Hz -2 to +6	1004-2604Hz < 300uSec. 804-2804Hz < 500uSec. 604-3004Hz <1500uSec. 504-3004Hz <3000uSec.
Multipoint -End Link- (EU to CO Bridge) Standard	504-2504Hz -1 to + 4 404-2804Hz -1 to + 5 304-3004Hz -1.5 to +6	804-2604Hz < 685uSec.
C1	1004-2404Hz -0.6 to +1.5 304-2704Hz -1 to +3 2704-3004Hz -1.5 to + 6	1004-2404Hz < 400uSec. 804-2604Hz < 685uSec.
C2	504-2804Hz -0.6 to +1.5 304-3004Hz -1 to +3	1004-2604Hz < 200uSec. 604-2604Hz < 600uSec. 504-2804Hz <1200uSec.
C4	504-3004Hz -1 to +1.5 304-3204Hz -1 to +3	1004-2604Hz < 165uSec. 804-2804Hz < 275uSec. 604-3004Hz < 825uSec. 504-3004Hz <1650uSec.

Conditioning Table		
Conditioning	Attenuation Distortion by Frequency Band Limits	Envelope Delay Distortion by Frequency Band Limits
Multipoint -Mid Link- (Bridge to Bridge)Standard	504-2504Hz -1 to +3.5 404-2804Hz -1 to +5 304-3004Hz -1.5 to +6	804-2604Hz < 400uSec.
C1	1004-2404Hz -0.5 to +1.5 304-2704Hz -1 to +3 2704-3004Hz -1.5 to +6	1004-2404Hz < 250uSec. 804-2604Hz < 400uSec.
C2	504-2804Hz -0.5 to +1.5 304-3004Hz -1 to +3	1004-2604Hz < 125uSec. 604-2604Hz < 375uSec. 504-2804Hz < 750uSec.
C4	Not Applicable	Not Applicable

4.6   Compatible Interface Code Combinations

The following table summarizes VG 36 optional features by functional data type. Both 2 Point and Multipoint services are addressed, where appropriate. Note that two NCI codes are listed together; these are the only valid compatible interface codes for VG 36. Other combinations may be requested under VG Customized described in Chapter 6.

Interface Code Combinations: VG 36			
	NCI Code		
Optional Features	EU-A	EU-Z	Conditioning Optional [1]
2 Point			
Data	02DA2 04DA2 06DA2 06DA2 04DS9.15 [2] 04DS9.15 [2] 04DS9.15 [2] 04DS9.NO [2]	02DA2 04DA2 04DA2 06DA2 02DA2 04DA2 06DA2 04DS9.NO	02DA2.*** - 02DA2.*** 04DA2.*** - 04DA2.*** 06DA2.*** - 04DA2.*** 06DA2.*** - 06DA2.*** 04DS9.15 - 02DA2.*** 04DS9.15 - 04DA2.*** 04DS9.15 - 06DA2.*** - -

Continued on next page.

Interface Code Combinations: VG 36			
	NCI Code		
Optional Features	**EU-A**	**EU-Z**	**Conditioning Optional [1]**
Multipoint CO Bridging			
Resistive Bridge Conference Data	04BR2.CF	02DA2	04BR2.CF - 02DA2.***
	04BR2.CF	04DA2	04BR2.CF - 04DA2.***
	04BR2.CF	06DA2	04BR2.CF - 06DA2.***
	04BR2.CF [2]	04DS9.15	- -
Split Path Data (One Way)	02BR2.SP	02DA2	02BR2.SP - 02DA2.***
	04BR2.SP	02DA2	04BR2.SP - 02DA2.***
	04BR2.SP	04DA2	04BR2.SP - 04DA2.***
	04BR2.SP	06DA2	04BR2.SP - 06DA2.***
	04BR2.SP	04DS9.15	- -
.Bridge-To-Bridge	04BR2	04BR2	- -
.Bridge-To-Transfer	04B42	04BT2	- -
Transfer Arrangement	04BT2	02DA2	04BT2 - 02DA2.***
	04BT2	04DA2	04BT2 - 04DA2.***
	04BT2	06DA2	04BT2 - 06DA2.***
	04BT2	04DS9.15	- -
.Transfer-To-Transfer	04BT2	04BT2	- -
Data Select-A-Station	04BS2	02DE2	- -
	04BS2	04DS9.15	- -
	04BS2	04DE2	- -
.Bridge-To-Bridge	04BS2	04BS2	- -
Split Frequency (Two Way)	04BF2	02DA2	- -
	04BF2	04DS9.15	- -
	04BF2	04DA2	- -
	04BF2	04BF2	- -
DDS Off Net Ext (Subrate)	04BD2.24	04DA2	- -
	04BD2.48	04DA2	- -
	04BD2.96	04DA2	- -

Notes continued on next page.

Notes:

1. With C-conditioning option:

   *** = C1
   *** = C2
   *** = C4

   With D-conditioning option (2 Point Only):

   *** = D1

   With C + D-conditioning option (2 Point Only):

   *** = C11
   *** = C21
   *** = C41

2. Substitute 04CS9.15 for Command A Link service, but not with optional conditioning.

4.7   Transmission Levels: VG 36

The NCI code describes the number of wires, protocol code, options, and levels at the network interface to the end user. See Appendix A for a complete description of the NCI code. This table relates the NCI code with the default levels for TLVT (Transmit) and TLVR (Receive).

Permissible TLP Values at the Interface		
NCI Code [1]	Transmit Level Out from the CO (dB) TLVT	Receive Level Into the CO (dB) TLVR
04BD2 [2, 3]	-	-
04BF2 [2, 3]	-	-
02BR2 [2, 3] 04BR2 [2, 3]	- -	- -
04BS2 [2, 3]	-	-
04BT2 [2,3]	-	-
02DA2 [5] 04DA2 [5] 06DA2 [5]	-3.0	+13.0
02DE2	-17.0	+13.0
04DE2	-3.0	+13.0
04DS9 [2, 4]	-	-
04CS9 [2, 4]	-	-

Notes:

1. The levels shown are the permissible values for each interface.

2. This interface is a termination in a QWEST CO.

3. Levels are dashed out (-); default to QWEST equipment levels.

4. Digital interface (DS1); levels are dashed out (-).

5. QWEST will place Data Channel Terminating Equipment at the POT for NCI of 0xDA2.

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Chapter and Section   **Page**

5.   Voice Grade Basic

5.1   Channel Performance

Voice Grade Basic (VGB) service is a 2 Point nonswitched service used for voice grade (300-3000Hz) applications without signaling or performance enhancements. The facility may be metallic or carrier derived at the option of QWEST DC continuity is not inherent in this service. Two wire circuits, end-to-end, will be limited to one CO serving area while four wire circuits may be ordered within or between any CO within a LATA. Voice band signaling may be used for supervision by the customer, but will not be supported by QWEST.

Network Channel Code: VGB

Network Channel		
Service Code	**Options**	**Remarks**
1-2	3-4	
UZ	- -	Standard

5.2   Optional Features and Functions

The customer can specify whether the channel will be wholly 2-Wire or wholly 4-Wire. No other option is available for this nondesigned service. No special equipment is added to compensate for attenuation distortion, delay distortion, loss, noise or longitudinal imbalance. Circuit loss is not fixed and will vary based on the type and length of facilities connecting the two locations. QWEST assumes that the customer can evaluate the characteristics of a VGB circuit and provide the needed equipment to complement the facility. Typical circuit loss will be in the range of 0-16dB. Higher circuit losses are possible but their occurrence would be rare.

5.3   Interface Code Combinations

The electrical interface with QWEST for VGB is described by an interface code at each end of the service. See Appendix A for a complete description of the NI Codes.

Valid Code Combinations: VGB

Valid Code Combinations: VGB			
	EU-A		**EU-Z**
Intra Wire Center	02NO2	to	02NO2
	04NO2	to	04DS9.15
	04NO2	to	04NO2
Inter Wire Center	04NO2	to	04DS9.15
	04NO2	to	04NO2

Only the code combinations shown above will be provided. Note that 2-Wire to 4-Wire conversion is not available with this nondesigned service.

A Voice Grade Basic channel ordered between two central offices will generally encounter carrier facilities. The loss contribution of all carrier facilities will be set to 0dB at 1004Hz. This leaves only the loss of the local channels serving each POT. (Exception: At no time will the transmission level exceed 0dB into QWEST cable facilities.)

The circuit loss and frequency response is a function of the facility length, gauge of the wire, and loading schemes. Substantial description of local serving loops has been published by the Institute of Electrical and Electronics Engineers (IEEE). This IEEE document, 820-1984, can be used effectively to predict expected circuit loss.

Service turnup tests will be limited to "continuity" tests only. When carrier facilities are involved, continuity will be checked using a test tone. Typically 1004Hz will be used. On metallic facilities DC tests may be used to determine circuit continuity.

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6.   Voice Grade Custom

6.1   Channel Performance

The Voice Grade Custom (VGC) category is designed to accommodate unusual circuit arrangements and interfaces. The complete Network Channel Code for VGC is shown in the following table:

Network Channel Code: VGC (Customized)

Network Channel		
Service Code	**Options**	**Remarks**
1-2	3-4	
UQ	-Z	Customized

6.2   Channel Technical Specification

Grade Customized channels should be used when specific requirements cannot be met by VG 32, VG 33 or VG 36 described above. Requirements for channel performance and interface codes should be submitted to QWEST who will then develop the serving arrangement, if possible.

6.3   Compatible Interface Combinations

Transmission limits described in VG 32, VG 33 or VG 36 may be supported in this category. Any combination of voice frequency interface codes will be considered in this customized category.

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7.   Audio Services (Non-Broadcast)

7.1   Channel Performance

Audio Services (Non-Broadcast) (AP) channels are designed to provide a nonbroadcast grade of service. Transmission parameters are the same as traditionally found on end-to-end services.

The Service Code for AP is "UE". The full NC Code is shown in the following table. The NCI's for AP services, are discussed in Para. 7.2

Network Channel Code: AP

Network Channel		
Service Code	**Options**	**Remarks**
1-2	3-4	
UE	- - -B P- PB	Standard CO Bridging Gain/Equalization Gain/Equal + CO Brdg

AP provides a unidirectional channel with an Expected Measured Loss (EML) of =12dB when measured at 1004Hz. The nominal bandpass of the channel is described by the NCI Code selected. Four bandwidth options are available; 200-3000 Hz, 100-5000 Hz, 50-8000 Hz and 50-15000 Hz.

The facility may be metallic or carrier derived at the option of QWEST DC continuity is not inherent in this service.

7.2   Transmission Levels

The NCI code describes the number of wires, protocol code, options, and levels at the network interface to the end user. See Appendix A for a complete description of the NCI codes. This table relates the NCI code with the default level and ranges for TLVT (Transmit) and TLVR (Receive) measured at 1004Hz.

Permissible TLP Values at the Interface		
NCI Code	**Transmit Level Out from the CO (dB) TLVT**	**Receive Level Into the CO (dB) TLVR**
02PG2.3 02PG2.5 02PG2.8 02PG2.1	= 12.0 = 12.0 = 12.0 = 12.0	0.0 0.0 0.0 0.0

7.3   Loss Variation

The loss variation with time (with reference to the initial EML) will not exceed the following:

- ± 0.5 dB within 5 seconds
- ± 1.0 dB within 1 hour
- ± 4.0 dB over the life of the service

7.4   Gain/Frequency Distortion

The non-equalized acceptance limit for gain/frequency response for all NCI codes will not exceed the loss at 1004Hz by more than the limit shown in Para. 7.8 ("+" means more loss and "-" means less loss compared to actual loss at 1004Hz). Exceeding these levels is considered as the Immediate Action Limit (IAL).

7.5   Noise

The signal to weighted noise measurements are referenced to a maximum peak audio signal of +18dBm0. Received noise objectives can be calculated, based on circuit loss and signal-to-noise ratio. See the Program (Non-Broadcast) Service Limits chart for a full discussion of measured noise based on NCI code.

7.6   Crosstalk

The acceptance limit for crosstalk is that no audible conversation, bits of conversation or tones are detectable in the noise measuring set monitor receiver. The noise measuring set gain is adjusted to the noise requirement at the point of measurement. The monitoring tests should be made during heavy traffic periods by listening for at least 10 minutes.

7.7   Total Distortion

- Zero Transmission Level Point

  The 0 TLP (Transmission Level Point) in a program circuit is any point where the average program level is + 8 VU. This level is the MAXIMUM permitted by QWEST and was established as a compromise that would provide an adequate signal-to-noise ratio without introducing harmful crosstalk into the network plant. This is a higher level than permitted for other services and is permissible only because of the relatively small percentage of circuits used for program audio.

- Test Tones and Peak Program Levels

  QWEST normally applies 0-dBm alignment and test tones at the 0 TLP (0 dbm0). This is equivalent to program material measured at +8 VU averaged over one second. Non-linear distortion, such as harmonic distortion, can be measured at such levels, but unacceptable non-linear distortion that may occur on normally occurring instantaneous peaks of program material will not be revealed. These peaks are assumed to be 10-dB higher than the average program level as read on a vu meter. The system design recognizes that such peaks occur and must be transmitted without exceeding specifications for non-linear distortion.

- Maximum Permitted Test: Tone Levels

  In channels involving multi-paired cable and/or preemphasized carrier systems, the maximum continuous test-tone power (averaged over one second) that can be applied is:

  - 8 dBm0 between 54 Hz and 404 Hz
  - 0 dBm0 between 404 Hz and 15,004 Hz

  Note: 404 Hz is the frequency below which there is no preemphasis in systems with emphasis.

  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 preemphasis in the circuit. Total Distortion will be within the service limits based on the type of NCI code (see Para. 7.8).

  Noise is measured and expressed in terms of dBm, which has a zero reference of -90dBm. That is 0dBrn = -90dBm. For example, in 02PG2.1 the receiving POT is a minimum -12TLP (maximum of 12dB loss relative to the 0-Level Point). If the 15-kHz flat-weighted noise measured at that point were 5dBrn, the noise translated to the 0TLP would be 5dBrn +12dB = 17dBrn (-73dBm).

7.8   Program (Non-Broadcast) Service Limits

Parameter	Network Channel Interface Code			
	02PG2.3	02PG2.5	02PG2.8	02PG2.1
Loss Limit (AML)				
• Non-Equalized	=12.0dB	=12.0dB	=12.0dB	=12.0dB
• Equalized	0.0dB	0.0dB	0.0dB	0.0dB
Loss Variation				
• Short Term	±0.5dB	±0.5dB	±0.5dB	±0.5dB
• Long Term	±1.0dB	±1.0dB	±1.0dB	±1.0dB
Highest Program Level	+8VU	+8VU	+8VU	+8VU
Bandwidth	200-3000	100-5000	50-8000	50-15000
Attenuation Dist†				
• Non Equalized	-3 to +10dB	-3 to +20dB	-3 to +20dB	-3 to +20dB
• Equalized	-1 to +1dB	-1 to +1dB	-1 to +1dB	-1 to +1dB
THD + N (+13dBm0* @ 404Hz)	3.5%	2.5%	2.0%	1.0%
Weighted Random Noise				
• dBrn0	43	44	46	37
• dBm0	-47	-46	-44	-53
Weighting	C MSG	15-kHz flat	15-kHz flat	15-kHz flat

*   Maximum application time = 4 seconds

†   Negative values correspond to losses; positive values to gains.
       Negative number = more loss

7.9   Compatible Interface Code Combinations

The following table summarizes AP optional features. Both 2 Point and Multipoint services are addressed, where appropriate. Note that two NCI codes are listed together; these are the only valid compatible interface codes for AP. Other combinations may be requested under AP Customized described in Chapter 8.

Optional Channel Performance		
	NCI Code	
Optional Features	**EU-A**	**EU-Z**
2 Point 3.0 kHz 5.0 kHz 8.0 kHz 15.0 kHz	02PG2.3--.OS 02PG2.5--.OS 02PG2.8--.OS 02PG2.1--.OS	02PG2.3--.-O 02PG2.5--.-O 02PG2.8--.-O 02PG2.1--.-O
Multipoint CO Bridging 3.0 kHz 5.0 kHz 8.0 kHz 15.0 kHz Bridge-to-Bridge	02BP2 02BP2 02BP2 02BP2 02BP2 02BP2 02BP2 02BP2 02BP2	02PG2.3--.-O 02PG2.3--.O- 02PG2.5--.-O 02PG2.5--.O- 02PG2.8--.-O 02PG2.8--.O- 02PG2.1--.-O 02PG2.1--.O- 02BP2

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8.   Audio Services Custom

8.1   Channel Performance

The Audio Services Customized (APC) category is designed to accommodate unusual circuit arrangements and interfaces. The limit of frequency bandwidth is determined by the interface codes selected. However, the highest bandwidth provided by APC is 50 to 15kHz. Service requested under APC may be one way, two way, 2 Point or Multipoint.

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

The complete Network Channel Code for APC is shown in the following table:

Network Channel Code : APC (Customized)

Network Channel		
Service Code	**Options**	**Remarks**
1-2	3-4	
UP	-Z	Customized

8.2   Cross-Reference to Historical CLCI

Audio Services Customized channels should be used when specific requirements cannot be met by AP service (NC code UE) described above. Requirements for needed channel performance and both interface codes should be submitted to U S WEST. They will then develop the serving arrangement, if possible, and the appropriate charges.

8.3   Interface Code Combinations

Any combination of interface codes will be considered in this customized category.

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Chapter and Section   **Page**

9.   Interface Illustrations

9.1   Interface Type 02AC2

DESCRIPTION: Connects EU premise station to a service for the
                               transmission of voice and 20-Hz ringdown (pushbutton)
                               signaling.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

References: Technical Reference 43201

ILLUSTRATION:

POT

QWEST Communications International Inc.

End-User

T

R

Eqpt

← – 20 Hz – –➤

9.2   Interface Type 02AC2.R

DESCRIPTION: Connects end-user premise station to a service for the
                           transmission of voice and 20-Hz ringdown (code-select)
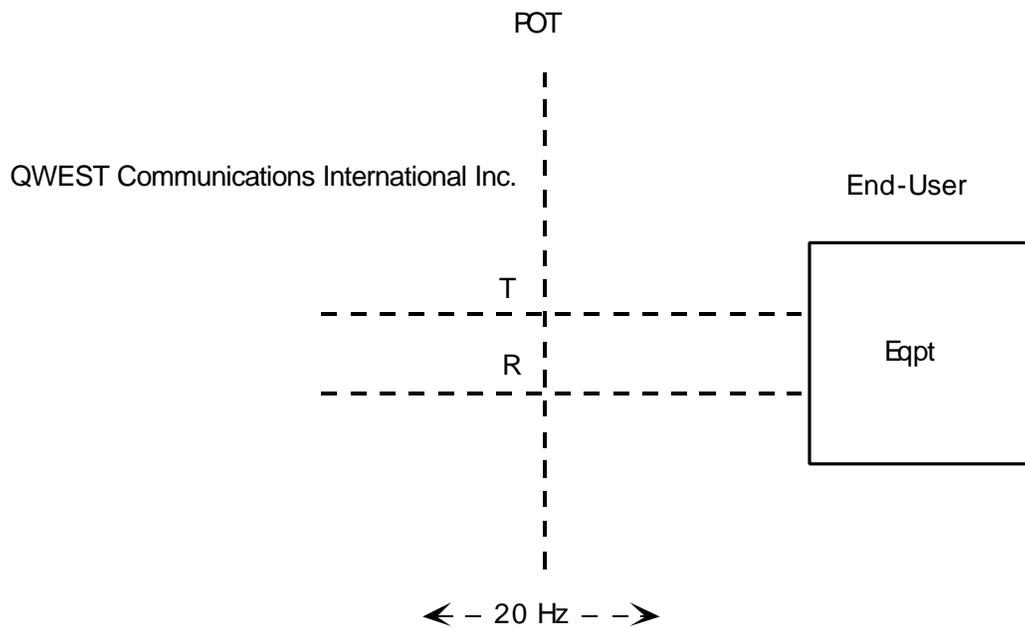   signaling.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

References: Technical Reference 43201

ILLUSTRATION:

POT

QWEST Communications International Inc.

End-User

T

R

Eqpt

← – 20 Hz – –→
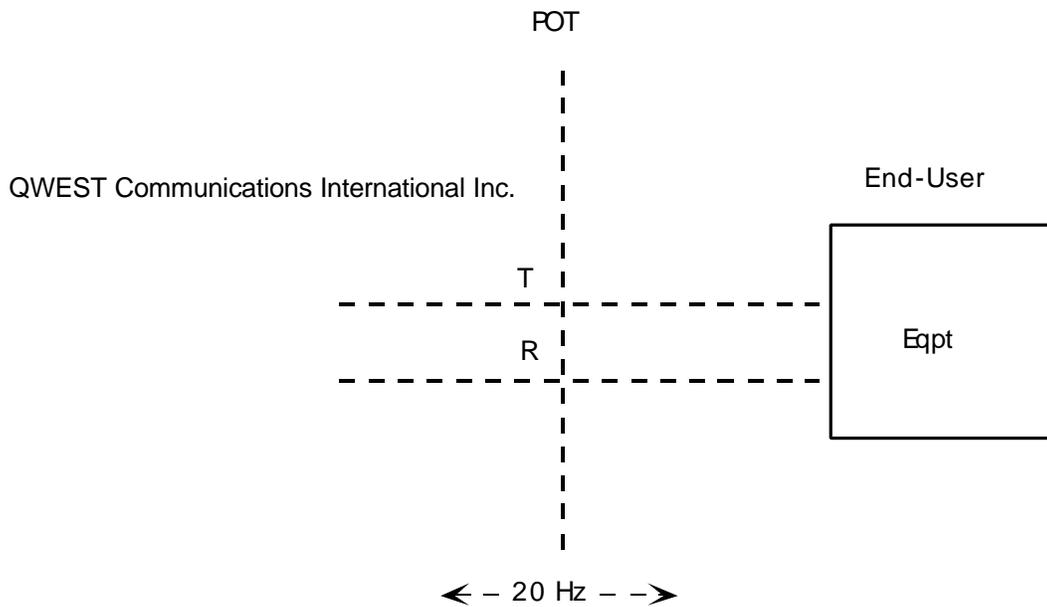
9.3   Interface Type 02BL2

DESCRIPTION: Central Office bridging arrangement - Bridge Lifter

OPERATING MODE: Two alternate customer locations.

2 - Wire   (T, R)

IMPEDANCE: 900 ohms

LEVELS: Audio levels into and out of the CO bridge will be
                                controlled by QWEST.

ILLUSTRATION:

9.4   Interface Type 02BP2

DESCRIPTION: Central Office bridging arrangement - Audio Services

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

LEVELS: Audio levels into and out of the CO bridge will be
                                controlled by QWEST.
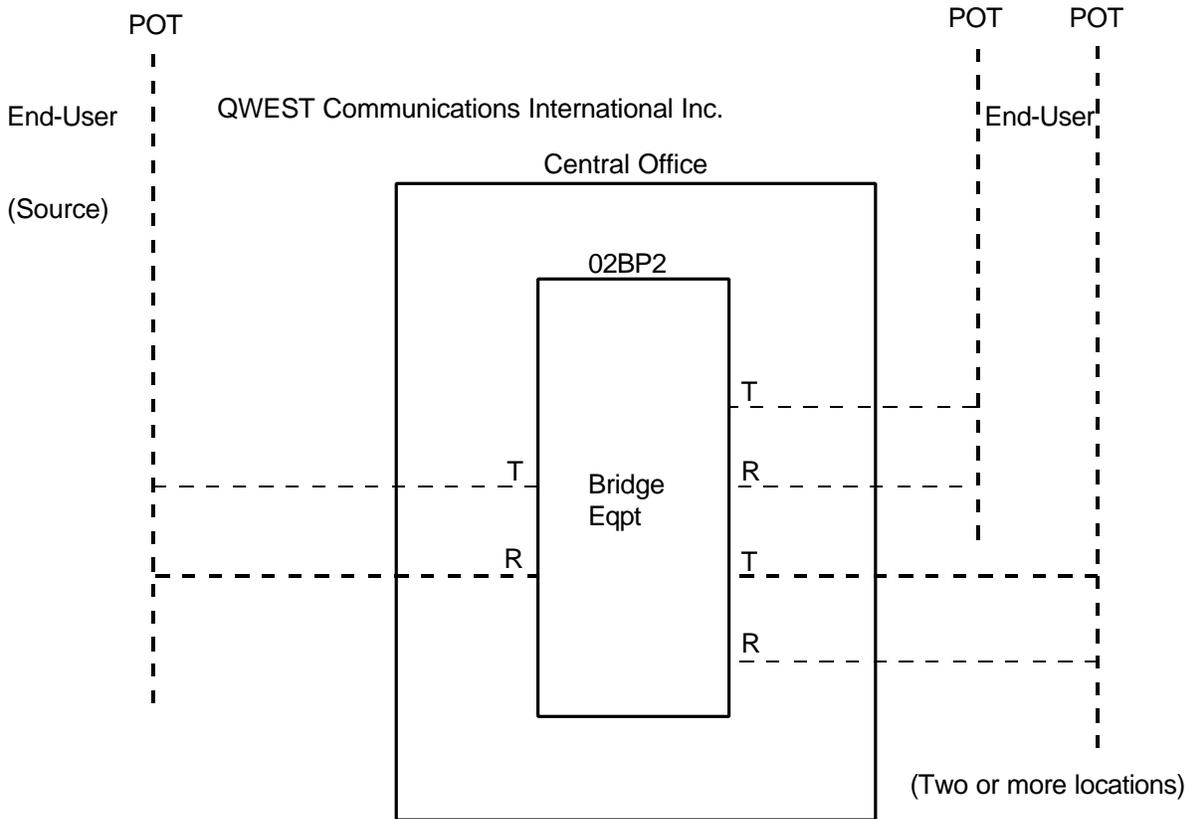
ILLUSTRATION:

9.5   Interface Type 02BR2.SP

DESCRIPTION: Central Office bridging arrangement - Resistive Bridge, split
                               path.

OPERATING MODE: One Way service only.
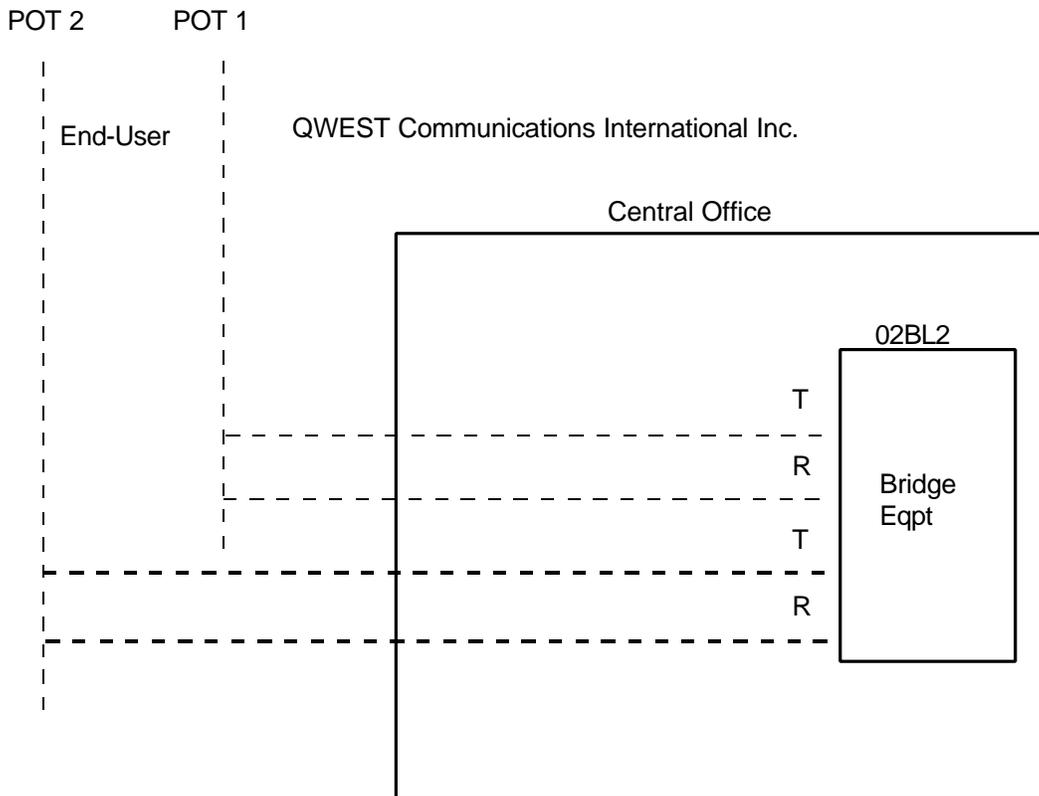
2 - Wire   (T, R)

IMPEDANCE: 600 ohms

ILLUSTRATION:
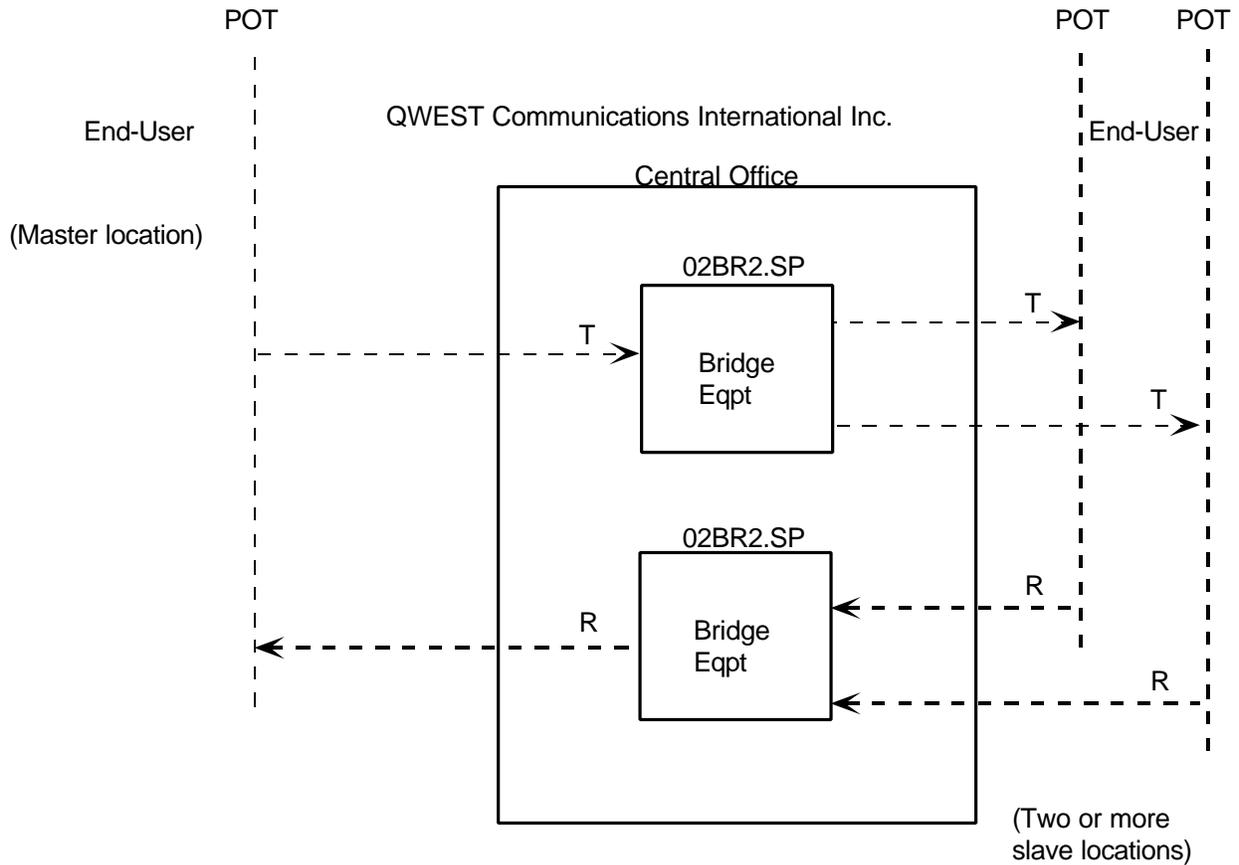
9.6   Interface Type 02BT2

DESCRIPTION: Central Office bridging - Transfer Arrangement. Transfer
                               relay equipment provides 2-Wire transfer capability. See
                               Low Speed Data Channel for the control leg of the Transfer
                               Arrangement.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

ILLUSTRATION:
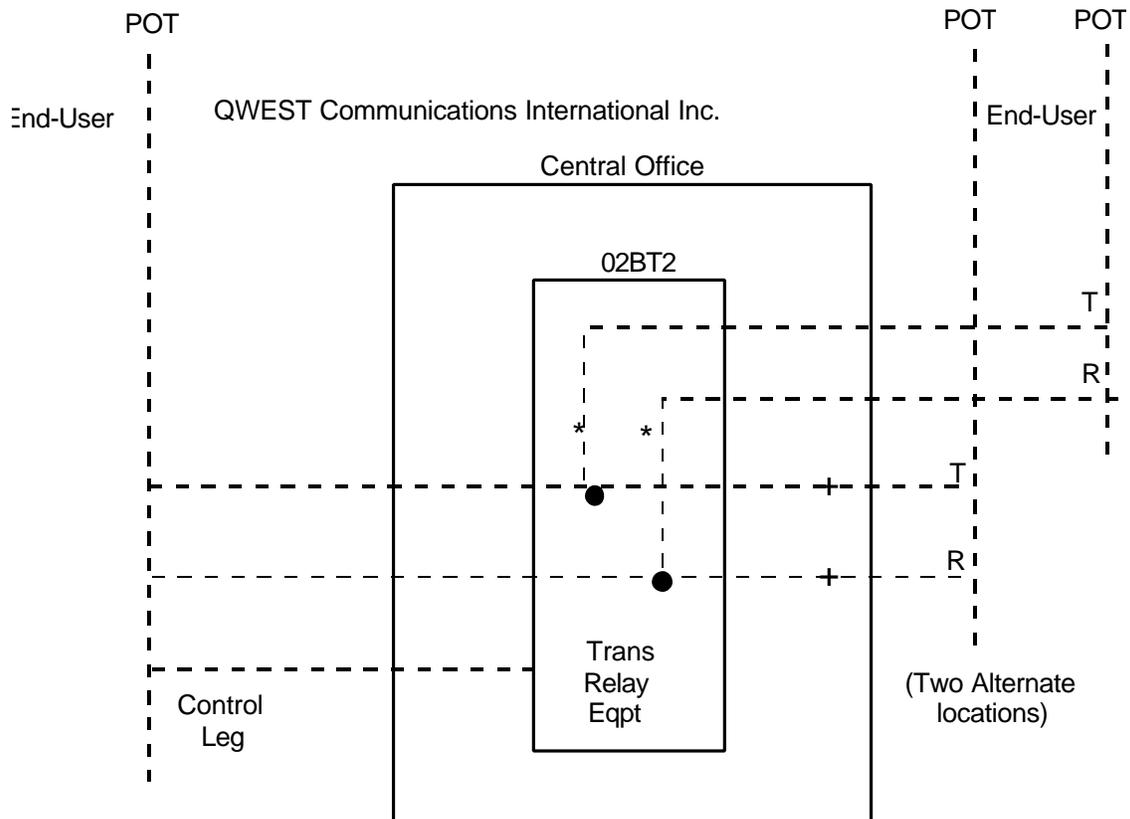
9.7 Interface Type 02CT3

DESCRIPTION: Theoretical interface between the Centrex trunk equipment
                                and the Centrex switch. The signaling protocol will be
                                specified at the EU POT by the customer. QWEST will
                                provide compatible signaling at the analog Centrex trunk
                                equipment (generally E&M).

IMPEDANCE: 900 ohms

ILLUSTRATION:
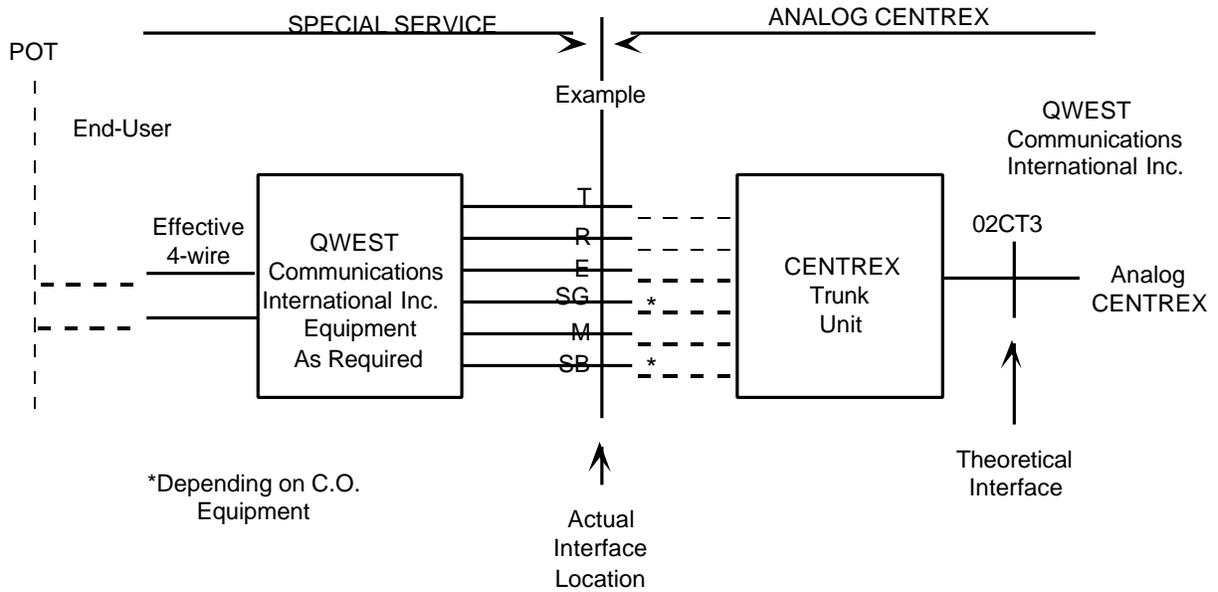
9.8   Interface Type 02DA2

DESCRIPTION: Connects EU premise to a service suitable for the
                                transmission of 1-way data and/or control and supervisory
                                signals.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

References: Technical Reference 41004, 41014

ILLUSTRATION:

POT

QWEST Communications International Inc.   End-User

Eqpt   T   Modem
              R
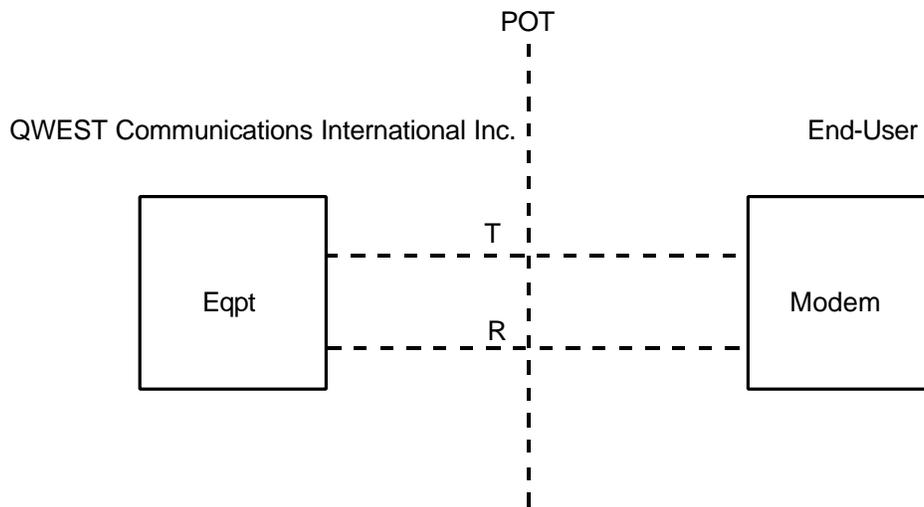
9.9   Interface Type 02DE2

DESCRIPTION: Connects EU to a service suitable for the transmission of
                               data or tones used for Data Select-A-Station.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

References: Technical Reference 41014

ILLUSTRATION:
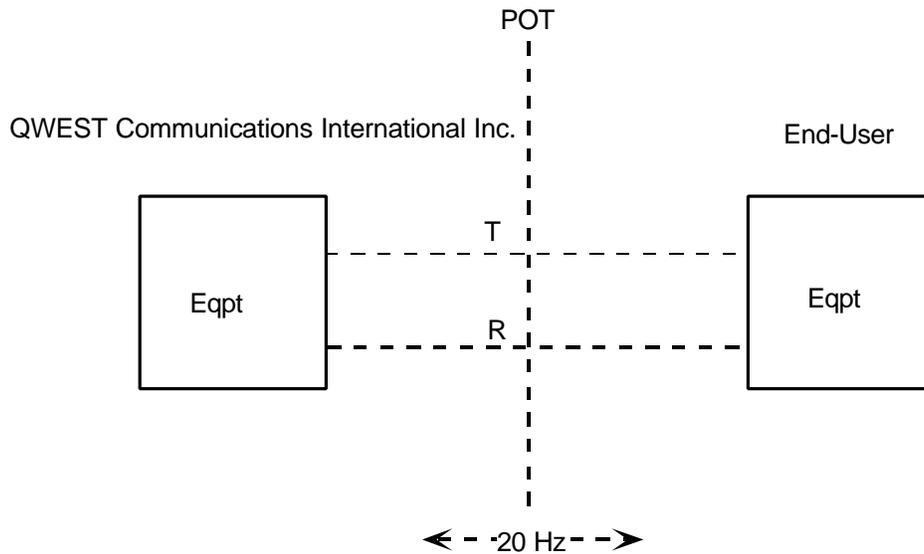
9.10   Interface Type 02GO2

DESCRIPTION:	Ground-start signal open-end (switch) function presented by EU at interface to the QWEST service.
2 - Wire	(T, R)
IMPEDANCE:	02GO2-600 ohms, 02GO3-900 ohms
References:	Technical Reference 43201, TA-NPL-000912

ILLUSTRATION:

POT

End-User

QWEST Communications
International Inc.

- Ring ground seizure
+ address

Eqpt

T

R

20-Hz ringing,
tip ground seizure

9.11   Interface Type 02GS2

DESCRIPTION: Ground-start signaling closed-end (station) function
                                presented by EU at interface to the QWEST service.

2 - Wire   (T, R)

IMPEDANCE: 02GS2-600 ohms, 02GS3-900 ohms

References: Technical Reference 43201, 43701, TA-NPL-000912

ILLUSTRATION:
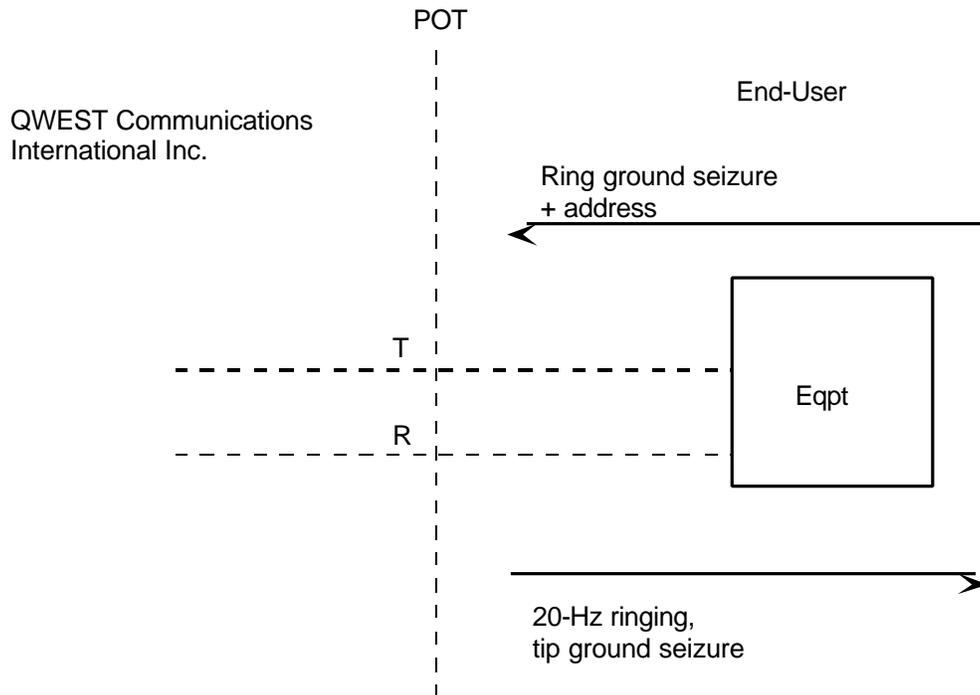
9.12   Interface Type 02LA2, 02LB2, 02LC2, 02LG2

DESCRIPTION: Loop-start signaling open-end, registered ports, connects end-user premise
switching to a service as part of a through circuit to a remote station.

02LA2   Type A registered port, 0-199 ohms loop resistance range

02LB2   Type B registered port, 200-899 ohms loop resistance range

02LC2   Type C registered port, > 900 ohms loop resistance range

02LG2   Type A registered port, 0-199 ohms loop resistance range
with ringing generator for repeated ringing

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

References: Technical Reference 43201, 43701, 62113

ILLUSTRATION:
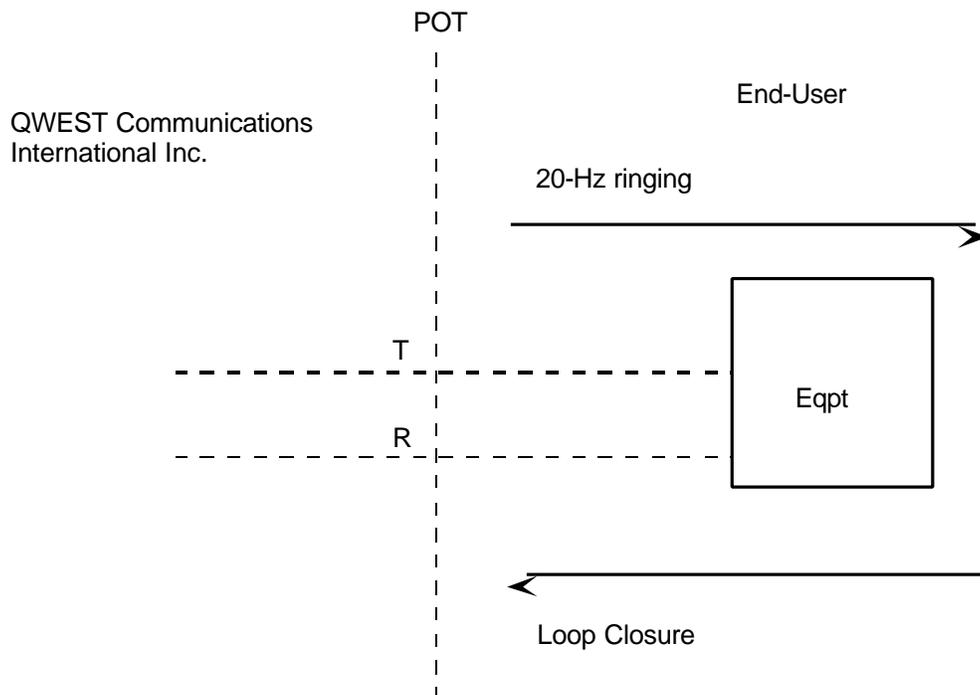
9.13   Interface Type 02LO2

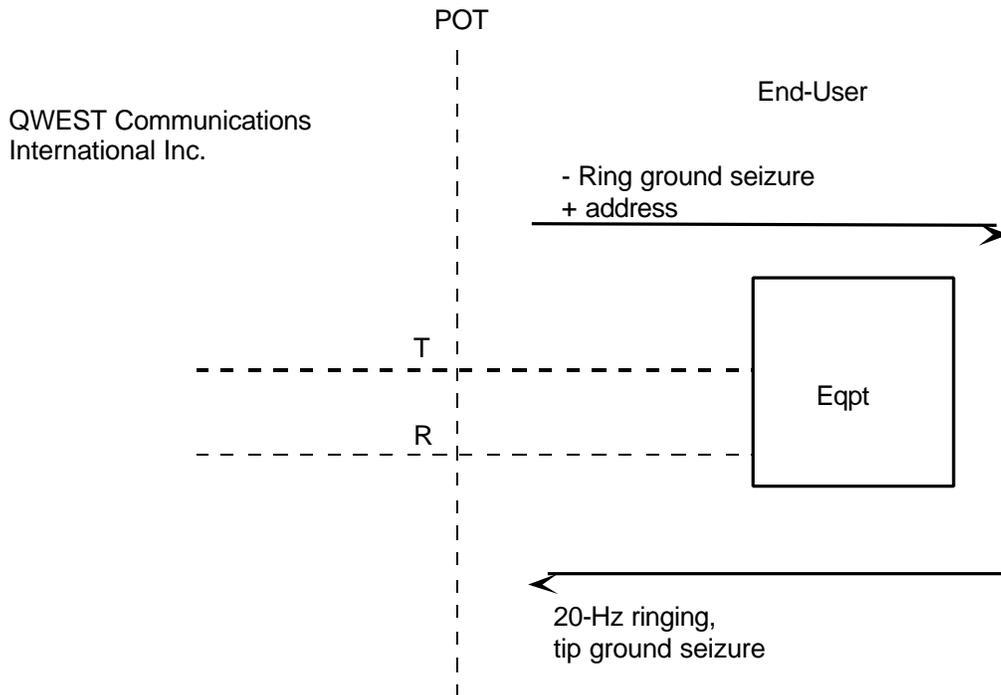DESCRIPTION: Loop-start signaling open-end (switch) function presented by
                               the EU at interface to the QWEST service.

2 - Wired   (T, R)

IMPEDANCE: 02LO2-600 ohms, 02LO3-900 ohms.

References: Technical Reference 43201, TA-NPL-000912
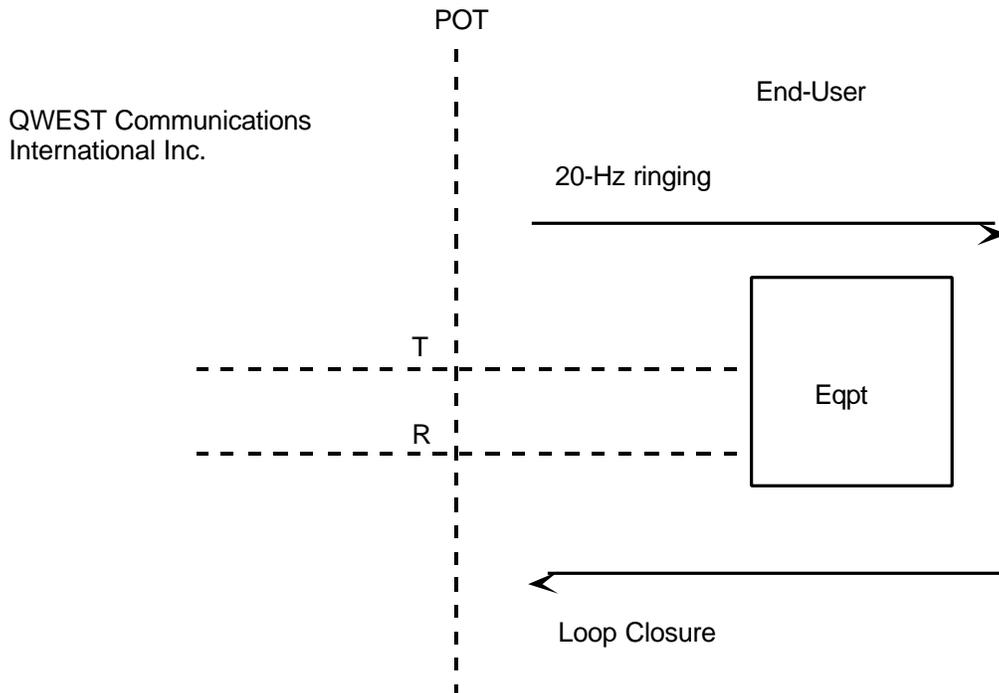
ILLUSTRATION:

9.14   Interface Type 02LR2

DESCRIPTION: Private line automatic ringdown (PLAR) with PLAR
                                equipment by QWEST at Central Office.

2 - Wire   (T, R)

IMPEDANCE :   600 ohms

References: Technical Reference 43201
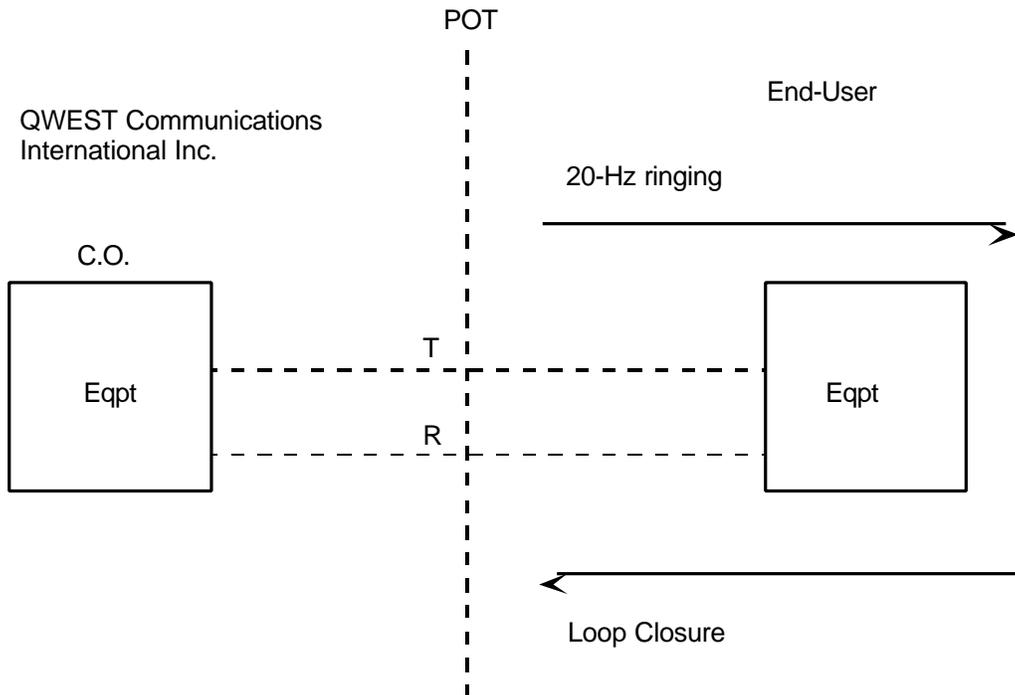
ILLUSTRATION:

9.15   Interface Type 02LS2

DESCRIPTION: Loop-start signaling closed-end (station) function presented
                                by the EU at the interface to QWEST service.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms

References: Technical Reference 43201, TA-NPL-000912

ILLUSTRATION:

POT

End-User

QWEST Communications
International Inc.

20-Hz ringing

T

Eqpt

R

Loop Closure
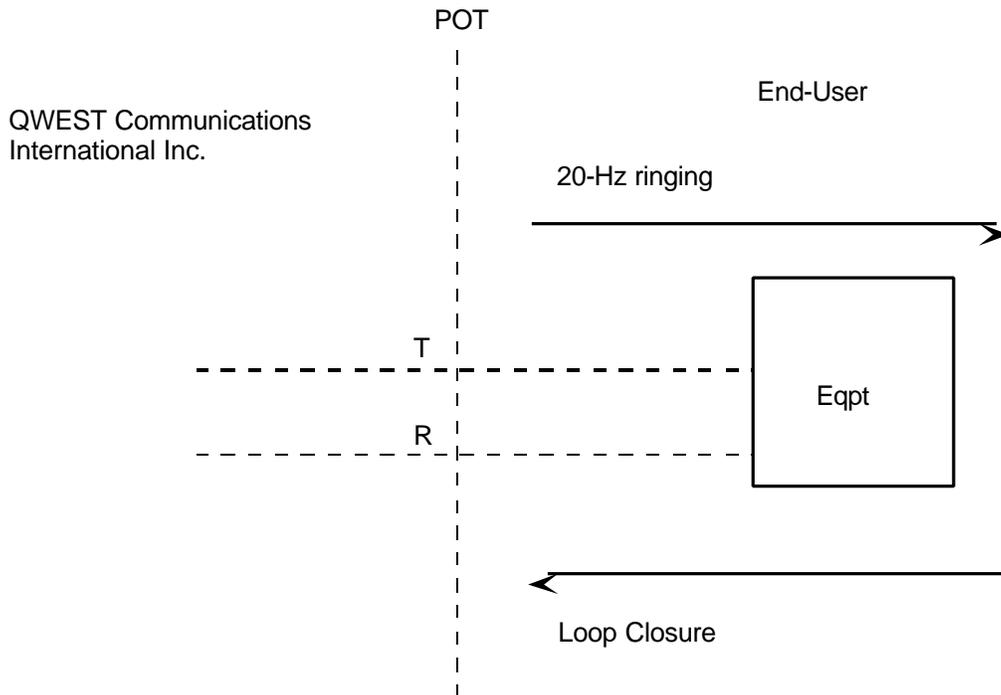
9.16   Interface Type 02NO2

DESCRIPTION: To connect Customer Provided Equipment (CPE) or
facilities to a service suitable for voice or data transmission
with no signaling equipment provided by QWEST.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms nominal

TRANSMISSION LEVELS (dB):

	Transmit (to customer)	Receive (from customer)
at POT	*	0

*See permissible TLP values listed in service categories

ILLUSTRATION:

POT

End-User

QWEST Communications
International Inc.

T

R

Eqpt
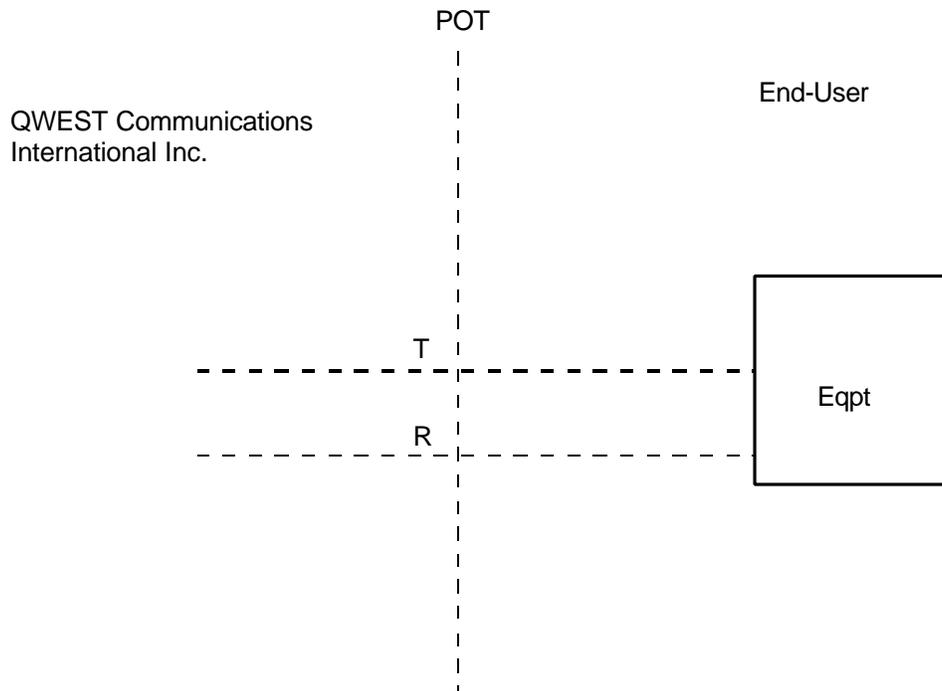
9.17   Interface Type 02PG2.3

DESCRIPTION: To connect Customer Provided Equipment (CPE) or
                                    facilities to a nonbroadcast Audio Services channel.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms nominal

BANDWIDTH: 200 to 3000 Hz

MODE: Audio Services channels are unidirectional only.

TRANSMISSION LEVELS (dB):

	Transmit TLVT (one way to customer)	Receive TLVR (one way from customer)
at POT	= 12dB	0

ILLUSTRATION:

9.18   Interface Type 02PG2.5

DESCRIPTION: To connect Customer Provided Equipment (CPE) or
                                facilities to a nonbroadcast Audio Services channel.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms nominal

BANDWIDTH: 100 to 5000Hz

MODE: Audio Services channels are unidirectional only.

TRANSMISSION LEVELS (dB):

	Transmit TLVT (one way to customer)	Receive TLVR (one way from customer)
at POT	= 12dB	0

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

T

R

Eqpt

9.19   Interface Type 02PG2.8

DESCRIPTION: To connect Customer Provided Equipment (CPE) or
                                 facilities to a nonbroadcast Audio Services channel.

2 - Wire   (T, R)

IMPEDANCE: 600 ohms nominal

BANDWIDTH: 50 to 8000Hz

MODE: Audio Services channels are unidirectional only.

TRANSMISSION LEVELS (dB):

	Transmit TLVT (one way to customer)	Receive TLVR (one way from customer)
at POT	= 12dB	0

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

T

R

Eqpt
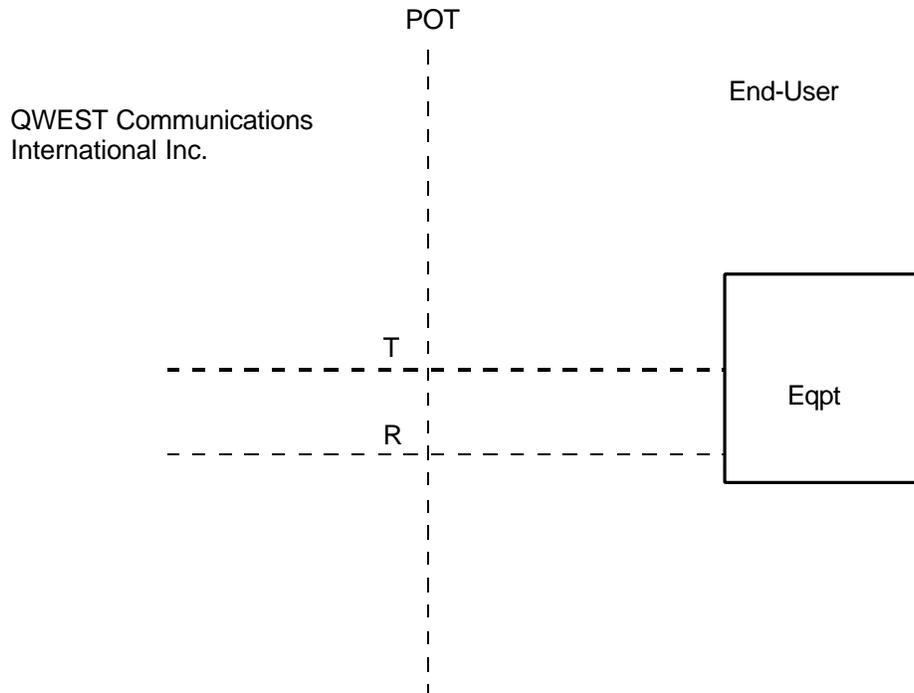
9.20   Interface Type 02PG.1

DESCRIPTION: To connect Customer Provided Equipment (CPE) or
                                facilities to a nonbroadcast Audio Services channel.

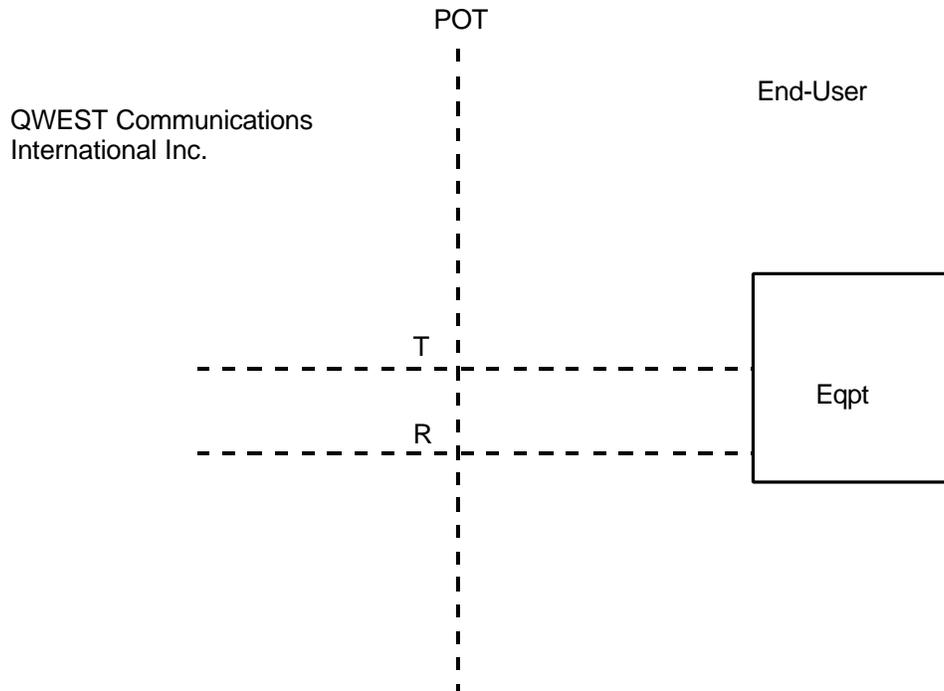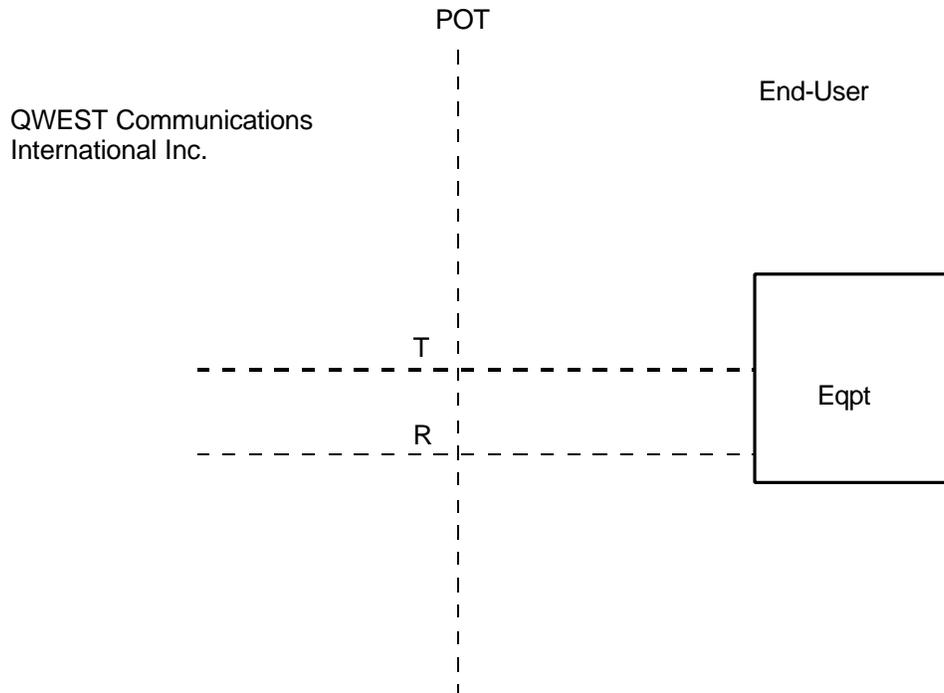2 - Wire   (T, R)

IMPEDANCE: 600 ohms nominal

BANDWIDTH: 50 to 15,000Hz

MODE: Audio Services channel are unidirectional only.

TRANSMISSION LEVELS (dB):

	Transmit TLVT (one way to customer)	Receive TLVR (one way from customer)
at POT	= 12dB	0

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

T

R

Eqpt
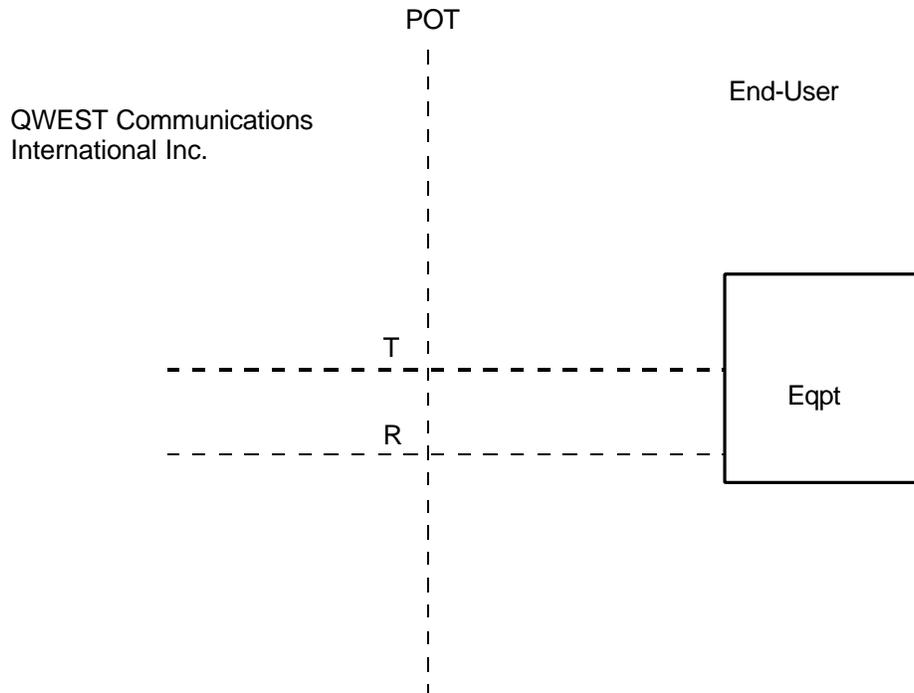
9.21   Interface Type 02RV2

DESCRIPTION: Loop Reverse - Battery signaling presented by the customer for switched private line, such as DID trunks.

2 - Wire   (T, R)

IMPEDANCE: 02RV2 - 600 ohms, 02RV3 - 900 ohms

References: Technical Reference 43201

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

Battery Reversal

T

R

Eqpt

Dial Pulses, MF, TT
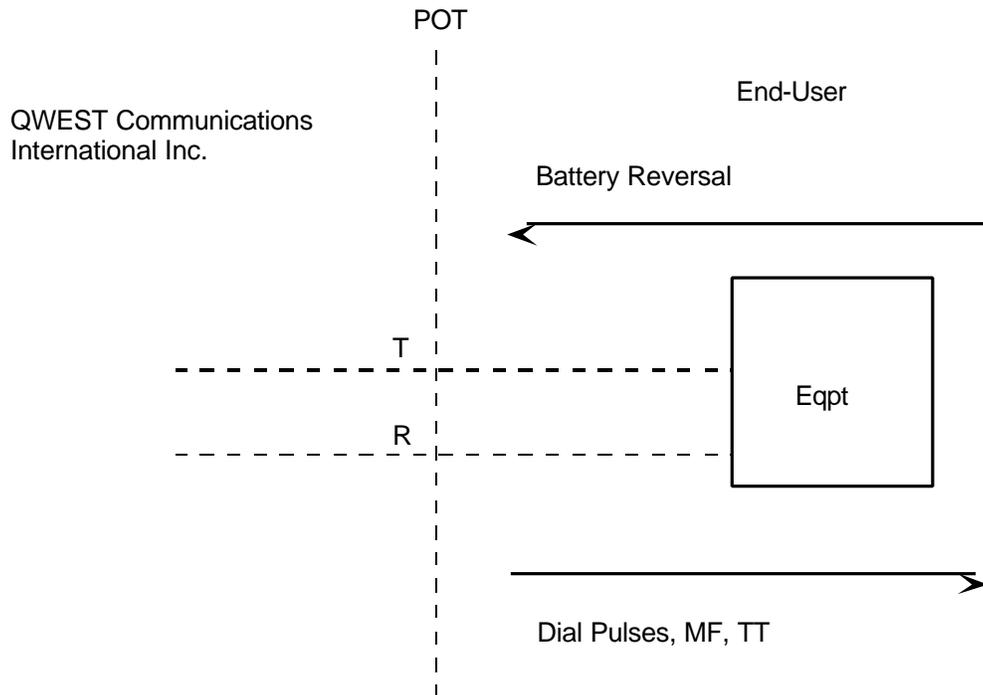
9.22   Interface Type 04AC2

DESCRIPTION: Connects Customer Provided Equipment (CPE) to a service
                                that provides transmission of voice and 20-Hz ringdown
                                (pushbutton) signaling.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

References: Technical Reference 43201
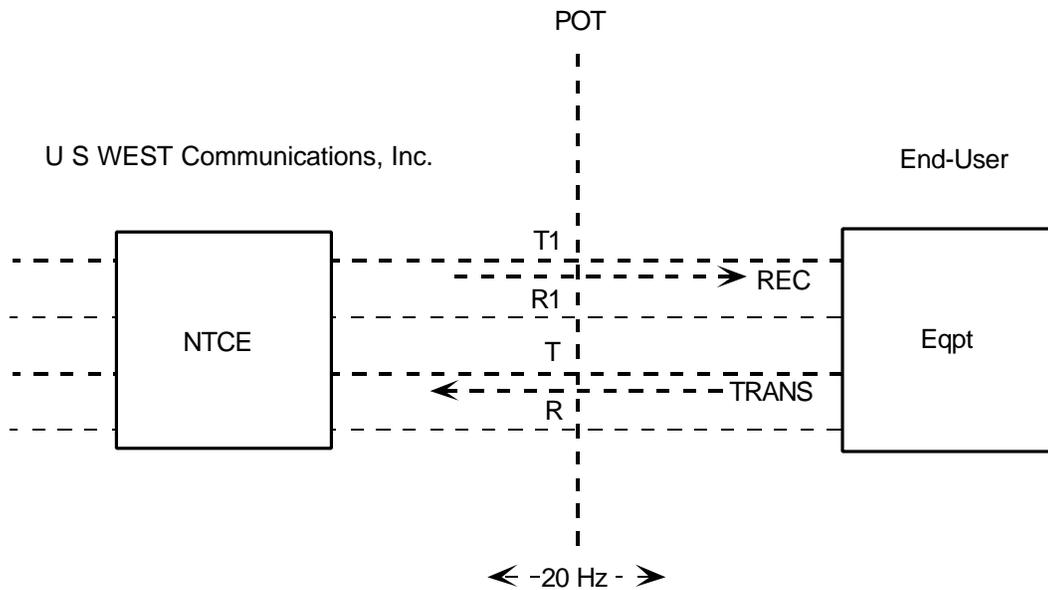
ILLUSTRATION:

9.23   Interface Type 04AC2.R

DESCRIPTION: Connects EU premise station to a service for the
                                transmission of voice and 20-Hz ringdown (code select)
                                signaling.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

References: Technical Reference 43201
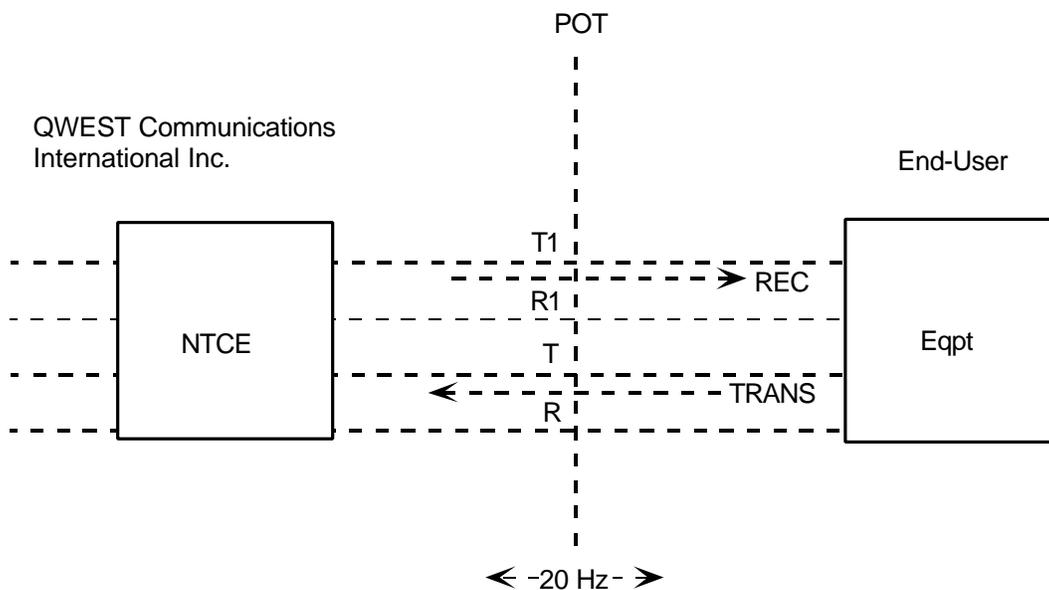
ILLUSTRATION:

9.24   Interface Type 04BD2

DESCRIPTION: Central Office bridging arrangement - DDS off-net extension

OPERATING MODE: 2400, 4800, 9600 or 56k bit

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

ILLUSTRATION:

9.25   Interface Type 04BF2

DESCRIPTION: Central Office bridging arrangement - Split Frequency

OPERATING MODE: 0 to 300 Baud

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

SPEED: = 300 Baud

ILLUSTRATION:
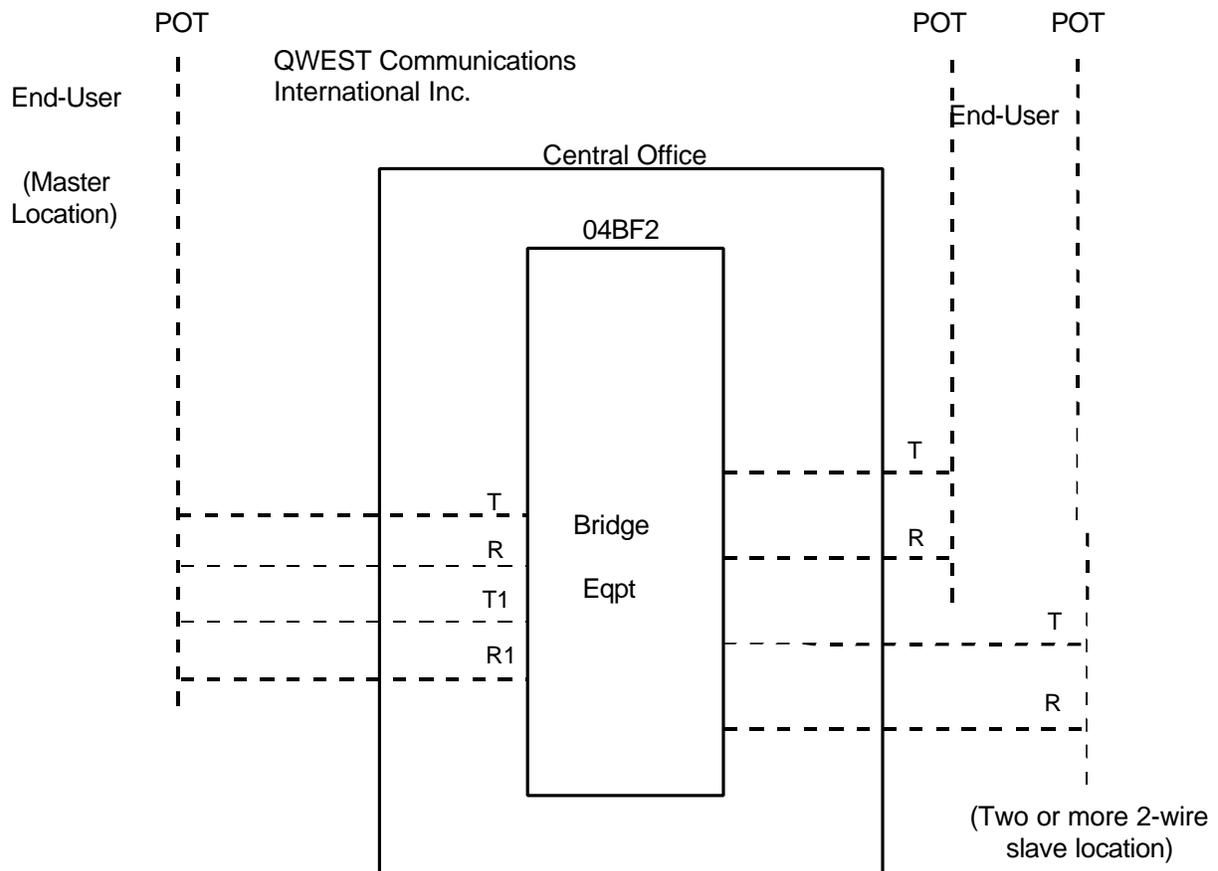
9.26   Interface Type 04BR2.CF

DESCRIPTION: Central Office bridging arrangement - Resistive Bridge,
                                Conference Operation.

OPERATING MODE: Four wire resistor network distributing voice frequency
                                signals to three or more locations.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

ILLUSTRATION:
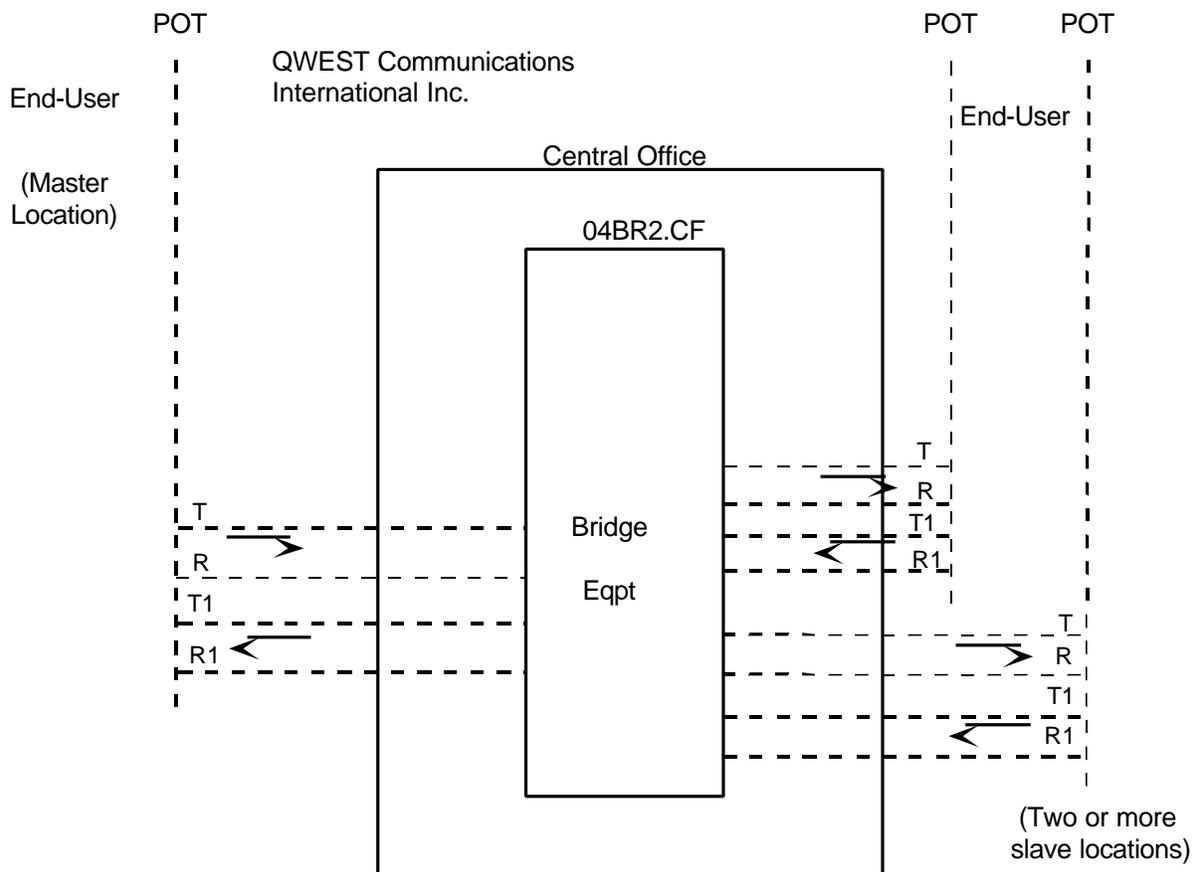
9.27   Interface Type 04BR2.SP

DESCRIPTION: Central Office bridging arrangement - Resistive Bridge,
                                 Split Path Operation.

OPERATING MODE: Independent transmission path for each direction of
                                 transmission.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms
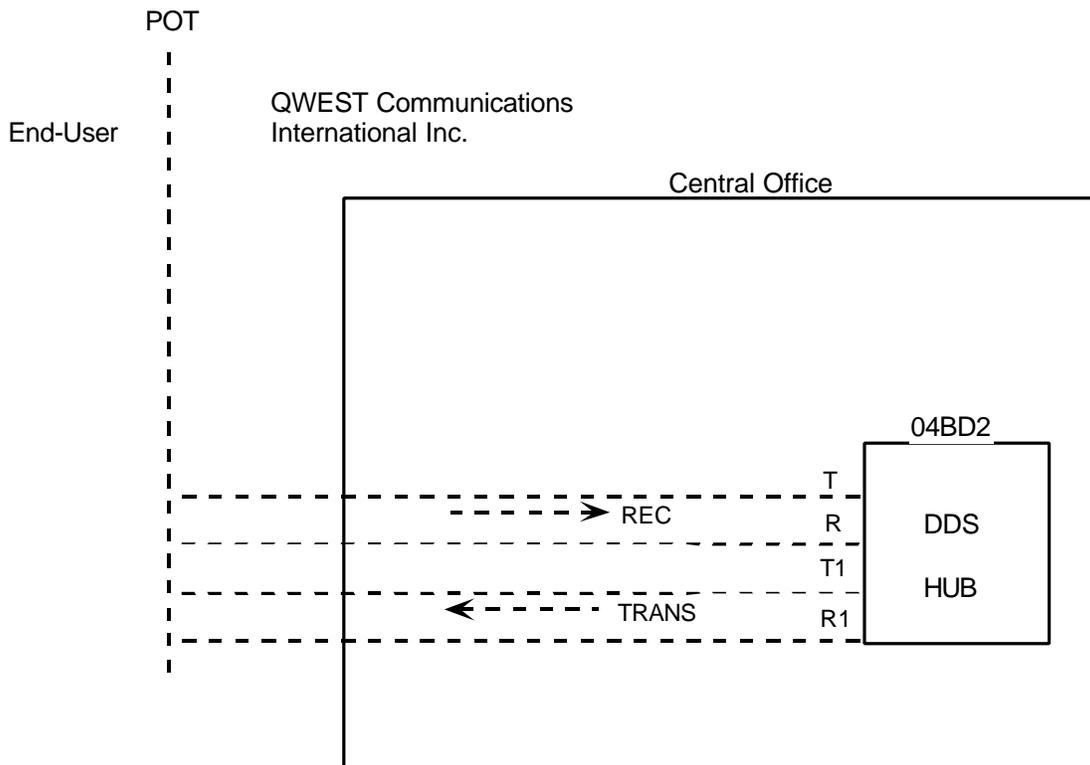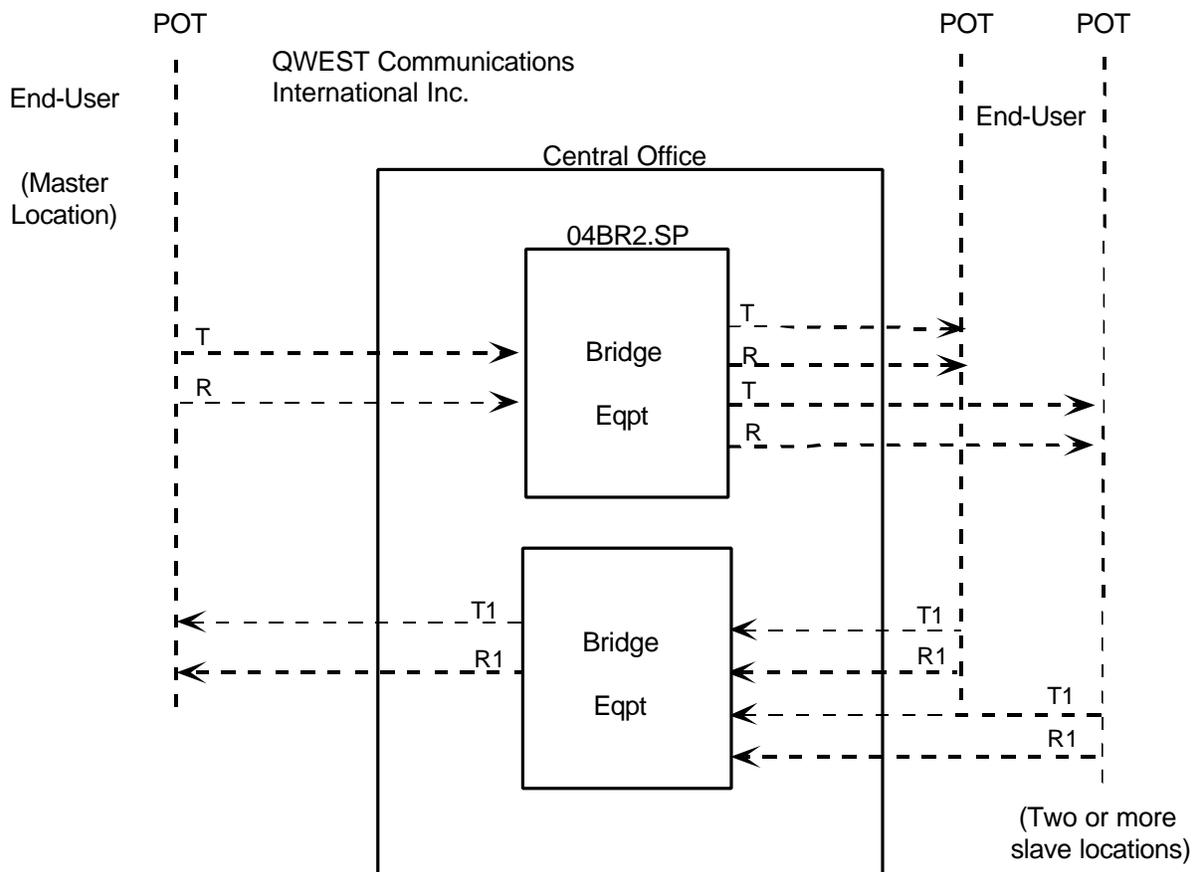
ILLUSTRATION:

9.28   Interface Type 04BS2

DESCRIPTION: Central Office Bridging arrangement - Data Select-A-
                                Station.

OPERATING MODE: Either addressable or sequential master station to remote
                                station polling.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

ILLUSTRATION:

9.29   Interface Type 04BT2

DESCRIPTION: Central Office bridging - Transfer Arrangement. Transfer
                                relay equipment provides 4-Wire transfer capability. See
                                Low Speed Data Channel for the control leg of the Transfer
                                Arrangement.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

ILLUSTRATION:
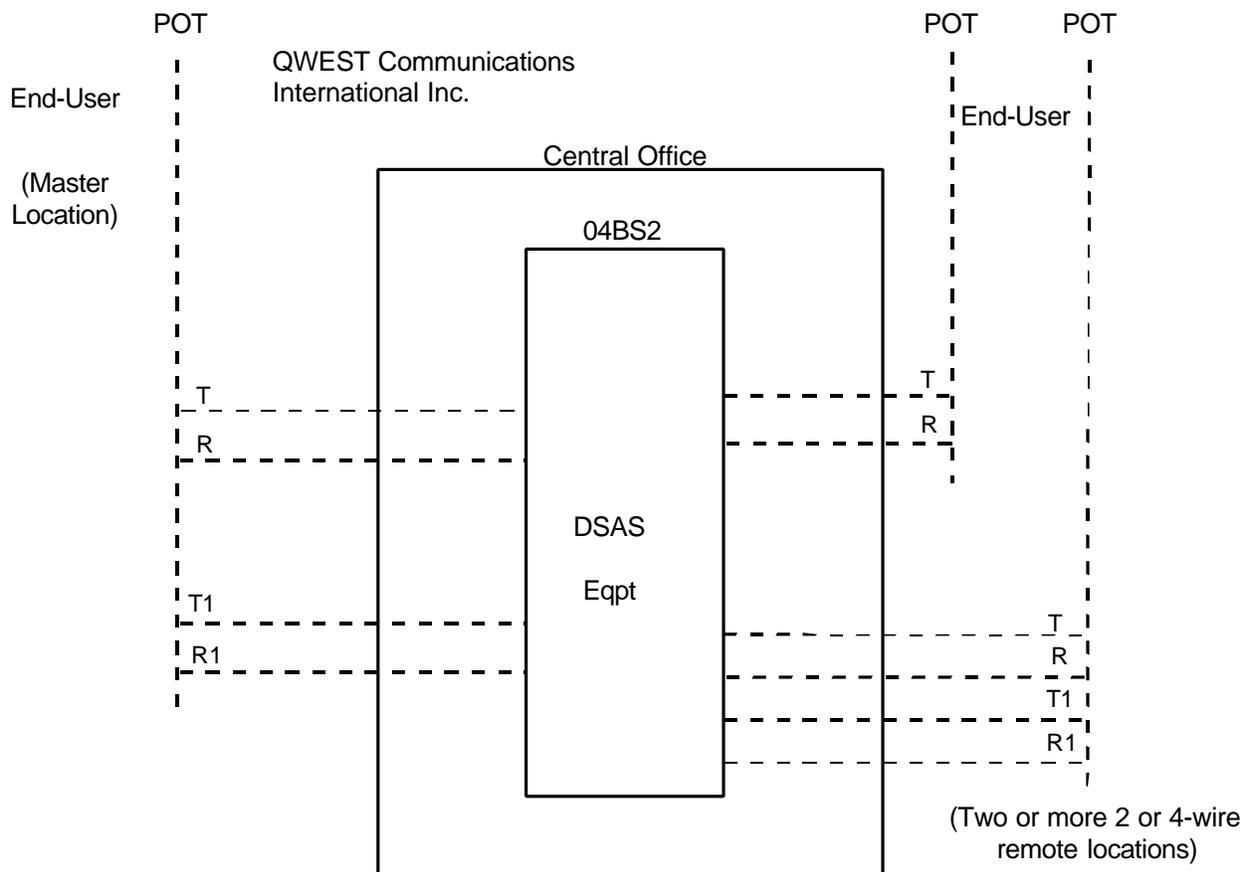
9.30   Interface Type 04CT3

DESCRIPTION: Theoretical interface between the Centrex trunk equipment
                                and the digital Centrex switch. The signaling protocol will
                                be specified at the EU POT by the customer. QWEST will
                                provide compatible signaling at the digital Centrex trunk
                                equipment.

IMPEDANCE: 600 ohms

ILLUSTRATION:
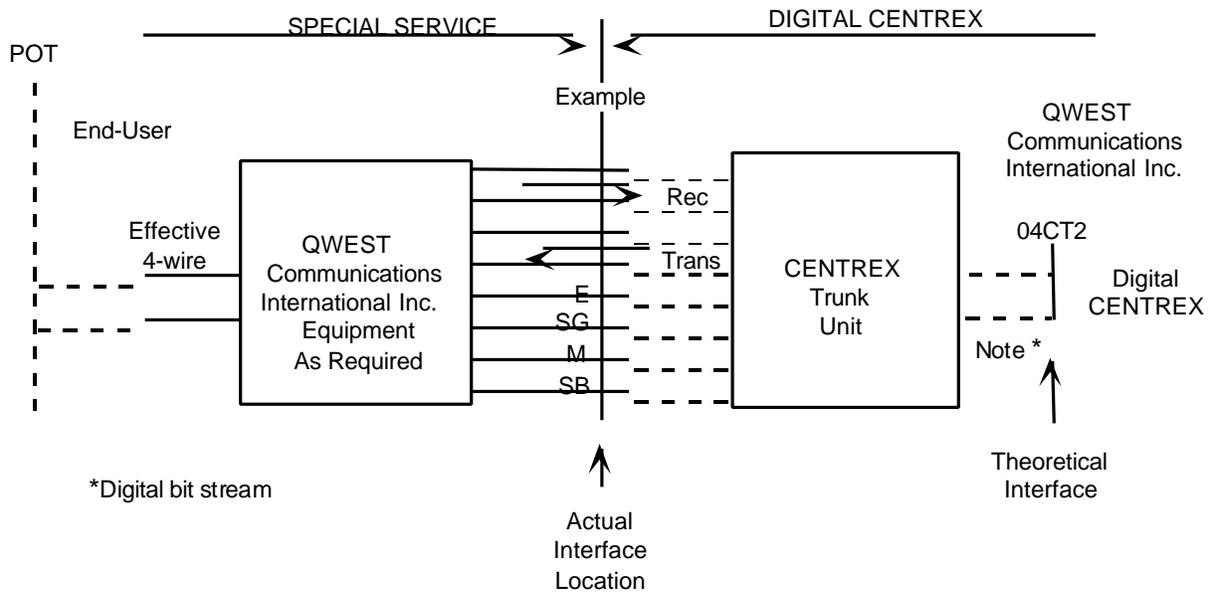
9.31   Interface Type 04DA2

DESCRIPTION: Connects EU premise to an effective 4-Wire service suitable
                                for the transmission of full duplex data or control and
                                supervisory signals.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

                                Transmit   Receive
LEVELS: +13   -3

References: Technical Reference 41004, 41014

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

Eqpt

Modem

T

R

T1

R1

REC
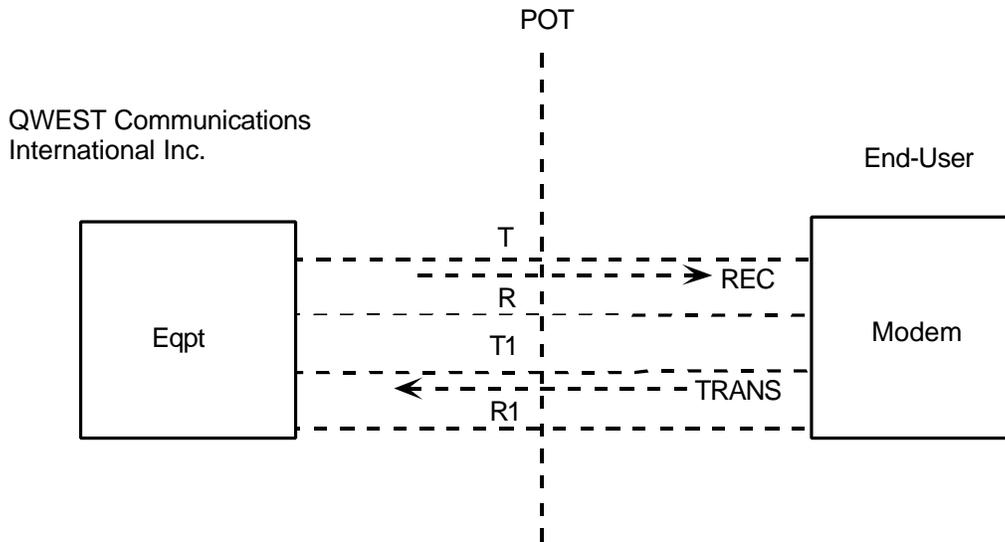
TRANS

9.32   Interface Type 04DE2

DESCRIPTION: Connects EU 4-Wire service suitable for the transmission of
                                    data or tones used for Data Select-A-Station.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

References: Technical Reference 41004, 41014

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

Eqpt

T
R
T1
R1

REC
TRANS

Eqpt
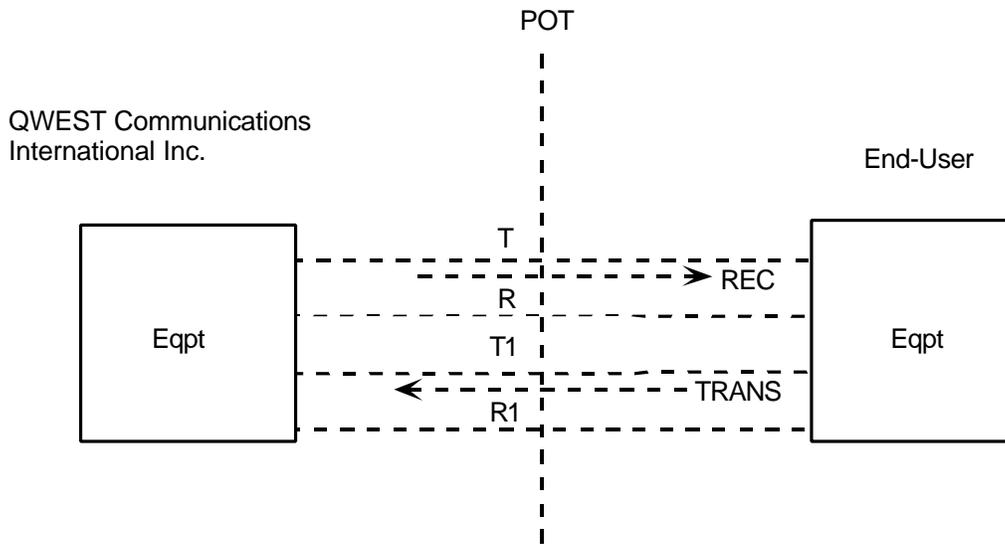
9.33   Interface Type 04DS9.15

MODE: D4 Framing Format

IMPEDANCE: 100 ohms

SPEED: 1.544 Mb/s ± 50 ppm

References: TR-TSY-000054 and ANSI T1.403-1989
                             All interface codes with a DS protocol are digital high
                             capacity interfaces. A brief definition of the line codes and
                             formats is given in Appendix A.3. Other interfaces exist
                             which are not covered in this publication.

4 - Wire   (T, R, T1, R1)

ILLUSTRATION:

POT

QWEST Communications
International Inc.

End-User

T

R   Eqpt

T1

R1

Arrows denote direction of transmission
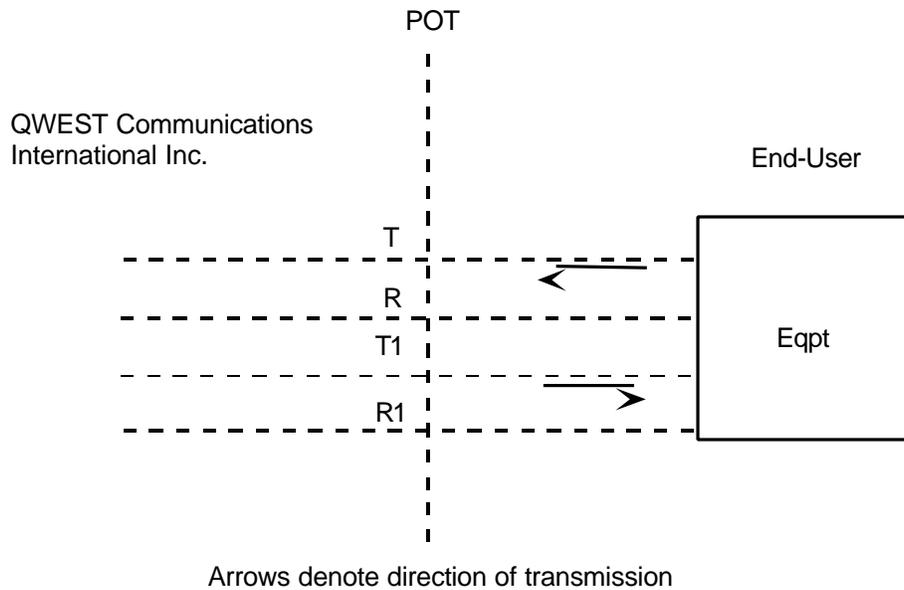
9.34   Interface Type 04EA2.E, 04EA2.M

DESCRIPTION: Type I E&M Lead Signaling. EU equipment originates on E
                                   lead with -E option. EU equipment originates on M lead
                                   with -M option.

4-Wire   (T, R, E, M)

IMPEDANCE: 04EA2-E, 04EA2-M-600 ohms

ILLUSTRATION:
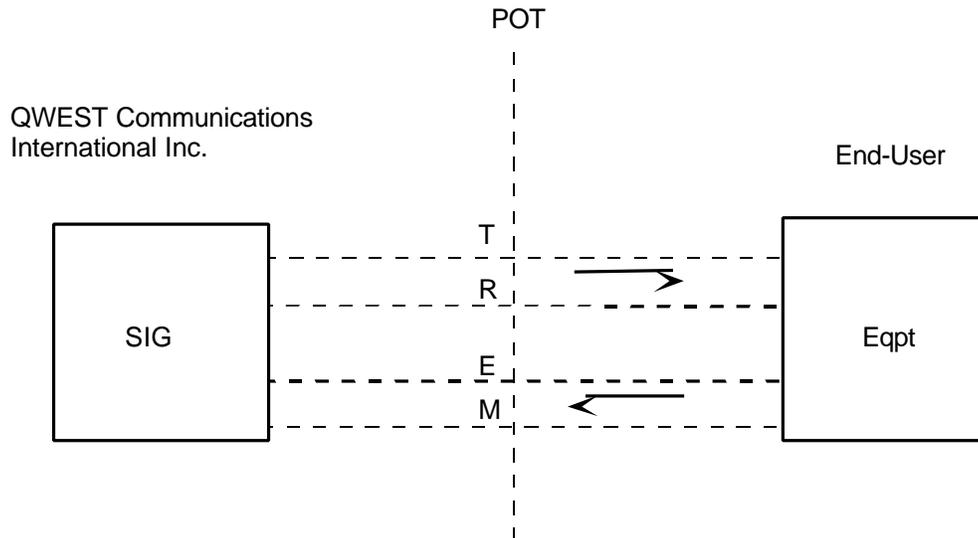
9.35   Interface Type 04NO2

DESCRIPTION: To connect Customer Provided Equipment (CPE) or
                                facilities to a service suitable for voice transmission with no
                                signaling equipment provided by QWEST EU may apply
                                inband analog signals to the channel.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms nominal

TRANSMISSION LEVELS (dB):

	Transmit (out of CO)	Receive (into CO)
at POT	*	0 dBm

* Determined by cable loss, permissible TLP values listed in service categories.

ILLUSTRATION:

Arrows denote direction of transmission
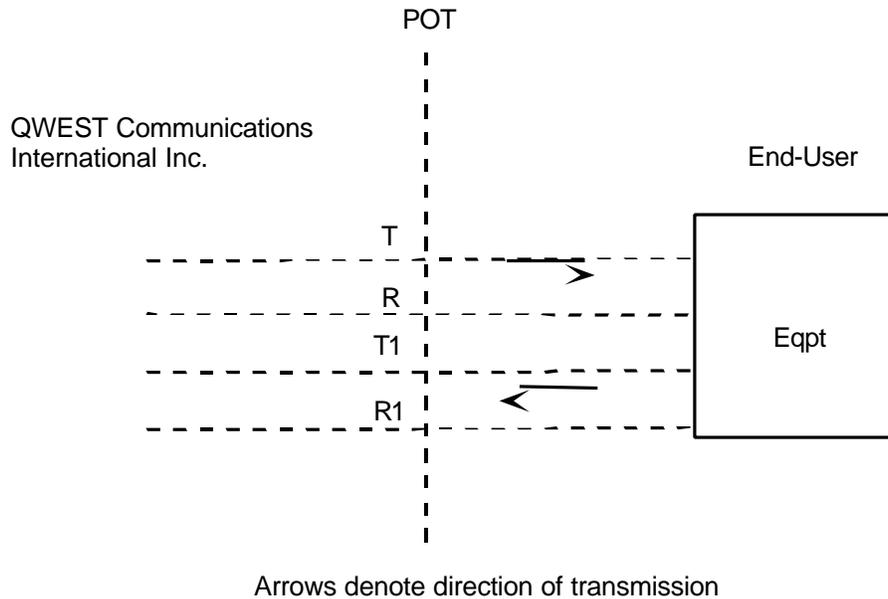
9.36   Interface Type 06DA2

DESCRIPTION: Connects EU premise to an effective 4-Wire service suitable
                                for the transmission of full duplex data signals.

6-Wire   (DT, DR, DT1, DR1, TEK5, TEK6)

IMPEDANCE: 600 ohms

                                Transmit   Receive
LEVELS: +13   -3

References: Technical Reference 41004, 41014

ILLUSTRATION:

POT

QWEST Communications
International Inc.   End-User

```
                    DT
                    DR   ←──────── REC
        Eqpt        DT1
                    DR1  ────────→ TRANS       Modem
                    TEK5
        - - -       TEK6
            *
```
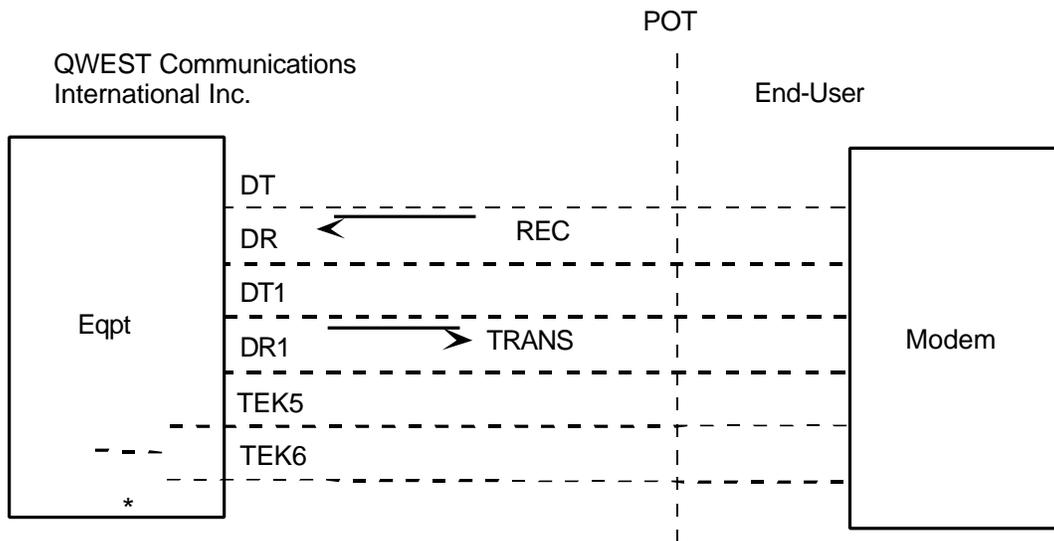
9.37   Interface Type 06EA2.E, 06EA2.M

DESCRIPTION: Type I E&M Lead Signaling. EU equipment originates on E
                                lead with -E option. EU equipment originates on M lead
                                with -M option.

6 - Wire   (T, R, T1, R1, E, M)

IMPEDANCE: 600 ohms

References: Technical Reference 43201, 62114

ILLUSTRATION:

9.38   Interface Type 06EB2.E, 06EB2.M

DESCRIPTION: Type II E&M Lead Signaling. EU equipment originates on E
                                 lead with -E option. EU equipment originates on M lead
                                 with -M option.

6 - Wire   (T, R, E, SG, M, SB)

IMPEDANCE: 06EB2-E, 06EB2-M-600 ohms

References: Technical Reference 43201, 62114

ILLUSTRATION:

POT

QWEST Communications
International Inc.   End-User

SIG   T   Eqpt
             R
             E
             SG
             M
             SB

9.39   Interface Type 08EB2.E, 08EB2.M

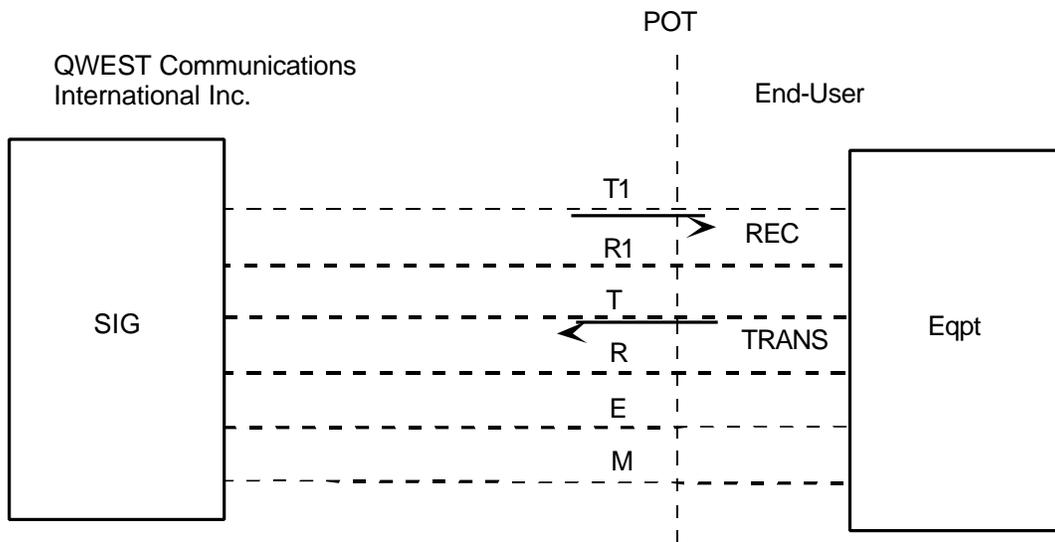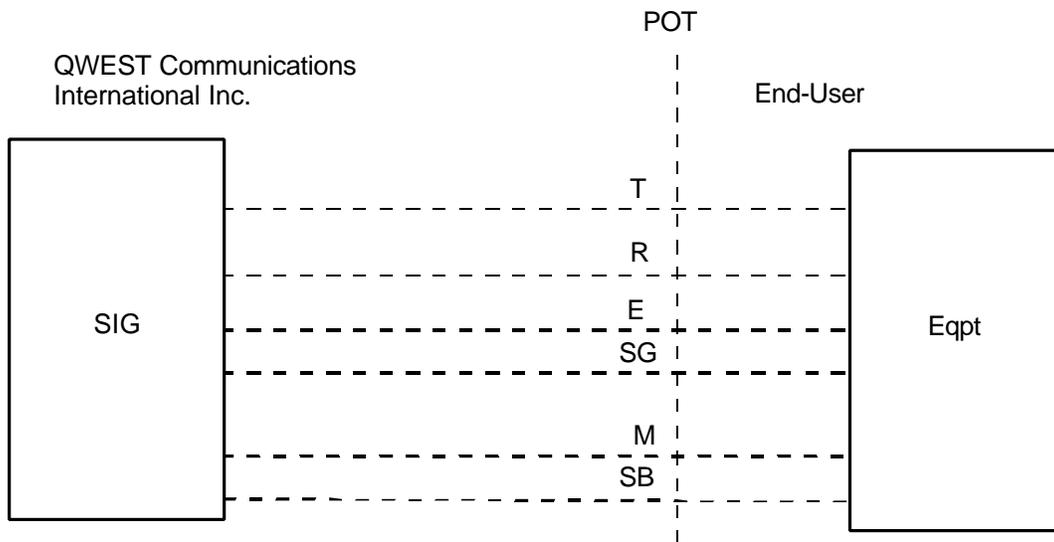DESCRIPTION: Type II E&M Lead Signaling. EU equipment originates on E
                                Lead with -E option. EU equipment originates on M lead
                                with -M option.

8 - Wire   (T, R, T1, R1, E, M, SB, SG)

IMPEDANCE: 600 ohms

References: Technical Reference 43201, 62118, 62119

ILLUSTRATION:
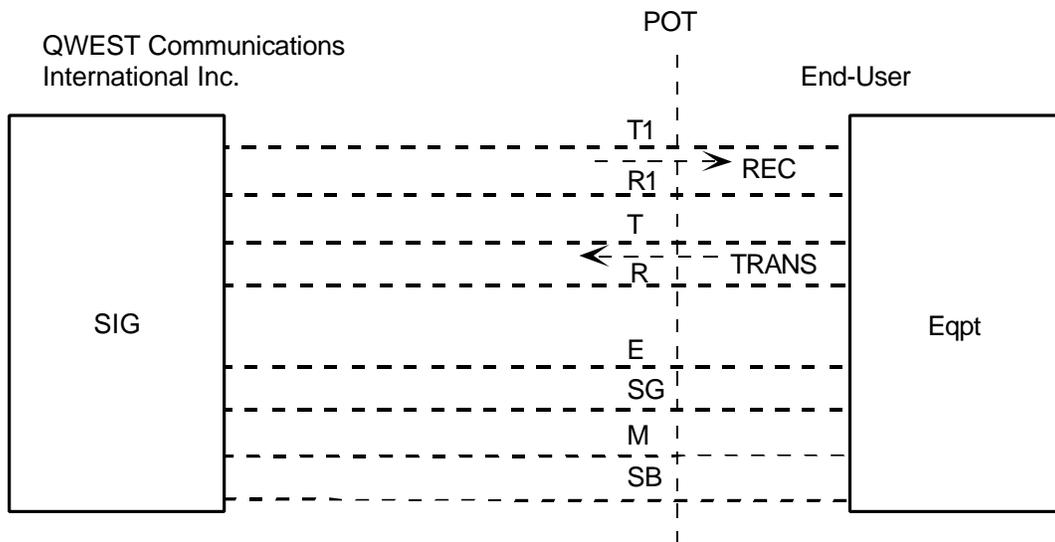
9.40   Interface Type 04RV2

DESCRIPTION: Loop Reverse-Battery signaling presented by the EU for
                                switched private line, such as DID trunks.

4 - Wire   (T, R, T1, R1)

IMPEDANCE: 600 ohms

References: Technical Reference 43201

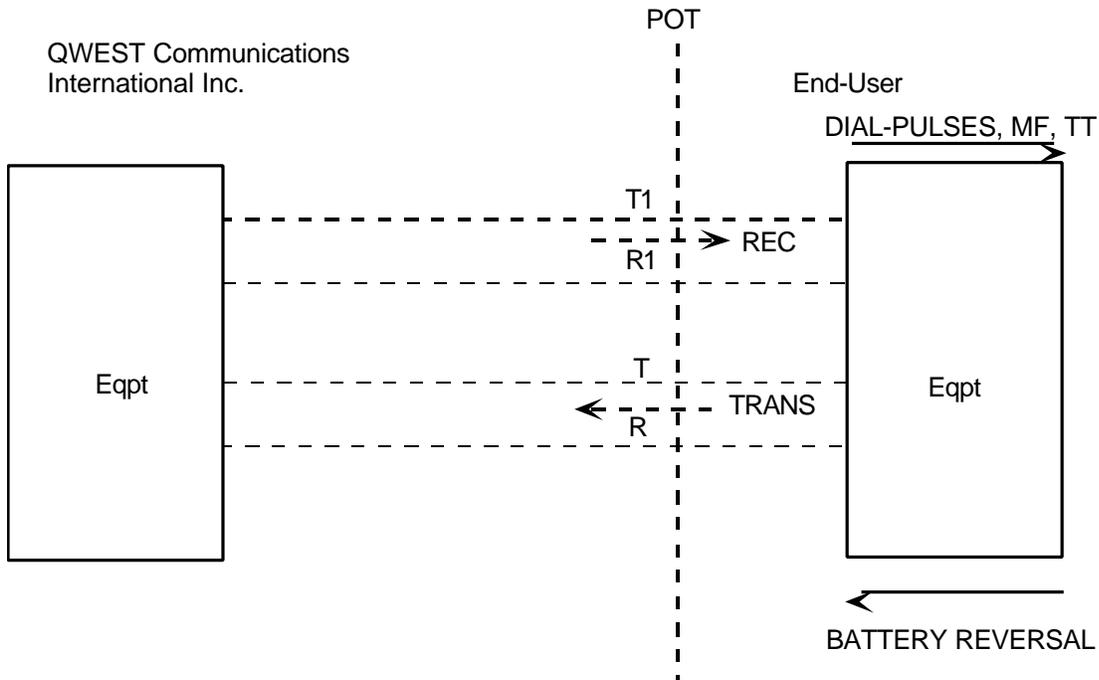ILLUSTRATION:

CONTENTS

10.   Definitions

10.1   Acronyms

AP	Audio Services (Non-Broadcast)
APC	Audio Services Custom
BF	Split Frequency Bridge
BL	Bridge Lifters
BR	Resistive Bridge
BS	Data Select-A-Station Bridge
BT	1) Transfer Bridge 2) Transfer Relay
CLCI™	COMMON LANGUAGE® Circuit Identification
CO	Central Office
CPE	Customer Provided Equipment
DCTE	Data Channel Terminating Equipment
DDS	Digital Data Systems
DS1	Digital Interface
EML	Expected Measured Loss
EU	End-User
IAL	Immediate Action Limit
IEEE	Institute of Electrical and Electronics Engineers
LATA	Local Access and Transport Area
NC	Network Channel
NCI	Network Channel Interface
PLAR	Private Line Automatic Ringdown
POT	Point of Termination
RCC	Radio Common Carriers
TLP	Transmission Level Point
TLP	Transmission Level Points
TLVR	Transmission Level Value Receive
TLVT	Transmission Level Value Transmit
UC	Service Code for VG 32
UD	Service Code for VG 33

UE	Service Code for AP
UG	Service Code for VG 36
VG	Voice Grade
VGB	Voice Grade Basic
VGC	Voice Grade Custom

CONTENTS

Chapter and Section   **Page**

11.   References

11.1   American National Standards Institute Documents

ANSI T1.403-1989   *Carrier to Customer Installation - DS1 Metallic Interface*

11.2   Telcordia Documents

PUB 41004   *Data Communications Using Voiceband Private Line Channels*, October 1973

PUB 41014   *Data Communications Using DATAPHONE® Select-A-Station Service*, February 1978

PUB 43201   *Private Line Interconnection Voice Applications*, June 1970

PUB 43701   *Private Line Interconnection - Connection to a Channel of a Communications System*, February 1977

PUB 62113   *Network Channel Interface Specifications for Off-Premises Station Lines (PBX End) Facility Interface Codes OL13A, OL13B and OL13C*, November 1981

PUB 62114   *Network Channel Interface Specifications for Tie Trunk-Like Channel's Accommodating Four Wire Lossless Registered Terminal Equipment that originates on M-Lead Facility Interface Codes TL31M and TL32M*, December 1981

PUB 62118   *Network Channel Interface Specifications for Tie Trunk-Like Channels Accommodating Conventional Term Set Registered Terminal Equipment that originates on M-Lead Facility Interface Codes TC31M and TC32M*, February 1982

TR-NPL-000912   *Compatibility Information for Telephone Exchange Service*, Issue 1, February 1989

TR-TSY-000054   *High Capacity Digital Service (1.544 Mb/s) Interface Generic Requirements for End-Users*

11.3   Institute of Electrical and Electronics Engineers (IEEE)

IEEE 820   Telephone Loop Performance Characteristics - 1985

11.4   QWEST Technical Publications

PUB 77312   *QWEST Digital Data Service, Technical Product Description Transmission Parameter Limits, and Interface Combinations*, Issue F, July 2001.

PUB 77307   *Low Speed Data, Telegraph and Direct Current Services, Issue B, July 2001.*

PUB 77314   *PNB Local Area Data Service*, Issue C, July 2001.

11.5   Ordering Information

Several Technical References may be of assistance in providing a complete network of services. Listed are the major complementary Technical References and Technical Publications for LATA services.

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.

Employees of QWEST Communications International Inc. may order publications by submitting form RG 31-0033 to:

> Central Distribution Center (CDC)
> 1005 17th St., S-30
> Denver, CO 80202
> Phone: (303) 896-9446
> Fax: (303) 965-8652

Most QWEST publications are available to QWEST employees on the company network (E*MEDIA). Call the (303) 624-4796 or email: emedia@qwest.com for further information.

Those who are not QWEST employees may order:

• American National Standards Institute (ANSI) documents from:

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

> ANSI has a catalog available which describes their publications.

- Telcordia documents from:

  Telcordia Customer Relations
  8 Corporate Place, PYA 3A-184
  Piscataway, NJ 08854-4156
  Fax: (908) 336-2559
  Phone: (800) 521-CORE (2673) (U.S. and Canada)
  Phone: (908) 699-5800 (Others)
  Web: www.telcordia.com

- Institute of Electrical and Electronic Engineers from:

  Institute of Electrical and Electronics Engineers, Inc.
  345 East 47th Street
  New York, NY 10017-2394

- QWEST Technical Publications from:

  http://www.qwest.com/techpub

11.6   Trademarks

CLCI	Trademark of Bell Communications Research, Inc.
COMMON LANGUAGE	Registered Trademark of Bell Communications Research, Inc.
Dataphone	Trademark of AT&T Technologies
Select-A-Station	Trademark of AT&T Technologies
QWEST®	Registered Trademark of QWEST Communications International Inc.

CONTENTS

A. Network Channel Interface (NCI) Code

The NCI Code used to describe both ends of a two-point Non-Access channel can have up to 12 positions to fully describe all the options needed. The following paragraphs describe the format, codes and options associated with the NCI Code.

A.1 NCI Code Format

NCI Code Format											
Network Channel Interface (NCI) Code											
Total Wires		Protocol Code			Delimiter	Protocol Options (Default ---)			Delimiter	TLP Levels	
										Transmit *	Receive #
1	2	3	4	5	6	7	8	9	10	11	12
					•				•		

Paragraph A.4

Paragraph A.3

Paragraph A.2

Paragraph A.5
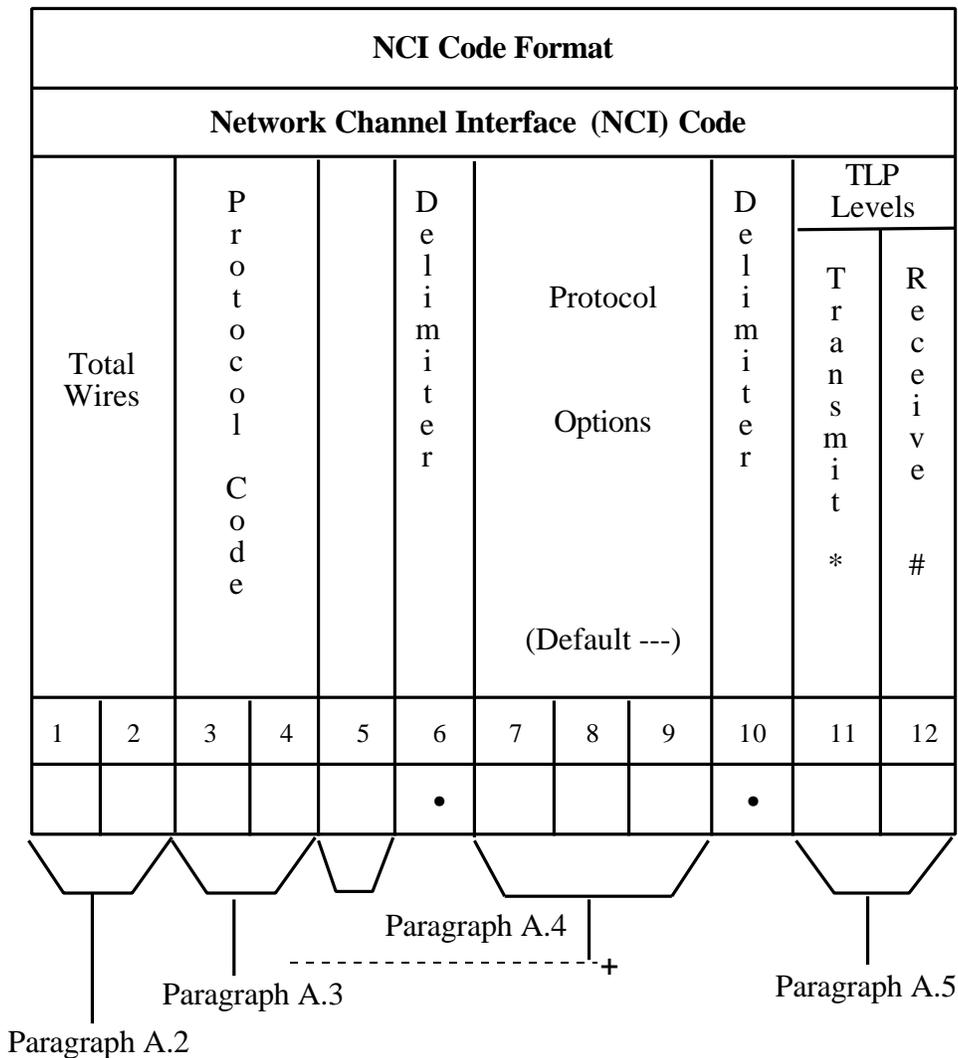
* TLVT TLP from CO into Interface
# TLVR TLP from Interface into CO

A.2   NCI Decode

Total Wires

NUMBER OF WIRES	CODE
2	02
4	04
5	05
6	06
7	07
8	08
9	09
10	10
12	12

A.3   NCI Protocol Codes and Options

Cross-Reference To NCI Codes

Network Channel Interface (NCI) Protocol Codes And Options (Positions 3, 4 and 7, 8, 9)		
3, 4	**7, 8, 9**	
Code	**Options**	**Definitions**
AC		Accepts 20 Hz ringing at the customer's premises
	R	Accepts 20 Hz Code Selective ringing
BB		C.O. Bridge - Direct Bridge (Bunch Block)
BD		C.O. connection to a QWEST Digital Data Service (e.g. analog data to digital data)
	24	for 2.4 kbps QWEST Digital Data Service
	48	for 4.8 kbps QWEST Digital Data Service
	96	for 9.6 kbps QWEST Digital Data Service
BF		C.O. Bridge - Split Frequency Bridge
BH		C.O. Bridge - Telegraph HUB
BL		C.O. Bridge - Bridge Lifter
BM		C.O. Bridge: 3-State (McCulloh) series bridge
BP		C.O. Bridge - Audio Services

Network Channel Interface (NCI) Protocol Codes And Options (Positions 3, 4 and 7, 8, 9)		
3, 4	**7, 8, 9**	
Code	**Options**	**Definitions**
BR	CF SP	C.O. Bridge - Resistive Type C.O. Bridge - Resistive Type: Conference Operation C.O. Bridge - Resistive Type: Split Path Operation. An independent path (2-Wire bridge) is provided for each direction of transmission
BS		C.O. Bridge - Data Select-A-Station® type
BT		C.O. Relay - Transfer Arrangement
CC		Contact Closure - QWEST Communications, Inc. provided dry contact closure to the interface.
CS	15	Digital Hierarchy Interface at a C.O. Digital Crossconnect (or similar) device (i.e. the Command a Link end of the service).
CT	DD	CO Centrex tie trunk termination with Data Enhancement
DA	C1 C2 C4 C11 C21 C41 D1	Data stream in VF frequency band at the interface Optional C1 conditioning Optional C2 conditioning Optional C4 conditioning (No Midlink) Optional C1 plus D1 conditioning (2-Point Only) Optional C2 plus D1 conditioning (2-Point Only) Optional C4 plus D1 conditioning (2-Point Only) Optional D1 conditioning (2-Point Only)
DC	1 2 3 4	Direct Current or Voltage 3 State monitoring interface (McCulloh receiver) QWEST Communications, Inc. energized interface Direct Current/Metallic/DC continuity Direct Current/QWEST Facilities/DC continuity
DE		Data Select-A-Station® Interface at end-user premises

Network Channel Interface (NCI) Protocol Codes And Options (Positions 3, 4 and 7, 8, 9)		
3, 4	**7, 8, 9**	
Code	**Options**	**Definitions**
DS		Digital Hierarchy Carrier Interface (DSX1)
	15	1.544 Mb/s (DS1) with AMI line code and Superframe (SF) Format
	15K	1.544 Mb/s (DS1) with AMI line code and Extended Superframe (ESF) Format
	15M	DS1-to-Voice C.O. Multiplexer
	15S	1.544 Mb/s (DS1) using B8ZS line code and Extended Superframe (ESF) Format
	15Z	1.544 Mb/s (DS1) using AMI line code and Extended Superframe (ESF) Format with ZBTSI Application
	44	44.736 Mb/s (DS3)
	63	6.312 Mb/s (DS2)
DS	EA	E&M signaling DS1 rate
	GO	Ground-start loop signaling-open end, DS1 rate
	GS	Ground-start loop signaling-closed end, DS1 rate
	LO	Loop start-loop signaling-open end, DS1 rate
	LS	Loop start-loop signaling-closed end, DS1 rate
	NO	Transmission only-no signaling DS1 rate
DU		Digital End User Interface
	B	1.544 Mb/s (DS1) with AMI line code and Superframe (SF) Format.
	BN	1.544 Mb/s (DS1) with AMI line code and Superframe (SF) Format, with line power not extended to the interface.
	C	1.544 Mb/s (DS1) with AMI line code and Extended Superframe (ESF) Format
	CN	1.544 Mb/s (DS1) with AMI line code and Extended Superframe (ESF) Format, with line power not extended to Network Interface (NI).
	S	1.544 Mb/s (DS1) using B8ZS line code and Extended Superframe (ESF) Format.
	SN	1.544 Mb/s (DS1) using B8ZS line code and Extended Superframe (ESF) Format, with line power not extended to Network Interface (NI).
	Z	1.544 Mb/s (DS1) using AMI line code and Extended Superframe (ESF) Format with ZBTSI application.
	ZN	1.544 Mb/s (DS1) using AMI line code and Extended Superframe (ESF) Format with ZBTSI application, and with line power not extended to Network Interface (NI).

Network Channel Interface (NCI) Protocol Codes And Options (Positions 3, 4 and 7, 8, 9)		
3, 4	**7, 8, 9**	
Code	**Options**	**Definitions**
EA	E EDD M MDD	Type I, E&M signaling Ground on E-lead by customer to Originate E-lead Originate + DD Data Enhancement Battery on M-lead by customer to Originate M-lead originate + DD Data Enhancement
EB	E EDD M MDD	Type II, E&M signaling Ground on E-lead by customer to Originate E-lead Originate + DD Data Enhancement Battery on M-lead by customer to Originate M-lead Originate + DD Data Enhancement
GO	DD	Ground Start loop signaling (open end) Optional DD Data Enhancement
GS	DD	Ground Start loop signaling (closed end) Optional DD Data Enhancement
IA		EIA interface RS-232 (25pin)
LA	DB	Loop-start Signaling - Class A registered port (open end) Optional DB Data Enhancement
LB	DB	Loop-start Signaling - Class B registered port (open end) Optional DB Data Enhancement
LC	DB	Loop-start Signaling - Class C registered port (open end) Optional DB Data Enhancement
LG	DB	Loop-start Signaling - Class A registered port (open end) with repeated ringing. Optional DB Data Enhancement.
LO	DB	Loop-start signaling (open end) Optional DB Data Enhancement
LR		Loop-start automatic ringdown signaling (closed end)
LS	DB	Loop-start signaling (closed end) Optional DB Data Enhancement
MT		Metallic Facilities Direct Current (DC)
NO		No Signaling - Transmission Only Interface

Network Channel Interface (NCI) Protocol Codes And Options (Positions 3, 4 and 7, 8, 9)		
3, 4	**7, 8, 9**	
Code	**Options**	**Definitions**
PG		Program transmission - no dc signaling
	3	Nominal frequency from 200 Hz to 3,000 Hz
	5	Nominal frequency from 100 Hz to 5,000 Hz
	8	Nominal frequency from 50 Hz to 8,000 Hz
	1	Nominal frequency from 50 Hz to 15,000 Hz
RV		Loop reverse battery supervision
	O	Battery supplied by QWEST Communications, Inc. End-User originates
	T	Battery supplied by customer, customer terminates
TT		Telegraph grade interface
	2	20.0 Milliamperes interface
	6	62.5 Milliamperes interface

A.4   Reference Impedance Code

Value (ohms)	Code
110	0
150	1
600	2
900	3
1200	4
135	5
75	6
124	7
Variable	8
100	9
Fiber	F

A.5   Transmission Level Point (TLP) Code

-	=	See [1]	I	=	See [2]	R	=	-1.0
A	=	-16.0	J	=	-8.0	S	=	0.0
B	=	-15.0	K	=	-7.0	T	=	+1.0
C	=	-14.0	L	=	-6.0	U	=	+2.0
D	=	-13.0	M	=	-5.0	V	=	+3.0
E	=	-12.0	N	=	-4.0	W	=	+4.0
F	=	-11.0	O	=	See [3]	X	=	+5.0
G	=	-10.0	P	=	-3.0	Y	=	+6.0
H	=	-9.0	Q	=	-2.0	Z	=	+7.0

Notes:
1. A "-" in the TLP column means QWEST will substitute the default Transmission Level Value
2. Refer to note on the Service Order: Transmission Level Value
3. An "O" in the TLP column means no transmission in this direction