QWEST Communications International Inc. Technical Publication

Private Line
Voice Grade Analog Channels
For Access Service

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NOTICE

This publication provides technical information about the Private Line Voice Grade Analog Channels for Access Services available from QWEST. Included is interface information at customer interfaces. Network Channel and Network Channel Interface Codes are included. Much of this information was formerly found in the U S WEST publication number 77365, *Network Channel and Network Channel Interface Combinations.*

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Tables

1. Introduction

1.1 General

This publication provides technical information about the Private Line Voice Grade Analog Channels for Access Services available from QWEST. Included is interface information at customer interfaces. Network Channel and Network Channel Interface Codes are included. Much of this information was formerly found in the QWEST publication number 77365, *Network Channel and Network Channel Interface Combinations.*

1.2 Reason For Reissue

This publication is being revised to:

- Change the Network Interface for delivery to a Collocated Interconnector.
- Update the references (Chapter 19).

1.3 Document Organization

This document is organized into chapters as listed in Table 1-1.

A brief note about numbering in this document might help the reader. The tables and figures are numbered using the form: Table/Figure 2-3. This table/figure would be the third table/figure in Chapter 2. Thus the above reference to Table 1-1 means the first table in this chapter.

Similarly, Section 4.2 would be the second section in Chapter 4. Subsections take the form 4.2.3 meaning the third subsection in Section 2, which is in Chapter 4.

1.4 Scope of Document

This document provides descriptions of the Voice Grade Services and their options. NC and NCI codes are provided along with valid NC/NCI code combinations. The document refers to Telcorida's TR-NWT-000335, *Voice Grade Special Access Services - Transmission Parameter Limits and Interface Combinations*, for additional information of a technical nature. This information may be used to order the proper voice grade service to fit a particular application.

1.5 How To Use This Document

This document may be used in several ways depending on what is known about the desired service. It is assumed that the service is a private line voice grade access service.

1.5.1 Selecting a Desired Service and Options

The best place to start the search is in Chapter 2. The brief descriptions will help identify the required voice grade service and desired options. TR-NWT-000335 should be consulted if further details are required.

Table 1-1 Document Organization

Chapter	Title	Contents
1	Introduction	Information about this document
2	Service Description	Description of the service and options and an explanation of selected terms.
3	Network Channel Codes	Definition of NC codes and list of valid NC codes offered by QWEST.
4	Network Channel Interface Codes	Definition of NCI codes and list of valid NCI codes offered by QWEST.
5	NC/NCI Combinations - General	General information about the NC/NCI code combinations and configurations offered by QWEST. Includes instructions on how to read the combinations tables.
6	NC/NCI Combinations - VG1	Voice Grade 1 NC/NCI combinations
7	NC/NCI Combinations - VG2	Voice Grade 2 NC/NCI combinations
8	NC/NCI Combinations - VG3	Voice Grade 3 NC/NCI combinations
9	NC/NCI Combinations - VG4	Voice Grade 4 NC/NCI combinations
10	NC/NCI Combinations - VG5	Voice Grade 5 NC/NCI combinations
11	NC/NCI Combinations - VG6	Voice Grade 6 NC/NCI combinations
12	NC/NCI Combinations - VG7	Voice Grade 7 NC/NCI combinations
13	NC/NCI Combinations - VG8	Voice Grade 8 NC/NCI combinations
14	NC/NCI Combinations - VG9	Voice Grade 9 NC/NCI combinations
15	NC/NCI Combinations - VG10	Voice Grade 10 NC/NCI combinations
16	NC/NCI Combinations - VG12	Voice Grade 12 NC/NCI combinations
17	Technical Information	Technical Information not included in other referenced publications.
18	Definitions	List of acronyms and a glossary of terms used in this document
19	References	List of references with ordering instructions and a list of Trademarks.

1.5.2 Selecting a Network Channel Code

Once the type of voice grade service and options are identified, Chapter 3 may be used to identify or encode the proper four-character NC code. Chapter 3 briefly explains NC codes and lists the available codes for the required options. The tables contain a cross-reference to the NC/NCI combination tables later in this document.

Alternatively, Table 1-1 may be used to turn directly to the proper chapter for a desired voice grade type.

1.5.3 Selecting a Network Channel Interface Code

Chapter 4 may be searched for a list of available interfaces offered by QWEST along with their NCI codes. Actual technical descriptions may be found in the documents listed in Table 4-3. TR-NWT-000335 is the primary source of information.

1.5.4 Verifying Availability of Channel and Interface Combinations

If both NC and NCI codes have been selected, the proper NC/NCI Combinations table can be consulted to see if the NC/NCI combination is available from QWEST. Chapter 5 explains how to read the combinations tables. Table 1-1 or a Table of Contents may be used to turn directly to the combinations table for a desired voice grade service.

1.5.5 Configurations

This publication uses "Configurations" as an aid in understanding the basic concept of what NC/NCI combinations are describing. These Configurations are numbered, generic drawings of the service described by the NC and NCI codes. See Section 5.3 for further information.

1.6 Other Technical Publications

Information about QWEST's non-access voice grade services may be found in PUB 77311, *Analog Channel for Non-Access Service.* Several other technical documents are identified throughout this document. Ordering information about each may be found in Chapter 18.

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2. Service Description

2.1 General

Voice Grade Special Access Services are suitable for the access segments of line-type, trunk-type, and private line data services. Usable frequencies are nominally 300 to 3000 Hz. Some voice grade categories include such services as switched specials, voice/tone relaying, data, etc. The services extend from a Network Interface (NI) or Point of Termination (POT) at an Interexchange Carrier (IC) or Access Customer location (i.e., an IC-POT) to a NI or POT at an End-User (EU) location (i.e., an End-User NI), unless stated otherwise. Services may also go between two Access Customers or between an Interconnector in a QWEST Central Office and either an End-User or Access Customer.

The terms End-User NI, IC-POT or Access Customer NI will be used in this document when needed. Otherwise, more the generic term "Customer Interface" will be used when the distinction between the NIs is not required.

Table 2-1 summarizes the types of Voice Grade Special Access services. Additional information may be found in the remainder of the chapter.

Information about IntraLATA Private Line Services (IPLS) may be found in Section 2.15.

Further information about both services may be found in TR-NWT-000335. Interconnection is described in PUB 77386, *Expanded Interconnection and Collocation for Private Line Transport and Switched Access Services.*

2.2 Voice Grade 1 (VG1)

Special Access Service VG1 is suitable for the access segment of basic two-point, non-switched voice circuits where the higher transmission quality of other access services is not required.

2.3 Voice Grade 2 (VG2)

Special Access Service VG2 is suitable for the access segment of voice line-type and switched special service circuits. For services such as Foreign Exchange (FX) that are switched at a Local Exchange Carrier Central Office (LEC CO), this service is suitable for the station or closed-end only. (The open [CO] end of FX services will be provided by Switched Access Services, Feature Group A. These are beyond the scope of this publication.) The VG2 service will support effective 2-wire or 4-wire transmission and extends from an End-User NI or a QWEST CO, where a Centrex switch is located, to an Access Customer NI, or between End-User NIs (in the case of IntraLATA Private Line Service. Connections between Interconnectors and either Access Customers or End-Users are also available.

2.4 Voice Grade 3 (VG3)

Special Access Service VG3 is suitable for the access segment of voice trunk-type circuits. The service extends from and End-User NI or QWEST CO, where a Centrex Switch is located, to an Access Customer NI, or between End-User NIs in the case of IntraLATA Private Line Service. Connections between Interconnectors and either Access Customers or End-Users are also available.

Table 2-1 Summary of Voice Grade Special Access Services

Service	Description	Typical Applications
VG1	Two-point Non-switched Line	Voice Private Line
VG2	Two-point or multipoint Switched Line	Two-point or Multipoint Switched Voice Circuit; Off-Premises Station Line; Foreign Exchange Line
VG3	Two-point Trunk	PBX-CO Trunk; Centrex Trunk
VG4	Specialized Voice/Control Tone Circuit	Government Specification 1142A Circuits (Federal Aviation Administration)
VG5	Two-point or Multipoint Circuit	Two-point or Multipoint Low-speed Voiceband Data Circuit
VG6	Two-point or Multipoint Circuit	Two-point or Multipoint Voiceband Data Circuit
VG7	Two-point Line	Two-point Voiceband Line or Trunk Suitable for Permissive Voiceband Data
VG8	Two-point Trunk	Voiceband Trunk Suitable for Permissive Voiceband Data
VG9	Two-point Trunk	Voiceband Trunk Suitable for Permissive Voiceband Data: Access Customer NI to Access Customer NI or Access Customer NI to QWEST Central Office
VG10	Two-point or Multipoint Circuit	Two-point or Multipoint Voice Grade Private Line Data Circuit
VG12	Two-point or Multipoint Circuit	Two-point or Multipoint Specialized Audio Tone Protective Relaying Circuits
VG Custom	Two-point or Multipoint Circuit	Customized

2.5 Voice Grade 4 (VG4)

Special Access Service VG4 is a 4-wire channel suitable for the access segment of specialized voice/tone circuits for the Federal Aviation Administration per Government Specification S-1142A. This service provides two-way voice transmission and also provides one-way or two-way transmission of control tones, which operate or monitor the status of radio transceivers.

2.6 Voice Grade 5 (VG5)

Special Access Service VG5 is suitable for the access segment of low-speed voice grade data circuits. A typical application is DATAPHONE® Select-A-Station, a historical or grandfathered service.

2.7 Voice Grade 6 (VG6)

Special Access Service VG6 is a 4-wire channel suitable for the access segment of most voice grade data circuits.

2.8 Voice Grade 7 (VG7)

Special Access Service VG7 is suitable for the access segment of "permissive data" type private line circuits. For example, voice line-type or voice trunk-type circuits capable of transporting medium speed analog data. The VG7 service will support effective 2-wire or 4-wire transmission and extends from an End-User NI or a QWEST CO, where a Centrex switch is located, to an Access Customer NI, or between End-User NIs in the case of IntraLATA Private Line Service. Connections with Interconnectors are also available.

2.9 Voice Grade 8 (VG8)

Special Access Service VG8 is an effective 4-wire channel suitable for the access segment of "permissive data" trunk-type circuits capable of transporting medium speed analog data. The VG8 service extends from an End-User NI or a QWEST CO, where a Centrex switch is located, to an Access Customer NI. Connections with Interconnectors are also available.

2.10 Voice Grade 9 (VG9)

Special Access Service VG9 is a 4-wire channel suitable for the access segment of "permissive data" trunk-type circuit capable of transporting simultaneous two-way medium speed analog data. The service extends from one Access Customer NI to another Access Customer NI in the same LATA. Connections with Interconnectors are also available.

2.11 Voice Grade 10 (VG10)

Special Access Service VG10 is suitable for the access segment of voice grade data circuits. The VG10 service extends from an End-User NI to an Access Customer NI, or between End-User NIs in the case of IntraLATA Private Line Service. Connections with Interconnectors are also available.

2.12 Voice Grade 12 (VG12)

Special Access Service VG12 is suitable for the access segment of specialized voice grade private line audio tone protective relaying circuits.

2.13 Voice Grade Custom (VGC)

Special Access VGC may be used for two-point service including end-links and mid-links of Special Access Voice Grade multipoint circuits. The VGC service is a Voice Grade Special Access Service that may be "customized" by specifying any of the technical specifications for VG1 through VG12.

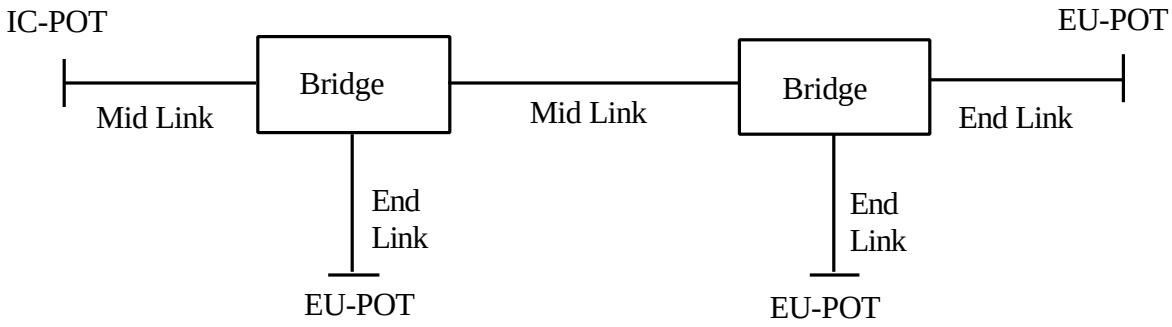
Customized technical specification packages will be provided by QWEST where technically feasible. If QWEST determines that the requested specifications are not compatible or feasible, the customer will be advised and given the opportunity to change the order.

2.14 Optional Features

A number of optional features may be ordered with VG1 through VG10 and VG12.

2.14.1 Central Office Bridging

Certain Special Access Services may be provided as multipoint private line circuits. A typical multipoint Special Access Service would extend from an Access Customer NI location to a bridging HUB (mid-link), from a bridging HUB to another bridging HUB (mid-link), or from a bridging HUB to an End-User NI (end-link). A typical multipoint circuit is illustrated in Figure 2-1. Careful consideration should be given to using more than 20 links in a multipoint circuit. Further information about bridging and multipoint services may be found in Section 2.20.



Key:
IC = Interexchange Carrier
POT = Point of Termination
EU = End-user

Figure 2-1 Typical Multipoint Circuit

2.14.2 Conditioning

Several Conditioning options are available:

C Conditioning

C Conditioning is available as a separate option for Special Access Service VG5, 6, 7, 8, 9, 10, and Custom. C Conditioning changes the frequency response limits and upgrades the envelope delay distortion limits.

Improved Attenuation Distortion

The improved attenuation distortion option is available as a separate option for Special Access Services VG5, 6, 7, 8, 9, 10, and Custom. As implied, the improved attenuation distortion option upgrades the frequency/loss response limits of the channel.

Improved Envelope Delay Distortion

Improved envelope delay distortion is available as a separate option for Special Access Services VG5, 6, 7, 8, 9, 10, and Custom. As implied, improved envelope delay distortion upgrades the frequency/envelope delay response limits of the channel.

Data Capability

Data capability is available for Special Access Services VG6, 7, and 10. This option upgrades the signal-to-C-notched noise ratio and intermodulation distortion limits.

2.14.3 Effective Four-Wire Transmission With Two-Wire Interface

When a customer requests that an effective 4-wire channel be terminated with a 2-wire interface at the customer designated premises, then this optional feature applies. Placement of QWEST equipment (hybrid) will be required at the customer's designated premises with the 2-wire NI.

2.14.4 Improved Echo Control ELEPL-2 at Four-Wire Interface

Equal Level Echo Path Loss-2 (ELEPL-2) is available on an effective 2-wire transmission path with one end being a 4-wire NI. It provides for more stringent control of echo return loss and singing return loss. In order for this option to apply, the channel interfaces must be 4-wire at one NI and 2-wire at the other NI. The equal Level Echo Path Loss parameters are delineated in Technical Reference TR-NWT-000335.

2.14.5 Improved Return Loss At Two-Wire Interface

Improved Return Loss is available on effective 2-wire transmission, at the 2-wire NI. It provides more stringent echo control specifications. In order for this option to apply, the transmission path must be 4-wire at one NI and 2-wire at the other NI. The Improved Return Loss parameters are delineated in Technical Reference TR-NWT-000335.

2.14.6 Improved Termination

This option provides a matching 600 ohm impedance toward the customer at a 4-wire NI, an extended range of customer specified levels (-16 to + 7 TLP {Transmission Level Point}), and allows for simplex reversal (when applicable). This option requires that QWEST equipment be placed at the customer designated premises. The Improved Termination parameters are delineated in Technical Reference TR-NWT-000335. Improved Termination is not available to Interconnectors.

2.15 IntraLATA Private Line Service

IntraLATA Private Line Service (IPLS) described in this document meet the criteria described in this section. (PUB 77311 should be consulted for other IntraLATA services.)

The service must be an end-to-end channel (i.e., between two End-Users) located in the same LATA and falling under the jurisdiction of the Federal Communications Commission (FCC).

The service falls under FCC jurisdiction if it meets one or more of the following criteria:

- Interstate service where a LATA boundary crosses a state boundary (e.g., between Fargo, North Dakota and Moorhead, Minnesota).
- IntraLATA service that may carry interstate traffic either occasionally or predominately by being connected to interstate circuits.

The features, options and transmission performance specifications for IPLS are briefly described in this document and in Section 6 of TR-NWT-000335. However, this does not restrict IPLS to the figures or examples shown, provided adherence to FCC Part 68 Registration Rules and Regulations is maintained and the TLPs and other technical specifications are observed.

The transmission performance parameters limits for IPLS are not as stringent as those specified for Voice Grade Special Access Service because IPLS is an end-to-end communication channel (from the viewpoint of an End-User) and an access service is but a portion of an end-to-end channel.

Table 2-2 summarizes the IPLS services.

Table 2-2 Summary of IntraLATA Private Line Services

Service	Description	Typical Applications
VG2	Two-point Line	Voice Private Line
VG3	Two-point Trunk	Voice Trunk
VG 7	Two-point Line/Trunk	Voice/Permissive Data Line/Trunk
VG10	Two-point Circuit	Data Circuit

2.16 Channel Configurations

Services may be provided over 2-wire, effective 2-wire, 4-wire or effective 4-wire channels. The physical makeup of the channel may consist of either metallic cable, carrier facilities or a combination of both. Section 2.16 describes these terms.

The use of “configuration” in this section should not be confused with the more formal usage described in Chapter 5 and the remainder of this document.

Much of the following information is from TR-NWT-000335.

2.16.1 Two-Wire & Effective Two-Wire Channels

A 2-wire channel is a 2-wire facility, terminated in a 2-wire interface at both the End-User NI and the Access Customer NI. An effective 2-wire channel is terminated in a 2-wire interface at the End-User NI and may have either a 2-wire or a 4-wire NI at the Access Customer NI. Effective 2-wire channels may be entirely 2-wire or may contain a 4-wire facility section such as a carrier with a 2-wire metallic extension. An effective 2-wire channel will contain at least one 2-wire segment and its expected transmission performance will be that of a 2-wire channel. The two directions of transmission are not physically separated and echo (signal energy reflected from points of impedance mismatch) must be a consideration in system operation. With 2-wire and effective 2-wire channel configurations, it is not possible to ensure simultaneous independent transmission in both directions without special applications such as frequency-division multiplexing, split-band filtering or echo canceling modems.

Figure 2-2 provides examples of 2-wire and effective 2-wire configurations.

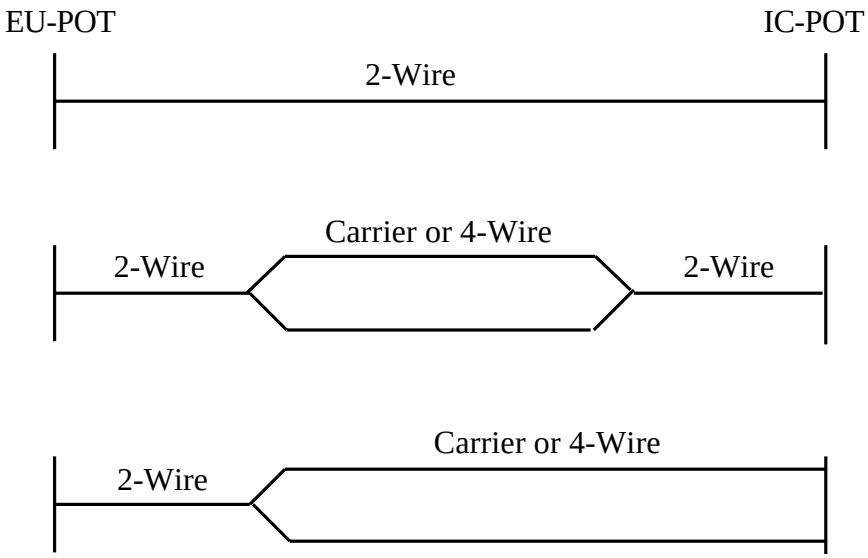


Figure 2-2 Typical 2-Wire & Effective 2-Wire Channel Configurations

2.16.2 Effective Four-Wire Channels

An effective 4-wire channel is terminated in a 2-wire interface at the End-User NI and a 4-wire interface at the Access Customer or Interconnector NI. An effective 4-wire channel consists of 4-wire facilities with no intermediate 2-wire segments. The expected transmission performance of the effective 4-wire channel is better than that of the 2-wire or effective 2-wire channel. Because there is a point of conversion from 4-wire to 2-wire transmission (at the End-User NI), echo must be considered and simultaneous independent transmission of information in both directs cannot be ensured without special applications as noted in Section 2.16.1. The method of implementing effective 4-wire is at the discretion of QWEST. Figure 2-3 illustrates a typical effective 4-wire channel configuration.

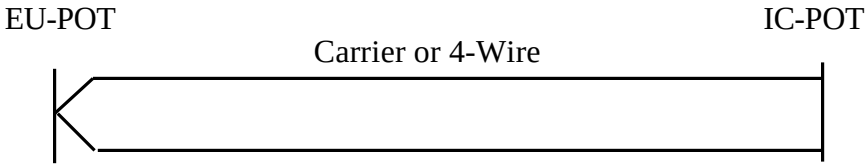


Figure 2-3 Typical Effective 4-Wire Channel Configuration

Figure 2-3 illustrates an Effective 4-wire channel that may occur with an IPLS channel. This channel has 2-wire interfaces at both End-User NIs.

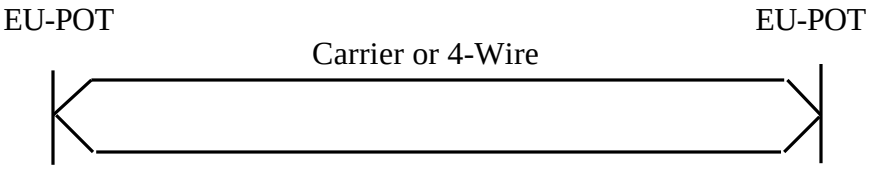


Figure 2-4 IntraLATA Effective 4-Wire Channel Configuration

2.16.3 Four-Wire Channels

A 4-wire channel is terminated in 4-wire interfaces at both NIs and consists of entirely 4-wire facilities. The 4-wire channel overcomes the limitations of simultaneous independent 2-way transmission inherent in effective 2-wire and effective 4-wire channels. Figure 2-5 illustrates a typical 4-wire channel configuration.

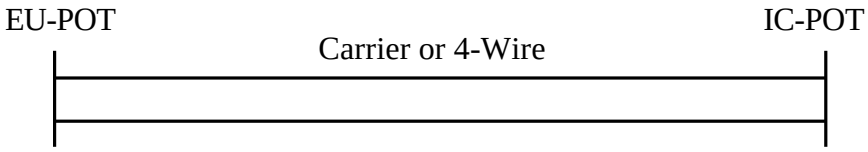


Figure 2-5 Typical 4-Wire Channel Configuration

2.17 Signal Level Considerations

Signal level power on a channel must be constrained to a range that approximates the average telephone voice power that transverses the telecommunications network. This is necessary to avoid overloading carrier systems or overdriving metallic loops, which results in signal distortion, noise and crosstalk.

Section 2.7 in TR-NWT-000335 should be consulted for further information. One term, the Transmission Level Point (TLP), does appear in this document. The TLP can be encoded into the Network Channel Interface (NCI) code in positions eleven and twelve. See Chapter 4 for further information.

2.18 Echo Return Loss and Stability

The conversion from a 4-wire to a 2-wire transmission path is usually accomplished using a hybrid circuit with a balance network. At the junction of the conversion (4-wire to 2-wire), any impedance mismatch results in reflected energy. A complete mismatch (as with a short or open circuit at the 2-wire port of the hybrid) will cause the return loss or impedance balance at the junction to be zero. When the impedances match exactly, the return loss is extremely high.

Signal reflections at impedance mismatch points on a voiceband channel are manifested as echoes. Power circulating in the 4-wire transmission path of the channel is manifested as an oscillation or "singing". Proper balance at 2-wire to 4-wire junctions, resulting in high return loss at the junction, is used to control echo and singing. Consequently, return loss can be used as a measure of the impedance match of the balance network to the 2-wire line or termination and as an indication of circuit stability.

Additional information on this subject may be found in Section 2.8 of TR-NWT-000335. The terms "Echo path loss" (EPL) and "Equal level echo path loss" (ELEPL) are defined.

2.19 Signaling Arrangements

Signaling is used to pass supervisory signals between the customer's equipment and the service provider's equipment. The signals are used to provide supervision (e.g., off-hook and on-hook), address information (e.g., the called number) and several other functions. This section contains an overview of the types of signaling arrangements commonly referenced in this publication. Included are: loop-start, ground-start, E&M, and reverse-battery. The first two are used for line-side switch terminations while the latter two are used for trunk-side terminations. Two other types, single-frequency (SF) and duplex (DX), are used to extend the range of these signaling arrangements.

This discussion of signaling is very brief. Those requiring further information on the subject should consult TR-NWT-000335 (Section 4). Other references on the general subject of signaling include GR-334-CORE, *Switched Access Service: Transmission Parameter Limits and Interface Combinations* (Section 4) and SR-TSV-002275, *BOC Notes on the LEC Network-1994* (Section 6).

The material is described as it would apply to the Private Line Voice Grade Access Channel described in this publication. However, the information could apply to other types of services.

2.19.1 Loop-Start Signaling

Loop-start signaling arrangements are applicable to VG1, VG2, VG3, VG7 and VGC (VG2, VG3 and VG7 for IPLS). There are two "ends" of the signaling arrangement. The open-end (code LO) applies to the switch end of the service while the closed-end (code LS) applies to the terminal or station end of the service. These "ends" may be applied at either an End-User, Interconnector or Access Customer NI.

Closed-end (LS)

In the idle or on-hook state, the terminal (closed-end) appears as a very high impedance to the switch (open-end). The terminal/station goes off-hook to initiate a request for service. This lowers the tip-to-ring dc resistance, drawing a dc current from the open-end of the circuit. This process is called seizure.

The idle terminal is alerted to an incoming call by a 20 Hz ringing signal. This signal has a nominal 2-second-on/4-second-off cycle.

Open-end (LO)

The open-end of the circuit detects the seizure by detecting the dc current caused by the closed-end going off-hook.

The open-end must also have the ability to generate the nominal 20 Hz ringing signal necessary to alert the closed-end of an incoming call.

2.19.2 Ground-Start Signaling

Ground-start signaling arrangements are applicable to VG1, VG2, VG3, VG7 and VGC (VG2, VG3 and VG7 for IPLS). As with the loop-start arrangement, there are two ends: the open-end (code GO) and the closed-end (code GS). These "ends" may be applied at either an End-User, Interconnector or Access Customer NI.

Closed-end (GS)

The terminal (closed-end) initiates a request for service by grounding the ring conductor. The resultant current is detected by the switch (open-end) which responds by grounding the tip conductor and placing a battery in the loop. The closed-end ground detector detects the ground on the tip conductor and closes the switch-hook contacts and removes the ground from the ring conductor, placing the closed-end equipment in the operating mode. The equipment will remain in this mode until either end opens the circuit.

Open-end (GO)

The open-end connects a ringing circuit to the line to initiate a call to the closed-end. This applies aground to the tip conductor, negative battery to the ring conductor, and 20 Hz ringing to the ring conductor. Ringing is used to alert the closed-end. The closed-end answers the call by closing the switch-hook contacts. The open-end responds by removing the ringing signal and connecting the talking path.

2.19.3 E&M Lead Signaling

E&M signaling interfaces are applicable for VG3, VG7, VG8, and VG9 at either carrier or End-User network interfaces (VG3 and VG7 for IPLS). E&M signaling is not available to Interconnectors. An E&M lead signaling interface consists of two or four signaling conductors in addition to the transmission path conductors. The M-lead (battery) originate interface codes are identified by an "M" protocol option and the E-lead (ground) originate interface codes are identified by an "E" protocol option.

There are three types of E&M signaling. Table 2-3 lists the signaling states for each type.

Table 2-3 E&M Lead Signal States

Type	Trunk to Signaling Circuit			Signaling to Trunk Circuit		
	Lead	On-Hook	Off-Hook	Lead	On-Hook	Off-Hook
I	M	Ground	Battery	E	Open	Ground
II	M	Open	Battery	E	Open	Ground
III	M	Ground	Battery	E	Open	Ground

The signaling leads in E&M interfaces are separate from the transmission leads. The total number of conductors at the NI is the addition of two groups of leads, Transmission and Signaling.

Type I E&M Interface (EA-E, EA-M)

The Type I interface was the original E&M interface. This type uses the 2-wire E and M leads for signaling.

Type II E&M Interface (EB-E, EB-M)

The Type II interface is a 4-wire signaling path (E, M, SB and SG leads) fully looped but non-symmetrical arrangement.

Type III E&M Interface (EC)

The Type III interface is a compromise, partially looped, 4-wire signaling path (E, M, SB and SG leads) arrangement. This type is similar to the Type I interface except that the SB and SG leads provide battery and ground for signaling on the M lead. This type is available only at a carrier interface and should be used only if the carrier does not have the capability for Type I or II E&M terminations.

2.19.4 Loop Reverse-Battery Signaling (RV-O, RV-T)

Reverse-battery signaling arrangements are applicable to VG3 and VG7 (IPLS VG3 and VG7). Direct-inward-dial (DID) trunks are a typical application that uses reverse-battery signaling. In this arrangement, the battery and ground are reversed on the tip and ring conductors at the terminating end of the circuit to indicate answer supervision (off-hook).

The interface RV-O is used at the interface when the customer originates the signaling sequence. In this case, battery is supplied by QWEST. The interface at the distant end is designated RV-T and battery is supplied by the customer.

2.19.5 Duplex Signaling (DX)

Duplex signaling arrangements are applicable to VG3, VG7, VG8, VG9 and VGC (IPLS VG3 and VG7). DX signaling is used to extend signaling circuit E&M leads beyond their normal limitation. A single DX signaling section is limited to a maximum loop resistance of 5000 ohms. DX interfaces are transitional or historical and are not recommended.

2.19.6 Single-Frequency Signaling (SF)

Single frequency signaling systems are applicable to VG2, VG3, VG7, VG8, VG9 and VGC. The systems use a 2600 Hz single-frequency tone for signaling transmitted over the voice path.

2.19.7 Digital Multiplexed (DS) Signaling

Multiplexed high-bit-rate digital interfaces (DS) are available at carrier interfaces for all voice grade services in the Service Wire Centers. Standard signaling is bit-per-channel or "robbed-bit" signaling with D3 or D4 format. The NCI protocol options 15L, GO, GS, LO, LS, EA and NO are described in Table 4-3. These codes are represented by "Digital" (see Section 4.4.5) in the NC/NCI combination tables.

2.19.8 Ringdown Signaling

Ringdown signaling involves the manual or automatic application of 20 Hz ringing signal to alert the distant end. Supervisory (i.e., disconnect) and address (i.e., called number) are not transmitted with this arrangements.

2.20 Central Office Bridging

Multipoint circuits with Central Office Bridging are used to connect three or more locations together as discussed in Section 2.14.1. Central office bridging is available with VG2, VG5, VG6, VG10, VG12 and VGC. This section includes some basic information about multipoint services. Further information may be found in TR-NWT-000335 and other documents.

2.20.1 VG2

Multipoint Special Access VG2 is suitable for links of multipoint private line circuits. The transmission interface is 2-wire or 4-wire at the End-User NI and is 4-wire at the Access Customer NI. This service will support 4-wire transmission with 4-wire at all interfaces. When 4-wire transmission is used with 2-wire interfaces at the End-User NI, cautious design, installation, and maintenance is required to minimize reflected power from each leg that "combines" at the bridge and may cause "singing" or "near singing" conditions. Effective 2-wire applications are intended for one-way transmission (EXCEPT for End-User to End-User multipoint circuits, or for IC to End-User multipoint circuits with and EU Network Channel Interface of 02LS2, i.e., a Bridge Lifter).

2.20.2 VG5

Multipoint Special Access VG5 is suitable for links of low-speed multipoint data circuits. The transmission interface is 2-wire or 4-wire at the End-User NI and is 4-wire at the Access Customer NI. This service will support 4-wire transmission with 4-wire at all interfaces. When 4-wire transmission is used with 2-wire interfaces at the End-User NI, cautious design, installation, and maintenance are required to minimize reflected power from each leg that combines at the bridge and may cause "singing" or "near singing" conditions. Effective 2-wire applications are intended for one-way transmission (EXCEPT for DATAPHONE® Select-A-Station and Telemetry/Alarm Bridging Services Passive and Telemetry/Alarm Bridging Services Split-Band Active Bridging Services which are two-way transmission and may be provisioned on effective 2-wire.

2.20.3 VG6

Multipoint Special Access Service VG6 is suitable for links of most voice grade multipoint data circuits.

2.20.4 VG10

Multipoint Special Access Service VG10 is suitable for links of voice grade multipoint private line data circuits.

2.20.5 VG12

Multipoint Special Access Service VG12 is also suitable for links of specialized Voice Grade Private Line Audio Tone Protective Relaying Circuits.

2.20.6 Multipoint (Bridging) Configurations

There are three different circuit or channel configurations commonly used with multipoint bridging services:

- **Conference Arrangement:** Two-way communication between all stations.
- **Split Operation:** Two-way communication between control/master station and any remote station but no communication between remote stations. Uses polling operations.
- **Broadcast:** Two variations exist. The first provides one-way communication from control/master station to all remote stations. No communication back to master station or between remote stations. The other provides one-way communication from each remote station to the control/master station. No communication back from the master station to remote stations or between remote stations.

Configurations for bridge lifters are described elsewhere.

2.20.7 Design Considerations

The facility between a bridge and an end-User is called an end-link as illustrated in Figure 2-1. The facility between two bridges or between a bridge and another carrier is called a mid-link. Each link is considered to be a separate two-point channel, which taken together with the other links makes up the multipoint circuit.

There is a limit on how many links can be used on a multipoint network. Unfortunately, the wide variety of factors makes it difficult to establish precise rules. The number of links affects both transmission quality and availability.

Adding links increases the potential for outage and increases the time required to restore service following an outage. It is recommended that careful consideration be given to establishing networks of more than twenty (20) links.

There are a few issues involving the choice between 2-wire and 4-wire channels and interfaces. Data systems that simultaneously use the same portion of the bandwidth in both directions of transmission or those that do not permit sufficient turnaround time for the decay of echoes should use 4-wire channels and interfaces. This is especially true for End-User to End-User applications. Four-wire channels are normally required for networks of more than six (6) links to prevent "singing" and high-level echoes.

Four wire channels offer significant advantages on multipoint polling systems in which remote stations are not required to communicate directly with each other. The advantages include the capability for a greater number of links, faster turnaround time, full-duplex operation, and simpler safeguards for preventing false remote station start up.

TR-NWT-000335 contains information about the technical parameters that could be expected under several conditions.

2.20.8 Types of Bridging

There are several types of bridging used with multipoint services. They include:

Resistive Bridging

Resistive bridges are the most commonly used type of bridge for analog multipoint services. The name comes from the use of a resister to provide isolation. Gain is normally required. Either a 4-wire bridge or two 2-wire bridges are used to provide a 4-wire bridge application.

Split Frequency Bridging

Split frequency (also known as Split-band) bridging is a bridging system for telemetry and alarm services which divides the voiceband into two separate portions, one portion for each direction of transmission. Split frequency bridging employs a 4-wire circuit between the master station and the bridge and employs 2-wire facilities between the bridge and the remote premises. Split Frequency bridges use filters to allow tones at different frequencies to be used for transmit and receive directions over effective 2-wire channels. Figure 4-5 illustrates an application.

Bridge Lifters

A Bridge Lifter is a special 3-port bridge used with Loop-Start signaling when lengthy off-premise extensions are required. The bridge detects when either station goes off-hook (i.e., is answered) and electrically isolates the path to the on-hook station for the duration of the call.

Section 4.5 contains some illustrations and further information about multipoint applications.

2.20.9 2-Wire/4-Wire Bridges

The commonly used bridges are available in both 2-wire and 4-wire types. One-way services use 2-wire bridges. Full duplex service is provided on either 4-wire bridges or on two 2-wire bridges. The latter arrangement, commonly called a split bridge arrangement, uses one bridge for each direction of transmission. Together, the two 2-wire bridges are treated as a single 4-wire bridge for NC/NCI coding purposes.

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3. Network Channel (NC) Codes

3.1 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.

3.2 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 T1.223-1997, *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*.

3.3 Available Network Channels

There are a number of Voice Grade channels available. They are identified by their NC codes. The tables in Section 3.3 define the NC codes and include a reference to the tables in later chapters, which list valid combinations of NC and Network Channel Interface (NCI) codes.

Some NC code options, identified by the fourth character option "Z", are "Nonstandard" (e.g., LB-Z). There are no standard NC/NCI combination tables available. This is designated by "na" in the tables in Section 3.3.

3.3.1 Voice Grade 1 (VG1)

Table 3-1 Voice Grade 1 (LB)

Network Channel Code	Description	NC/NCI Table
LB--	No options	6-1
LB-A	Effective 4-wire	6-2
LB-D	Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	6-3
LB-L	Improved Termination at 4-wire End-User Point of Termination	6-4
LB-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	6-5
LB-R	Improved Termination at 4-wire Access Customer Point of Termination	6-6
LBB-	ELEPL-2	6-7
LBBR	ELEPL-2 & Improved Termination at Access Customer Point of Termination	6-8

3.3.2 Voice Grade 2 (VG2)

Table 3-2 Voice Grade 2 (LC)

Network Channel Code	Description	NC/NCI Table
LC--	No options	7-1
LC-A	Effective 4-wire	7-2
LC-B	Central Office Bridging	7-3
LC-C	Improved Return Loss for Effective 2-wire	7-4
LC-D	Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	7-5
LC-E	Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	7-6
LC-F	Effective 4-wire & Central Office Bridging	7-7
LC-H	Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	7-8
LC-L	Improved Termination at 4-wire End-User Point of Termination	7-9
LC-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	7-10
LC-Q	Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination	7-11
LC-R	Improved Termination at 4-wire Access Customer Point of Termination	7-12
LCB-	ELEPL-2	7-4
LCBC	ELEPL-2 & Improved Return Loss for Effective 2-wire	7-4
LCBQ	ELEPL-2 & Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination	7-11
LCBR	ELEPL-2 & Improved Termination at 4-wire Access Customer Point of Termination	7-11
LC1-	IntraLATA Private Line Service	7-13
LC1A	IntraLATA Private Line Service and Effective 4-wire	7-14

3.3.3 Voice Grade 3 (VG3)

Table 3-3 Voice Grade 3 (LD)

Network Channel Code	Description	NC/NCI Table
LD--	No options	8-1
LD-A	Effective 4-wire	8-2
LD-C	Improved Return Loss for Effective 2-wire	8-3
LD-D	Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	8-4
LD-L	Improved Termination at 4-wire End-User Point of Termination	8-5
LD-M	Software Connection *	8-6
LD-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	8-7
LD-Q	Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination	8-8
LD-R	Improved Termination at 4-wire Access Customer Point of Termination	8-9
LDB-	ELEPL-2	8-2
LDBC	ELEPL-2 & Improved Return Loss for Effective 2-wire	8-3
LDBQ	ELEPL-2 & Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination	8-8
LDBR	ELEPL-2 & Improved Termination at 4-wire Access Customer Point of Termination	8-4
LD1-	IntraLATA Private Line Service	8-12
LD1A	IntraLATA Private Line Service and Effective 4-wire	8-13

* Software connection to connect Centrex to Common Control Switching Arrangement within the same switch.

3.3.4 Voice Grade 4 (VG4)

Table 3-4 Voice Grade 4 (LE)

Network Channel Code	Description	NC/NCI Table
LE--	No options	9-1
LE-L	Improved Termination at 4-wire End-User Point of Termination	9-2
LE-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	9-3
LE-R	Improved Termination at 4-wire Access Customer Point of Termination	9-4
LE1-	IntraLATA Private Line Service	9-5

3.3.5 Voice Grade 5 (VG5)

Table 3-5 Voice Grade 5 (LF)

Network Channel Code	Description	NC/NCI Table
LF--	No options	10-1
LF-A	Effective 4-Wire	10-2
LF-B	Central Office Bridging	10-3
LF-D	Effective 4-Wire & Improved Termination at 4-wire Access Customer Point of Termination	10-4
LF-E	Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	10-5
LF-F	Effective 4-Wire & Central Office Bridging	10-6
LF-H	Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	10-7
LF-L	Improved Termination at 4-wire End-User Point of Termination	10-8
LF-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	10-9
LF-R	Improved Termination at 4-wire Access Customer Point of Termination	10-10
LFB-	ELEPL-2	10-11
LFBR	ELEPL-2 & Improved Termination at 4-wire Access Customer Point of Termination	10-13
LFC-	C Conditioning	10-14
LFCA	C Conditioning & Effective 4-wire	10-2
LFCB	C Conditioning & Central Office Bridging	10-15
LFCD	C Conditioning & Effective 4-Wire & Improved Termination at 4-wire Access Customer Point of Termination	10-4
LFCE	C Conditioning & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	10-5
LFCF	C Conditioning & Effective 4-Wire & Central Office Bridging	10-6
LFCH	C Conditioning & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	10-7
LFCL	C Conditioning & Improved Termination at 4-wire End-User Point of Termination	10-8
LFCP	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	10-9
LFCR	C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination	10-16

Table 3-5 Voice Grade 5 (LF) (Continued)

Network Channel Code	Description	NC/NCI Table
LFF-	Improved Envelope Delay Distortion	10-14
LFFA	Improved Envelope Delay Distortion & Effective 4-wire	10-2
LFFD	Improved Envelope Delay Distortion & Effective 4-Wire & Improved Termination at 4-wire Access Customer Point of Termination	10-4
LFFF	Improved Envelope Delay Distortion & Effective 4-Wire & Central Office Bridging	10-6
LFFL	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	10-8
LFFP	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	10-9
LFFR	Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	10-16
LFG-	Improved Attenuation Distortion	10-14
LFGA	Improved Attenuation Distortion & Effective 4-wire	10-2
LFGD	Improved Attenuation Distortion & Effective 4-Wire & Improved Termination at 4-wire Access Customer Point of Termination	10-4
LFGE	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	10-5
LFGF	Improved Attenuation Distortion & Effective 4-Wire & Central Office Bridging	10-6
LFGH	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	10-7
LFGL	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination	10-8
LFGP	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	10-9
LFGR	Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination	10-16

Table 3-5 Voice Grade 5 (LF) (Continued)

Network Channel Code	Description	NC/NCI Table
LFJ-	Improved Envelope Delay Distortion & Improved Attenuation Distortion	10-14
LFJA	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Effective 4-wire	10-2
LFJD	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Effective 4-Wire & Improved Termination at 4-wire Access Customer Point of Termination	10-4
LFJH	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	10-7
LFJL	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination	10-8
LFJP	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	10-9
LFJR	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination	10-16
LFRE	Improved Envelope Delay Distortion & Bridging & Improved Termination at 4-wire Access Customer Point of Termination	10-5
LFRH	Improved Envelope Delay Distortion & Bridging & Improved Termination at 4-wire End-User Point of Termination	10-7
LFTB	Improved Envelope Delay Distortion & Central Office Bridging	10-15
LFUB	Improved Attenuation Distortion & Central Office Bridging	10-15
LFVB	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging	10-15
LFWE	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	10-5
LFWF	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging & Effective 4-wire	10-6

3.3.6 Voice Grade 6 (VG6)

Table 3-6 Voice Grade 6 (LG)

Network Channel Code	Description	NC/NCI Table
LG--	No options	11-1
LG-B	Central Office Bridging	11-2
LG-E	Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LG-H	Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LG-L	Improved Termination at 4-wire End-User Point of Termination	11-5
LG-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LG-R	Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGC-	C Conditioning	11-8
LGCB	C Conditioning & Central Office Bridging	11-2
LGCE	C Conditioning & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGCH	C Conditioning & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGCL	C Conditioning & Improved Termination at 4-wire End-User Point of Termination	11-5
LGCP	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGCR	C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGD-	Data Capability	11-8
LGDB	Data Capability & Central Office Bridging	11-2
LGDE	Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGDH	Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGDL	Data Capability & Improved Termination at 4-wire End-User Point of Termination	11-5
LGDP	Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGDR	Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	11-7

Table 3-6 Voice Grade 6 (LG) (Continued)

Network Channel Code	Description	NC/NCI Table
LGE-	C Conditioning & Data Capability	11-8
LGEB	C Conditioning & Data Capability & Central Office Bridging	11-2
LGEE	C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGEH	C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGEL	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination	11-5
LGEP	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGER	C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGF-	Improved Envelope Delay Distortion	11-8
LGFB	Improved Envelope Delay Distortion & Central Office Bridging	11-2
LGFE	Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGFH	Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGFL	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	11-5
LGFP	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGFR	Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGG-	Improved Attenuation Distortion	11-8
LGGB	Improved Attenuation Distortion & Central Office Bridging	11-2
LGGE	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGGH	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGGL	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination	11-5
LGGP	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6

Table 3-6 Voice Grade 6 (LG) (Continued)

Network Channel Code	Description	NC/NCI Table
LGGR	Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGJ-	Improved Attenuation Distortion & Improved Envelope Delay Distortion	11-8
LGJB	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging	11-2
LGJE	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGJH	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGJL	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	11-5
LGJP	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGJR	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGM-	Improved Attenuation Distortion & Data Capability	11-8
LGMB	Improved Attenuation Distortion & Data Capability & Central Office Bridging	11-2
LGME	Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGMH	Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGML	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	11-5
LGMP	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGMR	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	11-7

Table 3-6 Voice Grade 6 (LG) (Continued)

Network Channel Code	Description	NC/NCI Table
LGN-	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion	11-8
LGNB	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging	11-2
LGNE	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGNH	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGNL	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	11-5
LGNP	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGNR	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	11-7
LGQ-	Improved Envelope Delay Distortion & Data Capability	11-8
LGQB	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging	11-2
LGQE	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	11-3
LGQH	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	11-4
LGQL	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	11-5
LGQP	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	11-6
LGQR	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	11-7

3.3.7 Voice Grade 7 (VG7)

Table 3-7 Voice Grade 7 (LH)

Network Channel Code	Description	NC/NCI Table
LH--	No options	12-1
LH-A	Effective 4-wire	12-2
LH-C	Improved Return Loss for Effective 2-wire	12-3
LH-D	Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LH-L	Improved Termination at 4-wire End-User Point of Termination	12-5
LH-M	Software Connect *	12-6
LH-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LH-Q	Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-8
LH-R	Improved Termination at 4-wire Access Customer Point of Termination	12-9
LHB-	ELEPL-2	12-2
LHBC	ELEPL-2 & Improved Return Loss for Effective 2-wire	12-3
LHBQ	ELEPL-2 & Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-8
LHBR	ELEPL-2 & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHC-	C Conditioning	12-10
LHCA	C Conditioning & Effective 4-wire	12-2
LHCD	C Conditioning & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHCL	C Conditioning & Improved Termination at 4-wire End-User Point of Termination	12-5
LHCP	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHCR	C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination	12-11

* Software connection to connect Centrex to Common Control Switching Arrangement within the same switch.

Table 3-7 Voice Grade 7 (LH) (Continued)

Network Channel Code	Description	NC/NCI Table
LHD-	Data Capability	12-10
LHDA	Data Capability & Effective 4-wire	12-2
LHDD	Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHDL	Data Capability & Improved Termination at 4-wire End-User Point of Termination	12-5
LHDP	Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHDR	Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	12-11
LHE-	C Conditioning & Data Capability	12-10
LHEA	C Conditioning & Data Capability & Effective 4-wire	12-2
LHED	C Conditioning & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHEL	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination	12-5
LHEP	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHER	C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	12-11
LHF-	Improved Envelope Delay Distortion	12-10
LHFA	Improved Envelope Delay Distortion & Effective 4-wire	12-2
LHFD	Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHFL	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	12-5
LHFP	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHFR	Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	12-11

Table 3-7 Voice Grade 7 (LH) (Continued)

Network Channel Code	Description	NC/NCI Table
LHG-	Improved Attenuation Distortion	12-10
LHGA	Improved Attenuation Distortion & Effective 4-wire	12-2
LHGD	Improved Attenuation Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHGL	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination	12-5
LHGP	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHGR	Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination	12-11
LHJ-	Improved Attenuation Distortion & Improved Envelope Delay Distortion	12-10
LHJA	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire	12-2
LHJD	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHJL	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	12-5
LHJP	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHJR	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	12-11
LHM-	Improved Attenuation Distortion & Data Capability	12-10
LHMA	Improved Attenuation Distortion & Data Capability & Effective 4-wire	12-2
LHMD	Improved Attenuation Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHML	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	12-5
LHMP	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7

Table 3-7 Voice Grade 7 (LH) (Continued)

Network Channel Code	Description	NC/NCI Table
LHMR	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	12-11
LHN-	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion	12-10
LHNA	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire	12-2
LHND	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHNL	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	12-5
LHNP	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHNR	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	12-11
LHQ-	Improved Envelope Delay Distortion & Data Capability	12-10
LHQA	Improved Envelope Delay Distortion & Data Capability & Effective 4-wire	12-2
LHQD	Improved Envelope Delay Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination	12-4
LHQL	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	12-5
LHQP	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	12-7
LHQR	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	12-11

Table 3-7 Voice Grade 7 (LH) (Continued)

Network Channel Code	Description	NC/NCI Table
LH1-	IntraLATA Private Line Service	12-14
LH1A	IntraLATA Private Line Service & Effective 4-wire	12-16
LH2-	IntraLATA Private Line Service & C Conditioning	12-15
LH2A	IntraLATA Private Line Service & C Conditioning & Effective 4-wire	12-16
LH3-	IntraLATA Private Line Service & Data Capability	12-15
LH3A	IntraLATA Private Line Service & Data Capability & Effective 4-wire	12-16
LH4-	IntraLATA Private Line Service & C Conditioning & Data Capability	12-15
LH4A	IntraLATA Private Line Service & C Conditioning & Data Capability & Effective 4-wire	12-16

3.3.8 Voice Grade 8 (VG8)

Table 3-8 Voice Grade 8 (LJ)

Network Channel Code	Description	NC/NCI Table
LJ--	No options	13-1
LJ-R	Improved Termination at 4-wire Access Customer Point of Termination	13-2
LJC-	C Conditioning	13-3
LJCR	C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination	13-2
LJF-	Improved Envelope Delay Distortion	13-3
LJFR	Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	13-2
LJG-	Improved Attenuation Distortion	13-3
LJGR	Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination	13-2
LJJ-	Improved Attenuation Distortion & Improved Envelope Delay Distortion	13-3
LJJR	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	13-2

3.3.9 Voice Grade 9 (VG9)

Table 3-9 Voice Grade 9 (LK)

Network Channel Code	Description	NC/NCI Table
LK--	No options	14-1
LK-L	Improved Termination at 4-wire Point of Termination (Z End)	14-2
LK-P	Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)	14-3
LK-R	Improved Termination at 4-wire Point of Termination (A End)	14-4
LKC-	C Conditioning	14-5
LKCL	C Conditioning & Improved Termination at 4-wire Point of Termination (Z End)	14-2
LKCP	C Conditioning & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)	14-3
LKCR	C Conditioning & Improved Termination at 4-wire Point of Termination (A End)	14-4
LKF-	Improved Envelope Delay Distortion	14-5
LKFL	Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End)	14-2
LKFP	Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)	14-3
LKFR	Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (A End)	14-4
LKG-	Improved Attenuation Distortion	14-5
LKGL	Improved Attenuation Distortion & Improved Termination at 4-wire Point of Termination (Z End)	14-2
LKGP	Improved Attenuation Distortion & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)	14-3
LKGR	Improved Attenuation Distortion & Improved Termination at 4-wire Point of Termination (A End)	14-4
LKJ-	Improved Attenuation Distortion & Improved Envelope Delay Distortion	14-5
LKJL	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End)	14-2
LKJP	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)	14-3
LKJR	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (A End)	14-4

3.3.10 Voice Grade 10 (VG10)

Table 3-10 Voice Grade 10 (LN)

Network Channel Code	Description	NC/NCI Table
LN--	No options	15-1
LN-B	Central Office Bridging	15-2
LN-E	Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LN-H	Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LN-L	Improved Termination at 4-wire End-User Point of Termination	15-5
LN-P	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LN-R	Improved Termination at 4-wire Access Customer Point of Termination	15-7
LNC-	C Conditioning	15-1
LNCB	C Conditioning & Central Office Bridging	15-2
LNCE	C Conditioning & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNCH	C Conditioning & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNCL	C Conditioning & Improved Termination at 4-wire End-User Point of Termination	15-5
LNCP	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNCR	C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LND-	Data Capability	15-1
LNDB	Data Capability & Central Office Bridging	15-2
LNDE	Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNDH	Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNDL	Data Capability & Improved Termination at 4-wire End-User Point of Termination	15-5
LNDP	Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNDR	Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	15-7

Table 3-10 Voice Grade 10 (LN) (Continued)

Network Channel Code	Description	NC/NCI Table
LNE-	C Conditioning & Data Capability	15-1
LNEB	C Conditioning & Data Capability & Central Office Bridging	15-2
LNEE	C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNEH	C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNEL	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination	15-5
LNEP	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNER	C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LNF-	Improved Envelope Delay Distortion	15-1
LNFB	Improved Envelope Delay Distortion & Central Office Bridging	15-2
LNFE	Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNFH	Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNFL	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	15-5
LNFP	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNFR	Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LNG-	Improved Attenuation Distortion	15-1
LNGB	Improved Attenuation Distortion & Central Office Bridging	15-2
LNGE	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNGH	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNGL	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination	15-5
LNGP	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6

Table 3-10 Voice Grade 10 (LN) (Continued)

Network Channel Code	Description	NC/NCI Table
LNGR	Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LNJ-	Improved Attenuation Distortion & Improved Envelope Delay Distortion	15-1
LNJB	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging	15-2
LNJE	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNJH	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNJL	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination	15-5
LNJP	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNJR	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LNM-	Improved Attenuation Distortion & Data Capability	15-1
LNMB	Improved Attenuation Distortion & Data Capability & Central Office Bridging	15-2
LNME	Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNMH	Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNML	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	15-5
LNMP	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNMR	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	15-7

Table 3-10 Voice Grade 10 (LN) (Continued)

Network Channel Code	Description	NC/NCI Table
LNN-	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability	15-1
LNNB	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging	15-2
LNNE	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNNH	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNNL	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	15-5
LNNP	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNNR	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LNQ-	Improved Envelope Delay Distortion & Data Capability	15-1
LNQB	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging	15-2
LNQE	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	15-3
LNQH	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination	15-4
LNQL	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination	15-5
LNQP	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination	15-6
LNQR	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination	15-7
LN1-	IntraLATA Private Line Service	15-8
LN2-	IntraLATA Private Line Service & C Conditioning	15-9
LN3-	IntraLATA Private Line Service & Data Capability	15-9
LN4-	IntraLATA Private Line Service & C Conditioning & Data Capability	15-9

3.3.11 Voice Grade 12 (VG12)

Table 3-11 Voice Grade 12 (LR)

Network Channel Code	Description	NC/NCI Table
LR--	No options	16-1
LR-B	Central Office Bridging	16-2
LR-E	Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination	16-3
LR-R	Improved Termination at 4-wire Access Customer Point of Termination	16-4
LR1-	IntraLATA Private Line Service	16-5

3.3.12 Voice Grade Custom (VGC)

No formal NC/NCI Combinations tables are provided since the service is "Custom". The Custom service must be technically feasible. Standard NCI codes should be used whenever possible. However, there are no standard combinations.

Table 3-12 Voice Grade Custom (LQ)

Network Channel Code	Description	NC/NCI Table
LQ-Z	Nonstandard	na

CONTENTS

Chapter and Section **Page**

Figures

Tables

4. Network Channel Interface (NCI) Codes

4.1 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.

4.2 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 when used with most Protocol codes. Some Protocol code data elements require additional specifications, which are found in the Protocol Option code data element. The latter is necessary for technical reasons. The format is illustrated in Figure 4-1.

Network Channel Interface Code

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

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

Figure 4-1 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. These codes are listed in Tables 4-3 and 4-4.

Impedance (character position 5) is a one-character alpha or numeric code representing the nominal reference impedance, presented toward the network, that will terminate the channel for the purpose of evaluating transmission performance. Values are listed in Table 4-1

Table 4-1 NCI Impedance Values

Impedance in Ohms (Character Position 5)			
Data Value	**Code**	**Data Value**	**Code**
110	0	124	7
150	1	Variable	8
600	2	100	9
900	3 *	Fiber	F
1200	4	Radio	Z
135	5	50	C
75	6		

* With the exception of interface code 04DD3, the impedance character 3, when used with a 4-wire voice-frequency path at the POT, denotes a historical customer (IC) provided transmission termination rather than a 900 ohm impedance. Such terminations were provided by customers in accordance with FCC Docket No. 20099 settlement Agreement and by Automatic Transmission Test and Control Circuit used in the previous provisioning process.

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. These codes are listed in Tables 4-3 and 4-4.

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 4-2.

Further information about NCI Codes may be found in ANSI T1.223-1997, *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*. TR-NWT-000335 also contains additional information.

Table 4-2 NCI Transmission Levels

Transmission Level Point Code (Character Positions 11 and 12)	
Data Value	**Code**
-16.0	A
-15.0	B
-14.0	C
-13.0	D
-12.0	E
-11.0	F
-10.0	G
-9.0	H
Fractional TLP	I
-8.0	J
-7.0	K
-6.0	L
-5.0	M
-4.0	N
No transmission this Direction (One-way Service)	O
-3.0	P
-2.0	Q
-1.0	R
0.0	S
+1.0	T
+2.0	U
+3.0	V
+4.0	W
+5.0	X
+6.0	Y
+7.0	Z
QWEST Specified	-
Recommended (Default Value)	(Blank)

4.3 Other Interfaces, Options, and Related Services

There are several special interfaces or options that may be encountered with voice grade services. This section briefly discusses several related interfaces or options. Diagrams, showing both Network Channel (NC) and NCI codes are included.

4.3.1 CO Multiplexer to Multiplexer Connecting Arrangement

An arrangement to allow a customer to interconnect an individual channel of one multiplexer to an individual channel of another multiplexer. This is done, in this application, at the voice grade level.

Figure 4-2 illustrates a typical arrangement using a VG6 circuit. Two DS1 High Capacity channels with CO Multiplexing (HC-G) are ordered. Table 5-1 describes these as a Configuration 10. Then a two-point VG6 (LG--) service is ordered to connect a channel in each CO multiplexer together forming a Multiplexer to Multiplexer Connecting Arrangement. The LG-- service is described as a Configuration 9 in Table 5-1.

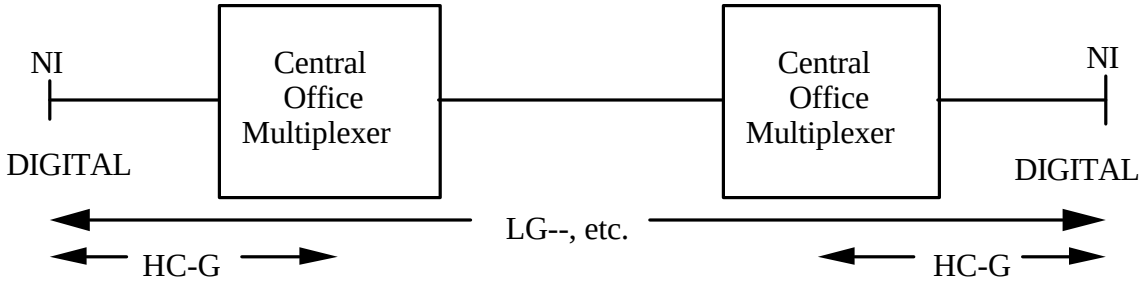


Figure 4-2 Typical Multiplexer to Multiplexer Connecting Arrangement

4.3.2 COMMAND A LINK℠

This feature allows the customer to control the reconfiguration of a network consisting of voice grade circuits on a near real-time basis. The reconfiguration is done by using an Intelligent Network Element such as a Digital Cross-connect System (DCS).

The circuits purchased to work with COMMAND A LINK℠ go from a customer location to the COMMAND A LINK℠ device located in a QWEST central office. This service is available only at selected locations. See Technical Publication 77371, *COMMAND A LINK℠ Technical Description And Interface Combinations,* for further information.

The basic building block of the COMMAND A LINK^{SM} service is a circuit from a customer location to the central office located Digital Cross-Connect System (DCS). A typical circuit is illustrated in Figure 4-3. These building blocks are then connected together to form a network.

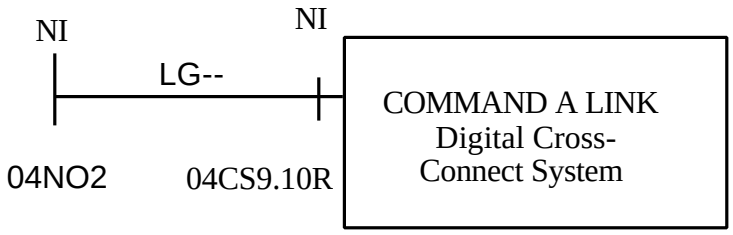


Figure 4-3 Typical COMMAND A LINK^{SM} Circuit

Information about the NC and NCI codes may be found in PUB 77371 or in this document. The 04NO2 at the customer location denotes a standard VG6 interface with no signaling. The 04CS9.10R at the DCS denotes that the CO interface is on a 1/0 DCS and is customer reconfigurable. The VG6 channel is described by the LG-- NC code.

Figure 4-4 illustrates a typical customer VG6 network using COMMAND A LINK^{SM} to control the network. The network consists of two VG6 services and two DS1 services connected to the DCS. The connections are controlled by the customer via the COMMAND A LINK^{SM} controller. Four customer locations are indicated. The customer may then connect the VG6 services to each other or to an appropriate DS0 channel on the DS1 services.

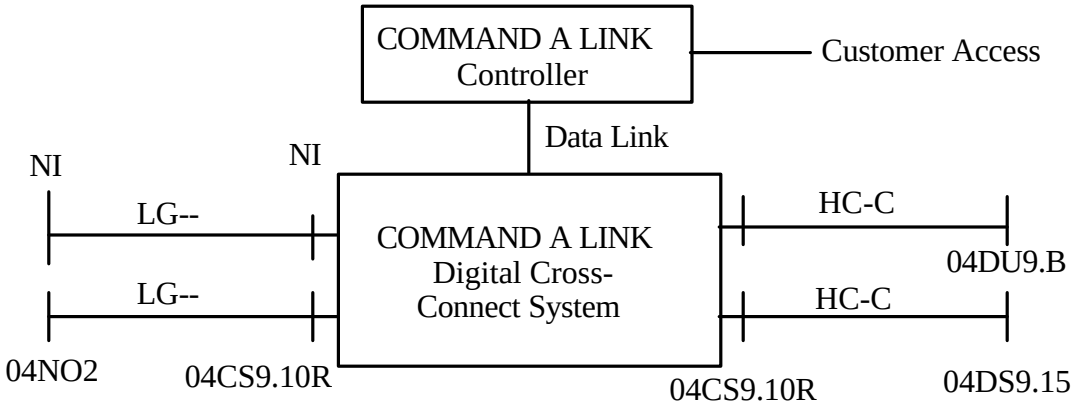


Figure 4-4 Typical COMMAND A LINK^{SM} Network

The two LG-- circuits on the left are connected via DS0 ports to the DCS. The two DS1 channels on the right are connected, via DS1 ports, to an End-User (04DU9.B) and an Interexchange Carrier (04DS9.15). These DS1 channels may carry other services. See PUB 77371 for further information.

4.3.3 Public Packet Switching Network Connection

Public Packet Switching Network (PPSN) is a service, which utilizes packet switching technology, and digital transmission facilities to provide common user switched data transport. A typical NCI code is 04DM2.4P.

This option applies to VG6 and VG10 only.

Information about QWEST DIGIPAC® service may be found in PUB 77359, *QWEST DIGIPAC® Service Interface Specifications for Public Packet Switching Network Module 5*.

4.3.4 Signaling Capability

Signaling Capability provides for the process by which one-customer premises alerts another customer premises on the same service with which it wishes to communicate. This feature provides for the transmission of signaling information.

The following signaling types are available:

Loop-start
Ground-start
E&M
Single Frequency
Manual/Code-select Ringdown
Automatic Ringdown
Reverse-battery

Examples of NCI codes include:

02LS2	02GS2
06EA2.M	04SF2
02AC2	02AC2.R
02LR2	02RV2.T
02CT3	

There are no high capacity digital interfaces available at End-Users premises using SF signaling. QWEST does not generate SF signaling toward the End-User. Some additional information about signaling may be found in Section 2.19.

4.3.5 High Capacity Services (Digital)

Several high capacity services may be encountered when ordering voice grade services. Section 4.3.1 briefly mentioned the QWEST DS1 Service. Another service is the QWEST DS3 Service. These services, using CO multiplexing, are frequently used to transport voice grade (and other) services to the customer interface.

The DS1 service uses NCI codes such as 04DS9.15, 04DU9.BN or 04DJ9.1S. Valid values for positions 3 and 4 are DS and DJ at carrier interfaces and DU at End-User interfaces. The NC codes take the form HCxx where the x's take various values.

Common NC and NCI codes for the DS3 service are HF-- and 04DS6.44 or 04DS6.44I respectively. The valid value for positions 3 and 4 of the NCI code is DS.

Most network interfaces used by these high capacity services are collectively identified by the term "Digital" in the NC/NCI combination tables later in this document. Certain specific DS1 NCI codes that apply only to analog services are included in this document. These codes are similar to the 04DS9.15 NCI code interface. Further discussion of these interfaces is beyond the scope of this document.

Further information on the DS1 service may be found in PUB 77200, *QWEST DS1 Service and QWEST DS1 Rate Synchronization Service,* and in PUB 77375, *1.544 Mbit/s Channel Interfaces*.

The DS3 service is described in PUB 77324, *QWEST DS3 Service*.

SONET interfaces, such as 04SOF.D, are described in PUB 77346, *Synchronous Service Transport.*

Other high level interfaces may also apply.

4.3.6 Central Office Bridging

Bridges are used to connect three or more points together to form a multipoint circuit as discussed in Section 4.5.

4.4 Available Network Channel Interfaces

Table 4-3 lists the NCI Protocol and Protocol Option codes for Voice Grade Special Access Services used by QWEST. Titles and ordering instructions for the referenced publications may be found in Chapter 18.

The "CT" NCI code used with Centrex was created to fill a generic Centrex need to simplify the order process. See TA-NWT-000335 for further information.

Table 4-3 NCI Protocol and Protocol Option Codes

Protocol Code 3 4	Protocol Option 7 8 9	Definition	References
AC		Connects End-User premises station to an Access Service for the transmission of voice and 20-Hz ringdown (pushdown) signaling.	TR-NPL-000335
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 are included in the term "Digital" in the computability tables in this publication.)	TR-NWT-000339
	B	60 kHz to 108 kHz (12 channels)	
	C	312 kHz to 552 kHz (60 Channels)	
	D	564 kHz to 3084 kHz (600 Channels)	
CT		Central Office Centrex Tie Trunk Termination	TR-NWT-000335
DA		Connects End-User premises to an Access Service suitable for the transmission of data and/or control supervisory signals	TR-NWT-000335
	D	Customer Selectable Addressing and Testing, customer powered	77310, Sec. 17.4
	L	Line Powered Data Station Terminating Equipment	77310, Sec. 17.4
DB		Connects Access Customer to an Access Service suitable for the transmission of data and/or control supervisory signals	TR-NWT-000335
DM		Data stream in VF frequency band at Central Office location. (Interface at Central Office data modem.)	77310, Chap. 17
	2P	1.2 kbit/s 212A type modem operation & packet switched	
	3	1.2 kbit/s 202T type modem operation	
	3P	1.2 kbit/s 202T type modem operation & packet switched	
	4P	2.4 kbit/s 201B type modem & packet switched	
	5P	4.8 kbit/s 208A type modem operation & packet switched	
	6P	9.6 kbit/s CCITT V.29 type modem & packet switched	
	7P	4.8 kbit/s CCITT V.27 type modem & packet switched	

Table 4-3 NCI Protocol and Protocol Option Codes (Continued)

Protocol Code 3 4	Protocol Option 7 8 9	Definition	References
DJ		Carrier to carrier DS1 interface specification that is the result of joint engineering.	PUB 77375
DS		Digital Hierarchy Interface at DS1 rate (or higher)	
DU		Digital Access Interface at DS1 rate (1.544 Mbit/s) for use at End-User Network Interface	
		{Several protocol options may be ordered as listed in PUB 77375. Only selected NCI code options uniquely used with analog Voice Grade services are listed here.}	
	15L *	1.544 Mbit/s (DS1) using AMI line code and Superframe format, with single frequency signaling on analog end (subject to availability) provided by QWEST (Does not apply to DU protocol code.)	
	44	44.736 Mbit/s (DS3), M2/3 Format	
	44L *	44.736 Mbit/s (DS3), Single Frequency signaling on analog end of circuit (subject to availability).	
	EA *	E & M Signaling	
	GO *	Ground-start loop signaling - open-end	
	GS *	Ground-start loop signaling - closed-end	
	LO *	Loop-start loop signaling - open-end	
	LS *	Loop-start loop signaling - closed-end	
	NO *	Transmission only - no signaling	
EA		Type I, E & M signaling	TR-NWT-000335
	E	Ground on E-lead by customer to originator	
	M	Battery on M-lead by customer to originator	
EB		Type II, E & M signaling	TR-NWT-000335
	E	Ground on E-lead by customer to originator	
	M	Battery on M-lead by customer to originator	
EC		Type III, E & M signaling at IC-POT, IC originates on M lead (The “M” option code in position 7 is optional.)	TR-NWT-000335

* These options are available only in QWEST Serving Wire Centers.

Table 4-3 NCI Protocol and Protocol Option Codes (Continued)

Protocol		Definition	References
Code 3 4	Option 7 8 9		
GO		Ground-start signaling - open-end (switch) function presented by customer at interface to QWEST Access Service.	TR-NWT-000335
GS		Ground-start signaling - closed-end (station) function presented by customer at interface to QWEST Access Service.	TR-NWT-000335
	C	Centrex foreign exchange trunk termination	
LA		EU-POT loop-start loop signaling - Class A registered port, open-end	TR-NWT-000335
LB		EU-POT loop-start loop signaling - Class B registered port, open-end	TR-NWT-000335
LC		EU-POT loop-start loop signaling - Class C registered port, open-end	TR-NWT-000335
LO		Loop-start signaling - open-end (switch) function presented by customer at interface to QWEST Access Service.	TR-NWT-000335
LR		Private line automatic ringdown (PLAR) with PLAR equipment provided by QWEST.	TR-NWT-000335
	A	D4 type PLAR channel unit signaling format	
	B	D3 type PLAR channel unit signaling format	
LS		Loop-start signaling - closed-end (station) function presented by the customer at the interface to QWEST Access Service.	TR-NWT-000335
NO		Connects customer to an Access Service suitable for voice transmission with no signaling provided by QWEST	TR-NWT-000335
	17	Loopback 1713 Hz (VG6 & VG7 only)	77310, Chap. 17
	17P	Loopback 1713 Hz & Line Powering (VG6 & VG7 only)	77310, Chap. 17
	19	Loopback 1913 Hz (VG6 & VG7 only)	77310, Chap. 17
	19P	Loopback 1913 Hz & Line Powering (VG6 & VG7 only)	77310, Chap. 17
	24	Loopback 2413 Hz (VG6 & VG7 only)	77310, Chap. 17
	24P	Loopback 2413 Hz & Line Powering (VG6 & VG7 only)	77310, Chap. 17
	27	Loopback 2713 Hz (VG6 & VG7 only)	77310, Chap. 17
	27P	Loopback 2713 Hz & Line Powering (VG6 & VG7 only)	77310, Chap. 17

Table 4-3 NCI Protocol and Protocol Option Codes (Continued)

Protocol Code 3 4	Protocol Option 7 8 9	Definition	References
PR		Connects EU premises protective relaying suitable for the transmission of control signals (voice frequency tones) for protective relaying.	TR-NWT-000335 PUB 77321
RV		Loop-reverse-battery supervision	TR-NWT-000335
	O	Loop closure provided by customer to QWEST; Battery provided by QWEST to customer	
	T	Loop closure provided by QWEST to customer; Normal and Reverse-battery provided by customer to QWEST	
SF		Single frequency (2600 Hz) tone signaling	TR-NWT-000335
	EA	SF to E & M signaling	
	GO	SF to loop signaling, ground-start, open-end	
	GS	SF to loop signaling, ground-start, closed-end	
	LO	SF to loop signaling, loop-start, open-end	
	LS	SF to loop signaling, loop-start, closed-end	

4.5 Multipoint Services

4.5.1 Bridge Interface Codes

Table 4-4 lists Central Office NCI codes for Central Office bridges. The Protocol Option positions seven through nine are not included in the NC/NCI combination tables later in this publication.

Table 4-4 NCI Protocol and Protocol Option Codes for Bridges

Protocol Code 3 4	Option 7 8 9	Definition	References
BF		Central Office Bridge - Split Frequency	TR-NWT-000335
	A *	400 Hz Lo-Pass	
	B *	1300 Hz Lo-Pass	
	C *	1370 Hz Lo-Pass	
	D *	1650 Hz Hi-Pass	
	E *	1925 Hz Hi-Pass	
	F *	Customer to specify Lo-Pass	
	G *	1300 Hz Hi-Pass	
	H *	1810 Hz Hi-Pass	
	J *	1460 Hz Lo-Pass	
	K *	Customer to specify Hi-Pass	
BL		Central Office Bridging - Bridgelifter	TR-NWT-000335
BR		CO Bridging - Resistive Type	TR-NWT-000335
	CF	Resistive Type Conference Operation	TR-NWT-000335
	SP	Resistive Type: Split Path Operation. An independent path is provided for each direction of transmission.	TR-NWT-000335
	SPL	Resistive Type: Split Path Operation. An independent path is provided for each direction of transmission, zero buss level required.	TR-NWT-000335

* Filters can be used in both positions 7 and 8 if required. Position 7 refers to the receive filter from the master station and position 8 refers to the transmit filter.

4.5.2 Illustrative Examples

Figure 4-5 illustrates two applications of the Split Frequency type of bridge.

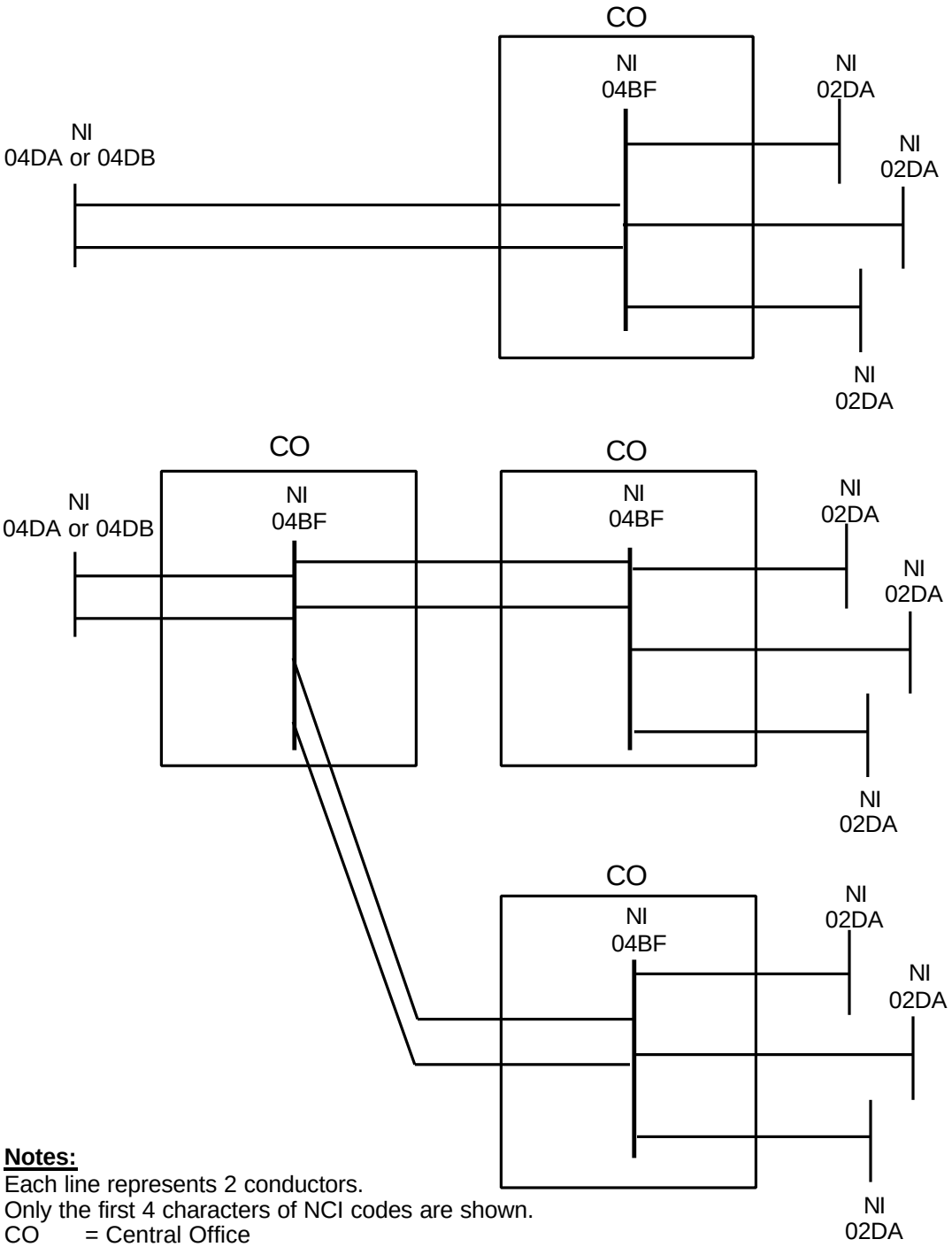
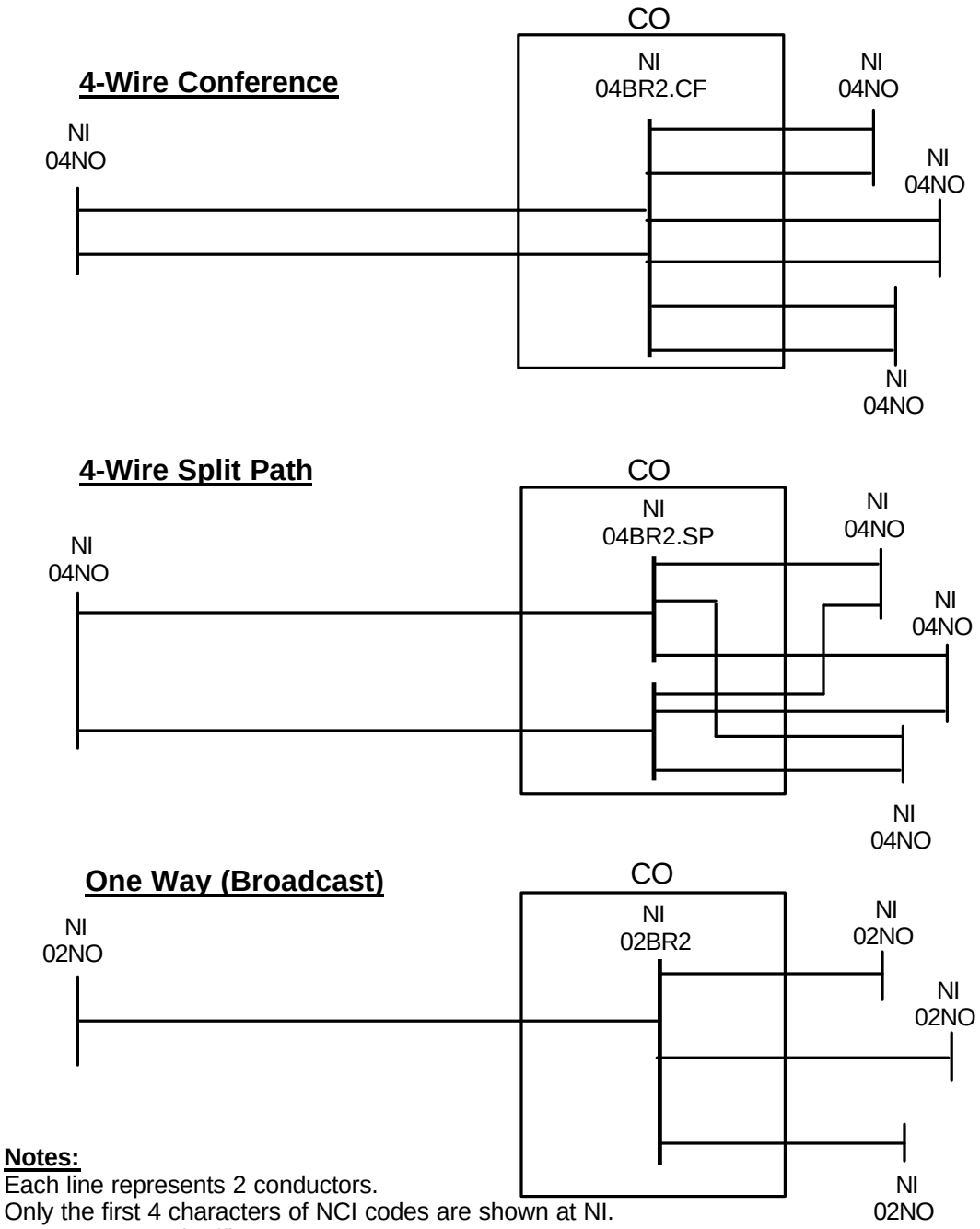


Figure 4-5 Split-Frequency Bridge Applications

Figure 4-6 illustrates three applications of the Resistive type of bridge.



Notes:
Each line represents 2 conductors.
Only the first 4 characters of NCI codes are shown at NI.
CO = Central Office
NI = Network Interface

Figure 4-6 Resistive Bridge Applications

4.6 Historical Network Interfaces and Services

There are a few older interfaces and services that may still be in use but are no longer offered for new services. These interfaces are "grandfathered" in the tariffs. Table 4-7 contains a description of some of the NCI codes that may still be in use. Dataphone® Select-A-Station Service and Telemetry and Alarm Bridging Service are examples of services that have been Grandfathered. Further information about these interfaces and their NC/NCI code combinations is beyond the scope of this publication. See the appropriate tariff for further information.

A number of NC and NCI codes and their combinations were declared Historical in PUB 77365 and are not repeated here.

Table 4-5 Historical NCI Protocol and Protocol Option Codes

Protocol		Definition	References
Code 3 4	Option 7 8 9		
DD		Connects an IC to an Access Service suitable for the transmission of data or tones used with the Dataphone® Select-A-Station service.	TR-NWT-000335
DE		Connects a customer to an Access Service suitable for the transmission of data or tones used with the Dataphone® Select-A-Station service.	TR-NWT-000335
DX		Connects a customer to an Access Service suitable for the transmission of voice using DX signaling	TR-NWT-000335
	X	Simplex reversal (4-wire)	
DY		Duplex signaling (DX). Connects End-Users Grandfathered switching system described in Part 68 of the FCC Rules and Regulations to an Access Circuit.	TR-NWT-000335

Other specific NCI codes have been defined as "Transitional" in TR-NWT-000335 and are not included in this publication. The code 02RV3.T, for example, has been "replaced" by 02RV2.T for new applications.

CONTENTS

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Figures

Tables

5. Network Channel/Network Channel Interface Combinations - General

5.1 Combinations

This chapter describes the concept of Network Channel (NC) and Network Channel Interface (NCI) combinations. The concept of "Configurations" is also introduced.

Chapters 3 and 4 described the NC and NCI codes available with the private line voice grade service. Chapters 6 through 18 list the combinations of NC and NCI codes for each voice grade service.

The NC code describes the channel. The NCI codes describe the Network Interfaces. The combination of these codes are used to describe the service. All two-point circuits and legs of multipoint circuits are described by one NC code and two NCI codes, with two exceptions:

1) A service which goes from a Network Interface to a multiplexer uses only one NCI (at the NI) with the NC code, and
2) Some tariffs and ordering procedures do not allow the use of Central Office NCIs, as noted in the following paragraph.

The tables in Chapters 6 through 17 list NCI code pairs that apply for each NC code.

The "BR" NCI code is normally not used by QWEST for these services. Only a single NCI code at the customer interface is used with the NC code. However, the "BR" code correctly defines the available interfaces for bridging. The seventh through ninth position Protocol Options for bridges (Table 4-4) is not listed in the NC/NCI combination tables. Only positions one through five are listed (e.g., 04BR2).

5.2 Terminology

The term "Digital" is used in the tables to represent a DS1 or higher-level digital interface. Representative NCI codes include 04DS9.15, 04DS9.15L, 04DJ9.1S, 04DU9.BN, 04DS6.44, and various SONET and fiber interfaces, etc. The term "DS1/3 Digital" specifically denotes a DS1 or DS3 interface of the "DS" protocol code only.

In the case of Access Customer Network Interfaces, "Digital" may also include the analog interfaces of 04AH5.B, 04AH6.C or 04AH6.D where permitted by tariff.

A DS1 interface at an End-User location uses the "DU" protocol code. The "DS" protocol code is used at other DS1 interfaces including an Access Customer or a collocated Interconnector. The "DJ" code may be used only at a carrier interface. Digital interfaces above the DS1 level do not share these distinctions.

5.3 Configurations

Some generic channel service configurations have been developed as an aid in understanding the NC and NCI combination tables in the remainder of this document.

Table 5-1 contains diagrams of the channel services provided by U S WEST. The channel service configurations are numbered and appear in the combinations tables. Solid lines indicate the channel service being described by the NC/NCI code combinations. Dashed lines indicate parts of separately ordered services which, combined with the solid line portion, provide the specified channel service. For voice grade services, each line represents one pair or two wires. Thus two lines represent a four wire interface and/or channel.

E & M signaling requires special treatment with Configurations. The Configurations address only the transmission path and not the signaling path. Thus 04EA2.E, 04EA2.M, 06EB2.E and 06EB2.M are considered to be 2-wire (Tip and Ring) interfaces for Configuration purposes. The extra two or four wires are used for signaling purposes. Similarly, 06EA2.E, 06EA2.M, 08EB2.E, 08EB2.M and 08EC2 are considered to be 4-wire interfaces (Tip, Ring, T1 and R1) for Configuration purposes.

5.4 Customers and Service Providers

Terminology describing customers and service providers has changed with the introduction of new service providers and customers. “Customers” are assumed to be U S WEST’s customers in this publication. The meaning of “End-User” has not changed.

5.4.1 Access Provider

An Access Provider includes any of the communications companies licensed by the appropriate utility commission to provide local telecommunication service within a LATA. QWEST is an Access Provider

5.4.2 Access Customer

An Access Customer is any of the companies that provide telecommunications service between LATAs and order from the Access Tariffs. Interexchange Carriers (ICs) are Access Customers.

5.4.3 Interconnectors

Customers who have transmission equipment in a QWEST wire center through some type of collocation agreement for interconnection to QWEST’s Private Line Transport or Switched Services, will be termed "Interconnectors." Additional information about collocation and Interconnectors may be found in PUB 77386, *Interconnection and Collocation For Transport and Switched Unbundled Network Elements and Finished Services.* Chapter 9 in PUB 77386 discusses analog services.

The most common type of Interconnector is a Certified Local Exchange Carrier (CLEC). In general, CLECs which are collocated in a QWEST wire center, may order the same Network Interfaces delivered to a CLEC-Point of Termination (CLEC-POT) that an IC may order to an IC-POT.

Table 5-1 Generic Configurations Encountered With Voice Grade Services

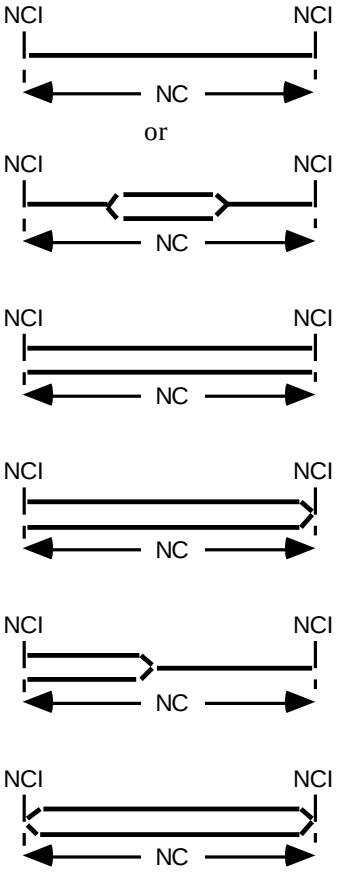
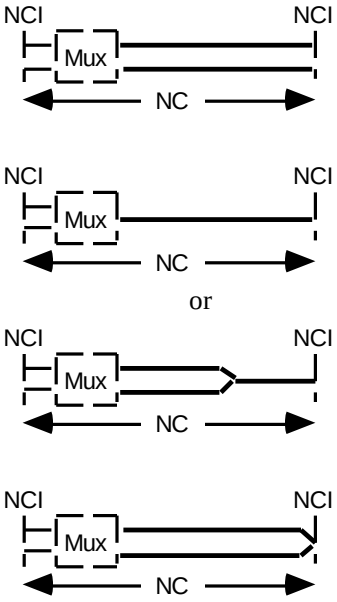
#	Configuration	Description
1 1.1 1.2 1.3 1.4 1.5		A two-point Special Access/Private Line Service where the channel and interfaces have the same "value", e.g. the channel indicates Voice Grade, and both interfaces indicate Voice Band. 1.1 2-wire or Effective 2-wire (2/2) 1.2 4-wire 1.3 Effective 4-wire 1.4 Effective 2-wire (4/2)* 1.5 Effective 4-wire - IPLS ** only Diagrams may be reversed left to right in some applications. See Section 2.17 for explanation of channel types. * The location of the hybrid in Configuration 1.4 will be determined by QWEST to meet transmission requirements. ** IPLS = IntraLATA Private Line Service
2 2.1 2.2 2.3 		A two-point Special Access/ Private Line Service where one interface has a higher “value” (bit rate or bandwidth) than the channel and second interface. This Configuration requires additional information showing its relationship to the higher service , i.e., Configuration 10, through the use of the Connecting Facility Assignment, or CFA. Example: the channel indicates Voice Grade, the first interface indicates DS1 and the second interface indicates Voice Band. 2.1 4-wire 2.2 2-wire or Effective 2-wire (4/2) * 2.3 Effective 4-wire * The location of the hybrid in Configuration 2.2 (Effective 2-wire) will be determined by QWEST to meet transmission requirements.

Table 5-1 Generic Configurations Encountered With Voice Grade Services (Cont.)

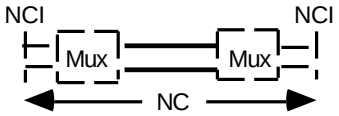
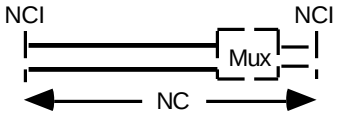
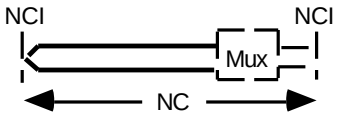
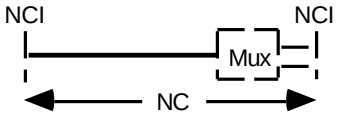
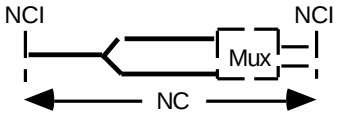
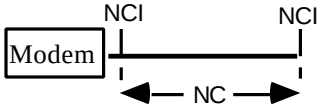
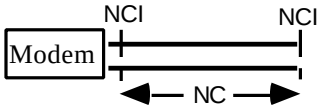
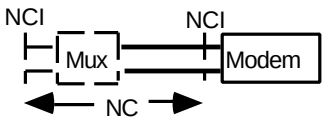
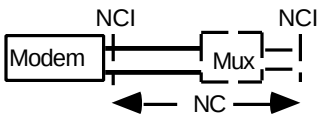
#	Configuration	Description
2a		A two-point Special Access/Private Line Service where both interfaces have a higher "value" (bit rate) than the channel. This Configuration requires additional information showing both relationships to the higher services, i.e. the Configuration 10s, through the use of the Connecting Facility Assignment, (CFA) and Secondary CFA (SCFA).
2b 2b.1		Same as Configuration 2, except that the first NCI has a lower bit rate than the second NCI. In addition, the SCFA should be used to indicate the relationship between this Configuration and Configuration 10.
2b.2		2b.1 4-wire 2b.2 Effective 4-wire 2b.3 2-wire or Effective 2-wire *
2b.3	 or 	* The location of the hybrid in Configuration 2b.3 (Effective 2-wire) will be determined by QWEST to meet transmission requirements.
1.1m		Similar to the respective configurations (1.1, 1.2, 2.1, and 2b.1) except that one end terminates on a Central Office modem (NCI code 02DM2 or 04DM2). Configurations 1.1m and 1.2m may be reversed. Configuration 1.1m may also take the alternate Configuration 1.1 form with two hybrids (Effective 2-wire).
1.2m		
2.1m		
2b.1m		

Table 5-1 Generic Configurations Encountered With Voice Grade Services (Cont.)

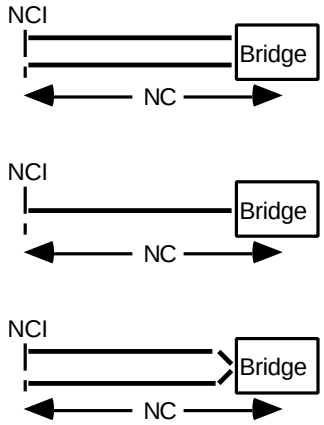
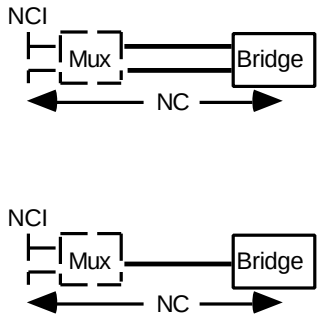
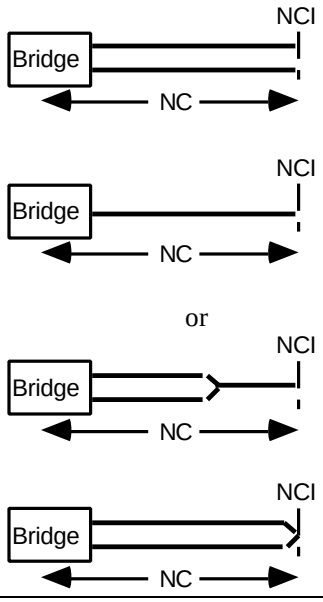
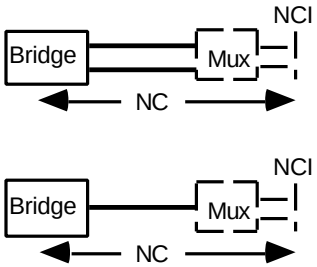
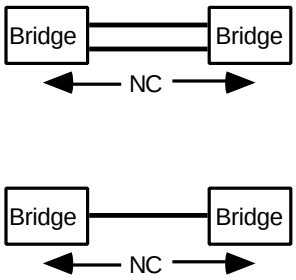
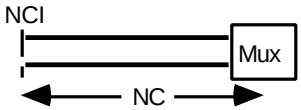
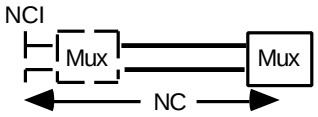
#	Configuration	Description
7 7.1 7.2 7.3		The portion of a multipoint Special Access/Private Line Service which connects the Access Customer to the QWEST Central Office (CO) bridge. The channel (indicating CO bridging) and interface have the same "value", e.g. the channel indicates Voice Grade with CO bridging, and the interface indicates Voice Band. 7.1 4-wire 7.2 2-wire 7.3 Effective 2-wire (4/2) * * The location of the hybrid in Configurations 7.3 will be determined by QWEST to meet transmission requirements.
7c 7c.1 7c.2		The same as Configuration 7 except that the NCI has a higher "value" (bit rate) than the channel. This Configuration requires additional information showing its relationship to the higher service, i.e., Configuration 10, through the use of the CFA. Example: the channel indicates Voice Grade, the first interface indicates DS1 and the second interface indicates Voice Band. 7c.1 4-wire 7c.2 2-wire
8 8.1 8.2 8.3		The portion of a multipoint Special Access/Private Line Service which connects the End-User to the QWEST bridge. The channel (indicating CO bridging) and interface have the same "value", e.g. the channel indicates Voice Grade with CO bridging, and the interface indicates Voice Band. 8.1 4-wire 8.2 2-wire or Effective 2-wire * 8.3 Effective 4-wire The order in the tables may be reversed for EU-EU applications * The location of the hybrid in Configurations 8.2 will be determined by QWEST to meet transmission requirements.

Table 5-1 Generic Configurations Encountered With Voice Grade Services (Cont.)

#	Configuration	Description
8c 8c.1 8c.2		The same as Configuration 8 except that the NCI has a higher "value" (bit rate) than the channel. This Configuration requires additional information showing its relationship to the higher service, i.e., Configuration 10, through the use of the CFA. Example: the channel indicates Voice Grade, the first interface indicates DS1 and the second interface indicates Voice Band. 8c.1 4-wire 8c.2 2-wire
9 9.1 9.2		The portion of a multipoint Special Access/Private Line Service which connects two QWEST bridges in two different COs. The channel indicates bridging. Additionally, the customer specifies both CO bridging locations. Example: the channel indicates Voice Grade with CO bridging, and the customer specifies two CO bridging locations (e.g., using CLLI™ codes). 9.1 4-wire 9.2 2-wire
10		A two-point Special Access/Private Line Service with one interface and one channel. This Configuration requires a customer specified CO multiplexing location using CLLI™. The channel (indicating CO multiplexing) and interface have the same "value." Example: both the channel and the interface indicate DS1 Service. The customer will assign lower bit rate services into the Configuration 10 (e.g., see Configuration 2).
10a		Configuration 10a is assigned to another Configuration 10. The NCI is a higher "value" than the NC code. CFA shows relationship between this Configuration 10a and the first Configuration 10 of the higher service (i.e., the dashed service on the left).

5.4.4 Dial Tone Providers

There are a number of similar terms that identify dial tone providers including, but not limited to:

Alternate Exchange Carrier (AEC)
Competitive Local Exchange Carrier (CLEC)
Alternate Local Exchange Carrier (ALEC)
Independent Local Exchange Carrier (ILEC)

These providers may be Interconnectors. A Local Exchange Carrier such as QWEST is also a Dial Tone Provider.

5.4.5 Loop and Transport Providers

Similarly, there are a number of similar terms that identify providers of loops or transport including, but not limited to:

Local Exchange Carrier (LEC, e.g., QWEST)
Alternate Exchange Carrier (AEC)
Competitive Local Exchange Carrier (CLEC)
Alternative Access Provider (AAP)
Competitive Access Provider (CAP)

5.4.6 Application of Terms

This publication makes use of “Access Customer”, “End-User” and “Interconnector” in the NC/NCI combination tables. The other terms are provided for the reader as background information. PUB 77386 provides additional information.

5.5 How To Read the NC/NCI Combination Tables

Chapters 6 through 17 contain NC/NCI Combination Tables based on common attributes in the NC code. Many Tables are further subdivided into major signaling groups (identified in the Remarks column) which are separated by **bold** horizontal lines. Table 5-2 is a one-page excerpt of the first group (with “No Signaling”) from Table 7-1 listing the NCI code combinations for VG2 using the NC code of LC--. The table lists the Configuration and the NCI code combinations that would apply at an Access Customer NI, in a QWEST Central office NI, at an Interconnector (collocated in a QWEST Central office) NI, or at an End-User NI. The bold horizontal line is at the end of the second page of the table.

The Remarks column in Table 5-2 contains italicized line numbers (*1* through *20*) to aid the description.

Table 5-2 Sample NC/NCI Combinations Table (Voice Grade 2 - LC--)

N C / N C I C o m b i n a t i o n s

NC = L C - - No Options

Remarks		Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
No Signaling	*1*	1.1	02NO2 †			02NO2
	2	1.4	04NO2			
	3	2.2	Digital			
	4	1.2	04NO2			04NO2
	5	2.1	Digital			
	6	2b.3	02NO2 †			Digital
	7	2b.1	04NO2			
	8	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	9	1.1			02NO2 †	02NO2
	10	2b.3				Digital
	11	1.2			04NO2	04NO2
	12	2b.1				Digital
	13	2.2			DS1/3 Digital	02NO2
	14	2.1				04NO2
	15	1.1	02NO2 †		02NO2 †	
	16	2.2	Digital			
	17	1.2	04NO2		04NO2	
	18	2.1	Digital			
	19	2b.3	02NO2 †		DS1/3 Digital	
	20	2b.1	04NO2			

† For one-way transmission.
* DJ may be substituted for DS at an Access Customer Network Interface.

Compatible pairs of NCI codes for this NC code are read horizontally between sets of medium width lines. The first set (lines 1, 2, and 3) lists the four NCI codes (at an Access Customer's NI) 02NO2, 04NO2 and Digital as being compatible with 02NO2 (at an End-User's NI).

The Configurations (see Table 5-1 for descriptions) are separated by horizontal light lines. Thus, for example, the first line NCI combination of 02NO2 - 02NO2 would be a Configuration 1.1. Similarly, a Digital - 02NO2 combination (line 3) would be a Configuration 2.2.

The set defined by lines 4 and 5 are read in a similar manner.

Line 8 lists some compatible NCI codes for LC-- channels with both ends at a higher "value" as denoted by Configuration 2a. The higher capacity channels with CO multiplexing were ordered previously as Configuration(s) 10 and, if more than a DS1 is involved, as Configurations 10a. Section 5.5 explains this in greater detail.

Lines 6 and 7 are similar but have the higher interface only at the End-User's interface.

Lines 9 through 12 show 2-wire and 4-wire connections between an Interconnector and an End-User (e.g. 02NO2 - 02NO2). Again, if the End-User NI is at a higher "value", Configuration 10s were ordered (e.g., a DS1 with CO multiplexing: HC-G).

Lines 13 and 14 are also between an Interconnector and an End-User. However, the Interconnector is a DS1 or DS3 interface and the Interconnector has purchased a DS1 multiplexer as Configuration 10. In the case of a DS3, a DS3 multiplexer (Configuration 10) has also been ordered making the DS1 multiplexer a Configuration 10a. This situation is similar to the example in Section 5.5.

Lines 15 through 20 describe the channels between an Access Customer and an Interconnector.

5.6 High Capacity Channels

The NCI code pairs such as "Digital - 02NO2" (line 3 of Table 5-2) differ in that the "values" of the channels do not correspond with the value of both interfaces. This implies that multiplexing is involved. This means that a DS1 with CO multiplexing has been ordered as illustrated in Configuration 10 (Table 5-1). Once the DS1 was in place, the voice grade channel (LC-- in this example) is ordered. This channel is 2-wire from the End-User NI (Configuration 2.2), through the multiplexer (Mux), and on to the 4-wire interface at the Access Customer's NI. The dashed portions represent the previously ordered carrier facility and mux of Configuration 10.

The interface "Digital" could be at a higher level than DS1. In this case, another (or several) Configuration(s) 10 would be concatenated with the first Configuration 10. This is illustrated by Configuration 10a.

An example, illustrated in Figure 5-1 of a high capacity DS3 NI might help understand the concept. The higher capacity DS3 channel with CO multiplexing is ordered as, for example, a HF-1 (Configuration 10). Then the lower capacity DS1 channel with CO multiplexing is ordered as, for example, HC-G (Configuration 10a). CFA information is included to assign the HC-G channel to a channel on the original HF-1 multiplexer (Configuration 10).

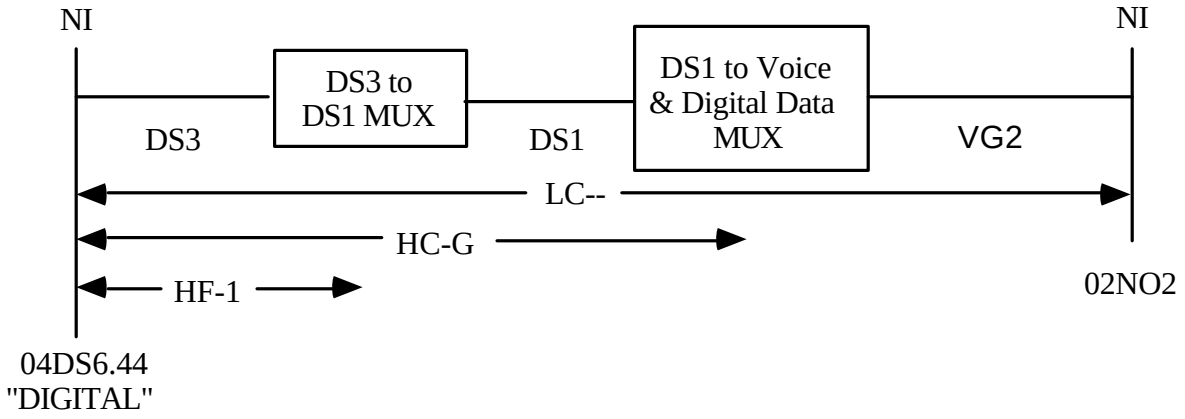


Figure 5-1 High Capacity with Voice Grade 2 Example

Once the High Capacity Services (HF-1 and HC-G), represented by Configurations 10 and 10a, are in place, the voice grade channels (LC--), represented on line 3 of Table 5-2, are ordered. The NCI code pairs “Digital” - 02NO2, are represented by Configuration 2.2 (Table 5-1). Configuration 2.2 has a 2-wire interface on the right. The two levels of CO multiplexing and channels on the left side of Configuration 2.2 (only one level is shown in Configuration 2.2) were ordered as Configurations 10 and 10a and are indicated by dashed lines. The LC-- channel is represented by solid lines. Typical NC and NCI codes are used for the high capacity channels.

Some special problems may occur if voice grade channels are ordered when both NIs are at a higher value (i.e., Configuration 2a).

The NCI pair 04DS9.NO - 04DS9.NO presents no problem since the signaling requirements can be determined from the NO option code in the DS1 level NCI codes.

A NCI code pair *Digital - 04DS9.NO* or *Digital - 04DS6.NO*, where “Digital” represents a high level interface, should not present a problem since one can infer the NO signaling requirements on the left side from the NO stated in the right NCI.

However, the Digital - Digital code pair can present a problem. All intelligence concerning the signaling requirements for the LC-- voice grade channel can been lost if voice grade channels are not properly ordered. Any high capacity system is ordered using the proper protocol option codes (e.g., 04DS9.15 or 04SOF.D). When voice grade services are ordered, the signaling protocol option codes should be substituted. Thus, using the example in the two previous paragraphs, the voice grade would use 04SOF.NO in place of the 04SOF.D. This allows the important signaling (or non-signaling in the “NO” case) to be retained for provisioning and testing purposes.

5.7 Multiplexer to Multiplexer Connecting Arrangement

One option available in some jurisdictions is a Central Office Multiplexer to Multiplexer Connecting Arrangement. This option connect the channels of two separately ordered DS1-to-Voice multiplexers. The option is available with and without tandem signaling.

Figure 5-2 illustrates a typical application. Any appropriate NC code can apply to the Voice Grade channel. Typical NC codes are shown for a DS1 with the separately ordered Central Office Multiplexing services. The NCI codes are represented by the term "Digital" as used in the NC/NCI combination tables later in this publication. These tables do not specifically include the Digital to Digital combinations that would be used for this arrangement if, for example, between two Access Customer multiplexers.

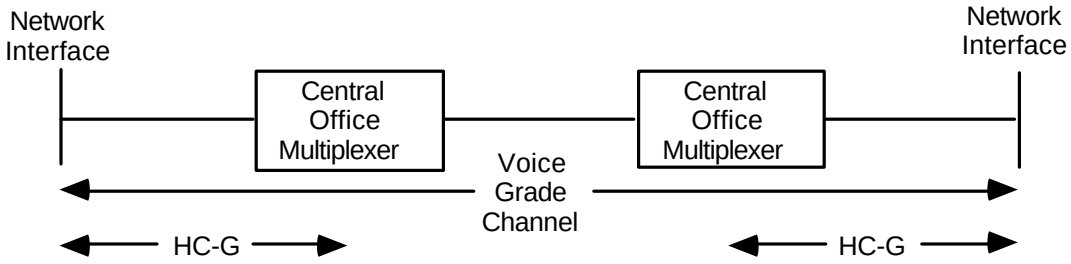


Figure 5-2 Typical Multiplexer to Multiplexer Application

5.8 Nonstandard Combinations

A "Nonstandard" option, designated by a "Z" in the fourth position of the NC code (e.g., LB-Z), is available with the voice grade services. Similarly, the NC code LQ-Z denotes a Nonstandard service. In an attempt to reduce coding redundancy, only the LQ-Z will remain in effect. Nonstandard services formerly ordered by using a "Z" in the fourth position of the NC code should now use LQ-Z.

Normally, the compatible NCI codes are the same as or similar to the NCI codes for similar "standard" options. For example, a former LB-Z (now LQ-Z) may be similar to a LB--. However, since there is something that is not standard, NC/NCI combination tables are not included. Use the other tables as a guide in selecting compatible NCI codes.

When "Nonstandard" is used, the customer must specify on the Access Service Request (or the equivalent) what is expected of the channel. See the appropriate tariff or catalog for further information.

CONTENTS

Chapter and Section **Page**

Tables

6. Network Channel/Network Channel Interface Combinations - VG 1

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

6.1 Voice Grade 1 - LB--

Table 6-1 VG 1 - LB--

N C / N C I C o m b i n a t i o n s

NC = L B - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.1	02NO2			02NO2
	1.4	04NO2			
	2.2	Digital			
	1.2	04NO2			04NO2
	2.1	Digital			
	2b.3	02NO2			Digital
	2b.1	04NO2			
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.1			02NO2	02NO2
	2b.3				Digital
	1.4			04NO2	02NO2
	1.2				04NO2
	2b.1				Digital
	2.2			DS1/3 Digital	02NO2
	2.1				04NO2
	1.1	02NO2		02NO2	
	1.4	04NO2			
	2.2	Digital			
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.3	02NO2		DS1/3 Digital	
	2b.1	04NO2			

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

Table 6-1 VG 1 - LB-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L B - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Loop-start Signaling (End-User has open end)	1.1	02LS2			02LO2
	1.4	04LS2			
	2.2	Digital			
	2b.3	02LS2			Digital
	2b.1	04LS2			
	2a	Digital 04DS9.LS * 04DS6.LS			Digital 04DU9.LO 04DS6.LO
	1.1			02LS2	02LO2
	2b.3				Digital
	1.4			04LS2	02LO2
	2b.1				Digital
	2.2			DS1/3 Digital	02LO2
	1.1	02LS2		02LO2	
	1.4	04LS2			
	2.2	Digital			
	1.2	04LS2		04LO2	
	2.1	Digital			
	2b.3	02LS2		DS1/3 Digital	
	2b.1	04LS2			

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

Table 6-1 VG 1 - LB-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L B - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Loop-start Signaling (End-User has closed-end)	1.1	02LO2			02LS2
	1.4	04LO2			
	2.2	Digital			
	2b.3	02LO2			Digital
	2b.1	04LO2			
	2a	Digital 04DS9.LO * 04DS6.LO			Digital 04DU9.LS 04DS6.LS
	1.1			02LO2	02LS2
	2b.3				Digital
	1.4			04LO2	02LS2
	2b.1				Digital
	2.2			DS1/3 Digital	02LS2
	1.1	02LO2		02LS2	
	1.4	04LO2			
	2.2	Digital			
	1.2	04LO2		04LS2	
	2.1	Digital			
	2b.3	02LO2		DS1/3 Digital	
	2b.1	04LO2			

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

Table 6-1 VG 1 - LB-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L B - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-Start (End-User has open-end)	1.1	02GS2			02GO2
	1.4	04GS2			
	2.2	Digital			
	2b.3	02GS2			Digital
	2b.1	04GS2			
	2a	Digital 04DS9.GS * 04DS6.GS			Digital 04DU9.GO 04DS6.GO
	1.1			02GS2	02GO2
	2b.3				Digital
	1.4			04GS2	02GO2
	2b.1				Digital
	2.2			DS1/3 Digital	02GO2
	1.1	02GS2		02GO2	
	1.4	04GS2			
	2.2	Digital			
	1.2	04GS2		04GO2	
	2.1	Digital			
	2b.3	02GS2		DS1/3 Digital	
	2b.1	04GS2			

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

Table 6-1 VG 1 - LB-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L B - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-Start (End-User has closed-end)	1.1	02GO2			02GS2
	1.4	04GO2			
	2.2	Digital			
	2b.3	02GO2			Digital
	2b.1	04GO2			
	2a	Digital 04DS9.GO * 04DS6.GO			Digital 04DU9.GS 04DS6.GS
	1.1			02GO2	02GS2
	2b.3				Digital
	1.4			04GO2	02GS2
	2b.1				Digital
	2.2			DS1/3 Digital	02GS2
	1.1	02GO2		02GS2	
	1.4	04GO2			
	2.2	Digital			
	1.2	04GO2		04GS2	
	2.1	Digital			
	2b.3	02GO2		DS1/3 Digital	
	2b.1	04GO2			

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

6.2 Voice Grade 1 - LB-A

Table 6-2 VG 1 - LB-A

NC / NCI Combinations **NC = LB-A** Effective 4-Wire					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.3	04NO2			02NO2
	2.3	Digital			
	1.3			04NO2	02NO2
	2.3			DS1/3 Digital	
	1.3	04NO2		02NO2	
	2.3	Digital			
Loop-start Signaling (End-User has open-end)	1.3	04LS2			02LO2
	2.3	Digital			
	1.3			04LS2	02LO2
	2.3			DS1/3 Digital	
	1.3	04LS2		02LO2	
	2.3	Digital			
Loop-start Signaling (End-User has closed-end)	1.3	04LO2			02LS2
	2.3	Digital			
	1.3			04LO2	02LS2
	2.3			DS1/3 Digital	
	1.3	04LO2		02LS2	
	2.3	Digital			
Ground-start (End-User has open-end)	1.3	04GS2			02GO2
	2.3	Digital			
	1.3			04GS2	02GO2
	2.3			DS1/3 Digital	
	1.3	04GS2		02GO2	
	2.3	Digital			

Table 6-2 VG 1 - LB-A (Continued)

N C / N C I C o m b i n a t i o n s

NC = L B - A Effective 4-Wire

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	QWEST Central Office End-User
Ground-start (End-User has closed-end)	1.3	04GO2			02GS2
	2.3	Digital			
	1.3			04GO2	02GS2
	2.3			DS1/3 Digital	
	1.3	04GO2		02GS2	
	2.3	Digital			

6.3 Voice Grade 1 - LB-D

Table 6-3 VG 1 - LB-D

N C / N C I C o m b i n a t i o n s **NC = L B - D** Improved Termination at Access Customer Point of Termination and Effective 4-Wire					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.3	04NO2			02NO2
	1.3	04NO2		02NO2	
Loop-start Signaling (End-User has open-end)	1.3	04LS2			02LO2
	1.3	04LS2		02LO2	
Loop-start Signaling (End-User has closed-end)	1.3	04LO2			02LS2
	1.3	04LO2		02LS2	
Ground-start (End-User has open-end)	1.3	04GS2			02GO2
	1.3	04GS2		02GO2	
Ground-start (End-User has closed-end)	1.3	04GO2			02GS2
	1.3	04GO2		02GS2	

6.4 Voice Grade 1 - LB-L

Table 6-4 VG 1 - LB-L

N C / N C I C o m b i n a t i o n s **NC = L B - L** Improved Termination at End-User Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	

6.5 Voice Grade 1 - LB-P

Table 6-5 VG 1 - LB-P

N C / N C I C o m b i n a t i o n s **NC = L B - P** Improved Termination at Access Customer Point of Termination and at End-User Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2

6.6 Voice Grade 1 - LB-R

Table 6-6 VG 1 - LB-R

N C / N C I C o m b i n a t i o n s

NC = L B - R Improved Termination at Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
No Signaling	1.4	04NO2			02NO2
	1.2				04NO2
	2b.1				Digital
	1.4	04NO2		02NO2	
	1.2			04NO2	
	2b.1			DS1/3 Digital	
Loop-start Signaling (End-User has open end)	1.4	04LS2			02LO2
	2b.1				Digital
	1.4	04LS2		02LO2	
	1.2			04LO2	
	2b.1			DS1/3 Digital	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2			02LS2
	2b.1				Digital
	1.4	04LO2		02LS2	
	1.2			04LS2	
	2b.1			DS1/3 Digital	
Ground-Start Signaling (End-User has open-end)	1.4	04GS2			02GO2
	2b.1				Digital
	1.4	04GS2		02GO2	
	1.2			04GO2	
	2b.1			DS1/3 Digital	
Ground-Start Signaling (End-User has closed-end)	1.4	04GO2			02GS2
	2b.1				Digital
	1.4	04GO2		02GS2	
	1.2			04GS2	
	2b.1			DS1/3 Digital	

6.7 Voice Grade 1 - LBB-

Table 6-7 VG 1 - LBB-

NC / NCI Combinations **NC = LBB-** ELEPL-2					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
Loop-start Signaling (End-User has open end)	1.4	04LS2			02LO2
	2.2	Digital			
	1.4			04LS2	02LO2
	2.2			DS1/3 Digital	
	1.4	04LS2		02LO2	
	2.2	Digital			
Loop-start Signaling (End-User has closed-end)	1.4	04LO2			02LS2
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4	04LO2		02LS2	
	2.2	Digital			
Ground-start (End-User has open end)	1.4	04GS2			02GO2
	2.2	Digital			
	1.4			04GS2	02GO2
	2.2			DS1/3 Digital	
	1.4	04GS2		02GO2	
	2.2	Digital			

Table 6-7 VG 1 - LBB- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L B B - ELEPL-2

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-start (End-User has closed-end)	1.4	04GO2			02GS2
	2.2	Digital			
	1.4			04GO2	02GS2
	2.2			DS1/3 Digital	
	1.4	04GO2		02GS2	
	2.2	Digital			

6.8 Voice Grade 1 - LBBR

Table 6-8 VG 1 - LBBR

N C / N C I C o m b i n a t i o n s **NC = L B B R** Improved Termination at Access Customer Point of Termination and ELEPL-2					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	1.4	04NO2		02NO2	
Loop-start Signaling (End-User has open-end)	1.4	04LS2			02LO2
	1.4	04LS2		02LO2	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2			02LS2
	1.4	04LO2		02LS2	
Ground-start (End-User has open-end)	1.4	04GS2			02GO2
	1.4	04GS2		02GO2	
Ground-start (End-User has closed-end)	1.4	04GO2			02GS2
	1.4	04GO2		02GS2	

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Chapter and Section **Page**

Tables

7. Network Channel/Network Channel Interface Combinations - VG 2

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

7.1 Voice Grade 2 - LC--

Table 7-1 VG 2 - LC--

N C / N C I C o m b i n a t i o n s

NC = L C - - No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.1	02NO2 †			02NO2
	1.4	04NO2			
	2.2	Digital			
	1.2	04NO2			04NO2
	2.1	Digital			
	2b.3	02NO2 †			Digital
	2b.1	04NO2			
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.1			02NO2 †	02NO2
	2b.3				Digital
	1.4			04NO2	02NO2
	1.2				04NO2
	2b.1				Digital
	2.2			DS1/3 Digital	02NO2
	2.1				04NO2
	1.1	02NO2 †		02NO2	
	1.4	04NO2			
	2.2	Digital			
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.3	02NO2 †		DS1/3 Digital	
	2b.1	04NO2			

† For one-way transmission.
* DJ may be substituted for DS at an Access Customer Network Interface.

Table 7-1 VG 2 - LC-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - - No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2
	2.2	Digital			02LC2
	1.4	04LS2 04SF2.LS	02LO3		
	2.2	Digital			
	2b.1	04LS2 04SF2.LS			Digital 04DU9.LO
	2a	Digital 04DS9.LS * 04DS6.LS			04DS6.LO
	1.4		02LO3	04LS2	
	2.2			DS1/3 Digital	
	1.4			04LS2	02LA2 02LB2 02LC2
	2b.1				Digital
	2.2			DS1/3 Digital	02LA2 02LB2 02LC2
	1.4	04LS2 04SF2.LS		02LO2	
	2.2	Digital			
	1.2	04LS2 04SF2.LS		04LO2	
	2.1	Digital			
	2b.1	04LS2 04SF2.LS		DS1/3 Digital	

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

Table 7-1 VG 2 - LC-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - - No Options

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	2b.1	04LO2 04SF2.LO			Digital 04DU9.LS
	2a	Digital 04DS9.LO * 04DS6.LO			04DS6.LS
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4			04LO2	02LS2
	1.2				04LS2
	2b.1				Digital
	2.2			DS1/3 Digital	02LS2
	2.1				04LS2
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			
	1.2	04LO2 04SF2.LO		04LS2	
	2.1	Digital			
	2b.1	04LO2 04SF2.LO		DS1/3 Digital	

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

Table 7-1 VG 2 - LC-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - - No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Ground-Start Signaling (End-User has open-end)	1.4	04GS2 04SF2.GS	02GO3		
	2.2	Digital			
	1.4		02GO3	04GS2	
	2.2			DS1/3 Digital	
	1.4	04GS2 04SF2.GS		02GO2	
	2.2	Digital			
	1.2	04GS2 04SF2.GS		04GO2	
	2.1	Digital			
	2b.1	04GS2 04SF2.GS		DS1/3 Digital	

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

Table 7-1 VG 2 - LC-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - - No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Private Line	1.4	04LR2 04SF2.LR			02LR2 †††
Automatic	2.2	Digital			
Ring-down (PLAR)	2.2	Digital			02LR2.A 02LR2.B
	1.2	04LR2 04SF2.LR			04LR2 †††
	2.1	Digital			
	2.1	Digital			04LR2.A 04LR2.B
	2b.1	04LR2 04LR2.A 04LR2.B 04SF2.LR			Digital
	2a	Digital			
	1.4			04LR2	02LR2 †††
	1.2				04LR2 †††
	2b.1				Digital
	2.2			DS1/3 Digital	02LR2 ††† 02LR2.A
	2.1				04LR2 ††† 04LR2.A
	2.2	Digital			
	1.2	04LR2 04SF2.LR		04LR2	
	2.1	Digital			
	2b.1	04LR2 04LR2.A 04SF2.LR		DS1/3 Digital	

††† Audible tone is not guaranteed.

Table 7-1 VG 2 - LC-- (Continued)

N C / N C I C o m b i n a t i o n s **NC = L C - -** No Options					
Remarks	**Configuration (Table 5-1)**	**Access Customer**	**QWEST Central Office Centrex**	**Interconnector**	**End-User**
Voice and	2.2	Digital			02AC2
20 Hz	2.1				04AC2
Ring-down	2a				Digital
	2.2			DS1/3 Digital	02AC2
	2.1				04AC2
Single Frequency	2.1	Digital to 04SF2.LO # or 04SF2.LS #			

Access Customer-to-Access Customer connection when associated protocol is high capacity (Digital)

7.2 Voice Grade 2 - LC-A

Table 7-2 VG 2 - LC-A

NC / NCI Combinations **NC = LC-A** Effective 4-Wire					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.3	04NO2			02NO2
	2.3	Digital			
	1.3			04NO2	02NO2
	2.3			DS1/3 Digital	
	1.3	04NO2		02NO2	
	2b.2			DS1/3 Digital	
	2.3	Digital		02NO2	
Loop-start Signaling (End-User has open-end)	1.3	04LS2 04SF2.LS			02LA2 02LB2
	2.3	Digital			02LC2
	1.3			04LS2	02LA2
	2.3			DS1/3 Digital	02LB2 02LC2
	1.3	04LS2		02LO2	
	2b.2	04SF2.LS		DS1/3 Digital	
	2.3	Digital		02LO2	
Loop-start Signaling (End-User has closed-end)	1.3	04LO2 04SF2.LO			02LS2
	2.3	Digital			
	1.3			04LO2	02LS2
	2.3			DS1/3 Digital	
	1.3	04LO2		02LS2	
	2b.2	04SF2.LO		DS1/3 Digital	
	2.3	Digital		02LS2	

Table 7-2 VG 2 - LC-A (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - A Effective 4-Wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Private Line	1.3	04LR2 04SF2.LR			02LR2 †††
Automatic	2.3	Digital			
Ring-down (PLAR)	2.3	Digital			02LR2.A 02LR2.B
	1.3			04LR2	02LR2 †††
	2.3			DS1/3 Digital	02LR2.A
	1.3	04LR2		02LR2 †††	
	2b.2	04SF2.LR		DS1/3 Digital	
Voice and	2.3	Digital			02AC2
20 Hz	2.3			DS1/3 Digital	02AC2
Ring-down					

††† Audible tone is not guaranteed.

7.3 Voice Grade 2 - LC-B

Table 7-3 VG 2 - LC-B

NC / NCI Combinations **NC = LC-B** Central Office Bridging					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI ##**	**Interconnector**	**End-User**
No Signaling	7.2	02NO2 †	02BR2. †		
	7c.2	Digital 04DS9.NO * 04DS6.NO			
	7.1	04NO2	04BR2.		
	7c.1	Digital 04DS9.NO * 04DS6.NO			
	8.2		02BR2. †		02NO2
	8c.2				Digital 04DU9.NO 04DS6.NO
	8.1		04BR2.		04NO2
	8c.1				Digital 04DU9.NO 04DS6.NO
	7.2, 8.2		02BR2. †	02NO2	
	7.1, 8.1		04BR2.	04NO2	
	9.2		02BR2†%		
	9.1		04BR2. %		
Loop-start Signaling	7.3	04LS2	02BL2		
	7c.2	Digital			
End-User has open-end)	8.2		02BL2		02LA2 02LB2 02LC2 02LO3 ††
	7.2		02BL2	02LO2	
	8.2			02LS2	

† For one-way transmission.
†† Central Office - Central Office Centrex station line only.
* DJ may be substituted for DS at an Access Customer Network Interface.
See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-bridge application (Mid-link).

Table 7-3 VG 2 - LC-B (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - B Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
Loop-start	7.3	04LO2	02BL2		
Signaling	7c.2	Digital			
(End-User has	8.2		02BL2		02LS2 02LS3 ††
closed-	7.2		02BL2	02LO2	
end)	8.2			02LS2	
Voice and	7c.1	Digital	04BR2.		
20 Hz	8.2 *		04BR2.		02AC2
Ring-down	8.1				04AC2
	7.1, 8.1		04BR2.	Digital 1/3	
	9.1		04BR2. %		

†† Central Office - Central Office Centrex station line only.
See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-bridge application (Mid-link).
* Effective 2-wire version.

7.4 Voice Grade 2 - LC-C, LCB-, LCBC

Table 7-4 VG 2 - LC-C, LCB-, LCBC

N C / N C I C o m b i n a t i o n s

NC = L C - C Improved Return Loss for Effective 2-Wire

NC = L C B - ELEPL-2

NC = L C B C ELEPL-2 and Improved Return Loss for Effective 2-Wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
	2b.3	04NO2		DS1/3 Digital	
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2
	2.2	Digital			02LC2
	1.4	04LS2 04SF2.LS	02LO3		
	2.2	Digital			
	1.4		02LO3	04LS2	
	2.2			DS1/3 Digital	
	1.4			04LS2	02LA2
	2.2			DS1/3 Digital	02LB2 02LC2
	1.4	04LS2 04SF2.LS		02LO2	
	2.2	Digital			
	2b.3	04LS2 04SF2.LS		DS1/3 Digital	

Table 7-4 VG 2 - LC-C, LCB-, LCBC (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - C Improved Return Loss for Effective 2-Wire

NC = L C B - ELEPL-2

NC = L C B C ELEPL-2 and Improved Return Loss for Effective 2-Wire

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	Interconnector	End-User
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			
	2b.3	04LO2 04SF2.LO		DS1/3 Digital	
Ground-Start Signaling (End-User has open-end)	1.4	04GS2 04SF2.GS	02GO3		
	2.2	Digital			
	1.4		02GO3	04GS2	
	2.2			DS1/3 Digital	
	1.4	04GS2 04SF2.GS		02GO2	
	2.2	Digital			
	2b.3	04GS2 04SF2.GS		DS1/3 Digital	

Table 7-4 VG 2 - LC-C, LCB-, LCBC (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - C Improved Return Loss for Effective 2-Wire

NC = L C B - ELEPL-2

NC = L C B C ELEPL-2 and Improved Return Loss for Effective 2-Wire

	Configuration	QWEST Central Office			
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
Private Line	1.4	04LR2 04SF2.LR			02LR2 †††
Automatic	2.2	Digital			
Ring-down (PLAR)	2.2	Digital			02LR2.A 02LR2.B
	1.4			04LR2	02LR2 †††
	2.2			DS1/3 Digital	02LR2.A
	1.4	04LR2 04SF2.LR		02LR2 †††	
	2.2	Digital			
	2b.3	04LR2 04SF2.LR		DS1/3 Digital	
Voice and	2.2	Digital			02AC2
20 Hz Ring-down	2.2			DS1/3 Digital	02AC2

††† Audible tone is not guaranteed.

7.5 Voice Grade 2 - LC-D

Table 7-5 VG 2 - LC-D

N C / N C I C o m b i n a t i o n s

NC = L C - D Improved Termination at Access Customer Point of Termination and Effective 4-Wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.3	04NO2			02NO2
	1.3	04NO2		02NO2	
Loop-start Signaling (End-User has open-end)	1.3	04LS2 04SF2.LS			02LA2 02LB2 02LC2
	1.3	04LS2 04SF2.LS		02LO2	
Loop-start Signaling (End-User has closed-end)	1.3	04LO2 04SF2.LO			02LS2
	1.3	04LO2 04SF2.LO		02LS2	
Private Line	1.3	04LR2 04SF2.LR			02LR2 †††
Automatic Ring-down (PLAR)	1.3	04LR2 04SF2.LR		02LR2 †††	

††† Audible tone is not guaranteed.

7.6 Voice Grade 2 - LC-E

Table 7-6 VG 2 - LC-E

N C / N C I C o m b i n a t i o n s

NC = L C - E Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	7.1	04NO2	04BR2.		

See Table 4-4 for applicable Protocol Option Codes.

7.7 Voice Grade 2 - LC-F

Table 7-7 VG 2 - LC-F

N C / N C I C o m b i n a t i o n s

NC = L C - F Effective 4-wire and Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	8.3		04BR2		02NO2
Voice and 20 Hz Ring-down	8.3		04BR2		02AC2

See Table 4-4 for applicable Protocol Option Codes.

7.8 Voice Grade 2 - LC-H

Table 7-8 VG 2 - LC-H

N C / N C I C o m b i n a t i o n s					
NC = L C - H Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination					
Remarks	**Configuration (Table 5-1)**	**Access Customer**	**QWEST Central Office CO NI ##**	**Interconnector**	**End-User**
No Signaling	8.1		04BR2		04NO2
Voice and 20 Hz Ring-down	8.1		04BR2		04AC2

See Table 4-4 for applicable Protocol Option Codes.

7.9 Voice Grade 2 - LC-L

Table 7-9 VG 2 - LC-L

N C / N C I C o m b i n a t i o n s

NC = L C - L Improved Termination at End-User Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	
Loop-start Signaling (End-User has) closed-end	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	1.2			04LO2	04LS2
	2.1			DS1/3 Digital	
Private Line Automatic Ring-down (PLAR)	1.2	04LR2 04SF2.LR			04LR2 †††
	2.1	Digital			
	2.1	Digital			04LR2.A 04LR2.B
	1.2			04LR2	04LR2 †††
	2.1			DS1/3 Digital	04LR2.A
Voice and 20 Hz Ring-down	2.1	Digital			04AC2
	2.1			DS1/3 Digital	04AC2

††† Audible tone is not guaranteed.

7.10 Voice Grade 2 - LC-P

Table 7-10 VG 2 - LC-P

N C / N C I C o m b i n a t i o n s

NC = L C - P Improved Termination at 4-Wire End-User Point of Termination and at 4-Wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.2	04NO2			04NO2
Loop-start Signaling (End-User has closed-end)	1.2	04LO2 04SF2.LO			04LS2
Private Line Automatic Ring-down (PLAR)	1.2	04LR2 04SF2			04LR2 †††

††† Audible tone is not guaranteed.

7.11 Voice Grade 2 - LC-Q, LCBQ, LCBR

Table 7-11 VG 2 - LC-Q, LCBQ, LCBR

N C / N C I C o m b i n a t i o n s

NC = L C - Q Improved Return Loss for Effective 2-Wire and Improved Termination at 4-Wire Access Customer Point of Termination

NC = L C B Q ELEPL-2 and Improved Return Loss for Effective 2-Wire and Improved Termination at 4-Wire Access Customer Point of Termination

NC = L C B R ELEPL-2 and Improved Termination at 4-Wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.4	04NO2			02NO2
	1.4	04NO2		02NO2	
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2 02LC2
	1.4	04LS2 04SF2.LS		02LO2	
Loop-start Signaling (End-User has closed- end)	1.4	04LO2 04SF2.LO			02LS2
	1.4	04LO2 04SF2.LO	02LS3		
	1.4	04LO2 04SF2.LO		02LS2	
Private Line Automatic Ring-down (PLAR)	1.4	04LR2 04SF2			02LR2 †††
	1.4	04LR2 04SF2		02LR2 †††	

††† Audible tone is not guaranteed.

7.12 Voice Grade 2 - LC-R

Table 7-12 VG 2 - LC-R

N C / N C I C o m b i n a t i o n s **NC = L C - R** Improved Termination at 4-wire Access Customer Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	1.2				04NO2
	2b.1				Digital
	1.4	04NO2		02NO2	
	1.2			04NO2	
	2b.1			DS1/3 Digital	
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2			02LA2 02LB2 02LC2
	2b.1				Digital
	1.4	04LS2 04SF2	02LO3		
	1.4	04LS2		02LO2	
	2b.1	04SF2		DS1/3 Digital	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2			02LS2
	1.2	04SF2			04LS2
	2b.1				Digital
		04LO2 04SF2	02LS3		
	1.4	04LO2		02LS2	
	1.2	04SF2		04LS2	
	2b.1			DS1/3 Digital	
Ground-Start Signaling (End-User has open-end)	1.4	04GS2 04SF2	02GO3		
	1.4	04GS2		02GO2	
	2b.1	04SF2		DS1/3 Digital	

Table 7-12 VG 2 - LC-R (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C - R Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	End-User
Private	1.4	04LR2			02LR2 †††
Line	1.2	04SF2			04LR2 †††
Automatic	2b.1				Digital
Ring-down	1.4	04LR2		02LR2 †††	
(PLAR)	1.2	04SF2		04LR2 †††	
	2b.1			DS1/3 Digital	

††† Audible tone is not guaranteed.

7.13 Voice Grade 2 - LC1-

Table 7-13 VG 2 - LC1-

N C / N C I C o m b i n a t i o n s **NC = L C 1 -** IntraLATA					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**End-User**	**CO NI**		**End-User**
No Signaling	1.1	02NO2			02NO2
	1.4				04NO2
	2b.3				Digital
	1.2	04NO2			04NO2
	2b.1				Digital
	2a	Digital 04DU9.NO 04DS6.NO			Digital 04DU9.NO 04DS6.NO
Loop-start Signaling	1.1	02LA2			02LS2
	1.4	02LB2			04LS2
	2b.3	02LC2			Digital
	1.1		02LO3		02LS2
	1.4				04LS2
	2b.3				Digital
	2b.3	02LS2			Digital
	2b.1	04LS2			
	2a	Digital 04DU9.LO 04DS6.LO			Digital 04DU9.LS 04DS6.LS
Ground-Start Signaling	1.1		02GO3		02GS2
	2b.3				Digital
	2b.3	02GS2			Digital
	2a	Digital 04DU9.GO 04DS6.GO			Digital 04DU9.GS 04DS6.GS

Table 7-13 VG 2 - LC1- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L C 1 - IntraLATA

Remarks	Configuration (Table 5-1)	End-User	QWEST Central Office CO NI		End-User
Private Line Automatic Ring-down (PLAR)	1.1	02LR2 †††			02LR2 †††
	1.4				04LR2 †††
	2b.3				Digital
	1.2	04LR2 †††			04LR2 †††
	2b.3				Digital
	2a	Digital			Digital
Voice and 20 Hz Ring-down	1.1	02AC2			02AC2
	1.4				04AC2
	2b.3				Digital
	1.2	04AC2			04AC2
	2b.1				Digital
	2a	Digital			Digital

††† Audible tone is not guaranteed.

7.14 Voice Grade 2 - LC1A

Table 7-14 VG 2 - LC1A

N C / N C I C o m b i n a t i o n s **NC = L C 1 A** IntraLATA and Effective 4-wire					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**End-User**	**CO NI**		**End-User**
No Signaling	1.5	02NO2			02NO2
	1.3	04NO2			
Loop-start Signaling	1.5	02LS2			02LA2
	1.3	04LS2			02LB2 02LC2
Private Line Automatic Ring-down (PLAR)	1.5	02LR2 †††			02LR2 †††
	1.4	04LR2 †††			
Voice and 20 Hz Ring-down	1.5	02AC2			02AC2
	1.4	04AC2			

††† Audible tone is not guaranteed.

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Chapter and Section **Page**

Tables

8. Network Channel/Network Channel Interface Combinations - VG 3

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

8.1 Voice Grade 3 - LD--

Table 8-1 VG 3 - LD--

N C / N C I C o m b i n a t i o n s

NC = LD-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.2	04NO2			04NO2
	2.1	Digital			
	2b .1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.4			04NO2	02NO2
	1.2				04NO2
	2b.1				Digital
	2.2			DS1/3 Digital	02NO2
	2.1				04NO2
	1.4	04NO2		02NO2	
	2.2	Digital			
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.1	04NO2		DS1/3 Digital	

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

Table 8-1 VG 3 - LD-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LD-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	2b.1	04LO2 04SF2.LO			Digital 04DU9.LS
	2a	Digital 04DS9.LO * 04DS6.LO			04DS6.LS
	1.4			04LO2	02LS2
	1.2				04LS2
	2b.1				Digital
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	2.2			DS1/3 Digital	02LS2
	2.1				04LS2
	1.4	04LO2		02LS2	
	2.2	Digital			
	1.2	04LO2		04LS2	
	2.1	Digital			
	2b.1	04LO2		DS1/3 Digital	

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

Table 8-1 VG 3 - LD-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LD-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-Start Signaling (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	2.2	Digital			
	1.4	04GO2 04SF2.GO	02GS3.C		
	2.2	Digital			
	1.2	04GO2 04SF2.GO			04GS2
	2.1	Digital			
	1.2	04GO2 04SF2.GO	04GS2.C		
	2.1	Digital			
	2b.1	04GO2 04SF2.GO			Digital 04DU9.GS
	2a	Digital 04DS9.GO * 04DS6.GO			04DS6.GS
	1.4			04GO2	02GS2
	1.2				04GS2
	2b.1				Digital
	1.4		02GS3.C	04GO2	
	1.2		04GS2.C		
	2.2			DS1/3 Digital	02GS2
	2.1				04GS2
	2.2		02GS3.C	DS1/3 Digital	
	2.1		04GS2.C		
	1.4	04GO2		02GS2	
	2.2	Digital			
	1.2	04GO2		04GS2	
	2.1	Digital			
	2b.1	04GO2		DS1/3 Digital	

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

Table 8-1 VG 3 - LD-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LD-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	End-User
Single Frequency	2.1	Digital to 04SF2.EA # or 04SF2.GO # or 04SF2.GS # or 04SF2.LO # or 04SF2.LS #			
Reverse Battery	2.2	Digital			02RV2.T
E & M Signaling	1.4	04SF2.EA 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.2	Digital			06EB2.M +
	1.4	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	2.2	Digital			
	1.2	04SF2.EA 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E +
	2.1	Digital			08EB2.M +
	1.2	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		
	2.1	Digital			
	2b.1	04SF2.EA 06EA2.E + 06EA2.M +			Digital
	2a	Digital 04DS9.EA * 04DS6.EA			Digital 04DU9.EA 04DS6.EA

* DJ may be substituted for DS at an Access Customer Network Interface.
\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.
\# Access Customer-to-Access Customer connection when associated protocol is high capacity (Digital).

8.2 Voice Grade 3 - LD-A,

Table 8-2 VG 3 - LD-A

N C / N C I C o m b i n a t i o n s

NC = L D - A Effective 4-wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	End-User
No Signaling	1.3	04NO2			02NO2
	2.3	Digital			
	1.3			04NO2	02NO2
	2.3			DS1/3 Digital	
	1.3	04NO2		02NO2	
	2.3	Digital			
Loop-start Signaling (End-User has closed-end)	1.3	04LO2 04SF2.LO			02LS2
	2.3	Digital			
	1.3			04LO2	02LS2
	2.3			DS1/3 Digital	
	1.3	04LO2 04SF2.LO		02LS2	
	2.3	Digital			
Ground-Start Signaling (End-User has closed-end)	1.3	04GO2 04SF2.GO			02GS2
	2.3	Digital			
	1.3			04GO2	02GS2
	2.3			DS1/3 Digital	
	1.3	04GO2 04SF2.GO		02GS2	
	2.3	Digital			
Reverse Battery	1.3	04SF2			02RV2.T
	2.3	Digital			
	2.3			DS1/3 Digital	02RV2.T
	1.3	04SF2		02RV2.T	
	2.3	Digital			

Table 8-2 VG 3 - LD-A (Continued)

N C / N C I C o m b i n a t i o n s

NC = L D - A Effective 4-wire

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
E & M Signaling	1.3	04SF2.EA 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.3	Digital			06EB2.M +
	1.3	04SF2.EA 06EA2.E + 06EA2.M + 08EC2 +	02CT3		
	2.3	Digital			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

8.3 Voice Grade 3 - LD-C, LDBC

Table 8-3 VG 3 - LD-C, LDBC

NC / NCI Combinations

NC = LD-C Improved Return Loss for Effective 2-wire

NC = LDBC ELEPL-2 and Improved Return Loss for Effective 2-wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			
Ground-Start (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	2.2	Digital			
	1.4			04GO2	02GS2
	2.2			DS1/3 Digital	
	1.4	04GO2 04SF2.GO		02GS2	
	2.2	Digital			

Table 8-3 VG 3 - LD-C, LDBC (Continued)

N C / N C I C o m b i n a t i o n s

NC = L D - C Improved Return Loss for Effective 2-wire

NC = L D B C ELEPL-2 and Improved Return Loss for Effective 2-wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Reverse Battery	1.4	04SF2			02RV2.T
	2.2	Digital			
				DS1/3 Digital	02RV2.T
	1.4	04SF2		02RV2.T	
	2.2	Digital			

8.4 Voice Grade 3 - LD-D

Table 8-4 VG 3 - LD-D

N C / N C I C o m b i n a t i o n s

NC = L D - D Effective 4-wire and Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No	1.3	04NO2			02NO2
Signaling	1.3	04NO2		02NO2	
Loop-start Signaling	1.3	04LO2 04SF2.LO			02LS2
(End-User has closed-end)	1.3	04LO2 04SF2.LO		02LS2	
Ground-Start	1.3	04GO2 04SF2.GO			02GS2
Signaling (End-User has closed-end)	1.3	04GO2 04SF2.GO		02GS2	
Reverse	1.3	04SF2			02RV2.T
Battery	1.3	04SF2		02RV2.T	
E & M Signaling	1.3	04SF2.EA 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +
	1.3	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

8.5 Voice Grade 3 - LD-L

Table 8-5 VG 3 - LD-L

N C / N C I C o m b i n a t i o n s

NC = L D - L Improved Termination at 4-wire End-User Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2	04NO2		04NO2	
	2.1	Digital			
Loop-start Signaling (End-User has closed-end)	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	1.2	04LO2 04SF2.LO		04LS2	
	2.1	Digital			
Ground-Start (End-User has closed-end)	1.2	04GO2 04SF2.GO			04GS2
	2.1	Digital			
	1.2	04GO2 04SF2.GO		04GS2	
	2.1	Digital			
E & M Signaling	1.2	04SF2.EA 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E +
	2.1	Digital			08EB2.M +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

8.6 Voice Grade 3 - LD-M

Table 8-6 VG 3 - LD-M

N C / N C I C o m b i n a t i o n s

NC = L D - M Software Connection to connect Centrex to Common Control Switching Arrangement within the same switch

Remarks	Configuration (Table 5-1)	QWEST Central Office			
		Access Customer	Centrex	Interconnector	End-User
Ground-Start Signaling (End-User has closed-end)	Software	02GO2	02GS3.C		
Connects End-User	Software		02CT3-02CT3		
to theoretical Central Office Centrex Tie Trunk Equipment	Software		04CT2-04CT2		

8.7 Voice Grade 3 - LD-P

Table 8-7 VG 3 - LD-P

N C / N C I C o m b i n a t i o n s

NC = L C - P Improved Termination at 4-wire End-User Point of Termination and at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office			
		Access Customer	Centrex	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
Loop-start Signaling (End-User has closed-end)	1.2	04LO2 04SF2.LO			04LS2
Ground-Start Signaling (End-User has closed-end)	1.2	04GO2 04SF2.GO			04GS2
E & M Signaling	1.2	04SF2.EA 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

8.8 Voice Grade 3 - LD-Q, LDBQ

Table 8-8 VG 3 - LD-Q, LDBQ

N C / N C I C o m b i n a t i o n s

NC = L D - Q Improved Return Loss for Effective 2-wire and Improved Termination at 4-wire Access Customer Point of Termination

NC = L D B Q ELEPL-2 and Improved Return Loss for Effective 2-wire and Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.4	04NO2			02NO2
	1.4	04NO2		02NO2	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	1.4	04LO2 04SF2.LO	02LS3		
	1.4	04LO2 04SF2.LO		02LS2	
Ground-Start Signaling (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	1.4	04GO2 04SF2.GO		02GS2	
Reverse Battery	1.4	04SF2			02RV2.T
	1.4	04SF2		02RV2.T	

8.9 Voice Grade 3 - LD-R

Table 8-9 VG 3 - LD-R

N C / N C I C o m b i n a t i o n s

NC = L D - R Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
No Signaling	1.4	04NO2			02NO2
	1.2				04NO2
	2b.1				Digital
	1.4	04NO2		02NO2	
	1.2			04NO2	
	2b.1			DS1/3 Digital	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	1.2				04LS2
	2b.1				Digital
	1.4	04LO2 04SF2.LO	02LS3		
	1.4	04LO2 04SF2.LO		02LS2	
	1.2			04LS2	
	2b.1			DS1/3 Digital	
Ground-Start (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	1.2				04GS2
	2b.1				Digital
	1.4	04GO2 04SF2.GO	02GS3.C		
	1.4	04GO2 04SF2.GO		02GS2	
	1.2			04GS2	
	2b.1			DS1/3 Digital	

Table 8-9 VG 3 - LD-R (Continued)

N C / N C I C o m b i n a t i o n s

NC = L D - R Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Reverse Battery	1.4	04SF2.EA 06EA2.E + 06EA2.M +			02RV2.T
	1.4	04SF2.EA		02RV2.T	
E & M Signaling	1.4	04SF2.EA 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +
	1.4	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	1.2	04SF2.EA 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +
	1.2	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

8.10 Voice Grade 3 - LDB-

Table 8-10 VG 3 - LDB-

NC / NCI Combinations **NC = LDB-** ELEPL-2					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			

Table 8-10 VG 3 - LDB- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LDB- ELEPL-2

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-Start Signaling (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	2.2	Digital			
	1.4	04GO2 04SF2.GO	02GS3.C		
	2.2	Digital			
	1.4			04GO2	02GS2
	2.2			DS1/3 Digital	
	1.4		02GS3.C	04GO2	
	2.2			DS1/3 Digital	
	1.4	04GO2 04SF2.GO		02GS2	
	2.2	Digital			
Reverse Battery	1.4	04SF2			02RV2.T
	2.2	Digital			
	2.2			DS1/3 Digital	02RV2.T
	1.4	04SF2		02RV2.T	
	2.2	Digital			

8.11 Voice Grade 3 - LDBR

Table 8-11 VG 3 - LDBR

N C / N C I C o m b i n a t i o n s **NC = L D B R** ELEPL-2 and Improved Termination at 4-wire Access Customer Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No	1.4	04NO2			02NO2
Signaling	1.4	04NO2		02NO2	
Loop-start Signaling	1.4	04LO2 04SF2.LO			02LS2
(End-User has	1.4	04LO2 04SF2.LO	02LS3		
closed-end)	1.4	04LO2 04SF2.LO		02LS2	
Ground-Start	1.4	04GO2 04SF2.GO			02GS2
Signaling (End-User	1.4	04GO2 04SF2.GO	02GS3.C		
has closed-end)	1.4	04GO2 04SF2.GO		02GS2	
Reverse	1.4	04SF2			02RV2.T
Battery	1.4	04SF2		02RV2.T	

8.12 Voice Grade 3 - LD1-

Table 8-12 VG 3 - LD1-

N C / N C I C o m b i n a t i o n s					
NC = L D 1 - IntraLATA					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**End-User**	**Centrex**	**Interconnector**	**End-User**
Loop-start	1.1	02LO2			02LS2
Signaling	1.4				04LS2
(End-User	1.4	04LO2			02LS2
has closed-end)	1.2				04LS2
Ground-	1.1	02GO2			02GS2
Start	1.4				04GS2
Signaling	1.1	02GO2	02GS3.C		
(End-User	1.4	04GO2			02GS2
has	1.2				04GS2
closed-end)	1.4	04GO2	02GS3.C		
Reverse Battery	1.1	02RV2.T			02RV2.O

Table 8-12 VG 3 - LD1- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L D 1 - IntraLATA

Remarks	Configuration (Table 5-1)	QWEST Central Office End-User	QWEST Central Office Centrex	QWEST Central Office Interconnector	QWEST Central Office End-User
E & M Signaling	1.1	04EA2.E + 04EA2.M +			04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +
	1.4				06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +
	1.2	06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +
	1.1		02CT3- 02CT3		
	1.4		02CT3- 04CT2		
	1.1	04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +	02CT3		
	1.4	04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +	04CT2		
	1.2	06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

8.13 Voice Grade 3 - LD1A

Table 8-13 VG 3 - LD1A

N C / N C I C o m b i n a t i o n s

NC = L D 1 A IntraLATA and Effective 4-wire

Remarks	Configuration (Table 5-1)	End-User	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
Loop-start Signaling	1.5	02LO2			02LS2
	1.3				04LS2
	1.3	04LO2			02LS2
Ground-Start Signaling	1.5	02GO2			02GS2
	1.3				04GS2
	1.3	02GO2	04GS3.C		
	1.3	04GO2			02GS2
E & M Signaling	1.5	04EA2.E + 04EA2.M +			04EA2.E + 04EA2.M +
	1.3	06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +
	1.5	04EA2.E + 04EA2.M +	02CT3		
	1.3	06EA2.E + 06EA2.M + 08EC2 +			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

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9. Network Channel/Network Channel Interface Combinations - VG 4

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

9.1 Voice Grade 4 - LE--

Table 9-1 VG 4 - LE--

N C / N C I C o m b i n a t i o n s

NC = L E - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.2			04NO2	04NO2
	2.b1				Digital
	2.1			DS1/3 Digital	04NO2
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.1	04NO2		DS1/3 Digital	

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

9.2 Voice Grade 4 - LE-L

Table 9-2 VG 4 - LE-L

N C / N C I C o m b i n a t i o n s

NC = L E - L Improved Termination at 4-wire End-User Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	04NO2

9.3 Voice Grade 4 - LE-P

Table 9-3 VG 4 - LE-P

N C / N C I C o m b i n a t i o n s **NC = L E - P** Improved Termination at 4-wire End-User Point of Termination and at 4-wire Access Customer Point of Termination					
Remarks	**Configuration Number (Table 5-1)**	**Access Customer Network Interface NCI Code**	**QWEST Central Office**		**End-User NI NCI Code**
			CO NI NCI Code	**Interconnector NI NCI Code**	
No Signaling	1.2	04NO2			04NO2

9.4 Voice Grade 4 - LE-R

Table 9-4 VG 4 - LE-R

N C / N C I C o m b i n a t i o n s **NC = L E - R** Improved Termination at 4-wire Access Customer Point of Termination					
Remarks	**Configuration Number (Table 5-1)**	**Access Customer Network Interface NCI Code**	**QWEST Central Office**		**End-User NI NCI Code**
			CO NI NCI Code	**Interconnector NI NCI Code**	
No	1.2	04NO2			04NO2
Signaling	1.2	04NO2		04NO2	

9.5 Voice Grade 4 - LE--

Table 9-5 VG 4 - LE1-

NC / NCI Combinations **NC = LE1-** IntraLATA					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**End-User**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2a	Digital 04DU9.NO 04DS6.NO			Digital 04DU9.NO 04DS6.NO

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10. Network Channel/Network Channel Interface Combinations - VG 5

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

10.1 Voice Grade 5 - LF--

Table 10-1 VG 5 - LF--

N C / N C I C o m b i n a t i o n s

NC = L F - - No options

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	Interconnector	End-User
No Signaling	1.1	02NO2 †			02NO2
	1.4	04NO2			
	2.2	Digital			
	1.2	04NO2			04NO2
	2.1	Digital			
	2b.3	02NO2 †			Digital
	2b.1	04NO2			
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.1			02NO2 †	02NO2
	1.4			04NO2 †	
	2.2			DS1/3 Digital	
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	
	2b.3			02NO2 †	Digital
	2b.1			04NO2	
	1.1	02NO2 †		02NO2	
	1.4	04NO2			
	2.2	Digital †			
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.3	02NO2 †		DS1/3 Digital	
	2b.1	04NO2			

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

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

Table 10-1 VG 5 - LF-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L F - - No options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
Suitable for Data	1.1	02DB2 †			02DA2 †
	1.4	04DB2			
	2.2	Digital			
	1.2	04DB2			04DA2
	2.1	Digital			
	1.2	04DB2			06DA2 ++
	2.1 ++	Digital			
	2b.3	02DB2 †			Digital
	2b.1	04DB2			
	2a	Digital			Digital
	1.1			02DB2 †	02DA2 †
	1.4			04DB2	
	2.2			DS1/3 Digital	
	1.2			04DB2	04DA2
	2.1			DS1/3 Digital	
	1.2 ++			04DB2	06DA2 ++
	2.1 ++			DS1/3 Digital	
	2b.3			02DB2 †	Digital
	2b.1			04DB2	
	1.1	02DB2 †		02DB2	
		04DB2			
	2.2	Digital †			
	1.2	04DB2		04DB2	
	2.2	Digital			
	2b.3	02DB2 †		DS1/3 Digital	
	2b.1	04DB2			

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

10.2 Voice Grade 5 - LF-A, LFCA, LFFA, LFGA, LFJA

Table 10-2 VG 5 - LF-A, LFCA, LFFA, LFGA, LFJA

N C / N C I C o m b i n a t i o n s

NC = L F - A Effective 4-wire

NC = L F C A C Conditioning and Effective 4-wire

NC = L F F A Improved Envelope Delay Distortion and Effective 4-wire

NC = L F G A Improved Attenuation Distortion and Effective 4-wire

NC = L F J A Improved Envelope Delay Distortion and Improved Attenuation Distortion and Effective 4-wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.3	04NO2			02NO2
	2.3	Digital			
	1.3			04NO2	02NO2
	2.3			DS1/3 Digital	
	1.3	04NO2		02NO2	
	2.3	Digital			
Suitable for Data	1.3	04DB2			02DA2 †
	2.3	Digital			
	1.3			04DB2	02DA2 †
	2.3			DS1/3 Digital	
	1.3	04DB2		02DB2	
	2.3	Digital			

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

10.3 Voice Grade 5 - LF-B

Table 10-3 VG 5 - LF-B

N C / N C I C o m b i n a t i o n s **NC = L F - B** Central Office Bridging					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI ##**	**Interconnector**	**End-User**
No Signaling	8.2		02BR2. †		02NO2
	8c.2				Digital 04DU9.NO 04DS6.NO
	8.2		04BR2		02NO2
	8.1				04NO2
	8c.1				Digital 04DU9.NO 04DS6.NO
	7.2	02NO2 †	02BR2. †		
	7c.2	Digital 04DS9.NO * 04DS6.NO			
	7.1	04NO2	04BR2		
	7c.1	Digital 04DS9.NO * 04DS6.NO			
	7.2		02BR2 †	02NO2	
	7c.2			DS1/3 Digital	
	7.1		04BR2	04NO2	
	7c.1			DS1/3 Digital	
	9.2		02BR2 †%		
	9.1		04BR2 %		

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.
* DJ may be substituted for DS at an Access Customer Network Interface.
See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-Bridge application (Mid-link).

Table 10-3 VG 5 - LF-B (Continued)

N C / N C I C o m b i n a t i o n s

NC = L F - B Central Office Bridging

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI ##	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Suitable for Data	8.2		02BR2. †		02DA2 †
	8c.2				Digital
	8.2		04BR2		02DA2 †
	8.1				04DA2
	8.1 ++				06DA2 ++
	8c.1				Digital
	7.2	02DB2 †	02BR2. †		
	7c.2	Digital			
	7.1	04DB2	04BR2		
	7c.1	Digital			
	7.2		02BR2 †	02DB2	
	7c.2			DS1/3 Digital	
	7.1		04BR2	04DB2	
	7c.1			DS1/3 Digital	
	9.2		02BR2 †%		
	9.1		04BR2 %		

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.
See Table 4-4 for applicable Protocol Option Codes.
++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.
% Bridge-to-Bridge application (Mid-link).

10.4 Voice Grade 5 - LF-D, LFCD, LFFD, LFGD, LFJD

Table 10-4 VG 5 - LF-D, LFCD, LFFD, LFGD, LFJD

NC / NCI Combinations

NC = LF-D Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFCD C Conditioning & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFFD Improved Envelope Delay & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFGD Improved Attenuation Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFJD Improved Envelope Delay Distortion & Improved Attenuation Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	CO NI	Interconnector	End-User
No Signaling	1.3	04NO2			02NO2
	1.3	04NO2		02NO2	
Suitable for Data	1.3	04DB2			02DA2
	1.3	04DB2		02DB2	

10.5 Voice Grade 5 - LF-E, LFCE, LFGE, LFRE, LFWE

Table 10-5 VG 5 - LF-E, LFCE, LFGE, LFRE, LFWE

NC / NCI Combinations

NC = LF-E Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFCE C Conditioning & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFGE Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFRE Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFWE Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office Access Customer	CO NI ##	Interconnector	End-User
No Signaling	7.1	04NO2	04BR2		
Suitable for Data	7.1	04DB2	04BR2		

See Table 4-4 for applicable Protocol Option Codes.

10.6 Voice Grade 5 - LF-F, LFCF, LFFF, LFGF, LFWF

Table 10-6 VG 5 - LF-F, LFCF, LFFF, LFGF, LFWF

N C / N C I C o m b i n a t i o n s

NC =	**L F - F**	Effective 4-wire & Central Office Bridging
NC =	**L F C F**	C Conditioning & Effective 4-wire & Central Office Bridging
NC =	**L F F F**	Improved Envelope Delay Distortion & Effective 4-wire & Central Office Bridging
NC =	**L F G F**	Improved Attenuation Distortion & Effective 4-wire & Central Office Bridging
NC =	**L F W F**	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Effective 4-wire & Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No	8.3		04BR2		02NO2
Signaling	8.3		04BR2	02NO2	
Suitable	8.3		04BR2		02DA2 †
for Data	8.3		04BR2	02DB2 †	

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

See Table 4-4 for applicable Protocol Option Codes.

10.7 Voice Grade 5 - LF-H, LFCH, LFGH, LFJH, LFRH

Table 10-7 VG 5 - LF-H, LFCH, LFGH, LFJH, LFRH

NC / NC I Combinations	
NC = LF-H	Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC = LFCH	C Conditioning & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC = LFGH	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC = LFJH	Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC = LFRH	Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI ##**	**Interconnector**	**End-User**
No Signaling	8.1		04BR2		04NO2

See Table 4-4 for applicable Protocol Option Codes.

10.8 Voice Grade 5 - LF-L, LFCL, LFFL, LFGL, LFJL

Table 10-8 VG 5 - LF-L, LFCL, LFFL, LFGL, LFJL

N C / N C I C o m b i n a t i o n s

NC = L F - L Improved Termination at 4-wire End-User Point of Termination

NC = L F C L C Conditioning & Improved Termination at 4-wire End-User Point of Termination

NC = L F F L Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = L F G L Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = L F J L Improved Envelope Delay Distortion & Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

	Configuration		QWEST Central Office		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	

10.9 Voice Grade 5 - LF-P, LFCP, LFFP, LFGP, LFJP

Table 10-9 VG 5 - LF-P, LFCP, LFFP, LFGP, LFJP

NC / NCI Combinations

NC = LF-P Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LFCP C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LFFP Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LFGP Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LFJP Improved Envelope Delay Distortion & Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

	Configuration	QWEST Central Office			
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2

10.10 Voice Grade 5 - LF-R

Table 10-10 VG 5 - LF-R

N C / N C I C o m b i n a t i o n s **NC = L F - R** Improved Termination at 4-wire Access Customer Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	1.2				04NO2
	2b.1				Digital
	1.2	04NO2		04NO2	
	2b.1			DS1/3 Digital	
Suitable for Data	1.4	04DB2			02DA2 †
	1.2				04DA2
	1.2 ++				06DA2 ++
	2b.1				Digital
	1.2	04DB2		04DB2	
	2b.1			DS1/3 Digital	

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

10.11 Voice Grade 5 - LFB-

Table 10-11 VG 5 - LFB-

NC / NCI Combinations **NC = LFB-** ELEPL-2					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
Suitable for Data	1.4	04DB2			02DA2 †
	2.2	Digital			
	1.4			04DB2	02DA2 †
	2.2			DS1/3 Digital	
	1.4	04DB2		02DB2	
	2.2	Digital			

† Intended for 1-way or half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

10.12 Voice Grade 5 - LFBR

Table 10-12 VG 5 - LFBR

N C / N C I C o m b i n a t i o n s

NC = L F B R ELEPL-2 and Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.4	04NO2			02NO2
Suitable for Data	1.4	04DB2			02DA2 †

† Intended for half-duplex transmission; for 2-way operation the channel should be ordered as Effective 4-wire to meet cross-talk requirements.

10.13 Voice Grade 5 - LFC-, LFF-, LFG-, LFJ-

Table 10-13 VG 5 - LFC-, LFF-, LFG-, LFJ-

N C / N C I C o m b i n a t i o n s

NC = L F C - C Conditioning

NC = L F F - Improved Envelope Delay Distortion

NC = L F G - Improved Attenuation Distortion

NC = L F J - Improved Envelope Delay Distortion and Improved Attenuation Distortion

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	1.2			04NO2	04NO2
	2b.1				Digital
	2.1			DS1/3 Digital	04NO2
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.1	04NO2		DS1/3 Digital	
Suitable for Data	1.2	04DB2			04DA2
	1.2 ++				06DA2 ++
	2b.1				Digital
	2.1	Digital			04DA2
	2.1 ++				06DA2 ++
	1.2			04DB2	04DA2
	1.2 ++				06DA2 ++
	2b.1				Digital
	2.1			DS1/3 Digital	04DA2
	2.1 ++				06DA2 ++
	1.2	04DB2		04DB2	
	2.1	Digital			
	2b.1	04DB2		DS1/3 Digital	

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

10.14 Voice Grade 5 - LFCB, LFTB, LFUB, LFVB

Table 10-14 VG 5 - LFCB, LFTB, LFUB, LFVB

N C / N C I C o m b i n a t i o n s

NC = LFCB C Conditioning & Central Office Bridging

NC = LFTB Improved Envelope Delay Distortion & Central Office Bridging

NC = LFUB Improved Attenuation Distortion & Central Office Bridging

NC = LFVB Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	8.1		04BR2		04NO2
	8b.1				Digital 04DU9.NO 04DS6.NO
	7.1	04NO2	04BR2		
	7.c1 ++	Digital			
	8.1		04BR2	04NO2	
	8c.1			DS1/3 Digital	
	9.1		04BR2 %		
Suitable for Data	8.1		04BR2		04DA2
	8.1 ++				06DA2 ++
	8b.1				Digital
	7.1	04DB2	04BR2		
	7.c1 ++	Digital			
	8.1		04BR2	04DB2	
	8c.1			DS1/3 Digital	
	9.1		04BR2 %		

See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-Bridge application (Mid-link).
++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

10.15 Voice Grade 5 - LFCR, LFFR, LFGR, LFJR

Table 10-15 VG 5 - LFCR, LFFR, LFGR, LFJR

N C / N C I C o m b i n a t i o n s

NC = LFCR C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LFJR Improved Envelope Delay Distortion & Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2b.1				Digital 04DU9.NO 04DS6.NO
	1.2	04NO2		04NO2	
	2b.1			DS1/3 Digital	
Suitable for Data	1.2	04DB2			04DA2
	1.2 ++				06DA2 ++
	2b.1				Digital
	1.2	04DB2		04DB2	
	2b.1			DS1/3 Digital	

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

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11. Network Channel/Network Channel Interface Combinations - VG 6

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”. See Table 4-3 for available options for the “DA” NCI code.

11.1 Voice Grade 6 - LG--

Table 11-1 VG 6 - LG--

N C / N C I C o m b i n a t i o n s **NC = L G - -** No Options					
	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.2			04NO2	04NO2
	2b.1				Digital
	2.1			DS1/3 Digital	04NO2
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.1	04NO2		DS1/3 Digital	
Suitable for data	1.2	04DA2 04DB2			04DA2
	1.2 ++	06DA2			
	2.1	Digital			
	1.2 ++	04DA2 04DB2			06DA2
	1.2 ++	06DA2			
	2.1 ++	Digital			
	2b.1	04DA2 04DB2			Digital
	2b.1 ++	06DA2			
	2a	Digital			

* DJ may be substituted for DS at an Access Customer Network Interface.
++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

Table 11-1 VG 6 - LG-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L G - - No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Suitable for data Continued	1.2m		04DM2.3P		04DA2
	1.2m ++		04DM2.4P		06DA2
	2b.1m		04DM2.5P 04DM2.6P 04DM2.7P		Digital
	1.2m	04DA2 04DB2 04NO2	04DM2.3P 04DM2.4P 04DM2.5P		
	1.2m ++	06DA2	04DM2.6P		
	2.1m	Digital	04DM2.7P		
	1.2			04DB2	04DA2
	1.2 ++				06DA2
	2b.1				Digital
	2.1			DS1/3 Digital	04DA2
	2.1 ++				06DA2
	2b.1	04DB2		DS1/3 Digital	

* DJ may be substituted for DS at an Access Customer Network Interface.
++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

11.2 Voice Grade 6 - LG-B, LGCB, LGDB, LGEB, LGFB, LGGB, LGJB, LGMB, LGNB, LGQB

Table 11-2 VG 6 - LG-B, LGCB, LGDB, LGEB, LGFB, LGGB, LGJB, LGMB, LGNB, LGQB

N C / N C I C o m b i n a t i o n s

NC = LG-B Central Office Bridging

NC = LGCB C Conditioning & Central Office Bridging

NC = LGDB Data Capability & Central Office Bridging

NC = LGEB C Conditioning & Data Capability & Central Office Bridging

NC = LGFB Improved Envelope Delay Distortion & Central Office Bridging

NC = LGGB Improved Attenuation Distortion & Central Office Bridging

NC = LGJB Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging

NC = LGMB Improved Attenuation Distortion & Data Capability & Central Office Bridging

NC = LGNB Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging

NC = LGQB Improved Envelope Delay Distortion & Data Capability & Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	8.1		04BR2.		04NO2
	8c.1				Digital 04DU9.NO 04DS6.NO
	7.1	04NO2	04BR2.		
	7C.1	Digital 04DS9.NO * 04DS6.NO			
	7.1, 8.1		04BR2	04NO2	
	9.1		04BR2 %		

* DJ may be substituted for DS at an Access Customer Network Interface.
See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-bridge application (Mid-link).

Table 11-2 VG 6 - LG-B, LGCB, LGDB, LGEB, LGFB, LGGB, LGJB, LGMB, LGNB, LGQB (Continued)

N C / N C I C o m b i n a t i o n s

NC = LG-B Central Office Bridging

NC = LGCB C Conditioning & Central Office Bridging

NC = LGDB Data Capability & Central Office Bridging

NC = LGEB C Conditioning & Data Capability & Central Office Bridging

NC = LGFB Improved Envelope Delay Distortion & Central Office Bridging

NC = LGGB Improved Attenuation Distortion & Central Office Bridging

NC = LGJB Improved Envelope Delay Distortion & Improved Attenuation Distortion & Central Office Bridging

NC = LGMB Improved Attenuation Distortion & Data Capability & Central Office Bridging

NC = LGNB Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging

NC = LGQB Improved Envelope Delay Distortion & Data Capability & Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
Suitable for data	8.1		04BR2		04DA2
	8.1 ++				06DA2
	8c.1				Digital
	7.1	04DA2 04DB2	04BR2		
	7.1 ++	06DA2			
	7c.1	Digital			
	8.1		04BR2	04DB2	
	9.1		04BR2 %		

See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-bridge application (Mid-link).
++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

11.3 Voice Grade 6 - LG-E, LGCE, LGDE, LGEE, LGFE, LGGE, LGJE, LGME, LGNE, LGQE

Table 11-3 VG 6 - LG-E, LGCE, LGDE, LGEE, LGFE, LGGE, LGJE, LGME, LGNE, LGQE

N C / N C I C o m b i n a t i o n s

NC = LG-E Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGCE C Conditioning & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGDE Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGEE C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGFE Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGGE Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGJE Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGME Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGNE Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGQE Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	7.1	04NO2	04BR2		
Suitable for data	7.1	04DB2	04BR2		

See Table 4-4 for applicable Protocol Option Codes.

11.4 Voice Grade 6 - LG-H, LGCH, LGDH, LGEH, LGFH, LGGH, LGJH, LGMH, LGNH, LGQH

Table 11-4 VG 6 - LG-H, LGCH, LGDH, LGEH, LGFH, LGGH, LGJH, LGMH, LGNH, LGQH

NC/NCI Combinations

NC = LG-H Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGCH C Conditioning & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGDH Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGEH C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGFH Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGGH Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGJH Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGMH Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGNH Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

NC = LGQH Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	8.1		04BR2		04NO2

See Table 4-4 for applicable Protocol Option Codes.

11.5 Voice Grade 6 - LG-L, LGCL, LGDL, LGEL, LGFL, LGGL, LGJL, LGML, LGNL, LGQL

Table 11-5 VG 6 - LG-L, LGCL, LGDL, LGEL, LGFL, LGGL, LGJL, LGML, LGNL, LGQL

N C / N C I C o m b i n a t i o n s

NC = LG-L Improved Termination at 4-wire End-User Point of Termination

NC = LGCL C Conditioning & Improved Termination at 4-wire End-User Point of Termination

NC = LGDL Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LGEL C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LGFL Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LGGL Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LGJL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LGML Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LGNL Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LGQL Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

			QWEST Central Office		
Remarks	**Configuration (Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	

11.6 Voice Grade 6 - LG-P, LGCP, LGDP, LGEP, LGFP, LGGP, LGJP, LGMP, LGNP, LGQP

Table 11-6 VG 6 - LG-P, LGCP, LGDP, LGEP, LGFP, LGGP, LGJP, LGMP, LGNP, LGQP

NC/NCI Combinations

NC =	**LG-P**	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGCP**	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGDP**	Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGEP**	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGFP**	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGGP**	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGJP**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGMP**	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGNP**	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LGQP**	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2

11.7 Voice Grade 6 - LG-R, LGCR, LGDR, LGER, LGFR, LGGR, LGJR, LGMR, LGNR, LGQR

Table 11-7 VG 6 - LG-R, LGCR, LGDR, LGER, LGFR, LGGR, LGJR, LGMR, LGNR, LGQR

NC / NCI Combinations

NC = LG-R Improved Termination at 4-wire Access Customer Point of Termination

NC = LGCR C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGDR Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGER C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGMR Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGNR Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LGQR Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.2	04NO2			04NO2
	1.2	04NO2		04NO2	
Suitable for data	1.2	04DB2			04DA2
	1.2 ++				06DA2
	1.2m	04DB2	04DM2.6P		

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

11.8 Voice Grade 6 - LGC-, LGD-, LGE-, LGF-, LGG-, LGJ-, LGM-, LGN-, LGQ-

Table 11-8 VG 6 - LGC-, LGD-, LGE-, LGF-, LGG-, LGJ-, LGM-, LGN-, LGQ-

N C / N C I C o m b i n a t i o n s

NC = LGC- C Conditioning

NC = LGD- Data Capability

NC = LGE- C Conditioning & Data Capability

NC = LGF- Improved Envelope Delay

NC = LGG- Improved Attenuation Distortion

NC = LGJ- Improved Attenuation Distortion & Improved Envelope Delay

NC = LGM- Improved Attenuation Distortion & Data Capability

NC = LGN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay

NC = LGQ- Improved Envelope Delay & Data Capability

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	
	2b.1			04NO2	Digital
	1.2	04NO2		04NO2	
	2b.1			DS1/3 Digital	
	2.1	Digital		04NO2	

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

Table 11-8 VG 6 - LGC-, LGD-, LGE-, LGF-, LGG-, LGJ-, LGM-, LGN-, LGQ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LGC- C Conditioning

NC = LGD- Data Capability

NC = LGE- C Conditioning & Data Capability

NC = LGF- Improved Envelope Delay

NC = LGG- Improved Attenuation Distortion

NC = LGJ- Improved Attenuation Distortion & Improved Envelope Delay

NC = LGM- Improved Attenuation Distortion & Data Capability

NC = LGN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay

NC = LGQ- Improved Envelope Delay & Data Capability

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
Suitable for data	1.2	04DA2 04DB2			04DA2
	1.2 ++	06DA2			
	2.1	Digital			
	1.2 ++	04DA2 04DB2			06DA2
	1.2 ++	06DA2			
	2.1 ++	Digital			
	2b.1	04DA2 04DB2			Digital
	2b.1 ++	06DA2			
	2a	Digital			
	1.2m		04DM2.3P		04DA2
	1.2m ++		04DM2.4P		06DA2
	2b.1		04DM2.5P 04DM2.6P 04DM2.7P		Digital

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

Table 11-8 VG 6 - LGC-, LGD-, LGE-, LGF-, LGG-, LGJ-, LGM-, LGN-, LGQ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LGC- C Conditioning

NC = LGD- Data Capability

NC = LGE- C Conditioning & Data Capability

NC = LGF- Improved Envelope Delay

NC = LGG- Improved Attenuation Distortion

NC = LGJ- Improved Attenuation Distortion & Improved Envelope Delay

NC = LGM- Improved Attenuation Distortion & Data Capability

NC = LGN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay

NC = LGQ- Improved Envelope Delay & Data Capability

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
Suitable for data Continued	1.2m	04DA2	04DM2.3P		
	1.2m ++	06DA2	04DM2.4P		
	2.1m	Digital	04DM2.5P 04DM2.6P 04DM2.7P		
	1.2m	04DB2	04DM2.6P		
	1.2			04DB2	04DA2
	1.2 ++				06DA2
	2.1				Digital
	2.1			DS1/3 Digital	04DA2
	2.1 ++				06DA2
	2b.1	04DB2		DS1/3 Digital	
	1.2m ++	06DA2			

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

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12. Network Channel/Network Channel Interface Combinations - VG 7

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

12.1 Voice Grade 7 - LH--

Table 12-1 VG 7 - LH--

N C / N C I C o m b i n a t i o n s **NC = L H - -** No Options					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO 04DS6.NO
	1.4			04NO2	02NO2
	1.2				04NO2
	2b.1				Digital
	1.4			DS1/3 Digital	02NO2
	1.2				04NO2
	1.4	04NO2		02NO2	
	2.2	Digital			
	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.1	04NO2		DS1/3 Digital	

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

Table 12-1 VG 7 - LH-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2
	2.2	Digital			02LC2
	1.4	04LS2 04SF2.LS	02LO3		
	2.2	Digital			
	2b.1	04LS2 04SF2.LS			Digital
	2a	Digital 04DS9.LS * 04DS6.LS			Digital 04DU9.LO 04DS6.LO
	1.4			04LS2	02LA2 02LB2 02LC2
	2b.1				Digital
	1.4		02LO3	04LS2	
	2.2			DS1/3 Digital	
	2.2			DS1/3 Digital	02LA2 02LB2 02LC2
	1.4	04LS2		02LS2	
	2.2	Digital			
	1.2	04LS2		04LS2	
	2.1	Digital			
	2b.1	04LS2		DS1/3 Digital	

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

Table 12-1 VG 7 - LH-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L H - - No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	2b.1	04LO2 04SF2.LO			Digital
	2a	Digital 04DS9.LO * 04DS6.LO			Digital 04DU9.LS 04DS6.LS
	1.4			04LO2	02LS2
	1.2				04LS2
	2.1				Digital
	2.2			DS1/3 Digital	02LS2
	2.1				04LS2
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			
	1.2	04LO2		04LS2	
	2.1	Digital			
	2b.1	04LO2 04SF2.LO		DS1/3 Digital	

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

Table 12-1 VG 7 - LH-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-start Signaling (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	2.2	Digital			
	1.2	04GO2 04SF2.GO			04GS2
	2.1	Digital			
	1.4	04GO2 04SF2.GO	02GS3.C		
	2.2	Digital			
	1.2	04GO2 04SF2.GO	04GS2.C		
	2.1	Digital			
	2b.1	04GO2 04SF2.GO			Digital 04DU9.GS
	2a	Digital 04DS9.GO * 04DS6.GO			04DS6.GS
	1.4			04GO2	02GS2 02GS3.C
	1.2				04GS2 04GS2.C
	2b.1				Digital
	1.4		02GS3.C	04GO2	
	1.2		04GS2.C		
	2.2			DS1/3 Digital	02GS2
	2.1				04GS2
	2.2		02GS3.C	DS1/3 Digital	
	2.1		04GS2.C		
	1.4	04GO2		02GS2	
	2.2	Digital			
	1.2	04GO2		04GS2	
	2.1	Digital			
	2b.1	04GO2		DS1/3 Digital	

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

Table 12-1 VG 7 - LH-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Ground-start Signaling (End-User has closed-end) Continued	1.4	04GO2		02GS2	
	2.2	Digital			
	1.2	04GO2		04GS2	
	2.1	Digital			
	2b.1	04GO2		DS1/3 Digital	
Private Line Automatic Ring-down (PLAR)	1.4	04LR2			02LR2 †††
	1.2	04SF2.LR			04LR2 †††
	2b.1	04LR2 04SF2.LR			Digital
	2.2	Digital			02LR2 ††† 02LR2.A ††† 02LR2.B †††
	2.1				04LR2 ††† 04LR2.A ††† 04LR2.B †††
	1.4			04LR2	02LR2 ††† 02LR2.A †††
	1.2				04LR2 ††† 04LR2.A †††
	2b.1				Digital
	2.2			DS1/3 Digital	02LR2 ††† 02LR2.A †††
	2.1				04LR2 ††† 04LR2.A †††
	1.4	04LR2		02LR2 †††	
	2.2	Digital			
	1.2	04LR2		04LR2 †††	
	2.1	Digital			
	2b.1	04LR2 04SF2.LR		DS1/3 Digital	

††† Audible tone is not guaranteed.

Table 12-1 VG 7 - LH-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Single Frequency	2.1	Digital to 04SF2.EA # or 04SF2.GO # or 04SF2.GS # or 04SF2.LO # or 04SF2.LS # or			
Reverse-Battery	1.4 +	04SF2.EA 06EA2.E + 06EA2.M +			02RV2.T
	2.2	Digital			
	2b.1	04SF2.EA 06EA2.E + 06EA2.M +			Digital
	2a	Digital			
	1.4			06EA2.E + 06EA2.M +	02RV2.T
	2.2			DS1/3 Digital	
E & M Signaling	1.4	04SF2.EA 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.2	Digital			06EB2.M +
	1.4	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	2.2	Digital			
	1.2	04SF2.EA 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E +
	2.1	Digital			08EB2.M +

* DJ may be substituted for DS at an Access Customer Network Interface.
\# Access Customer-to-Access Customer connection when associated protocol is high capacity (Digital).
\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

Table 12-1 VG 7 - LH-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-- No Options

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
E & M Signaling Continued	1.2	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		
	2.1	Digital			
	2b.1	04SF2.EA 06EA2.E + 06EA2.M +			Digital
	2A	Digital 04DS9.EA * 04DS6.EA			Digital 04DU9.EA 04DS6.EA

* DJ may be substituted for DS at an Access Customer Network Interface.
\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.2 Voice Grade 7 - LH-A, LHCA, LHDA, LHEA, LHFA, LHGA, LHJA, LHMA, LHNA, LHQA

Table 12-2 VG 7 - LH-A, LHCA, LHDA, LHEA, LHFA, LHGA, LHJA, LHMA, LHNA, LHQA

NC/NCI Combinations

NC = LH-A Effective 4-wire

NC = LHCA C Conditioning & Effective 4-wire

NC = LHDA Data Capability & Effective 4-wire

NC = LHEA C Conditioning & Data Capability & Effective 4-wire

NC = LHFA Improved Envelope Delay Distortion & Effective 4-wire

NC = LHGA Improved Attenuation Distortion & Effective 4-wire

NC = LHJA Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHMA Improved Attenuation Distortion & Data Capability & Effective 4-wire

NC = LHNA Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHQA Improved Envelope Delay Distortion & Data Capability & Effective 4-wire

	Configuration	QWEST Central Office			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.3	04NO2			02NO2
	2.3	Digital			
	1.3			04NO2	02NO2
	2.3			DS1/3 Digital	
	1.3	04NO2		02NO2	
	2.3	Digital			
Loop-start Signaling (End-User has open-end)	1.3	04LS2 04SF2.LS			02LA2 02LB2
	2.3	Digital			02LC2
	1.3			04LS2	02LA2 02LB2
	2.3			DS1/3 Digital	02LC2
	1.3	04LS2 04SF2.LS		02LA2 02LB2	
	2.3	Digital		02LC2	

Table 12-2 VG 7 - LH-A, LHCA, LHDA, LHEA, LHFA, LHGA, LHJA, LHMA, LHNA, LHQA (Continued)

NC / NCI Combinations

NC = LH-A Effective 4-wire

NC = LHCA C Conditioning & Effective 4-wire

NC = LHDA Data Capability & Effective 4-wire

NC = LHEA C Conditioning & Data Capability & Effective 4-wire

NC = LHFA Improved Envelope Delay Distortion & Effective 4-wire

NC = LHGA Improved Attenuation Distortion & Effective 4-wire

NC = LHJA Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHMA Improved Attenuation Distortion & Data Capability & Effective 4-wire

NC = LHNA Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHQA Improved Envelope Delay Distortion & Data Capability & Effective 4-wire

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
Loop-start Signaling (End-User has closed end)	1.3	04LO2 04SF2.LO			02LS2
	2.3	Digital			
	1.3			04LO2	02LS2
	2.3			DS1/3 Digital	
	1.3	04LO2 04SF2.LO		02LS2	
	2.3	Digital			
Ground-start Signaling (End-User has closed end)	1.3	04GO2 04SF2.GO			02GS2
	2.3	Digital			
	1.3			04GO2	02GS2
	2.3			DS1/3 Digital	
	1.3	04GO2 04SF2.GO		02GS2	
	2.3	Digital			

Table 12-2 VG 7 - LH-A, LHCA, LHDA, LHEA, LHFA, LHGA, LHJA, LHMA, LHNA, LHQA (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-A Effective 4-wire

NC = LHCA C Conditioning & Effective 4-wire

NC = LHDA Data Capability & Effective 4-wire

NC = LHEA C Conditioning & Data Capability & Effective 4-wire

NC = LHFA Improved Envelope Delay Distortion & Effective 4-wire

NC = LHGA Improved Attenuation Distortion & Effective 4-wire

NC = LHJA Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHMA Improved Attenuation Distortion & Data Capability & Effective 4-wire

NC = LHNA Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHQA Improved Envelope Delay Distortion & Data Capability & Effective 4-wire

NC = LHQA Improved Envelope Delay Distortion & Data Capability & Effective 4-wire

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
Private Line	1.3	04LR2 04SF2.LR			02LR2 †††
Automatic	2.3	Digital			
Ring-down	2.3	Digital			02LR2.A †††
(PLAR)	1.3			04QC2.A	02LR2 †††
	2.3			DS1/3 Digital	02LR2.A †††
	1.3	04LR2 04SF2.LR		02LR2 †††	
	2.3	Digital			
Reverse-	1.3	04SF2			02RV2.T
Battery	2.3	Digital			
	1.3			04QC2.RVT	02RV2.T
	2.3			DS1/3 Digital	
	1.3	04SF2		02RV2.T	
	2.3	Digital			

††† Audible tone is not guaranteed.

Table 12-2 VG 7 - LH-A, LHCA, LHDA, LHEA, LHFA, LHGA, LHJA, LHMA, LHNA, LHQA (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-A Effective 4-wire

NC = LHCA C Conditioning & Effective 4-wire

NC = LHDA Data Capability & Effective 4-wire

NC = LHEA C Conditioning & Data Capability & Effective 4-wire

NC = LHFA Improved Envelope Delay Distortion & Effective 4-wire

NC = LHGA Improved Attenuation Distortion & Effective 4-wire

NC = LHJA Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHMA Improved Attenuation Distortion & Data Capability & Effective 4-wire

NC = LHNA Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire

NC = LHQA Improved Envelope Delay Distortion & Data Capability & Effective 4-wire

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
E & M Signaling	1.3	04SF2.EA 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.3	Digital			06EB2.M +
	1.3	04SF2.EA 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	2.3	Digital			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.3 Voice Grade 7 - LH-C, LHBC

Table 12-3 VG 7 - LH-C, LHBC

N C / N C I C o m b i n a t i o n s

NC = LH-C Improved Return Loss for Effective 2-wire

NC = LHBC ELEPL-2 & Improved Return Loss for Effective 2-wire

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2
	2.2	Digital			02LC2
		04LS2 04SF2.LS	02LO3		
		Digital			
	1.4			04LS2	02LA2
	2.2			DS1/3 Digital	02LB2 02LC2
	1.4		02LO3	04LS2	
	2.2			DS1/3 Digital	
	1.4	04LS2 04SF2.LS		02LA2 02LB2	
	2.2	Digital		02LC2	

Table 12-3 VG 7 - LH-C, LHBC (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-C Improved Return Loss for Effective 2-wire

NC = LHBC ELEPL-2 & Improved Return Loss for Effective 2-wire

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	QWEST Central Office Interconnector	QWEST Central Office End-User
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	2.2	Digital			
	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			
Ground-start Signaling (End-User has closed end)	1.4	04GO2 04SF2.GO			02GS2
	2.2	Digital			
	1.4			04GO2	02GS2
	2.2			DS1/3 Digital	
	1.4	04GO2 04SF2.GO		02GS2	
	2.2	Digital			
Private Line Automatic Ring-down (PLAR)	1.4	04LR2 04SF2.LR			02LR2 †††
	2.2	Digital			
	1.4			04LR2	02LR2 †††
	2.2			DS1/3 Digital	
	1.4	04LR2 04SF2.LR		02LR2 †††	
	2.2	Digital			

††† Audible tone is not guaranteed.

12.4 Voice Grade 7 - LH-D, LHCD, LHDD, LHED, LHFD, LHGD, LHJD, LHMD, LHND, LHQD

Table 12-4 VG 7 - LH-D, LHCD, LHDD, LHED, LHFD, LHGD, LHJD, LHMD, LHND, LHQD

NC / NCI Combinations

NC = LH-D Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHCD C Conditioning & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHDD Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHED C Conditioning & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHFD Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHGD Improved Attenuation Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHJD Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHMD Improved Attenuation Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHND Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHQD Improved Envelope Delay Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.3	04NO2			02NO2
	1.3	04NO2		02NO2	
Loop-start Signaling (End-User has open-end)	1.3	04LS2 04SF2.LS			02LA2 02LB2 02LC2
	1.3	04LS2 04SF2.LS	02LO3		
	1.3	04LS2 04SF2.LS		02LA2 02LB2 02LC2	

Table 12-4 VG 7 - LH-D, LHCD, LHDD, LHED, LHFD, LHGD, LHJD, LHMD, LHND, LHQD (Continued)

NC / NCI Combinations

NC = LH-D Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHCD C Conditioning & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHDD Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHED C Conditioning & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHFD Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHGD Improved Attenuation Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHJD Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHMD Improved Attenuation Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHND Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHQD Improved Envelope Delay Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

			QWEST Central Office		
Remarks	**Configuration (Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
Loop-start Signaling (End-User has closed-end)	1.3	04LO2 04SF2.LO			02LS2
	1.3	04LO2 04SF2.LO	02LS3		
	1.3	04LO2 04SF2.LO		02LS2	
Ground-start Signaling (End-User has closed-end)	1.3	04GO2 04SF2.GO			02GS2
	1.3	04GO2 04SF2.GO	02GS3.C		
	1.3	04GO2 04SF2.GO		02GS2	

Table 12-4 VG 7 - LH-D, LHCD, LHDD, LHED, LHFD, LHGD, LHJD, LHMD, LHND, LHQD (Continued)

N C / N C I C o m b i n a t i o n s

NC =	**LH-D**	Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHCD**	C Conditioning & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHDD**	Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHED**	C Conditioning & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHFD**	Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHGD**	Improved Attenuation Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHJD**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHMD**	Improved Attenuation Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHND**	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination
NC =	**LHQD**	Improved Envelope Delay Distortion & Data Capability & Effective 4-wire & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	**Configuration (Table 5-1)**	**QWEST Central Office**			
		Access Customer	**Centrex**	**Interconnector**	**End-User**
Private Line	1.3	04LR2, 04SF2.LR			02LR2 †††
Automatic Ring-down (PLAR)	1.3	04LR2, 04SF2.LR		02LR2 †††	
Reverse-	1.3	04SF2.RVO			02RV2.T
Battery	1.3	04SF2.RVO		02RV2.T	

††† Audible tone is not guaranteed.

12.5 Voice Grade 7 - LH-L, LHCL, LHDL, LHEL, LHFL, LHGL, LHJL, LHML, LHNL, LHQL

Table 12-5 VG 7 - LH-L, LHCL, LHDL, LHEL, LHFL, LHGL, LHJL, LHML, LHNL, LHQL

NC/NCI Combinations

NC = LH-L Improved Termination at 4-wire End-User Point of Termination

NC = LHCL C Conditioning & Improved Termination at 4-wire End-User Point of Termination

NC = LHDL Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHEL C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHFL Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHGL Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHJL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHML Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHNL Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHQL Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	
Loop-start Signaling (End-User has closed end)	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	1.2			04LO2	04LS2
	2.1			DS1/3 Digital	

Table 12-5 VG 7 - LH-L, LHCL, LHDL, LHEL, LHFL, LHGL, LHJL, LHML, LHNL, LHQL (Continued)

NC/NCI Combinations

NC = LH-L Improved Termination at 4-wire End-User Point of Termination

NC = LHCL C Conditioning & Improved Termination at 4-wire End-User Point of Termination

NC = LHDL Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHEL C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHFL Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHGL Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHJL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHML Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHNL Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHQL Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Ground-start	1.2	04GO2 04SF2.GO			04GS2
Signaling	2.1	Digital			
(End-User	1.2			04GO2	04GS2
has closed end)	2.1			DS1/3 Digital	
Private Line	1.2	04LR2 04SF2			04LR2 †††
Automatic	2.1	Digital			
Ring-down	2.1	Digital			04LR2.A †††
(PLAR)	1.2			04LR2	04LR2 †††
	2.1			DS1/3 Digital	04LR2 ††† 04LR2.A †††

††† Audible tone is not guaranteed.

Table 12-5 VG 7 - LH-L, LHCL, LHDL, LHEL, LHFL, LHGL, LHJL, LHML, LHNL, LHQL (Continued)

NC/NCI Combinations

NC = LH-L Improved Termination at 4-wire End-User Point of Termination

NC = LHCL C Conditioning & Improved Termination at 4-wire End-User Point of Termination

NC = LHDL Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHEL C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHFL Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHGL Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHJL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHML Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LHNL Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LHQL Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
E & M Signaling	1.2	04SF2.EA 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E +
	2.1	Digital			08EB2.M +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.6 Voice Grade 7 - LH-M

Table 12-6 VG 7 - LH-M

N C / N C I C o m b i n a t i o n s

NC = LH-M Software connection to connect Centrex to Common Control Switching Arrangement within the same switch

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	Interconnector	End-User
Connects End-User to theoretical Central Office Centrex Tie Trunk Equipment	Software		02CT3-02CT3		
	Software		04CT3-04CT3		

12.7 Voice Grade 7 - LH-P, LHCP, LHDP, LHEP, LHFP, LHGP, LHJP, LHMP, LHNP, LHQP

Table 12-7 VG 7 - LH-P, LHCP, LHDP, LHEP, LHFP, LHGP, LHJP, LHMP, LHNP, LHQP

N C / N C I C o m b i n a t i o n s

NC = LH-P Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHCP C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHDP Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHEP C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHFP Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHGP Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHJP Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHMP Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHNP Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHQP Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
Loop-start Signaling (End-User has closed-end)	1.2	04LO2 04SF2.LO			04LS2

Table 12-7 VG 7 - LH-P, LHCP, LHDP, LHEP, LHFP, LHGP, LHJP, LHMP, LHNP, LHQP (Continued)

N C / N C I C o m b i n a t i o n s

NC = LH-P Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHCP C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHDP Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHEP C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHFP Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHGP Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHJP Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHMP Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHNP Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

NC = LHQP Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
Ground-start Signaling (End-User has closed-end)	1.2	04GO2 04SF2.GO			04GS2
Private Line Automatic Ring-down (PLAR)	1.2	04LR2 ††† 04SF2			04LR2 †††

††† Audible tone is not guaranteed.

Table 12-7 VG 7 - LH-P, LHCP, LHDP, LHEP, LHFP, LHGP, LHJP, LHMP, LHNP, LHQP (Continued)

NC/NCI Combinations

NC =	**LH-P**	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHCP**	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHDP**	Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHEP**	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHFP**	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHGP**	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHJP**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHMP**	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHNP**	Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LHQP**	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
E & M Signaling	1.2	04SF2 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.8 Voice Grade 7 - LH-Q, LHBQ

Table 12-8 VG 7 - LH-Q, LHBQ

N C / N C I C o m b i n a t i o n s

NC = LH-Q Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHBQ ELEPL-2 & Improved Return Loss for Effective 2-wire & Improved Termination at 4-wire Access Customer Point of Termination

			QWEST Central Office		
Remarks	**Configuration (Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	1.4	04NO2		02NO2	
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2 02LC2
	1.4	04LS2 04SF2.LS	02LO3		
	1.4	04LS2 04SF2.LS		02LA2 02LB2 02LC2	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	1.4	04LO2 04SF2.LO	02LS3		
	1.4	04LO2 04SF2.LO		02LS2	
Ground-start Signaling (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	1.4	04GO2 04SF2.GO		02GS2	
Private Line Automatic Ring-down (PLAR)	1.4	04LR2 ††† 04SF2.LR			02LR2 †††
	1.4	04LR2 ††† 04SF2.LR		02LR2 †††	
Reverse-Battery	1.4	04SF2			02RV2.T
	1.4	04SF2		02RV2.T	

††† Audible tone is not guaranteed.

12.9 Voice Grade 7 - LH-R

Table 12-9 VG 7 - LH-R

NC/NCI Combinations **NC = LH-R** Improved Termination at 4-wire Access Customer Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	1.2				04NO2
	2b.1				Digital
	1.4	04NO2		02NO2	
	1.2			04NO2	
	2b.1			DS1/3 Digital	
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2 02LC2
	2b.1				Digital
	1.4	04LS2 04SF2.LS	02LO3		
	1.4	04LS2		02LA2 02LB2 02LC2	
	2b.1	04SF2.LS		DS1/3 Digital	
Loop-start Signaling (End-User has closed-end)	1.4	04LO2 04SF2.LO			02LS2
	1.2				04LS2
	2b.1				Digital
	1.4	04LO2 04SF2.LO	02LS3		
	1.4	04LO2 04SF2.LO		02LS2	
	1.2			04LS2	
	2b.1			DS1/3 Digital	
Ground-start Signaling (End-User has closed-end)	1.4	04GO2 04SF2.GO			02GS2
	1.2				04GS2
	2b.1				Digital
	1.4	04GO2	02GS3.C		
	1.2	04SF2.GO	04GS2.C		
	1.4	04GO2		02GS2	
	1.2	04SF2.GO		04GS2	
	2b.1			DS1/3 Digital	

Table 12-9 VG 7 - LH-R (Continued)

N C / N C I C o m b i n a t i o n s

NC = L H - R Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Private Line Automatic Ring-down (PLAR)	1.4	04LR2 †††			02LR2 †††
	1.2	04SF2			04LR2 †††
	2b.1				Digital
	1.4	04LR2 †††		02LR2 †††	
	1.2	04SF2		04LR2 †††	
	2b.1			DS1/3 Digital	
Reverse-Battery	1.4	04SF2			02RV2.T
	2b.1	06EA2.E + 06EA2.M +			Digital
	1.4	04SF2		02RV2.T	
	2b.1			DS1/3 Digital	
E & M Signaling	1.4	04SF2 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +
	1.2				06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +
	2b.1				Digital
	1.4	04SF2	02CT3		
	1.2	06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		

††† Audible tone is not guaranteed.
+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.10 Voice Grade 7 - LHB-

Table 12-10 VG 7 - LHB-

NC / NCI Combinations **NC = LHB-** ELEPL-2					
	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.4	04NO2			02NO2
	2.2	Digital			
	1.4			04NO2	02NO2
	2.2			DS1/3 Digital	
	1.4	04NO2		02NO2	
	2.2	Digital			
Loop-start Signaling (End-User has open-end)	1.4	04LS2 04SF2.LS			02LA2 02LB2
	2.2	Digital			02LC2
	1.4	04LS2 04SF2.LS	02LO3		
	2.2	Digital			
	1.4			04LS2	02LA2
	2.2			DS1/3 Digital	02LB2 02LC2
	1.4		02LO3	04LS2	
	2.2			DS1/3 Digital	
	1.4	04LS2 04SF2.LS		02LA2 02LB2	
	2.2	Digital		02LC2	

Table 12-10 VG 7 - LHB- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LHB- ELEPL-2

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	Interconnector	End-User
Loop-start Signaling	1.4	04LO2 04SF2.LO			02LS2
(End-User	2.2	Digital			
has closed end)	1.4	04LO2 04SF2.LO	02LS3		
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4		02LS3	04LO2	
	2.2			DS1/3 Digital	
	1.4	04LO2 04SF2.LO		02LS2	
	2.2	Digital			
Ground-start	1.4	04GO2 04SF2.GO			02GS2
Signaling	2.2	Digital			
(End-User has closed	1.4	04GO2 04SF2.GO	02GS3.C		
end)	2.2	Digital			
	1.4			04GO2	02GS2
	2.2			DS1/3 Digital	
	1.4		02GS3.C	04GO2	
	2.2			DS1/3 Digital	
	1.4	04GO2 04SF2.GO		02GS2	
	2.2	Digital			

Table 12-10 VG 7 - LHB- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LHB- ELEPL-2

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Private Line	1.4	04LR2 04SF2.			02LR2 †††
Automatic Ring-down	2.2	Digital			02LR2 ††† 02LR2.A †††
(PLAR)	1.4			04QC2.A	02LR2 †††
	2.2			DS1/3 Digital	02LR2 ††† 02LR2.A †††
	1.4	04LR2 04SF2.		02LR2 †††	
	2.2	Digital			
Reverse-Battery	1.4	04SF2.RVO			02RV2.T
	2.2	Digital			
	2.2			DS1/3 Digital	02RV2.T
	1.4	04SF2.RVO		02RV2.T	
	2.2	Digital			

††† Audible tone is not guaranteed.

12.11 Voice Grade 7 - LHBR

Table 12-11 VG 7 - LHBR

NC / NCI Combinations **NC = LHBR** ELEPL-2 & Improved Termination at 4-wire Access Customer Point of Termination					
	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
No	1.4	04NO2			02NO2
Signaling	1.4	04NO2		02NO2	
Loop-start Signaling (End-User	1.4	04LS2 04SF2.LS			02LA2 02LB2 02LC2
has open-end)	1.4	04LS2 04SF2.LS	02LO3		
	1.4	04LS2 04SF2.LS		02LA2 02LB2 02LC2	
Loop-start Signaling	1.4	04LO2 04SF2.LO			02LS2
(End-User has	1.4	04LO2 04SF2.LO	02LS3		
closed-end)	1.4	04LO2 04SF2.LO		02LS2	
Ground-start	1.4	04GO2 04SF2.GO			02GS2
Signaling (End-User	1.4	04GO2 04SF2.GO	02GS3.C		
has closed-end)	1.4	04GO2 04SF2.GO		02GS2	
Private Line	1.4	04LR2, 04SF2			02LR2 †††
Automatic Ring-down (PLAR)	1.4	04LR2, 04SF2		02LR2 †††	
Reverse-	1.4	04SF2.RVO			02RV2.T
Battery	1.4	04SF2.RVO		02RV2.T	

††† Audible tone is not guaranteed.

12.12 Voice Grade 7 - LHC-, LHD-, LHE-, LHF-, LHG-, LHJ-, LHM-, LHN-, LHQ-

Table 12-12 VG 7 - LHC-, LHD-, LHE-, LHF-, LHG-, LHJ-, LHM-, LHN-, LHQ-

N C / N C I C o m b i n a t i o n s

NC = LHC- C Conditioning

NC = LHD- Data Capability

NC = LHE- C Conditioning & Data Capability

NC = LHF- Improved Envelope Delay Distortion

NC = LHG- Improved Attenuation Distortion

NC = LHJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LHM- Improved Attenuation Distortion & Data Capability

NC = LHN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion

NC = LHQ- Improved Envelope Delay Distortion & Data Capability

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			04DU9.NO 04DS6.NO
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	
	2b.1			04NO2	Digital
	1.2	04NO2		04NO2	
	2b.1			DS1/3 Digital	
	1.2	Digital		04NO2	

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

Table 12-12 VG 7 - LHC-, LHD-, LHE-, LHF-, LHG-, LHJ-, LHM-, LHN-, LHQ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LHC- C Conditioning

NC = LHD- Data Capability

NC = LHE- C Conditioning & Data Capability

NC = LHF- Improved Envelope Delay Distortion

NC = LHG- Improved Attenuation Distortion

NC = LHJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LHM- Improved Attenuation Distortion & Data Capability

NC = LHN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion

NC = LHQ- Improved Envelope Delay Distortion & Data Capability

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Loop-start Signaling (End-User has closed end)	1.2	04LO2 04SF2.LO			04LS2
	2.1	Digital			
	2b.1	04LO2 04SF2.LO			Digital 04DU9.LS
	2a	Digital 04DS9.LO * 04DS6.LO			04DS6.LS
	1.2			04LO2	04LS2
	2.1			DS1/3 Digital	
	2b.1			04LO2	Digital
	1.2	04LO2 04SF2.LO		04LS2	
	2.1	Digital			
	2b.1	04LO2 04SF2.LO		DS1/3 Digital	

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

Table 12-12 VG 7 - LHC-, LHD-, LHE-, LHF-, LHG-, LHJ-, LHM-, LHN-, LHQ- (Continued)

NC / NCI Combinations

NC = LHC- C Conditioning

NC = LHD- Data Capability

NC = LHE- C Conditioning & Data Capability

NC = LHF- Improved Envelope Delay Distortion

NC = LHG- Improved Attenuation Distortion

NC = LHJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LHM- Improved Attenuation Distortion & Data Capability

NC = LHN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion

NC = LHQ- Improved Envelope Delay Distortion & Data Capability

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: Centrex	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Ground-start Signaling (End-User has closed-end)	1.2	04GO2 04SF2.GO			04GS2
	2.1	Digital			
	1.2	04GO2 04SF2.GO	04GS2.C		
	2.1	Digital			
	2b.1	04GO2 04SF2.GO			Digital 04DU9.GS
	2a	Digital 04DS9.GO * 04DS6.GO			04DS6.GS
	1.2			04GO2	04GS2
	2.1			DS1/3 Digital	
	1.2		04GS2.C	04GO2	
	2.1			DS1/3 Digital	
	2b.1			04GO2	Digital
	1.2	04GO2 04SF2.GO		04GS2	
	2.1	Digital			
	2b.1	04GO2 04SF2.GO		DS1/3 Digital	

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

Table 12-12 VG 7 - LHC-, LHD-, LHE-, LHF-, LHG-, LHJ-, LHM-, LHN-, LHQ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LHC- C Conditioning

NC = LHD- Data Capability

NC = LHE- C Conditioning & Data Capability

NC = LHF- Improved Envelope Delay Distortion

NC = LHG- Improved Attenuation Distortion

NC = LHJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LHM- Improved Attenuation Distortion & Data Capability

NC = LHN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion

NC = LHQ- Improved Envelope Delay Distortion & Data Capability

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
Private Line	1.2	04LR2 ††† 04SF2			04LR2 †††
Automatic	2.1	Digital			
Ring-down (PLAR)		Digital			04LR2.A ††† 04LR2.B †††
	1.2			04LR2 †††	04LR2 †††
	2.1			DS1/3 Digital	04LR2.A †††
	1.2	04LR2 ††† 04SF2		04LR2 †††	
	2.1	Digital			

††† Audible tone is not guaranteed.

Table 12-12 VG 7 - LHC-, LHD-, LHE-, LHF-, LHG-, LHJ-, LHM-, LHN-, LHQ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LHC- C Conditioning

NC = LHD- Data Capability

NC = LHE- C Conditioning & Data Capability

NC = LHF- Improved Envelope Delay Distortion

NC = LHG- Improved Attenuation Distortion

NC = LHJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LHM- Improved Attenuation Distortion & Data Capability

NC = LHN- Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion

NC = LHQ- Improved Envelope Delay Distortion & Data Capability

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
E & M Signaling	1.4	04SF2 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.2	Digital			06EB2.M +
	1.4	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	2.2	Digital			
	1.2	04SF2 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E +
	2.1	Digital			08EB2.M +
	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		
	2.1	Digital			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.13 Voice Grade 7 - LHCR, LHDR, LHER, LHFR, LHGR, LHJR, LHMR, LHNR, LHQR

Table 12-13 VG 7 - LHCR, LHDR, LHER, LHFR, LHGR, LHJR, LHMR, LHNR, LHQR

NC/NCI Combinations

NC = LHCR C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHDR Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHER C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHMR Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHNR Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHQR Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
	1.2	04NO2		04NO2	
Loop-start Signaling (End-User has closed-end)	1.2	04LO2 04SF2.LO			04LS2
	1.2	04LO2 04SF2.LO		04LS2	

Table 12-13 VG 7 - LHCR, LHDR, LHER, LHFR, LHGR, LHJR, LHMR, LHNR, LHQR (Continued)

NC/NCI Combinations

NC = LHCR C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHDR Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHER C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHMR Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHNR Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHQR Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office			
		Access Customer	Centrex	Interconnector	End-User
Ground-start	1.2	04GO2 04SF2.GO			04GS2
Signaling (End-User	1.2	04GO2 04SF2.GO	04GS2.C		
has closed-end)	1.2	04GO2 04SF2.GO		04GS2	
Private Line	1.2	04LR2 ††† 04SF2			04LR2 †††
Automatic Ring-down (PLAR)	1.2	04LR2 ††† 04SF2		04LR2 †††	

††† Audible tone is not guaranteed.

Table 12-13 VG 7 - LHCR, LHDR, LHER, LHFR, LHGR, LHJR, LHMR, LHNR, LHQR (Continued)

NC/NCI Combinations

NC = LHCR C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHDR Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHER C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHMR Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHNR Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHQR Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

	Configuration	**QWEST Central Office**			
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
E & M Signaling	1.4	04SF2 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E + 06EB2.M +
	1.4	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	1.2	04SF2 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

Table 12-13 VG 7 - LHCR, LHDR, LHER, LHFR, LHGR, LHJR, LHMR, LHNR, LHQR (Continued)

NC/NCI Combinations

NC = LHCR C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHDR Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHER C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHMR Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHNR Improved Attenuation Distortion & Data Capability & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LHQR Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office			
		Access Customer	Centrex	Interconnector	End-User
E & M Signaling Continued	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.14 Voice Grade 7 - LH1-

Table 12-14 VG 7 - LH1-

NC / NC I Combinations **NC = LH1-** IntraLATA					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**End-User**	**Centrex**	**Interconnector**	**End-User**
No Signaling	1.1	02NO2			02NO2
	1.4				04NO2
	1.2	04NO2			04NO2
Loop-start Signaling	1.1	02LA2			02LS2
	1.4	02LB2 02LC2 02LO2			04LS2
	1.4	04LO2			02LS2
	1.2				04LS2
Ground-start Signaling	1.1	02GO2			02GS2
	1.4				04GS2
	1.4	04GO2			02GS2
	1.2				04GS2
	1.1	02GO2	02GS3.C		
	1.4	04GO2			
Reverse-Battery	1.1	02RV2.T			02RV2.O

Table 12-14 VG 7 - LH1- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L H 1 - IntraLATA

Remarks	Configuration (Table 5-1)	End-User	QWEST Central Office Centrex	Interconnector	End-User
E & M Signaling	1.1	04EA2.E 04EA2.M			04EA2.E + 04EA2.M +
	1.4				06EA2.E + 06EA2.M +
	1.1	04EA2.E	02CT3		
	1.4	04EA2.M	04CT2		
	1.1		02CT3-02CT3		
	1.4		02CT3-04CT2		
	1.2		04CT2-04CT2		
	1.2	06EA2.E + 06EA2.M +	04CT2		
	1.2	06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.15 Voice Grade 7 - LH2-, LH3-, LH4-

Table 12-15 VG 7 - LH2-, LH3-, LH4-

N C / N C I C o m b i n a t i o n s

NC = LH2- IntraLATA and C Conditioning

NC = LH3- IntraLATA and Data Capability

NC = LH4- IntraLATA and C Conditioning & Data Capability

Remarks	Configuration (Table 5-1)	QWEST Central Office End-User	Centrex	Interconnector	End-User
No Signaling	1.2	04NO2			04NO2
Loop-start Signaling	1.2	04LO2			04LS2
Ground-start Signaling	1.2	04GO2			04GS2
	1.2	04GO2	04GS2.C		
E & M Signaling	1.1	04EA2.E + 04EA2.M +			04EA2.E + 04EA2.M +
	1.1	04EA2.E + 04EA2.M +	02CT3		
	1.1		02CT3-02CT3		
	1.4		02CT3-04CT2		
	1.2		04CT2-04CT2		
	1.4	04EA2.E + 04EA2.M +			06EA2.E + 06EA2.M +
	1.2	06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M +
	1.4	04EA2.E + 04EA2.M +	04CT2		
	1.2	06EA2.E + 06EA2.M +			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

12.16 Voice Grade 7 - LH1A, LH2A, LH3A, LH4A

Table 12-16 VG 7 - LH1A, LH2A, LH3A, LH4A

NC/NCI Combinations

NC = LH1A IntraLATA and Effective 4-wire

NC = LH2A IntraLATA and C Conditioning & Effective 4-wire

NC = LH3A IntraLATA and Data Capability & Effective 4-wire

NC = LH4A IntraLATA and C Conditioning & Data Capability & Effective 4-wire

Remarks	Configuration (Table 5-1)	QWEST Central Office End-User	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
No Signaling	1.5	02NO2			02NO2
	1.3				04NO2
Loop-start Signaling	1.5	02LA2			02LS2
	1.3	02LB2 02LC2 02LO2			04LS2
	1.3	04LO2			02LS2
Ground-start Signaling	1.5	02GO2			02GS2
	1.3				04GS2
	1.5	02GO2	02GS3.C		
	1.3	04GO2			02GS2
	1.3	04GO2	02GS3.C		
E & M Signaling	1.3	04EA2.E 04EA2.M			06EA2.E + 06EA2.M +
	1.3	04EA2.E 04EA2.M	04CT2		

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

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13. Network Channel/Network Channel Interface Combinations - VG 8

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”. The term “USW” denotes QWEST in this chapter.

13.1 Voice Grade 8 - LJ--

Table 13-1 VG 8 - LJ--

N C / N C I C o m b i n a t i o n s

NC = L J - - No Options

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	Interconnector	End-User
Loop Start Signaling, (Closed-end at End-User end), E & M at Access Customer end	1.4	04SF2.LO			02LS2
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4	04SF2.LO		02LS2	
	2.2	Digital			
E & M Signaling	1.4	04SF2 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.2	Digital			06EB2.M +
	1.2	04SF2 06EA2.E + 06EA2.M +			06EA2.E + 06EA2.M + 08EB2.E +
	2.1	Digital			08EB2.M +
	1.4	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	2.2	Digital			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

Table 13-1 VG 8 - LJ-- (Continued)

N C / N C I C o m b i n a t i o n s

NC = L J - - No Options

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	End-User or USW Centrex
E & M Signaling Continued	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		
	2.1	Digital			
	2b.1	04SF2 06EA2.E + 06EA2.M +			Digital
	2a	Digital			Digital 04DU9.EA 04DS6.EA

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

13.2 Voice Grade 8 - LJ-R, LJCR, LJFR, LJGR, LJJR

Table 13-2 VG 8 - LJ-R, LJCR, LJFR, LJGR, LJJR

N C / N C I C o m b i n a t i o n s

NC = L J - R Improved Termination at 4-wire Access Customer Point of Termination

NC = L J C R C Conditioning & Improved Termination at 4-wire Access Customer Point of Termination

NC = L J F R Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = L J G R Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = L J J R Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	Centrex	Interconnector	End-User
Loop Start	1.4	04SF2.LO			02LS2
Signaling, (Closed-end) at End-User end, E & M at Access Customer end	1.4	04SF2.LO		02LS2	
E & M Signaling	1.4	04SF2 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E 06EB2.M
	1.2				06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +
	2b.1	04SF2 06EA2.E + 06EA2.M +			Digital
	1.4	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +	02CT3		
	1.2	08EC2 +	04CT2		

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

13.3 Voice Grade 8 - LJC-, LJF-, LJG-, LJJ-

Table 13-3 VG 8 - LJC-, LJF-, LJG-, LJJ-

N C / N C I C o m b i n a t i o n s

NC = LJC- C Conditioning

NC = LJF- Improved Envelope Delay Distortion

NC = LJG- Improved Attenuation Distortion

NC = LJJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office Centrex	QWEST Central Office Interconnector	End-User
Loop Start Signaling, (Closed-end) at End-User end, E & M at Access Customer end	1.4	04SF2.LO			02LS2
	2.2	Digital			
	1.4			04LO2	02LS2
	2.2			DS1/3 Digital	
	1.4	04SF2.LO		02LS2	
	2.2	Digital			
E & M Signaling	1.4	04SF2 06EA2.E + 06EA2.M +			04EA2.E + 04EA2.M + 06EB2.E +
	2.2	Digital			06EB2.M +
	1.2	04SF2 06EA2.E + 06EA2.M +			06EA2.E 06EA2.M 08EB2.E
	2.1	Digital			08EB2.M
	2b.1	04SF2 06EA2.E + 06EA2.M +			Digital

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

Table 13-3 VG 8 - LJC-, LJF-, LJG-, LJJ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LJC- C Conditioning

NC = LJF- Improved Envelope Delay Distortion

NC = LJG- Improved Attenuation Distortion

NC = LJJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

	Configuration		QWEST Central Office		
Remarks	**(Table 5-1)**	**Access Customer**	**Centrex**	**Interconnector**	**End-User**
E & M Signaling Continued	1.4	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	02CT3		
	2.2	Digital			
	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M + 08EC2 +	04CT2		
	2.1	Digital			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

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14. Network Channel/Network Channel Interface Combinations - VG 9

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”. The term “USW” denotes QWEST in this chapter. Voice Grade 9 is between two Access Customer (AC) Point of Terminations.

14.1 Voice Grade 9 - LK--

Table 14-1 VG 9 - LK--

N C / N C I C o m b i n a t i o n s

NC = LK-- No Options

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	Access Customer
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DS9.NO * 04DS6.NO
	1.2			04NO2	04NO2
	2.1				Digital
	2.1			DS1/3 Digital	04NO2
E & M Signaling	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +			06EA2.M + 08EB2.M + 08EC2 +
	2.1	Digital			
	2a	Digital 04DS9.EA * 04DS6.EA			Digital 04DS9.EA * 04DS6.EA
	2.1	Digital 04DS9.EA * 04DS6.EA			04SF2.EA

* DJ may be substituted for DS at an Access Customer Network Interface.
\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

14.2 Voice Grade 9 - LK-L, LKCL, LKFL, LKGL, LKJL

Table 14-2 VG 9 - LK-L, LKCL, LKFL, LKGL, LKJL

NC / NCI Combinations

NC = LK-L Improved Termination at 4-wire Point of Termination (Z End)

NC = LKCL C Conditioning & Improved Termination at 4-wire Point of Termination (Z End)

NC = LKFL Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End)

NC = LKGL Improved Attenuation Distortion & Improved Termination at 4-wire Point of Termination (Z End)

NC = LKJL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End)

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	Access Customer
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	
E & M Signaling	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +			06EA2.M + 08EB2.M + 08EC2 +
	2.1	Digital			

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

14.3 Voice Grade 9 - LK-P, LKCP, LKFP, LKGP, LKJP

Table 14-3 VG 9 - LK-P, LKCP, LKFP, LKGP, LKJP

NC / NCI Combinations

NC = LK-P Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)

NC = LKCP C Conditioning & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)

NC = LKFP Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)

NC = LKGP Improved Attenuation Distortion & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)

NC = LKJP Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (Z End) & at 4-wire Point of Termination (A End)

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	Access Customer
No Signaling	1.2	04NO2			04NO2
E & M Signaling	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +			06EA2.M + 08EB2.M + 08EC2 +

\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

14.4 Voice Grade 9 - LK-R, LKCR, LKFR, LKGR, LKJR

Table 14-4 VG 9 - LK-R, LKCR, LKFR, LKGR, LKJR

NC / NCI Combinations

NC = LK-R Improved Termination at 4-wire Point of Termination (A End)

NC = LKCR C Conditioning & Improved Termination at 4-wire Point of Termination (A End)

NC = LKFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (A End)

NC = LKGR Improved Attenuation Distortion & Improved Termination at 4-wire Point of Termination (A End)

NC = LKJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Point of Termination (A End)

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	Access Customer
No Signaling	1.2	04NO2			04NO2
E & M Signaling	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +			06EA2.M + 08EB2.M + 08EC2 +
	2.1	Digital 04DS9.EA * 04DS6.EA			04SF2.EA

* DJ may be substituted for DS at an Access Customer Network Interface.
\+ The additional wires in 6 or 8-wire interfaces are for signaling and are not shown.

14.5 Voice Grade 9 - LKC-, LKF-, LKG-, LKJ-

Table 14-5 VG 9 - LKC-, LKF-, LKG-, LKJ-

N C / N C I C o m b i n a t i o n s

NC = LKC- C Conditioning

NC = LKF- Improved Envelope Delay Distortion

NC = LKG- Improved Attenuation Distortion

NC = LKJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	Access Customer
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DS9.NO * 04DS6.NO
	1.2			04NO2	04NO2
	2.1				Digital
	2.1			DS1/3 Digital	04NO2
E & M Signaling	1.2	04SF2 06EA2.E + 06EA2.M + 08EB2.E + 08EB2.M +			06EA2.M + 08EB2.M + 08EC2 +
	2.1	Digital			

* DJ may be substituted for DS at an Access Customer Network Interface.
\+ The additional wires in these 4, 6 or 8-wire interfaces are for signaling and are not shown.

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15. Network Channel/Network Channel Interface Combinations - VG 10

See Section 5.2 for explanation of the terms “Digital” and “DS1/3 Digital”.

15.1 Voice Grade 10 - LN--, LNC-, LND-, LNE-, LNF-, LNG-, LNJ-, LNM-, LNN-, LNQ-

Table 15-1 VG 10 - LN--, LNC-, LND-, LNE-, LNF-, LNG-, LNJ-, LNM-, LNN-, LNQ-

NC / NCI Combinations

NC = LN-- No Options

NC = LNC- C Conditioning

NC = LND- Data Capability

NC = LNE- C Conditioning & Data Capability

NC = LNF- Improved Envelope Delay Distortion

NC = LNG- Improved Attenuation Distortion

NC = LNJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LNM- Improved Attenuation Distortion & Data Capability

NC = LNN- Improved Attenuation Distortion & Improved Envelope Delay Distortion Data Capability

NC = LNQ- Improved Envelope Delay Distortion & Data Capability

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	QWEST Central Office End-User
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	2b.1	04NO2			Digital
	2a	Digital 04DS9.NO * 04DS6.NO			Digital 04DU9.NO * 04DS6.NO
	1.2			04NO2	04NO2
	2b.1			DS1/3 Digital	
	2b.1			04NO2	Digital

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

Table 15-1 VG 10 - LN--, LNC-, LND-, LNE-, LNF-, LNG-, LNJ-, LNM-, LNN-, LNQ- (Continued)

NC / NCI Combinations

NC = LN-- No Options

NC = LNC- C Conditioning

NC = LND- Data Capability

NC = LNE- C Conditioning & Data Capability

NC = LNF- Improved Envelope Delay Distortion

NC = LNG- Improved Attenuation Distortion

NC = LNJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LNM- Improved Attenuation Distortion & Data Capability

NC = LNN- Improved Attenuation Distortion & Improved Envelope Delay Distortion Data Capability

NC = LNQ- Improved Envelope Delay Distortion & Data Capability

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	QWEST Central Office End-User
No Signaling Continued	1.2	04NO2		04NO2	
	2.1	Digital			
	2b.1	04NO2		DS1/3 Digital	
Suitable for Data	1.2	04DB2			04DA2
	2.1	Digital			
	1.2m		04DM2.3P 04DM2.4P 04DM2.5P 04DM2.6P 04DM2.7P		04DA2
	1.2 ++	04DB2			06DA2
	2.1 ++	Digital			
	2a	Digital			Digital
	1.2m ++		04DM2.3P 04DM2.4P 04DM2.5P 04DM2.6P 04DM2.7P		06DA2

Table 15-1 VG 10 - LN--, LNC-, LND-, LNE-, LNF-, LNG-, LNJ-, LNM-, LNN-, LNQ- (Continued)

N C / N C I C o m b i n a t i o n s

NC = LN-- No Options

NC = LNC- C Conditioning

NC = LND- Data Capability

NC = LNE- C Conditioning & Data Capability

NC = LNF- Improved Envelope Delay Distortion

NC = LNG- Improved Attenuation Distortion

NC = LNJ- Improved Attenuation Distortion & Improved Envelope Delay Distortion

NC = LNM- Improved Attenuation Distortion & Data Capability

NC = LNN- Improved Attenuation Distortion & Improved Envelope Delay Distortion Data Capability

NC = LNQ- Improved Envelope Delay Distortion & Data Capability

Remarks	Configuration (Table 5-1)	QWEST Central Office: Access Customer	QWEST Central Office: CO NI	QWEST Central Office: Interconnector	QWEST Central Office: End-User
Suitable for Data Continued	1.2m	04DB2	04DM2.3P		
	2.1m	Digital	04DM2.4P 04DM2.5P 04DM2.6P 04DM2.7P		
	1.2			04DB2	04DA2
	1.2 ++				06DA2
	2.1			DS1/3 Digital	04DA2
	2.1 ++				06DA2
	1.2	04DB2		04DA2	
	2.1	Digital			
	2b.1	04DB2		DS1/3 Digital	

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

15.2 Voice Grade 10 - LN-B, LNCB, LNDB, LNEB, LNFB, LNGB, LNJB, LNMB, LNNB, LNQB

Table 15-2 VG 10 - LN-B, LNCB, LNDB, LNEB, LNFB, LNGB, LNJB, LNMB, LNNB, LNQB

N C / N C I C o m b i n a t i o n s

NC =	**LN-B**	Central Office Bridging
NC =	**LNCB**	C Conditioning & Central Office Bridging
NC =	**LNDB**	Data Capability & Central Office Bridging
NC =	**LNEB**	C Conditioning & Data Capability & Central Office Bridging
NC =	**LNFB**	Improved Envelope Delay Distortion & Central Office Bridging
NC =	**LNGB**	Improved Attenuation Distortion & Central Office Bridging
NC =	**LNJB**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging
NC =	**LNMB**	Improved Attenuation Distortion & Data Capability & Central Office Bridging
NC =	**LNNB**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging
NC =	**LNQB**	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	8.1		04BR2.		04NO2
	8c.1				Digital 04DU9.NO 04DS6.NO
	7.1	04NO2	04BR2.		
	7c.1	Digital 04DS9.NO * 04DS6.NO			
	8.1		04BR2	04NO2	
	9.1		04BR2 %		

* DJ may be substituted for DS at an Access Customer Network Interface.
See Tables 4-4 and 4-5 for applicable Protocol Option Codes.
% Bridge to Bridge application (Mid Link).

Table 15-2 VG 10 - LN-B, LNCB, LNDB, LNEB, LNFB, LNGB, LNJB, LNMB, LNNB, LNQB (Continued)

N C / N C I C o m b i n a t i o n s

NC = LN-B Central Office Bridging

NC = LNCB C Conditioning & Central Office Bridging

NC = LNDB Data Capability & Central Office Bridging

NC = LNEB C Conditioning & Data Capability & Central Office Bridging

NC = LNFB Improved Envelope Delay Distortion & Central Office Bridging

NC = LNGB Improved Attenuation Distortion & Central Office Bridging

NC = LNJB Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging

NC = LNMB Improved Attenuation Distortion & Data Capability & Central Office Bridging

NC = LNNB Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging

NC = LNQB Improved Envelope Delay Distortion & Data Capability & Central Office Bridging

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI ##**	**Interconnector**	**End-User**
Suitable for Data	8.1		04BR2		04DA2
	8.1 ++				06DA2
	8b.1				Digital
	7.1	04DB2	04BR2		
	7c.1	Digital			
	8.1		04BR2	04DB2	
	9.1		04BR2 %		

See Tables 4-4 and 4-5 for applicable Protocol Option Codes.
% Bridge to Bridge application (Mid Link).
++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

15.3 Voice Grade 10 - LN-E, LNCE, LNDE, LNEE, LNFE, LNGE, LNJE, LNME, LNNE, LNQE

Table 15-3 VG 10 - LN-E, LNCE, LNDE, LNEE, LNFE, LNGE, LNJE, LNME, LNNE, LNQE

NC / NCI Combinations

NC = LN-E Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNCE C Conditioning & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNDE Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNEE C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNFE Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNGE Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNJE Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNME Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNNE Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNQE Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
No Signaling	7.1	04NO2	04BR2		
Suitable for Data	7.1	04DB2	04BR2		

See Tables 4-4 and 4-5 for applicable Protocol Option Codes.

15.4 Voice Grade 10 - LN-H, LNCH, LNDH, LNEH, LNFH, LNGH, LNJH, LNMH, LNNH, LNQH

Table 15-4 VG 10 - LN-H, LNCH, LNDH, LNEH, LNFH, LNGH, LNJH, LNMH, LNNH, LNQH

NC / NCI Combinations

NC =	**LN-H**	Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNCH**	C Conditioning & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNDH**	Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNEH**	C Conditioning & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNFH**	Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNGH**	Improved Attenuation Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNJH**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNMH**	Improved Attenuation Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNNH**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination
NC =	**LNQH**	Improved Envelope Delay Distortion & Data Capability & Central Office Bridging & Improved Termination at 4-wire End-User Point of Termination

	Configuration		QWEST Central Office		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI ##**	**Interconnector**	**End-User**
No Signaling	8.1		04BR2		04NO2

See Tables 4-4 and 4-5 for applicable Protocol Option Codes.

15.5 Voice Grade 10 - LN-L, LNCL, LNDL, LNEL, LNFL, LNGL, LNJL, LNML, LNNL, LNQL

Table 15-5 VG 10 - LN-L, LNCL, LNDL, LNEL, LNFL, LNGL, LNJL, LNML, LNNL, LNQL

N C / N C I C o m b i n a t i o n s

NC = LN-L Improved Termination at 4-wire End-User Point of Termination

NC = LNCL C Conditioning & Improved Termination at 4-wire End-User Point of Termination

NC = LNDL Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LNEL C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LNFL Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LNGL Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LNJL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination

NC = LNML Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LNNL Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

NC = LNQL Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination

	Configuration		QWEST Central Office		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2.1	Digital			
	1.2			04NO2	04NO2
	2.1			DS1/3 Digital	

15.6 Voice Grade 10 - LN-P, LNCP, LNDP, LNEP, LNFP, LNGP, LNJP, LNMP, LNNP, LNQP

Table 15-6 VG 10 - LN-P, LNCP, LNDP, LNEP, LNFP, LNGP, LNJP, LNMP, LNNP, LNQP

N C / N C I C o m b i n a t i o n s

NC =	**LN-P**	Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNCP**	C Conditioning & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNDP**	Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNEP**	C Conditioning & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNFP**	Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNGP**	Improved Attenuation Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNJP**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNMP**	Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNNP**	Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination
NC =	**LNQP**	Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire End-User Point of Termination & at 4-wire Access Customer Point of Termination

	Configuration		QWEST Central Office		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2

15.7 Voice Grade 10 - LN-R, LNCR, LNDR, LNER, LNFR, LNGR, LNJR, LNMR, LNNR, LNQR

Table 15-7 VG 10 - LN-R, LNCR, LNDR, LNER, LNFR, LNGR, LNJR, LNMR, LNNR, LNQR

NC/NCI Combinations

NC = LN-R Improved Termination at 4-wire Access Customer Point of Termination

NC = LNCR Improved Termination at 4-wire Access Customer Point of Termination

NC = LNDR Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNER C Conditioning & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNFR Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNGR Improved Attenuation Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNJR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNMR Improved Attenuation Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNNR Improved Attenuation Distortion & Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

NC = LNQR Improved Envelope Delay Distortion & Data Capability & Improved Termination at 4-wire Access Customer Point of Termination

	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
No Signaling	1.2	04NO2			04NO2
	2b.1				Digital
	1.2	04NO2		04NO2	
Suitable for Data	1.2	04DB2			04DA2
	1.2 ++				06DA2
	2b.1				Digital
	1.2m	04DB2	04DM2.3P 04DM2.4P 04DM2.5P 04DM2.6P 04DM2.7P		

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

15.8 Voice Grade 10 - LN1-

Table 15-8 VG 10 - LN1-

N C / N C I C o m b i n a t i o n s **NC = L N 1 -** IntraLATA					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**End-User**	**CO NI**		**End-User**
No Signaling	1.1	02NO2			02NO2
	1.4				04NO2
	1.2	04NO2			04NO2
Suitable for Data	1.1	02DA2			02DA2
	1.4				04DA2
	1.4 ++				06DA2
	1.2	04DA2			04DA2
	1.2 ++				06DA2
	1.2 ++	06DA2			06DA2
	1.1m		02DM2.2P		02DA2
	1.2m		04DM2.3P		04DA2
	1.2m ++		04DM2.4P 04DM2.5P 04DM2.6P 04DM2.7P		06DA2

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

15.9 Voice Grade 10 - LN2-, LN3-, LN4-

Table 15-9 VG 10 - LN2-, LN3-, LN4-

N C / N C I C o m b i n a t i o n s

NC = LN2- IntraLATA and C Conditioning

NC = LN3- IntraLATA and Data Capability

NC = LN4- IntraLATA and C Conditioning & Data Capability

Remarks	Configuration (Table 5-1)	QWEST Central Office End-User	QWEST Central Office CO NI	QWEST Central Office Interconnector	QWEST Central Office End-User
No Signaling	1.2	04NO2			04NO2
Suitable for Data	1.2	04DA2			04DA2
	1.2 ++				06DA2
	1.2 ++	06DA2			06DA2
	1.2m		04DM2.3P		04DA2
	1.2m ++		04DM2.4P 04DM2.5P 04DM2.6P 04DM2.7P		06DA2

++ The additional wires in a 06DA2 interface are used for Line Status and are not shown.

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Tables

16. Network Channel/Network Channel Interface Combinations - VG 12

See Section 5.2 for explanation of the term “Digital”.

16.1 Voice Grade 12 - LR--

Table 16-1 VG 12 - LR--

N C / N C I C o m b i n a t i o n s

NC = L R - - No Options

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI	QWEST Central Office Interconnector	QWEST Central Office End-User
	1.1	02DB2			02PR2 †
	2.2	Digital			
	1.2	04DB2			04PR2
	2.1	Digital			
	1.1	02DB2		02DB2	
	2.2	Digital			
	1.2	04DB2		04DB2	
	2.1	Digital			

† For one-way transmission.

16.2 Voice Grade 12 - LR-B

Table 16-2 VG 12 - LR-B

N C / N C I C o m b i n a t i o n s

NC = L R - B Central Office Bridging

Remarks	Configuration (Table 5-1)	Access Customer	QWEST Central Office CO NI ##	Interconnector	End-User
	8.2		02BR2 †		02PR2 †
	8.1		04BR2		04PR2
	7.2	02DB2 †	02BR2 †		
	7c.2	Digital			
	7.1	04DB2	04BR2		
	7c.1	Digital			
	9.2		02BR2%†		
	9.1		04BR2 %		

See Table 4-4 for applicable Protocol Option Codes.
% Bridge-to-Bridge application (Mid Link).
† For one-way transmission.

16.3 Voice Grade 12 - LR-E

Table 16-3 VG 12 - LR-E

N C / N C I C o m b i n a t i o n s

NC = L R - E Central Office Bridging & Improved Termination at 4-wire Access Customer Point of Termination

Remarks	Configuration (Table -)	Access Customer	QWEST Central Office CO N ##I	Interconnector	End-User
	7.1	04DB2	04BR2.		

See Table 4-4 for applicable Protocol Option Codes.

16.4 Voice Grade 12 - LR-R

Table 16-4 VG 12 - LR-R

N C / N C I C o m b i n a t i o n s					
NC = L R - R Improved Termination at 4-wire Access Customer Point of Termination					
	Configuration		**QWEST Central Office**		
Remarks	**(Table 5-1)**	**Access Customer**	**CO NI**	**Interconnector**	**End-User**
	1.2	04DB2			04PR2

16.5 Voice Grade 12 - LR1-

Table 16-5 VG 12 - LR1-

N C / N C I C o m b i n a t i o n s					
NC = L R 1 - IntraLATA and Private Line Service					
	Configuration		**QWEST Central Office**		
Remarks	**(Table -)**	**End-User**	**CO NI**	**Interconnector**	**End-User**
	1.1	02PR2 †			02PR2 †
	1.2	04PR2			04PR2

† For one-way transmission.

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17. Technical Information

17.1 General Technical Specifications

The majority of the technical specifications for Voice Grade Access Services can be found in TR-NPL-000335. This document describes Network Interfaces and service parameters for each service. However, there are a few exceptions. This chapter includes the exceptions to the information found in TR-NPL-000335.

17.2 Exceptions for Voice Grades One Through Ten and Twelve

The technical specifications for dropouts, phase hits, and gain hits are not in TR-NPL-000335. ANSI T1.512-1994, *Network Performance - Point-to-Point Voice-Grade Special Access Network Voiceband Data Transmission Objectives,* discusses the parameters by pointing out that precise measurements of these parameters are difficult to make and must be done with care because many standard measurement devices are inconsistent in their readings.

These specifications primarily affect voice grade data services and are seldom considered by voice users. QWEST will work with customers to solve transmission transient problems that degrade the performance of their service.

17.3 Sealing Current

Direct current sealing current is transmitted over a pair of wires to maintain a low resistance at splices and cross-connect points by breaking down small accumulations of dirt and oxides to reduce noise and other trouble conditions.

Sealing current will be provided at the option of QWEST to maintain the service at the standards delineated in the appropriate Technical Reference. Sealing current is not an option that can be ordered by a customer.

17.4 Data Channel Terminating Equipment

Data Channel Terminating Equipment (DCTE) is available for use on four-wire Voice Grade facilities.

The material in this section is based on the FCC #5 tariff. Other jurisdictions may be somewhat different. Consult the appropriate tariff or catalog for further information.

A customer powered DCTE unit is provided whenever the customer specifies the “DA” Network Channel Interface (NCI) code. The DCTE is optional to the Voice Grade Six (VG6) or VG7 customer ordering the “NO” Network Interface. The DCTE loopback capability operates at 2713 Hz. This loopback is used by QWEST to test the service.

Two options for the DCTE are available.

17.4.1 Central Office Powered Unit

The Central Office Powered DCTE provides for line powering of the DCTE. This option ensures service continuity during commercial AC power outages. The appropriate NCI code is 04DA2.L. The “L” NCI option code is not shown in the NC/NCI combination tables.

The Central Office or line powered DCTE option is also available as an option for the 04NO2 NCI code as discussed in Section 17.4.

17.4.2 Customer Selectable Addressing and Testing

This option provides a customer powered DCTE with customer selectable addressing and testing using a four digit Dual Tone Multi-Frequency (DTMF) code. The first three digits of this code select a unique station (up to 1000 different combinations) and the fourth digit selects one of three testing modes. The modes are: loop-back, tone source or quiet termination. The customer may use the addressing and testing modes to sectionalize and terminate a station in trouble.

This option is identified by the 04DA2.D NCI code listed in Table 4-3. The "D" NCI option code does not appear in the NC/NCI Combination chapters.

17.5 Customer Requested Loopback

Customers may order Voice Grades 6 or 7 using the 04NO2 interface with a loop-back capability that operates at frequencies other than the standard 2713 Hz. This is helpful if the customer requires the use of the 2713 Hz frequency for their data application. The loop-back is available for the operating frequencies of 1713, 1913, 2413 or 2713 Hz. The NCI option codes are listed in Table 4-3, but are not specifically included in the tables in Chapter 11 and 12. This option is also available in conjunction with the Central Office powering option discussed in Section 17.4.1.

17.6 Interface at Central Office Data Modem (DM)

Voice Grade data circuits may terminate on a modem in a QWEST Central Office or Wire Center. This termination is represented by the Network Channel Interface Protocol Code "DM" listed in Table 4-3. Figure 18-1 illustrates the arrangement. Further information about the modems may be found in PUB 77359, *QWEST DIGIPAC® Service Interface Specifications for Public Packet Switching Network,* and in respective publications listed in PUB 77359.

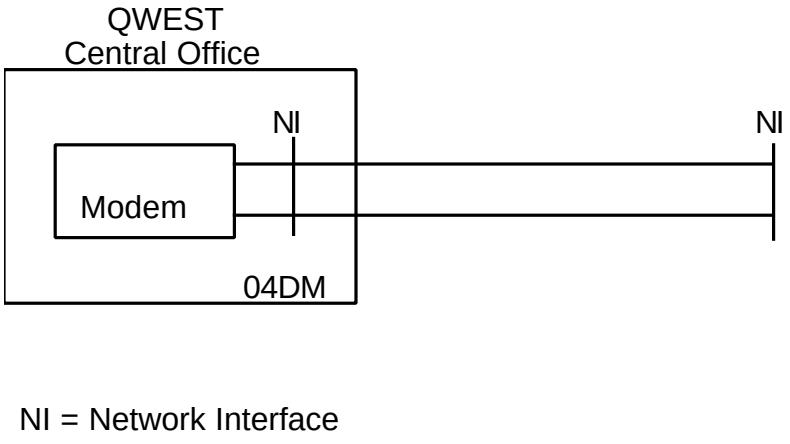

Figure 17-1 Data Stream in Voice Frequency Band at Central Office Location

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18. Definitions

18.1 Acronyms

AMI	Alternate Mark Inversion
ASR	Access Service Request
Bellcore	Bell Communications Research, Inc.
CCITT	Consultative Committee on International Telephone and Telegraph
CENTREX	Centralized Exchange for Business Customer Services
CLEC	Certified Local Exchange Carrier
CFA	Connecting Facility Assignment
CLCI™-S/S	Common Language® Circuit Identification - Special Services
CLLI™	Common Language® Location Identification
CO	Central Office
CPE	Customer Provided Equipment
dB	decibel
DCTE	Data Channel Terminating Equipment
DS0	Digital Signal Level 0 (64 kbit/s) (1 voice channel)
DS1	Digital Signal Level 1 (1.544 Mbit/s)
ELEPL	Equal Level Echo Path Loss
EU	End-User
EU-POT	End-User-Point of Termination
FCC	Federal Communications Commission
HERTZ	Cycles per Second
Hz	1 Hertz (formerly 1 cycle per second)
IC	Interexchange Carrier (or IEC)
IPLS	IntraLATA Private Line Service
kbit/s	kilobits per second (1,000 bit/s)
kHz	Kilohertz (1,000 Cycles Per Second)
LATA	Local Access and Transport Area
LEC	Local Exchange Carrier
LS	Loop-start
Mbit/s	Megabit per Second

Modem	Modulator/DEModulator
MUX	Multiplexer
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
PLAR	Private Line Automatic Ring-down
POT	Point Of Termination
PPSN	Public Packet Switched Network
RMS	Root-Mean-Square
S/N	Signal to Noise
SF	1) Single Frequency (Signaling) 2) Superframe Format
TLP	Transmission Level Point
VF	Voice Frequency
VG	Voice Grade

18.2 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.

Alternate Mark Inversion (AMI)

A one (mark) pulse which is the opposite polarity as its predecessor.

American National Standards Institute (ANSI)

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

Amplitude Response Versus Frequency

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

Attenuation Distortion

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

Balance (Longitudinal Balance)

See Longitudinal Balance

Bandwidth

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

Bit (Binary Digit)

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

Bridging (MULTIPOINT-SERVICE)

Denotes the process of connecting three or more customer locations.

Carrier

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

Central Office (CO)

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

Channel

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

Closed-end

The end of a switched service which transmits address signals.

Conditioning

Denotes an enhancement to the transmission performance of a voice band channel. Parameter(s) affected are attenuation distortion, envelope delay distortion and noise.

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.

Customer Specified Premises Levels

The customer may specify both transmit and/or receive levels within ranges as delineated in various technical publications.

Customers

Denotes any individual, partnership or corporation who subscribes to the services provided by QWEST customers are divided into two distinct and separate categories: (1) carriers, who provide interexchange services for hire for others, and (2) End-Users, who request services only for their own use.

Data Enhancement (End-Link, Mid-Link Applications)

This option provides improved attenuation distortion requirements and establishes limits for envelope delay distortion, phase jitter, and intermodulation distortion.

DATAPHONE® Select-A-Station

Denotes a switched voice band private line data system designed to allow a single master station to communicate with a number of remote stations one at a time. The system enables point-to point voice band connection between the master station at the customer premises and each remote station. Direct transmission between remote stations is not possible, nor is simultaneous communication from the master station to more than one station. This service has been “grandfathered”.

dBm

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

Decibel (dB)

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

Demultiplexing

The opposite of multiplexing. That is, the multiplexer combines signals and the demultiplexer takes them apart again. Also see Multiplexing.

E & M Signaling Arrangements

Denotes a method of transmitting supervisory information between a switching machine or an End-User and signaling system.

Echo Control

The control of reflected signals in a telephone channel.

Echo Path Loss (EPL)

The echo path loss, in decibels, is the difference between the incident and reflected signal powers.

Echo Return Loss

The weighted average of the return losses of all frequencies between 560 and 1965 Hz.

Effective 2-Wire

A channel consisting of a single electrical path capable of voice grade transmission in both directions, but not simultaneously, and which is 2-Wire at the points of termination.

Effective 4-Wire

An effective 4-Wire channel is comprised entirely of 4-Wire facilities. The channel may be terminated as 2-Wire or 4-Wire at the End-User. The termination of the Interexchange Carrier Point of Termination (IC-POT) must be 4 Wire. When terminated as 2-Wire it is not possible to ensure independent information transmission simultaneously in both directions.

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 QWEST's responsibility for the provision of service ends.

Envelope Delay Distortion

A measure of the linearity of the phase-verses-frequency characteristic of a channel.

Equal Level Echo Path Loss (ELEPL)

The measure of echo path loss at a 4-Wire interface which is corrected by the difference between the transmit and receive Transmission Level Points (TLPs).

ELEPL = EPL - TLPtransmit + TLPreceive

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.

Facilities

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

Foreign Exchange

Telephone company line arrangement where calls placed into the switched network, from a customer location, enter the network through a Central Office located in a Wire Center which is different than the one which normally services the customer location.

Full Duplex

Simultaneous transmission in both directions between two points.

Grandfathered

Denotes certain services offered to existing customers only.

Group

A bandwidth allocation in frequency-division multiplexed systems that provides for twelve (12) voice bandwidth channels.

Half-Duplex

Transmission in either direction between two points, but not simultaneously.

Hub

A QWEST designated serving wire center at which bridging and multiplexing functions are performed.

Hybrid Circuit

A circuit having four sets of terminals arranged in two pairs designed so that there is high loss between the two sets of terminals of a pair when the terminals of the other pair are suitably terminated. Hybrids are commonly used to couple 4-wire circuits to 2-wire circuits.

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.

Impedance Balance

A measure of the degree of equality of the two impedances that are connected to the two conjugate ports of a hybrid set (or equivalent circuit).

Improved Echo Control at the 2-Wire POT Option

The Improved Echo Control 2-Wire option provides an upgraded return loss limit at the 2-Wire Point Of Termination (POT). This option is applicable for effective 2-Wire configurations.

Improved Echo Control at the 4-Wire POT Option

The improved echo control 4-Wire option provides an upgraded Equal Level Echo Path Loss (ELEPL) limit at the 4-Wire Point Of Termination (POT). This option is applicable for effective 4-Wire configurations.

Improved Termination Option

Provides the ordered impedance (nominally 600 ohms at 1 kHz), a wide range of transmission level points (-16 to +7.0) and simplex reversal (when applicable) at the Point Of Termination (POT).

Impulse Noise

Any momentary occurrence of the noise on a channel significantly exceeding the normal noise peaks. It is evaluated by counting the number of occurrences that exceed a threshold.

Inserted Connection Loss

This term denotes the 1004 Hz power difference (in dB) between the maximum power available at the originating end, and the actual power reaching the terminating end through the inserted connection.

Insertion Loss

Insertion loss is the ratio (expressed in dB) of the power delivered to a specified load at the receiving interface by a specified source at the transmitting interface to the power delivered by the same source directly to an identical load.

Interexchange Carrier (IC)/(IEC) 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.

Interface Code

See Network Channel Interface

Intermodulation Distortion

A measure of the nonlinearity of a channel.

Key Activated Transfer Arrangement

An arrangement that allows the customer to transfer a leg of a Private Line Transport Service to either spare or working channel that terminates in either the same or a different customer premises. A key activated control service is required to operate the transfer arrangement.

Kilobit/Second (kbit/s)

One thousand (1000) bits/second

Line-Type Connection

Denotes a connection between a station at a customers premise and a Central Office (CO). These are connected on the dial tone side of the CO.

Local Area Network (LAN)

Network permitting the interconnection and intercommunication of a group of computers, primarily for the sharing or resources such as data storage devices and printers.

Local Access and Transport Area (LATA)

A geographic area for the provision and administration of communications service. It encompasses designated exchanges that are grouped to serve common social, economic and other purposes.

Local Exchange Carrier (LEC)

The regulated entity providing Access and Intra-LATA services.

Longitudinal Balance (Longitudinal-to-Metallic)

The Longitudinal balance of any circuit is an expression, in dB, of the ratio of the longitudinal voltage(E1) to the metallic voltage (Em): Balance (dB) =20 log (E1/Em) where E1 is the voltage measured "tip and ring to ground", and Em is the voltage measured across the tip and ring.

Loop

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

Loop Signaling

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

Loopback

An out-of-service test procedure applied to a full duplex channel that causes a received signal to be returned to the source.

Master Station

Denotes the equipment located on the customer's premises which controls communications between the master station and remote stations.

Megabit per Second (Mbit/s)

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

Modulator/DEModulator (Modem)

A contraction formed from the words modulator and demodulator to describe electronic equipment having both of these capabilities. A modem is a Data Communications Equipment (DCE) device to convert business machine interface, e.g. RS232, to voice band signals suitable for transmission over a telecommunications channel.

Multiplex

See multiplexer

Multiplexer (Mux)

An equipment unit 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

The interconnected telecommunications equipment and facilities.

Network Channel (NC) Code

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

Network Channel Interface (NCI) Code

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

Network Interface (NI)

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

Ohm

The unit of electric resistance.

Open-end

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

Packet

A unit of data, consisting of binary digits including data and call-control signals, that is switched and transmitted as a composite whole.

Packet Switched Network

A switched network which provides connection for forwarding standard data packets between user parties.

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).

Point-To-Point

A circuit connecting two (and only two) points.

Premises

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

Private Line Automatic Ringdown (PLAR)

Denotes a two-point or multipoint channel with QWEST provided signaling at a serving wire center. Either end of the channel can originate a seizure which will cause a 20 Hz ringing signal to be applied to the remote end until answered. The customer must identify primary and remote stations.

Protocol

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

Protocol Code

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

Return Loss

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

Reverse-battery

The switch, during setup and ringing, places -48v on ring, ground on tip. When the called party goes off-hook, the condition is reversed (i.e., -48v on tip, ground on ring).

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).]

Serving Wire Center

The term "Serving Wire Center" denotes a QWEST Central Office from which dial tone for the local Exchange Service would normally be provided to the demarcation point on the property at which the customer is served.

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).

Signaling

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

Simplex Reversal Option

The Simplex Reversal Option physically turns over the simplexed DC path presented at the 4-Wire Point Of Termination (POT).

Singing Return Loss

The frequency-weighted measure of return loss at the edges of the voice band (260 to 500 Hz and 2200 to 3400 Hz), where singing (instability) problems are most likely to occur. (See IEEE Std. 743-1984, Table 10, for Singing Return Loss low and Table 11 for Singing Return Loss high).

Single Frequency Signaling (SF)

The use of a voice frequency tone (between 300 and 3300 Hz), keyed on and off, to transport dial pulse signaling, on-hook and off-hook supervision, or a combination of signaling and supervision over a carrier channel or 4-wire metallic facility.

Superframe Format (SF)

A superframe consists of 12 consecutive DS1 frames. Bit one of each frame (the F-bit) is used to describe a 12-bit framing pattern during the 12 frames.

Supervision

The function of initiating a call request, holding a connection, or releasing a connection.

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.

Transfer Arrangements

An arrangement that affords the customer an additional measure of flexibility in the use of their Private Line Transport channel(s). The arrangement can be utilized to transfer a leg of a Private Line Transport Service to another channel that terminates in either the same or a different customer designated premises. A key activated control channel will be used to operate the transfer arrangement and will be rated as a Low Speed Data Channel Service. The Key will be located at the customer's premises and will be provided by the customer.

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 (0TLP) is an arbitrarily established point in a communication circuit to which all relative levels at other points in the circuit are referred.

Transmission Path

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

Trunk

A communications path connecting two switching systems in a network, used in the establishment of an end-to-end connection.

Trunk-Side Connection

Denotes the connection of a transmission path to the non-dial tone side of a local exchange switching system.

Two-Wire to Four-Wire Conversion

Denotes an arrangement, which converts a 4-Wire transmission path to a 2-Wire transmission path to allow a 4-Wire facility to connect to a 2-Wire entity.

Voice Grade (VG)

A term used to describe a channel, circuit, facility or service that is suitable for the transmission of speech, digital or analog data or facsimile, generally with a frequency range of about 300 to 3000 Hz.

Voice Band

Relating to the frequency spectrum from 300 to 3000 Hz.

Wire Center

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

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Chapter and Section **Page**

19. References

19.1 QWEST Technical Publications

PUB 77200 *QWEST DS1 Service and QWEST DS1 Rate Synchronization Service.* Issue F, September 2001.

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

PUB 77311 *Analog Channels for Non-Access Service.* Issue D, July 2001.

PUB 77321 *Special High Voltage Protection.* Issue A, June 1988.

PUB 77324 *QWEST DS3 Service.* Issue D, September 2001.

PUB 77359 *QWEST DIGIPAC® Service Interface Specifications for Public Packet Switching Network module 1.* Issue I, October 2001.

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PUB 77371 *COMMAND A LINK℠ Technical Description And Interface Combinations.* Issue D, September 2001.

PUB 77375 *1.544 Mbit/s Channel Interfaces.* Issue E, September 2001.

PUB 77386 *Expanded Interconnection And Collocation For Transport And Switched Unbundled Network Elements and Finished Services.* Issue F, July 2001.

19.2 Telcordia Documents

GR-334-CORE *Switched Access Service: Transmission Parameter Limits and Interface Combinations.* Issue 1, June 1994.

TR-NWT-000335 *Voice Grade Special Access Service - Transmission Parameter Limits and Interface Combinations.* Issue 3, May 1993.

TR-NPL-000339 *Wideband Analog Special Access Service. Transmission Parameter Limits and Interface Combinations* Issue 1, October 1987.

TR-TSV-002275 *BOC Notes on the Network - 1994.* Issue 2, April 1994

19.3 FCC Documents

Part 68 FCC Rules and Regulations

19.4 American National Standards Institute Documents

ANSI T1.223-1997 *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*

ANSI T1.512-1994 *Network Performance - Point-to-Point Voice-Grade Special Access Network Voiceband Data Transmission Objectives.*

19.5 Ordering Information

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

Those who are not QWEST employees may order;

American National Standards Institute (ANSI) documents from:

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