CHANGE NOTICE
314-410-105

AT&T letter EL2978/PL2774 indicates that the title previously assigned as "HIGH PERFORMANCE DATA OPTION (HPDO)" has been changed to "HIGH PERFORMANCE DATA CONDITIONING (HPDC)".

To accommodate this change and to meet publication schedules, the title of the section shown in this handbook has been changed to "HIGH PERFORMANCE DATA CONDITIONING". References to **HPDO** in the text have been modified to read **HPDC.**

VOICE BANDWIDTH PRIVATE LINE DATA CIRCUITS TYPE D1 - HIGH PERFORMANCE DATA CONDITIONING (HPDC) DESCRIPTION AND TEST REQUIREMENTS

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1. GENERAL

1.01 This section provides information on maintenance considerations and testing policy to be used when providing service on voice bandwidth private line data circuits ordered with the ***Hi***gh ***P***erformance ***D***ata **Conditioning**. These circuits may be identified by the Universal Service Order Code (USOC) QHA.

1.02 A HPDC channel may be necessary when more stringent control over nonlinear distortion and C-notched noise is required in order to support high speed data transmission.

1.03 The HPDC design is furnished only on 2-point (not multipoint) 3002-type channels. It may be provided on 3002 alternate voice data arrangements; however, voice performance may be degraded due to the possible removal of the N or ON carrier compandored channel units. It should not be provided on transfer arrangements such as alternate night use of a PBX tie trunk, because the degraded performance due to noise is not acceptable for this type operation.

1.04 The HPDC design may be furnished on basic 3002-type or C1, C2, C4, or C5 conditioned channels. The available combinations are shown in Table A.

1.05 The policies, methods, and requirements specified in Sections 314-410-100, -101, -102, -103, -104, -300, and -500 apply to all HPDC private line data circuits unless stated otherwise in this section.

TABLE A

CIRCUIT DESIGN AND CONDITIONING COMBINATIONS

CIRCUIT DESIGN	CONDITIONING				
	BASIC	C1	C2	C4	C5
2-Point Standard	A	A	A	A	A
2-Point HPDC	A	A	A	A	A
Multipoint Standard	A	A	A	R	NA
Multipoint HPDC	NA	NA	NA	NA	NA

A—Available

R—Restricted to 3- or 4-point operation. Refer to Section 314-410-100.

NA—Not Available

2. MEASUREMENT TESTS

2.01 The required transmission tests given in Table C of Section 314-410-300 specify the circuit order, routine, and trouble tests that are required on private line data circuits. When using that table, all HPDC circuits should be considered as terminating in type 3 data sets. The C-notched noise and nonlinear distortion requirements for HPDC circuits are tariff requirements and must be met.

2.02 End-to-end measurements of HPDC circuits are preferred in all cases and should be performed if service conditions permit. If all carrier channels assigned to the circuit are located between the serving test centers (STCs) at each end of the circuit, measurement tests of C-notched noise, nonlinear distortion, and phase jitter may be made between the STCs instead of at the customer station. The end-to-end requirements for these parameters should be met at the STC.

2.03 C-notched noise measurements may be made with a C-message noise test set when compandored facilities are not used. (N or ON carrier channels equipped with special service channel

units or VF amplifiers are considered as noncompandored channels.) In this case make a C-message noise measurement with and without a 1004-Hz holding tone applied at data level. The test tone to C-notched noise ratio is determined as follows:

C-notched noise = C-message noise measured with holding tone minus the C-message noise measured without the holding tone.

Example: C-message noise with holding tone = 75 dBrnc

C-message noise without the holding tone = 29 dB

Note: This method will give misleading results when used on T carrier channels or N or ON carrier channels equipped with compandored channel units.

2.04 The measurement tests of attenuation distortion, envelope delay distortion, C-message noise, and impulse noise must be made at the customer station. Sectional measurements of these parameters are permitted on basic (nonconditioned) HPDC channels only. Sectional measurements of these parameters made entirely with the Collins CLA-101A system are permitted on C-conditioned HPDC channels also. End-to-end measurements are required in all cases where the customer is not satisfied and the need for technical escalation is indicated.

2.05 For the purpose of estimating end-to-end performance from sectional measurements, a 2-point circuit should be divided into only two sections. One section should normally be from the control STC to its station and the other section should be from the same STC to the distant station. Care should be exercised to ensure that no office equipment or wiring is omitted or measured twice in this sectionalization. End-to-end performance is estimated from sectional measurements as given in Section 314-410-102.

Note: If sectional measurements are permitted and are made partly with the Collins CLA-101A and partly with other test equipment, the static measurements should be made using the CLA-101A frequencies where possible.

3. TEST REQUIREMENTS

3.01 All of the transmission requirements specified in Section 314-410-500 apply to the HPDC designed channel, with the exception of the C-message noise, C-notched noise or nonlinear distortion (harmonic distortion) requirements. The requirements for these parameters are as follows:

C-Notched Noise

Ratio of the received 1004-Hz test tone power to the C-notched noise power: 28 dB

Nonlinear Distortion (Four Tone Method)

Ratio of fundamental to second order products: 35 dB

Ratio of fundamental to third order product: 40 dB

Note: If this test capability for measuring nonlinear distortion is not available, the following limits for harmonic distortion may be substituted.

Harmonic Distortion

Ratio of fundamental to second harmonic: 35 dB

Ratio of fundamental to third harmonic: 42 dB

C-Message Noise

Circuits using N or ON carrier with special service channel units or VF amplifiers; all mileage bands: 49 dBrnc0

Circuits ***not*** using N or ON carrier with special service channel units or VF amplifiers; all mileage bands: Use C-message noise limits given in Section 314-410-500.

3.02 A channel that fails to meet the preceding requirements cannot be designated as a HPDC channel. Refer this problem to the responsible circuit design engineer.

4. FACILITY CONSIDERATIONS

4.01 All facility selection should be made by or under the direction of the circuit design engineer. The following information is included for completeness only and is not intended to imply that such selection or design considerations should be made in the field.

4.02 Careful selection of facilities is necessary in order to meet the strict C-notched noise and nonlinear distortion requirements for HPDC circuits. LMX channels and metallic facilities are preferred. When a choice is available, select T carrier equipped with D1D, D2, or D3 channel banks.

4.03 If N2, N3, or ON carrier must be used, VF amplifiers will generally be required. Enhanced levels should be used on N2 channel as specified in Section 362-800-510. N1 carrier and T carrier equipped with D1A or D1B channel banks normally will not be used.

4.04 No more than three links of short haul carrier (such as N, ON, or T carrier) should be used. No more than two links of N or ON carrier should be used in the overall channel.

Note: A link is defined as a pair of channel banks.

4.05 The use of noncompandored N or ON channels will generally result in higher C-notched noise levels than if compandored channel units are used. However, the compandored channel units have greater nonlinear distortion than the noncompandored channel units, and this may be a greater problem than noise. In cases where the overall HPDC C-notched noise requirements cannot be met but the nonlinear distortion requirements can be easily met, it may be worthwhile to try compandored channel units as a means of improving the noise performance. The nonlinear distortion test must be repeated after making this equipment substitution to ensure that it is still within limits.

4.06 The facility C-notched noise and nonlinear distortion requirements for T carrier channels and compandored N and ON carrier channels are given in Section 314-410-500. Noncompandored N and ON channels that barely meet the noise requirements in Division 362 practices may not be satisfactory for HPDC circuits. The N and ON channels which meet a C-notched noise requirement of 31 dB or better will generally be satisfactory.

5. REFERENCES

5.01 The following sections provide additional information on facilities and equipment that may be associated with HPDC channels.

314-410-100	Voice Bandwidth Private Line Data Circuits—Description
314-410-101	Voice Bandwidth Private Line Data Circuits—Transmission Requirements of Bell System Data Sets
314-410-102	Voice Bandwidth Private Line Data Circuits—End-To-End Transmission Performance
314-410-103	Voice Bandwidth Private Line Data Circuits—Overseas Circuits
314-410-104	Voice Bandwidth Private Line Data Circuits—Circuit Conditioning Requirements Using the Collins CLA-101A System
314-410-300	Voice Bandwidth Private Line Data Circuits—Maintenance
314-410-500	Voice Bandwidth Private Line Data Circuits—Tests and Requirements
362-800-510	Type N2 Carrier Telephone System—Voice Amplifier J99272B (STD), J99272AA (MD), and J99272BA (MD)—Through Channel Connector J99272CA—Transmitting and Receiving

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