

## VOICE BANDWIDTH PRIVATE LINE DATA CIRCUITS TRANSMISSION REQUIREMENTS

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F. Maximum Peak-to-Peak Phase Jitter Requirements . . . . .	4	1.01 This section lists the transmission requirements for voice-bandwidth channels used for private line data service. This service includes telemetry, alternate voice/data, 2-point, multipoint, and certain switched arrangements.	
G. Minimum P/AR Objectives . . . . .	4	1.02 This section is reissued to update and realign information consistent with the Data General Layer (314-010-ZZZ). This section now contains <i>only transmission requirements</i> . Information previously covered in this section can be found in the Data General Layer or Section 314-410-300. Since this reissue is a general revision, no revision arrows have been used to denote significant changes.	
H. P/AR Values for Single and Multi-Facility Channels . . . . .	5	1.03 This issue affects Equipment Test Lists. The Equipment Test List for Digital and Analog Data Transmission is covered in Section 314-001-011.	
I. P/AR Values for Nonrepeated Cable . . . . .	6	1.04 Descriptive information common to the transmission of data on the Public Switched Network (PSN), private line (PL) services, and	
J. P/AR Values for Repeated Cable . . . . .	6		
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**NOTICE**

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**SECTION 314-410-500**

Switched Service Networks (SSN) is covered in the following sections:

- Data General—Analog Transmission Parameters—Description (Section 314-010-100)
- Data General—Data Testing Principles (Section 314-010-101)
- Data General—Data Services Support (Section 314-010-102)
- Data General—Interconnection/Interpositioning (Section 314-010-103)

A basic understanding of the Data General Sections is recommended prior to the use of this section.

**2. TRANSMISSION REQUIREMENTS**

**2.01** The PL data transmission requirements are given in Tables A through Q. These requirements correspond to the order of tests as required for trouble investigation.

**TABLE A**  
**1004-HZ LOSS DEVIATION (NOTE)**

CONNECTION	CIRCUIT ORDER	ROUTINE OR TROUBLE ISOLATION
End Link	±0.5 dB	±2.0 dB
Middle Link	±0.5 dB	±1.0 dB
End-to-End	±1.0 dB	±4.0 dB
Loop-Back	±0.8 dB	±2.0 dB

*Note:* Maximum deviation from EML stated on circuit layout record card.

TABLE B

C-NOTCHED NOISE REQUIREMENTS  
ON COMPANDORED FACILITIES

FACILITY LENGTH (MILES)	dBrnc0	
	N-TYPE CARRIER	T1/D-TYPE CARRIER
0-100	41	41
101-200	42	42

TABLE D

MAXIMUM ALLOWABLE IMPULSE  
COUNTS (15-MINUTE PERIOD)

COUNTER CIRCUIT	MAXIMUM COUNTS
1 Threshold	15
2 Threshold + 4 dB	9
3 Threshold + 8 dB	5

*Note:* See Table E for threshold settings.

TABLE C

C-NOTCHED NOISE REQUIREMENTS  
ON UNCOMPANDORED FACILITIES

CIRCUIT LENGTH (MILES)	NOISE MEASUREMENT (dBrnc0)
0-100	32
101-200	34
201-400	35
401-1000	38
1001-1500	39
1501-2500	41
2501-4000	43

TABLE E

**IMPULSE NOISE THRESHOLD  
SETTINGS IN dBrnc0**

LENGTH (MILES)	TYPE FACILITY				
	(1)	(2)	(3)	(4)	(5)
0 - 59	54	73	67	70	58
60 - 124	54	73	67	70	58
125 - 249	54	73	67	70	59
250 - 499	54	73	67	70	59
500 - 999	—	—	—	—	59
1000 - 1999	—	—	—	—	61
over 2000	—	—	—	—	64

- (1) Voice frequency cable facilities only
- (2) N3 carrier with VF amplifiers
- (3) N1, O, ON, N3L junction facilities or T carrier facilities
- (4) N2, N3, or N4 carrier facilities
- (5) LMX carrier facilities.

*Note 1:* These thresholds assume the use of a -13 dBm0 holding tone. Do not use other holding tone levels as the above thresholds for type 2 (compandored) facilities would be incorrect.

*Note 2:* On PBX tie trunks, a minimum threshold of 59 dBrnc0 should be used to account for impulse noise which may originate at the PBX switch.

TABLE F

**MAXIMUM PEAK-TO-PEAK PHASE JITTER REQUIREMENTS**

FACILITY LENGTH (MILES)	MAXIMUM LIMITS (DEGREES P-P)		
	BELL (20-300 Hz)	LF (4-20 Hz)	BELL PLUS LF 4-300 Hz
0 - 250	2	5	7
251 - 500	4	5	9
501 - 1000	6	5	11
1001 - 2000	8	5	13
2001 - 4000 (Overall)	10	5	15

TABLE G

**MINIMUM P/AR OBJECTIVES**

CONNECTION	MINIMUM VALUE
Mid Link	80
End Link	80
End-to-End	50

TABLE H

## P/AR VALUES FOR SINGLE AND MULTIFACILITY CHANNELS

TYPE	MAXIMUM (NOTE 1)	MAINTENANCE LIMIT (NOTE 2)	TYPICAL VALUE (NOTE 3)
O, ON, N3	94	86	90
N1	98	86	92
L or Radio	99	87	93
N2	101	93	97
T1	102	93	97
2T1	97	88	92
2N3	93	83	88
2N2	96	88	92
2N1	93	85	89
T1 + N3	95	87	91
T1 + N2	96	88	92
N1 + N3	97	87	92
ON + T1	96	87	91
ON + A	93	83	88
ON + N3	93	83	88
ON + N2	96	88	92
ON + N1	96	88	92
2 ON	91	83	87
T1 + N1	96	87	91
N2 + N3	97	87	92
N1 + N2	95	87	91
2 "A" Type	92	82	87
A + T1	95	86	90
A + N3	91	83	87
A + N2	96	86	91
A + N1	96	86	91
3A	83	74	78

Note 1: Highest allowable value

Note 2: Minimum allowable value

Note 3: Expected value.

TABLE I

## P/AR VALUES FOR NONREPEATERED CABLE

TYPE	LENGTH	MAINTENANCE LIMIT
Nonloaded	0 — 18 kft	97
H88	0 — 18 kft	94

TABLE J

## P/AR VALUES FOR REPEATERED CABLE

TYPE	LENGTH	MAINTENANCE LIMIT
Nonloaded	0 — 18 kft	90
H88	0 — 36 kft	90
H88	> 36 kft	80

TABLE K

PRIVATE LINE VOICE BANDWIDTH CIRCUIT ATTENUATION DISTORTION REQUIREMENTS (dB) (NOTE)

FREQUENCY RANGE IN HZ	2- POINT	0	1		2		3		4	
		MID LINK	MID LINK		MID LINK		MID LINK		MID LINK	
		END LINK	END LINK	MID LINK	END LINK	MID LINK	END LINK	MID LINK	END LINK	MID LINK
3002 (ALSO 2001)										
BASIC	(VB)	(VBE0)	(VBE1)	(VBM1)	(VBE2)	(VBM2)	(VBE3)	(VBM3)	(VBE4)	(VBM4)
500 - 2500	-2 to +8	-1.5 to +4	-1 to +4	-1 to +3.5	-1 to +4	-1 to +3.5	-1 to +3.5	-0.8 to +3.5	-0.8 to +3.5	-0.8 to +3
300 - 3000	-3 to +12	-1.5 to +6	-1.5 to +6	-1.5 to +6	-1.5 to +6	-1.5 to +5	-1.5 to +5	-1 to +4.5	-1.5 to +4.5	-1 to +4.5
C1	(C1)	(C1E0)	(C1E1)	(C1M1)	(C1E2)	(C1M2)	(C1E3)	(C1M3)	(C1E4)	(C1M4)
1000 - 2400	-1 to +3	-0.7 to +1.5	-0.6 to +1.5	-0.5 to +1	-0.5 to +1.5	-0.5 to +1				
300 - 2700	-2 to +6	-1.5 to +3	-1 to +3	-1 to +3	-1 to +3	-1 to +2.5	-1 to +3	-0.8 to +2	-0.8 to +3	-0.8 to +2
2700 - 3000	-3 to +12	-1.5 to +6	-1.5 to +6	-1.5 to +6	-1.5 to +6	-1.5 to +5	-1.5 to +5	-1.5 to +4.5	-1.5 to +4.5	-1 to +4.5
C2	(C2)	(C2E0)	(C2E1)	(C2M1)	(C2E2)	(C2M2)	(C2E3)	(C2M3)	(C2E4)	(C2M4)
500 - 2800	-1 to +3	-0.7 to +1.5	-0.6 to +1.5	-0.5 to +1	-0.5 to +1.5	-0.5 to +1				
300 - 3000	-2 to +6	-1.5 to +3	-1 to +3	-1 to +3	-1 to +3	-1 to +2.5	-1 to +3	-0.8 to +2	-0.8 to +3	-0.8 to +2
C4	(C4)	<p style="text-align: center;">Classification Codes - Examples</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>VB</p> <p>Basic Conditioning</p> </div> <div style="text-align: center;"> <p>E</p> <p>End Link</p> </div> <div style="text-align: center;"> <p>3</p> <p>No. of Mid Links</p> </div> <div style="text-align: center;"> <p>C2</p> <p>C2 Conditioning</p> </div> <div style="text-align: center;"> <p>M</p> <p>Mid Link</p> </div> <div style="text-align: center;"> <p>2</p> <p>No. of Mid Links</p> </div> </div>								
500 - 3000	-2 to +3									
300 - 3200	-2 to +6									
C5	(C5)									
500 - 2800	-0.5 to +1.5									
300 - 3000	-1 to +3									

( ) Figures in parentheses are classification codes which may be found on some CLR cards to indicate the conditioning requirement for each link of the circuit.

+ means loss with respect to 1004 Hz.

- means gain with respect to 1004 Hz.

Note: Requirements using the Collins CLA-101A system are given in Section 314-410-104.

TABLE L

OVERALL INTERMODULATION DISTORTION LIMITS

WITHOUT D-TYPE CONDITIONING	
PRODUCT	LIMIT
Second Order	27 dB
Third Order	32 dB
WITH D-TYPE CONDITIONING	
PRODUCT	LIMIT
Second Order	35 dB
Third Order	40 dB

TABLE M

PHASE HIT, GAIN HIT, AND DROPOUT LIMITS

TRANSIENT	MID LINK	END LINK	END-TO-END
Phase Hits	$\leq 2$ in 15 min $\geq 20^\circ$	$\leq 2$ in 15 min $\geq 20^\circ$	$\leq 8$ in 15 min $\geq 20^\circ$
Gain Hits	$\leq 2$ in 15 min $\geq 3$ dB	$\leq 2$ in 15 min $\geq 3$ dB	$\leq 8$ in 15 min $\geq 3$ dB
Dropouts	$\leq 2$ in 1 hour $\geq 12$ dB	$\leq 2$ in 1 hour $\geq 12$ dB	$\leq 2$ in 1 hour $\geq 12$ dB

Note:  $\geq$  Equal to or greater than.

$\leq$  Equal to or less than.

TABLE N

RETURN LOSS REQUIREMENTS

NUMBER OF 2-WIRE STATIONS	MINIMUM RETURN LOSS (EACH STATION)
1 - 2	10 dB
3 - 4	16 dB
5 - 8	22 dB
Over 8	28 dB

**TABLE O**  
**SINGLE FREQUENCY INTERFERENCE**  
**REQUIREMENTS**

CIRCUIT LENGTH MILES	LEVEL OF MEASURED TONE dBmC0
0 - 50	28
51 - 100	31
101 - 400	34
401 - 1000	38
1001 - 1500	40
1501 - 2500	42
2501 - 4000	44
4001 - 8000	47
8001 - 16,000	50
Satellite Channel	41

**TABLE P**  
**FREQUENCY OFFSET REQUIREMENTS**

CONNECTION	MAXIMUM ALLOWABLE SHIFT
Mid Link	$\leq 1$ Hz
End Link	$\leq 1$ Hz
End-to-End	$\leq 5$ Hz Max

*Note:*  $\leq$  Equal to or less than.

TABLE Q

PRIVATE LINE VOICE BANDWIDTH CIRCUIT ENVELOPE DELAY REQUIREMENTS (MICROSECONDS) (NOTE)

FREQUENCY RANGE IN HZ	2-POINT	0	1		2		3		4	
		MID LINK	MID LINK		MID LINK		MID LINK		MID LINK	
		END LINK	END LINK	MID LINK	END LINK	MID LINK	END LINK	MID LINK	END LINK	MID LINK
3002 (ALSO 2001)										
BASIC	(VB)	(VBE0)	(VBE1)	(VBM1)	(VBE2)	(VBM2)	(VBE3)	(VBM3)	(VBE4)	(VBM4)
800 – 2600	1750	960	685	550	550	400	400	375	375	275
C1	(C1)	(C1E0)	(C1E1)	(C1M1)	(C1E2)	(C1M2)	(C1E3)	(C1M3)	(C1E4)	(C1M4)
1000 – 2400	1000	550	400	300	300	250	250	200	200	175
800 – 2600	1750	960	685	550	550	400	400	375	375	275
C2	(C2)	(C2E0)	(C2E1)	(C2M1)	(C2E2)	(C2M2)	(C2E3)	(C2M3)	(C2E4)	(C2M4)
1000 – 2600	500	275	200	150	150	125	125	100	100	80
600 – 2600	1500	825	600	450	450	375	375	300	300	260
500 – 2800	3000	1650	1200	900	900	750	750	600	650	500
C4	(C4)	<p style="text-align: center;">Classification Codes — Examples</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>VB    E    3</p> <p>Basic Conditioning    End Link    No. of Mid Links</p> </div> <div style="text-align: center;"> <p>C2    M    2</p> <p>C2 Conditioning    Mid Link    No. of Mid Links</p> </div> </div>								
1000 – 2600	300									
800 – 2800	500									
600 – 3000	1500									
500 – 3000	3000									
C5	(C5)									
1000 – 2600	100									
600 – 2600	300									
500 – 2800	600									

( ) Figures in parentheses are classification codes which may be found on some CLR cards to indicate the conditioning requirement for each link of the circuit.

Note: Requirements using the Collins CLA-101A system are given in Section 314-410-104.