

“DATAPHONE®” DATA COMMUNICATIONS SERVICE
TEST REQUIREMENTS FOR
SUBSCRIBER, REMOTE EXCHANGE, FOREIGN EXCHANGE,
PBX, AND WIDE AREA TELECOMMUNICATIONS SERVICE LINES
DATA SYSTEMS ON THE PUBLIC SWITCHED NETWORK

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1. GENERAL

1.01 This section describes the transmission test requirements on subscriber, remote exchange (RX), foreign exchange (FX), PBX, and wide area telecommunications service (WATS) lines used to access the switched telecommunications network for data transmission. Information in this section applies equally to both DATAPHONE service and other data service with customer-provided equipment (CPE) unless otherwise specified.

1.02 This section is reissued to update the tables and references. Since this is a general revision, no revision arrows have been used to denote significant changes.

1.03 The tests described in this section are made between the jack located at customer premises and the dial tone office unless otherwise specified. Maximum use should be made of test signal sources such as milliwatt source, quiet termination, and 107-type test line or similar type test line, when available,

to avoid the need for a second craft employee at the serving office during testing.

1.04 Descriptive information common to the transmission of data on the Public Switched Network (PSN), private line (PL) services, and Switched Service Network (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. ACCESS LINE TERMINATIONS

2.01 Two types of access line terminations are defined for data use: lines terminated in voice jacks and lines terminated in data jacks. These jacks are used to connect either telephone company (TELCO) data sets or customer provided equipment (CPE). The customer may order either type of termination. At installation, both are treated the same as any other business line regardless of bit rate or modem ownership (Table A). That is, only a normal business line test is required. However, insertion loss is measured as part of the data jack installation. In

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case of problems at installation or a customer trouble report, the parameters given in Table B are measured and supported. The parameters listed in Tables A through E are given in the suggested order in which they should be measured during installation and maintenance activities.

2.02 Voice jacks are used to connect data sets with a fixed output level not exceeding -9 dBm. Data jacks are used for data sets with either -4 dBm or programmable output levels.

3. TYPES OF ACCESS LINES

Local Loop

3.01 The local loop is the facility from the customer premises to the main frame of the normal serving central office. Local loops are normally 2-wire facilities, and data transmission requirements for them are given in Table C.

FX Lines

3.02 An FX line provides service between the customer premises and a remote central office in an area other than the central office which normally would serve that customer location. Data service on FX lines is supported only up to 200 miles from the dial tone office, regardless of the length of the FX line itself. Data transmission requirements are given in Table D.

WATS Lines

3.03 The WATS lines may be direct (the serving central office is the dial tone for the WATS line) or remote (serving central office is not the dial tone for the WATS line). Direct WATS lines have the same transmission requirements as a local loop. These requirements are given in Table C. Remote WATS requirements are given in Table E.

Data Service Through a PBX

3.04 Data stations may be located on stations behind PBXs. Registration rules require that only voice jacks be used for stations of a PBX.

3.05 The PBX-CO trunks and off-premises stations are designed per Section 851-300-100, and transmission requirements are given in Section 311-100-102.

3.06 Note that when treatment is applied to one PBX trunk all trunks must meet the same criteria.

RX Lines

3.07 The RX lines are used when it becomes necessary to provide service from a distant central office because the nearest central office is not suitable for data transmission. RX lines are supported the same as remote WATS lines. Data transmission requirements for RX lines are given in Table E.

4. INSTALLATION TESTS

4.01 For local loops, normal business line tests, except for those tests required in the data jacks installation procedures and any tests associated with TELCO data sets, are required at installation. If problems are encountered which indicate a possible transmission impairment, tests in Table B should be used to isolate the cause. If the investigations show that insertion loss or slope requirements cannot be met, the matter should be referred to the circuit provision center (CPC) for action on an expedited basis.

4.02 Designed services, such as FX and WATS, require other transmission tests. These tests are shown in Table A under the column headings of FX and remote WATS.

4.03 Results of installation tests, when performed, should be recorded on the work order record detail (WORD) document or other record forms as "bench marks" for use during maintenance testing.

4.04 During trouble investigation, additional measurements may be needed to verify the transmission parameters given in Tables C, D, and E.

5. TEST REQUIREMENTS

5.01 Tables A and B list the installation and maintenance tests, respectively, that should be performed depending on the type access line. Tables C, D and E give the data transmission requirements for installation and maintenance tests.

6. REFERENCES

6.01 Bell System Practices covering the various equipment associated with data service are as follows.

SECTION	TITLE	SECTION	TITLE
311-100-102	Installation and Maintenance—Tests and Requirements—Switched Special Service Circuits	330-300-503	Completion Tests of Exchange-Area Cables—Testing
311-100-500	Switched Special Services—Circuit Order and Trunk Order Transmission Tests For Special Services Having Access to the Direct Distance Dialing Network	330-300-504	Completion Tests of Exchange-Area Cables—Analysis and Reports
314-205-300	DATAPHONE Data Communications Service—Overall Maintenance Procedures—Data Systems on the Public Switched Network	590-101-103	Jacks for Registered Data Equipment—Single and Multiline Installations
314-205-500	DATAPHONE Data Communications Service—Overall Data Transmission Test Requirements—Data Systems on the Public Switched Network	668-010-300	DATAPHONE Data Communications Service—Data Test Center, Trouble Analysis Procedure—Data Systems on the Public Switched Network
314-205-503	DATAPHONE Data Communications Service—Minimum Acceptable Performance (MAP) Criteria—Data Systems on the Public Switched Network		
314-410-500	Voice Bandwidth Private Line Data Circuits, Tests and Requirements		
330-300-500	Completion Tests of Exchange-Area Cables—Introduction		
330-300-501	Completion Tests of Exchange-Area Cables—Apparatus, Records, and Forms		
330-300-502	Completion Tests of Exchange-Area Cables—Preparation		

TABLE A
INSTALLATION TEST

PARAMETER	LOCAL LOOP LOCAL WATS (NOTE 1)	FX	REMOTE WATS AND RX
Insertion Loss	X*	X	X
Impulse Noise		X	X
C-Notched Noise		X	X
Slope (3-tone)		X	X

Note 1: Measurement of all parameters may be necessary if problems are encountered. See Part 4.

*Required for installation of data jack.

TABLE B

**RECOMMENDED ORDER OF TEST TO BE
PERFORMED DURING INSTALLATION, ROUTINE,
AND TROUBLE INVESTIGATION**

RECOMMENDED ORDER OF TESTS	ROUTINE (SWITCHED)	TROUBLE INVESTIGATION
1. Continuity	X	X
2. Loss	X	X
3. "C" Notched Noise	X	X
4. Impulse Noise		X
5. Phase Jitter		X*
6. Gain Slope (3 tone)	X	X†
7. P/AR		‡
8. Attenuation Distortion (Comp)		X
9. Intermodulation Distortion		X
10. Hits, Dropouts		X
11. Return Loss	X	X
12. Single Frequency Interference		X
13. Frequency Offset		X
14. Envelope Delay Distortion		X

* Two of three phase jitter measurements required (4 to 20, 20 to 300, or 4 to 300 Hz).

† Required on all circuits that have access to the Public Switched Network if a P/AR test is not made.

‡ If P/AR fails, skip immediately to measuring attenuation distortion return loss and envelope delay distortion.

TABLE C
LOCAL LOOP REQUIREMENTS (NOTE 1)

PARAMETER	LIMIT	
	VOICE JACK	DATA JACK
1004-Hz Insertion Loss	10 dB Maximum	8.5 dB Maximum
C-Notched Noise*	30 dBrnC0	28 dBrnC0 Maximum
Impulse Noise at 59 dBrnC0	15 counts in 15 minutes Maximum	15 counts in 15 minutes Maximum
Attenuation Distortion (slope) 404 to 2804 Hz referenced to 1004 Hz	No Requirement	-1 to +3 dB Maximum
P/AR	Not Specified	90 Minimum
Transmitted Data Power (at serving CO)	-12 dBm Maximum	-12 dBm Maximum
Envelope Delay Distortion†	Not Specified	100 Microseconds (1004 to 2804 Hz)

Note 1: If requirements are not met, refer to Section 314-205-300 or 668-010-300 for corrective measures.

* Assumes -13 dBm0 holding tone.

† Required only if P/AR requirements are not met.

TABLE D
FX REQUIREMENTS

PARAMETER	LIMIT
C-Notched Noise*	50 dBrnC0 Maximum
Impulse Noise	≤ 10 in 15 minutes at 68 dBrnC0
Phase Jitter, (20 to 300 Hz)	8° P-P Maximum
Phase Jitter, (4 to 300 Hz)	12° P-P Maximum
Phase Jitter, (4 to 20 Hz)	5° P-P Maximum
Slope	-1 to 8 dB Maximum, 404 to 2804 Hz referenced to 1004 Hz
P/AR	70 Minimum
Intermodulation Distortion Second Order	28 dB Minimum
Third Order	35 dB Minimum
Gain Hits	≤ 6 in 15 minutes ≥ 3 dB
Phase Hits	≤ 6 in 15 minutes ≥ 20°
Dropouts	≤ 1 in 15 minutes ≥ 12 dB
Frequency Offset	3 Hz Maximum
Envelope Delay Distortion	1000 Microseconds 900 to 2500 Hz

* Assumes -13 dBm0 holding tone

TABLE E
REMOTE WATS AND RX LINES

PARAMETER	LIMIT
C-Notched Noise*	48 dBrnC0 Maximum
Impulse Noise	≤ 5 in 15 minutes at 68 dBrnC0
Phase Jitter, (20 to 300 Hz)	2° P-P Maximum
Phase Jitter, (4 to 300 Hz)	6° P-P Maximum
Phase Jitter, (4 to 20 Hz)	5° P-P Maximum
Slope	-1 to 4.5 dB 404 to 2804 Hz referenced to 1004 Hz
P/AR	85 Minimum
Intermodulation Distortion Second Order	33 dB Minimum
Third Order	39 dB Minimum
Gain Hits	≤ 2 in 15 minutes ≥ 3 dB
Phase Hits	≤ 2 in 15 minutes ≥ 20°
Dropouts	≤ 1 in 15 minutes ≥ 12 dB
Frequency Offset	2 Hz Maximum
Envelope Delay Distortion	400 Microseconds 900 to 2500 Hz

* Assumes -13 dBm0 holding tone

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