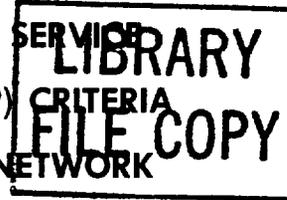


**"DATAPHONE®" DATA COMMUNICATIONS SERVICE
MINIMUM ACCEPTABLE PERFORMANCE (MAP) CRITERIA
DATA SYSTEMS ON THE PUBLIC SWITCHED NETWORK**



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1. GENERAL

1.01 The switched telecommunications network and other switched networks may provide a large number of possible tandem arrangements of equipment and facilities on successive calls between two specific locations. It would be impractical to attempt to specify transmission requirements for every arrangement and to maintain each arrangement to its separate requirement. Although transmission performance on the network is maintained in such a manner that, on an "average," customers will receive satisfactory performance on a large percentage of data calls, it is recognized that a small number of customers may, because of geographical location, calling patterns, limited network access, etc, experience frequent or consistent substandard performance. The minimum acceptable performance (MAP) program has been initiated as an aid in identifying the situations where a substandard grade of service exists.

1.02 This section is reissued to update MAP parameters and limits. Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The MAP program is intended to be used with assistance from data technical (DATEC) support personnel investigating escalated data trouble reports. Trouble reports are normally escalated to the DATEC teams when craft personnel are not able to clearly establish that a trouble situation exists or are not able to correct a trouble situation satisfactorily. Normally, the DATEC personnel will not be involved until after it has been determined that operational problems, timing arrangements, data set strapping options, and other nontransmission problems are not causing the problems experienced. Similar problems involving data circuits on private switched networks may also be investigated.

1.04 Descriptive information common to the transmission of data on the Public Switched Network (PSN), private line (PL) services, and 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. MAP PROGRAM

2.01 The MAP program requires the measurement of up to 12 critical transmission parameters to determine whether any of the parameters are out of

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limits on over 85 percent of calls. The program applies either where telephone company (TELCO) or customer-provided equipment (CPE) data sets are used. The MAP program applies only to supported arrangements using data jacks at both ends.

3. PARAMETERS MEASURED

3.01 The parameters used in the MAP program to rate transmission performance are 1004-Hz insertion loss, C-notched noise (measured using a 1004-Hz holding tone on the facility), impulse noise, phase jitter, slope between 404 and 2804 Hz referenced to 1004 Hz, peak-to-average signal ratio (P/AR), intermodulation distortion (second and third order measured using the 4-tone method), gain hits, phase hits, dropouts, frequency offset, and envelope delay distortion. These parameters are supported data, jack-to-data jack.

3.02 If two of the MAP criteria parameters are at their maximum requirements and nominal amounts of other impairments are present on the channel, degraded performance can be expected. Survey statistics indicate that there will be less than 1 percent of the PSN connections where more than two of the parameter requirements specified in this section are exceeded.

4. TEST EQUIPMENT

4.01 A list of test equipment which has been evaluated for use in making transmission measurements is given in the AT&T Product Evaluation Report (PER) 117. Appropriate test equipment for measuring the parameters given in paragraph 3.01 should be available to the DATEC personnel at each test location.

5. BASIC PROCEDURES

5.01 The basic procedure followed by DATEC teams in identifying trouble situations where MAP measurements are required is to dispatch personnel to the selected test locations, place test calls, and measure the MAP parameters. Test requirements are given in paragraph 6.02.

5.02 The MAP program is intended only to identify the connections on which trouble situations exist. Craft personnel will (with the guidance of DATEC) refer to appropriate sections for corrective actions.

Choosing Test Locations

5.03 An analysis of trouble reports may be helpful in determining the proper test locations. If trouble has been experienced while transmitting to a particular location, end-to-end tests will be made to that location. If reports indicate that more than one location is involved in trouble reports, tests should be made to the location reporting the most trouble.

5.04 If trouble has been experienced in sending to more than one location without a pattern, test locations must be chosen arbitrarily. Under such conditions, it should be remembered that the trouble is likely to be located in the calling loop, the serving central office, or the toll connecting trunks at the calling end.

5.05 If the trouble reports indicate that the difficulties are experienced in a particular time period in the day, tests should be made during that specific time period.

Placing Test Calls

5.06 Where TELCO data sets are used with data jacks, the DATEC team should place test calls in the same manner as a customer would or may ask the customer to place the calls. If CPE data sets are used, the customer should be asked to place a series of calls in the usual operating manner. In either case, steps should be taken to ensure that the customer is not billed for the test calls by following the procedures given in Section 010-250-001.

6. REQUIREMENTS

6.01 A simplified procedure may be used where the customer establishes a connection which is "bad" and has the same problem that has been referred to DATEC. All MAP parameters are then measured on this connection. If all parameters meet requirements on two such connections, terminate testing. If any parameter does not meet requirements, corrective action is required.

6.02 When a test call has been set up, measurement of the parameters listed in Table A should be made. Note that P/AR may be substituted for envelope delay distortion measurement in most cases. In the following sequence, if (1) or (2) is accomplished, the service can be rated satisfactory and no further action is required. If condition (3) exists, holding and

tracing will be required to isolate the trouble condition. Action should be taken to correct parameters that do not meet requirements so that condition (1) or (2) is met. Complete one of the following series of calls as follows:

- (1) Seven calls with no parameter requirement exceeded on any call
- (2) Ten calls with one or more parameter requirements exceeded on only one call
- (3) Two calls with one or more parameter requirements exceeded on each before accomplishing either (1) or (2).
- 6.03 Requirements for the measured parameters are given in Table A. If two or more MAP cri-

TABLE A
MAP PROGRAM PARAMETERS AND REQUIREMENTS

PARAMETER	REQUIREMENTS (DATA JACK TO DATA JACK)
1004-Hz Insertion Loss	30 dB maximum
C-Notched Noise (1004-Hz Holding Tone)	At least 24 dB below received power of 1004-Hz test tone at data level
Impulse Noise (1004-Hz Holding Tone)	≤15 counts in 15 minutes, threshold at 6 dB below received data level
Phase Jitter*(20 to 300 Hz) (4 to 300 Hz) (4 to 20 Hz)	≤10 degrees, peak-to-peak ≤15 degrees, peak-to-peak ≤5 degrees, peak-to-peak
Slope, 404 to 2804 Hz (Referenced to 1004 Hz)	≤14 dB
P/AR	≥48
Intermodulation Distortion Second order Third order	≥27 dB below received fundamental ≥32 dB below received fundamental
Gain Hits	≤8 in 15 minutes ≥3 dB
Phase Hits	≤8 in 15 minutes ≥20° dB
Dropouts	≤2 in 15 minutes ≥12 dB
Frequency Offset	5 Hz maximum
Envelope Delay Distortion†	800 μs maximum (1004 to 2404 Hz) 2600 μs (604 to 2804 Hz)

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

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

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teria do not meet requirements, a connection is considered unsatisfactory and additional investigation will be required.

6.04 If the facility is proven satisfactory in a case where customer-provided equipment is used, it is the responsibility of the customer to have the equipment tested.

6.05 Table B provides a listing of MAP test call parameters and limits. This table can be used to indicate the number of calls and the number of times each parameter was measured.

7. REFERENCES

7.01 When a trouble situation has been identified, reference should be made to appropriate sections for aid in isolating and clearing the indicated troubles. The following sections cover maintenance procedures and give information about test equipment used in making MAP investigations.

SECTION	DESCRIPTION
010-250-001	Crediting Charges on Test Calls
314-010-100	Data General, Analog Transmission Parameters, Description, Data Transmission Systems
314-010-101	Data General, Data Testing Principles

SECTION	DESCRIPTION
314-010-102	Data General, Data Services Support, Digital and Analog Data Transmission Services
314-010-103	Data General, Interconnection/Interpositioning, Digital and Analog Data Transmission Systems
314-205-300	DATAPHONE Data Communications Service, Overall Maintenance Procedures, Data Systems on the Public Switched Network
314-205-500	DATAPHONE Data Communications Service, Overall Data Transmission Test Requirements, Data Systems on the Public Switched Network
314-205-501	DATAPHONE Data Communications Service, Test Requirements for Subscriber, Foreign Exchange, PBX, and WATS Lines, Data Systems on the Public Switched Network.
590-101-103	Jacks for Registered Data Equipment, Single and Multiline Installations

TABLE B
MAP TEST CALL PARAMETERS AND REQUIREMENTS
TEST CALLS

CUSTOMER _____ (16)

CALL _____ (10)

REQUIRED CALLS	1	2	3	4	5	6	7	8	9	10	REQUIREMENT
1004-Hz Insertion Loss											30 dB maximum
C-Notched Noise (1004-Hz Holding Tone)											At least 24 dB below received power
Impulse Noise (1004-Hz Holding Tone)											≤15 counts in 15 minutes, threshold at 6 dB below 1004-Hz level
Phase Jitter* 20 to 300 Hz 4 to 300 Hz 4 to 20 Hz											≤10 degrees, peak-to-peak ≤15 degrees, peak-to-peak ≤5 degrees, peak-to-peak
Gain Slope 1004 Hz 404 Hz 2804 Hz											≤14 dB
P/AR											≥48
Intermodulation Distortion Second order Third order											≥27 dB minimum ≥32 dB minimum
Gain Hits											≤8 in 15 minutes ≥3 dB
Phase Hits											≤8 in 15 minutes ≥20 dB
Dropouts											≤2 in 15 minutes ≥12 dB
Frequency Offset 1004 Hz											5 Hz maximum
Envelope Delay Distortion† 1004 to 2404 Hz 604 to 2804 Hz											800 μsec maximum 2600 μsec maximum

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

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