DIGITAL TRANSMISSION SYSTEMS

T1 DIGITAL LINE

DIGITAL DATA SYSTEM QUALIFICATION TESTS

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1. GENERAL

1.01 This section contains the tests for initially qualifying T1 digital lines that are to be used in the Digital Data System (DDS).

1.02 This issue does ***not*** affect Equipment Test Lists.

1.03 The DDS is intended to provide full-duplex service; therefore, all its parts must be capable of satisfactory 2-way transmission. Evaluating the T1 line on a looped basis (Chart 1) allows estimating the 2-way performance of the overall facility with little craft time and effort. Two one-way tests (Chart 2) can also be used. This method is useful if in-service lines must be tested, since the test can be made on a monitoring basis and does not require that the system under test be removed from service.

1.04 After the T1 line has been selected or constructed as described in Section 886-100-100, line performance must be evaluated before the line can be used for DDS service. The purpose of the line qualification tests given in this section is to ensure that both directions of line transmission meet the performance objective for the customer channel.

2. APPARATUS

2.01 The following apparatus, or equivalent, is required to perform the tests in this section. This apparatus is required at each office performing the test. Operation and maintenance instructions are contained in the section listed after each test set.

1—J98710R Quasi-Random Signal Source (Section 103-493-104)

1—Error Rate Test Set (see 2.02)

1—3P7C Cord.

2.02 Either the Bowmar 271B (Section 103-493-110) or the Northeast Electronics 7031 (Section 103-493-111) error rate test set is suitable for performing the T1 line qualification test. The Bowmar 271B transmitter generates a quasi-random signal; therefore, if this test set is used, the quasi-random signal source listed in 2.01 is not required.

3. TESTS

3.01 T1 digital lines should always be supplied with a bipolar signal to maintain stable line operation when nonintegrated circuit 201-, 205-, and 206-type repeaters are used. This signal can be supplied by a quasi-random signal source, by a working line through a bridging repeater, or by a spare terminal. The quasi-random signal source generates a stringent repetitive word that may cause a marginal digital line to transmit errors. Thus, lines that are found to have acceptable error rates while transmitting a quasi-random signal have been tested more rigorously than lines transmitting other signals.

3.02 Some lines may exhibit poorer than normal performance during certain periods of the day. On most of these lines, these periods occur during the business hours. Therefore, the line qualification test should be performed during the business day, preferably spanning the busiest hour. For locations that exhibit busy periods outside the normal business day, the 2-hour line qualification test should span those busy periods.

3.03 Depending on the system layout, T1 lines may consist of a single span or of several spans connected through intermediate offices. However, the line qualification test must be performed on the overall T1 line between DDS terminal locations.

3.04 Error performance on the T1 line can be measured in two ways: (a) by comparison with a quasi-random signal source, and (b) by counting bipolar violations. The two methods provide equivalent results except in the case of loss of T1 line signal.

3.05 Two methods may be used to perform the line qualification test: (a) on an out-of-service basis with the T1 line looped (Chart 1), or (b) on an end-to-end basis (Chart 2). End-to-end testing is less efficient in craft time and in test equipment usage; however, it is useful when in-service lines must be tested. The end-to-end test involves only the monitoring of performance and does not require that the system be removed from service.

CHART 1

LOOPED LINE QUALIFICATION TEST

STEP	PROCEDURE
	Note: If the T1 line to be tested is in service, patch traffic off to an available alternate line (see Section 365-226-500).
1	Ensure that the tests in Section 365-224-500 have been completed.
2	Have the line under test looped at the office repeater bay at the far end.
3	Determine whether a 1.544-Mb/s signal from a quasi-random signal source is being supplied to the line under test. If a signal is being supplied, proceed to Step 5; if not, proceed to Step 4.
4	If the office repeater is a 206-type, patch the output of the quasi-random signal source to the L IN jack on the repeater. If the office repeater is a 201- or 208-type in a 201 bay, patch the output of the quasi-random signal source to the IN jack of the span terminating assembly.
5	If the office repeater is a 206-type, connect the error rate test set to the MON jack located below the X IN jack on the repeater. If the office repeater is a 201- or 208-type in a 201 bay, connect the error rate test set to the MON jack on the side of the associated span terminating assembly assigned to the receiving direction. ***Note:*** The receiving side of the repeater should be terminated by a 386B plug.
6	Count the number of bit error-seconds for a 2-hour period during the business day, preferably spanning the busiest hour (see 3.02).

CHART 1 (Cont)

STEP	PROCEDURE

Note: Refer to Section 103-493-110 or 103-493-111 for operating instructions for the error rate test set.

Requirement 1: The error-seconds count is 50 or less.

Requirement 2: The LOST POWER and LOST DATA indicators are extinguished.

7 If the requirement of Step 6 is met, remove all test equipment and have the loop removed at the far end.

8 Ensure that a bipolar signal is being supplied to the line (see 3.01).

9 If the requirement of Step 6 is not met, isolate the malfunctioning span by repeating Steps 5 and 6 with the line looped at the receiving end of each span.

Note: If it is suspected that the requirement of Step 6 was not met because of an unusual, nonrecurring event such as maintenance activity, the line should be retested the next business day.

10 Locate the trouble within the malfunctioning span according to Section 365-227-500.

CHART 2

END-TO-END QUALIFICATION TEST

STEP	PROCEDURE

Note 1: This test may be performed in one direction of transmission at a time or in both directions of transmission simultaneously. If both directions of transmission are to be tested simultaneously, omit Step 11.

Note 2: For this test, designate one end of the line under test as the transmitting end and the other as the receiving end.

Both Ends

1 Ensure that the tests in Section 365-224-500 have been completed.

2 Determine whether a bipolar signal is being supplied to the line under test (see 3.01). If a signal is being supplied, proceed to Step 4; if not, proceed to Step 3.

CHART 2 (Cont)

STEP	PROCEDURE
	Transmitting End
3	If the office repeater is a 206-type, patch the output of the quasi-random signal source to the L IN jack on the repeater. If the office repeater is a 201- or 208-type in a 201 bay, patch the output of a quasi-random signal source to the IN jack of the span terminating assembly.
4	Notify the receiving end to proceed with Step 5.
	Receiving End
5	If the office repeater is a 206-type, connect the error rate test set to the MON jack located below the X IN jack on the repeater. If the office repeater is a 201- or 208-type in a 201 bay, connect the error rate test set to the MON jack on the side of the associated span terminating assembly assigned to the receiving direction. ***Note:*** The receiving side of the repeater should be terminated by a 386B plug.
6	Count the number of bit error-seconds or bipolar violation (BPV) seconds for a 2-hour period during the business day, preferably spanning the busiest hour (see 3.02). ***Note:*** Refer to Section 103-493-110 or 103-493-111 for operating instructions for the error rate test set. ***Requirement 1:*** The error-seconds count is 30 or less. ***Requirement 2:*** The LOST POWER and LOST DATA indicators are extinguished.
7	If the requirement of Step 6 is not met, isolate the malfunctioning span by repeating Steps 5 and 6 at the receiving end of each span.
8	Locate the trouble within the malfunctioning span according to Section 365-227-500.
9	If the requirement of Step 6 is met, remove all test equipment.
10	Ensure that a bipolar signal is being supplied to the line (see 3.01). ***Note:*** If both directions of transmission have been tested, omit Step 11.
11	Repeat Steps 1 through 10 for the other direction of transmission.

4. REFERENCES

4.01 The following sections contain additional testing and maintenance information for T1 lines associated with the DDS. These sections may not have been issued yet; check the applicable index to determine whether a section is available.

314-900-300	Digital Data System—Private Line Service—Overall Maintenance
314-901-300	Digital Data System—Serving Test Center—Two-Point Private Line Circuit—Maintenance Procedures
314-903-200	Digital Data System—DS-1 Facility—Turn-Up Procedure
314-903-300	Digital Data System—DS-1 Facility Maintenance Procedures