"DATAPHONE®" DIGITAL SERVICE

1.544-MB/S DIGITAL SERVICE

WITH 1.344-MB/S OPTION

TEST PROCEDURES

1. GENERAL

1.01 This section contains the testing procedures used for initial lineup and trouble isolation of the 1.344- and 1.544-Mb/s digital service.

1.02 If this section is reissued, the reason for reissue will be given in this paragraph.

1.03 Figure 1 shows an example of the near-end of a digital service facility with the wideband data test center (WDTC) patched for testing.

> *Note:* In some instances, the circuit may be hard-wired through the WDTC.

A. Self-Testing Procedures

1.04 In order to ascertain whether a test set is performing within tolerances, a self-testing procedure should be performed before each use. The following self-testing procedure is used for the 271B error-rate test set.

271B ERROR-RATE TEST SET

STEP	PROCEDURE
1	Set switches to the following initial positions:

      • MODE

         INDIVIDUAL/ERROR-SECONDS to ERROR-SECONDS

         VIOLATIONS/ERRORS to VIOLATIONS

271B ERROR-RATE TEST SET (Cont)

STEP	PROCEDURE
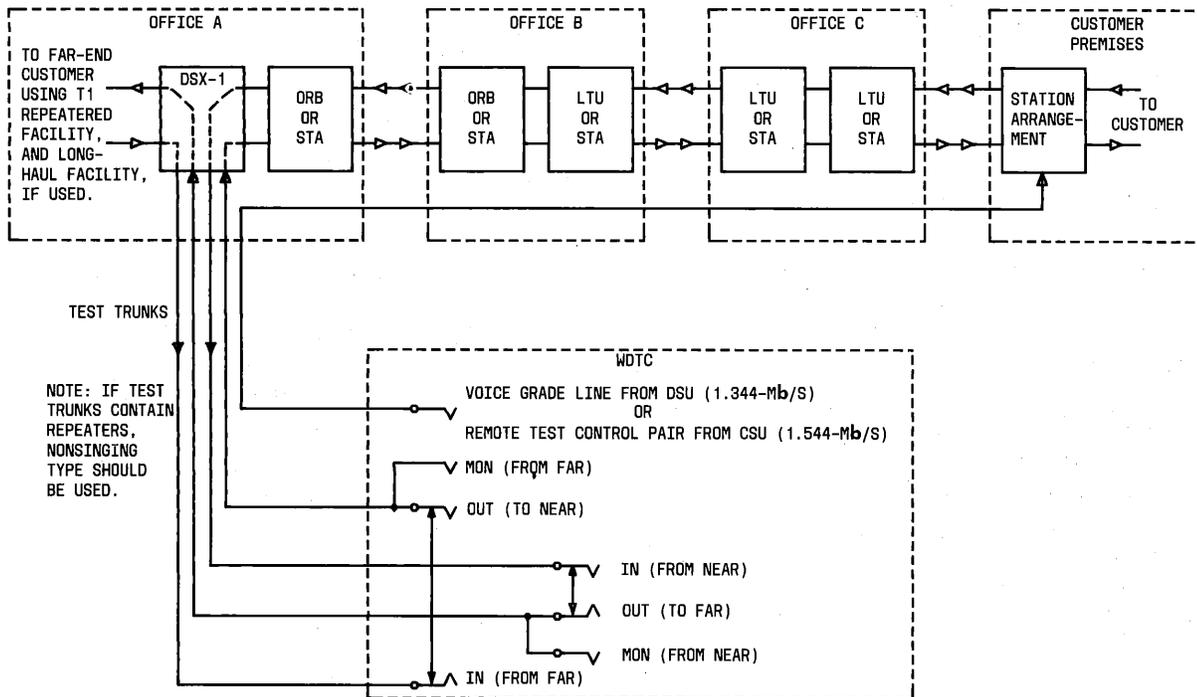
Fig. 1—Example of Near End Digital Service Facility With WDTC Patched for Testing

- SYNC MODE to MANUAL

- SELF TEST to NORMAL

- DISPLAY INTERVAL (SEC) to "1" (full counterclockwise)

- COUNT INTERVAL (BITS) to 10^6

- COUNT INTERVAL (MIN) to "0" (zero)

- RESET/RESYNC-momentarily operate and release

Requirement: NO SYNC and LOST SYNC indicators are lighted; and NO DATA, LOST DATA, LOST POWER and OVERFLOW indicators are extinguished. COUNT indicator is

271B ERROR-RATE TEST SET (Cont)

STEP	PROCEDURE

alternately **on** for approximately 2/3 second and **off** for approximately 1 second. Display indicates 000.

2   Turn the DISPLAY INTERVAL (SEC) control clockwise to the 10 position.

     Requirement: The COUNT indicator should alternately be **on** for approximately 2/3 second and **off** for approximately 10 seconds.

3   Place the DISPLAY INTERVAL (SEC) control in its HOLD position and momentarily operate the RESET/RESYNC switch.

     Requirement: The COUNT indicator should come **on** for approximately 2/3 second and then remain **off** indefinitely.

4   Place the DISPLAY INTERVAL (SEC) control at some point between 1 and 5. Hold the SELF TEST switch at its INSERT ERRORS position.

     Requirement: The indicated count on the display should change by increments of two from a starting count of 000 to a final count of 008 while the COUNT indicator is **on.** At the count of 008, the display should clear to 000 and begin a new cycle.

     Note: The first count interval may not yield a total of eight errors, but each succeeding interval should register a count of 008 on the display.

5   Holding the SELF TEST switch at its INSERT ERRORS position, change the COUNT INTERVAL (BITS) switch from 10^6 to 10^7.

     Requirement: The indicated count on the display should perform as it did in step 4; however, a full count interval should now register 080 on the display.

6   Holding the SELF TEST switch at its INSERT ERRORS position, change the COUNT INTERVAL (BITS) switch from 10^7 to 10^8.

     Requirement: The indicated count on the display should perform as it did in steps 4 and 5; however, a full count interval should now register 800 on the display.

7   Holding the SELF TEST switch at its INSERT ERRORS position, change the COUNT INTERVAL (BITS) switch from 10^8 to CONT and momentarily operate the RESET/RESYNC switch.

     Requirement: The count on the display should accumulate as in the preceding steps, and the OVERFLOW indicator should come **on** as the display goes from 998 to 000.

8   Holding the SELF TEST switch at its INSERT ERRORS position, momentarily operate the RESET/RESYNC switch.

271B ERROR-RATE TEST SET (Cont)

STEP	PROCEDURE

Requirement: As the RESET/RESYNC switch is operated, the display should clear to 000, and the OVERFLOW and COUNT indicators should go *off*, the COUNT indicator should come *on* again within 2/3 second of switch release.

9   Release the SELF TEST switch and return the COUNT INTERVAL (BITS) switch to the 10^6 position.

10   Place the VIOLATIONS/ERRORS switch to the ERRORS position, and momentarily operate the RESET/RESYNC switch.

Requirement: The display indication should be 000 and all RECEIVE STATUS indicators should be *off.*

11   Hold the SELF TEST switch at its INTERRUPT DATA position.

Requirement: The NO DATA and NO SYNC indicators should come *on.*

12   Release the SELF TEST switch.

Requirement: The NO DATA indicator should go *off*, the LOST DATA indicator should come *on*, and the NO SYNC indicator should remain *on.* At the same time, the display should show 888 with an OVERFLOW indicator during the count interval and any number with OVERFLOW at the end of the count interval.

13   Momentarily operate the RESET/RESYNC switch.

Requirement: The NO DATA, LOST DATA, NO SYNC, and LOST SYNC indicators should be *off* and the display should read 000 with the OVERFLOW indicator extinguished.

14   Set the SYNC MODE switch to AUTO and hold the SELF TEST switch at INTERRUPT DATA.

Requirement: The NO DATA and NO SYNC indicators should come *on.*

15   Release the SELF TEST switch.

Requirement: The NO DATA and NO SYNC indicators should go *off* and the LOST DATA and LOST SYNC indicators should come *on.* The display should read 000.

16   Momentarily operate the RESET/RESYNC switch.

Requirement: The LOST DATA and LOST SYNC indicator should go *off.*

17   Hold the SELF TEST switch at its INSERT ERRORS position.

271B ERROR-RATE TEST SET (Cont)

STEP	PROCEDURE
	Requirement: The COUNT indicator should come **on** and the display should change by increments of two to a final count of 008.
18	Set the INDIVIDUAL/ERROR-SECONDS switch to ERROR-SECONDS. Set the COUNT INTERVAL (BITS) switch to CONT. Hold the SELF TEST switch at INSERT ERRORS and momentarily operate the RESET/RESYNC switch.
	Requirement: The COUNT indicator should come **on,** and the display should increment at a rate of approximately once per second.
19	Holding the SELF TEST switch at INSERT ERRORS, change the VIOLATIONS/ERRORS switch to VIOLATIONS.
	Requirement: The COUNT indicator should be **on,** and the display should continue to increment at the rate of approximately once per second.
20	Change the COUNT INTERVAL (BITS) switch to the timer (all the way down past CONT) position.
	Requirement: The COUNT indicator should go **off** within 2/3 second, but the display should not clear to 000.
21	Set the COUNT INTERVAL (MIN) switch at some arbitrary position past 20 and momentarily operate the RESET/RESYNC switch.
	Requirement: The display should clear to 000 and the COUNT indicator should come **on.**
22	Hold the SELF TEST switch at INSERT ERRORS.
	Requirement: The display should increment at the once per second rate.
23	Return the SELF TEST switch to NORMAL position.
	Requirement: The display should not increment.
	Note: There will be considerable, but normal, delay between the operation of the SELF TEST switch and the reaction of the display.
24	Manually return the COUNT INTERVAL (MIN) switch to 0 (zero) position.
	Requirement: The COUNT indicator should go **off** but the display should not clear.
	Note: The timer may continue to tick for some time.
25	Momentarily operate the POWER switch to the OFF position and back to the ON position.

271B ERROR-RATE TEST SET (Cont)

STEP	PROCEDURE

Requirement: The LOST POWER indicator should come **on** and remain **on.**

26   Operate the RESET/RESYNC switch.

Requirement: The LOST POWER indicator should go **off.**

Note: The following steps require the use of a 7-digit frequency counter capable of measuring a 1.544-MHz signal.

27   Connect the frequency counter input to the TRANSMITTER—BIT SYNC output and the GND terminal of the test set.

28   Adjust the frequency counter for a 1-second count interval; ie, to read directly in hertz and a consistent display.

Requirement: The counter should register a 1.544-MHz ±35 Hz at the end of each count interval.

Note: If the requirement is not met, the transmitting oscillator should be adjusted according to the procedure contained in the 271B technical manual.

29   Disconnect the frequency counter.

1.05 The following self-testing procedure is used for the 912A WDTS with a J79912AB interface unit. If the 306A data set in the WDTB is to be tested for proper operation, refer to the Section 314-602-100 entitled Data Systems Central Office—915-Type Wideband Data Test Bays for these procedures.

912A WDTS

STEP	PROCEDURE

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1   Set the controls on the WDTS to the following positions:

TRANSMIT—
- BIT RATE to 250
- TEST SIGNAL to 131111
- TRIGGER to +
- OUTPUT to NORMAL

912A WDTS (Cont)

STEP	PROCEDURE

RECEIVE
- BIT RATE to 250
- TIMING to 0
- TEST SIGNAL to 131111
- TRIGGER to +
- INPUT to NORMAL
- WORD SYNC to AUTO
- COUNTER to ON

INTERFACE
- TEST MODE to LOOPED
- SEND REQ to OFF

- POWER to ON

2   Reset the counter on the WDTS.

Requirement: No errors should be registered on the counter.

3   Set the RECEIVE — TEST SIGNAL switch to 2087.

Requirement: Many errors are registered on the counter.

Note: If requirements are not met, the test set is defective.

B.   Remote Testing Loopback Information

1.344-Mb/s Digital Service

1.06   The remote test for the 1.344-Mb/s station arrangement consists of two loopback conditions: remote test 1 (RT1) which loops the station arrangement between the channel service unit (CSU) and the data service unit (DSU) and remote test 2 (RT2) which loops the DSU at the output to the customer.

Note: The RT1 loopback can only be activated when Option B is installed in the 32A1 data unit which is part of the DSU.

1.07   The remote tests are controlled from the wideband data test bay (WDTB) by sending

a 2800-Hz signal over the remote test control pair. The received signal (at the DSU) is required to be between −8 and −25 dBm in power and must be present for a period of at least 7 seconds for proper actuation of the test circuitry. The first application and release of the remote test signal (2800-Hz) actuates RT1. The DSU remains locked in this state until the 2800-Hz signal is applied a second time to actuate RT2. A third application and removal of the 2800-Hz signal restores the normal operating condition. Procedures for activating RT1 and RT2 loopbacks from a WDTB are contained in Section 314-602-100. RT2 loopback is activated when performing the error-rate test in 5.03.

1.544-Mb/s Digital Service

1.08 The remote test for 1.544-Mb/s station arrangement consists of a single loopback condition which loops the received data output to the transmit data input at the customer's side of the CSU.

1.09 The remote test is controlled by applying a voltage to the remote test control pair. Operation of the remote test requires a minimum of 15 volts at 20 ma at the CSU. The remote test loopback is activated when performing the error-rate test in 5.02.

2. INITIAL LINEUP TESTS

2.01 The initial lineup tests assume that the long-haul facilities, if used, and T1 spans have been fully tested and turned up according to normal procedure.

A. 1.344-Mb/s Digital Service

2.02 The initial lineup for 1.344-Mb/s digital service is performed using the end-to-end test method. The end-to-end test consists of test signals being sent and received between two stations, thus the test conditions are very similar to actual data operation.

End-to-End Test

2.03 Using a 912A WDTS at both ends, one WDTS applies a test signal to the transmitter portion of the near-end 306A data set. The transmitted output is sent to the far-end 306A data set via the T1 repeatered facility. The second WDTS monitors the received signal at the far-end

and performs a bit error count. This determines the performance of one direction of transmission. The opposite direction of transmission is tested in the same manner. When the bit count requirement is exceeded, the trouble isolation flowchart in Section 314-645-300 can be used to locate the area of trouble.

2.04 The initial lineup test requires that three, 15-minute random interval, end-to-end tests be performed, with at least one of the tests being performed during the busy part of the day. The maximum bit error count for each 15-minute test is 1500.

2.05 The end-to-end test procedures described above are contained in Section 593-801-500.

2.06 After the end-to-end test has been completed, the bit rate test (see Part 3) must be performed.

B. 1.544-Mb/s Digital Service

2.07 The initial lineup test for 1.544-Mb/s digital service is performed from the WDTB using 271B error-rate test set. The basic lineup procedure is to perform a 1.544-Mb/s error-rate test per 5.02 to the near-end of the facility with the far-end WDTB monitoring the output of the long-haul facility (if used). The far-end of the facility is tested in the same manner.

2.08 The initial lineup test requires that three, 15-minute random internal tests be performed, with at least one of the tests being performed during the busy part of the day.

2.09 The basic lineup procedure is as follows:

(1) Monitor for pulses and bipolar violations (Part 4) at the control WDTB. If the requirements of the monitoring tests are not met, use the trouble isolation flowchart of Section 314-645-300 to locate the trouble.

(2) Perform a 15-minute error-rate test (5.02) from the control WDTB to the near-end station. At the same time, the WDTB at the far-end should monitor the output of the long-haul facility, if used, to determine its performance. If the errored-seconds count does not exceed 45 error seconds at either WDTB, the objectives are being met.

(c) Repeat the above procedures for the far-end of the facility with the control WDTB monitoring the output of the long-haul facility. If the 45 errored-second count is met at the far-end, repeat the lineup test per 2.08.

3. BIT-RATE TEST

3.01 The following test is used to determine the accuracy of the station arrangement clock. The test is performed for initial lineup or when troubles are difficult to locate or where the signal on the data under voice facility is showing partial response violations.

3.02 The test uses the 271B error-rate test set to monitor the bit rate from the station and a frequency counter to count the bit rate monitored by the 271B. Any 7-digit frequency counter capable of counting to at least 1.544-MHz will be satisfactory.

STEP	PROCEDURE
	Note: Ensure that the customer has completely released the circuit.
1	Have test trunk from WDTC patched to digital service facility to be tested.
2	Perform the 271B error-rate test set, self-test procedure in Part 1.
3	Set the controls on the 271B error-rate test set as follows:
	• MODE
	VIOLATIONS/ERRORS to VIOLATIONS
	INDIVIDUAL/ERROR-SECONDS to ERROR-SECONDS
	• SYNC MODE to AUTO
	• SELF TEST to NORMAL
	• DISPLAY INTERVAL (SEC) to HOLD
	• COUNT INTERVAL (BITS) to CONT
	• COUNT INTERVAL (MIN) to 0 (zero)
4	The NO DATA, NO SYNC, and LOST SYNC indicators are *on.*
5	Plug a patch cord from the DS-1 INPUT jack to the MON (from near) jack.
6	Adjust the frequency counter for a 1-second count interval (to read directly in hertz), and adjust the count input controls for a consistent display.
7	Connect the frequency counter input to the test set RECEIVER — BIT SYNC output and GND terminal.
8	Press the RESET/RESYNC switch.

STEP	PROCEDURE

Requirement 1: On the test set, the NO DATA, NO SYNC, and LOST SYNC indicators are **off.** The COUNT indicator is **on.** If the NO DATA indicator remains **on,** no signal pulses are present and a trouble is indicated. The display should show 000 errors.

Requirement 2: The counter should show a 1,544,000 ±75 Hz count.

Note: If Requirement 2 is not met, special services personnel should check the station arrangement for trouble.

9   Disconnect the patch cord and the frequency counter.

4. MONITORING TEST

4.01   Monitoring of 1.344- and 1.544-Mb/s digital service facilities is accomplished using the 271B error-rate test set. The purpose of this test is to determine if pulses are present on the facility and if any bipolar violations (BPVs) are present in the pulses.

4.02   Monitoring for pulses and BPVs can be accomplished from either direction of transmission. However, all monitoring **must** be accomplished from the monitor jacks. Care **must** be taken not to open or remove signal pulses from the T1 repeatered facility except as instructed.

STEP	PROCEDURE

1   Have test trunk from WDTC patched to digital service facility to be tested.

2   Perform the 271B error-rate test set, self-test procedure in Part 1.

3   Set the controls on the 271B error-rate test set as follows:

   • MODE

      VIOLATIONS/ERRORS to VIOLATIONS

      INDIVIDUAL/ERROR–SECONDS to ERROR–SECONDS

   • SYNC MODE to AUTO

   • SELF TEST to NORMAL

   • DISPLAY INTERVAL (SEC) to HOLD

   • COUNT INTERVAL (BITS) to CONT

   • COUNT INTERVAL (MIN) to 0 (zero)

4   The NO DATA, NO SYNC, and LOST SYNC indicators are **on.**

STEP	PROCEDURE

5   Plug a patch cord from the DS1 INPUT jack to the appropriate MON jack. Press the RESET/RESYNC switch.

       Requirement: The NO DATA, NO SYNC, and LOST SYNC indicators are ***off.*** The COUNT indicator is ***on.*** If the NO DATA indicator remains ***on***, no signal pulses are present and a trouble is indicated.

6   If the NO DATA indicator is ***off***, observe the display for 10 seconds.

       Requirement: The display should show 000 errors. If any errors are shown, press the RESET/RESYNC switch and observe the display for another 10 seconds. If the display shows 000 errors, no bipolar violations are present. If, however, errors are shown again, a trouble in the digital service facility is indicated.

7   Disconnect the patch cord.

5. ERROR-RATE TESTS

5.01 The error-rate test set is used to determine the performance of a 1.344- or 1.544-Mb/s digital service facility between the WDTB and the output of the DSU or CSU, respectively. For 1.544-Mb/s digital service, Test A using a 271B error-rate test set is the only test necessary since the CSU connects to the customer's equipment. However, for 1.344-Mb/s digital service the CSU connects to the DSU; and, therefore, another test (Test B), using the 912A WDTS, is required to determine its performance.

A. Error-Rate Test to CSU

5.02 The following test is used to determine the performance of a digital service facility between the WDTB and the output of the CSU using a 271B error-rate test set at the WDTB.

STEP	PROCEDURE

1   Have test trunk and remote test control pair or voice pair from WDTC patched to digital service facility to be tested.

2   Perform the 271B error-rate test set, self-test procedure in Part 1.

3   Loopback the CSU as discussed in 1.09.

4   Set the controls on the 271B error-rate test set as follows:

       • MODE

          VIOLATIONS/ERRORS to ERRORS

          INDIVIDUAL/ERROR-SECONDS to ERROR-SECONDS

       • SYNC MODE to MANUAL

STEP	PROCEDURE

      • SELF TEST to NORMAL

      • DISPLAY INTERVAL (SEC) to HOLD

      • COUNT INTERVAL (BITS) to timer (all the way down past CONT.)

      • COUNT INTERVAL (MIN) set to number of minutes as required (5 minutes for trouble isolation or 15 minutes for initial lineup test).

5   The NO DATA and NO SYNC indicators are *on.*

6   Plug a patch cord from one of the DS1 OUTPUT jacks to the appropriate OUT jack. Plug another patch cord from the DS1 INPUT jack to the appropriate MON jack. Press RESET/RESYNC switch.

Requirement 1: The NO DATA and NO SYNC indicators are *off.* The COUNT indicator is *on.* If the NO DATA and NO SYNC indicators remain *on,* the quasi-random signal transmitted by the test set is not being returned. A trouble in the digital service facility is indicated.

Requirement 2: If the NO DATA and NO SYNC indicators are *off,* any errored seconds in the received signal are counted on the display (see Note 1). When the COUNT INTERVAL (MIN) times out (COUNT lamp *off*), the display shows the number of errored seconds (15 errored seconds for trouble isolation and 45 errored seconds for initial lineup tests). See Note 2.

Note 1: During the counting interval, if the number of errors displayed are greater than the requirement for the entire counting interval or the OVERFLOW is *on,* stop the test since a large number of errors are present.

Note 2: In order to have a valid count at the end of the counting interval (COUNT indicator *off*), all indicators *must* be *off.* If any indicator is *on,* the error-rate test is invalid and must be repeated.

7   Disconnect both patch cords and place the station arrangement in its normal operating condition.

B. Error-Rate Test to DSU

5.03   The following test is used to determine the performance of a 1.344-Mb/s digital service facility between the WDTB and the output of the DSU using a 912A WDTS at the WDTB.

STEP	PROCEDURE

1   Have test trunk from WDTC patched to 1.344-Mb/s digital service facility to be tested.

STEP	PROCEDURE

2   Perform the self-test procedure for the 912A WDTS in Part 1.

3   Initially set the controls on the 912A WDTS to the following positions:

TRANSMIT
- BIT RATE to EXT
- TEST SIGNAL to 131111
- TRIGGER to +
- OUTPUT to NORMAL

RECEIVE
- BIT RATE to EXT
- TIMING to 0
- TEST SIGNAL to 131111
- TRIGGER to +
- INPUT to NORMAL
- WORD SYNC to AUTO
- COUNTER to OFF

INTERFACE UNIT
- TEST MODE to OPERATE
- SEND REQ to OFF
- DATA SET to number associated with 306A data set

- POWER to OFF

4   Perform the RT2 loopback discussed in 1.07.

5   Set the POWER and SEND REQ controls on the 912A WDTS to the ON position.

6   Verify that the AGC/COO indicator is *on.*

7   Reset the counter on the 912A WDTS and set the COUNTER switch to the ON position.
        At the end of 5 minutes, set the COUNTER switch to the OFF position.

STEP	PROCEDURE

Requirement: No more than 300 bit errors should be indicated on the counter.

8   Disconnect the patch cords and place the station arrangement in its normal operating condition.