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Filing Instructions:
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ADDENDUM 591-014-500
Issue 1, December 1967
AT&TCo Standard

DATA SET 103A TYPE

TEST PROCEDURES

1. GENERAL

1.001 This addendum supplements Section 591-014-500, Issue 4. The attached pages must be inserted in the section in accordance with the filing instructions above.

1.002 This addendum is issued to revise Table A, Table B, Paragraph 6.07(1), and Paragraph 6.08(2).

Attached:

Page 3 dated December 1967 — reissued
Page 4 dated December 1967 — revised
Page 5 dated December 1967 — reissued
Page 6 dated December 1967 — revised
Page 9 dated December 1967 — revised
Page 10 dated December 1967 — revised

4. INTERFACE TEST

The following changes apply to Part 4 of the section:

(a) Table A — revised
(b) Table B — revised

6. END-TO-END TESTS

The following changes apply to Part 6 of the section:

(a) Paragraph 6.07(1) — revised
(b) Paragraph 6.08(2) — revised

DATA SET 103A TYPE

TEST PROCEDURES

1. GENERAL

1.01 Tests described in this section are to be made at the time of installation and when clearing trouble conditions.

1.02 This section is reissued to add Fig. 1 and information concerning Data Set 103A2 testing.

1.03 Before proceeding with any tests of the data set, verify that:

(1) Data loop has been tested and meets requirements as specified in the practice, Data Systems — On Direct Distance Dialing (DDD) Network DATA-PHONE* Services — Transmission Requirements DATA-PHONE Subscriber Lines (Section 314-205-500).

* Service Mark of the American Telephone and Telegraph Company

(2) Telephone portion of installation meets standard dc talk, signaling, and supervision requirements.

(3) Data set strapping options agree with service order.

1.04 Tests described in this section are as follows:

Installation Tests ←

- Power outlet ground test
- Loop-back test from data test center
- Interface test with data test center
- Demonstration call

Maintenance Tests ↰

- End-to-end tests between customer locations are required only when there is report of transmission difficulties or poor error performance. ↲

2. POWER OUTLET GROUND TEST

2.01 When required (see Section 591-014-200), measure the impulse noise between the data set ground and the business machine ground using a 6A Impulse Counter as shown in Fig. 1.

3. LOOP-BACK TEST

3.01 Request loop-back test from data test center:

(1) Lift handset of associated telephone set, depress TALK button, and call nearest data test center (see note). Request a loop-back test for Data Set 103A1 or Data Set 103A2 and hang up.

(2) When called and instructed by the data test center, depress TEST 1 button. Hold it depressed until TEST 1 lamp lights. Data set is now under control of the data test center.

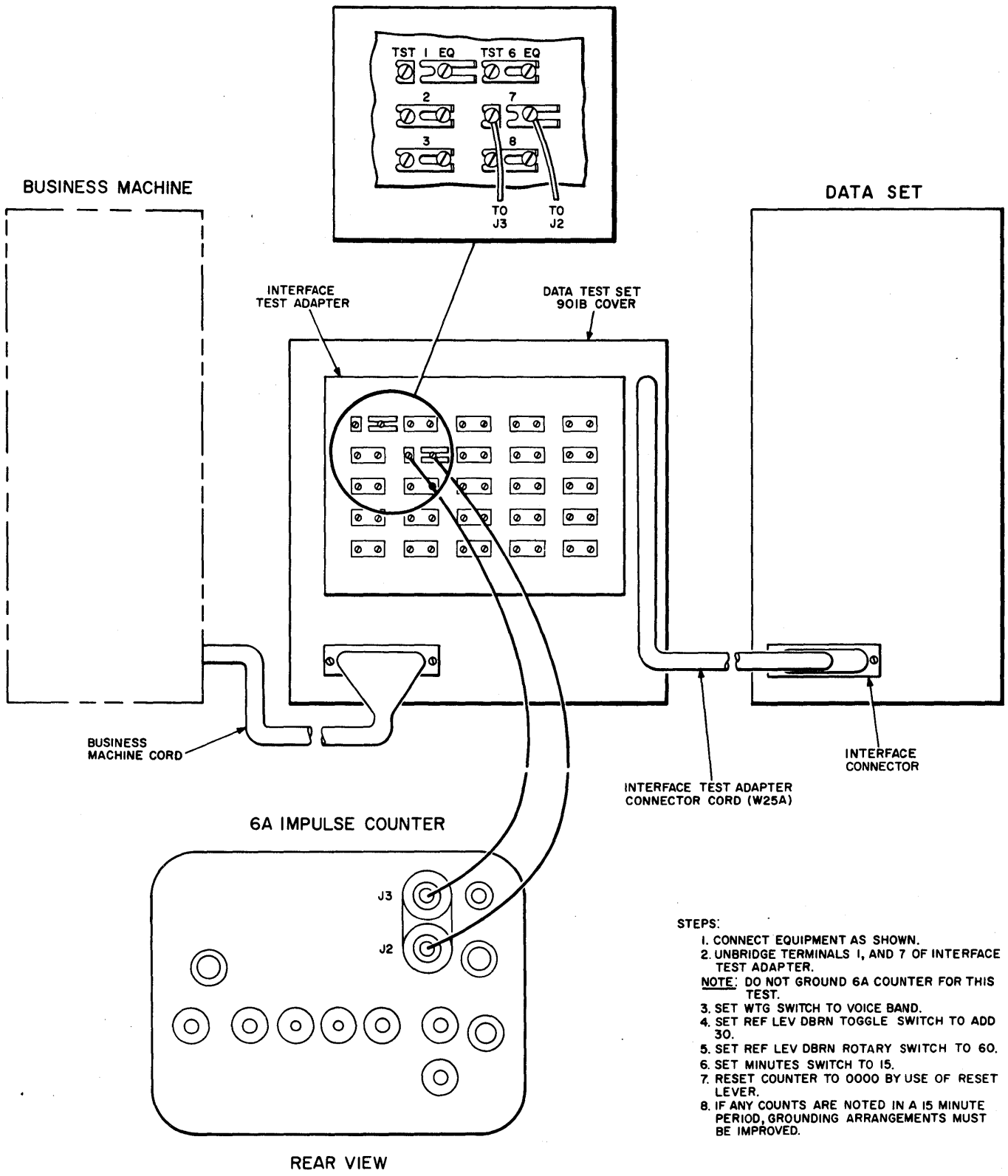
3.02 As answering station:

(1) Data test center originates test call to data set.

(2) When ringer in associated telephone set rings (allow one full ring), depress TALK button and lift handset (see note). When instructed to do so, depress TEST 1 button and hold depressed until TEST 1 lamp lights. Data set is now under control of the data test center.

3.03 As originating station:

(1) Data test center originates test call to data set.



STEPS:

1. CONNECT EQUIPMENT AS SHOWN.
2. UNBRIDGE TERMINALS 1, AND 7 OF INTERFACE TEST ADAPTER.
   NOTE: DO NOT GROUND 6A COUNTER FOR THIS TEST.
3. SET WTG SWITCH TO VOICE BAND.
4. SET REF LEV DBRN TOGGLE SWITCH TO ADD 30.
5. SET REF LEV DBRN ROTARY SWITCH TO 60.
6. SET MINUTES SWITCH TO 15.
7. RESET COUNTER TO 0000 BY USE OF RESET LEVER.
8. IF ANY COUNTS ARE NOTED IN A 15 MINUTE PERIOD, GROUNDING ARRANGEMENTS MUST BE IMPROVED.

Fig. 1 — Impulse Noise Test Using a 6A Impulse Counter

(2) When ringer in associated telephone set rings (allow one full ring), depress TALK button and lift handset (see note). When instructed to do so, depress TEST 1 button and TEST 2 button as instructed by the data test center. When the TEST 1 lamp lights, the data set is under the control of the data test center.

Note: When the telephone set associated with the data set is not arranged for voice communication, connect a 1011 type handset across data line to talk to the data test center.

4. INTERFACE TEST

4.01 Tests to data test centers (DTC) should be made to the nearest center capable of performing the type of tests required. Tests should be made during busy hours using the same telephone facilities that the customer will use. The following equipment is required at the station:

- 901B Data Test Set
- J79901B, List 3 Interface Test Adapter
- KS-14510, List 1 volt-ohm-milliammeter or equivalent
- 1011 type handset

4.02 The interface test adapter (J79901B, List 3) must be arranged as shown in Fig. 2.

4.03 A block diagram illustrating the equipment set up for the interface test is shown in Fig. 3.

4.04 Perform the interface test according to Table A (originating station) and Table B (answering station) on each data set.

5. CUSTOMER VERIFICATION

5.01 When the preceding tests have been completed and the test requirements have been met, suggest to the customer that he verify that the service is satisfactory. If customer has messages to transmit, verify that the service is satisfactory. If customer has no messages to transmit, consider the Data Set 103A type satisfactory for service.

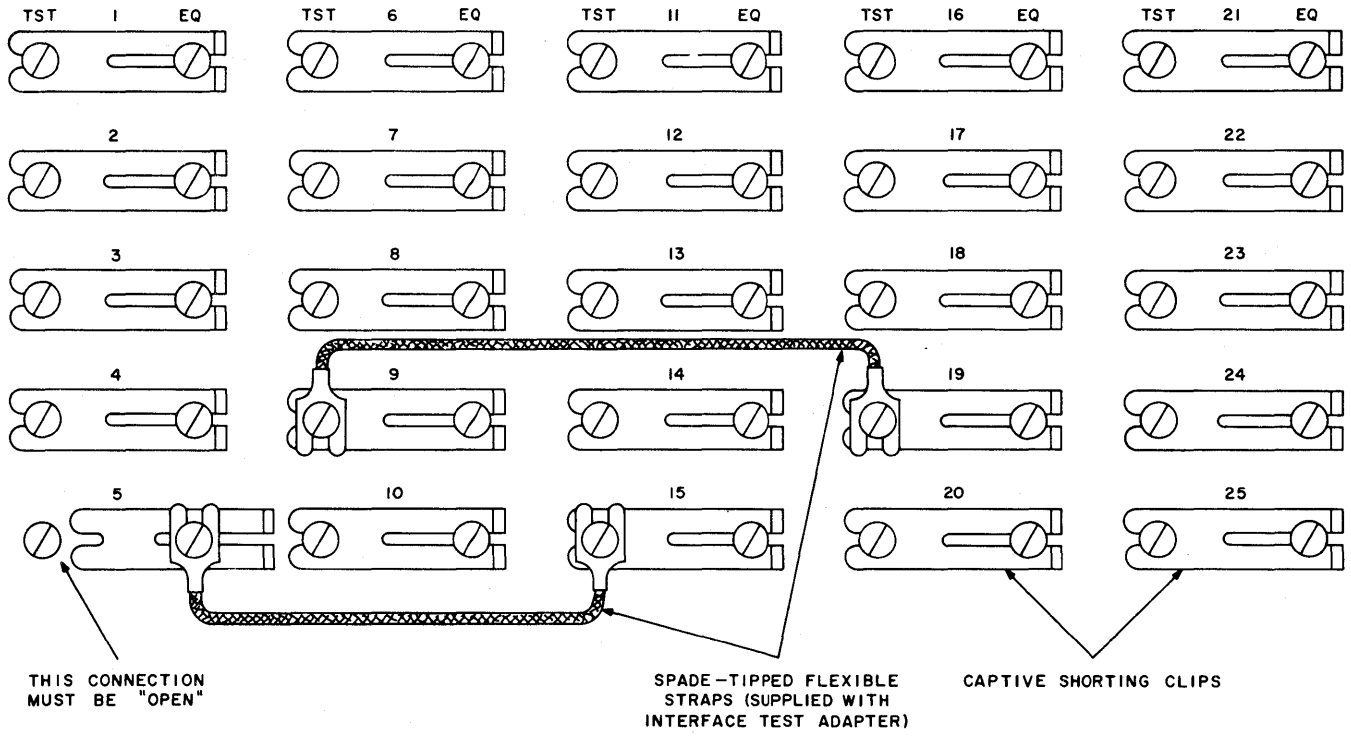


Fig. 2 — Interface Test Adapter, Connection Arrangement, Data Set 103A Type

TABLE A

TESTS FOR ORIGINATING STATION

STEP	PREPARATION	901B DATA TEST SET			VOLT-OHM-MILLIAMMETER				INTERFACE LEAD AND CONDITION
		TEST SWITCH		TOGGLE SWITCH	SCALE	CONNECT PROBE		READING	
		A	B			+	−		
1	Connect interface test adapter (strapped per Fig. 2) to interface connector of data set.								
2	Connect 901B Data Test Set to interface test adapter. Set SELECTOR switch of 901B Data Test Set to Position 1.	2	OFF	UNATT	12 VDC	C	A	8.5 ± 1.5	BB (MARK)
3	Change meter scale before moving TEST switch.	3	OFF	UNATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)
4		5	OFF	UNATT	60 VDC	C	B	22.0 ± 3.0	CB (OFF)
5	Call data test center. Request center to send 2025 Hz for Data Set 103A1, or 2225 Hz for Data Set 103A2. Go to data mode when tone is heard.	3	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CC (ON)
6	Maintain voice communication with data test center on another line.	5	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CB (ON)
7		6	OFF	UNATT	12 VDC	C	A	8.5 ± 1.5	BB (MARK)
8		3	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CC (ON)
9	(A) ***If respond to disconnect option is provided:*** (1) Request data test center send 2225 Hz for Data Set 103A1, or 2025 Hz for Data Set 103A2. (2) There will be a delay of 2 seconds after the tone is received and reading is observed. (3) End of test, data set should go to on-hook condition.	3	OFF	UNATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)

TABLE A (Cont)

TESTS FOR ORIGINATING STATION

STEP	PREPARATION	901B DATA TEST SET			VOLT-OHM-MILLIAMMETER				INTERFACE LEAD AND CONDITION
		TEST SWITCH		TOGGLE SWITCH	SCALE	CONNECT PROBE		READING	
		A	B			+	−		
9 (Cont)	(B) ***If respond to disconnect option is not provided:*** (1) Request data test center send 2225 Hz for Data Set 103A1, or 2025 Hz for Data Set 103A2. (2) If initiate disconnect option is not provided, reading should be observed immediately after operating ATT switch. (3) If initiate disconnect option is provided, there will be a delay of 3 seconds after operating ATT switch and observing meter reading. (4) End of test, data set should go to on-hook condition.	2	OFF	UNATT	12 VDC	A	C	8.5 ± 1.5	BB (SPACE)
		3	OFF	ATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)

TABLE B

TESTS FOR ANSWERING STATION

STEP	PREPARATION	901B DATA TEST SET			VOLT-OHM-MILLIAMMETER				INTERFACE LEAD AND CONDITION
		TEST SWITCH		TOGGLE SWITCH	SCALE	CONNECT PROBE		READING	
		A	B			+	−		
1	Connect interface test adapter (strapped per Fig. 2) to interface connector of data set.								
2	Connect 901B Data Test Set to interface test adapter. Set SELECTOR switch of 901B Data Test Set to Position 1.	2	OFF	ATT	12 VDC	C	A	8.5 ± 1.5	BB (MARK)
3	Change meter scale before moving TEST switch.	5	OFF	ATT	60 VDC	C	B	22.0 ± 3.0	CB (OFF)
4		3	OFF	ATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)
5	Disconnect meter before changing meter scale.	2	OFF	ATT	60 VDC	C	B	22.0 ± 3.0	CE (OFF)
6	Depress AUTO ANS button. Have a data test center call. (Maintain voice communication with data test center on another line.)	2	OFF	ATT	60 VDC	B	C	* 22.0 ± 3.0	CE (ON)
7	Disconnect meter before changing meter scale.	3	OFF	ATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)
8	Ringer in telephone should stop ringing. Data set should go to data mode.	3	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CC (ON)
9	Disconnect meter before moving TEST switch.	5	OFF	UNATT	60 VDC	C	B	22.0 ± 3.0	CB (OFF)
10	Pick up telephone handset, depress TALK button, and verify that voice communication is possible with data test center.	3	OFF	UNATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)
11	Depress DATA button. A 2025- or 2225-Hz tone will be heard at DTC for A1 or A2, respectively.	3	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CC (ON)

TABLE B (Cont)

TESTS FOR ANSWERING STATION

STEP	PREPARATION	901B DATA TEST SET			VOLT-OHM-MILLIAMMETER				INTERFACE LEAD AND CONDITION
		TEST SWITCH		TOGGLE SWITCH	SCALE	CONNECT PROBE		READING	
		A	B			+	-		
12	Request data test center send 1070 Hz for Data Set 103A1, or 1270 Hz for Data Set 103A2.	5	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CB (ON)
13		6	OFF	UNATT	12 VDC	C	A	8.5 ± 1.5	BB (MARK)
14		3	OFF	UNATT	60 VDC	B	C	22.0 ± 3.0	CC (ON)
15	(A) ***If respond to disconnect option is provided:*** (1) Request data test center send 1270 Hz for Data Set 103A1, or 1070 Hz for Data Set 103A2. (2) There will be a delay of 2 seconds after tone is received and reading is observed. (3) End of test, data set should go to on-hook condition.	3	OFF	UNATT	60 VDC	C	B	22.0 ± 3.0	CC(OFF)
15	(B) ***If respond to disconnect option is not provided:*** (1) Request data test center send 1270 Hz for Data Set 103A1, or 1070 Hz for Data Set 103A2. (2) If initiate disconnect option is not provided, reading should be observed immediately after operating ATT switch.	2	OFF	UNATT	12 VDC	A	C	8.5 ± 1.5	BB (SPACE)

TABLE B (Cont)

TESTS FOR ANSWERING STATION

STEP	PREPARATION	901B DATA TEST SET			VOLT-OHM-MILLIAMMETER				INTERFACE LEAD AND CONDITION
		TEST SWITCH		TOGGLE SWITCH	SCALE	CONNECT PROBE		READING	
		A	B			+	-		
15 (B) (Cont)	(3) If initiate disconnect option is provided, there will be a delay of 3 seconds after operating ATT switch and reading is observed. (4) End of test.	3	OFF	ATT	60 VDC	C	B	22.0 ± 3.0	CC (OFF)

*This reading should be observed during ringing voltage portion of ringing cycle.

6. END-TO-END TESTS

6.01 The following tests should be made only when there is a report of transmission difficulties or poor error performance. If these tests fail, report facility trouble to the Direct Distance Dialing (DDD) Service Bureau.

6.02 The following test equipment is required at *each* station:

- 901B Data Test Set
- J79901B, List 3 Interface Test Adapter
- 902 type Data Test Set
- 903 type Data Test Set
- 1011 type handset

6.03 A block diagram illustrating the equipment set up for end-to-end tests is shown in Fig. 4.

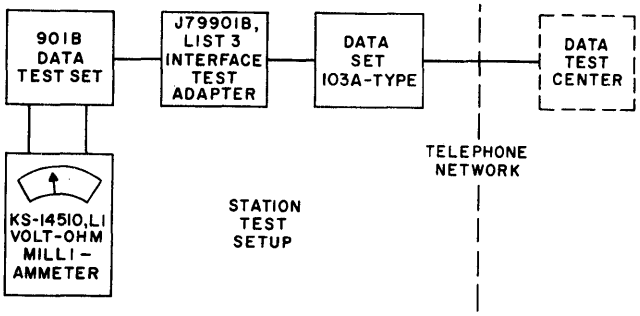


Fig. 3 — Interface Test, Block Diagram

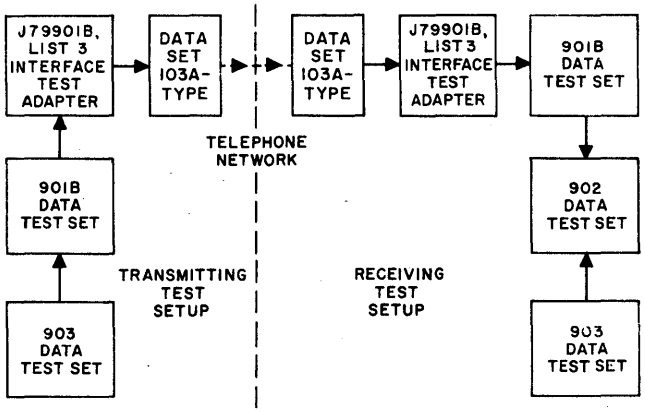


Fig. 4 — End-to-End Test, Block Diagram

6.04 Verify that the test equipment is in good operating condition. Refer to the appropriate sections covering operational and calibra-

tion tests. Sections covering data test sets specified in these tests are as follows:

DATA TEST SET	SECTION
901B (and adapter)	107-100-100
902 type	107-300-100
903 type	107-200-100

6.05 The block diagram shows the equipment set up at the two terminals for testing one direction of transmission. The test setup is reversed at each end to test the other direction of transmission. This checks the transmitter and receiver of both data sets and the two directions of transmission of the connecting facilities.

6.06 These tests measure the distortion and error rate of the data system. The transmitting data set is driven by a 903 type Data Test Set (63-bit word generator). At the receiving end, the data set feeds the data signals to a 902 type Data Test Set (distortion-measuring and error-checking set). Also at the receiving end, a 903 type Data Test Set is used to deliver to the 902 type Data Test Set a signal identical to the signal sent from the transmitting end. The 902 type Data Test Set synchronizes these two signals, measures the peak distortion, and counts the number of errors in the received data.

Caution: Do not connect the 903 type Data Test Set until all other equipment is connected and all equipment switches have been placed to proper settings. Do not change switch settings of the test equipment to any settings other than those specified for the specific data set being tested.

PREPARATION OF TEST AND DATA SETS

6.07 Transmit End

- 901B Data Test Set:

  SELECTOR to Position 1

  A TEST to OFF

  B TEST to Position 3

  ATT-UNATT to UNATT

- 903 Type Data Test Set:

  RANDOM-DOT to RANDOM

  TRIGGER to +

  BIT RATE { 180, DATA-PHONE data service / 75, TWX network

(1) On the interface test adapter, strap terminals by use of spade-tipped flexible straps provided and as shown in Fig. 2. Open ← connection between terminals 5EQ and 5TST by moving captive shorting clip. Verify that all other captive shorting clips are arranged according to Fig. 2. ←

(2) Connect the interface test adapter to the interface connector of the data set (in place of the business machine cord).

(3) Connect 901B Data Test Set to connector of the interface test adapter.

(4) Run two leads from SIGNAL OUT terminals of 903 type Data Test Set to TRANSMIT DATA terminals of 901B Data Test Set. Connect red to red and black to black.

(5) Connect the power cord of 903 type Data Test Set to 117-volt ac outlet. Turn power switch ON.

6.08 Receive End

- 901B Data Test Set:

  SELECTOR to Position 1

  A TEST to OFF

  B TEST to Position 3

  ATT-UNATT to UNATT

- 902 Type Data Test Set:

  BIT RATE to transmitted bit speed

  Meter selection switch to DIST ADJ

  TRIGGER — Not required

- 903 Type Data Test Set:

  BIT RATE to EXT CLOCK

  RANDOM-DOT to RANDOM

  TRIGGER to +

(1) Run two leads from RECEIVE DATA terminals of the 901B Data Test Set to DATA IN terminals of the 902 type Data Test Set. Connect red to red and black to black.

(2) On the interface test adapter, strap terminals by use of spade-tipped flexible straps provided and as shown in Fig. 2. Verify that all other captive shorting clips are arranged according to Fig. 2.

(3) Connect interface test adapter to interface connector of data set (in place of business machine cord).

(4) Connect 901B Data Test Set to connector of the interface test adapter.

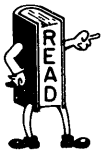
(5) Run one lead from red TRANSMIT DATA terminal of the 901 type Data Test Set to the red SIGNAL OUT terminal of the 903 type Data Test Set.

(6) Connect the 903 type Data Test Set to the 902 type Data Test Set with the cord provided.

(7) Connect power cord of 903 type Data Test Set to 117-volt ac outlet. Turn power switch ON.

6.09 Complete end-to-end tests will involve making two 15-minute and ten 1-minute test calls. Establish voice communication in the manner normally used by the customer when placing data calls, e.g.:

- DDD
- Attendant- or operator-assisted



Take proper steps to insure that the customer is not billed for calls on test (Section 010-250-001).

6.10 Alternately place calls from each end except where one customer location will always be originating the call. These test calls should be made during busy hours. This will give reasonable assurance that all test calls do not use the same trunks and routes.

PROCEDURE

6.11 Establish voice communication between stations.

6.12 The transmitting end shifts from the talk mode to the data mode by depressing the DATA button and momentarily depressing the START switch of the 903 type Data Test Set. The transmitting station has no further duties until the end of the test period.

6.13 The receiving end shifts from the talk to the data mode by depressing the DATA button and performs the following steps:

(1) Allows the 902 type Data Test Set meter selection switch to remain in the DIST ADJ position for several seconds before making distortion calibration adjustment.

(2) Zeros the meter by means of the DISTORTION adjustment knob.

(3) Moves the meter selection switch to VOLT ADJ position and again zeros the meter by means of the VOLTS adjustment control.

(4) Moves the meter selection switch to PHASE ADJ and again zeros the meter by means of the PHASE adjustment control.

Note: The BIAS ADJ position on the 902 type Data Test Set is not used in this test.

(5) Moves the meter selection switch to DIST MEAS. Depresses the WORD SYNC & RESET switch momentarily and records the time.

(6) The microammeter should settle down to some relatively stable value that indicates peak distortion. One microamp is equal to one percent distortion. For example, a meter indication of 8 microamps would be 8 percent peak distortion.

(7) The TOTAL ERROR lamps lighted on the 902 type Data Test Set indicate the number of errors in received data from the time the WORD SYNC & RESET switch was released. For example, should the 8, 4, and 1 lamps be lighted, this would be an indication of a total of 13 errors.

TEST CALL REQUIREMENTS

6.14 During the 15-minute calls, count errors in one-minute test periods:

(1) Disregard the two test periods with the highest number of errors.

(2) Of the remaining 13 test periods, 10 periods may have no bit errors per period.

(3) The remaining three test periods may have no more than two errors per period.

6.15 For the one-minute calls:

(1) No more than 2 bit errors should occur in 8 out of 10 calls.

(2) An average distortion of 20 percent must not be exceeded in 9 out of 10 calls.

(3) The maximum allowable average distortion must not exceed 20 percent. An occasional peak over 20 percent is permissible as long as the 20 percent average is not exceeded.

Note: The above rates are in no way guaranteed error rates. Except in unusual circumstances, the error rates experienced by the customer should be considerably less.