

DATA SET 109F USED IN DATREX* SERVICE

TEST PROCEDURE

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1. GENERAL

1.01 This practice provides information for testing Data Set 109F (Fig. 1) when used as part of a DATREX system. The test procedures given in this section can be used to verify that the data station is operative and to aid in locating and clearing a trouble condition.

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1.02 These tests procedures check the operation of the combined data sets and teletypewriter as a station. When it is necessary to check the teletypewriter separately, refer to the applicable Field Maintenance Practice (FMP) for the teletypewriter (TTY) used at the station.

1.03 The Data Set 109F and the associated TTY make up the data station provided for the line side of the 10-type concentrator. The test procedure given in this practice checks the data station and line to the concentrator. No attempt is made to verify that the operation of the concentrator or trunk-side equipment is acceptable,

except for a loop-back test which provides an operational system test.

1.04 All the tests given in this section can be used independently since each test is complete and does not depend upon the performance or results of any preceding test. Some of the tests given in this practice overlap and thereby provide more than one method of checking the data equipment. When this is the case, the test to be used is left to the discretion of the telephone craft employee and the available test equipment. Due to this overlap, not all of the tests will be required and only those tests that are needed to locate an abnormal or trouble condition need be performed.

1.05 A suggested sequence of testing, to locate or isolate a trouble condition, is given by the section entitled Data Set 109F Used in DATREX* Service—Maintenance (591-035-301). By using the sequence of testing recommended in the maintenance section, unnecessary testing can be avoided when locating or pinpointing a trouble condition.

1.06 In order to perform the following test, a telephone company employee will have to be dispatched to the station. In some cases, a double dispatch is necessary when assistance is required at the concentrator or trunk-side station.

2. TEST EQUIPMENT

2.01 In addition to the normal maintenance tools and equipment carried by craft employees, the following equipment will be required to perform the tests given in this section.

- 911A Data Test Set (DTS) (J-79911A)
- 901B-23 Data Test Set cover (used as an interface test adapter)
- KS-14510-L1 volt-ohm-milliammeter or equivalent

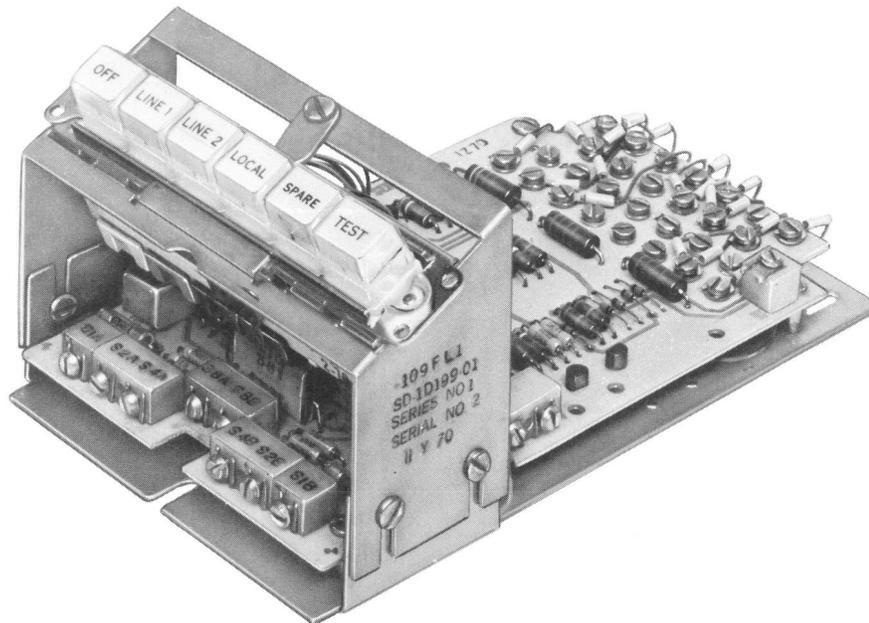


Fig. 1—Data Set 109F

- W1AD cord, 4 feet 7 inches long, equipped with one 35 cord tip and one 27 Mueller test clip with 29 Mueller insulator, black (used for connection of the interface test adapter and 911A DTS) or equivalent
- W1BB cord, 2 feet long, equipped with one KS-19531-L2 connector and one 30 Mueller test clip with No. 32 insulator (used for connection of the interface test adapter to the 911A DTS), or equivalent—2 required.

3. TEST PROCEDURES

LINE RESISTANCE MEASUREMENTS

Note: The line current test can be substituted for the following line resistance test. Since it is not necessary to perform both tests, the test used is left to the discretion of the telephone craft employee.

3.01 This test checks the resistance of the line from the Data Set 109F to the 10-type concentrator. Information is provided in this test for determining if a change in line resistance is appreciable, therefore requiring corrective action.

This test will also indicate that the line is not shorted or open.

3.02 Measure the line resistance as follows.

Note: This procedure requires a telephone company employee at the concentrator to complete the test.

- (1) Obtain access to the data set terminals. Refer to the section entitled Data Set 109F Used in DATREX* Service—Maintenance (591-035-301).
- (2) Establish voice communication with the telephone company employee at the concentrator.
- (3) Request that the line to be tested be shorted at the concentrator.
- (4) Remove one side of the line from the data set.
- (5) Use a KS-14510-L1 volt-ohm-milliammeter to measure the resistance of the line.
- (6) Record the line resistance by using the KS-14510-L1 volt-ohm-milliammeter.

Note: If an open indication was obtained in (6), verify that the line is shorted at the concentrator. An open indication with the line shorted at the concentrator shows the line has gone open and must be replaced. If line resistance has decreased, a short-circuit condition may exist and the line should be checked for this condition. To check for a short, one side of the line will have to be removed from both the data set and the concentrator before measuring the line, which should indicate an open.

- (7) Compare the resistance measured in (6) with the resistance shown on the line order or circuit order card. If the resistance has not changed an appreciable amount, the line can be considered acceptable. See the following note for a definition of an appreciable change.

Note: An appreciable change in resistance is any amount that causes the total resistance of the DATREX system to exceed a nominal 2,000 ohms. The Data Set 109F line pads may be adjusted to compensate for changes in line resistance (refer to Section 591-035-201). If the change in resistance cannot be compensated for by adjusting the line pads, the line will have to be replaced or repaired.

- 3.03** After the completion of the preceding test procedures, inform the telephone company employee of the results.

Note: If the line is still shorted or disconnected from the concentrator or data set, it should be restored to operating condition at this time. Make sure the line is reconnected to the proper terminals.

- 3.04** When the line is to be replaced, refer to the section entitled Data Set 109F Used in DATREX* Service—Installation and Connections (591-035-201) for information on setting the line pad resistance and obtaining the proper polarity when connecting the line.

LINE CURRENT TEST

Note: The line resistance test and voltage test can be substituted for the following line current test. Since it is not necessary to perform each test, the one used is left to the discretion of the telephone craft employee.

- 3.05** This test checks the ability of the Data Set 109F to provide an acceptable request-for-service signal to the 10-type concentrator.

- 3.06** In order to perform a valid line current test, the line to the concentrator must be acceptable as well as the output of the data set. When the line is known good, from the performance of the previous test, any trouble experienced indicates a malfunction of the data set.

- 3.07** Make a line current test by performing the following steps.

Note: This procedure requires a telephone company employee at the concentrator to perform this test. An alternate procedure that does not require a telephone company employee at the concentrator verifies the pad and line resistance by measuring the camp-on signal loop current. When a camp-on signal can be obtained, a KS-14510-L1 meter is connected as indicated in (4) and (5) and Fig. 2. The correct or acceptable camp-on loop current is given in the appropriate column of Table A.

- (1) Obtain access to the data set terminals. Refer to the section entitled Data Set 109F Used in DATREX* Service—Maintenance (591-035-301).
- (2) Establish voice communication with the telephone company employee at the concentrator.
- (3) Request that the line of the station being tested be shorted at the concentrator.
- (4) Refer to Fig. 2 and remove the line from terminal 24 of the EU2 circuit pack.
- (5) Connect the positive lead of the KS-14510-L1 volt-ohm-milliammeter to the line.
- (6) Connect the negative lead of the KS-14510-L1 to terminal 24 of the EU2 circuit pack.
- (7) Set the KS-14510-L1 volt-ohm-milliammeter to measure milliamps.
- (8) Operate the LINE 1 key.
- (9) Record the indicated loop current.

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(10) Find the total resistance of the data set pads and the facility in Table A. If the current recorded in (9) is between the limits given in the appropriate line of Table A, the data set line current is acceptable.

Note: To determine the resistance value of the data set pads, refer to the section entitled Data Set 109F Used in DATREX* Service—Installation and Connections (591-035-201).

(12) After completing the line current test, request that the telephone company employee remove the short at the concentrator.

3.08 When dual access is provided, a line current test using the LINE 2 key can be made. When this is done, the polarity will be reversed from the connections given for the LINE 1 key test shown by Fig. 2.

VOLTAGE TEST

Note: The line current test can be substituted in place of the following voltage test. Since it is not necessary to perform each test, the one used is left to the discretion of the telephone craft employee.

3.09 The voltage test checks the ability of the data set to provide an acceptable mark and space voltage. Perform the following steps to make a voltage test.

- (1) Obtain access to the Data Set 109F terminals. Refer to the section entitled Data Set 109F Used in DATREX* Service—Maintenance (591-035-301).
- (2) Open the line by removing either the T or R lead from the data set.
- (3) Connect a KS-14510-L1 volt-ohm-milliammeter across the T and R terminals of the data set. For information on the line connections to the data set, refer to the section entitled Data Set 109F Used in DATREX* Service—Installation and Connections (591-035-201).
- (4) Operate the data station and measure the voltage at the data set terminals. A mark voltage should be from 4.0 to 4.6 volts. A space

voltage should be opposite in polarity to the mark voltage and be between 12.0 and 14.0 volts.

STATION TEST (LOCAL)

3.10 When the station being tested is arranged to provide full-duplex service, the operation of the LOCAL key loops the signal from the TTY through the data set and back to the TTY selector magnet driver. This provides a test of both the TTY and the data set circuits. The slicing level of the data set can also be checked as follows (applies to FDX only).

- (1) Open the line by removing either the T or R connection.
- (2) Condition the data set to provide space crossover shift (refer to 591-035-201).
- (3) Operate the LINE 1 key. The TTY will run open until the BREAK key is depressed which will cause the TTY to run closed.
- (4) Condition the data set to provide mark crossover shift (refer to 591-035-201) and operate the LINE 1 key. The TTY will run closed. When the BREAK key is depressed, the TTY will continue to run closed. The previous test indicates satisfactory operation of the slicing level.

3.11 Operation of the LOCAL key when the station is arranged for half-duplex operation provides a test of the TTY only. In the local mode, the TTY can be operated and the characters generated will be printed by the TTY machine.

LOOP-BACK DISTORTION TEST USING THE DATA SET TEST KEY AND 911A DATA TEST SET

3.12 The Data Set 109F is equipped with a TEST key that provides for loop around testing. This test can only be made from a trunk-side data station after a connection is forced at the concentrator. Due to the difficulty of making this test, it is performed only when it is necessary to check the overall system by a loop-back distortion test.

3.13 When the line data set is placed in the test mode, the following conditions exist.

- The send contacts of the TTY are isolated from the data set.

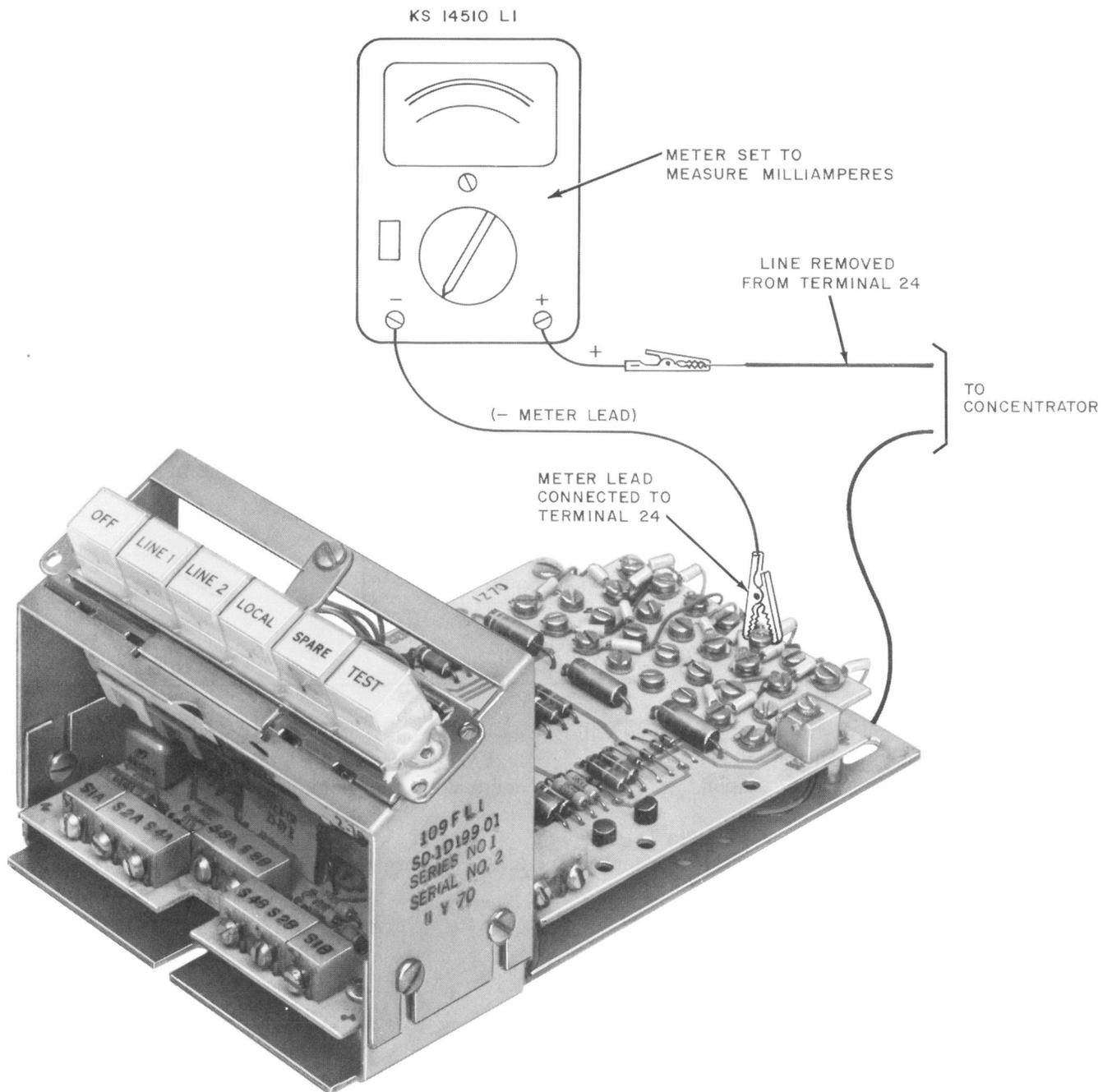


Fig. 2—Connections for Measuring the Data Set 109F Line Current

- The data set is conditioned for full-duplex operation to enable loop-back testing.
- The data set is conditioned to receive the incoming signal, loop it through the data set, and retransmit the signal to the line.

- The TTY will print the received signal.

Note: The loop-back test procedures require three telephone company employees since an employee will be required at the line station, concentrator, and trunk station. Initiation

TABLE A
DATA SET LOOP CURRENT ADJUSTMENTS

APPROXIMATE RESISTANCE OF DATA SET AND LINE TO CONCENTRATOR	LINE PAD ADJUSTMENT WITH CAMP-ON SIGNAL LOOP CURRENT (ma)	LINE PAD ADJUSTMENT WITH SHORT CIRCUIT AT CONCENTRATOR LOOP CURRENT (ma)
1650 to 1500	1.6 to 1.8	2.2 to 2.4
1550 to 1400	1.7 to 1.85	2.3 to 2.5
1450 to 1300	1.75 to 2.0	2.4 to 2.7
1350 to 1200	1.85 to 2.1	2.6 to 2.9
1250 to 1100	2.0 to 2.2	2.8 to 3.1
1150 to 1000	2.1 to 2.4	3.0 to 3.3
1050 to 900	2.25 to 2.55	3.2 to 3.6
950 to 800	2.4 to 2.75	3.4 to 3.9
850 to 700	2.6 to 3.0	3.7 to 4.3
750 to 600	2.85 to 3.3	4.1 to 4.8
650 to 500	3.1 to 3.7	4.5 to 5.4
550 to 400	3.5 to 4.2	5.0 to 6.2

and coordination of the test procedure will be the responsibility of the telephone company employee at the trunk-side station.

measurements. Refer to Fig. 3 and the following text for information on setting up the test equipment and making the required test connections.

3.14 A loop-back test using a 911A Data Test Set provides a method of making system distortion

3.15 Perform the following Step-Action-Verification.

STEP	ACTION	VERIFICATION
1	At the 27A1 Data Unit associated with the trunk data set being used for this test, the following action must be taken. Disconnect the customer-provided terminal (CPT) interface cable from the connector of the data set.	

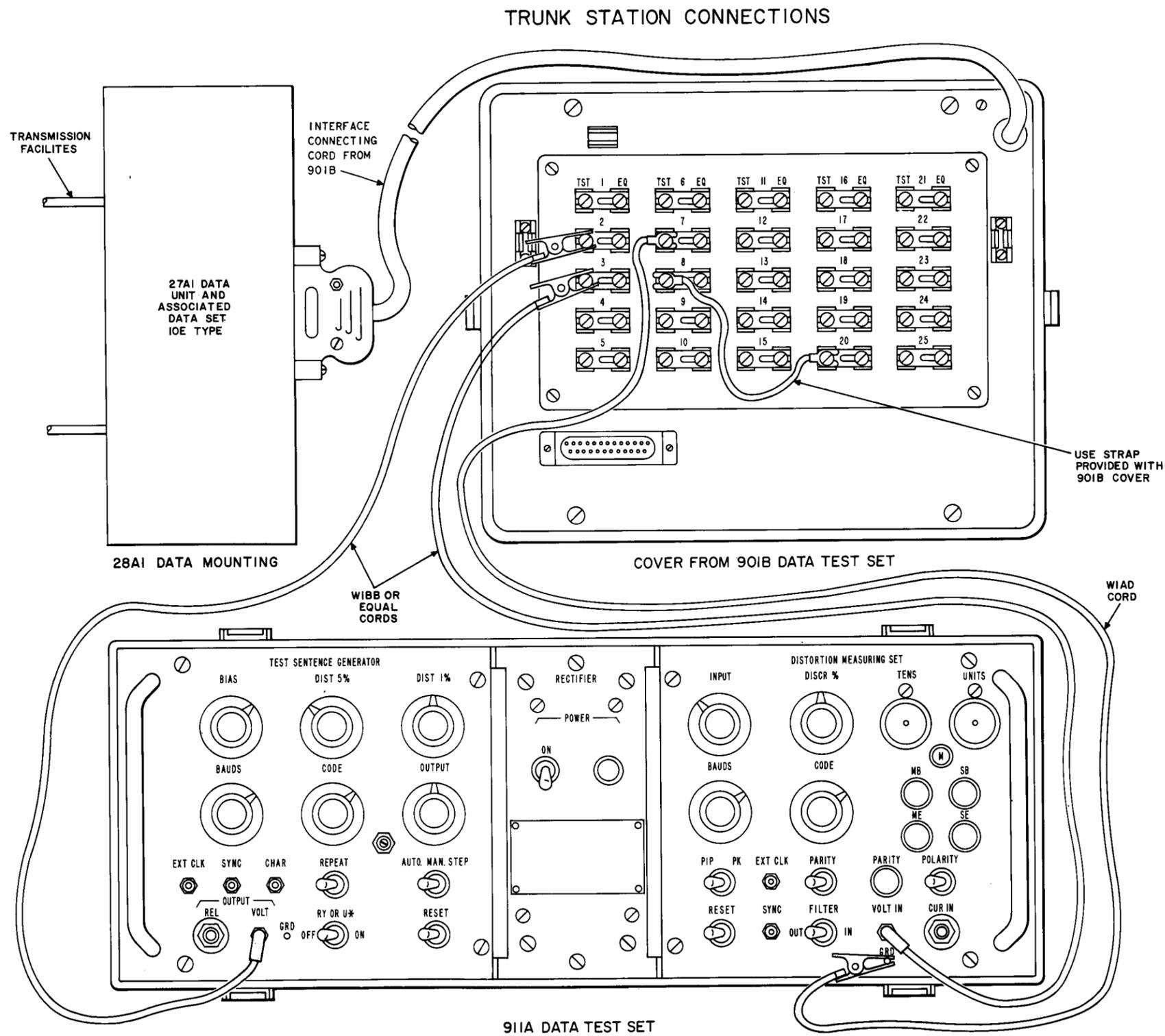


Fig. 3—Loop-Back Distortion Test Using the 911A Data Test Set

STEP	ACTION	VERIFICATION
2	Make the connections indicated in Fig. 3.	
3	Operate the controls on the TEST SENTENCE GENERATOR section of the 911A DTS as indicated in Table B.	

TABLE B

911B DATA TEST SET — CONTROL SETTINGS

CONTROL	SETTING
BIAS	0
DIST 5%	0
DIST 1%	0
BAUDS	Rate provided by terminal equipment
CODE	Code used by terminal equipment
OUTPUT	EIA
AUTO-MAN-STEP	MAN
All other	OFF

- 4 Operate the controls on the DISTORTION MEASURING SET section of the 911A DTS as indicated in Table C.

Note: When performing this test, take the proper steps to ensure the customer is not billed for test calls. Refer to the section

TABLE C

911C DATA TEST SET — CONTROL SETTINGS

CONTROL	SETTING
INPUT	EIA
DIST %	0
BAUDS	Rate provided by terminal equipment
CODE	Code used by terminal equipment
PK-PIP	PK
PARITY	OFF
POLARITY	+
FILTER	OUT

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STEP	ACTION	VERIFICATION
		entitled Crediting Charges on Test Calls (010-250-001).
5	Operate the POWER switch on the 911A DTS to the ON position.	POWER lamp lights on the 911A DTS.
6	Using a nearby telephone— Call the line station and inform the station that the trunk station has performed the operations required for making this test.	Note: The telephone company employee at the concentrator must be instructed to force the test call to the trunk station used for this test. (Refer to Sections 591-811-500 and 591-811-501.)
7	Initiate a call from the line station being tested by depressing the LINE 1 key.	The LINE 1 key lights.
8	At the line station— While holding the LINE 1 key depressed, depress the TEST key.	The LINE 1 key remains lighted and the TEST key lights. The TTY will now print out whatever is received from the line. Note: The trunk-side data set is now looped back through the line-side data set providing for an end-to-end test. This test must be made from the trunk-side data station using the 911A DTS as indicated in the following steps.
9	At the trunk station— Set the AUTO MAN STEP switch to AUTO. This switch is located on the TEST SENTENCE GENERATOR (TSG) section of the 911A DTS.	
10	Operate both of the RESET switches. There is a RESET switch on both the TSG and the distortion measuring set (DMS).	At the line station end— TTY repeatedly prints out "THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 1234567890 TESTING" error free. (Each test message will be preceded by two carriage returns, a rub out character, and a line feed). The measured distortion at the trunk station should not exceed 15%.
11	Disconnect all test equipment and return all stations to service.	
3.16	The telephone company employee at the trunk station should inform the line station of the results of this test and the percentage distortion that was measured.	send, and receive. A test sentence such as "FOX" can be used to check the trunk station and customer equipment receiving capability.
3.17	System operation may be checked by operating the line station to verify that it will connect,	