

DATA SET 109F
PRIVATE LINE APPLICATION
TEST PROCEDURES

	CONTENTS	PAGE
1. GENERAL	1
2. TEST EQUIPMENT	1
3. TEST PROCEDURES	2
LINE RESISTANCE MEASUREMENTS	2
LINE CURRENT TEST	3
VOLTAGE TEST	3
LOCAL COPY TEST	5
SLICING LEVEL TEST	5
LOOP-BACK TEST	5
DISTORTION TEST USING THE 911A DATA TEST SET	5

1. GENERAL

1.01 This practice provides information for testing data set 109F (Fig. 1) when used as part of a private line 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.

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

1.03 The data set 109F and the associated TTY make up the data station. The test procedure given in this practice checks the data station and line to the data set at the far end. No attempt is made to verify that the operation of the data station at the far end 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.

Note: When applicable, the local station test will isolate most trouble conditions in the TTY or data set with only one man at the data station.

1.05 A suggested sequence of testing, to locate or isolate a trouble condition, is given by the section entitled Data Set 109F—Private Line Application—Maintenance (591-035-300). By using the sequence of testing recommended in the maintenance section, unnecessary testing can be avoided when locating or pinpointing a trouble condition.

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 Data Test Set cover (interface test adapter)
- KS-20538-L1 volt-ohm-milliammeter (VOM), or equivalent

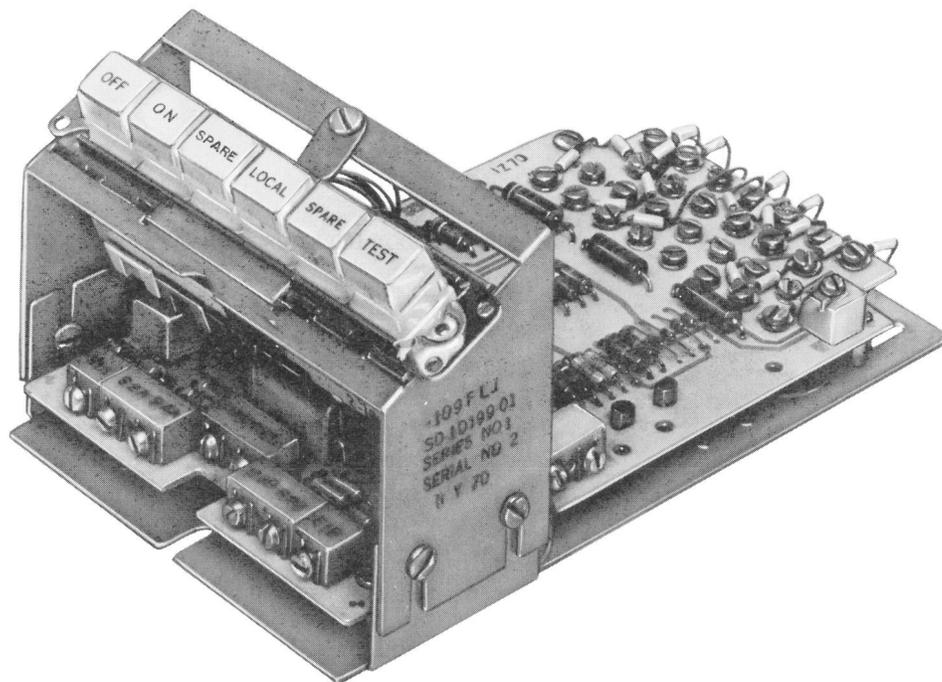


Fig. 1—Data Set 109F

- 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
- W1AH cord, 6 feet long, equipped with one amp No. 6 terminal and one 45 Mueller pee-wee clip with one 47 Mueller insulator, black (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. The resistance test is used if a change in line resistance is suspected.

3.01 This test checks the resistance of the line from the data set 109F to the data set at the far end. 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 far end of the metallic loop to complete the test.

- (1) Obtain access to the data set terminals. Refer to Section 591-035-300.
- (2) Establish voice communication with the telephone company employee at the far end.
- (3) Request that the line to be tested be shorted at the far end.
- (4) Remove one side of the line from the near-end data set.
- (5) Use a VOM to measure the resistance of the line.
- (6) Record the line resistance.

Note: If an open indication was obtained in (6), verify that the line is shorted at the far end. An open indication with the line shorted at the far end 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.

- (7) Compare the resistance measured in (6) with the resistance shown on the line order or circuit order card. If the resistance is within ± 65 ohms of the correct value, the line can be considered acceptable.

Note: The data set 109F line pads may be adjusted to compensate for changes in line resistance [refer to the section entitled Data Set 109F—Private Line Application—Installation (591-035-200)]. 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 at the far end of the results.

Note: If the line is still shorted or disconnected from either 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 Section 591-035-200 for information on setting the line pad resistance and obtaining the proper polarity when connecting the line.

LINE CURRENT TEST

- 3.05** The line current test is generally the quickest and simplest means of testing the output of data set 109F and the line facility. When the line is known to be good from the performance of the previous test, any trouble experienced indicates a malfunction of the data set.

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

Note: This procedure requires aid from either a telephone company employee or a customer at the far data set to perform this test.

- (1) Obtain access to the near-end data set terminals. Refer to Section 591-035-300.
- (2) Establish voice communication with the telephone company employee or customer at the far-end data set.
- (3) If the far-end data set is equipped with option K (transmits mark when OFF), request that the OFF button be depressed. If the far-end data set is equipped with option M (transmits space when OFF), request that the ON and TEST buttons be depressed, or request that the ON button be depressed and that the customer transmit a steady mark.

Note: When the TEST button is depressed, the far-end data set is looping back received signals. The near-end data set controls the far-end data set. If the near-end data set transmits a mark, the far-end data set will transmit a mark.

- (4) Refer to Fig. 2 and remove the line from terminal 22 of the EU2 circuit pack.
- (5) Connect the positive lead of the VOM to the line.
- (6) Connect the negative lead of the VOM to terminal 22 of the EU2 circuit pack.
- (7) Set the VOM to measure milliamps.
- (8) Operate the ON key.
- (9) Record the indicated loop current.
- (10) The loop current should indicate from 3.0 to 3.2 mA.
- (11) After completing the line current test, inform the customer or telephone company employee at the far end that the test is completed.

VOLTAGE TEST

Note: The line current test can be substituted in place of the following voltage test.

- 3.07** 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.

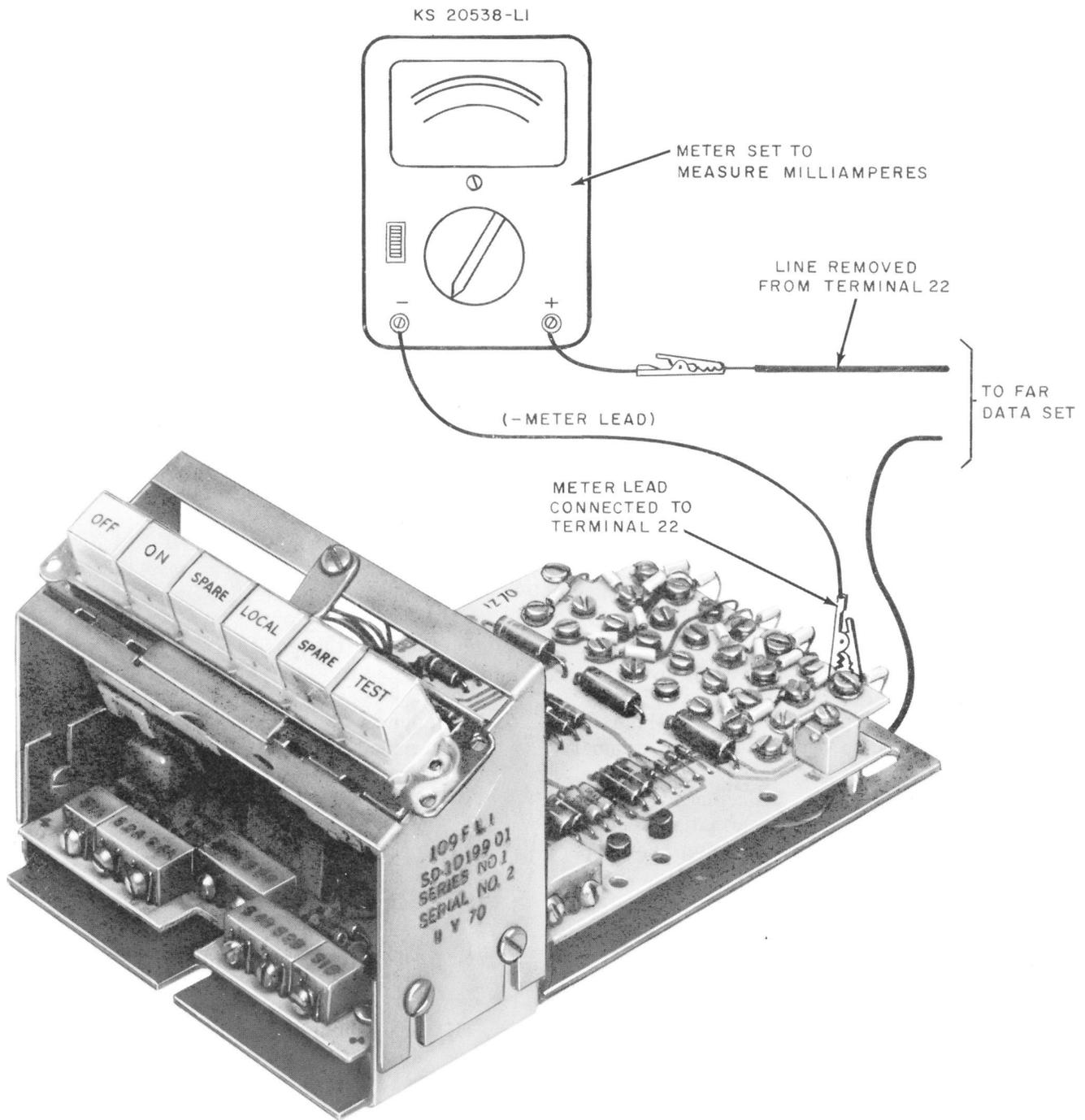


Fig. 2—Connections for Measuring the Data Set 109F Line Current

- (1) Obtain access to the data set 109F terminals. Refer to Section 591-035-300.
- (2) Open the line by removing one of the leads from either terminal 7 or 22.
- (3) Connect VOM from terminal 7 to 22. For information on the line connections to the data set, refer to Section 591-035-200.
- (4) Operate the data station and measure the voltage at the data set terminals. Transmit a mark. The voltage should be from 4.0 to 4.6 volts. Transmit a space. The voltage should be opposite in polarity to the mark voltage and should be between 12.0 and 14.0 volts.

LOCAL COPY TEST

3.08 When the station being tested is arranged with a teletypewriter 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. Typing a message to check local copy provides a test of both the TTY and the data set circuits.

SLICING LEVEL TEST

3.09 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 tip or ring from terminal 7 or 22.
- (2) Condition the data set to provide space crossover shift (refer to Section 591-035-200).
- (3) Operate the ON 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 591-035-200) and operate the ON 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.

LOOP-BACK TEST

3.10 If the far-end data set is placed in the TEST mode, any data sent from the near-end data

set will be looped-back. Although a distortion measurement cannot be made, the ability of the system to loop back data without distortion can be checked by typing a test message at the near-end station. This loops the message through the far-end data set and back to the near-end station where the message is checked for distortion. Since the customer can be requested to press the TEST key at the far-end station, only one telephone craft employee is required to perform this test.

DISTORTION TEST USING THE 911A DATA TEST SET

3.11 Due to the difficulty of making this test, it is performed only when it is necessary to check the overall system distortion.

Note: A distortion test is not performed when the far-end data set is associated with a TTY because there is not a simple way to plug into the interface between the data set and TTY. If the far-end data set is used in conjunction with a low-voltage hub, the distortion test can be performed at the hub according to the section entitled Type-3 Low Voltage Hub—Test Procedures (312-807-500). If the far-end data set is used in conjunction with a high-voltage hub. The distortion test can be performed according to the section entitled No. 2 Telegraph Serviceboard—Description and Operation (666-101-100).

3.12 When the near-end data set is placed in the test mode, the following conditions exist.

- The send contacts of the TTY are isolated from the data set.
- 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 distortion test procedures require two telephone company employees since an employee will be required at the near-end station and the far-end station. Initiation and coordination of the test procedure will be the responsibility of the telephone company employee at the far-end station. The far-end

SECTION 591-035-500

data set must be associated with either a hub or CPT in order to perform the loop-back distortion test.

distortion measurements. Refer to Fig. 3 and the following text for information on setting up the test equipment and making the required test connections at the far-end (trunk in Fig. 3) station.

3.13 A distortion test using a 911A Data Test Set provides a method of making system

3. TEST

STEP	ACTION	VERIFICATION
1	At the data unit associated with the far-end data set being used for this test— Disconnect the CPT interface cable from the connector of the data set.	
2	Make the connections indicated in Fig. 3.	
3	Operate the controls on the TEST SENTENCE GENERATOR section of the 911B DTS as indicated in Table A.	

TABLE A

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

STEP

ACTION

VERIFICATION

TABLE B

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

as indicated in Table B.

- | | | |
|---|--|--|
| 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 near-end station and inform the station that the far-end station has performed the operations required for making this test. | |
| 7 | Initiate a call from the near-end station being tested by depressing the ON key. | The ON key lights and the TTY motor turns on. |
| 8 | At the near-end station—
While holding the ON key depressed, depress the TEST key. | The ON key remains lighted and the TEST key lights. The TTY will now print out whatever is received from the line. |
| | | <i>Note:</i> The far-end data set is now looped back through the near-end data set 109F providing for an end-to-end test. This test must be made from the far-end data station arranged for FDX, using the 911A DTS as indicated in the following steps. |
| 9 | At the far end—
Set the AUTO. MAN. STEP switch to AUTO. This switch is located on the TEST SENTENCE GENERATOR (TSG) section of the 911A DTS. | |

SECTION 591-035-500

STEP	ACTION	VERIFICATION
10	Operate both RESET switches. There is a RESET switch on both the TSG and the distortion measuring set (DMS).	At the near-end station— TTY repeatedly prints out the "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 line feed.) The measured distortion at the far-end station should not exceed 15%.
11	Disconnect all test equipment and return all stations to service.	
3.14	The telephone company employee at the far-end station should inform the near-end station of the results of this test and the percentage distortion that was measured.	
3.15	System operation may be checked by operating the near-end station to verify that it will send and receive. A test sentence such as "FOX" can be used to check the far-end station and customer equipment receiving capability.	

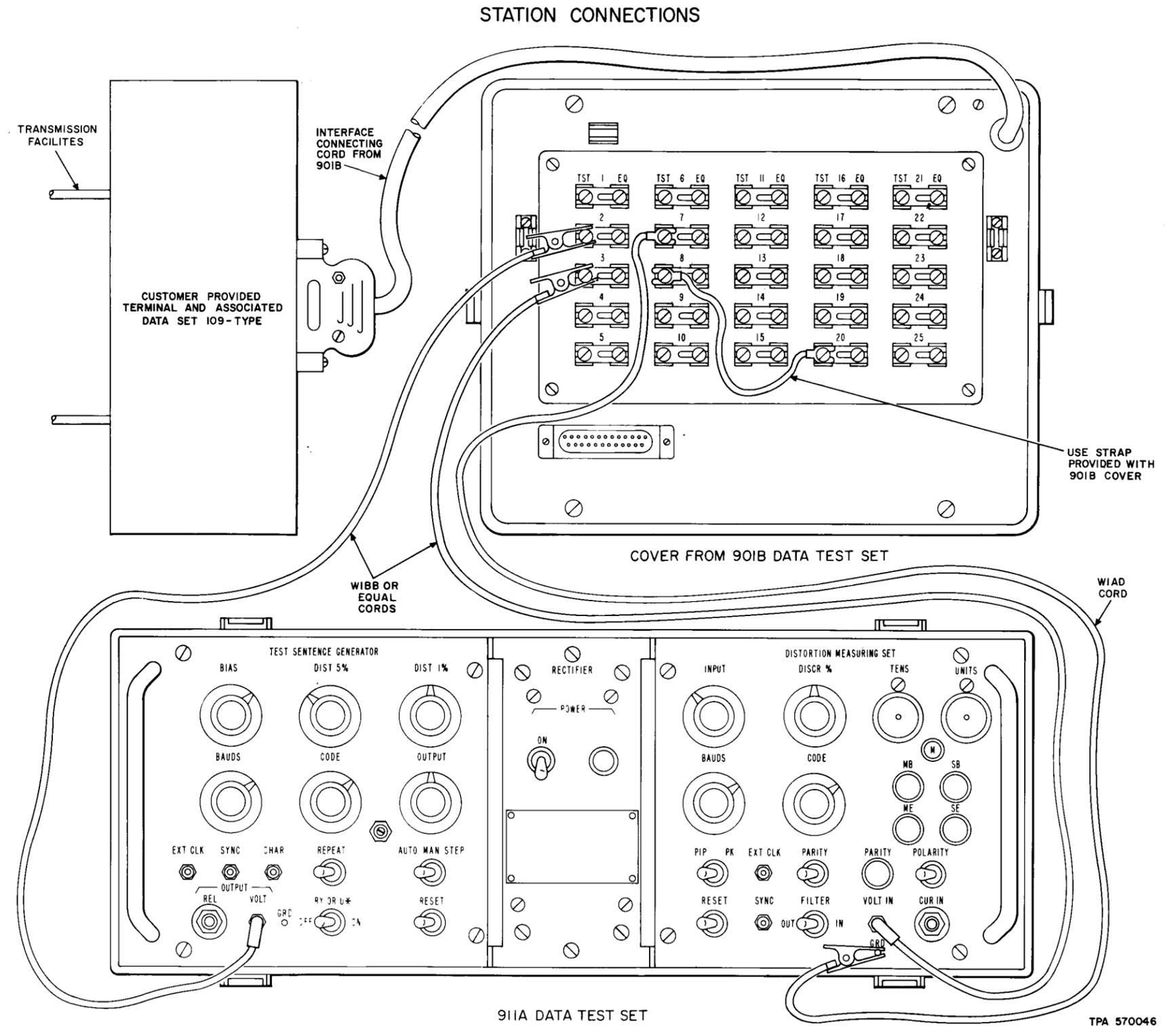


Fig. 3—Loop-Back Distortion Test Using the 911A Data Test Set