DATA SET 109H-TYPE
PRIVATE LINE APPLICATION
TEST PROCEDURES

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1. GENERAL

1.01 This practice provides information on testing the data set 109H-type (Fig. 1) when it is used as part of a private line system. The test procedures are designed to verify that the data set is operative and to aid in locating and clearing a trouble condition.

1.02 These test procedures are not intended as a test of the associated business machine or customer-provided terminal (CPT). When it is necessary to make a check of the CPT, the customer should be requested to verify that his equipment is operating properly. When the data set is used with a Bell System terminal, the complete station is tested. No attempt is made to verify that the operation of the far-end equipment is acceptable, except for a loop-back test which provides an operational test of the system.

1.03 All tests used in this section can be used independently since each test is complete and does not depend upon the results or performance 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 company employee. Due to this overlap, not all of the tests will be required or needed; therefore, only those tests necessary to locate a trouble condition should be made.

1.04 A suggested sequence of testing to locate or isolate a trouble condition is given in the section entitled Data Set 109H-Type—Private Line Application—Maintenance—(591-037-300). By using the sequence of testing recommended by the maintenance section, unnecessary testing can be avoided.

1.05 In order to perform the following tests, 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 far-end 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 Data Test Set cover (used as an interface test adapter)
- KS-20538-L1 volt-ohm–milliammeter (VOM) or equivalent

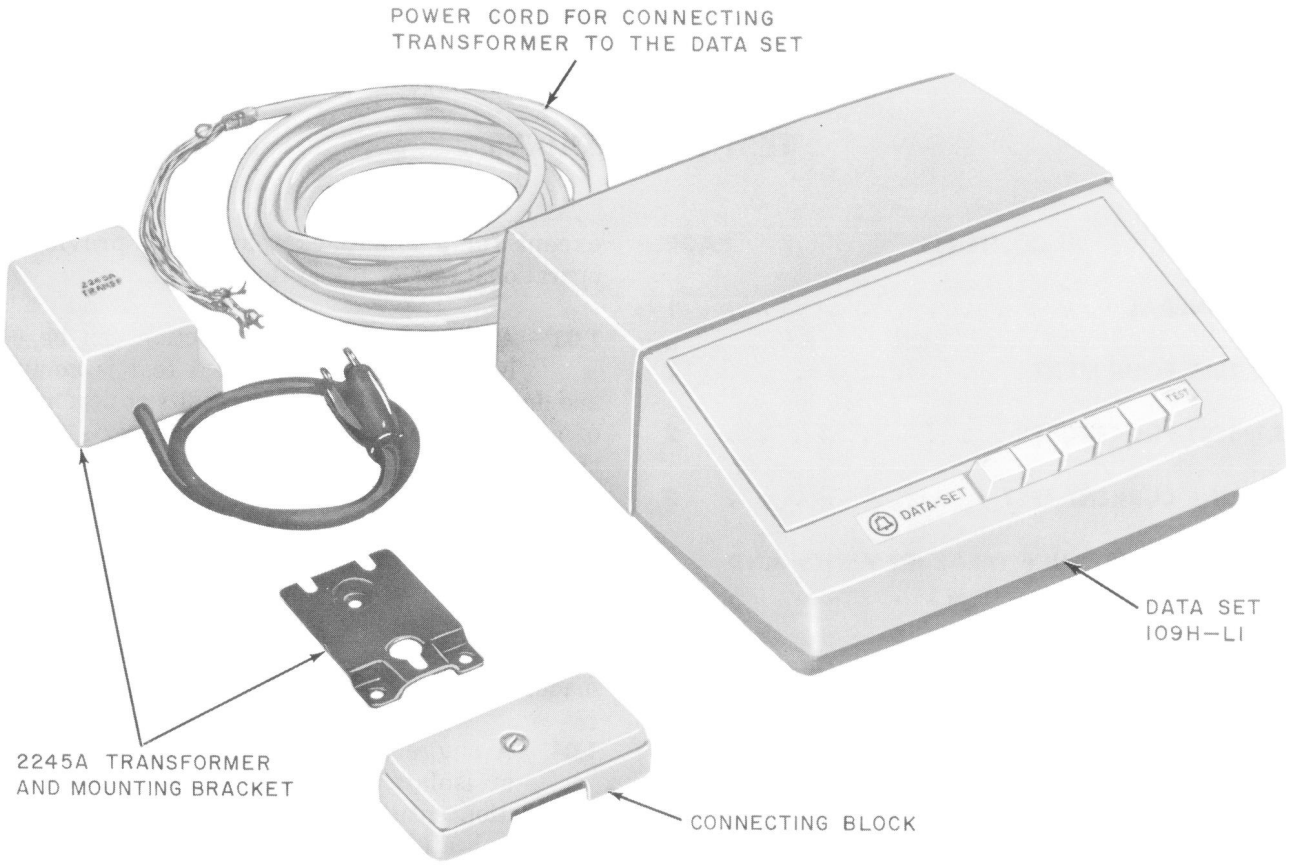

Fig. 1—Data Set 109H-L1

- 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 CURRENT TEST

Note: The line current test is the simplest and most accurate line test. Since it is not necessary to perform both the line current and line resistance or line voltage tests, the test used is left to the discretion of the telephone craft employee.

3.01 This test checks the ability of the data set to provide an acceptable signal level and checks the resistance of the loop. This test will also indicate that the line is not shorted or open.

3.02 Perform the following steps to make a line current test.

(1) Remove the cover from the 44A connecting block to gain access to the line terminals (terminals 9 and 10, Fig. 2).

(2) Set the KS-20538-L1 VOM to measure dc current.

(3) Connect a KS-20538-L1 VOM (or equivalent) in series with the line.

(4) Establish voice communication with the customer at the far end and request that the data set TEST key be depressed. Mark or triple space current can be measured by simply sending a mark or space, respectively.

(5) Record the indicated loop current. If the meter deflects down-scale, reverse the polarity of the meter to read the current.

(6) Marking loop current should be between 3.0 and 3.02 mA. An out-of-limit value indicates either a change in line resistance or an abnormal data set signal.

(7) Remove meter from line, restore the line, and replace the 44A connecting block cover. Request that the TEST key at the far end be returned to normal.

LINE RESISTANCE MEASUREMENTS AND TEST

3.03 This test checks the resistance of the line from the data set 109H-type to the far data set. Information is provided in this test to determine if a change in line resistance is appreciable, thereby requiring corrective action. This test will also indicate that the line is not shorted or open.

3.04 Measure the line resistance as follows.

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

(1) Obtain access to the data set line terminal connections by removing the cover on the 44A connecting block. The line connectors are made to terminals 9 and 10 (Fig. 2).

(2) Establish voice communications with the telephone company employee at the far end.

(3) Request that the line be shorted at the far-end data set.

(4) Remove one side of the line from the data set terminal block (44A connecting block).

(5) Use a VOM to measure the line resistance.

(6) Record the resistance measured in (5).

Note: If an open indication was obtained in the previous steps, verify that the line is shorted at the far end. An open indication with the line shorted indicates that the line has gone open and the trouble must be cleared. If line resistance has decreased, a short circuit condition should be suspected. To check for a short, both ends of the line will have to be disconnected. The line should then be open when tested unless a short exists.

(7) Compare the measured resistance 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.

The data set 109H-type line pads may be adjusted to compensate for changes in line resistance (refer to the section entitled Data Set 109H-Type—Private Line Application—Installation (591-037-200). If the change in resistance cannot be compensated for by adjustment of the line pads, the line will have to be repaired or replaced.

3.05 After completion of the preceding test, request that the line be reconnected or the short removed from the far end and that the data set be restored to operating condition at this time.

3.06 When the line has to be replaced, refer to Section 591-037-200 for information on setting the line pad resistance. Make sure that the polarity of the line has not been reversed at the data set.

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 check the data set mark and space voltage.

(1) Remove the cover from the 44A connecting block to gain access to the line terminals.

(2) Open the line by removing one side of the line from the terminal block (with terminal 9 or 10, Fig. 2).

(3) Connect the positive lead of the VOM to terminal 10 and the negative lead to terminal 9, and set the meter to measure voltage.

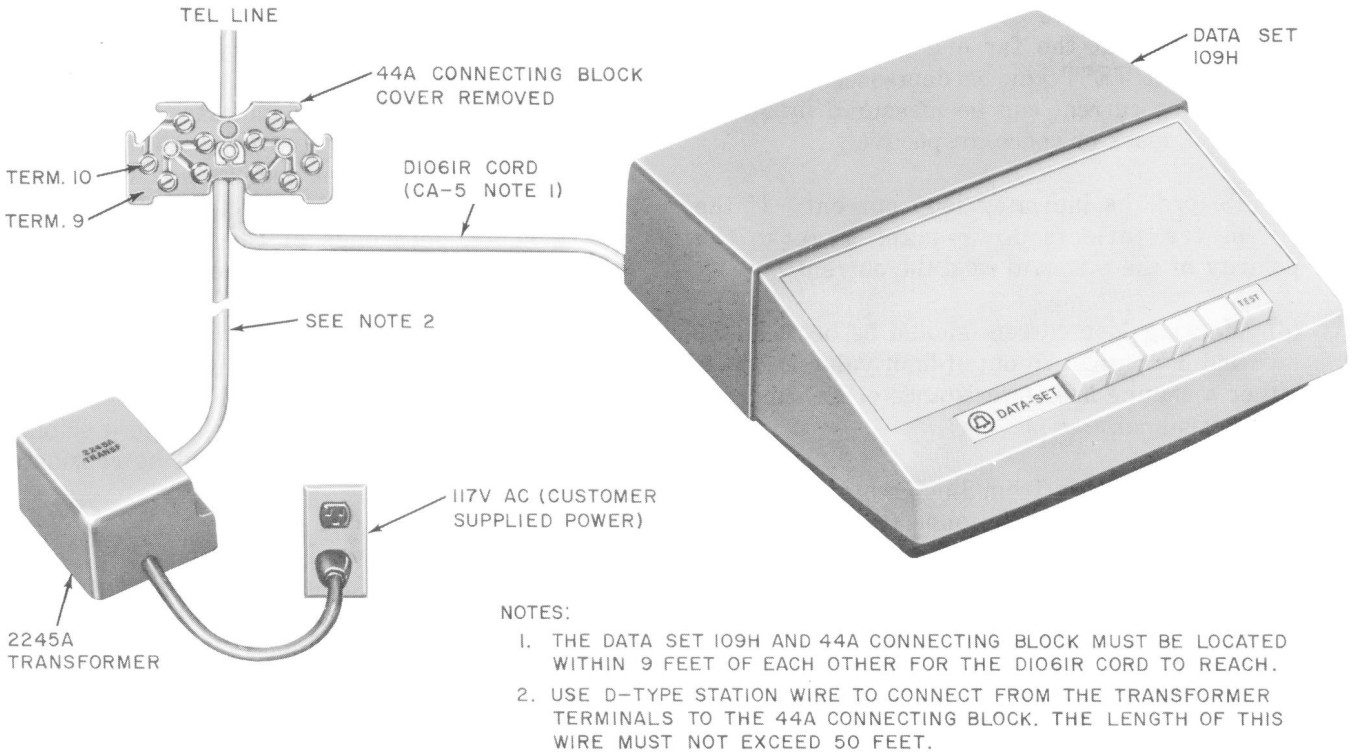

Fig. 2—Typical Data Set 109H-Type Installation Showing the Line Terminals of the 44A Connecting Block

(4) Operate the terminal equipment to obtain a mark signal. The marking voltage should be from 4.0 to 4.6 volts.

Note: Spacing voltage is opposite in polarity to a mark; therefore the meter polarity must be changed to measure the spacing voltage.

(5) Operate the terminal equipment to obtain a space signal. The spacing voltage should be between 12.0 and 14.0 volts and opposite in polarity to a mark.

(6) After checking the mark and space voltages, reconnect the line and return the station to operating condition.

STATION TEST

Loop-Around Test

3.08 A loop-around test of the data set can be performed by placing a call to the far-end data set and having the TEST key operated. This will loop back the far-end data set so any signal sent to the station can be received and retransmitted back for the sending location to monitor. This method of testing checks the near-end data set independently of the operation of the terminal equipment at the far end.

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

3.09 This test can be made in two ways. One method does not make use of the 911A Data Test Set (DTS), and is very simple. This method uses the CPT or TTY at one end of the line as a source of signal, with the data set at the opposite end in the loop-around condition (see 3.08). Although the degree of distortion is not measured, the transmission line can be checked for severe distortion and general operation. Since the signals are sent and received at the same station, a comparison is easily made to determine if line troubles exist. The other method requires use of the 911A Data Test Set and a much more elaborate procedure to determine the amount of distortion involved. Due to the difficulty of making this test, it is performed only when it is necessary to check the degree of

distortion. This test can also be made from either end with the opposite end in the loop-around condition (see 3.08). However, for convenience of explanation, it will be considered that the 911A DTS is located at the near station.

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

- The send circuits of the CPT or TTY are isolated from the far-end data set.
- The data sets are conditioned for full-duplex operation to enable loop-back testing.
- The far-end data set is conditioned to receive the incoming signal and loop the signal to the line.
- The near-end CPT or TTY will receive the incoming signal.

Note: The data set location ***without*** the 911A DTS is placed in the TEST mode. Initiation and coordination of the test procedure will be the responsibility of the telephone company employee at the near-end data station.

3.11 ***Test Procedure:***

STEP	ACTION	VERIFICATION
1	At the customer-provided terminal associated with the near-end data set being used for this test— Disconnect the customer-provided terminal interface cable from the connector of the data set.	
2	Make the connections indicated in Fig. 3. The connections at the near-end station are referred to as station connections in Fig. 3.	
3	Operate the controls on the TEST SENTENCE GENERATOR section of the 911B DTS as indicated in Table A.	
4	Operate the controls on the DISTORTION MEASURING SET section of the 911C DTS 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 and inform the far-end station that the station under test has performed the operations required for making this test.	
7	Request that the customer at the far end depress the TEST key.	TEST key lights. The CPT or TTY at the near-end station will now receive its own signals from the line.

Note: The near-end data set is now looped back through the far-end data set, providing for an end-to-end test. This test is made from the near-end data station using the 911A DTS as indicated in the following steps.

STEP	ACTION	VERIFICATION

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

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

STEP	ACTION	VERIFICATION
8	At the near-end station, set the AUTO. MAN. STEP switch to AUTO. This switch is located on the TEST SENTENCE GENERATOR (TSG) section of the 911A DTS.	
9	Operate both of the RESET switches. There is a RESET switch on both the TSG and the distortion measuring set (DMS).	At the near-end station, the test message (FOX...) should be received error free. The measured distortion should not exceed 15 percent.
10	Disconnect all test equipment and return all stations to service. Restore TEST key.	

3.12 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 station and customer equipment receiving capability.

4. REFERENCES

4.01 For additional information on the data set 109H-type, refer to SD- and CD-1D220-01—Data Systems Station Data Set 109H-type.

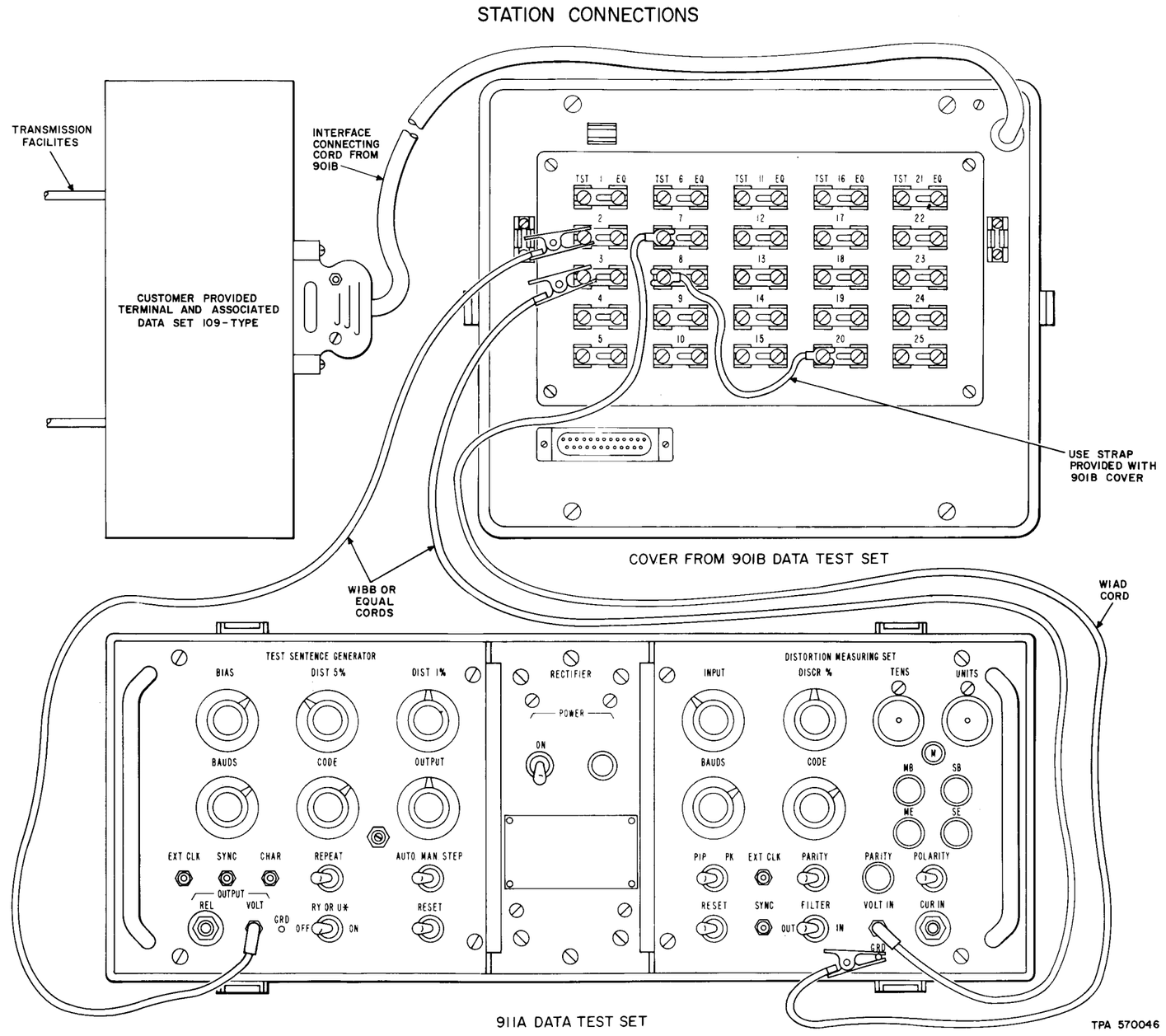

Fig. 3—Loop-Back Distortion Test Using the Data Set Test Key and the 911A Data Test Set