

DATA SET 109A-TYPE SINGLE PRIVATE LINE STATION USING DATA AUXILIARY SET 820D-TYPE TEST PROCEDURES

1. GENERAL

1.01 This section covers the test procedures for the data set 109A-type single private line station using data auxiliary set (DAS) 820D-type.

1.02 In this section, data set (DS) 109A and DAS 820D-type are referred to as a data station, exclusive of any Bell System- or customer-provided terminal equipment used in the installation.

1.03 The test procedures presented in this practice are designed to test the data station and transmission loop. Individual components such as cards, cords, etc, are not tested separately (with the exception of the 18A power supply) but tested by overall performance of the data station.

1.04 All tests in this section are limited to testing the data station, ie, the DAS 820D-type equipped with DS 109A-type. The terminal equipment at the data station may or may not be supplied by the Bell System. When a Bell System terminal is provided, it should be tested in accordance with the applicable Field Maintenance Practices (FMPs) when the terminal is suspected of a malfunction. When a customer-provided terminal (CPT) is used, the customer is responsible for testing the terminal.

1.05 Tests covered in this section are:

A. Power Supply Test: This test measures the +24V and -24V from the DAS power supply.

B. Loop Resistance Test: This test measures the transmission loop for proper resistance acceptability.



The remote station must be installed before performing Tests C, D, and E.

C. Circuit Pack Exchange Procedure: This test verifies that the specific data set or AR17 circuit pack is functioning properly.

D. End-to-End Test (Station to Station): This test verifies proper transmission and receiving capabilities of the station-to-station arrangement (Fig. 1).

E. End-to-End Test (Station to Hub): This test verifies proper transmission and receiving capabilities of the station-to-hub arrangement.

1.06 These tests should be performed in accordance with the maintenance philosophy and troubleshooting procedure given in the section entitled Data Set 109A-Type—Single Private Line Station—Using Data Auxiliary Set 820D-Type—Maintenance Procedures (591-024-301).

1.07 A letter *a*, *b*, *c*, etc, is added to a step number in Part 3 of this section to indicate an action which may or may not be required, depending on local conditions. The condition under which a lettered step should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

1.08 Each test outlined in this section may be performed separately or in conjunction with the other procedures to verify station operation or to locate a trouble condition. Successful completion of a preceding test is not a prerequisite for the following test to be valid unless otherwise indicated in this section.

2. APPARATUS

2.01 The test apparatus required for each test is shown in Table A. In Table A the details of each item are covered in the paragraph indicated by the number in parentheses.

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- 2.02** The 911A Data Test Set (DTS) is the J79911A DTS (Section 103-813-100).
- 2.03** The interface test adapter is a 901B-L3 DTS (cover of the 901B DTS) (Section 107-100-100).
- 2.04** KS-20538-L1 volt-ohm-milliammeter, or equivalent (Section 100-520-101).
- 2.05** Data set 109A-type (known to be good).
- 2.06** AR17 circuit pack (known to be good).
- 2.07** 2W6A cord, 10 feet long, equipped with one 310 plug and two alligator clip ends with insulator, green (used for current interface systems).
- 2.08** 2W7A cord, 9 feet 6 inches long, equipped with one 347-type plug and two alligator clip ends with insulator, green (used for current interface systems).
- 2.09** W1AD cord, 4 feet 7 inches long, equipped with one 35 cord tip and one 27 Mueller test clip with insulator, black (used for EIA interface systems).
- 2.10** W1BB cord, 2 feet long, equipped with one KS-19531-L2 plug and one Mueller No. 30 test clip with one 32 Mueller insulator, black (used for EIA interface systems).

TABLE A
DATA SET 109A TEST EQUIPMENT

APPARATUS	TEST						
	A	B	C	D		E	
				REMOTE STATION	LOCAL STATION	LOCAL STATION	HUB
911A Data Test Set (2.02)	---	---	---	1*	1	1	1
Interface Test Adapter (2.03)	---	---	1	1*	1	1	1
Meter (2.04)	1	1	1	---	---	---	---
Data Set 109A-Type (2.05)	---	---	1	---	---	---	---
AR17 Circuit Pack (2.06)	---	---	1	---	---	---	---
Cord (2.07) †	---	---	---	1	1	1	1
Cord (2.08) †	---	---	---	1	1	1	1
Cord (2.09) ‡	---	---	---	1	1	1	1
Cord (2.10) ‡	---	---	---	1	1	1	1

* At remote stations where use of the 911A data set is not feasible due to lack of access of the data set interface leads, or for some other reason, the station terminal equipment may be used to originate or receive test messages if Bell System terminal equipment is used. If the customer provides the terminal equipment (CPT), the terminal equipment can not be used unless the transmission code and speed are the same as the Bell System equipment at the STC.

† This cord is to be used for stations arranged for current interface only.

‡ These cords are needed only when the stations are arranged for EIA interface.

3. METHOD

STEP	ACTION	VERIFICATION
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A. Power Supply Test

- | | | |
|---|--|---------------------------------|
| 1 | Visually inspect the power source for the DAS or TTY and ensure that power is available to the data station. | |
| 2 | Remove cover or gain access to the DAS. | |
| 3 | Condition VOM to measure +24V dc. | |
| 4 | Connect + lead of VOM to TB1 terminal 25. | |
| 5 | Connect - lead of VOM to TB1 terminal 24. | Meter indicates +21 to +27V dc. |
| 6 | Disconnect VOM leads. | |

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STEP	ACTION	VERIFICATION
7	Connect + lead of VOM to TB1 terminal 24.	
8	Connect - lead of VOM to TB1 terminal 26.	Meter indicates -21 to -27V dc.
9	Disconnect VOM leads.	
10	End of test.	

B. Loop Resistance Test

1	Instruct the remote station to short the transmission loop leads.	
2	At the local station— Remove power from station.	
3	Condition VOM to measure resistance (R X 1K scale).	
4	Disconnect one transmission loop lead from TB1 of DAS.	
5	Connect the leads of the VOM to the transmission loop leads.	Meter indicates resistance value of loop.

Note: If loop resistance has changed appreciably from the resistance shown on the circuit layout record card, refer to Section 591-024-201 and reset strap adjustments of 13A1 data unit. An appreciable change is a change that can be compensated for by adjusting line pads.

6	Disconnect all VOM leads.	
7	Reconnect the transmission loop, being sure to observe proper polarity.	
8	Instruct remote station to return station to normal operation.	
9	End of test; return power to local station.	

C. Circuit Pack Exchange Procedure

1	Remove power from station.	
2	Remove cover or gain access to the DAS.	
3	Remove the AR17 circuit pack and replace the circuit pack with a known good spare, being careful to insert proper options in the AR17 circuit pack.	

STEP	ACTION	VERIFICATION
4	Apply power to the station.	Station operation is normal. <i>Note:</i> If station operation is not normal, proceed to Step 5.
5	Remove power from the station, remove DS 109A-type, and replace the data set with a good spare, being careful that correct options are inserted in the data set.	
6	Apply power to the station.	Station operation is normal. <i>Note:</i> If station operation is not normal, proceed to Step 7.
7	Remove power from station, remove the AR17 circuit pack and again replace it with the good spare.	
8	Apply power to the station.	Station operation is normal. <i>Note:</i> If station operation is not normal, request aid through proper channels.
9	End of test.	

D. End-to-End Test (Station to Station)

LOCAL STATION SETUP FOR TEST TRANSMISSION

- 1 At DAS 820D-type—
Disconnect terminal interface connection from J3 of DAS.
- 2 Connect plug of interface test adapter connector cord to J3 of DAS.
- 3 At the interface test adapter—
Ensure that all shorting bars are closed.

If local (transmitting) station is arranged for current interface, perform Steps 4a through 9a and refer to Fig. 1.

- 4a Connect the terminal equipment interface cable to the jack of the interface test adapter.
- 5a At the interface test adapter—
Open the shorting bar of terminal 2.
- 6a Connect the alligator clip end of 2W6A cord to terminal EQ 2.

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STEP	ACTION	VERIFICATION
7a	Connect the other alligator clip end of 2W6A cord to terminal 10.	
8a	At 911A DTS— Connect plug of 2W6A cord to OUTPUT REL jack.	
9a	Operate controls in accordance with Table B.	

Note: The baud rate should be that of the terminal equipment for standard Bell System baud rates. If the terminal equipment is a CPT, the station should be tested at the rate specified in the tariff (eg, 150 bauds for 134.6 baud service).

TABLE B
INTERFACE SETTINGS OF TSG*

CONTROL	SETTING
BIAS	0
DIST 5%	0
DIST 1%	0
BAUDS	Rate provided by terminal equipment (<i>see note</i>)
CODE	Code used by terminal equipment (<i>see note</i>)
OUTPUT (CURRENT)	REL
OUTPUT (EIA)	VOLT
AUTO. MAN.	
STEP	MAN.
All other	OFF

* Part of 911A DTS.

Note: These settings apply to only standard Bell System speed and code formats. Otherwise, use the tariff rate and 5- or 8-level codes as applicable to customer equipment.

If local (transmitting) station is arranged for EIA interface, perform Steps 10b through 14b and refer to Fig. 2.

10b	At interface test adapter— Connect alligator clip end of W1BB cord to terminal 2.
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STEP	ACTION	VERIFICATION
11b	Connect alligator clip end of W1AD cord to terminal 7.	
12b	At 911A DTS— Plug terminal end of W1BB cord into OUTPUT VOLT jack.	
13b	Connect alligator clip end of W1AD cord to ground post adjacent to OUTPUT VOLT jack.	
14b	Operate controls per Table B.	

REMOTE STATION SETUP FOR TEST RECEPTION

15	At the DAS— Disconnect the terminal interface connection from J3 of DAS.	
16	At interface test adapter— Connect plug of interface test adapter connector cord to J3 of DAS and ensure all shorting bars on the interface test adapter are closed.	
<p>If remote (receiving) station is arranged for current interface, perform Steps 17a through 22a and refer to Fig. 1 for setup.</p>		
17a	Connect terminal equipment interface cable to jack of interface test adapter.	
18a	Open shorting bar of terminal 3.	
19a	Connect one alligator clip end of 2W6A cord to terminal TST 3.	
20a	Connect the other alligator clip end of 2W7A cord to terminal EQ 3.	
21a	At 911A DTS— Connect plug of 2W7A cord to CUR. IN. jack.	
22a	Operate controls on 911A DTS according to Table C.	

If remote (receiving) station is arranged for EIA interface, perform Steps 23b through 27b and refer to Fig. 2.

23b	At interface test adapter— Connect spade-tip end of W1AD cord to terminal 7.	
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STEP

ACTION

VERIFICATION

TABLE C
INTERFACE SETTINGS OF DMS*

CONTROL	
INPUT (CURRENT)	REL
INPUT (EIA)	VOLT IN.
DIST %	0
BAUDS	Rate provided by terminal equipment (<i>see note</i>)
CODE	Code used by terminal equipment (<i>see note</i>)
AUTO. PK PIP	PK
PARITY	OFF
POLARITY	+
FILTER	OUT

* Part of 911A DTS.

Note: These settings apply to only standard Bell System speed and code formats. Otherwise, use the tariff rate and 5- or 8-level codes as applicable to customer equipment.

- 24b Connect alligator clip end of W1BB cord to terminal 3.
- 25b At 911A DTS—
Connect alligator clip end of W1AD cord to ground post adjacent to VOLT IN. jack.
- 26b Plug terminal end of W1BB cord into VOLT IN. jack.
- 27b Operate controls in accordance with Table C.
- 28 ***At remote station end (receiving)***—
Apply power to 911A DTS and operate RESET key of distortion measuring set (DMS).
- 29 ***At local station end (transmitting)***—
Apply power to 911A DTS, operate RESET key of test sentence generator (TSG), and put the AUTO. MAN. STEP switch to AUTO.
- 30 ***At remote station end (receiving)***—
Move the AUTO. PK PIP switch of DMS to PIP, then back to PK.

At remote station end—
DMS indicates less than 10 percent distortion.

STEP	ACTION	VERIFICATION
		<p>Note: If the system is arranged for current interface— TTY will print "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 rubout character, and a line feed.)</p>
31	Operate RESET key of DMS.	<p>At remote station end— DMS indication remains less than 10 percent distortion. (See note, Step 30.)</p>
32	Remove power from both 911A DTSs at the remote and local stations. Procedures for remote and local stations should now be reversed in order to check transmission of the remote station and reception at the local station.	
33	At local station end (receiving)— Perform Steps 17a through 27b.	
34	At remote station end (transmitting)— Perform Steps 4a through 14b.	
35	At the local station end (receiving)— Apply power to 911A DTS and operate RESET key of DMS.	
36	At remote station end (transmitting)— Apply power to 911A DTS and operate RESET key of TSG.	
37	At the local station end (receiving)— Move the AUTO. PK PIP switch to PIP, then back to PK.	<p>At local station end— DMS indicates less than 10 percent distortion.</p> <p>Note: If the system is arranged for current interface—</p> <p>TTY will print "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 rubout character, and a line feed.)</p>
38	Operate RESET key of DMS.	<p>At local station end— DMS indication remains less than 10 percent distortion. (See note, Step 37.)</p>

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STEP

ACTION

VERIFICATION



If a remote station end is equipped with data set 109C or 109E, it will be necessary to use TTY in place of 911A DTS. This procedure is as follows.

39c If 911A DTS is *not* used at the remote station end for transmitting a test—
Set up the local station end as in Steps 17a through 27b for receiving a test. Apply power to 911A DTS. Operate the RESET key of DMS.

40c *At remote station end (transmitting)*—
Repeatedly transmit the message "RY" or "U*" from the teletypewriter.

41c *At the local station end (receiving)*—
Move AUTO. PK PIP switch to PIP, then back to PK.

At the local station end—
DMS indicates less than 15 percent distortion.

Note: If the system is arranged for current interface, TTY will print "RY" or "U*" error free.

42c Operate RESET key of DMS.

At the local station—
DMS indication remains less than 15 percent distortion. (See note, Step 41c.)

43c If 911A DTS is *not* used at the remote station end for receiving a test (TTY receiver)—
Set up the local station end as in Steps 4a through 14b for transmitting a test.

44c *At local station end*—
Apply power to 911A DTS, operate the RESET key of TSG, and set AUTO. MAN. STEP switch to AUTO.

At the remote station end—
TTY will repeatedly print 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 rubout character, and a line feed.)

45c Increase distortion on TSG until errors occur on remote station printout.

Distortion level should be 15 percent or less.

46 Remove power from 911A DTS.

47 Disconnect all test leads.

48 End of test.

STEP	ACTION	VERIFICATION
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E. End-to-End Test (Station to Hub)

- 1 Ask the STC attendant to patch a 911A DTS into the hub of the data station reporting the trouble and condition it to transmit data.

Note: The hub may be the STC. All references to hub also apply to STC.

LOCAL STATION SETUP FOR TEST RECEPTION

- 2 Disconnect the terminal equipment interface cable of the terminal equipment from J3 of the DAS.
- 3 Connect the interface test adapter connector cable to J3 of the DAS.
- 4 Ensure all shorting bars are closed.

If the local data station (receiving) is arranged for current interface, perform Steps 5a through 10a and refer to Fig. 1.

- 5a Connect the CPT interface cable to the jack on the interface test adapter.
- 6a Open the shorting strip of terminal 3.
- 7a Connect one alligator clip end of the 2W7A cord to terminal TST 3.
- 8a Connect the other alligator clip end of the 2W7A cord to terminal EQ 3.
- 9a At 911A DTS—
Connect plug of 2W7A cord to CUR. IN. jack of the DMS.
- 10a Operate controls in accordance with Table C of Test D.

If local station (receiving) is arranged for EIA interface, perform Steps 11b through 15b and refer to Fig. 2.

- 11b At the interface test adapter—
Connect the alligator clip end of W1BB cord to terminal 3.
- 12b Connect the spade-tip end of W1AD cord to terminal 7.

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STEP	ACTION	VERIFICATION
13b	At 911A DTS— Plug terminal end of W1BB cord into VOLT IN. jack.	
14b	Connect alligator clip end of W1AD cord to ground post adjacent to the VOLT IN. jack.	
15b	Operate the controls of DTS per Table C.	
16	Apply power to the 911A DTS and operate the RESET key of the DMS.	
17	Ask the STC attendant to transmit the test message.	
18	<i>At the local station end (receiving)</i> — Move the AUTO. PK PIP switch to PIP, then back to PK.	At the local station end— DMS indicates less than 15 percent distortion. Note: If the system is arranged for current interface— TTY will print "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 rubout character, and a line feed.)
19	Repeat Step 18.	At the local station end— DMS indication remains less than 15 percent distortion. (See note, Step 18.)
20	Disconnect all test leads.	

LOCAL STATION SETUP FOR TEST TRANSMISSION TO HUB

- 21 Ask the STC attendant to take a margin reading or to measure transmission distortion.

At the local station (transmitting)—
If the local data station is arranged for current interface, perform Steps 22a through 25a and refer to Fig. 1.
- 22a At the interface test adapter—
Open the shorting bar of terminal 2.
- 23a Connect one alligator clip end of the 2W6A cord to terminal EQ 2.
- 24a Connect the other alligator clip end of 2W6A cord to terminal 10.

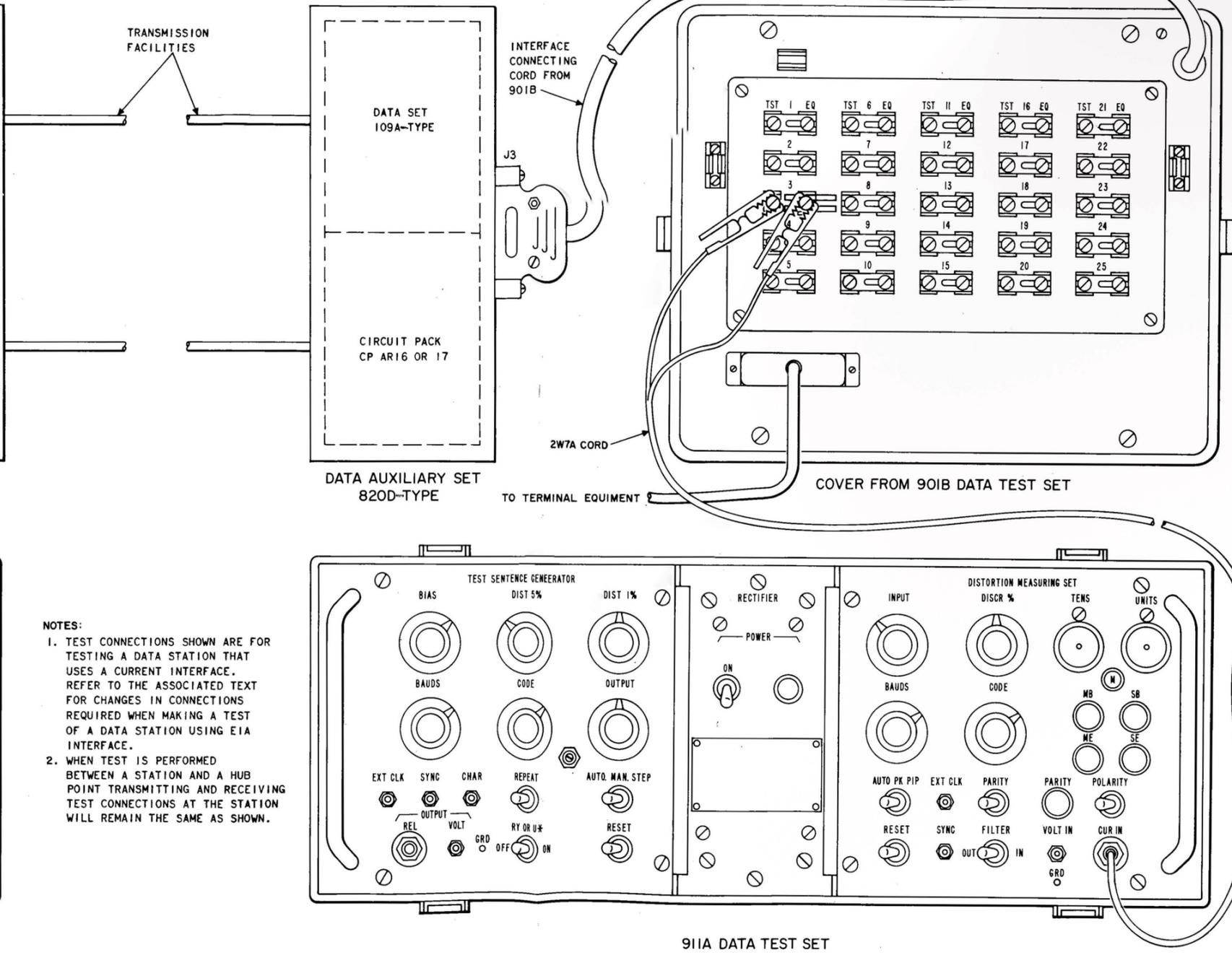
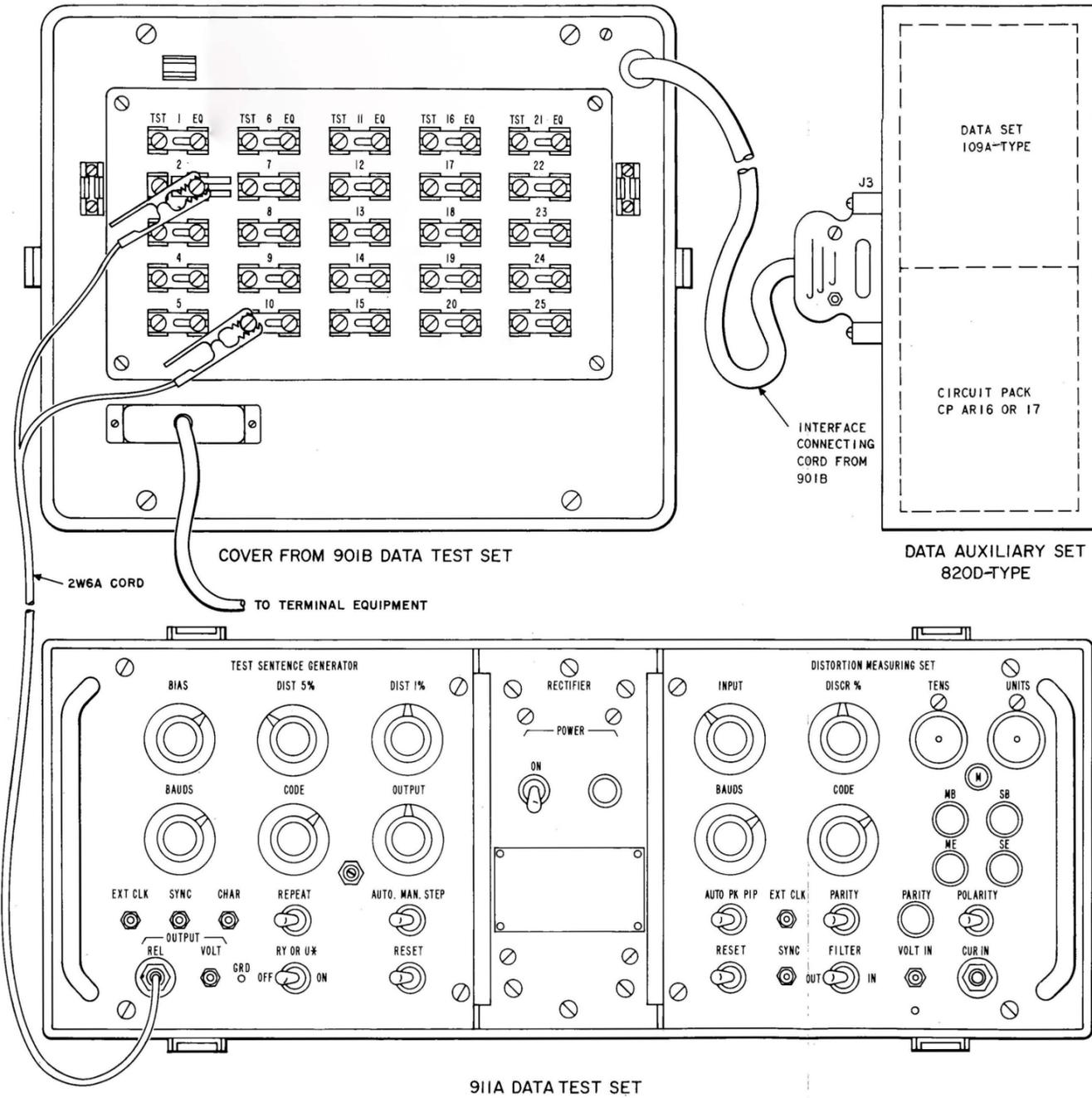
STEP	ACTION	VERIFICATION
25a	At 911A DTS— Connect plug of 2W6A cord to OUTPUT REL jack.	
26a	Operate the controls per Table B.	
	Note: The baud rate should be that of the terminal equipment for standard Bell System baud rates. If the terminal equipment is a CPT, the station should be tested at the rate specified in the tariff (eg, 150 bauds for 134.6 baud service).	
	If the local data station (transmitting) is arranged for EIA interface, perform Steps 27b through 31b and refer to Fig. 2.	
27b	At the interface test adapter— Connect the alligator clip end of the W1BB cord to terminal 2.	
28b	Connect the spade-tip end of the W1AD cord to terminal 7.	
29b	At the 911A DTS— Plug the terminal of the W1BB cord to the OUTPUT VOLT jack.	
30b	Connect the alligator clip end of the W1AD cord to the ground post adjacent the OUTPUT VOLT jack.	
31b	Operate the controls in accordance with Table B.	
32	At the hub (receiving)— Apply power to the 911A DTS, set the AUTO. PK PIP switch to AUTO., and operate the RESET key of DMS.	
33	At the local station— Apply power to the 911A DTS, set the AUTO. MAN. STEP switch to AUTO., and operate the RESET key of TSG.	
34	At the hub— Move the AUTO. PK PIP switch to PIP, then back to PK.	At the hub— DMS indicates less than 15 percent distortion.
35	Repeat Step 34.	At the hub— DMS indication remains less than 15 percent distortion.

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STEP	ACTION	VERIFICATION
	If a 911A DTS is not used at the local station, perform Steps 36c through 40c.	
36c	Repeatedly transmit the test message "RY" or "U*" with TTY to the hub.	
37c	<i>At the hub (receiving)</i> — Move the AUTO. PK PIP switch to PIP, then back to PK.	At the hub— DMS indicates less than 15 percent distortion.
38c	Repeat Step 37c.	At the hub— DMS indication remains less than 15 percent distortion.
39c	At the hub— Condition 911A DTS to transmit data.	
40c	Apply power to 911A DTS, set AUTO. MAN. STEP switch to AUTO., and operate the RESET key of TSG.	At local station— TTY repeatedly prints out "THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 1234567890 TESTING" error free. (Each message will be preceded by two carriage returns, a rubout character, and a line feed.)
41	Remove power from 911A DTS.	
42	Disconnect all test leads.	
43	End of test.	

TRANSMITTING STATION

RECEIVING STATION

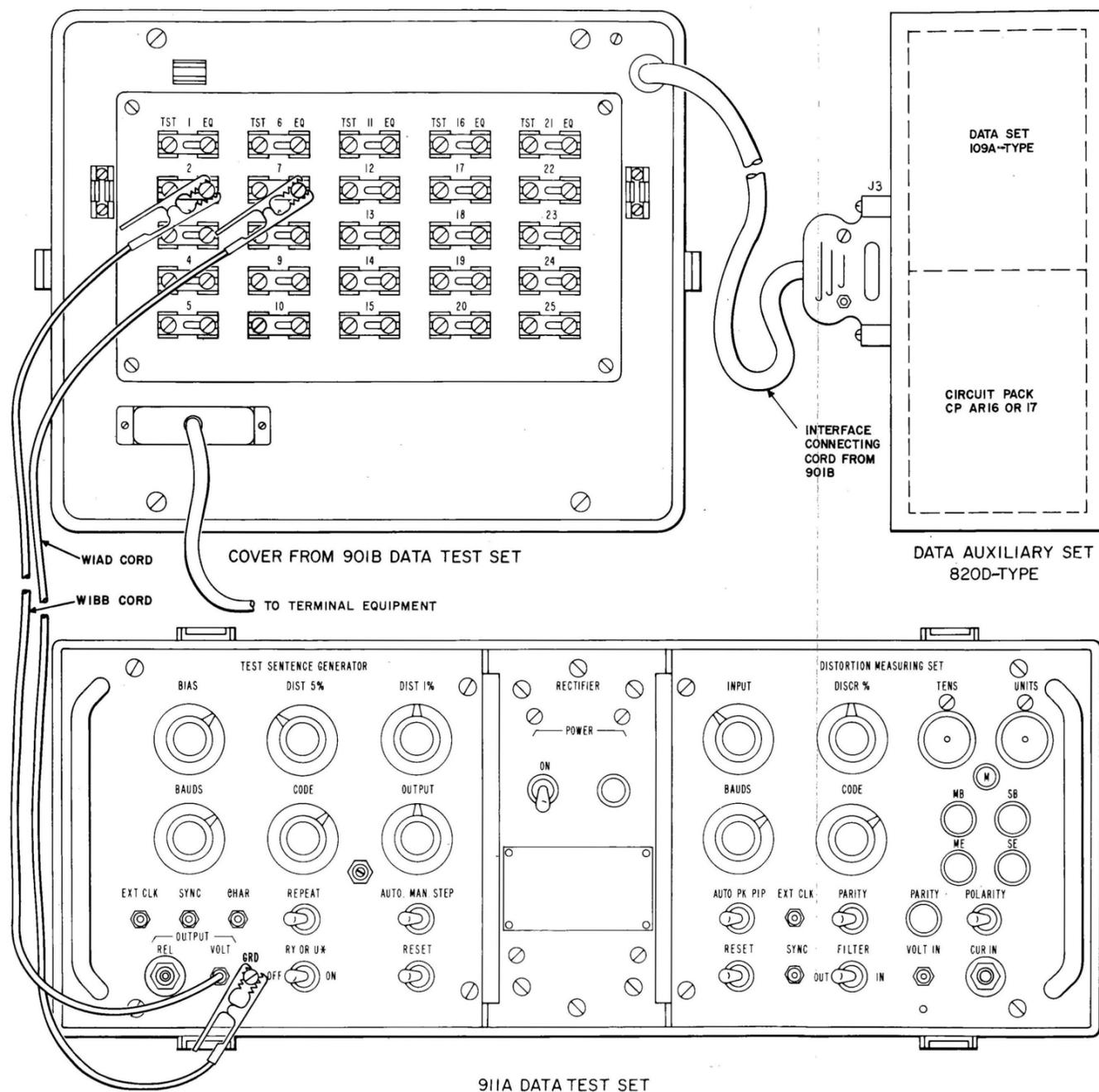


- NOTES:
1. TEST CONNECTIONS SHOWN ARE FOR TESTING A DATA STATION THAT USES A CURRENT INTERFACE. REFER TO THE ASSOCIATED TEXT FOR CHANGES IN CONNECTIONS REQUIRED WHEN MAKING A TEST OF A DATA STATION USING EIA INTERFACE.
 2. WHEN TEST IS PERFORMED BETWEEN A STATION AND A HUB POINT TRANSMITTING AND RECEIVING TEST CONNECTIONS AT THE STATION WILL REMAIN THE SAME AS SHOWN.

Fig. 1—Operational System Test Using the 911A Data Test Sets (Current Interface)

TRANSMITTING STATION

RECEIVING STATION



- NOTES:
1. TEST CONNECTIONS SHOWN ARE FOR TESTING A DATA STATION THAT USES A EIA INTERFACE. REFER TO THE ASSOCIATED TEXT FOR CHANGES IN CONNECTIONS REQUIRED WHEN MAKING A TEST OF A DATA STATION USING CURRENT INTERFACE.
 2. WHEN TEST IS PERFORMED BETWEEN A STATION AND A HUB POINT TRANSMITTING AND RECEIVING TEST CONNECTIONS AT THE STATION WILL REMAIN THE SAME AS SHOWN.

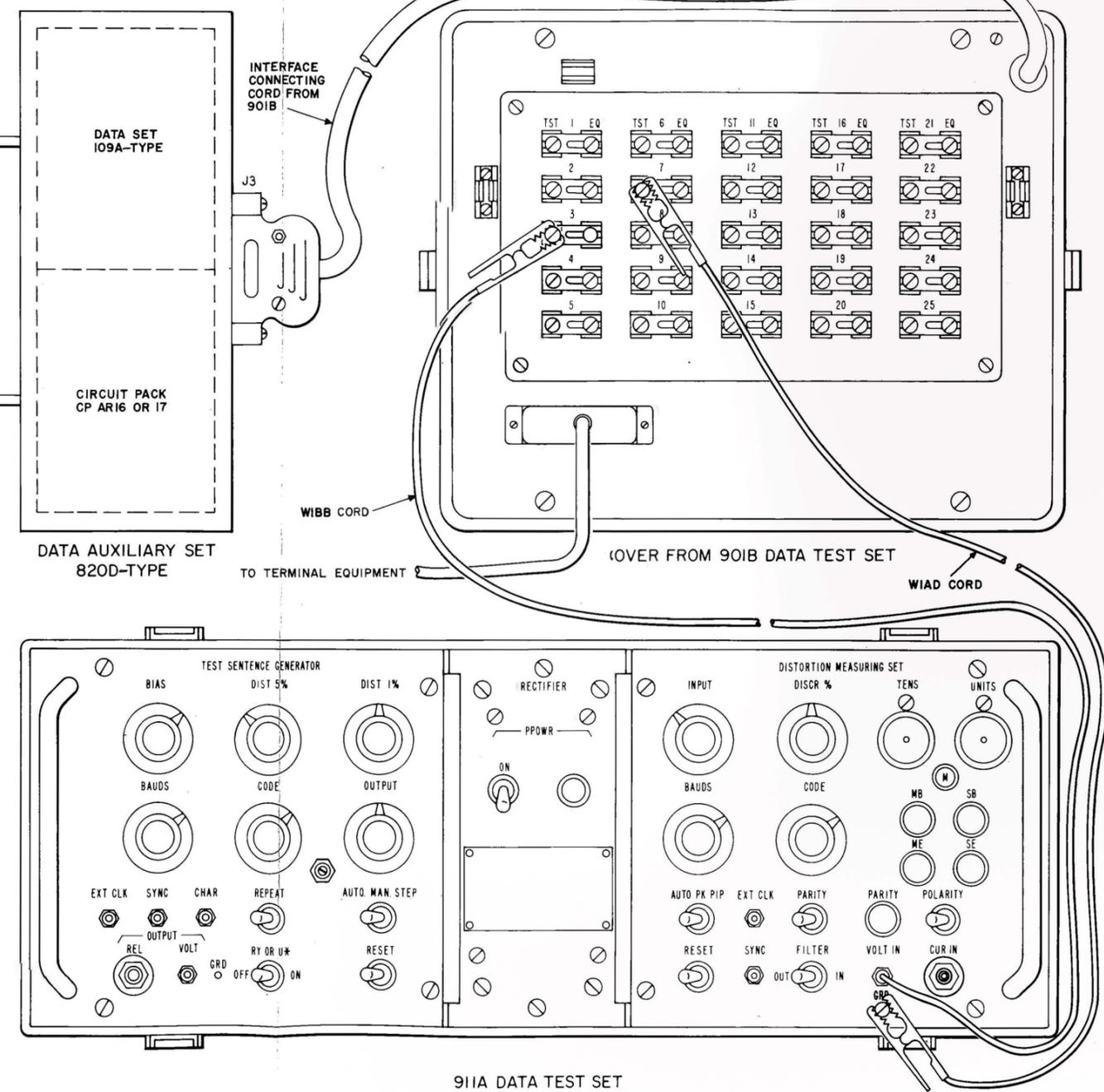


Fig. 2—Operational System Test Using the 911A Data Test Sets (EIA Interface)