

## DATA SET 103G-TYPE TEST PROCEDURES

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**1. GENERAL**

**1.01** This section describes the test procedures to be performed at the time of installation or when investigating trouble conditions associated with Data Set 103G-type.

**1.02** This section is reissued to include the power receptacle ground test, interface test, and end-to-end test, all using the 914B Data Test Set (DTS). Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** The tests covered are:

- A. *Power Receptacle Ground Test (901B Data Test Set Interface Test Adapter):*
- B. *Loop-Back Test From Data Test Center:*
- C. *Data Set Interface Test From 904-Type Data Test Center (901B Data Test Set):*
- D. *End-to-End Test Using a Second Data Set and 901B, 902-type, and 903-type Data Test Sets Separated by the Telephone Line Facility (When Available):*
- E. *Power Receptacle Ground Test (914B Data Test Set):*
- F. *Data Set Interface Test From 904-type Data Test Center (914B Data Test Set):*
- G. *End-to-End Test Using a Second Data Set and 914B Data Test Set Separated by the Telephone Line Facility (When Available):*



*When a 914B DTS is available, Tests E, F, and G should be performed in preference to Tests A, C, and D. Tests A, C, and D are included in this section for use at locations where a 914B DTS is not available.*

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**1.04** Prior to performing any tests, verify the following:

(a) The overall facilities have been tested and meet transmission requirements specified in the section entitled Data Systems—DATA-PHONE® Service on Direct Distance Dialing Network—Test Requirements for Subscribers, Foreign Exchange and Remote Exchange Lines (314-205-501).

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

**1.05** Test A or E is to be performed when required. See section entitled Data Set 103G-Type—Installation and Connections (591-026-200).

**1.06** Test B should be made at the time of installation by the nearest 904-type DTC.

**1.07** The interface tests (Tests C and F) require assistance of the nearest DTC.

**1.08** When the power receptacle ground test, loop-back test, and interface test have been completed and the test requirements have been met, suggest that the customer verify that service is satisfactory. If the customer has messages to transmit, verify that the service is satisfactory. If the customer does not have any messages to transmit, consider the Data Set 103G-type satisfactory for service.

**1.09** If any of the test requirements for the loop-back test or interface test are not met, replace the data set.

**1.10** Before performing any tests, verify that the test equipment is in good operating condition. Refer to the appropriate sections covering operational and calibration tests of test equipment, as follows:

(a) J94006A (6A) Impulse Counter—Description, Operation and Maintenance (103-620-100)

(b) 901A and 901B Data Test Sets—Identification and Operation (107-100-100)

(c) 902-Type Data Test Sets—Identification and Operation (107-300-100)

(d) 903-Type Data Test Sets—Description and Operation (107-200-100)

(e) 914B Data Test Set—Description and Operation (107-101-100).

**1.11 *Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 3 of this section indicates an action which may or may not be required, depending on local conditions. The condition under which a lettered step or a series of lettered steps 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.

**2. APPARATUS**

**2.01** The apparatus required for each test is shown in Table A.

**TABLE A**  
**APPARATUS**

APPARATUS	TESTS								
	A	B	C	D		E	F	G	
				REC TERM.	TRANS TERM.			REC TERM.	TRANS TERM.
6A Impulse Counter	1					1			
901B Data Test Set (J79901B)			1	1	1				
Interface Test Adapter (J79901B L3 — cover of J79901B)	1		1	1	1				
902-Type Data Test Set (J79902) *				1*					
903-Type Data Test Set (J79903) *				1*	1*				
914B Data Test Set (J79914B-1)						1	1	1	1
KS-14510-L1 or KS-16979-L1 Volt-Ohm-Milliammeter, or equivalent			1						
904-Type Data Test Center		1	1				1		

\* If 902B and 903B Data Test Sets are used at the receive terminal, 903B Data Test Set must be used at the transmit terminal. If 902C and 903C Data Test Sets are used at the receive terminal, 903C must be used at the transmit terminal. The 902B and 903B Data Test Sets cannot work into 903C Data Test Set, and vice versa.

### 3. PROCEDURE

#### A. Power Receptacle Ground Test Using 901B Data Test Set Interface Test Adapter

**3.01** When required [see section entitled Data Set 103G-Type—Installation and Connections (591-026-200)], measure the impulse noise between

the data set ground, data auxiliary set ground (if provided), and the business machine ground.

**3.02** The equipment required for Test A is:

- 6A impulse counter
- Interface test adapter (J79901B-L3—cover of J79901B)

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
1	Connect 6A impulse counter and interface test adapter as shown in Fig. 1.	
2	Unbridge terminals 1 and 7 of interface test adapter.  <i>Note:</i> Do not ground 6A impulse counter for this test.	
3	At Data Set 103G-type— Install option Q.	
4	At 6A impulse counter— Set WTG to VOICE BAND.	
5	Set REF LEV DBRN toggle switch to ADD 30.	
6	Set REF LEV DBRN rotary switch to 60.	
7	Set MINUTES switch to 15.	
8	Operate RESET lever to reset counter to 0000.	Counter remains at 0000 for 15 minutes.  <i>Note:</i> If any counts are noted in a 15-minute period, grounding arrangements must be improved.
9a	After completion of test— If option Q was installed in Step 3— Remove option Q.	

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**B. Loop-Back Test From 904-Type Data Test Center**

**3.03** The loop-back test should be made by the nearest 904-type DTC. This test should be made at the time of installation and when investigating trouble reports.

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
1	Call DTC and request a test of Data Set 103G-type.  <i>Note:</i> DTC must be informed of the type of operation (whether option G is used).	

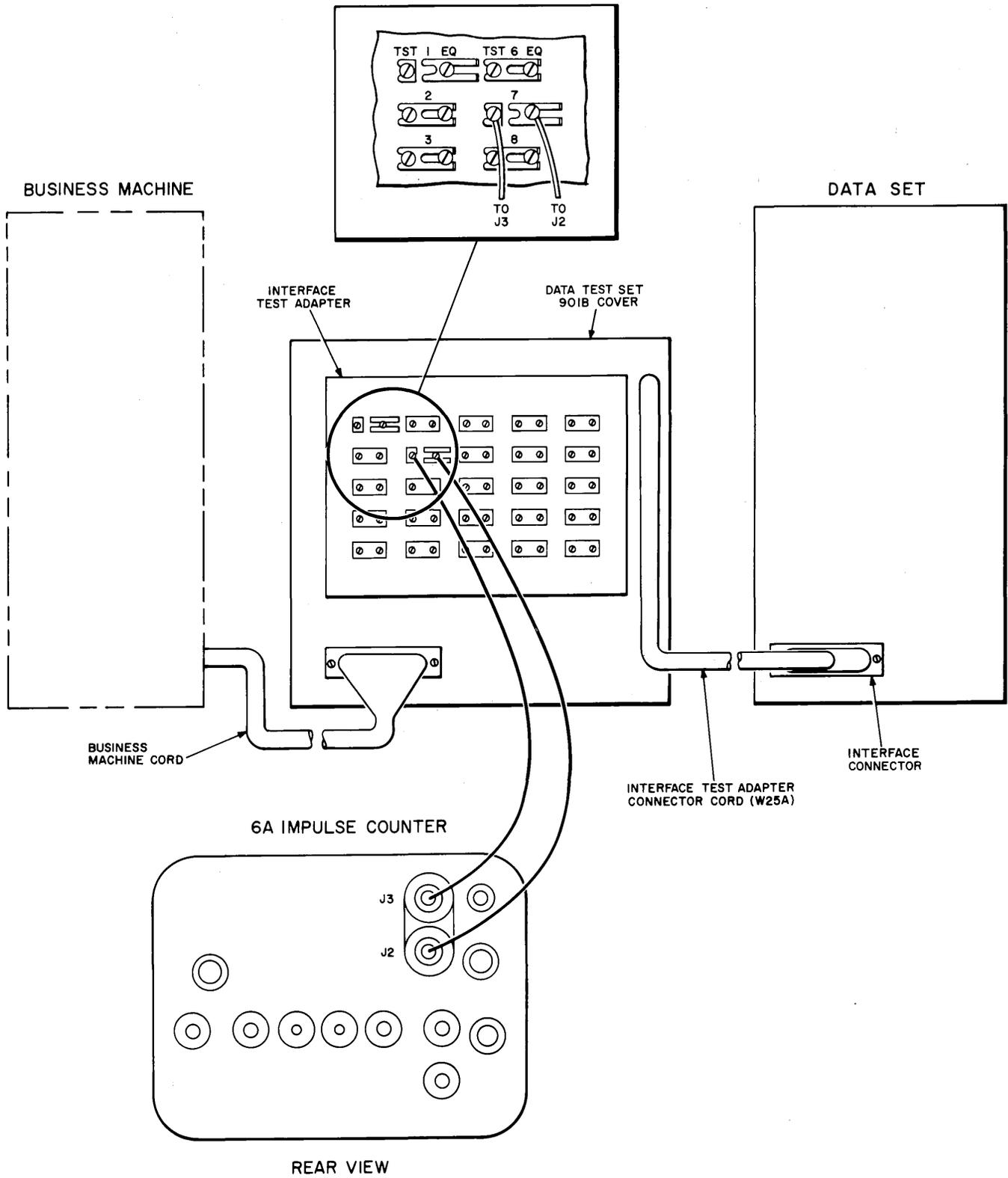


Fig. 1—Power Receptacle Ground Test Using 6A Impulse Counter and 901B Data Test Set Interface Test Adapter

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
2a	If option G is not provided— When DTC calls data set— Operate the TEST button at beginning of the second ring.	TEST lamp lighted.
3a	When TEST lamp is lighted— Release TEST button.	DTC will check sensitivity and mark, space, and slicing frequencies of the data set.
4b	If option G is provided— Call DTC.	
5b	When tone is received— Operate TEST button.	TEST lamp lighted.
6b	When TEST lamp is lighted— Release TEST button.	Same as 3a.
<p><b>Note:</b> At the end of the test, the DTC should disconnect the data set (TEST lamp extinguished).</p>		
7c	If disconnect does not occur automatically— Operate CLEAR-TALK button.	TEST lamp extinguished. Data set goes on-hook.

**C. Data Set Interface Test From 904-Type Data Test Center (901B Data Test Set)**

**3.04** The equipment required for Test C is:

- 901B DTS (J79901B)
- KS-14510-L1 volt-ohm-milliammeter (VOM), or equivalent
- Interface test adapter (J79901B-L3—cover of J79901B)
- 904-type DTC

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
1	At Data Set 103G-type, and if used, Data Auxiliary Set 801-type (ACU)— Disconnect power plug(s) from ac receptacle(s).	
2a	If option Q is not specified on order for Data Set 103G-type— Install option Q in data set.	
3b	If option V is specified on order for Data Set 103G-type— Remove option V from data set.	

STEP	ACTION	VERIFICATION
4	At 901B DTS— Strap interface test adapter as shown in Fig. 2.	
	<b>Caution:</b> Connect one of the 200-ohm resistors (provided with the 901B DTS) between terminals B and D of the 901B DTS.	
5	Connect interface test adapter to data set connector J8.	
6	Connect 901B DTS to interface test adapter.	
7	Set SELECTOR switch to 1.	
8	At Data Set 103G-type— Lift hand telephone set (handset) from switchhook.	Dial tone is heard in handset receiver if loop-start telephone is used.
9c	If ground-start telephone is used— Momentarily operate push-to-talk switch on handset.	Dial tone is heard in handset receiver.
10	Replace handset on switchhook.	
11	At 901B DTS— Set the A TEST and B TEST switches to OFF position.	

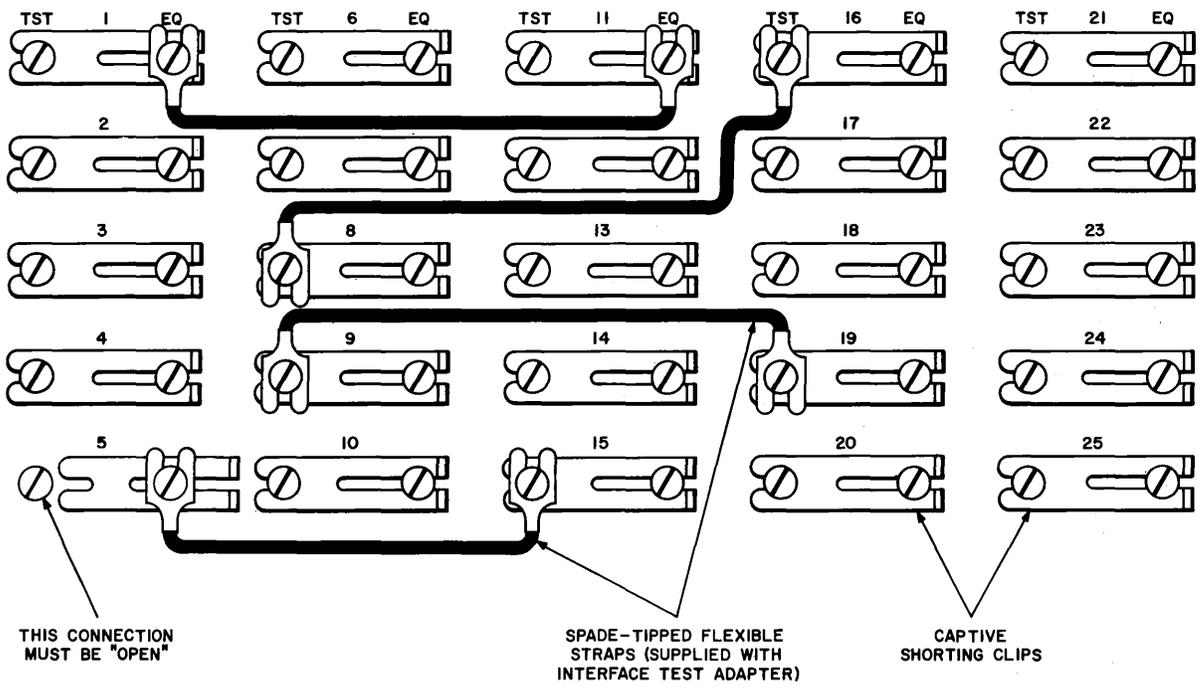


Fig. 2—Interface Test Adapter—Connection Arrangement for Data Set 103G-Type

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
12	Operate the UNATT/ATT toggle switch to the UNATT position.	
13	Connect VOM – probe to the RECEIVE DATA terminal and the + probe to terminal D.	
14	Set VOM scale switch to 12V DC position.	
15	At data set, and if used, ACU— Connect power plug(s) to ac receptacle(s).	VOM indicates between 5.2 and 7.2V dc.  <b>Note:</b> Interface lead BB is in mark condition (mark-hold).
16	At 901B DTS— Disconnect VOM.	
17	Set A TEST switch to position 2.	
18	Set VOM scale switch to 3V DC position and connect the – probe to terminal B and + probe to terminal D.	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CE is in the off condition.
19	Disconnect VOM.	
20	Set A TEST switch to position 3.	
21	At data set— Operate DATA button.	DATA lamp lighted. Dial tone heard in loudspeaker.
22d	If the data set is not a 103G5 or 6, or is a 103G5 or 6 and is provided with ZD option— At 901B DTS—  Connect VOM – probe to terminal D and + probe to terminal B .	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CC is in the on condition.
23e	If the data set is a 103G5 or 6 and is not provided with ZD option— At 901B DTS— Connect VOM – probe to terminal B and + probe to terminal D.	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CC is in the off condition.
24	Disconnect VOM.	
25	At data set— Operate CLEAR-TALK button.	DATA lamp extinguished. Dial tone turned off.
26	At 901B DTS— Connect VOM – probe to terminal B and + probe to terminal D.	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CC is in the off condition.

STEP	ACTION	VERIFICATION
27	Set A TEST switch to position 4.	VOM indicates between 0.9 and 1.3V dc. <b>Note:</b> Interface lead CF is in the off condition.
28	Set A TEST switch to position 5.	VOM indicates between 0.9 and 1.3V dc. <b>Note:</b> Interface lead CB is in the off condition.
29	Disconnect VOM.	
30	At data set— Call the DTC and request continuous f <sub>2</sub> mark (2225 Hz) be sent.	
31	When tone is heard— Operate DATA button and leave handset off-hook until instructed to hang up by DTC.  <b>Note:</b> The f <sub>2</sub> tone will be heard for 1/2 second.	DATA lamp lighted.
32	At 901B DTS— Set VOM scale switch to the 12V DC position and connect the — probe to the RECEIVE DATA terminal and the + probe to terminal D.	VOM indicates between 5.0 and 7.0V dc. <b>Note:</b> Interface lead BB is in the mark condition.
33	Disconnect VOM.	
34	Connect VOM — probe to terminal D and + probe to terminal B, and set scale switch to 3V DC position.	VOM indicates between 0.9 and 1.3V dc. <b>Note:</b> Interface lead CB is in the on condition.
35	Disconnect VOM.	
36	Set A TEST switch to position 3.	
37	Connect VOM — probe to terminal D and + probe to terminal B.	VOM indicates between 0.9 and 1.3V dc. <b>Note:</b> Interface lead CC is in the on condition.
38	Disconnect VOM.	
39	Set A TEST switch to position 4.	
40	Connect VOM — probe to terminal D and + probe to terminal B.	VOM indicates between 0.9 and 1.3V dc. <b>Note:</b> Interface lead CF is in the on condition.
41	Disconnect VOM.	

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STEP	ACTION	VERIFICATION
42	At data set— Operate CLEAR-TALK button.	CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.
43	Request the DTC retransmit f <sub>2</sub> mark and sweep to f <sub>2</sub> space when data set responds with f <sub>1</sub> mark.	
44	When tone is heard— Operate DATA button.	DATA lamp lighted.
45	At 901B DTS— Connect VOM — probe to terminal D and + probe to terminal B.	When DTC sweeps to space— VOM indicates between 0.9 and 1.3V dc.  <i>Note:</i> Interface lead CF is in the on condition. This test checks the carrier detector ability to hold during a space signal.
46	Disconnect VOM.	
47	Set A TEST switch to position 5.	
48	Set VOM scale switch to 60V DC position and connect — probe to terminal D and + probe to RECEIVE DATA terminal.	VOM indicates between 9.0 and 22.0V dc.  <i>Note:</i> Interface lead BB is in the space condition.
49	Disconnect VOM.	
50	At data set— Operate CLEAR-TALK button.	CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.
51f	If loss of carrier disconnect (option S) is provided— Request the DTC to send f <sub>2</sub> mark until data set responds with f <sub>1</sub> mark, and then remove the f <sub>2</sub> mark.	
52f	When tone is heard— Operate DATA button.	DATA lamp lighted. When DTC removes f <sub>2</sub> mark— CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.  <i>Note:</i> This checks the loss of carrier disconnect feature.
53	At data set, and if used, ACU— Disconnect power plug(s) from ac receptacle(s).	
54a	If option Q is not specified on the order for Data Set 103G-type— Remove option Q from data set.	

STEP	ACTION	VERIFICATION
55b	If option V is specified on the order for Data Set 103G-type— Install option V in the data set.	
56	Ensure that all of the correct options are installed in the data set.	
57	Connect power plug(s) to ac receptacle(s).	
58g	If space disconnect (option V or H) is provided— At data set— Request the DTC to send f <sub>2</sub> mark, and when data set responds with f <sub>1</sub> mark, sweep to f <sub>2</sub> space.	
59g	When tone is heard— Operate DATA button.	DATA lamp lighted. When DTC sweeps to f <sub>2</sub> space— DATA lamp extinguished.
		<b>Note:</b> This checks space disconnect feature.
60	Verify that AUTO button is released.	AUTO lamp extinguished.
61	At 901B DTS— Set A TEST switch to position 2.	
62	Set VOM scale switch to 3V DC position.	
63	At data set—  Request DTC to place first one call to the data set; when disconnect occurs, place a second call and send f <sub>1</sub> mark (1270 Hz). Replace handset on switchhook.	
64	During ringing interval of the first call, connect VOM — probe to terminal D and + probe to terminal B.	During ringing cycle— VOM indicates between 0.9 and 1.3V dc.
	<b>Note:</b> To avoid pegging meter in reverse direction during silent interval, disconnect VOM during silent intervals.	<b>Note:</b> Interface lead CE is in the on condition.
65	Disconnect VOM.	

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STEP	ACTION	VERIFICATION
66	Operate AUTO button.	AUTO lamp lighted. When data set answers call— DATA lamp lighted. 20 to 40 seconds after lighting— Data set disconnects. DATA lamp extinguished.  <b>Note:</b> This checks the automatic abort feature (HSS timer).
67	When DTC hears the data set disconnect— DTC places second call.	When data set answers call— DATA lamp lighted. Data set sends f <sub>2</sub> mark. When DTC receives f <sub>2</sub> mark— DTC sends f <sub>1</sub> mark.
68h	At 901B DTS— If answer mode indication (option X) is provided— Connect VOM – probe to terminal D and + probe to terminal B.	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CE is in the on condition.
69i	At 901B DTS— If answer mode indication (option W) is provided— Connect VOM – probe to terminal B and + probe to terminal D.	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CE is in the off condition.
70	Disconnect VOM.	
71	Set A TEST switch to position 4.	
72	Connect VOM – probe to terminal D and + probe to terminal B.	VOM indicates between 0.9 and 1.3V dc.  <b>Note:</b> Interface lead CF is in the on condition.
73	Set A TEST switch to position 5.	
74	Disconnect VOM.	
75	Set VOM scale switch to 12V DC position and connect the – probe to the RECEIVE DATA terminal and the + probe to terminal D.	VOM indicates between 5.0 and 7.0V dc.  <b>Note:</b> Interface lead BB is in the mark condition.
76	Disconnect VOM.	

STEP	ACTION	VERIFICATION
77j	If send disconnect (option T) is provided— Operate the UNATT/ATT toggle switch to the ATT position.	At data set— CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.
78k	If send disconnect (option T) is not provided— Operate the UNATT/ATT toggle switch to the ATT position.	At data set— DATA lamp extinguished.
79	At data set, and if used, ACU— Disconnect power plug(s) from ac receptacle(s).	
80	Disconnect 901B DTS from data set connector J8 and restore normal connection.	
81	Connect power plug(s) to ac receptacle(s).	

**D. End-to-End Test Using a Second Data Set and 901B, 902-Type, and 903-Type Data Test Sets Separated by the Telephone Line Facility (When Available)**

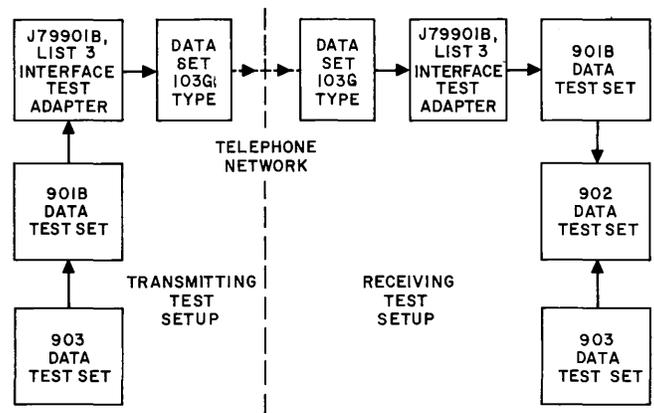
**3.05** The end-to-end test will be made only at the direction of the Plant Service Center (PSC). The PSC will determine if an end-to-end test is necessary and will coordinate the test between the end data sets. This test is to be performed only after all data apparatus and terminal equipment tests have been satisfactorily completed at both ends and the customer is still experiencing trouble.

**3.06** The block diagram (Fig. 3) shows the equipment setup for Test D at the two terminals for testing one direction of transmission.

**3.07** The equipment required for Test D is:

- 901B DTS
- Interface test adapter (J79901B-L3—cover of J79901B)
- 902-type DTS (J79902)
- 903-type DTS (J79903)

**Note 1:** Equipment listed is required at each station.



**Fig. 3—End-to End Test—Data Set 103G-Type Using 901B Data Test Set—Block Diagram**

**Note 2:** If 902B and 903B DTSs are used at the receive terminal, 903B DTS must be used at the transmit terminal. If 902C and 903C DTSs are used at the receive terminal, 903C DTS must be used at the transmit terminal. The 902B and 903B DTSs cannot work into 903C DTS and vice versa.

**THINK** *If either station is an originate-only or answer-only station, all test calls must be originated from the station capable of originating a call.*

STEP	ACTION	VERIFICATION
	<i>Caution: Do not connect the 903-type DTS until all the other equipment is connected and all of their switches have been placed to the proper settings. Do not change switch settings of the test equipment to any setting other than that specified for the specific data set being tested.</i>	
1	At transmit terminal, 901B DTS— Set SELECTOR switch to 1.	
2	Set A TEST switch to OFF.	
3	Set B TEST switch to 3.	
4	Set UNATT/ATT toggle switch to UNATT.	
5	At transmit terminal, 903-type DTS— Set RANDOM/DOT switch to RANDOM.	
6	Set TRIGGER switch to +.	
7	Set BIT RATE switch to 180 (903B) or 300 (903C).	
8	At interface test adapter— Strap as shown in Fig. 2.	
9	Verify that all shorting clips are arranged as shown in Fig. 2.	
10	Connect interface test adapter to data set connector J8.	
11	Connect 901B DTS to interface test adapter.	
12	Using two leads— Connect SIGNAL OUT terminals of 903-type DTS to TRANSMIT DATA terminals of 901B DTS. Connect red to red and black to black.	
13	Connect the 903-type DTS power plug to a 117-volt ac receptacle and operate the OFF/ON switch to ON.	
14	At receive terminal 901B DTS— Set SELECTOR switch to 1.	
15	Set A TEST switch to OFF.	

STEP	ACTION	VERIFICATION
16	Set B TEST switch to 3.	
17	Set UNATT/ATT toggle switch to UNATT.	
18	At receive terminal 902-type DTS— Set BIT RATE switch to 180 (902B) or 300 (902C).	
19	Set meter selection switch to DIST ADJ.	
	<b>Note:</b> TRIGGER is not required.	
20	At receive terminal 903-type DTS— Set BIT RATE switch to EXT CLOCK.	
21	Set RANDOM/DOT switch to RANDOM.	
22	Set TRIGGER switch to +.	
23	Using two leads— Connect RECEIVE DATA terminals of 901B DTS to DATA IN terminals of 902-type DTS. Connect red to red and black to black.	
24	Strap interface test adapter as shown in Fig. 2 and verify that all shorting clips are arranged as shown in Fig. 2.	
25	Connect interface test adapter to data set connector J8.	
26	Connect the 901B DTS to the interface test adapter connector.	
27	Using one lead— Connect red TRANSMIT DATA terminal of 901B DTS to red SIGNAL OUT terminal of 903-type DTS.	
28	Using the cord provided— Connect the 903-type DTS to the 902-type DTS.	
29	Connect the 903-type DTS power plug to 117-volt ac receptacle.	
30	Set the 903-type DTS OFF/ON switch to ON.	
	<b>Note 1:</b> If the station being tested is an originate-only or answer-only station, complete end-to-end tests (in one direction only) will	

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
	<p>involve one 15-minute and ten 1-minute calls. If the station being tested is an originate/answer station, complete end-to-end tests (in one direction only) will involve two 15-minute calls and ten 1-minute calls, of which one of the 15-minute and five of the 1-minute calls must be originated from one end and the other one 15-minute call and five 1-minute calls from the other end. These test calls should be made during busy hours to give reasonable assurance that all test calls do not use the same trunks and routes.</p> <p><b>Note 2:</b> Take proper steps to ensure the customer is not billed for test calls. Refer to the section entitled Crediting Charges On Test Calls (010-250-001).</p>	
31	<p>Originate a call from the receive terminal to establish voice communications between stations.</p> <p><b>Note:</b> If the call cannot be originated from the receive terminal, originate the call from the transmit terminal.</p>	
32	<p>At transmit terminal— At data set— Operate DATA button.</p>	DATA lamp lighted.
33	<p>At 903-type DTS— Momentarily operate START key.</p>	
34	<p>At receive terminal— At data set— Operate DATA button.</p>	DATA lamp lighted.
35	<p>After several seconds— At 902-type DTS— Adjust DISTORTION control for a zero meter reading.</p>	
36	<p>Set meter selection switch to VOLT ADJ.</p>	
37	<p>Adjust VOLTS control for a zero meter reading.</p> <p><b>Note:</b> BIAS control is not used in this test.</p>	
38	<p>Set meter selection switch to PHASE ADJ.</p>	
39	<p>Adjust PHASE control for a zero meter reading.</p>	

STEP	ACTION	VERIFICATION
40	Set meter selection switch to DIST MEAS.	
41	Momentarily operate WORD SYNC & RESET switch and record the time.	
42	At the end of 1 minute— Record number of errors shown on the TOTAL ERRORS lamps of 902-type DTS.	
	<i>Note:</i> To determine total number of errors, add the numbers panel-stamped next to the TOTAL ERRORS lamps together. For example, lighted 8, 4, and 1 lamps equal 13 total errors.	
43	Repeat Steps 41 and 42 until 15 error recordings have been made, then terminate the call.	Disregard the two test periods with the highest number of errors. Of the remaining 13 test periods, 10 must have no bit errors and 3 must have no more than 2 bit errors.
44a	If one location will not be originating all calls— Originate a call from the transmit terminal to establish voice communications between stations and repeat Steps 32 through 43.	
	<i>Note:</i> If the call cannot be originated from the transmit terminal, originate the call from the receive terminal.	
45	Originate a call from the transmit terminal to establish voice communications between stations and repeat Steps 32 through 40.	
	<i>Note:</i> Same as note following Step 44a.	
46	Momentarily operate WORD SYNC & RESET switch and observe 902-type DTS microammeter.	
47	At the end of 1 minute— Record the average peak distortion as shown on the 902-type DTS microammeter.	
	<i>Note:</i> One microamp is equal to one percent distortion.	
48	Record errors shown on the TOTAL ERRORS lamps of the 902-type DTS and terminate the call.	

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
49a	If one location will not be originating all calls— Originate a call from the receive terminal to establish voice communications and repeat Steps 32 through 40.	
50a	Repeat Steps 46 through 48.	
51a	Repeat Steps 45 through 50a until 10 average peak distortion and 10 total error recordings have been made.	No more than 2 bit errors per call shall occur for 8 of the 10 calls. Average peak distortion must not exceed 20 percent for 9 of the 10 calls.  <i>Note:</i> An occasional distortion peak of over 20 percent is permissible as long as the 20 percent average is not exceeded. When the average peak distortion requirement is not met and the total error rate requirement is met, the data set receiver may be suspected of trouble. Otherwise, the trouble is probably in the transmission facility.
52b	If one location will be originating all calls— Repeat Steps 45 through 48 until 10 average peak distortion and 10 total error recordings have been made.	Same as Step 51a.
53	To test transmission in the other direction, reverse the test setup and repeat the entire test.	
54	Disconnect all test equipment at both terminals and restore normal operating connections.	

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**E. Power Receptacle Ground Test (914B Data Test Set)**

**3.08** The equipment required for Test E is:

- 6A impulse counter
- 914B DTS (J79914B-1)

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
1	Remove all programming pins from 914B DTS matrix.	
2	Operate (depress) all interface selector switches except 1A, 1B and 7A, 7B.	



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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
5	At 6A impulse counter— Set WTG switch to VOICE BAND.	
6	Set REF LEV DBRN toggle switch to ADD 30.	
7	Set REF LEV DBRN rotary switch to 60.	
8	Set MINUTES switch to 15.	
9	Reset counter to 0000 by use of the RESET lever.	Counter remains at 0000 for 15 minutes.  <i>Note:</i> If any counts are noted in a 15-minute period, grounding arrangements must be improved.
10a	After completion of test— If option Q was installed in Step 4— Remove option Q.	
11	Remove all test connections and restore normal operating conditions.	

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**F. Interface Test from 904-Type Data Test Center  
Using 914B Data Test Set**

**3.09** The equipment required for Test F is:

- 914B DTS (J79914B-1)
- 904-type DTC

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
1	At 914B DTS— Program matrix, set switches, and connect data set as shown in Fig. 5.	
2	At Data Set 103G-type, and if used, data auxiliary set (ACU)— Disconnect power plug(s) from ac receptacle(s).	
3a	If option Q is not specified on order for Data Set 103G-type— Install option Q in data set.	
4b	If option V is specified on order for Data Set 103G-type— Remove option V from data set.	

STEP	ACTION	VERIFICATION
5	At 914B DTS— Operate POWER switch.	
6	Operate S7 switch to ON.	DS7 lamp lighted.  <i>Note:</i> Interface lead CD is in the on condition.
7	At Data Set 103G-type— Lift hand telephone set (handset) from switchhook.	Dial tone is heard in handset receiver if loop-start telephone is used.
8c	If ground-start telephone is used— Momentarily operate push-to-talk switch on handset.	Dial tone is heard in handset receiver.
9	Replace handset on switchhook.	
10	At 914B DTS— Operate S6 switch ON.	DS6 lamp lighted.  <i>Note:</i> Interface lead CM is in the on condition.
11	Set VERTICAL MONITOR switch to 3.	
12	Set RANGE switch to 10V DC.	
13	At data set, and if used, ACU— Connect power plug(s) to ac receptacle(s).	Meter indicates between 5.2 and 7.2V dc.  <i>Note:</i> Interface lead BB is in mark condition (mark-hold).
14	Set FUNCTION switch to OFF.	
15	At 914B DTS— Set VERTICAL MONITOR switch to 22.	
16	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0V dc.  <i>Note:</i> Interface lead CE is in the off condition.
17	Set FUNCTION switch to OFF.	
18	Set VERTICAL MONITOR switch to 6.	
19	Set METER POLARITY switch to NOR.	
20	Set FUNCTION switch to VOLT INT.	
21d	If the data set under test is a 103G5 or 6 not equipped with ZD option— Set METER POLARITY switch to REV.	

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
22	At data set under test— Operate DATA button.	Meter indicates between 8.0 and 10.0V dc. DATA lamp lighted. Dial tone heard in data set loudspeaker. All data sets except 103G5 or 6 not equipped with ZD option— DS4 lamp lighted.  <i>Note:</i> Interface lead CC is in the on condition.  Data Set 103G5 or 6 not equipped with ZD option— DS4 lamp extinguished.  <i>Note:</i> Interface lead CC is in the off condition.
23	Operate CLEAR-TALK button.	DATA lamp extinguished. DS4 lamp extinguished. Dial tone turned off.  <i>Note:</i> Interface lead CC is in the off condition.
24	At 914B DTS— Set METER POLARITY switch to REV.	
25	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0V dc.  <i>Note:</i> Interface lead CC is in the off condition.
26	Set FUNCTION switch to OFF.	
27	Set VERTICAL MONITOR switch to 8.	
28	Set FUNCTION switches to VOLT INT.	Meter indicates between 8.0 and 10.0V dc.  <i>Note:</i> Interface lead CF is in the off condition.
29	Set FUNCTION switch to OFF.	
30	Set VERTICAL MONITOR switch to 5.	
31	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0V dc.  <i>Note:</i> Interface lead CB is in the off position.
32	Set FUNCTION switch to OFF.	

STEP	ACTION	VERIFICATION
33	At Data Set 103G-type— Call the DTC and request continuous f <sub>2</sub> mark (2225 Hz) be sent.	
34	When tone is heard— Operate DATA button and leave handset off hook until instructed to hang up by DTC.  <i>Note:</i> The f <sub>2</sub> tone will be heard for 1/2 second.	DATA lamp lighted.
35	At 914B DTS— Set VERTICAL MONITOR switch to 3.	
36	Set FUNCTION switch to VOLT INT.	Meter indicates between 5.0 and 7.0V dc.  <i>Note:</i> Interface lead BB is in mark condition.
37	Set FUNCTION switch to OFF.	
38	Set VERTICAL MONITOR switch to 5.	
39	Set METER POLARITY switch to NOR.	
40	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0V dc. DS3 lamp lighted.  <i>Note:</i> Interface lead CB is in the on condition.
41	Set FUNCTION switch to OFF.	
42	Set VERTICAL MONITOR switch to 8.	
43	Set FUNCTION switch VOLT INT.	Meter indicates between 8.0 and 10.0V dc. DS5 lamp lighted.  <i>Note:</i> Interface lead CF is in on condition.
44	Set FUNCTION SWITCH to OFF.	
45	Set VERTICAL MONITOR switch to 6.	
46	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0V dc. DS4 lamp lighted.  <i>Note:</i> Interface lead CC is in the on condition.
47	Set FUNCTION switch to OFF.	
48	At Data Set 103G-type— Operate CLEAR-TALK button.	CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
49	Request DTC to retransmit f <sub>2</sub> mark and sweep to f <sub>2</sub> space when data set responds with f <sub>1</sub> mark.	
50	When tone is heard— Operate DATA button.	When DTC sweeps to space— DS5 lamp lighted.  <i>Note 1:</i> Interface lead CF is in the on condition.  <i>Note 2:</i> This test checks the carrier detector ability to hold during a space signal.
51	At 914B DTS— Set VERTICAL MONITOR switch to 3.	
52	Set FUNCTION switch to VOLT INT.	Meter indicates between 6.0 and 7.5V dc. DS2 lamp lighted.  <i>Note:</i> Interface lead BB is in the space condition.
53	Set FUNCTION switch to OFF.	
54	At Data Set 103G-type— Operate CLEAR-TALK button.	CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.
55e	If loss of carrier disconnect (option S) is provided— Request the DTC to send f <sub>2</sub> mark until data set responds with f <sub>1</sub> mark, and then remove the f <sub>2</sub> mark.	
56e	When tone is heard— Operate DATA button.	DATA lamp lighted. When DTC removes f <sub>2</sub> mark— CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.
57	At data set, and if used, ACU— Disconnect power plug(s) from ac receptacle(s).	
58a	If option Q is not specified on the order for Data Set 103G-type— Remove option Q from data set.	
59b	If option V is specified on the order for Data Set 103G-type— Install option V in the data set.	
60	Ensure that all the correct options are installed in the data set.	

STEP	ACTION	VERIFICATION
61	Connect power plug(s) to ac receptacles(s).	
62f	If space disconnect (option V or H) is provided— At Data Set 103G-type— Request the DTC to send f <sub>2</sub> mark, and when data set responds with f <sub>1</sub> mark, sweep to f <sub>2</sub> space.	
63f	When tone is heard— Operate DATA button.	DATA lamp lighted. When DTC sweeps to f <sub>2</sub> space— DATA lamp extinguished.  <i>Note:</i> This checks space disconnect feature.
64	Verify AUTO button is released.	AUTO lamp extinguished.
65	At 914B DTS— Set VERTICAL MONITOR switch to 22.	
66	At Data Set 103G-type— Request DTC to place one call to the data set and then, when disconnect occurs, place a second call and send f <sub>1</sub> mark (1270 Hz).	
67	During ringing intervals— Set FUNCTION switch to VOLT INT.  <i>Note:</i> In order to avoid pegging the meter, set FUNCTION switch to OFF during silent intervals.	During ringing intervals— Meter indicates between 8.0 and 10.0V dc. DS8 lamp lighted during ringing intervals, extinguished during silent intervals.  <i>Note:</i> Interface lead CE is in on condition.
68	Ensure that the FUNCTION switch is in the OFF position.	
69	Operate AUTO button.	AUTO lamp lighted. When data set answers call— DATA lamp lighted. DS4 lamp lighted.  <i>Note:</i> Interface lead CC is in the on condition. 20 to 40 seconds after lighting— Data set disconnects. DATA lamp extinguished. DS4 lamp extinguished.  <i>Note 1:</i> Interface lead CC is in off condition. <i>Note 2:</i> This checks the automatic abort feature (HSS timer).

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
70	When DTC hears the data set disconnect— DTC places second call.	<p>When data set answers call— DATA lamp lighted. Data set sends f<sub>2</sub> mark. When DTS receives f<sub>2</sub> mark— DTC sends f<sub>1</sub> mark. DS4 lamp lighted.</p> <p><i>Note :</i> Interface lead CC is in on condition.</p> <p>DS5 lamp lighted.</p> <p><i>Note :</i> Interface lead CF is in on condition.</p> <p>DS3 lamp lighted.</p> <p><i>Note :</i> Interface lead CB is in on condition.</p> <p>DS2 lamp extinguished.</p> <p><i>Note :</i> Interface lead BB is in mark condition.</p> <p>If answer mode indication (option X) is provided— DS8 lamp lighted.</p> <p><i>Note:</i> Interface lead CE is in the on condition.</p>
71g	If answer mode indication (option W) is provided— Set METER POLARITY to REV.	
72g	Set FUNCTION switch to VOLT INT.	<p>Meter indicates between 8.0 and 10.0V dc.</p> <p><i>Note:</i> Interface lead CE is in the off condition.</p>
73g	Set FUNCTION switch to OFF.	
74h	If send disconnect (option T) is provided— Operate S7 to OFF.	<p>At Data Set 103G-type— CLEAR-TALK lamp lighted for 3 seconds, then DATA and CLEAR-TALK lamps extinguished.</p> <p>At 914B DTS— DS7 lamp extinguished.</p> <p><i>Note:</i> Interface lead CD is in the off condition.</p>
75i	If send disconnect (option T) is not provided— Operate S7 to OFF.	<p>At Data Set 103G-type— DATA lamp extinguished. At 914B DTS— DS7 lamp extinguished.</p> <p><i>Note:</i> Interface lead CD is in the off condition.</p>

STEP	ACTION	VERIFICATION
76	At Data Set 103G-type, and if used, ACU— Disconnect power plug(s) from ac receptacle(s).	
77	Disconnect 914B DTS from data set connector J8 and restore normal connection.	
78	Connect power plug(s) to ac receptacle(s).	

**G. End-to-End Test Using a Second Data Set and 914B Data Test Set Separated by the Telephone Line Facility (When Available)**

**3.10** The end-to-end test will be made only at the direction of the Plant Service Center (PSC). The PSC will determine if an end-to-end test is necessary, and will coordinate the test between the end data sets. This test is to be performed only after all data apparatus and terminal equipment tests have been satisfactorily completed at both ends and the customer is still experiencing trouble.

**3.11** The test connection diagram (Fig. 6) shows the equipment setup at the two terminals for testing one direction of transmission. The TEST SET MODE switch must be changed from TRMT SER to RCV SER at the transmit station

and from RCV SER to TRMT SER at the receive station in order to transmit data in the other direction.

**3.12** The equipment required for Test G is:

- 914B DTS (J79914B-1) at each station

**Note:** Test G may also be performed using a 901B, 902C and 903C at one station and a 914B at the other station. However, if this is done, the employee must combine Test D and Test G to obtain proper instructions.



***If either station is an originate-only or answer-only station, all test calls must be originated from the station capable of originating a call.***

STEP	ACTION	VERIFICATION
1	At transmit terminal 914B DTS— Set switches and program matrix as shown in Fig. 6.	
2	Connect 914B DTS A connector to data set connector J8 with cord provided.	
3	At receive terminal 914B DTS— Set switches and program matrix as shown in Fig. 6.	
4	Connect 914B DTS A connector to data set connector J8 with cord provided.	
5	At transmit terminal 914B DTS— Operate POWER switch.	DS1 fluttering.

**Note:** For significance of lamp indications occurring during end-to-end test, see Table B.

STEP

ACTION

VERIFICATION

TABLE B

**LAMP INDICATIONS OCCURRING DURING  
END-TO-END TEST WITH 914B DATA TEST SET**

CONTROL SIGNAL LAMP	LEAD STATUS
DS1 Fluttering or dim	Data being applied to BA
DS1 ON	Space being applied to BA
DS2 Fluttering or dim	Data being received on BB
DS2 ON	Space being received on BB
DS3 ON	CB-ON— clear to send
DS4 ON	CC-ON— data set ready
DS5 ON	CF-ON— carrier received
DS6 ON	CM-ON— ON voltage applied to CM
DS7 ON	CD-ON— ON voltage applied to CD
DS8 ON	CE-ON— Ringing

- 6 At receive terminal 914B DTS—  
Operate POWER switch.

**Note 1:** If the station being tested is an originate-only or answer-only station, complete end-to-end tests (in one direction only) will involve one 15-minute and ten 1-minute calls. If the station being tested is an originate/answer station, complete end-to-end tests (in one direction only) will involve two 15-minute calls and ten 1-minute calls, of which one of the 15-minute and five of the 1-minute calls must be originated from one end and the other 15-minute call and five 1-minute calls from the other end. These test calls should be made during busy hours to give reasonable assurance that all test calls do not use the same trunks and routes.

**Note 2:** Take proper steps to ensure the customer is not billed for test calls. Refer to the section entitled Crediting Charges on Test Calls (010-250-001).

STEP	ACTION	VERIFICATION
7	At both transmit and receive terminal Data Sets 103G-type, and if used, ACU— Connect power plug(s) to ac receptacle(s).	
8	At both transmit and receive terminal 914B DTSS— Operate S7 ON.	DS7 lamp lighted.
9	Originate a call from the receive terminal to establish voice communications between stations.  <i>Note:</i> If the call cannot be originated from the receive terminal, originate the call from the transmit terminal.	
10	At both transmit and receive terminal Data Sets 103G-type— Operate DATA button.	DS1 lamp fluttering (transmit terminal). DS2 lamp fluttering (receive terminal). DATA lamp lighted. DS5 lamp lighted. DS4 lamp lighted. DS3 lamp lighted.
11	At receive terminal— At 914B DTS— Adjust PHASE control for a null meter indication.	
12	Operate RESET switch.	
13	Momentarily operate WORD SYNC switch to MAN.	
14	At the end of one minute— Record number of errors shown on the counter display of the 914B DTS.	
15	Repeat Steps 12 through 14 until 15 error recordings have been made, then terminate the call.	Disregard the two test periods with the highest number of errors. Of the remaining 13 test periods, 10 must have no bit errors and 3 must have no more than 2 bit errors.
16a	If one location will not be originating all calls— Originate a call from the transmit terminal to establish voice communications and repeat Steps 10 through 15.  <i>Note:</i> If the call cannot be originated from the transmit terminal, originate a call from the receive terminal.	

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<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
17	Originate a call from the transmit terminal to establish voice communications and repeat Steps 10 through 13.  <i>Note:</i> Same as note following Step 16a.	
18	At the end of one minute— Record errors shown on counter display and terminate the call.	
19a	If one location will not be originating all calls— Originate a call from the receive terminal to establish voice communications and repeat Steps 10 through 13.  <i>Note:</i> If the call cannot be originated from the receive terminal, originate the call from the transmit terminal.	
20a	Repeat Step 18.	
21a	Repeat Steps 17 through 20a until 10 total error recordings have been made.	No more than 2 bit errors per call shall occur for 8 of the 10 calls.
22b	If one location will be originating all calls— Repeat Steps 17 and 18 until 10 total error recordings have been made.	No more than 2 bit errors per call shall occur for 8 of the 10 calls.
23	To test transmission in the other direction, reverse the test setup and repeat the entire test.	
24	Disconnect all test equipment at both terminals and restore normal operating connections.	

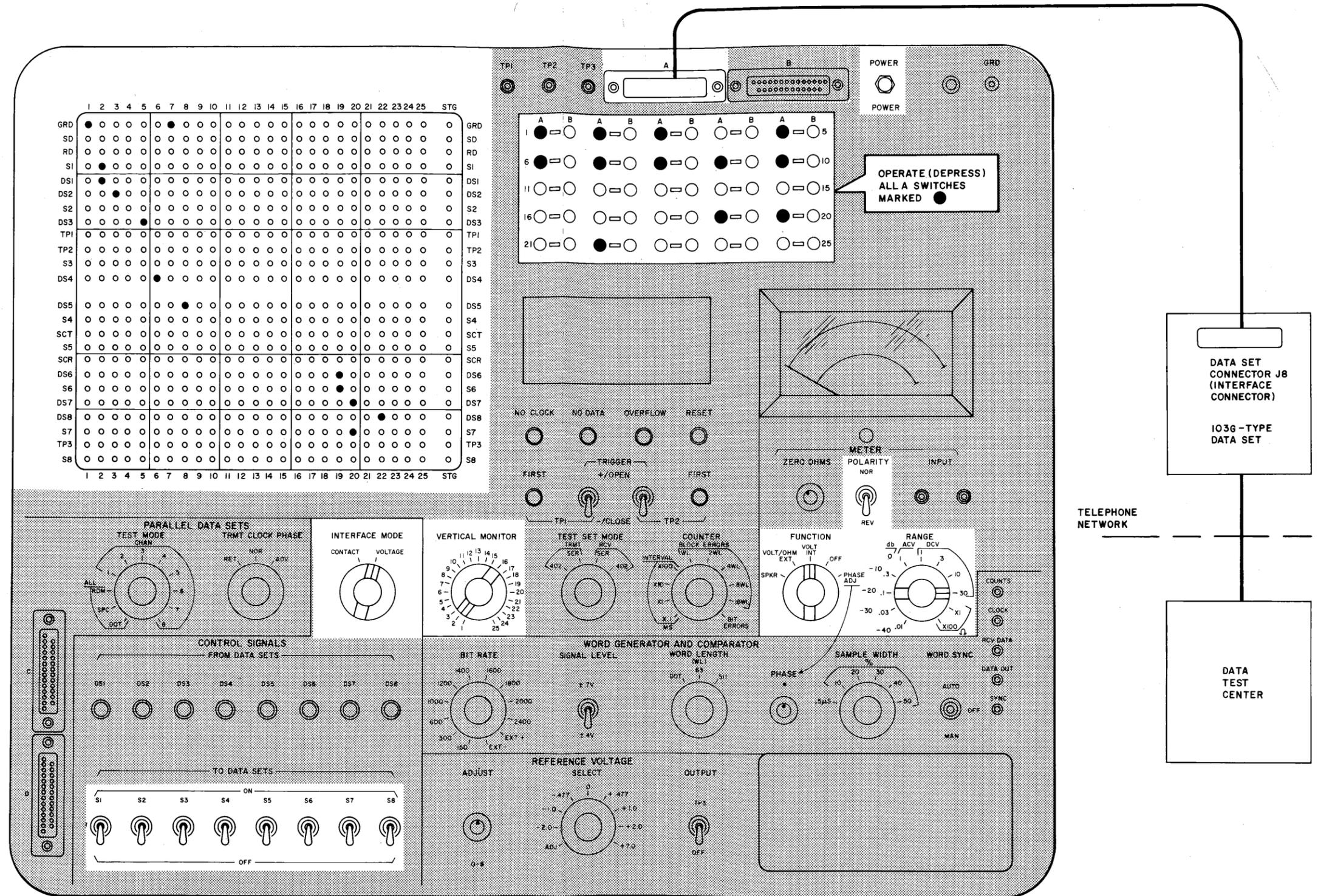


Fig. 5—Interface Test Connection Arrangement Using 914B Data Test Set

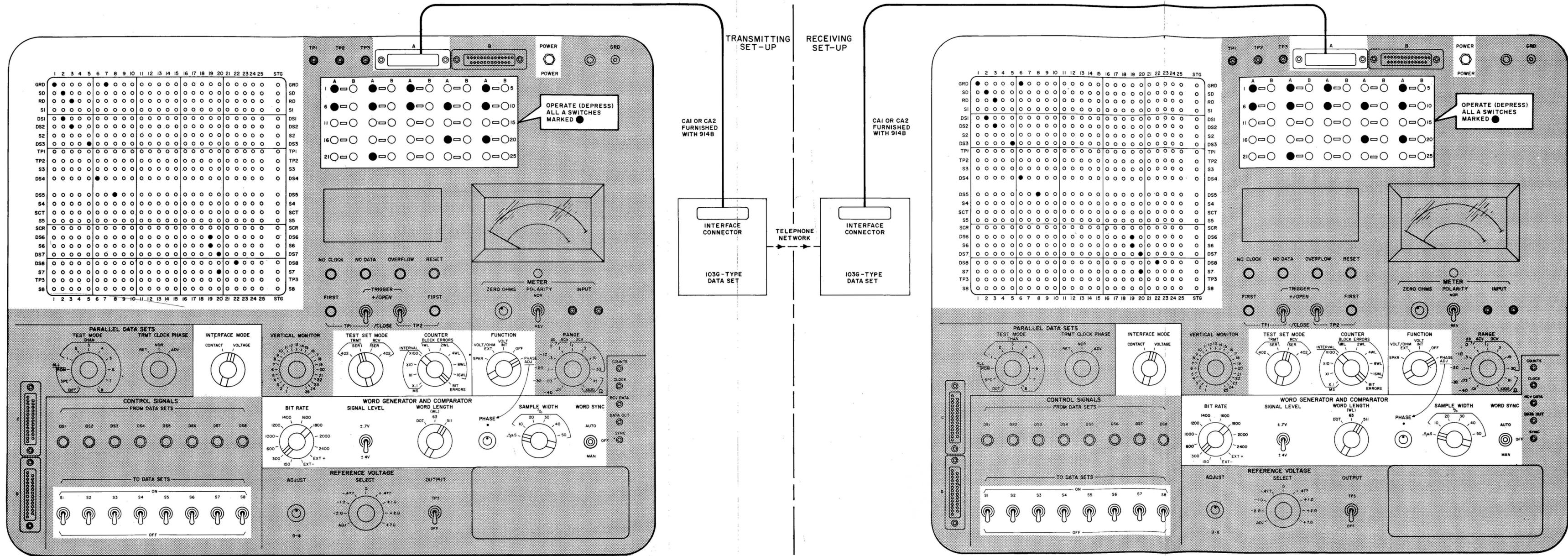


Fig. 6—End-to-End Test Connection Arrangement Using 914B Data Test Set