PRIVATE LINE STATION ARRANGEMENTS USING DATA AUXILIARY SETS 830A AND 830B WITH DATA SETS 108- AND 109-TYPE TEST PROCEDURES

CONTENTS PAGE

1. GENERAL

1.01 This section provides information on testing the data auxiliary set (DAS) 830A and the associated data set 108- or 109-type. The DAS 830B, when used, is considered part of the terminal equipment. Installation testing of the DAS 830B is limited to an operational test of the overall terminal.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The tests in this section are limited to the testing of DAS 830A and associated data sets. The terminal equipment 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 it is suspected of a malfunction. When a customer-provided terminal (CPT) is used, the customer is responsible for testing the terminal.

1.04 ***The tests to be used will be determined by the type of data set used in the data station.*** Refer to the table of contents for a list of the tests applicable to each type data set. Part 5 provides an overall operational test using the 911A and 914C data test sets.

2. DATA SET 108-TYPE TEST PROCEDURES

A. Tests

2.01 Tests for the data station using data set 108-type are listed below:

(a) ***Power Supply Test:*** This test measures the +24V and -24V from the DAS power supply.

(b) ***Data Set Exchange Procedure:*** This test verifies the operation of the data station and eliminates the data set as the source of trouble.

(c) ***Carrier Shift Test:*** This test determines if the near-end carrier frequencies can be shifted from the mark to space frequency.

In order to perform Test (d), the remote station must be installed.

(d) ***Carrier Monitoring Test:*** This test determines the presence of both near- and far-end carriers.

(e) ***Loop-Back Voltage Test:*** This test checks operation of data set and line facilities via loop back.

(f) ***Loop-Loss Measurement Test:*** This test measures the power loss of the line facilities.

B. Test Equipment

2.02 The test equipment required for a data station using a data set 108-type is listed below and with each test.

(a) The interface test adapter is a 901B-L3 DTS cover.

(b) KS-20538-L1 volt-ohm-milliammeter (VOM), or equivalent (Section 100-520-101).

(c) Data set 108D- or 108E-type, as applicable (spare) (Section 591-028-100).

(d) Portable station test set TTS-28, or equivalent.

(e) 1013-type handset (dial hand test set).

(f) Portable telegraph carrier test set (TCTS) (KS-19935-L7).

(g) W1AD Cord, or equivalent (3 req).

C. Procedures

2.03 This section is to be used in conjunction with troubleshooting procedures in Section 591-816-300.

2.04 In order to test the near-end station using data set 108D- or 108E-type in a private line arrangement, it is necessary to:

- Remove the carrier squelch on carrier fail option while performing test procedures if it is installed at either end.
- Ensure that the TEST button has ***not*** been pushed (TEST lamp should be unlit) at both ends.
- Reestablish connection by sending the required mark-a-space frequency for data set 108E (mark frequency required for data set 108D) if carrier squelch on carrier fail has been provided.

If the carrier squelch on carrier fail option is not removed at a station and a carrier fail condition occurs, the station cannot transmit until the data set at that station receives a connect signal. This condition will cause difficulty in isolating receive, loop, or far-end transmit problems. The test mode automatically installs a carrier squelch on carrier fail which can result in the same difficulty if option is not disabled.

2.05 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.

Power Supply Test for DAS 830A

2.06 Test equipment required for this test is listed below:

- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
1	Visually inspect the power source for the DAS or TTY and ensure that power is connected to the data station.	
2	Remove DAS rear cover.	
3	Condition VOM to measure +24 Vdc.	
4	Connect + lead of VOM to DAS terminal +24.	
5	Connect − lead of VOM to DAS terminal GRD.	Meter indicates +24 ±3 Vdc.
6	Disconnect VOM leads.	
7	Connect + lead of VOM to DAS terminal GRD.	
8	Connect − lead of VOM to DAS terminal −24.	Meter indicates −24 ±3 Vdc.
9	Disconnect VOM leads.	
10	End of test.	

Data Set Exchange Procedure

2.07 Test equipment required for this test is listed below:

- Data set 108D- or 108E-type, as applicable, spare known to be good.

STEP	ACTION	VERIFICATION
1	Remove DAS front cover.	
2	Remove data set 108-type and replace it with a spare that has had the correct options installed.	
3	Apply power to the station.	Station operation will be normal.

STEP	ACTION	VERIFICATION
		Note: If station operation is ***not*** normal, replace DAS 830A and check station operation. If trouble cannot be located, request aid from the immediate supervisor.
4	End of test.	

Carrier Shift Test

2.08 Test equipment required for this test is listed below:

- Interface test adapter (cover of 901B)
- 1013 handset
- W1AD cord
- TCTS (frequency measurement)
- W1AD cord (three required for frequency measurement).

STEP	ACTION	VERIFICATION
	Audible Indication	
1	Remove DAS front and rear covers.	
2	Remove carrier squelch on carrier fail option (if installed).	
3	Ensure that near-end station is not in the test mode.	Test mode switch (TM) is released and lamp is off.
4	Remove customer interface cord from J2 of the DAS and plug cord from the interface test adapter in its place.	
5	Operate 1013 handset TALK MON switch to MON and connect leads to test point (TP) 1 and TP2 (2-wire or 4-wire) on the front of the data set (see Fig. 1).	
6	Clip one end of W1AD cord to terminal 2 (BA lead) of interface test adapter.	
7	Using free end of W1AD cord, momentarily touch terminal 9 (+24V) of the interface test adapter while monitoring with 1013 handset.	
8	Monitor for shift in tone.	Shift in tone is heard.
9	Remove handset and interface test adapter, replace carrier squelch on carrier fail (if originally installed), and replace cover.	

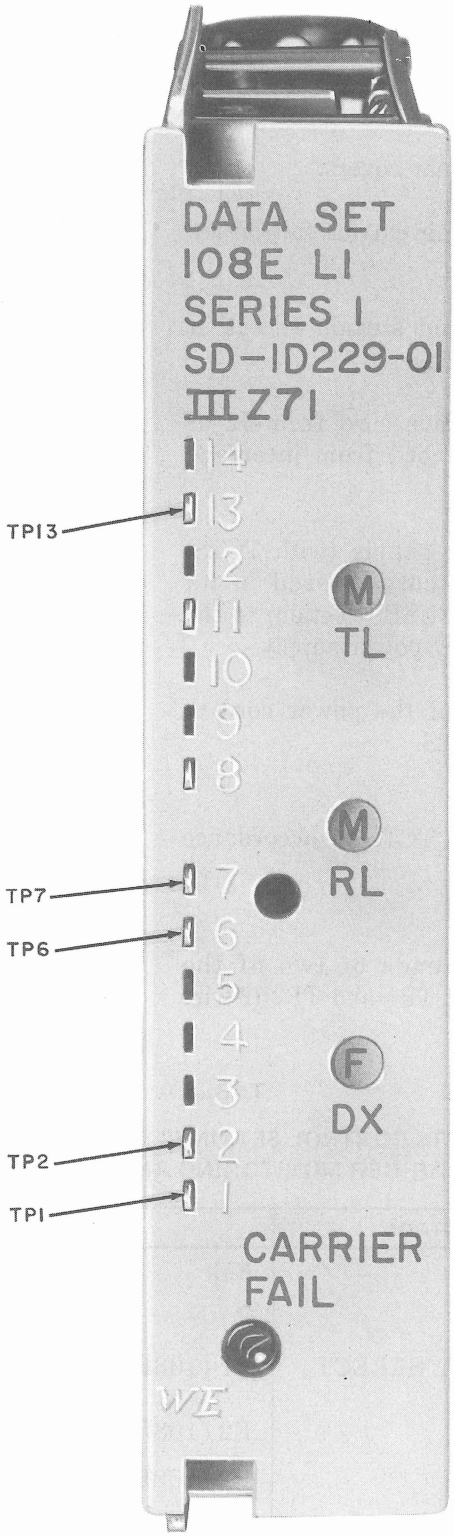


Fig. 1—Data Set Test Points

STEP	ACTION	VERIFICATION
	Frequency Measurement	
1	Remove DAS front and rear covers.	
2	Remove carrier squelch on carrier fail option (if installed).	
3	Ensure that the near-end station is not in the test mode.	Test mode switch (TM) is released and lamp is off.
4	Remove customer interface cord from J2 of the DAS and plug the cord from interface test adapter in its place.	
5	Connect auxiliary power supply (with TCTS) interconnection power cord (stored in its CABLES AND SPARE FUSES section) to the PWR jack of the auxiliary power supply.	
6	Connect the other end of the power cord to the PWR jack of the TCTS.	
7	Operate controls of the TCTS in accordance with Table A.	
8	Connect alligator clip ends of two of the W1AD cords to data set TP1 and TP2 (2-wire or 4-wire).	

TABLE A

TCTS CONTROL SETTINGS FOR DS 108-TYPE CARRIER MONITORING AND SHIFT TESTS

CONTROL	SETTING	
AM/FM	FM	
SW/DW/F	F	
CHANNEL SELECT	F1 (108D)	Near-End Test (Data Set Transmit Freq)
	F2 (108E)	
	F2 (108D)	Far-End Test (Data Set Receive Freq)
	F1 (108E)	
SPKR switch	ON	
HI-M/LO-M	HI-M	
LEVEL dBm	-17	

STEP	ACTION	VERIFICATION
9	Connect spade-tip ends of the two W1AD cords to VF-1 and VF-2 screws on the back of the TCTS.	
10	Connect spade-tip end of the third W1AD cord to terminal 2 of the interface test adapter.	
11	Connect alligator clip end of the third W1AD cord to terminal 7 of the interface test adapter.	
12	Operate PWR switch of the auxiliary power supply to ON.	FREQUENCY DEVIATION meter must indicate between −6 and +6 Hz deviation from F1 frequency for data set 108A and 108E (1270 a mark) or for F2 frequencies for data sets 108C and 108D (2225 Hz for a mark). ***Note:*** If the near-end station is sending a mark, the SIGS M-ON lamp of the TCTS will be lighted. If the near-end station is sending a space, the SIGS M-ON lamp will not be lighted.
13	Move alligator clip end of the third W1AD cord from terminal 7 to terminal 9 of the interface test adapter.	FREQUENCY DEVIATION meter indicates between −6 and +6 Hz from F1 frequencies for data set 108D (1070 Hz for a space) or from F2 frequencies for data set 108E (2025 Hz for a space).
14	Operate PWR switch of the auxiliary power supply to OFF.	
15	Replace carrier squelch on carrier fail option (if originally installed).	
16	Disconnect power cord and test cords.	
17	End of test.	

Carrier Monitoring Test

2.09 The test equipment required for this test is listed below:

- 1013 handset (audible indication)
- TCTS (frequency measurement)
- W1AD cord (two required for frequency measurement).

Note: The carrier squelch on carrier fail option (if installed at either end) must be removed for this test. This test will not work if either station is in the test mode.

STEP	ACTION	VERIFICATION
	Far-End Carrier Frequency Measurement	
1	Using a nearby telephone, instruct far-end station not to send data during this test.	

STEP	ACTION	VERIFICATION
2	Remove DAS front and rear covers.	
3	Connect one end of the auxiliary power supply (with TCTS) interconnection power cord (stored in the CABLES AND SPARE FUSES section of the auxiliary power supply) to the PWR jack of the auxiliary power supply.	
4	Connect the other end of the interconnection power cord to the PWR jack of the TCTS.	
5	Operate controls on the TCTS in accordance with Table A.	
6	Connect alligator clip ends of the two W1AD cords to data set TP1 and TP2 for 2-wire line facilities or TP6 and TP13 for 4-wire line facilities (see Fig. 1).	
7	Connect spade-tip ends of the two W1AD cords to VF-1 and VF-2 screws of TB1 on the back of the TCTS.	
8	Connect power cord of the auxiliary power supply to an available 120V 60-Hz ac power source.	
9	Operate PWR switch of auxiliary power supply to ON.	
10	Monitor incoming carrier frequency ***(E1 if data set at far end is data set 108D*** or ***F2 if data set is 108E).***	FREQUENCY DEVIATION meter indicates between −6 and +6 Hz from F1 frequencies for data set 108D (1270 Hz for a mark) or from F2 frequencies for data set 108E (2225 Hz for a mark). ***Note:*** If the far-end station is sending a mark, the SIGS M-ON lamp of the TCTS will be lighted. If the far-end station is sending a space, the SIGS M-ON lamp will not be lighted. The lamp will blink to indicate modulated carrier.
11	Operate PWR switch of auxiliary power supply (with TCTS) to OFF.	
12	Disconnect all power cords and test cords.	
13	Replace cover and restore normal station operation to the near- and far-end stations.	

STEP	ACTION	VERIFICATION
	Near-End Carrier Frequency Measurement	
1	Using a nearby telephone, instruct the far-end station not to send data during this test.	
2	Remove DAS front and rear covers.	
3	Connect one end of the auxiliary power supply (with TCTS) interconnection power cord (stored in the CABLES AND SPARE FUSES section of the auxiliary power supply) to the PWR jack of the auxiliary power supply.	
4	Connect the other end of the interconnection power cord to the PWR jack of the TCTS.	
5	Operate controls of the TCTS in accordance with Table A.	
6	Connect alligator clip ends of the two W1AD cords to data set TP1 and TP2 (2-wire or 4-wire).	
7	Connect spade-tip ends of the two W1AD cords to VF-1 and VF-2 screws of TB1 on the back of the TCTS.	
8	Connect power cord of the auxiliary power supply (with TCTS) to an available 120V 60-Hz ac power source.	
9	Operate PWR switch of auxiliary power supply to ON.	
10	Monitor near-end carrier frequency F1 (data set 108D) or F2 (data set 108E).	The FREQUENCY DEVIATION meter indicates between −6 and +6 Hz from F1 frequencies for data set 108D (1270 Hz for a mark), or from F2 frequencies for data set 108E (2225 Hz for a mark). ***Note:*** The SIGS M-ON lamp of the TCTS will be lighted.
11	Operate the PWR switch of the auxiliary power supply to OFF.	
12	Disconnect all test cords.	
13	Replace covers and return the near- and far-end stations to normal operation.	

Loop-Back Voltage Test

Note: The loop-back test is required when investigating trouble reports or at the time of installation to ensure proper operation of the data station. If the service offering is a voiceband data circuit, the 904-type data test center (DTC) will perform the test; if it is a telegraph channel, the private line telegraph testboard will perform the test. If the service is station-to-station operation, the far end must be placed in the test mode.

2.10 The test equipment required for this test is listed below:

- Interface test adapter (901B cover).
- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
1	At DAS 830A, remove customer interface cord from J2.	
2	Connect interface test adapter to J2 of DAS 830A.	
3	Request that the far end be placed in the test mode.	Far-end station TEST lamp lights.
4	Set FUNCTION switch of VOM to 30 Vdc.	
5	Connect + terminal of VOM to interface test adapter, terminal 7 (signal ground).	
6	Connect − terminal of VOM to interface test adapter, terminal 3 (BB lead).	Meter reads between 5 and 25 volts.
7	Remove meter leads from interface test adapter (901B DTS cover).	
8	Clip one end of W1AD cord to terminal 2 (BA lead) of the interface test adapter, and clip other end to terminal 9 (+24V).	
9	Connect − terminal of VOM to interface test adapter, terminal 7 (signal ground).	
10	Connect + terminal of VOM to interface test adapter, terminal 3 (BB lead).	Meter reads between 5 and 25 volts.
11	Remove test equipment; return to pretest conditions.	

Loop-Loss Measurement Test

2.11 The test equipment required for this test is listed below:

- TTS-28.

STEP	ACTION	VERIFICATION
1	Remove DAS front and rear covers.	
2	Remove power cord from DAS.	
3	Pull data set from mounting position to obtain access to terminals.	
4	Set FUNCTION switch of TTS-28 to DBM 900Ω TERM O position.	
5	Connect + and − terminals of TTS-28 to DAS terminals T and R (2-wire) or terminals T1 and R1 (4-wire).	
6	Request STC to send 1000 Hz at 0 dBm.	
7	Read TTS-28 meter. ***Note:*** It may be necessary to set FUNCTION switch of TTS-28 to DBM 900Ω TERM −10 position to obtain reading.	
8	Request STC to send 2300 Hz at 0 dBm.	
9	Read TTS-28 meter.	
10	Meter readings are the actual measured loss (AML) of the line facilities. These readings should be the same as the readings taken during installation of the data station. The station layout card shows the expected measured loss (EML) when the facilities were designed. The readings taken in Steps 7 and 9 should not deviate from the limits shown in Table B. If the AML is not within limits, the loop should be turned back for repair.	
11	If AML is within limits, remove connections from TTS-28, return data set to proper position, replace cover, and restore power to the station. ***Note:*** For 4-wire application, the loop loss of the transmit loop (terminals T and R) can be measured from the far end with a loop-loss measurement test.	

3. DATA SET 109A-TYPE TEST PROCEDURES

A. Tests

3.01 Tests for the data station using data set 109-type are listed below.

(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.

(c) ***Data Set Exchange Procedure:*** This test verifies that the specific data set is functioning properly.

TABLE B

LOOP LIMITS WHEN TESTING LOOP LOSS WITH DATA SET 108-TYPE

TYPE OF LOOP	AML LIMITS
Without repeaters or carriers	EMP 1 dB
With E7 repeaters only	EML 1 dB
With all other repeaters and/or carriers	EML 2 dB

Note: The maximum AML possible for station-to-hub configurations should be — 16 dB. The maximum AML for station-to-station configurations should be —24 dB.

B. Test Equipment

3.02 The test apparatus required is listed below and with each test.

(a) Interface test adapter (cover of the 901B DTS)

(b) KS-20538-L1 VOM, or equivalent

(c) Data set 109A-type, spare (Section 591-024-100).

C. Procedures

3.03 These tests should be performed in accordance with the maintenance philosophy and troubleshooting procedure given in Section 591-816-300.

3.04 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.

Power Supply Test

3.05 Test equipment required for this test is listed below:

- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
1	Visually inspect the power source for the DAS or TTY and ensure that power is connected to the data station.	
2	Remove DAS rear cover.	
3	Condition VOM to measure +24 Vdc.	
4	Connect + lead of VOM to DAS terminal +24.	
5	Connect — lead of VOM to DAS terminal GRD.	Meter indicates +24 ±3 Vdc.
6	Disconnect VOM leads.	
7	Connect + lead of VOM to DAS terminal GRD.	
8	Connect — lead of VOM to DAS terminal —24.	Meter indicates —24 ±3 Vdc.
9	Disconnect VOM leads.	
10	End of test.	

Loop Resistance Test

3.06 Test equipment required for this test is listed below:

- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
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 100 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 591-816-200 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. ***Caution: Be sure to observe proper polarity when reconnecting loop.***	
8	Instruct remote station to return station to normal operation.	
9	End of test. Return power to local station.	

Data Set Exchange Procedure

3.07 Test equipment required for this test is listed below:

- Data set 109A-type, spare known to be good.

STEP	ACTION	VERIFICATION
1	Remove power from the station, remove data set 109A-type, and replace the data set with a good spare, being careful that correct options are inserted in the data set.	

STEP	ACTION	VERIFICATION
2	Apply power to the station.	Station operation is normal. ***Note:*** If station operation is ***not*** normal, request aid through proper channels.
3	End of test.	

4. DATA SET 109E-TYPE TEST PROCEDURES

A. Tests

4.01 Tests for the data station using data set 109E-type are listed below:

(a) ***Power Supply Test:*** This test measures the +24V and −24V from the DAS power supply.

(b) ***Loop Resistance Test:*** This test measures resistance values of the transmission loop.

(c) ***Loop Current Test:*** This test verifies that the loop current is acceptable when both the local and remote stations are in the marking condition.

(d) ***Data Set Voltage Test:*** This test verifies that the data set is applying a proper marking voltage to the transmission loop.

(e) ***Data Set Exchange Procedure:*** This test verifies the operation of the data station and eliminates the data set as the source of trouble.

B. Test Equipment

4.02 Test equipment required is listed below and with each test.

(a) Interface test adapter (901B-L3 DTS cover)

(b) KS-20538-L1 VOM, or equivalent

(c) Data set 109E-type, spare (Section 591-036-100).

C. Procedures

4.03 The following test procedures are suggested to test data set 109E-type single private line station. These suggested procedures are to be used in conjunction with Section 591-816-300.

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

4.05 A letter, ***a, b, c,*** etc, is added to the step number in 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 given test. Where a condition does not apply, all steps designated by that letter should be omitted.

Power Supply Test

4.06 Test equipment required for this test is listed below.

- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
1	Visually inspect the power source for the DAS or TTY and ensure that power is properly connected to the data station.	
2	Remove DAS cover or gain access to the DAS.	

STEP	ACTION	VERIFICATION
3	Condition VOM to measure +24 Vdc.	
4	Connect + lead of VOM to DAS terminal +24.	
5	Connect − lead of VOM to DAS terminal GRD.	Meter indicates +24 ±3 Vdc.
6	Disconnect VOM leads.	
7	Connect + lead of VOM to DAS terminal GRD.	
8	Connect − lead of VOM to DAS terminal −24.	Meter indicates −24 ±3 Vdc.
9	Disconnect VOM leads.	
10	End of test.	

Loop Resistance Test

4.07 Test equipment required for this test is listed below.

- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
1	Instruct the hub or remote station to disconnect, and tag the incoming transmission loop.	
2a	If the system is a station-to-station arrangement— At the remote station— Instruct the telco employee to short the incoming transmission leads.	
3a	Condition VOM to measure resistance (R X 100 scale).	
4a	Connect leads of the VOM to incoming transmission leads.	Meter indicates resistance value of loop per circuit layout record card. ***Note:*** If the loop resistance has changed appreciably from the resistance shown on the circuit layout record card, refer to Section 591-816-200 and reset the line pads of the data set as required. An appreciable change is a change that requires compensation by adjusting the line pads or repairing the transmission loop.
5b	If the system is a station-to-hub arrangement— At the local station— Short the transmission leads.	

STEP	ACTION	VERIFICATION
6b	Instruct the hub to measure the resistance of the loop.	Meter indicates resistance of loop per circuit layout record card (see note of Step 4a).
7	Being careful to observe proper polarity, reconnect all transmission leads.	
8	End of test.	

Loop Current Test

4.08 Test equipment required for this test is listed below.

- KS-20538-L1 VOM or equivalent.

STEP	ACTION	VERIFICATION
	Note: The local and remote stations must be connected and in the marking condition to perform the following test.	
1	Condition VOM to measure 12 mA dc.	
2	Disconnect transmission lead from terminal T of DAS.	
3	Connect negative (−) lead of VOM to terminal T of the DAS.	
4	Connect the positive (+) lead of VOM to the disconnected transmission lead.	Meter indicates between +3.0 and +3.2 mA dc.
5	Disconnect VOM leads and connect transmission lead to terminal T on DAS.	
6	End of test.	

Data Set Voltage Test

4.09 Test equipment required for this test is listed below.

- Interface test adapter
- KS-20538-L1 VOM, or equivalent.

STEP	ACTION	VERIFICATION
1	Remove cover of DAS or gain access to data set 109E-type.	
2	Condition VOM to measure 12 Vdc.	

STEP	ACTION	VERIFICATION
3	Connect positive (+) lead of VOM to test point (TP) 10 of data set 109E-type.	
4	Connect negative (−) lead of VOM to TP11 of data set 109E-type.	Meter indicates +4.3 ±.3 Vdc.
5	Disconnect VOM leads.	
6	Disconnect CPT interface cable from J2 of the DAS.	
7	Plug the end of interface test adapter connector cord into J2 of the DAS.	
8	Connect cord tip end of the W1AD cord to terminal 9 of interface test adapter.	
9	Connect test clip end to terminal 2 of interface test adapter.	
10	Condition VOM to measure 60 Vdc.	
11	Connect −VOM lead to TP10 of data set 109E-type.	
12	Connect +VOM lead to TP11 of data set 109E-type.	Meter indicates +13 ±1 Vdc.
13	End of test. Disconnect test leads and return station to service.	

Data Set Exchange Procedure

4.10 Test equipment required for this test is listed below.

- Data set 109E-type; spare known to be good.

STEP	ACTION	VERIFICATION
1	Remove cover or gain access to the DAS.	
2	Remove data set 109E-type and replace it with a spare that is known to be good, set the proper options, and adjust to proper line pad resistance.	
3	Apply power to the station.	Station operation is normal. ***Note:*** If station operation is ***not*** normal, request aid from the immediate supervisor.
4	End of test.	

5. END-TO-END AND DISTORTION TESTING

A. Distortion Testing Using the 911A DTS

5.01 The following test requires the use of two 911A DTSs for checking the sending and receiving capabilities of each station. The test connections required for half duplex testing are shown by Fig. 2 (EIA interface). After testing in one direction, the receiving station is reconnected as the transmitting station and the transmitting station becomes the receiver to check operation in the reverse or opposite direction.

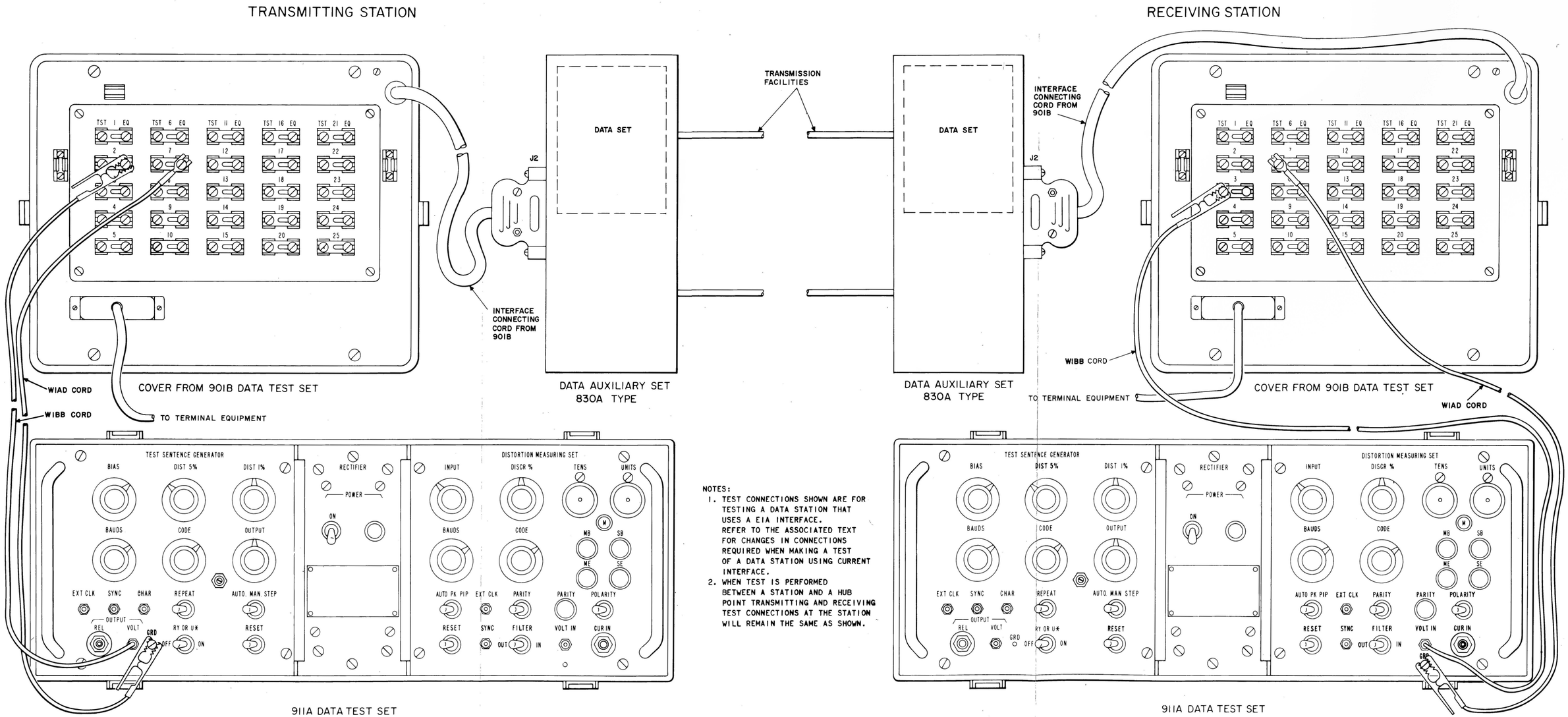
5.02 Full duplex testing requires both transmitting and receiving connections be made to each 911A for both stations. This allows each station to send and receive simultaneously.

5.03 The following text gives the procedure for making the half duplex test connections shown by Fig. 2. The test refers to transmitting and receiving stations. When making a full duplex test, disregard the transmitting and receiving designations and perform the following steps.

5.04 The test equipment required in this test is listed below:

- 911A DTS
- Interface test adapter (901B cover)
- W1AD cord (EIA interface)
- W1BB cord (two required for EIA interface)
- 2W6A cord (current interface)
- 2W7A cord (two required for current interface).

STEP	ACTION	VERIFICATION
1	Disconnect CPT interface cable from J2 of the DAS.	
2	Plug the end of interface test adapter connector cord into J2 of DAS. ***Note:*** DAS 830A always has an EIA interface. If DAS 820D is located at a station, it can be arranged for EIA or current interface.	
3	Ensure that all shorting bars of the interface test adapter are closed except as noted in the following text. ***Note:*** Before making connections on the 911A DTS, ensure that power is not applied to the set. Do not apply power until instructed to do so.	
4	If the data station is arranged for EIA interface (see Fig. 2)— At transmitting station, connect the spade-tip end of W1AD cord to terminal 7 of interface test adapter.	
5	Connect alligator clip end of the W1AD cord to GRD post adjacent to the OUTPUT VOLT jack.	



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—Distortion Measurement Test Using 911A DTSs (EIA Interface)

STEP	ACTION	VERIFICATION
6	Connect alligator clip end of a W1BB cord to terminal 2 of interface test adapter.	
7	Connect plug end of the W1BB cord to the OUTPUT VOLT jack.	
8	At the receiving station-- Connect spade-tip end of the W1AD cord to terminal 7 of interface test adapter.	
9	Connect alligator clip end of the W1AD cord to GRD post adjacent to the VOLT IN jack.	
10	Connect alligator clip end of a second W1BB cord to terminal 3 of interface test adapter.	
11	Connect terminal end of the second W1BB cord to VOLT IN jack.	
12	Adjust controls of 911A DTS according to Tables C and D.	
13	Cll the remote station and request attendant to place the station in test mode.	
14	Apply power to 911A DTS, set AUTO. MA. STEP switch to AUTO., and operate RESET keys of the distortion measuring set (DMS) and the test set generator (TSG).	
15	Move AUTO. PK PIP switch to PIP, then back to PK.	DMS indicates less than 10 percent distortion.
16	Operate RESET key of the DMS and repeat Step 15.	See verification of Step 15.
17	Set DIST 5% switch on TSG to 25.	
18	Set BIAS switch to SWC.	
19	Set DISCR% switch on DMS to 0.	DMS indicates less than 40 percent distortion. ***Note:*** This checks the ability of the system to operate with high distortion.
20	Remove power from 911A DTS and disconnect all test leads.	
21	End of test. Return station to normal operation.	

TABLE C

INTERFACE SETTINGS OF TSG* WITH ALL DATA SETS

CONTROL	SETTING
BIAS	0
DIST 5%	0
DIST 1%	0
BAUDS	Rate provided by terminal equipment *(see note)*
CODE	Code used by terminal equipment *(see note)*
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.

5.05 The test equipment required in this test is listed below:

B. End-to-End Testing Using the 914C DTS

5.06 ***End-To-End Test.*** This test verifies that a station-to-station arrangement can transmit and receive properly. The 914C DTS provides a Go/No Go type of test. If a measurement of the distortion is desired, a 911A DTS is required.

STEP	ACTION	VERIFICATION
1	Connect equipment as shown in Fig. 3.	
2	Apply power to the data set and then to 914C DTS.	Lamps DS2 and DS3 lighted.
3a	***Full-duplex:*** Establish voice communications between the data stations and request that the attendant at the far-end data station depress the DAS TEST button.	TEST lamp at far-end lights. The 914C DTS NO DATA and NO CLOCK lamps must be extinguished. This indicates that a valid connection has been established between data stations. If either lamp lights during the test, the test must be repeated.

TABLE D

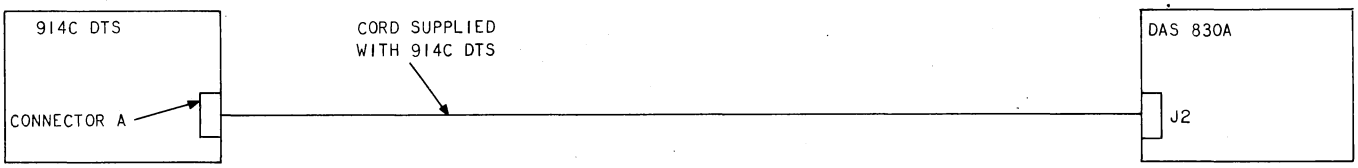
INTERFACE SETTINGS OF DMS* WITH ALL DATA SETS

CONTROL	SETTING
INPUT (CURRENT)	REL
INPUT (EIA)	VOLT IN.
DIST %	0
BAUDS	Rate provided by terminal equipment *(see note)*
CODE	Code used by terminal equipment *(see note)*
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.

STEP	ACTION	VERIFICATION
	Note: If testing a station using a half-duplex data set (such as data set 109A), a 914C DTS is required at both ends. Perform steps with letter "b" for HDX test.	
4a	Momentarily position DTS WORD SYNC switch to MAN.	Counter should stop counting except when errors occur.
5a	Depress the DTS RESET button and perform a 5-minute error run and record the total errors.	
6b	***Half-duplex:*** Establish voice communications between the data stations. Decide which data station will transmit first. The 914 DTS switch settings are the same for transmitting and receiving stations.	The attendant at the receiving station should verify that NO DATA and NO CLOCK lamps are extinguished. This indicates that a valid connection has been established between data stations. If either lamp lights during the test, the receiving station attendant must contact the transmitting station and agree to repeat the test.



914C MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	STG	
GRD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	GRD
SD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SD
RD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	RD
SI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SI
DSI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DSI
DS2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS2
S2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S2
DS3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS3
TPI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TPI
TP2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP2
S3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S3
DS4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS4
DS5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS5
S4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S4
SCT	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SCT
S5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S5
SCR	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SCR
DS6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS6
S6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S6
DS7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS7
DS8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS8
S7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S7
TP3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP3
S8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S8
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	STG	

SWITCH	SETTING
INTERFACE SELECTOR A SWITCHES	DEPRESSED
INTERFACE MODE	VOLTAGE
TEST SET MODE	SER
COUNTER	BIT ERRORS
RCV BIT RATE	EXT+
RCV WORD LENGTH	511
TRANSMIT BIT RATE	EXT+
TRANSMIT WORD LENGTH	511
SIG LEV	±4V
SAMPLE WIDTH	70%

INDICATOR LAMPS	
DS1	CA
DS2	CC
DS3	CF

Fig. 3—914C DTS Test

STEP	ACTION	VERIFICATION
7b	At the receiving data station, momentarily position the DTS WORD SYNC switch to MAN.	Counter should stop counting except when errors occur.
8b	At the receiving data station, depress the DTS RESET button and perform a 5-minute error run and record the total errors.	
9	At the end of the prearranged time interval, establish voice communication to discuss the test results.	

STEP	ACTION	VERIFICATION
	Note: For half-duplex end-to-end testing, agree to repeat the test in the opposite direction if necessary. The transmitting station would now become the receiving station. Repeat Steps 6b through 8b.	
10	End of test. Do not disconnect equipment unless ready to restore the data station to normal operating condition.	

5.07 ***CA Looped to CB Test.*** This test checks option X in DAS 830A (if the option is installed).

STEP	ACTION	VERIFICATION
1	With the equipment connected as shown in Fig. 3 and with switch S1 OFF, the DS1 lamp is not lighted.	
2	Position switch S1 to the ON position.	DS1 lamp lights if option X is installed and working.
3	End of 914C tests. Restore the data station to normal operating condition.	