DATA SET 108A- OR C-TYPE SINGLE PRIVATE LINE STATION USING DATA AUXILIARY SET ▸820D-L1 OR◂ 820D-L1A IN 10-TYPE DATA LINE CONCENTRATOR SYSTEM (DLCS) TEST PROCEDURES

CONTENTS PAGE

1. GENERAL

1.01 This section covers the test procedures to be followed at the time of installation of or when investigating a trouble condition at a Data Set 108A- or C-type single private line (PL) station which uses Data Auxiliary Set (DAS) ▸820D-L1 or◂ 820D-L1A ▸and is associated with the 10-type Data Line Concentrator System (DLCS).◂

1.02 This section is reissued to:

(a) Include information pertaining to DAS 820D-L1 which is used with a customer-provided terminal (CPT).

(b) Include information pertaining to the 6041H key which provides key control of transmit supervision, a remote TEST switch/lamp, and/or a visual indication of the camp-on signal.

(c) Include information pertaining to the AR463, Series 2 circuit pack which is used in the private line interconnection arrangement at the data line concentrator.

(d) Remove all reference to the acronym DATREX.

1.03 The tests covered are:

*A. **Power Supply Test:*** This test checks the voltage levels of the 18A power unit (part of DAS ▸820D-L1 or◂ 820D-L1A).

*B. **Trans-Hybrid Loss Test***

*C. **Loop-Loss Measurement Test:*** This test checks the loop loss of the transmission facility.

*D. **Carrier Test:*** This test checks the presence of carrier both to and from the station. A check is also made to determine whether the carrier from the station can be shifted.

*E. **Loop-Back Test:*** This test is performed by the 904-type Data Test Center (DTC) (if access is provided) for stations utilizing PL voiceband data circuits, or by the private line telegraph testboard for stations utilizing a PL telegraph channel.

*F. **Distortion Test Using 902- and 903-Type Data Test Sets (DTS):*** This test checks the distortion level and error rate of PL voiceband data loops not provided access to a 904-type DTC.

*G. **Distortion Test Using 911A DTS:*** This test checks the distortion level of PL voiceband data loops not provided access to a 904-type DTC.

*H. **Loop-Back Test Using Portable Station Test Set (TTS-28), or Equivalent:*** This test is for PL voiceband data loops not provided access to a 904-type DTC.

1.04 This section is to be used in conjunction with the sections entitled Data Set 108A- or C-Type Single Private Line Station—Using Data Auxiliary Set ▸820D-L1 or◂ 820D-L1A in 10-Type Data Line Concentrator System-Installation (591-023-210) and Data Set 108A- or C-Type Single Private Line Station Using Data Auxiliary Set ▸820D-L1 or◂ 820D-L1A in 10-Type Data Line Concentrator

System Maintenance (591-023-310).

1.05 Tests F, G, and H require action at the ◗data line◖ concentrator.

1.06 Both installation and maintenance test procedures are given. Since some of the tests are identical for installation and maintenance, each test is presented only once.

Installation Testing

1.07 The installation tests are designed to verify that the station has been properly assembled and is operative with the ◗data line◖ concentrator. The only test procedures that need be performed at time of installation are:

(1) Test A—Power Supply Test

(2) Test D—Carrier Test

Maintenance Testing

1.08 The maintenance test sequence will be determined by the nature of the trouble being investigated. In general, Test E (Loop-Back Test) should be performed first in an effort to determine the nature of the trouble. Any or all of the tests in this section may be used when investigating troubles. Tests F, G, and H are included in this section to replace Test E for voiceband loops not accessed by a 904-type DTC. Test F [Distortion Measurement Test Using 902- and 903-Type Data Test Sets (DTS)] is included in this section for use at locations where a 911A DTS is not available.

Teletypewriter (TTY) Maintenance

1.09 Maintenance procedures for the station TTY should be in accordance with the section entitled Model 33 Teletypewriters—Field Maintenance Practice (FMP)—(579-200-350) or Model 35 Teletypewriters—Field Maintenance Practice (FMP)—(579-300-350).

1.10 Before performing any tests, verify that test equipment is in good operating condition. Operational and calibration tests for DTS specified in this section are covered in the following:

SECTION	TITLE
103-813-100	911A, B, and C Data Test Sets—Description, Operation, and Maintenance
107-300-100	902A and 902B Data Test Sets—Identification and Operation
107-200-100	903A and 903B Data Test Sets—Description and Operation

1.11 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 3 of this section indicates a procedure which may or may not be required, depending on local conditions. The condition under which a lettered step or series of lettered steps should be made is given in the PROCEDURE 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. The details of each item in Table A are covered in the paragraph indicated by the number in parentheses.

TABLE A

APPARATUS	TEST						
	A	B	C	D	F	G	H
911A Data Test Set						1	
902-type Data Test Set (Note)					1		
903-type Data Test Set (Note)					2		
Portable Station Test Set TTS-28, or equivalent	1	1	1				1
Interface Test Adapter (2.02)	1			1	1	1	1
1011-type Handset (dial hand test set)				1			
Cord (2.03), or equivalent					3		
Cord (2.04), or equivalent						2	1
Cord (2.05), or equivalent						2	

Note: A 902B DTS cannot be used with a 903C DTS and vice versa.

2.02 J79901B-L3 interface test adapter (cover of 901B DTS).

2.03 W2DW testing cord, 8 feet long, equipped with one type 274-NK General Radio Co. shielded plug, one No. 716S19 (black) and one No. 717S19 (red) Hubbell interlock plugs, one No. 708S29 and one No. 709S29 (red) Hubbell interlock alligator clip attachments, and one No. 722S29 (black) and one No. 723S29 Hubbell interlock phone tip attachments.

2.04 W1AD testing cord, 4 feet 7 inches long, equipped with one 35 cord tip and one 27 Mueller test clip with one 29 Mueller insulator (black).

2.05 W1BB testing cord, 2 feet long, equipped with pin-type plug (black) and Mueller No. 30 alligator clip with Mueller No. 32 insulator (black).

3. PROCEDURES

3.01 Prior to performing Tests A through D and F through H ▸at a TTY station,◂ gain access to the DAS 820D-L1A as follows.

(1) ***Model 33-Type TTY:*** Remove two screws from top of rear panel on TTY pedestal.

(2) Pull rear panel of TTY pedestal out and then up to disengage bottom flange from pedestal.

(3) ***Model 35-Type TTY:*** Remove chad container by sliding it to the left, raising right side, and then sliding it to the right. Operate the two pushbutton fasteners located at the top of the front cover on the TTY pedestal. Depress the spring clip underneath the TTY keyboard, pivot the cover to the floor, disengage the cover from the pivot screws, and remove it from the pedestal.

3.02 Prior to performing Tests A, D, F, G, and H:

(1) Disconnect TTY ▸or CPT◂ interface cable from J3 of DAS.

(2) At installations where the optional 6041H key is utilized, ensure all buttons except the OFF button are released.

Requirement: All lamps on 6041H key extinguished.

(3) verify that all shorting clips on the interface test adapter are in the closed position.

(4) Connect interface test adapter cord to J3 of DAS.

Test A—Power Supply Test

STEP	PROCEDURE
1	Set FUNCTION switch of TTS-28 to 30 VDC position.
2	Connect – terminal and + terminal of TTS-28 to terminals 7 and 9, respectively, of interface test adapter. ***Requirement:*** Meter indicates between 21 and 27 volts.
3	Disconnect meter leads of Step 2.
4	Connect + terminal and – terminal of TTS-28 to terminals 7 and 10, respectively, of interface test adapter. ***Requirement:*** Meter indicates between 21 and 27 volts and within 2 volts of reading taken in Step 2.
5	Disconnect meter leads.
6	Disconnect interface test adapter.
7	Connect TTY ▶or CPT◀ interface cord to J3 of DAS.
8a	If ▶testing at a TTY station and◀ no further tests are to be performed, replace TTY pedestal rear ▶panel (33 TTY) or front cover (35 TTY)◀ by reversing the procedure in 3.01.

Test B—Trans-Hybrid Loss Test

This test requires that a 900-ohm termination (quiet line) be placed on the line.

STEP	PROCEDURE
1	Request the 900-ohm termination be placed on the line.
2	Set FUNCTION switch of TTS-28 to DBM BRDG 0 position.
3	Connect + and – terminals of TTS-28 to TP1 and TP2, respectively, of Data Set 108-type.

STEP	PROCEDURE
4	Record reading of TTS-28 meter.
5	Disconnect TTS-28.
6	Set TTS-28 FUNCTION switch to DBM BRDG −10 position.
7	Connect + and − terminals of TTS-28 to a good ground and TP3, respectively, of Data Set 108A- or C-type. ***Requirement:*** Meter indication should not be more positive than reading recorded in Step 4. ***Note:*** Meter actually reads at least 10 dB different from reading of Step 4 due to TTS-28 FUNCTION switch position.
8	Disconnect TTS-28.
9	Request 900-ohm termination be removed from line.
10a	If ◗testing at a TTY station and◖ no further tests are to be performed, replace TTY pedestal ◗rear panel (33 TTY) or front cover (35 TTY)◖ by reversing the procedure in 3.01.

Test C—Loop-Loss Measurement Test

STEP	PROCEDURE
1	Disconnect M3AY power cord from DAS 820D-L1A ◗(TTY station) or KS-14532-L16 power cord from DAS 820D-L1 (CPT station).◖
2	Disconnect transmission facility from TB1-1 and TB1-2 of DAS.
3	Set FUNCTION switch of TTS-28 to DBM 900Ω TERM 0 position.
4	Connect + and − terminals of TTS-28 to transmission facility.
5	Request DTC or telegraph testboard to send 1000 Hz at 0 dBm and record indication on TTS-28 meter. ***Note:*** It may be necessary to set TTS-28 FUNCTION switch to DBM 900Ω TERM −10 position to obtain meter indication. Meter indication is the actual measured loss (AML) of the transmission facility. The station circuit layout record card shows the expected measured loss (EML) when the facilities were designed. The maximum AML for voiceband data circuits should be −16 dB and for telegraph channel circuits −24 dB. ***Requirement:*** The indications recorded should not deviate from the limits shown in Table B.
6a	If AML is not within limits, report transmission facility for repair.

STEP	PROCEDURE
	TABLE B LOOP LIMITS

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

7	Disconnect TTS-28.
8	Reconnect tip and ring of transmission facility to TB1-1 and TB1-2, respectively, of DAS.
9	Connect M3AY ▶or KS-14532-L16◀ power cord to DAS.
10b	If ▶testing at a TTY station and◀ no further tests are to be performed, replace TTY pedestal rear ▶panel (33 TTY) or front cover (35 TTY)◀ by reversing the procedure in 3.01.

Test D—Carrier Test

STEP	PROCEDURE
1	Disconnect M3AY power cord from DAS 820D-L1A ▶(TTY station) or KS-14532-L16 power cord from DAS 820D-L1 (CPT station).◀
2	Operate 1011-type handset TALK MON switch to MON.
3	Connect leads of 1011-type handset to TB1-1 and TB1-2 of DAS. ***Requirement:*** Incoming tone is heard in handset (1270 Hz for Data Set 108A-2225 Hz for Data Set 108C).
4	Connect M3AY ▶or KS-14532-L16◀ power cord to DAS. ***Requirement:*** Second tone is heard in handset (2025 Hz for Data Set 108A—1070 for Data Set 108C). ***Note:*** Tone of Step 4 will be the louder of two tones (station data set transmit frequency).
5a	If option ZC is installed— Connect one end of W1AD testing cord to terminal 2 of interface test adapter.
6a	Momentarily connect other end of W1AD testing cord to terminal 9 of interface test adapter.

STEP	PROCEDURE
	Requirement: Loudest tone in handset changes to a higher tone while W1AD cord is connected to terminal 9.
7b	If 6041H key is provided— Operate ON button on 6041H key.
	Requirement: ON lamp lighted. Loudest tone in handset changes to a higher tone.
8b	Operate OFF button on 6041H key.
	Requirement: ON lamp extinguished.
9	Disconnect 1011-type handset from DAS.
10	Disconnect interface test adapter from DAS.
11	Connect TTY ▶or CPT◀ interface cable to J3 of DAS.
12c	If ▶testing at a TTY station and◀ no further tests are to be performed, replace TTY pedestal rear ▶panel (33 TTY) or front cover (35 TTY)◀ by reversing the procedure in 3.01.

Test E—Loop-Back Test

STEP	PROCEDURE
1a	If remote TEST switch is provided, operate TEST switch.
	Requirement: ▶If remote TEST lamp is provided, remote TEST lamp lighted.◀
2b	▶If 6041H key is provided, operate TEST button on 6041H key.
	Requirement: TEST lamp on 6041H key lighted.◀
3c	If ▶testing at a TTY station and◀ remote TEST switch on 6041H key is not provided, perform 3.01 (1) and (2) or (3).
4d	▶If testing at a TTY or CPT station and remote TEST switch on 6041H key is not provided, operate TEST switch on front of DAS 820D-L1 or 820D-L1A.◀
	Requirement: TEST lamp lighted.
	Note: Test is now under control of DTC or telegraph testboard.
5	When informed by DTC or telegraph testboard that test is complete, restore TEST switch operated in Step 1a, ▶2b or 4d◀ .
	Requirement: TEST lamp extinguished.

STEP	PROCEDURE
6e	If ▶testing at a TTY station and◀ no further tests are to be performed, replace TTY pedestal rear ▶panel (33 TTY) or front cover (35 TTY)◀ by reversing the procedure in 3.01.

Test F—Distortion Test Using 902- and 903-Type Data Test Sets (DTS)

STEP	PROCEDURE
	Caution: Do not connect the transmit lead 903-type DTS until all other equipment is connected and all of their switches are in the proper settings.
1	Set the switches of 902-type DTS as follows: BIT RATE to 150 (180 on 902B DTS) METER SELECTION switch to DIST ADJ TRIGGER—not required.
2	Set switches of receive lead 903-type DTS as follows: BIT RATE to EXT CLOCK RANDOM-DOT to RANDOM TRIGGER to +.
3	Set switches to transmit lead 903-type DTS as follows: RANDOM-DOT to RANDOM TRIGGER to + BIT RATE to 150 (180 on 903B DTS).
4a	If 6041H key ***is*** provided— Operate the ON button. ***Requirement:*** ON lamp on 6041H key lighted.
5b	If 6041H key ***is not*** provided— Connect W1AD cord between terminals 9 and 20 of interface test adapter.
6	Connect 902-type and both 903-type DTS as follows (see Fig. 1).

STEP	PROCEDURE
	902-Type DTS (1) Using W2DW testing cord, connect red DATA IN and black DATA IN jacks to interface test adapter terminals 3 and 7, respectively. **Receive Lead 903-Type DTS** (1) Using W2DW testing cord, connect red SIGNAL OUT and black SIGNAL OUT jacks to 902-type DTS red EXT SYNC and black EXT SYNC jacks, respectively. (2) Using cord provided with 902-type DTS, interconnect receive lead 903-type and 902-type DTS. **Transmit Lead 903-Type DTS** (1) Using W2DW cord, connect red SIGNAL OUT and black SIGNAL OUT jacks to interface test adapter terminals 2 and 7, respectively.
7	At ▶data line◀ concentrator, operate TEST switch on AR463, ▶Series 2◀ circuit pack (here after referred to in this section as AR430 CP) associated with station being tested ▶to TEST (for AR463, Series 1 CP, pull out the TEST switch).◀
8	Connect power cords of both 903-type DTS to 117-volt ac outlet and operate POWER switches to ON.
9	Momentarily operate START key on transmit line 903-type DTS.
10	After approximately one minute, adjust 902-type DTS as follows. (1) Adjust DISTORTION control for zero meter indication. (2) Operate meter selection switch to VOLT ADJ and adjust VOLTS control for zero meter indication. (3) Operate meter selection switch to PHASE ADJ and adjust PHASE control for zero meter indication.
11	Operate 902-type DTS meter selection switch to DIST MEAS position.
12	Momentarily operate 902-type DTS WORD SYNC & RESET switch and record time. ***Note:*** The 902-type DTS microammeter should settle down to some relatively stable value that indicates peak distortion. ***Requirement 1:*** 902-type DTS meter indicates 10 percent or less peak distortion in 5-minute test. ***Note:*** One microamp on 902-type DTS meter is equal to 1 percent peak distortion (eg, 8 microamps equal 8 percent peak distortion). ***Requirement 2:*** 902-type DTS TOTAL ERRORS lamps indicate 2 or less errors in 5-minute test. For marginal cases of trouble (customer complains of random errors), 15- to 30-minute tests should be made; same limits should be used.

STEP	PROCEDURE
	Note: The 902-type DTS TOTAL ERRORS lamps light to indicate the number of errors in data received from the time the WORD SYNC & RESET switch was released. The numbers stamped beside the lamps that are lighted should be added together to determine the total number of errors for a specific period of time (eg, lamps 8, 4, and 1 lighted indicate 13 total errors).
13	Disconnect all test equipment.
14a	If 6041H key ***is*** provided—
	Operate OFF button.
	Requirement: ON lamp on 6041H key extinguished.
15	▶At data line concentrator operate the TEST switch on the AR463, Series 2 CP associated with station being tested to NORMAL (for AR463, Series 1 CP, push in the TEST switch).◀
16	Reconnect TTY ▶or CPT◀ interface cable to J3 of DAS.
17c	If ▶testing a TTY station and◀ no further tests are to be performed, replace TTY pedestal rear ▶panel (33 TTY) or front cover (35 TTY)◀ by reversing the procedure in 3.01.

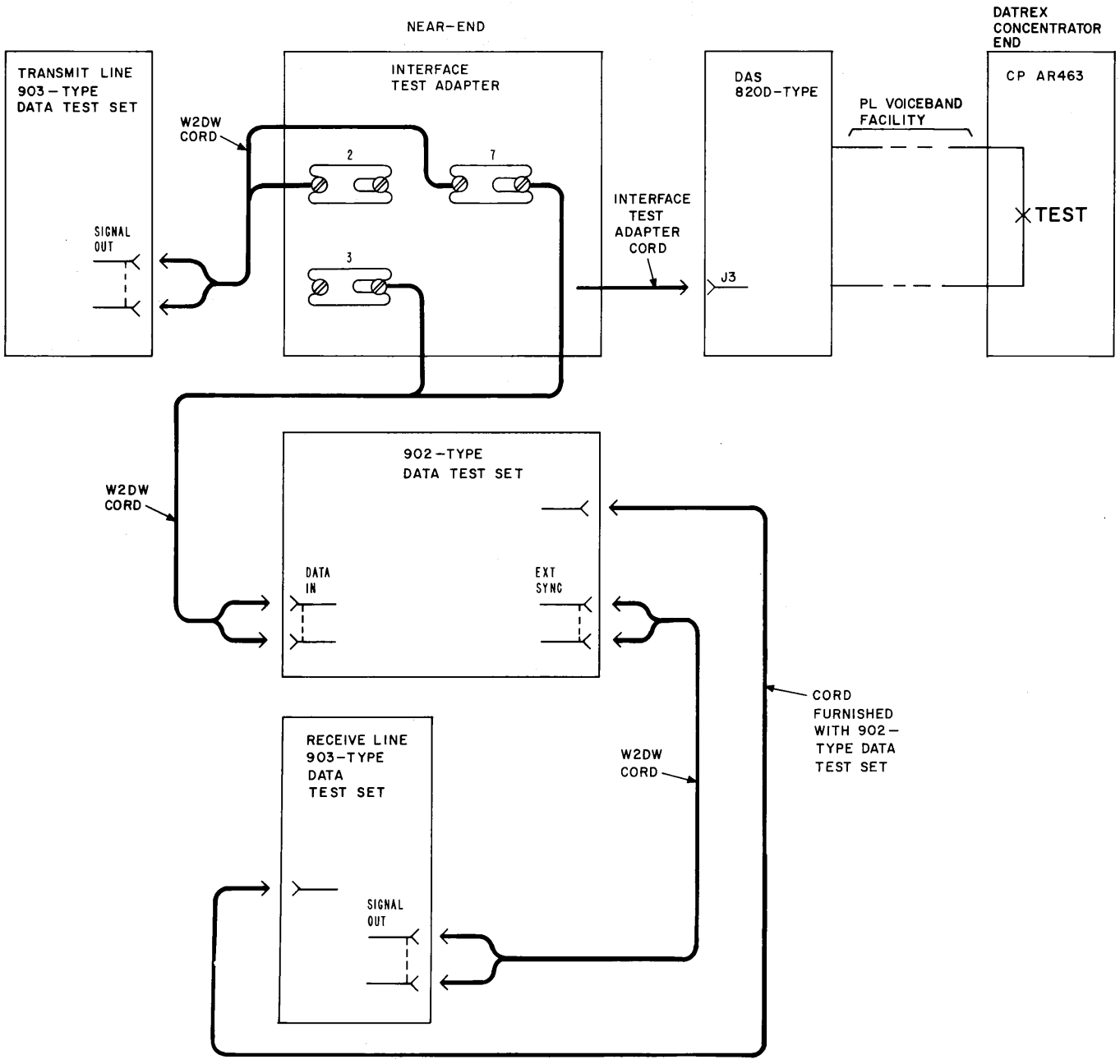

Fig. 1—Test Equipment Arrangement for Distortion Test Using 902-Type and 903-Type Data Test Sets

Test G—Distortion Test Using 911A DTS

STEP	PROCEDURE
1	Set controls on test sentence generator (TSG) portion of 911A DTS as follows: AUTO. MAN. STEP to AUTO.

STEP	PROCEDURE
	BAUDS to speed desired (eg, 110) BIAS to 0 CODE to code desired (eg, 8/11) DIST 1% to 0 DIST 5% to 0 REPEAT to OFF RY or U* to OFF OUTPUT to EIA.
2	Connect test sentence generator (TSG) portion of 911A DTS as follows (see Fig. 2). (1) Using W1BB testing cord, connect VOLT jack to interface test adapter terminal 2. (2) Using W1AD testing cord, connect GRD lug to interface test adapter terminal 7.
3	Set controls of distortion measuring set (DMS) portion of 911A DTS as follows: BAUDS to speed desired (eg, 110) CODE to code desired (eg, 8/11) DISCR % to 5 FILTER to OUT PARITY to OFF AUTO. PK-PIP to PIP INPUT to EIA.
4	Connect distortion measuring set (DMS) portion of 911A DTS as follows (see Fig. 2). (1) Using W1BB testing cord, connect VOLT IN jack to interface test adapter terminal 3. (2) Using W1AD testing cord, connect GRD lug to interface test adapter terminal 7.
5a	If 6041H key ***is*** provided— Operate ON button on 6041H key. ***Requirement:*** ON lamp on 6041H key lighted.
6b	If 6041H key ***is not*** provided— Connect W1AD cord between terminals 9 and 20 of interface test adapter.

STEP	PROCEDURE
7	At ▶data line◀ concentrator, operate TEST switch on AR463, ▶Series 2◀ CP associated with station being tested ▶to TEST (for AR463, Series 1 CP, pull out the TEST switch).◀
8	At 911A DTS, connect power cord to 117-volt ac outlet and operate POWER switch to ON.
9	After approximately 1 minute, momentarily operate AUTO PK-PIP switch of DMS to PK and then return it to PIP.
10	Operate RESET switch on DMS. ***Requirement:*** Distortion displayed on DMS pixie tubes should be 15 percent or less.
11	Set DIST 5% switch on TSG to 25.
12	Set BIAS switch to SWC.
13	Set DISCR % switch of DMS to 0. ***Requirement:*** Distortion displayed on DMS pixie tubes should be less than 40 percent.
14	Disconnect all test connections and reconnect TTY.
15a	If 6041H key is provided— Operate OFF button on 6041H key. ***Requirement:*** ON lamp on 6041H key extinguished.
16	▶At data line concentrator, operate TEST switch of AR463, Series 2 CP associated with station being tested to NORMAL (for AR463, Series 1 CP, push in the TEST switch).◀
17	Reconnect TTY ▶or CPT◀ interface to J3 of DAS.
18c	If ▶testing a TTY station and◀ no further tests are to be performed, replace TTY pedestal rear ▶panel (33 TTY) or front cover (35 TTY)◀ by reversing the procedure in 3.01.

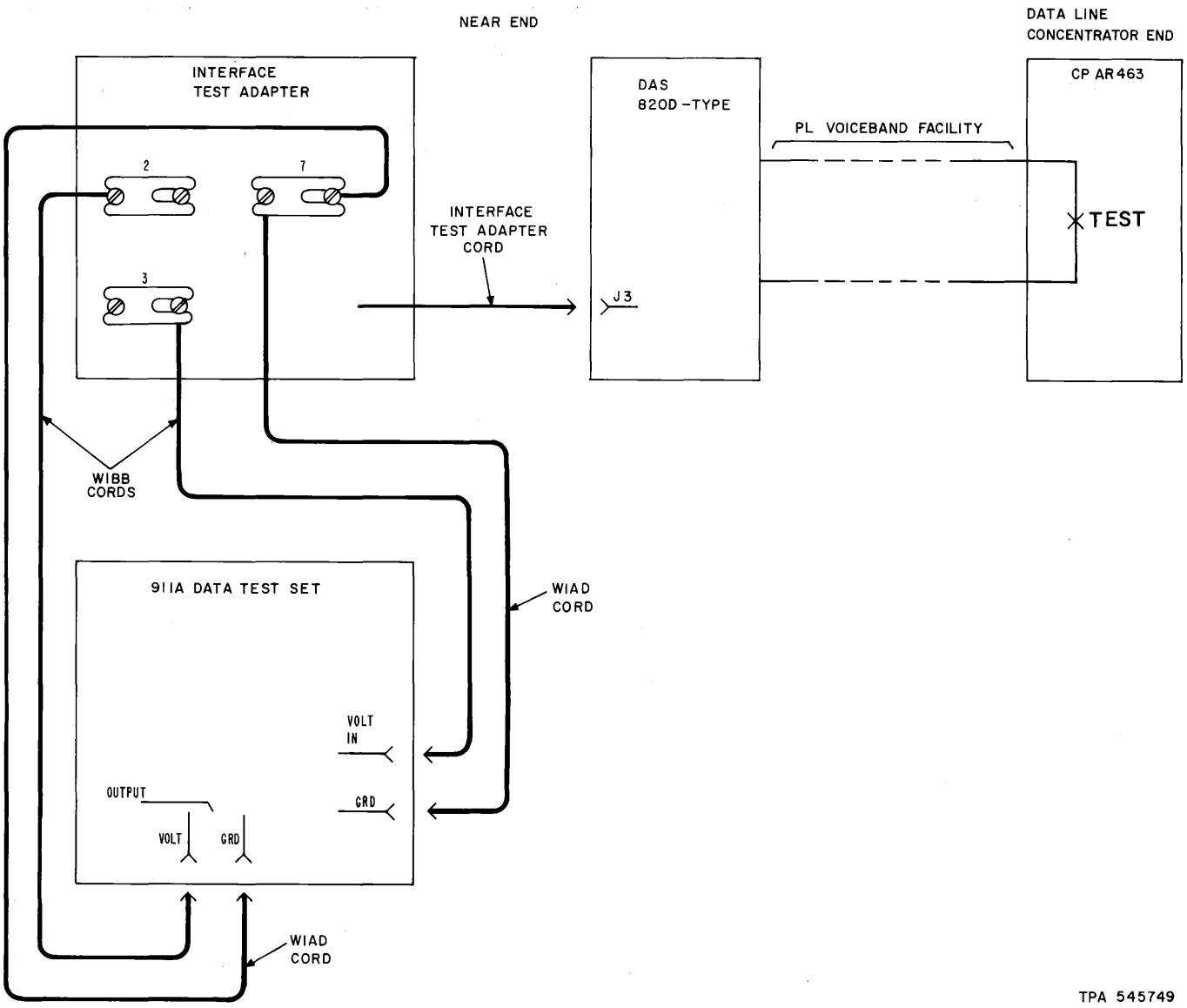

Fig. 2—Test Equipment Arrangement for Distortion Test Using 911A Data Test Set

Test H—Loop-Back Test Using Portable Station Test Set (TTS-28), or Equivalent (Static Test)

STEP	PROCEDURE
1	At data line concentrator, operate TEST switch of AR463 ▶Series 2 CP associated with station being tested to TEST (for AR463, Series 1 CP, pull out the TEST switch).◀
2	At station, set FUNCTION switch of TTS-28 to 30 VDC.

STEP	PROCEDURE
3	Connect + terminal and − terminal of TTS-28 to interface test adapter terminals 3 and 7, respectively. ***Requirement:*** Meter indicates between 5 and 25 volts.
4	Disconnect TTS-28.
5	Connect W1AD testing cord between interface test adapter terminals 20 and 9.
6	Connect + terminal and − terminal of TTS-28 to interface test adapter terminals 7 and 3, respectively. ***Requirement:*** Meter indicates between 5 and 25 volts.
7	Disconnect TTS-28.
8	Disconnect interface test adapter.
9	Reconnect TTY ◗or CPT◖ interface cable to J3 of DAS.
10	◗At data line concentrator, operate TEST switch of AR463, Series 2 CP associated with station being tested to NORMAL (for AR463, Series 1 CP, push in the TEST switch).◖
11a	If ◗testing a TTY station and◖ no further tests are to be performed, replace TTY pedestal rear ◗panel (33 TTY) or front cover (35 TTY)◖ by reversing the procedure in 3.01.