1A DATA STATION
SINGLE CHANNEL ARRANGEMENTS
BINARY MODE
ALIGNMENT AND TESTS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the alignment procedures to be performed at the initial installation of the 1A Data Station, Single Channel Arrangements (SCA), hereafter referred to as the 1A Data Station, operating in binary mode.

1.02 This section also describes the test procedures to be performed and the test requirements to be met when investigating trouble conditions associated with the 1A Data Station.

1.03 The following alignment procedures are covered:

(a) Send level adjustment

(b) Receive gain adjustment

(c) Carrier fail adjustment

(d) Receive bias adjustment—1A Data Station at each end of the system

(e) Receive bias adjustment—1A Data Station at one end and a 43B1 terminal at the other end of the system.

1.04 The following tests are covered:

(a) ***Remote Test:*** This test permits a 1A Data Station to be tested from a remote 1A Data Station, using the baseband loop-around feature at the remote station.

(b) ***End-to-End Test:*** This test may be used to further isolate a trouble area such as the transmitter at the near end, receiver at the far end, or the transmission facilities. The end-to-end tests may be performed with the following configurations:

- 1A Data Station—1A Data Station
- 1A Data Station—43B1 Terminal (VFCD System)
- 1A Data Station—43A1 Terminal (VFCT System).

1.05 This section should be used in conjunction with the installation and maintenance practices, 591-813-201 and 591-813-301, respectively, to locate troubles at the 1A Data Station.

1.06 The components of the 1A Data Station (circuit packs, power circuits, etc) not meeting the intallation test requirements should be replaced to restore customer service as quickly as possible.

1.07 The defective component shall be sent to the nearest Service Center for repair.

Maintenance on the components other than the Service Center shall ***not*** be attempted.

Care should be exercised in handling the circuit packs, particularly the transmitter and/or demodulator circuit packs, to avoid dropping them. It is a property of the ferrite core inductors used on these cards that a physical shock can alter the inductance sufficiently to change the BIAS by a few percent and change the frequency of the transmitter oscillator. A severe physical shock can crack the ferrite structure. It is possible for a hairline crack to develop and not be noticeable to the naked eye.

1.08 In order to provide a systematic approach to the location and clearance of a troubled circuit, the overall plan for investigating trouble in a 1A Data System is divided into the following areas of responsibility:

- Trouble in the terminal equipment
- Trouble in the transmission facilities
- Trouble in the 43A1 or 43B1 terminal end when connected to 1A Data Station

Note: Troubles in the above areas should be referred to the designated trouble reporting center.

Trouble in either the receive or transmit side of the 1A Data Station ***is*** covered in this secton.

1.09 Before proceeding with installation tests of the 1A Data Station, verify the following:

(a) Voice frequency facility has originally been tested and meets requirements as specified in the appropriate section entitled either Private Line Data Circuits, Voice Bandwidth Circuits for Miscellaneous Data, Overall Tests and Requirements (314-410-500) or Circuit Order or Trunk Order Tests for Carrier Telegraph Layouts (660-450-302).

(b) 1A Data Station strappings agree with circuit layout record (CLR).

(c) Trouble condition has been isolated as specified in Section 591-813-301.

(d) All connections and connectors are properly made.

1.10 The following is a list of test equipment necessary to perform the tests outlined in this section:

- J79901B List 3 Data Test Set (Interface Test Adapter—cover of 901B Data Test Set)
- KS-20538-L1 Volt-Ohm-Milliammeter (VOM), or equivalent 20,000-ohms-per-voltmeter
- KS-19935-L7 Telegraph Carrier Test Set (Stelma) (103-825-100)
- 911A2 Data Test Set (J79911A2) or equivalent.

2. INSTALLATION ALIGNMENT AND TEST PROCEDURES

A. General

2.01 The following procedures require that the 1A Data Station be installed with all option strappings applied as instructed by the section entitled 1A Data Station, Single Channel Arrangements, Binary Mode, Installation (591-813-201) and as required by the CLR.

B. Power Check

2.02 ***Equipment Required:*** The following equipment is required at the station to make the power check:

- J799A1B, List 3 Data Test Set (Interface Test Adapter—cover of 901B Data Test Set)
- KS-20538-L1 VOM, or equivalent.

2.03 ***Preparation (when a DP61 or DP66 Circuit Pack is in the Channel) (Fig. 1):***

(a) Remove the 25-pin plug (from the TTY or CPT) from the EIA connector.

(b) Connect the W25A test adapter cord to the EIA connector on the 31A2 or 37A1 data mounting unit.

2.04 ***Power Checks Procedure:***

STEP	PROCEDURE
	For positive dc voltage (KS-20538-L1 VOM)
1	Connect the black negative lead probe of the VOM to pin 7 (signal ground) of the 901B interface test adapter.
2	Operate the slide switch on the gray positive lead to the DCV position.
3	Condition the VOM for measuring +24 volts.
4	Connect the gray positive probe to pin 9 of the 901B interface test adapter.
	Requirement: +24 ±2.4 volts.
	For negative dc voltage (KS-20538-L1 VOM)
5	Remove the gray positive probe from pin 9 of the 901B interface test adapter.
6	Condition the VOM for measuring −24 volts.
7	Connect the gray positive probe to pin 10 of the 901B interface test adapter.
	Requirement: −24 ±2.4 volts
8	Remove the test leads connected in Steps 1 and 7.

2.05 ***Power Check When a DP67 Circuit Pack is in the Channel:*** The output of the 18B1 power unit does not appear at the EIA connector (J5) and cannot be monitored as in 2.04 for the DP61 and DP66 circuit packs. If after performing the alignment procedures which follow, the power unit is suspected as being at fault, the 1A Data Station should be replaced to restore or begin customer service as quickly as possible. The suspected faulty 1A Data Station should be sent to the nearest Service Center for repair.

C. Send Level Adjustment

2.06 ***General:*** The first adjustment to be made upon installation is the send level adjustment. A correct send level (or transmitted) signal must be available before the receive level adjustment, bias adjustment, etc, at the far-end receiver can be attempted.

2.07 The transmitter is keyed by applying a potential (simulation of data input from a TTY or CPT) at the 25-pin EIA connector on the 31A2 or 37A1 data mounting via the interface test adapter. The transmitted level of the signal applied to the facility is monitored at TS(A), while adjustment to the specified level is made at the SEND LEVEL potentiometer on the line station interface (EIA or current). [The Telco employee at the far receive end may use this opportunity to verify that signals delivered to his TS(A) are within tolerance.]

2.08 ***Equipment Required:*** The following equipment is required at the station to make the send level adjustments:

- J79901B, List 3 Data Test Set (Interface Test Adapter—cover of 901B Data Test Set)
- KS-20538-L1 VOM, or equivalent, calibrated for 600-ohm termination.

2.09 ***Preparation (Fig. 1):***

(a) Remove the 25-pin plug (from the TTY or CPT) from the EIA connector.

(b) Connect the W25A test adapter cord to the EIA connector on the 31A2 or 37A1 data mounting unit.

2.10 The following procedure should be used to make the send level adjustment. The adjustment is the same for both the line EIA interface (DP66* circuit pack) and the line current interfaces (DP61 circuit pack, 3-wire, FDX; and DP67 circuit pack, 2-wire, HDX).

* Early units may have DP60 (MD) installed. DP66 is standard.

2.11 ***Send Level Adjustment Procedure:***

STEP	PROCEDURE
1	***Using DP61 and DP66 Circuit Packs:*** At the interface test adapter, connect captive shorting clip 2 to captive shorting clip 10 with patch cord assemblies provided with the interface test adapter.
2	***Using DP67 Circuit Pack:*** At the interface test adapter, connect captive shorting clip 2 to captive shorting clip 7 with patch cord assemblies provided with the interface test adapter.
3	Condition the KS-20538-L1 VOM to measure dB.
4	For ***4-wire*** connections connect the probes of the KS-20538-L1 VOM to terminals 2 and 3 of TS(A).
5	For ***2-wire*** connections connect the probes of the KS-20538-L1 VOM to terminals 2 and 5 of TS(A).
6	Adjust the SEND LEVEL potentiometer on the line station interface (DP61, DP66, or DP67 circuit packs) while monitoring the KS-20538-L1 VOM. ***Requirement:*** $\pm$2 dB of the value specified on the circuit work/service order. If requirements cannot be met, see Part 3 of this BSP.
7	Disconnect patch cord assemblies from shorting clips, VOM probes, and 25-pin plug.
8	Reconnect TTY or CPT 25-pin plug.

D. Receive Gain Adjustments

2.12 ***General:*** Before proceeding with the receive gain adjustment, verify that the far-end send level has been adjusted to the specified level.

2.13 The basic philosophy is to verify that the level of the received signal at the line circuit (part of the line station interface, DP61, DP66, or DP67 circuit pack) is within specifications as required by the circuit order/service card, and then adjust the received level of the line circuit amplifier to provide the proper level as required at the receive interface (DP51 circuit pack) LIM IN test point.

2.14 ***Equipment Required:*** The following equipment is required at the station to make the receive gain adjustments:

- KS-20538-L1 VOM, or equivalent high impedance meter.

2.15 ***Preparation:*** A Telco employee must be dispatched to the far end to key the far-end transmitter.

2.16 ***Receive Gain Adjustment Procedure:***

STEP	PROCEDURE
	Receive Voice Frequency Level
1	Determine from the circuit order the required channel receive voice frequency level at input to the line circuit (part of the line station interface DP61, DP66, or DP67 circuit pack).
2	For 4-wire connections, bridge the KS-20538-L1 VOM, or equivalent, across terminals 4 and 5 of TS(A) on the 31A2 or 37A1 data mounting, and read the received voice frequency level.
3	For 2-wire connections, remove the transmitter circuit pack, bridge the KS-20538-L1 VOM, or equivalent, to terminals 2 and 5 of TS(A) on the 31A2 or 37A1 data mounting, and read the received voice frequency level. Replace the transmitter circuit pack after the measurements have been made. ***Requirement:*** $\pm$4 dB of the value specified on the circuit order/service card.
	Adjust Receive Level Gain
4	Connect the KS-20538-L1 VOM or equivalent high impedance meter from the LIM IN test point on the receive interface (DP51 circuit pack) to the GRD test point on the line station interface (DP61, DP66, or DP67 circuit pack).
5	Send either mark or space from the other end.
6	Adjust the RCV GAIN potentiometer on the line station interface (DP61, DP66, or DP67 circuit packs) for a reading at the LIM IN test point. ***Requirement:*** -32 dBm $\pm$2 dB.
7	Disconnect the KS-20538-L1 VOM, or equivalent, from the LIM IN test point.

E. Carrier Fail Level Adjustment

THINK ***Do not operate CF pushbutton switch after channel has been put in service.***

2.17 ***General:*** The carrier fail adjustments are made on the receive interface (DP51 circuit pack) by means of the CF ADJ potentiometer. The RCV GAIN adjustment should be made prior to the carrier fail adjustments. The gain of amplifier-limiter in channel is adjusted by means of the CF ADJ potentiometer, so that a drop of 12 dB in channel level will ***just*** operate the carrier fail lamp. This adjustment is accomplished by operating the CF switch (which reduces the gain of the amplifier by 12 dBm simulating a 12-dB drop in the receiving level) and adjusting the CF ADJ potentiometer to ***just*** operate the CF lamp.

2.18 ***Equipment Required:*** The following equipment is required at the station to make the carrier fail adjustment.

- KS-20538-L1 VOM, or equivalent.

2.19 ***Preparation:*** For an initial installation, a Telco employee will have been dispatched to the far end and is available to key the far-end transmitter. For a system that is already in operation, the far end idle mark signal may be used. The level at the near-end LIM IN test point must be as specified in 2.16, Step 6.

2.20 ***Carrier Fail Adjustment Procedure:***

STEP	PROCEDURE
1	Send a mark or space from the far end.
2	On the receive interface (DP51 circuit pack), depress the CF switch.
3	Adjust the carrier fail potentiometer CF ADJ so that the CF lamp (inside CF switchbutton) will ***just*** light (flashing) while the CF switch is still depressed. ***Note:*** The CF ADJ potentiometer has about 25 turns from end to end. A clockwise adjustment increases the gain of the amplifier-limiter and tends to extinguish the lamp.
4	Release the CF switch.

F. Receive Bias Alignment

2.21 ***General:*** The alignment of the receive bias makes use of a 911-type Data Test Set (DTS) at each end of the system. The end at which the receive bias adjustment is being made will be referred to as the ***near*** end. The end from which the signal is generated and transmitted will be referred to as the ***far*** end.

2.22 A 25-percent distorted EIA signal (first marking, then spacing) generated at the maximum bit rate for which the channel is to operate, is used to key the ***far***-end transmitter. The BIAS potentiometer at the ***near*** end is adjusted by measuring the received distortion and adjusting for equal distortion for both marking and spacing bias. This adjustment does not necessarily result in a minimum output distortion for 0-percent distortion input signals. This adjustment compensates for the bias distortion introduced into the overall circuit.

2.23 Before proceeding with these tests, the data channel must have all required straps in place and must have had the receive gain adjusted.

1A Data Station at Each End of a System (Fig. 2)

2.24 ***Equipment Required:*** The following equipment is required at ***each*** end (transmit and receive) to make the bias adjustment.

- 911A2 Data Test Set (DTS) (J79911A2)*, or equivalent
- J79901B-L3 (cover only of 901B Data Test Set)
- Patch cord (spade clip and probe pin at opposite ends)
- Patch cord [spade clip and small (strong) alligator clip at opposite ends].

*911A2 Data Test Set (J79911A2) is Standard. 911A Data Test Set (J79911A) is rated MD.

2.25 ***Preparation:*** A Telco employee must be dispatched to each end to disconnect the TTY or CPT 25-pin plug from the 31A2 or 37A1 data mounting. Connect the 25-pin interface adapter cord plug to the 25-pin EIA connector. At the ***far*** end, connect the 911A1 [911B2 test sentence generator (TSG) portion] Data Test Set to the J79901B-L3 interface test adapter with patch cords as indicated in Fig. 2. At the ***near*** end, connect the 911A2 [911C2 distortion measuring set (DMS) portion] Data Test Set to the J79901B-L3 interface test adapter with patch cords as indicated in Fig. 2.

2.26 *Bias Alignment Procedure:*

STEP	PROCEDURE
1	At the ***far*** end, operate the 911B2 TSG switches as shown in Table A.

TABLE A

SWITCH POSITIONS ON 911B2 TSG LOCATED AT FAR END FOR 25% DISTORTED SIGNAL OUTPUT

SWITCH	POSITION
AUTO-MAN-STEP	AUTO
BAUDS	5 for SW Channel (75 baud) 8 for DW Channel (150 baud)
BIAS	MB or SB (upon command from near end)
CODE 28-TTY (Note) 37-TTY 33- & 35-TTY	5/7.42 8/10 8/11
DIST 1%	0
DIST 5%	25
REPEAT	ON
RY OR U*	ON
RESET	—
OUTPUT	EIA--for DP66 REL--for DP61 and DP67

Note: 28-TTY with 5-element matrix installed in TSG. 37-, 33-, and 35-TTY with 8-element matrix installed in TSG.

2 At the ***near*** end, operate the 911C2 DMS switches as shown in Table B.

3 At the ***near*** end, adjust the BIAS potentiomer on the receive interface (DP51 circuit pack) for equal bias readings on the 911C2 DMS for marking and spacing bias.

Note: A ***counterclockwise*** adjustment with the screwdriver reduces marking bias in the received data signal, while a ***clockwise*** adjustment with the screwdriver reduces spacing bias.

4 At both ends, restore circuits to normal.

TABLE B

SWITCH POSITIONS ON 911C2 DMS
LOCATED AT NEAR END FOR 25%
DISTORTED SIGNAL INPUT

SWITCH	POSITION
BAUDS	5 for SW Channel (75 baud) 8 for DW Channel (150 baud)
28-TTY CODE 37-TTY 33- & 35-TTY	5 8 9
DISCR %	0
FILTER	OUT
INPUT EIA (DP66 CP) CUR (DP61 or 67 CP)	EIA NORM (20-mA or 62.5-mA)
PARITY	OFF
AUTO-PK-PIP	PIP
RESET	Operate when power is first turned on to prepare set to receive incoming signals. Do not operate while receiving signals.

Bias Adjustment at the 1A Data Station in a 1A—43B1 Configuration (Fig. 3)

2.27 ***Equipment Required:*** The equipment required at the 1A Data Station is the same as in 2.24. The following equipment is required at the 43B1 VFCD System end.

- 911G Test Sentence Generator (TSG) or equivalent

2.28 ***Preparation:*** The preparation at the 1A Data Station (near end) is the same as in 2.25.

2.29 ***Procedure for Bias Alignment at the Near-End 1A Data Station When Connected to a 43B1 VFCD System at the Far End:***

STEP	PROCEDURE
1	At the ***near*** end, operate the 911C2 DMS switches as shown in Table B.
2	At the ***far*** end, condition the 911G TSG, or equivalent, for operation by setting the front controls as shown in Table C.
3	Operate the 911G TMS CONN pushbutton ***once*** to apply the dotting signal (reversals) to the hub.

TABLE C

SWITCH POSITIONS ON THE 911G TSG
LOCATED AT THE FAR END #2 OR DOTC BOARD
FOR 25% DISTORTED SIGNAL OUTPUT

SWITCH	POSITION
AUTO/STOP/STEP	AUTO
REPEAT	ON
RY/U*	ON
BAUDS	3 for SW Channel (75 baud) 5 for DW Channel (150 baud) (Note 1)
CODE 28-TTY 37-TTY 33- & 35-TTY	5/7.42 8/10 8/11
OUTPUT	HD (Note 2)
BIAS	MB or SB (upon command of far end)
DIST 1%	0
DIST 5%	25

Note1: The 911G TSG, or equivalent, must be equipped with 75- and 150-baud crystals.

Note 2: For either HDX or FDX channels at the 43B1 VFCD System, connect the RL and SL leads to separate hubs.

STEP	PROCEDURE
4	At the ***near***-end 1A Data Station, adjust the BIAS potentiometer on the receive interface (DP51 circuit pack) for equal marking and spacing bias. ***Note:*** A ***counterclockwise*** adjustment with the screwdriver reduces marking bias in the received data signal, while a ***clockwise*** adjustment reduces spacing bias.
5	At both ends, restore the circuits to normal.

Bias Adjustment at the 43B1 VFCD System in a 1A —43B1 Configuration (Fig. 4)

2.30 ***Equipment Required:*** The equipment required at the 1A Data Station is the same as in 2.24. The equipment required at the 43B1 VFCD System end is as follows:

- 911F Distortion Measuring Set (DMS), or equivalent.

2.31 ***Preparation:*** The preparation at the 1A Data Station (far end) is the same as in 2.25.

2.32 ***Procedure for Bias Alignment at the Near-End 43B1 VFCD System When Connected to a 1A Data Station at the Far End:***

STEP	PROCEDURE
1	At the ***far*** end, operate the controls as shown in Table A.
2	At the ***near*** end serviceboard, condition the 911F DMS, or equivalent, for operation by setting the front panel control as shown in Table D.

TABLE D

SWITCH POSITIONS ON THE 911F DMS LOCATED AT THE NEAR END FOR 25% DISTORTED SIGNAL INPUT

SWITCH	POSITION
DISPLAY	F
FILTER	OUT
PARITY	OFF
BAUDS	3 for SW Channel (75 baud) 5for DW Channel (150 baud) (Note 1)
CODE	5 for 28-TTY 8 for 33-, 35-, or 37-TTY (Note 2)
INPUT	HUB

Note 1: The 911F DMS, or equivalent, must be equipped for 75- and 150-baud crystals.

Note 2: For both SW and DW channels.

3	Operate the 911F DMS CONN pushbutton switch ***once*** to gain access to the circuit.
4	At the ***near*** end 43B1 VFCD System, adjust the BIAS potentiometer on the receive interface (DP51 circuit pack) for equal marking and spacing bias readings on the 911F DMS. ***Note:*** If the marking bias is greater than the spacing bias, turn the screwdriver adjustment counterclockwise to reduce marking bias in the received data signal. If the spacing bias is greater than the marking bias, turn the screwdriver adjustment ***clockwise*** to reduce spacing bias in the received data signal.
5	Restore the channel terminals to normal operation.

G. System Check

2.33 This test should be performed immediately after the data stations have been installed and aligned to ensure that the intallation is ready to be placed in service before turning the system over to the customer.

2.34 Verify that the far-end baseband loop-around test circuit is operating properly by requesting the far-end customer to operate his TEST key while transmitting and receiving data at the near end. This test is to be made in each direction. The local copy option, if present, must be removed for this test.

2.35 The installer should request that the near- and far-end customers alternately send data to one another using their business machines. This test will establish the integrity of the system.

3. TROUBLESHOOTING

3.01 ***General:*** The preceding tests (Part 2) are designed to prepare the system for operation. If the 1A Data Station does not meet the conditions specified in Part 3, refer to the troubleshooting Tables E and F for the normal condition to be expected at the various test points.

3.02 ***Equipment Required:***

- KS-20538-L1 VOM or equivalent 20,000 ohms-per-volt meter
- J79901-L3 Interface Test Adapter (cover only of 901B Data Test Set)
- KS-19935-L7 Telegraph Carrier Test Set (Stelma)

3.03 ***Troubleshooting Procedure:*** Before performing any troubleshooting procedures, check the following for obvious causes of trouble.

- Loose cords, connectors, connections, etc
- Incorrect options
- Broken wires
- Physical damage.

3.04 If the remote data loop test or the end-to-end test does not pass the requirements as specified, refer to troubleshooting Table F for the correct indication to be expected at the various test points. If the circuit pack under the CIRCUIT PACK column is verified as operating properly and the trouble still exists, a point-to-point check of the interconnecting wiring is necessary.

3.05 ***Use of the Test Features:***

(a) (The local copy option must not be installed when performing this test.) The remote data loop test can be used to make certain checks of a station as an aid in isolating trouble. Although the remote tests do not check the control functions, they do provide a means of checking the station and transmission facilities. In the data loop mode, a signal can be sent from a distant station to the station under test. The signal is received, looped back at the customer interface, and transmitted back to the distant station. If the signals received at the distant station are essentially the same as those transmitted, then the station under test is assumed to be operating properly. If the signals received at the distant station are not essentially the same as those transmitted, then the station under test, or the facility, is not operating properly.

(b) Should the data loop test fail, the end-to-end test may be used to further isolate the trouble. This test will isolate the trouble to a specific path of the circuit, ie, either to the east-to-west or the west-to-east circuit components. When a path has been identified as being in trouble, then the transmitter at one 1A Data Station and the receiver at the other 1A Data Station may be more closely tested by referring to the troubleshooting table to find the malfunctioning circuit pack.

3.06 ***Replacing Circuit Packs:***

(a) When performing steps of a certain test and the 1A Data Station fails, this may indicate a specific circuit pack. When the trouble has been isolated to a particular circuit pack, the trouble may be corrected by replacing it.

(b) When replacing a circuit pack, verify that the correct options and no others are installed

on the new circuit pack for that particular 1A Data Station arrangement.

(c) If the trouble cannot be isolated to a particular circuit pack within the 1A Data Station, perform the following procedure:

(1) Replace circuit packs one at a time, until the trouble is corrected. Note which circuit pack corrected the trouble.

(2) Reinstall all original circuit packs except for the new one which corrected the trouble.

(3) If after replacing an original circuit pack the 1A Data Station functions properly, the original circuit pack is obviously defective and should be returned to the Distribution House for repair.

3.07 ***EIA Data Terminal:*** Table E gives the values expected at the customer connection at the EIA data terminal using a 901B test set adapter (Fig. 1).

TABLE E

VALUES TO BE EXPECTED AT CUSTOMER CONNECTION AT EIA DATA TERMINAL (25-PIN)

PIN AND CLIP NUMBERS (NOTE 1)	LEAD	CIRCUIT NOMENCLATURE	MODE	LINE STATION INTERFACE (NOTE 4)	
				EIA (DP66) (NOTE 3)	CUR (DP61 or DP67)
1	AA	Protective Ground	—	GRD	
2	BA (Note 2)	Transmitted Data	MARK SPACE	−14 ±11V +14 ±11V	20 mA 0 mA
3	BB	Received Data	MARK SPACE	−15 ±3V +15 ±3V	20 mA 0 mA
4	CA	Request-to-Send	OFF ON	−17 ±3V +24 ±3V	Does Not Apply
5	CB	Clear-to-Send	Same as CC lead when E6 strapped to E7		
6	CC	Data Set Ready	OFF ON	−17 ±3V +24 ±3V	
7	AB	Signal Ground	—	GRD	
8	CF	Received Line Signal Detector	ON OFF	+24 ±3V −15 ±3V	+24 ±3V −12 ±3V
9	+24V	Data Set Test	—	+24 ±3V	
10	−24V	Data Set Test	—	−24 ±3V	

Note 1: The 1A Data Station EIA interface terminal and the 901B interface test adapter captive shorting clip numbers are the same. (Numbers not listed are not used.)

Note 2: From customer equipment.

Note 3: Early stations may have DP60 (MD) installed. DP66 is standard.

Note 4: Voltage levels relative to pin 7, AB lead (Signal Grd).

3.08 ***Procedure for Monitoring Voltage Signals at the EIA Data Terminal Using a Line EIA Interface (DP66 Circuit Pack):***

STEP	PROCEDURE
1	Disconnect the customer plug from the EIA data terminal on the 31A2 or 37A1 data mounting.
2	Connect the test adapter connection cord plug to the EIA data terminal (Fig. 6).
3	Connect the customer data plug to the 25-pin connector on the face of the 901B interface test adapter (Fig. 6).
4	Connect the ground probe of a KS-20538-L1 VOM to pin 7 (signal ground) of the 901B interface test adapter.
5	Connect the positive probe of the KS-20538-L1 VOM to the pin whose signal is to be measured. ***Requirement:*** See Table E for voltages and polarity to be expected at the various pins for the mode under consideration.
6	Remove the VOM connections.
7	Disconnect the 901B interface test adapter.
8	Reconnect the customer plug to the EIA data terminal on the 31A2 or 37A1 data mounting.

3.09 ***Procedure for Monitoring the Transmitted Data Current (Pin 2) and the Received Data Current (Pin 3) at the EIA Data Terminal Using a Line CUR Interface (DP61 Circuit Pack, 3-Wire, FDX Operation):***

STEP	PROCEDURE
1	Disconnect the customer plug from the EIA data terminal on the 31A2 or 37A1 data mounting.
2	Connect the test adapter connection cord plug to the EIA data terminal (Fig. 6).
3	Connect the customer data plug to the connector on the face of the 901B interface test adapter (Fig. 6). **Monitoring of Transmitted Data Current**
4	Loosen screws and remove captive shorting clip number 2 of the test adapter to the open position.

STEP	PROCEDURE
5	Connect the positive probe of the VOM to the TST terminal of number 2 clip.
6	Connect the negative probe of the VOM to EQ terminal of number 2 clip.
7	Condition the VOM to read current.
8	Send a steady mark.
	Requirement: 20 mA
9	Send a steady space.
	Requirement: 0 mA
	Remedial action: See Section 591-813-301.
10	Remove the VOM connections.
11	Restore the captive shorting clip to the closed position.
	Monitoring of Received Data Current
12	Loosen screws and move captive shorting clip number 3 of the test adapter to the open position.
13	Connect the negative probe of the VOM to the TST terminal of number 3 clip.
14	Connect the positive probe of the VOM to the EQ terminal of number 3 clip.
15	Send a steady space.
	Requirement: 0 mA
16	Send a steady mark.
	Requirement: 20 mA
	Remedial action: See Section 591-813-301.
17	Remove the VOM connections.
18	Restore the captive shorting clip to the closed position.
19	Disconnect the 901B interface test adapter.
20	Reconnect the customer plug at the EIA data terminal on the 31A2 or 37A1 Data Mounting.

3.10 ***Procedure for Monitoring the Data Current in the Loop at the EIA Data Terminal Using a Line Current Interface (DP67 Circuit Pack, 2-Wire, HDX Operation):***

STEP	PROCEDURE
1	Disconnect the customer plug from the EIA data terminal on the 31A2 or 37A1 data mounting.
2	Connect the test adapter connection cord plug to the EIA data terminal (Fig. 6).
3	Connect the customer data plug to the connector on the face of the 901B interface test adapter (Fig. 6).
4	Loosen screws and remove captive shorting clip 2 of the test adapter to the open position.
5	Connect number 3 clip to number 7 clip (shorting wire).
6	Connect the positive probe of the VOM to the TST terminal of number 3 clip.
7	Connect the negative probe of the VOM to the EQ terminal of number 3 clip.
8	Condition VOM to read current.
9	Receive a steady mark. ***Requirement:*** For 62.5-mA—62.5 mA, $\pm$2.5 mA For 20-mA option—20 mA, $\pm$2.5 mA
10	Receive a steady space. ***Requirement:*** For either 62.5 mA or the 20-mA option—0 mA
11	Remove the VOM connections.
12	Restore the captive shorting clip to the closed position.
13	Disconnect the 901B interface test adapter.
14	Reconnect the customer plug at the EIA data terminal on the 31A2 or 37A1 data mounting.

3.11 ***Test Points:*** Table F gives the values expected of data signals at the circuit pack test points and TS(A) for a normally operating system.

3.12 ***Procedure for Monitoring Voltages and Signal Levels at the Test Points on the Various Circuit Packs as Shown in Table F:***

STEP	PROCEDURE
	For positive dc voltage (KS-20538-L1 VOM)
1	Connect the black lead probe of the VOM to the GRD test point on the line station interface (DP61, DP66, or DP67 circuit pack).
2	Operate the slide switch on the gray lead probe to the DCV position.
3	Connect the gray lead probe of the VOM to the desired circuit pack test point.
	Requirement: Dc voltage levels and polarities with tolerances as given in Table F.
	For negative dc voltage (KS-20538-L1 VOM)
4	Reverse the probe connections of Steps 1 and 3.
	Requirement: Dc voltage levels and polarities with tolerances as given in Table F.

3.14 ***Procedure for Measuring Power Level at Terminal Strip TS(A) Located on the 31A2 or 37A1 Data Mounting (4-Wire) with a KS-20538-L1 VOM:***

STEP	PROCEDURE
1	Operate the slide switch on the gray lead probe to the ACV, Ω, MA position.
2	***Receive Signal Level:*** Connect VOM probes to TS(A) terminals 4 and 5 on the 31A2 or 37A1 data mounting.
	Requirement: Ac power level as required by Table F and the TCLR.
3	***Transmit Signal Level:*** Connect VOM probes to TS(A) terminals 2 and 3 on the 31A2 or 37A1 data mounting.
	Requirement: Ac power level as required by the TCLR.

4. CUSTOMER VERIFICATION

4.01 When a test is completed, all test requirements have been met, and no further tests are to be made, suggest that the customer verify service as satisfactory. If the customer has data to deliver, verify that the service is satisfactory in this manner. If the customer has no data to deliver, consider the station satisfactory for interim service. When customer verification has been completed, return the station to normal service.

5. REFERENCES

5.01 For additional information relating to this section, refer to the following schematic diagrams and circuit descriptions:

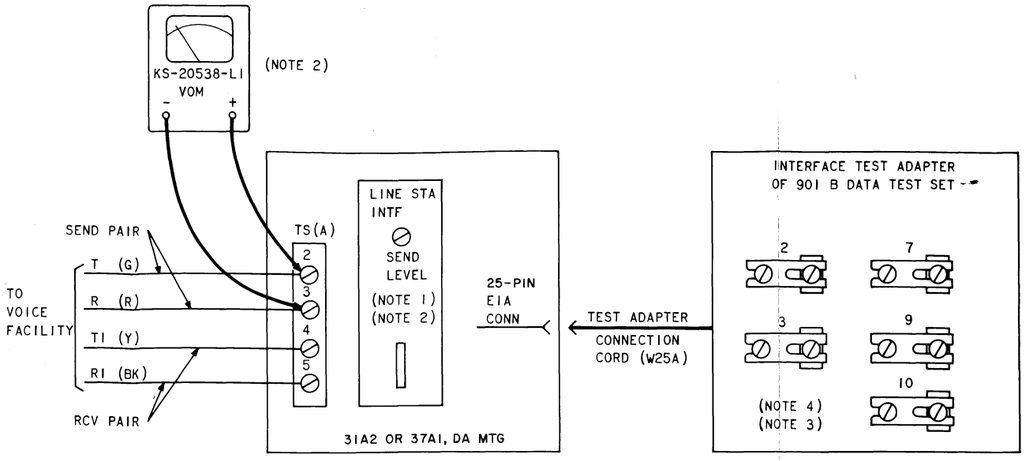
SECTION	TITLE
SD-&CD-1D148-01	1A Data Station, Multichannel Arrangements
SD-&CD-1D184-01	1A Data Station, Single Channel Arrangements
SD-&CD-70958-01	43B1 Voice Frequency Carrier Data System, Multichannel Arrangements
591-813-101	1A Data Station—Single Channel Arrangements—Binary Mode, Description and Operation
591-813-201	1A Data Station—Single Channel Arrangements—Binary Mode—Installation and Connections
591-813-301	1A Data Station—Single Channel Arrangements—Binary Mode—Maintenance
591-813-181	1A Data Station—Single Channel Arrangements — Summarizing Specification—Data Systems
312-710-100	43B1 Voice Frequency Carrier Data System—General Description
312-710-200	43B1 Frequency Carrier Data System—Installation and Out-of-Service Tests
312-710-201	43B1 Voice Frequency Carrier Data System—2- and 4-Wire Connections—Description and Installation
312-710-500	43B1 Voice Frequency Carrier Data System—Trouble Locating Tests
107-100-100	901A and 901B Data Test Sets—Identification and Operation
660-450-302	Circuit Order or Trunk Order Tests for Carrier Telegraph Layouts
807-170-161	43B1 Voice Frequency Carrier and Associated Equipment—Data Systems
AB27.350	Voice Bandwidth Circuits for Private Line Data Use—2000 Series and 3002 Channels—General Information
AB83.048.01	43B1 Voice Frequency Carrier Data System—General Engineering Considerations
591-813-100	1A Data Station—Mulitchannel Arrangements—Description and Operation
591-813-200	1A Data Station—Multichannel Arrangements—Installation
591-813-300	1A Data Station—Multichannel Arrangements—Maintenance
591-813-500	1A Data Station—Multichannel Arrangements—Tests

TABLE F

TROUBLESHOOTING TABLE FOR DATA SIGNALS

CIRCUIT PACK	TEST POINT	NORMAL CONDITION		TEST EQUIPMENT	PROBABLE TROUBLE AREA (NOTE 3)
		MARK	SPACE		
BINARY RCV INTF (DP51)	LIM IN	−32 dBm ± 2 dB	−32 dBm ± 2 dB	KS-20538-L1 (Note 5)	DP26-DP50, Facility, or Other Station
	EIA OUT (Note 4)	−16 Volts ± 3 Volts	+16 Volts ± 3 Volts		DP51 plus DP26-DP50, Facility, or Other Station
TRMTR (DP1-DP25)	TRMTR OUT (Note 1)	−13 dBm ±0.5 dB	−13 dBm ±0.5 dB		DP1-DP25, DP66, DP61, or DP67
TRMTR WITH LINE EIA INTF (DP66)	EIA IN	+0.2 Volt ±0.2 Volt	+5.5 Volts ±1.5 Volts		DP66
TRMTR WITH LINE CUR INTF (DP61 or 67) (Note 7)		−7 Volts ±2 Volts			DP61 or DP67
LINE EIA INTF (DP66) (Note 6), LINE CUR INTF (DP61 or 67)	SEND	Note 2			DP1-DP25, DP66, DP61, or DP67
	RCV	−12 dBm ± 2 dB	−12 dBm ± 2 dB		Facility, Other End Station, DP61, DP66, or DP67
	RD (Note 4)	−16 Volts ± 3 Volts	+16 Volts ± 3 Volts		DP61, DP66, or DP67 plus DP26-DP50, Facility, or Other Station
TS(A) ON 31A2 or 37A1 DATA MOUNTING	TERM 4 AND 5	See TCLR for RCV Level			Facility, Other End Station, DP61, DP66, or DP67
	TERM 2 AND 3	See TCLR for TRMT Level			DP1-DP25, DP61, DP66, or DP67

Note 1: Values shown at TRMTR OUT test point are for DW channels. SW channels are 3 dB lower.
Note 2: 600Ω facility: 4 dB higher than that delivered to facility.
900Ω facility: 2 dB higher than that delivered to facility.
Note 3: Replace circuit packs per 3.06.
Note 4: For distortion measurements, use 911-type Data Test Sets.
Note 5: Or equivalent, for low level ac voltage measurements.
Note 6: DP60 (MD) may be installed in early units. DP66 is standard.
Note 7: DP67 is for 62.5-mA loops (optional 20-mA).



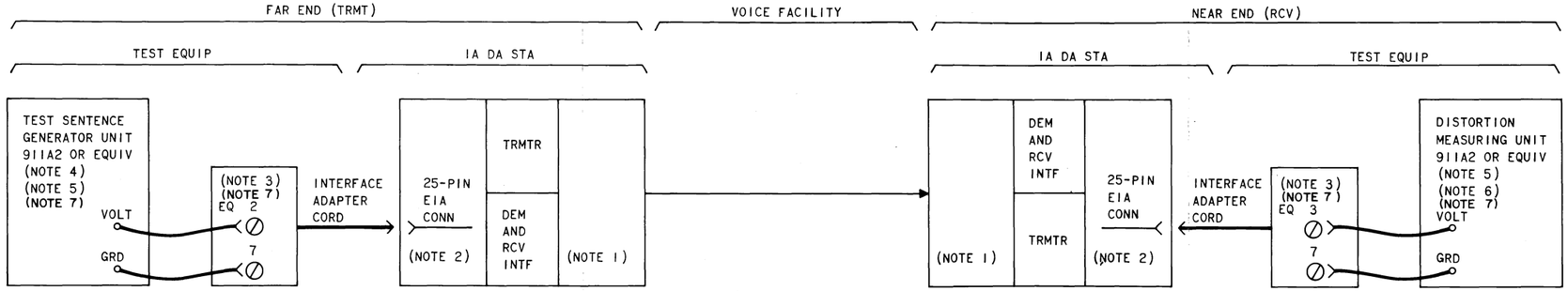
NOTES:
1. GAIN INCREASES WHEN SEND LEVEL POT. IS ADJUSTED CLOCKWISE.
2. ADJUST SEND LEVEL POT. FOR SEND LEVEL AT TERM. 2 AND 3 FOR 4-WIRE CONNECTIONS (2 AND 5 FOR 2-WIRE CONNECTIONS) ON TS(A) TO AGREE WITH CLR CARD.
3. CAPTIVE SHORTING CLIPS IN CLOSED POSITION.
4. CONNECTIONS ON J79901B - LIST 3 DATA TEST SET FOR KEYING TRMTR SEE TABLE:

CIRCUIT PACK LINE INTF	STEADY MARK	STEADY SPACE
EIA DP 66 *	STRAP 2 TO 10	STRAP 2 TO 9
CUR DP 61	STRAP 2 TO 10	LEAVE UNSTRAPPED
CUR DP 67	STRAP 2 TO 3	LEAVE UNSTRAPPED

* DP 66 IS STD DP 60(MD)

TPA 569903

Fig. 1—Send Level Adjustment—1A Data Station, SCA



NOTES:
1. LINE CIRCUIT PORTION OF LINE STATION INTERFACE.
2. STATION INTERFACE PORTION OF LINE STATION INTERFACE.
3. INTERFACE TEST ADAPTER, J79901B-L3 (COVER ONLY OF 901B DATA TEST SET)
4. USE 25% MARKING AND SPACING BIAS.
5. 911A2 DATA TEST SET (J79911A2) IS STD. 911A DATA TEST SET (J79911A) IS MD.
6. MEASURE FOR MINIMUM MARKING AND SPACING BIAS.
7. DIAGRAM SHOWS CONNECTIONS FOR DP66 CIRCUIT PACK. FOR DP61 AND DP67 CIRCUIT PACKS SEE FOLLOWING TABLE:

CIRCUIT PACK	TEST SENTENCE GENERATOR PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)	DISTORTION MEASURING SET PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)
DP61	CONNECT EQ 2 AND EQ 10 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS	CONNECT EQ 3 AND EQ 10 ON 901B DATA TEST SET TO "CUR IN" ON 911A2 DTS
DP67	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "CUR IN" ON 911A2 DTS

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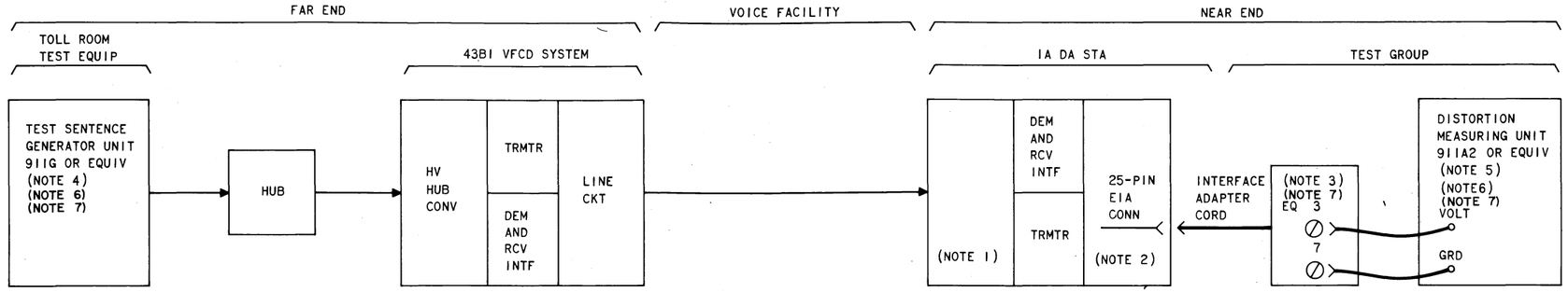
Fig. 2—Bias Adjustments—1A Data Station at Each End—1A Data Station, SCA



NOTES:
1. LINE CIRCUIT PORTION OF LINE STATION INTERFACE.
2. STATION INTERFACE PORTION OF LINE STATION INTERFACE.
3. INTERFACE TEST ADAPTER, J79901B-L3 (COVER ONLY OF 901B DATA TEST SET)
4. USE 25% MARKING AND SPACING BIAS.
5. MEASURE FOR MINIMUM MARKING AND SPACING BIAS.
6. 911A2 DATA TEST SET (J79911A2) IS STD. 911A DATA TEST SET (J79911A) IS MD.
7. DIAGRAM SHOWS CONNECTIONS FOR DP66 CIRCUIT PACK. FOR DP61 AND DP67 CIRCUIT PACKS SEE FOLLOWING TABLE:

CIRCUIT PACK	TEST SENTENCE GENERATOR PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)	DISTORTION MEASURING SET PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)
DP61	CONNECT EQ 2 AND EQ 10 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS	CONNECT EQ 3 AND EQ 10 ON 901B DATA TEST SET TO "CUR IN" ON 911A2 DTS
DP67	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "CUR IN" ON 911A2 DTS

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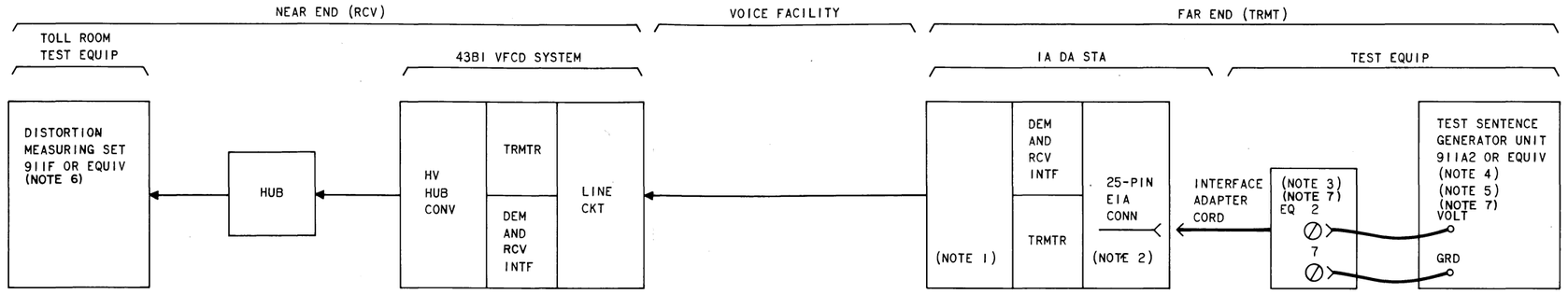
Fig. 3—Bias Adjustments at the 1A Data Station—1A Data Station and 43B1 VFCD System at Opposite Ends—1A Data Station, SCA

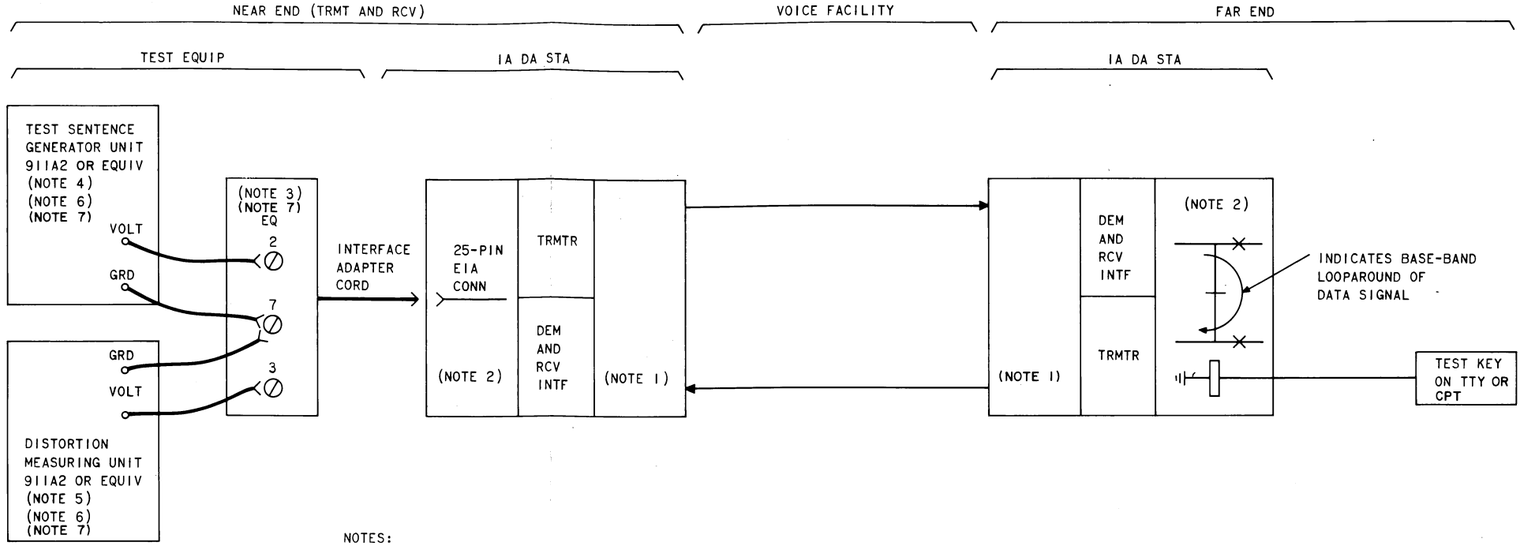


NOTES:
1. LINE CIRCUIT PORTION OF LINE STATION INTERFACE.
2. STATION INTERFACE PORTION OF LINE STATION INTERFACE.
3. INTERFACE TEST ADAPTER, J79901B-L3 (COVER ONLY OF 901B DATA TEST SET).
4. USE 25% MARKING AND SPACING BIAS.
5. 911A2 DATA TEST SET (J79911A2) IS STD. 911A DATA TEST SET (J79911A) IS MD.
6. MEASURE FOR MINIMUM MARKING AND SPACING BIAS.
7. DIAGRAM SHOWS CONNECTIONS FOR DP66 CIRCUIT PACK. FOR DP61 AND DP67 CIRCUIT PACKS SEE FOLLOWING TABLE:

CIRCUIT PACK	TEST SENTENCE GENERATOR PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)
DP61	CONNECT EQ 2 AND EQ 10 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS
DP67	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS

TPA 569906

Fig. 4—Bias Adjustment at the 43B1 VFCD System—1A Data Station and 43B1 VFCD System at Opposite Ends—1A Data Station, SCA

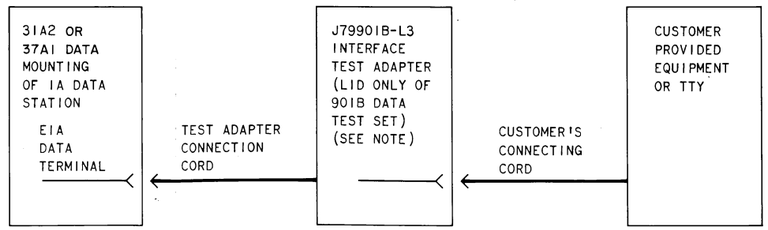


NOTES:
1. LINE CIRCUIT PORTION OF LINE STATION INTERFACE.
2. STATION INTERFACE PORTION OF LINE STATION INTERFACE.
3. INTERFACE TEST ADAPTER, J79901B-L3 (COVER ONLY OF 901B DATA TEST SET).
4. USE 25% MARKING AND SPACING BIAS.
5. MEASURE FOR MINIMUM MARKING AND SPACING BIAS.
6. 911A2 DATA TEST SET (J79911A2) IS STD 911A DATA TEST SET (J79911A) IS MD.
7. DIAGRAM SHOWS CONNECTIONS FOR DP66 CIRCUIT PACK. FOR DP61 AND DP67 CIRCUIT PACKS SEE FOLLOWING TABLE:

CIRCUIT PACK	TEST SENTENCE GENERATOR PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)	DISTORTION MEASURING SET PORTION OF 911A2 DATA TEST SET (BSP 103-813-100)
DP61	CONNECT EQ 2 AND EQ 10 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS	CONNECT EQ 3 AND EQ 10 ON 901B DATA TEST SET TO "CUR IN" ON 911A2 DTS
DP67	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "REL OUTPUT" ON 911A2 DTS	CONNECT EQ 2 AND EQ 3 ON 901B DATA TEST SET TO "CUR IN" ON 911A2 DTS

TPA 569907

Fig. 5—Remote Test of Far-End 1A Data Station—1A Data Station, SCA



NOTE:
ALL CAPTIVE SHORTING CLIPS MUST BE IN THE CLOSED POSITION FOR VOLTAGE READINGS. FOR CURRENT READINGS, OPEN SHORTING CLIPS AND CONNECT MILLIAMMETER IN SERIES WITH OPEN ENDS.

TPA 569908

Fig. 6—Connections for Gaining Access to EIA Data Terminal—1A Data Station, SCA