

43B1 VOICE FREQUENCY CARRIER DATA SYSTEM TROUBLE LOCATING TESTS

	CONTENTS	PAGE
1.	GENERAL	1
A.	Scope	1
B.	Maintenance Policy	1
2.	MAINTENANCE AIDS	2
3.	INSTALLATION TEST PROCEDURES	2
4.	MAINTENANCE PROCEDURES	2
A.	General	2
B.	Trouble Isolation Prior to Troubleshooting at the 43B1 VFCD System Bay	3
C.	Locating Troubles in the Receive Circuits	3
D.	Locating Troubles in the Transmit Circuits	4
E.	Test Point Readings	4

1. GENERAL

A. Scope

1.01 This section describes the procedures for isolating 43B1 Voice Frequency Carrier Data (VFCD) System troubles to the terminal equipment located in a bay at a central office (CO).

1.02 This section describes the trouble analysis and test procedures for locating a malfunctioning circuit pack in the terminal equipment of a 43B1 VFCD System located at the bay at a CO.

1.03 This section should be used in conjunction with the following 43B1 VFCD System practices: Description (312-710-100), Out-of-Service

and Installation Tests (312-710-200), and 2- and 4-Wire Connections—Description and Installation (312-710-201).

B. Maintenance Policy

1.04 No routine maintenance is required for the 43B1 VFCD System. This system requires maintenance only when a channel or system fails.

1.05 The 43B1 VFCD System or components of the system (circuit packs, rectifiers, etc) not meeting the test requirements should be replaced to restore customer service as quickly as possible.



Care should be exercised in handling the circuit packs, particularly the transmitter and/or the demodulator circuit packs, to avoid dropping them. It is the 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 also to change the FREQUENCY of the transmitter oscillator. A severe physical shock can crack the ferrite structure.

1.06 A malfunctioning circuit pack is to be replaced with a properly operating unit. It is recommended that the defective circuit pack be sent to the proper service center for repair. Maintenance on the circuit packs other than at the service center should *not* be attempted unless suitable test and repair facilities are available.

1.07 It is recommended that the trouble condition on a suspected circuit pack be verified by placing it in service on a spare channel and testing its operation. Marginal conditions occasionally result in errors in diagnosing which circuit pack is at fault.

SECTION 312-710-500

1.08 Verify that the correct options have been installed on the replacing circuit packs before placing them into positions.

1.09 If possible, use original cartons to store, transport, or ship the circuit packs.

2. MAINTENANCE AIDS

2.01 The following documents may be of assistance during a maintenance visit:

312-710-100 43B1 Voice Frequency Carrier Data System—Central Office Arrangement—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-Wire and 4-Wire Connections

SD-70958-01 43B1 Voice Frequency Carrier Data System

CD-70958-01 43B1 Voice Frequency Carrier Data System

807-170-161 43B1 Voice Frequency Carrier Data Systems and Associated Equipment

312-807-ZZZ Type-3 Low Voltage Hub

AB83.048-01 Transmission Engineering Considerations—43B1 Voice Frequency Carrier Data System and 1A Data Station

SD-81872-01 Power System—DC to DC Regulated Converter—J87308

332-852-107 4066G Network—Description

3. INSTALLATION TEST PROCEDURES

3.01 The following installation, test, and adjustment procedures may be found in Section 312-710-200, and are *not* repeated in this section.

- Strapping and option connections including strapping for send levels

- Tests and adjustment for transmitting channels

- Tests and adjustments for receiving channels

- Carrier fail adjustments

- Bias adjustments

- Channel and system alarm tests.

3.02 The following installation, connection, strapping, and adjustment procedures may be found in Section 312-710-201, and are *not* repeated in this section.

- 2- and 4-wire, 600-ohm and 900-ohm connections

- Compromise hybrid balancing network (on the line circuit circuit packs) adjustment

- 4066G external balancing network adjustment

3.03 The tests listed in 3.01 and 3.02 are performed during the initial installation of the 43B1 VFCD System. Should any circuit pack requiring strapping or adjustments be replaced, the replacing circuit pack should be equipped with the same strapping options. If adjustments are required, reference should be made to the installation sections (312-710-200 and 312-710-201).

3.04 Although the tests in 3.01 and 3.02 are primarily for use at the time of installation, it may be necessary to perform them again during maintenance.

4. MAINTENANCE PROCEDURES

A. General

4.01 The procedures in this section assume that the carrier terminal appears at a No. 2 serviceboard, No. 9B serviceboard, Data Observing Test Center (DOTC), or equivalent hub-type office, and that the 43B1 VFCD System operates in conjunction with a type-2 hub through a high voltage converter (DP64 circuit pack*) interface or directly into a type-3 low voltage hub.

*Early systems may have DP53 circuit packs (MD) installed. DP64 circuit pack is standard.

4.02 The procedures in this section assume that a malfunction in the 43B1 VFCD System has been isolated to either the transmit or receive circuitry by a craft employee at a serviceboard.

4.03 This practice will not concern itself with malfunctions occurring outside of the 43B1 VFCD System equipment in the bay other than to determine whether the trouble is at the near-end or at the far-end bay.

4.04 Maintenance of the 43B1 VFCD System should be in accordance with the flowcharts shown in Fig. 2 and 3. The flowcharts are recommended for an organized trouble investigation with a minimum amount of time spent in locating the cause of the trouble.



The numbers in brackets [] refer to the numbered blocks in the flowcharts.

4.05 The detailed procedure for performing tests (eg, voltage measurements, limits) indicated in the test procedure and the readings to be expected are covered in Part 4D.

B. Trouble Isolation Prior to Troubleshooting at the 43B1 VFCD System Bay

4.06 The first sign of trouble will usually be evident at the receiving end of the circuit, and will result in an office alarm, a customer report of nonreceipt of data or garbled copy, etc. The Telco employee at the testboard must then determine if the trouble is in one of the following:

- (a) The receive circuits of the 43B1 VFCD System *at the bay* of the near end
- (b) The transmit (send) circuit of the 43B1 VFCD System *at the bay* of the far end.

Troubles in the line facility are handled in accordance with normal testroom procedures.

4.07 Figure 1 shows one side of a 43B1 VFCD System and drawings of the face plates of the circuit packs. It is presented for orientation purposes and for use as a reference while isolating troubles prior to troubleshooting at the 43B1 VFCD System bay.

C. Locating Troubles in the Receive Circuits (Fig. 2)

4.08 The following procedure (Fig. 2) is to be used when tests or reports indicate that the malfunctioning portion of the system is at the receiving end of the 43B1 VFCD System located at the bay [1].

4.09 Send a steady mark from the transmit end and check for a negative dc signal at the EIA OUT test point [2]. Repeat for steady space and check for a positive dc signal at the EIA OUT test point [2]. If the dc signal is present at the EIA OUT test point, replace the HV hub converter (DP64 circuit pack) [3]. Verify that the circuit is operational [10] and proceed to 4.14.

4.10 If the correct received dc signal is not present at the EIA OUT test point of the receive interface (DP51 circuit pack) of the channel being tested, check for ac signal at the LIM IN test point [4]. If the ac signal is present at the correct level at the LIM IN test point, replace the receive interface (DP51 circuit pack) [5]. If the dc signal is now present at the EIA OUT test point, verify that the circuit is operational [10] and proceed to 4.14. If the dc signal is still not evident at the EIA OUT test point, replace the demodulator (DP26-DP50 circuit packs) [7]. Verify that the circuit is operational [10] and proceed to 4.14.

4.11 Should the ac signal not be present at the LIM IN test point [4], check for it at the RCV test point [6]. If the ac signal is present at the RCV test point and is not present at the LIM IN, replace the demodulator (DP26-DP50 circuit packs) [7]. Verify that the circuit is operational and proceed to 4.14.

4.12 If the signal is not present at the correct level at the RCV test point [6], check the level at the LIM IN test points at all the other channels in the same system. If the signals of all the channels are low, realign the channels per Section 312-710-200 [12]. Verify that all channels are operational [13] and proceed to 4.14.

4.13 Should only one channel have a low signal level, adjust the CF ADJ potentiometer [8]. If the CF lamp is extinguished, verify that the circuit is operational [10] and proceed to 4.14. If the lamp is not extinguished, replace the receive interface (DP51 circuit pack) [9]. Verify that the circuit is operational [10] and proceed to 4.14.

SECTION 312-710-500

4.14 Return all circuits to normal and close the trouble report [11].

D. Locating Troubles in the Transmit Circuits (Fig. 3)

4.15 The following procedure (Fig. 3) is to be used when tests or reports indicate that the malfunctioning portion of the system is at the transmitting end of the 43B1 VFCD System located at the bay [1].

4.16 Send a steady mark or steady space from the service position and check for an ac signal at the TRMTR OUT test point [2].

4.17 If the ac signal is present at the proper level at the TRMTR OUT test point [2], check for it at the SEND test point [3]. If the signal is present at the SEND test point, check and repair wiring between plug-ins [6] and verify that the circuit is operational [7]. However, if the signal is not present at the SEND test point, replace the line circuit [4] (DP52 circuit pack). Verify that all channels are operational [5]. Proceed to 4.19.



A release on all channels of the system must be procured before removing the line circuit (DP52 circuit pack).

4.18 If the ac signal did not appear at the TRMTR OUT test point [2], check the dc voltage of the signal at the EIA IN test point [8].

Should the dc signal not be present at the EIA IN test point, replace the high voltage hub converter (DP64 circuit pack) [10], and verify that the circuit is operational [7]. However, if the dc signal is present at the EIA IN test point, replace the transmitter (DP1-DP25 circuit pack) [9], and verify that the circuit is operational.

4.19 Return the circuits to normal and close the trouble report [11].

E. Test Point Readings

4.20 The following tables provide the expected values and levels at the various test points for a normally operating 43B1 VFCD System. See Fig. 1 for the location of the test points on the face of a circuit pack and for the relative position of the circuit pack in the signal path.

4.21 Table A gives the values and levels expected at the No. 2 or 9B testboard (service position) and at the VF testboard (facility position).

4.22 Table B gives the values and levels to be expected for data signals at the various test points at the 43B1 VFCD System bay for a normally operating system.

4.23 Table C gives the values for the normal condition and the alarm condition at the test points located on the system alarm (DP62 circuit pack).

TABLE A

VALUES TO BE EXPECTED AT THE TESTBOARD

SIGNAL	SERVICE POSITION	VOICE FACILITY POSITION	
	EITHER SEND OR RECEIVE	SEND	RECEIVE
MARK	With DP53 or DP64 Circuit Pack (HDX): +60 volts dc \pm 2 volts dc	DW: -23 dBm \pm 1 dB SW: -26 dBm \pm 1 dB	DW: -11 dBm \pm 1dB SW: -14 dBm \pm 1 dB
	With DP64 Circuit Pack (FDX): -10 volts dc \pm 1 volt dc		
SPACE	With DP63 or DP64 Circuit Pack (HDX): -30 volts dc \pm 5 volts dc With DP64 Circuit Pack (FDX): -60 volts +8 volts dc -2 volts dc		
DOUBLE-SPACE	With DP53 Circuit Pack (HDX): -60 volts +8 volts dc -2 volts dc	Does Not Apply	Does Not Apply

TABLE B

TROUBLESHOOTING TABLE FOR DATA SIGNALS

CIRCUIT PACK	TEST POINT (NOTE 10)	NORMAL CONDITION		PROBABLE TROUBLE AREA (NOTE 3)	TEST EQUIPMENT
		MARK	SPACE		
TRMTR DP1- DP25	EIA IN	-7 volts ±2 volts	+5.5 volts ±1.5 volts	DP64 (Note 5)	KS-20538-L1 (Note 7)
	TRMTR OUT (Note 1)	-13 dBm ±0.5 dB		DP1-DP25 or DP64	
RCV INTF DP51	LIM IN	-32 dBm ±2 dB		DP52 or DP26-DP50	
	EIA OUT (Note 4)	-16 volts ± 3 volts	+16 volts ± 3 volts	DP51, DP52, or DP26-DP50	
LINE CKT DP52	SEND	(Note 2)		DP52 (Note 6), DP1-DP25, or DP64	KS-19935-L7 (Stelma) (Note 9)
	RCV	-12 dBm ±2 dB		DP52, Facility, or other end TRMTR	

Notes:

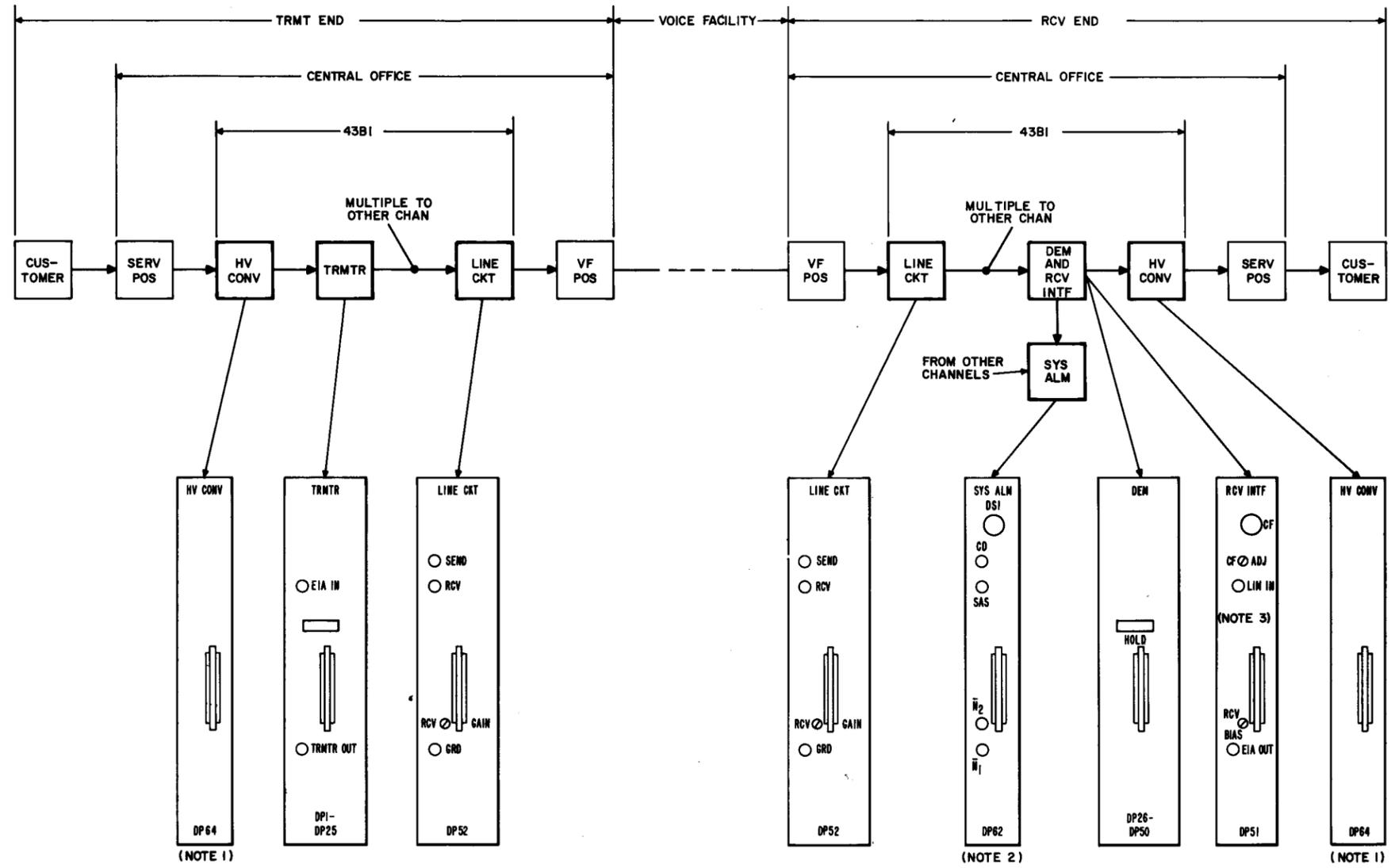
1. Values shown at TRMTR OUT test point are for DW channels. SW channels are 3 dB lower.
2. 600Ω facility: 4 dB higher than that delivered to facility (see TCLR).
900Ω facility: 2 dB higher than that delivered to facility (see TCLR).
3. Replace circuit packs per Part 2.
4. For distortion measurements, use 911-type Data Test Sets.
5. Early systems may have DP53 circuit pack (MD) installed. DP64 circuit pack is standard.
6. Only if LIM IN values for all channels are not normal.
7. Or equivalent, for low level ac voltage measurements.
8. Telegraph level given is for DW channel. SW channel telegraph level is 3 dB lower.
9. If KS-20538-L1 is used to measure total power, it must be terminated in 600 ohms.
10. Use high impedance meter at LIM IN test point on RCV INTF. Use 600Ω terminated meter at all other test points.

TABLE C

TROUBLESHOOTING TABLE FOR SYSTEM ALARM

CIRCUIT PACK	TEST POINT	NORMAL CONDITION	ALARM CONDITION
System Alarm (DP62)	\bar{N}_1	$-12 \pm 1V$	$-0.1 \pm 0.1V$
	\bar{N}_2	$-12 \pm 1V$	$-0.1 \pm 0.1V$
	CD	-0.7 to $+0.7V^*$	$+15$ to $+24V^*$
	SAS	$+12.0 \pm 2V^*$	$-10.5 \pm 2V^*$

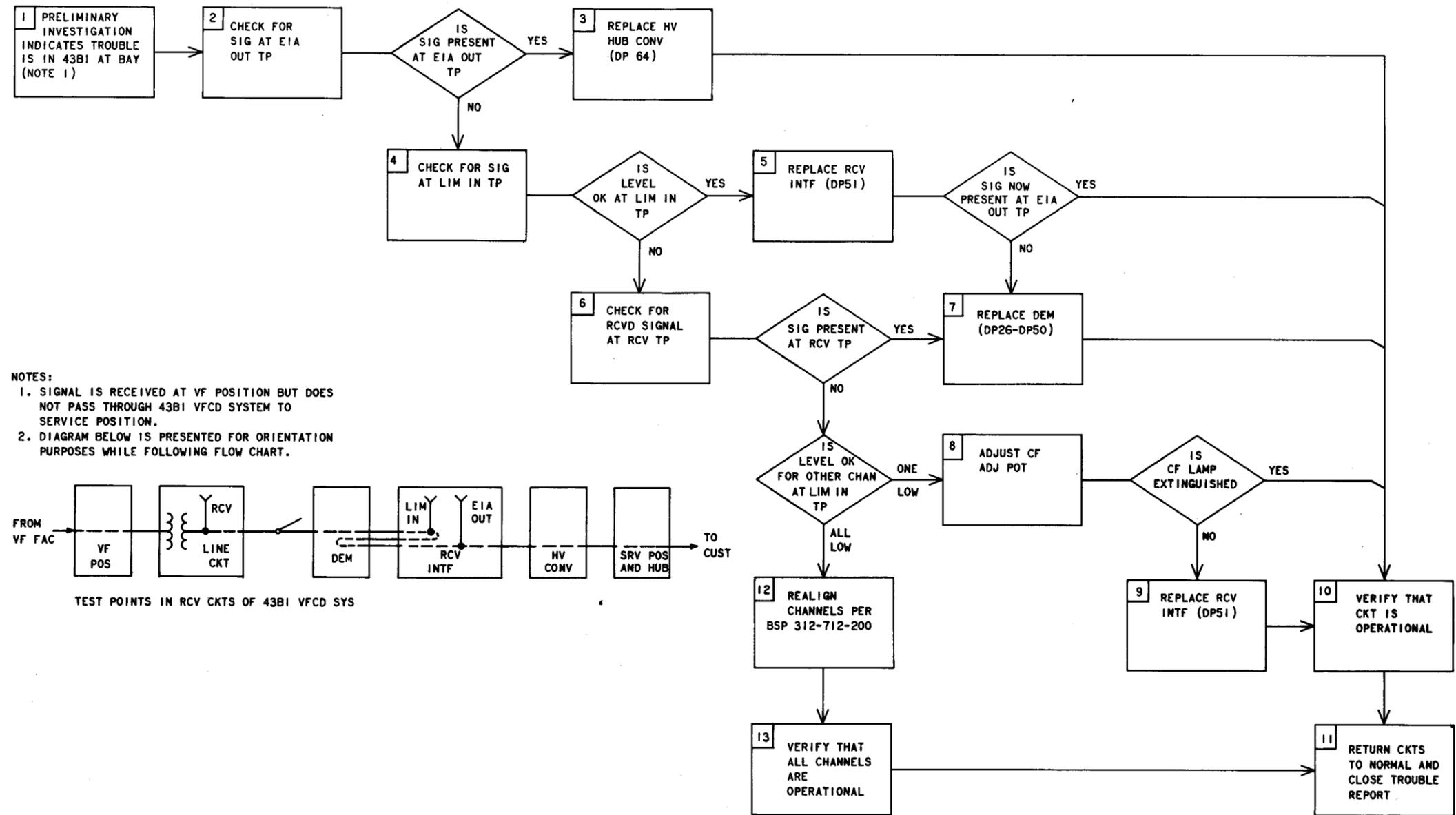
* Operate SYS ALM switch to the OFF position. Voltages thus provided are for an unterminated condition.



- NOTES:
1. EARLY UNITS MAY HAVE DP53 (MD) INSTALLED. DP64 IS STD.
 2. EARLY UNITS MAY HAVE DP54 (MD) INSTALLED. DP62 IS STD.
 3. USE HIGH IMPEDANCE METER AT RCV INTF LIM IN TEST POINT. USE 600Ω TERMINATED METER AT ALL OTHER TEST POINTS.
 4. SEE TABLE B FOR VALUES TO BE EXPECTED AT TEST POINTS.

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Fig. 1—Transmit End to Receive End—43B1 VFCD System—Orientation Drawing



NOTES:
 1. SIGNAL IS RECEIVED AT VF POSITION BUT DOES NOT PASS THROUGH 43B1 VCD SYSTEM TO SERVICE POSITION.
 2. DIAGRAM BELOW IS PRESENTED FOR ORIENTATION PURPOSES WHILE FOLLOWING FLOW CHART.

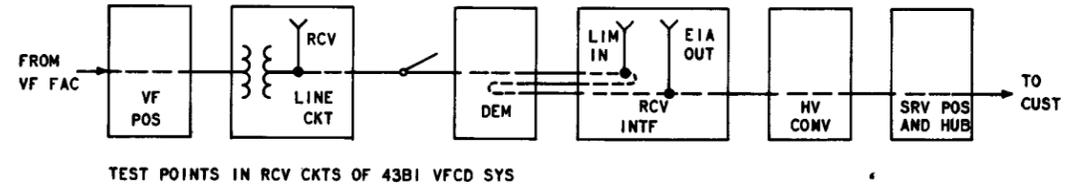
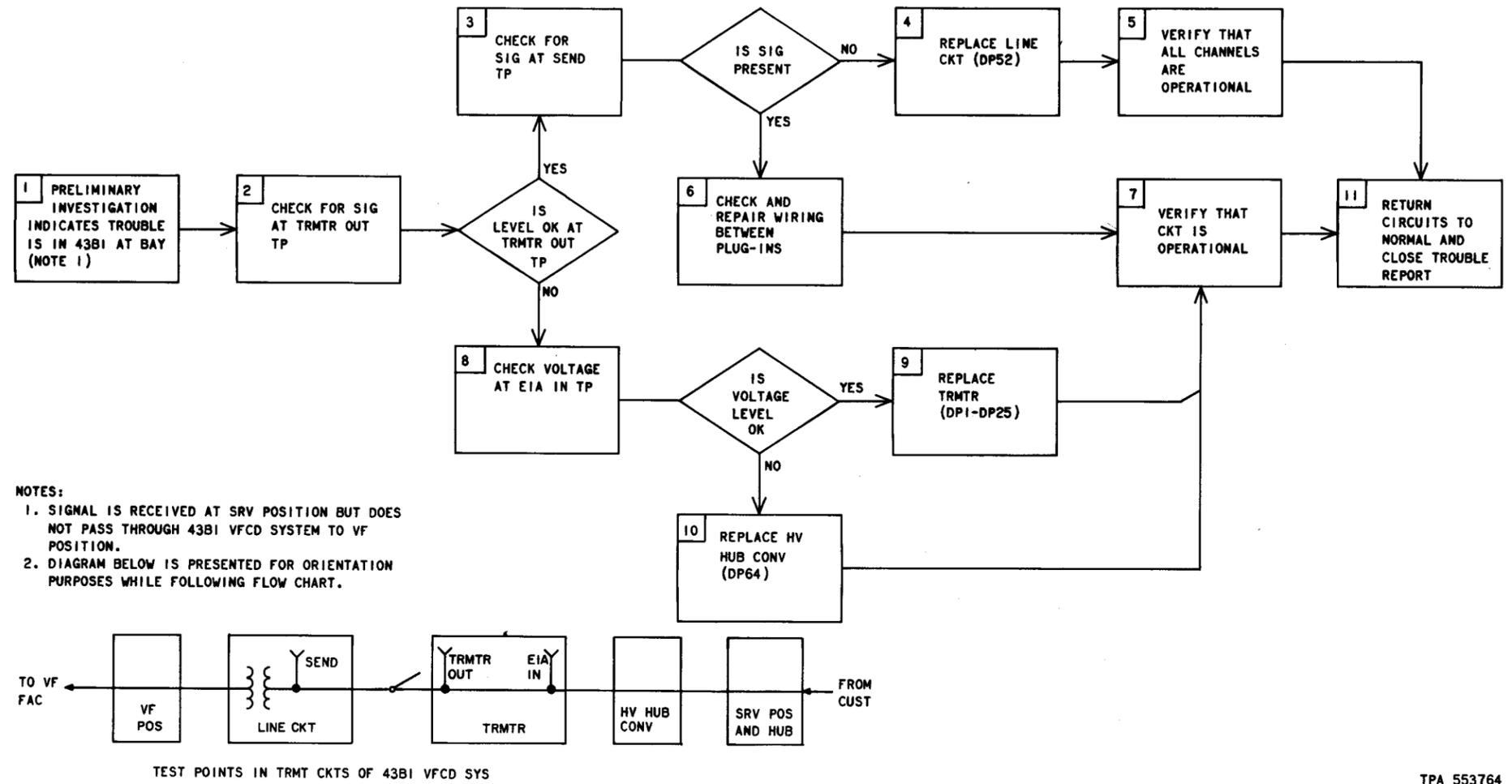


Fig. 2—Trouble Locating Tests—Receive Circuits—43B1 VCD System—Flowchart

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Fig. 3—Trouble Locating Tests—Transmit Circuits—43B1 VFCD System—Flowchart