DATA SET 113AR-L1B

TEST PROCEDURES USING 921A DATA TEST SET

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1. GENERAL

1.01 This section contains test procedures to be followed when using a 921A (version 2 or higher) data test set (DTS) to test a data set (DS) 113AR. These procedures are to be followed when needed on an initial installation or during a maintenance visit.

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

1.03 The DS 113AR provides asynchronous, full-duplex transmission and reception of serial binary data over the switched network at bit rates up to 300 bits per second (bps). The DS 113AR also provides a single mode of operation, originate only.

1.04 The 921A DTS (Fig. 1) is a portable, general purpose, data test set that provides the serial testing capabilities of the 914C DTS and is compatible with the 914C DTS for end-to-end testing. In addition, the 921A DTS is compatible with the 911A and 911NA DTSs for end-to-end start-stop distortion measurements. Additional information concerning the 921A DTS is contained in Section 107-402-100.

1.05 Input to the 921A DTS is made through a 20-button keyboard. A 32-character alphanumeric display provides operator prompting and test results.

Test Capabilities

1.06 Test circuitry built into DS 113AR permits the remote test of the data set from a data test center (DTC).

1.07 If a 921A DTS is used, digital loopback and end-to-end tests can be performed using pseudorandom data. By use of the 921A DTS, the customer interface circuits are tested and a more precise indication of bit and block errors can be obtained. Start-stop distortion tests can be performed for asynchronous operation.

2. INSTALLATION TESTS

2.01 This part provides the sequence in which tests are to be performed following installation of the data set. Before proceeding with the tests, verify that the local loop meets the requirements specified in Section 314-205-501.

2.02 Refer to Fig. 2 for the sequence of tests to be performed to verify proper installation.

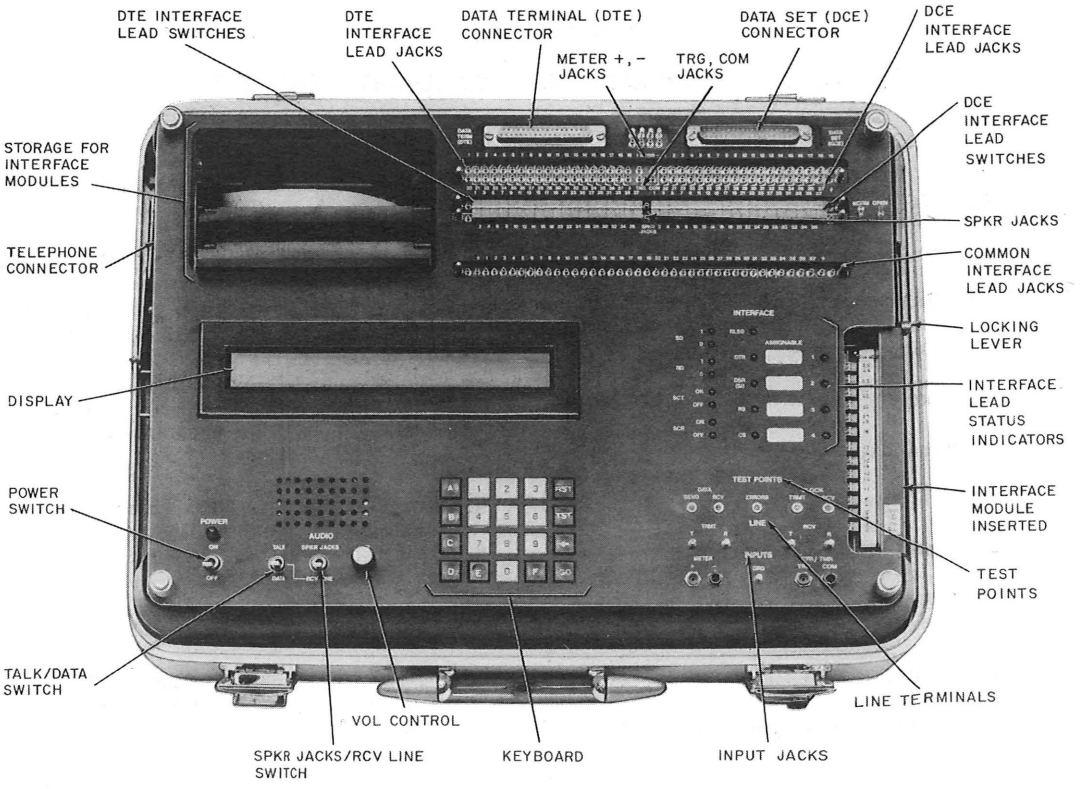

Fig. 1—921A Data Test Set—Front Panel

The 921A DTS is not required for installation testing, but may be used if desired.

3. MAINTENANCE TESTS

3.01 This part provides the sequence in which tests are to be performed when clearing a trouble report and during a maintenance visit to the data station.

3.02 When a trouble report is received, a DTC is responsible for isolating the trouble to the data station or the transmission facility. The procedure for doing this is shown in Fig. 3.

3.03 If the trouble seems to be in the data station equipment, a telephone company (telco) employee must be dispatched to conduct more extensive tests at the data station. The following equipment should be taken on a trouble visit:

- Spare data set
- 921A DTS.

3.04 Refer to Fig. 4 for the sequence in which tests are to be performed by the telco employee at the data station. If the data set is replaced, the defective data set should be tagged with a description of the trouble, carefully packed, and returned to a service center for repair. Verify that the replacement data set is equipped with the proper options before placing the data set in service.

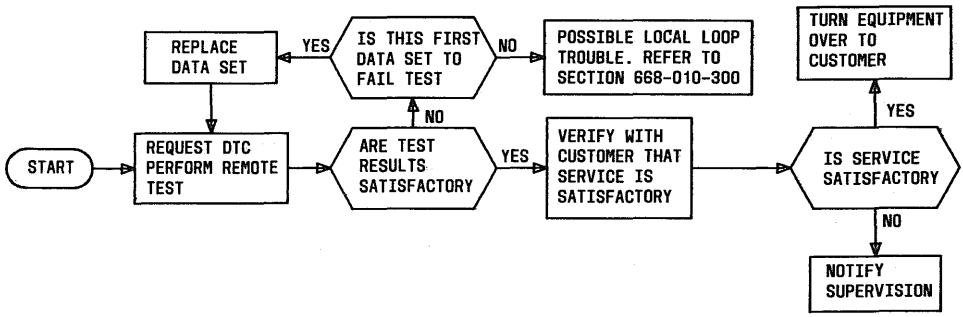

Fig. 2—Installation Test Sequence

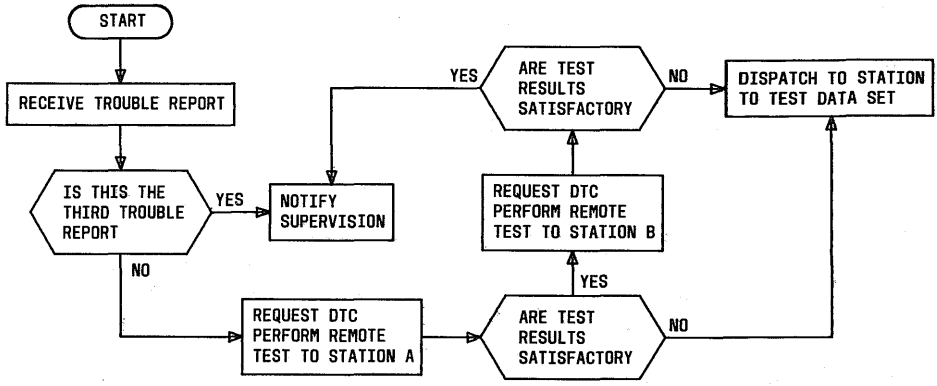

Fig. 3—Clearing Trouble Report

3.05 If the trouble persists after the tests have been completed, proceed as follows:

(a) Check that options installed in data set agree with those specified on service order.

(b) Verify that customer-provided equipment (CPE) has been tested and is operating properly.

(c) Check for physical damage to data station equipment.

(d) Verify that all cords and connectors are properly connected.

(e) Check for intermittent trouble in station wiring.

(f) Verify that data set and CPE are connected to a common ground.

(g) If trouble persists, request help from immediate supervisor.

4. TEST PROCEDURES

4.01 This part provides the procedures for the installation and maintenance tests.

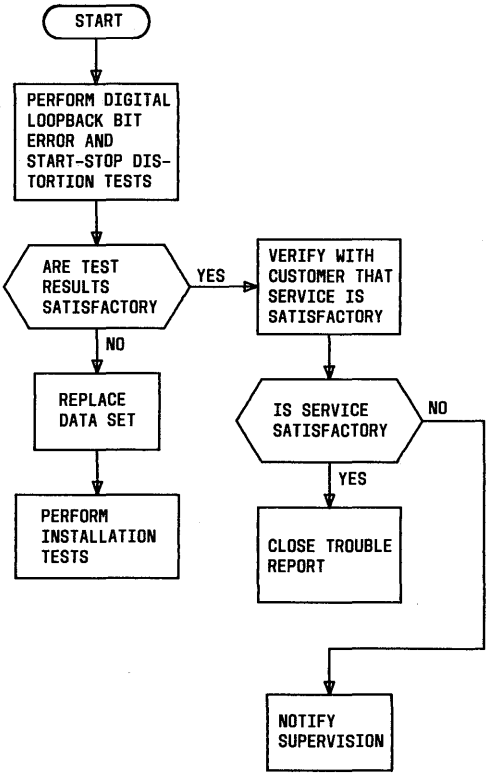

Fig. 4—Maintenance Test Sequence

A. Remote Test

4.02 This test allows a data test center (DTC) to check the data set transmitter and receiver and the facilities connecting the data set and the DTC. The customer interface is not checked.

4.03 Perform the test as follows:

(1) Contact DTC and request a remote test.

(2) When directed by DTC, depress TM switch on data set.

(3) DTC performs remote test.

(4) When directed by DTC, release TM switch.

B. Initial Test Setup for 921A DTS

4.04 Perform the initial test setup for the 921A DTS when used to test DS 113AR as follows:

STEP	ACTION	VERIFICATION
1	Connect data set to DTS using interface cable and Electronic Industries Association (EIA) adapter cord provided with DTS. *Note:* The interface cable is equipped with two 37-pin connectors. The 6-inch adapter cord is equipped with a 37-pin female connector and a 25-pin male connector. Connect interface cable from DATA SET (DCE) connector on DTS to 37-pin connector on adapter cord. Insert 25-pin connector on adapter cord into customer interface connector on data set.	
2	Connect DTS to a 105- to 129-Vac 60-Hz power source.	

STEP	ACTION	VERIFICATION
3	Apply power to data set.	
4	On front of DTS, set POWER switch to ON.	POWER lamp lights.
5	Press RST on keyboard. ***Note:*** If RST is pressed during a test, the test is ended and the DTS recycles to this step.	Display reads (briefly) version number of DTS. DTS then performs self tests. If DTS is defective, display reads— TEST FAILED. If DTS is satisfactory, display reads— DATA SET:
6	Remove EIA interface module from storage and ensure that all 25 interface module switches are in TERM position.	
7	On right side of DTS, ensure that locking lever is in OPEN position.	
8	Insert interface module into slot.	
9	Move locking lever to CLOSE position.	
10	On front of DTS, ensure that all 37 DCE interface lead switches are in NORM position.	
11	Enter 20 on keyboard. ***Note:*** To delete a wrong entry on keyboard during any test, press back arrow (←).	Display reads— DATA SET: 20
12	Press GO.	Display reads— BIT RATE:
13	Enter 03.	Display reads— BIT RATE: 03
14	Press GO. ***Note:*** If GO or TST is pressed at an unauthorized point in a test, the test is ended and the DTS recycles to this step.	Display reads— TEST SEQ:

C. Digital Loopback Bit Error Test

4.05 This test checks the transmitter and receiver of a local and a distant data set and the facilities connecting the data sets. The customer interface at the distant data set is not checked. Test data is generated by the DTS and transmitted by the local data set. This data is looped back internally from the receiver output to the transmitter input of the distant data set and retransmitted. The data is received by the local data set and compared to the original transmitted data by the DTS. Data errors are indicated by the DTS display.

4.06 Perform the test as follows:

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.04 has been performed.	Display reads— TEST SEQ:
2	On DTS, enter 55.	Display reads— TEST SEQ: 55
3	Press GO.	Display reads— TRANSMITTER=? 1=921 2=914 3=903
4	Enter 1.	Display reads briefly— TRANSMITTER=1 1=921 2=914 3=903 Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63 On DTS, DTR indicator lights.
5	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
6	Place a call to distant end and request attendant to depress TM switch on data set; then go into data mode at both ends.	On DTS, DSR indicator lights.
7	Enter 1.	Display reads— ???? SECONDS
8	Enter 0300. ***Note:*** To perform functions listed below, press associated key. **KEY — FUNCTION** A Repeat test. B Display time remaining in test. C Clear display. D End test. E Inject 8 errors into data stream. F Force out-of-sync condition.	Display reads (briefly)— 0300 SECONDS Display then reads— 0000 BITS IN ERROR From this point, display counts number of bits in error. If sync is lost during test, display flashes OSYN. If this occurs, test must be repeated by pressing A. At end of test, display reads TEST COMPLETE, total sync losses, and total bits in error. ***Requirement:*** Total bits in error are less than 2.
9	Place a call to distant end and request attendant to release TM switch on data set.	

D. Digital Loopback Start-Stop Distortion Test

4.07 This test uses the DTS to measure three types of start-stop distortion of a local and a distant data set, as follows:

- Peak distortion
- Number of "hits" above a specified threshold
- Average bias distortion.

4.08 Perform the test as follows:

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.04 has been performed.	Display reads— TEST SEQ:
2	On DTS, enter 52 79.	Display reads— TEST SEQ: 52 79
3	Press GO.	Display reads— PARITY=? (0=EVEN, 1=ODD) On DTS, DTR indicator lights.
4	Place a call to distant end and request attendant to depress TM switch on data set; then go into data mode at both ends.	On DTS, DSR indicator lights.
5	Enter 0.	Display reads (briefly)— PARITY=0 (0=EVEN, 1=ODD) Display then reads— TRMT=? (1=MAN 2=CONT)
6	Enter 2. ***Note:*** Ignore display, PRESS A TO START.	Display reads briefly— TRMT=2 (1=MAN 2=CONT) Display then reads— PRESS A TO START
7	Press GO.	Display reads (briefly)— TEST INTERRUPTED Display then reads— MODE=? (1=RCV 2=RCV & TRMT)
8	Enter 2.	Display reads (briefly)— MODE=2 (1=RCV 2=RCV & TRMT) Display then reads— HITS OVER ??% (MAX=49%)
9	Enter 15.	Display reads (briefly)— HITS OVER 15% (MAX=49%) Display then reads— ???? SECONDS

STEP	ACTION	VERIFICATION
10	Enter 0060 and after about 2 seconds, press C. ***Note:*** To perform functions listed below, press associated key. **KEY — FUNCTION** A Repeat test. B Display time remaining in test. C Clear display. D End test.	Display reads (briefly)— 0060 SECONDS Display then reads— PEAK=00% HITS=00/15 AVG BIAS=00% At end of test, display reads TEST COMPLETE and test results. ***Requirements:*** 1. Less than 15% peak distortion. 2. Less than 01/15 hits. 3. Less than 07% average bias distortion.
11	Place a call to distant end and request attendant to release TM switch on data set.	

E. End-to-End Bit Error Test

4.09 This test checks the transmitter and receiver of a local and a distant data set and the facilities connecting the data sets. The customer interface at both data sets is also checked. Identical test data is generated by DTSs at both data sets. This data is transmitted by one of the data sets and compared to the data generated by the DTS at the receiving data set. Data errors are indicated by the DTS display.

4.10 Perform the test as follows:

STEP	ACTION	VERIFICATION
1	Establish voice communication between the data stations and arrange to conduct an end-to-end bit error test.	
At both stations, perform Steps 2 through 9.		
2	Ensure that initial test setup described in paragraph 4.04 has been performed.	Display reads— TEST SEQ:
3	On DTS, enter 55.	Display reads— TEST SEQ: 55
4	Press GO.	Display reads— TRANSMITTER=? 1=921 2=914 3=903
5	Enter 1, 2, or 3 to correspond to the type of DTS being used at distant end.	Typical display reads (briefly)— TRANSMITTER=1 1=921 2=914 3=903 Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
6	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST

STEP	ACTION	VERIFICATION
	Note: If distant end DTS is a 903, enter 6 instead of 5. Display reads (briefly)—63 BIT ERROR TEST.	Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
7	Enter 1.	Display reads— ???? SECONDS
8	Place data set in data mode.	On DTS, DSR indicator lights.
9	Enter 0900. ***Note:*** To perform functions listed below, press associated key. **KEY — FUNCTION** A Repeat test. B Display time remaining in test. C Clear display. D End test. E Inject 8 errors into data stream. F Force out-of-sync condition.	Display reads (briefly)— 0900 SECONDS Display then reads— 0000 BITS IN ERROR From this point, display counts number of bits in error. If sync is lost during test, display flashes OSYN. If this occurs, test must be repeated by pressing A. At end of test, display reads TEST COMPLETE, total sync losses, and total bits in error. ***Requirement:*** Total bits in error are less than 6.

F. End-to-End Start-Stop Distortion Test

4.11 This test uses the 921A DTS to measure three types of start-stop distortion, as follows:

- Peak distortion
- Number of "hits" above a specified threshold
- Average bias distortion.

4.12 Perform the test as follows:

Note: A 911-type DTS can be used at the distant data station.

STEP	ACTION	VERIFICATION
1	Establish voice communication between the data stations and arrange to conduct an end-to-end start-stop distortion test.	
	At both stations, perform Steps 2 through 11.	
2	Ensure that initial test setup described in paragraph 4.04 has been performed.	Display reads— TEST SEQ:

STEP	ACTION	VERIFICATION
3	Enter 52 79.	Display reads— TEST SEQ: 52 79
4	Press GO.	Display reads— PARITY=? (0=EVEN, 1=ODD)
5	Enter 0.	Display reads (briefly)— PARITY=0 (0=EVEN, 1=ODD) Display then reads— TRMT=? (1=MAN 2=CONT)
6	Enter 2. ***Note:*** Ignore display, PRESS A TO START.	Display reads (briefly)— TRMT=2 (1=MAN 2=CONT) Display then reads— PRESS A TO START
7	Press GO.	Display reads (briefly)— TEST INTERRUPTED Display then reads— MODE=? (1=RCV 2=RCV & TRMT)
8	Enter 2.	Display reads (briefly)— MODE=2 (1=RCV 2=RCV & TRMT) Display then reads— HITS OVER ??% (MAX=49%)
9	Enter 08.	Display reads (briefly)— HITS OVER 08% (MAX=49%) Display then reads— ???? SECONDS
10	Place data set in data mode.	On DTS, DSR indicator lights.
11	Enter 0060 and after about 2 seconds, press C. ***Note:*** To perform functions listed below, press associated key. **KEY** **FUNCTION** A Repeat test. B Display time remaining in test. C Clear display. D End test.	Display reads (briefly)— 0060 SECONDS Display then reads— PEAK=00% HITS=00/08 AVG BIAS=00% At end of test, display reads TEST COMPLETE and test results. ***Requirements:*** 1. Less than 09% peak distortion. 2. Less than 01/08 hits. 3. Less than 03% average bias distortion.

5. REFERENCES

5.01 Additional information concerning the testing of DS 113AR is contained in the following publications:

SECTION	TITLE
107-402-100	921A Data Test Set—Description and Operation
314-205-501	Data Systems—DATAPHONE® Service and Data Access Arrangements Direct Distance Dialing Network—Test Requirements for Subscriber, Foreign Exchange, and Remote Exchange Lines
591-047-100	Data Set 113AR-L1B—Description and Operation
591-047-200	Data Set 113AR-L1B—Installation and Connections
591-047-500	Data Set 113AR-L1B—Test Procedure
668-010-300	Data Systems—DATAPHONE® Service on Direct Distance Dialing Network—Data Test Center—Trouble Analysis Procedures