

**DATA SET 208A-TYPE
TRANSMITTER-RECEIVER
TEST PROCEDURES USING 921A DATA TEST SET**

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B. Digital Loopback Self Test (DS 208A-L1A or -L1B)	7	1. GENERAL	
C. End-to-End Self Test (DS 208A-L1A or -L1B)	8	1.01 This section contains test procedures using the 921A data test set (DTS) and the self-test capabilities of data set (DS) 208A-type. Test procedures using the 914-type DTS and self-test capabilities of DS 208A-type are contained in Section 592-027-500. These procedures are to be used when testing DS 208A-type on an initial installation or during a maintenance visit.	
D. Remote Test	8	1.02 This section is reissued to add coverage for Version 2 of the 921A DTS. Since this reissue is a general revision, arrows normally used to indicate changes have been omitted.	
E. Initial Test Setup for 921A DTS	8	1.03 When DS 208A-type is used as an extension of a DS 209A-L1 multiplex system, refer to Section 592-032-300 for maintenance information. Procedures used at the serving test center (STC) to maintain this system are contained in Section 666-511-504.	
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NOTICE

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1.04 When DS 208A-type is used as a subrate off-net extension of the DDS, refer to Section 314-919-300 for maintenance information. Procedures used at the hub office STC to maintain the analog portion of this system are contained in Section 666-511-501.

A. Test Capabilities

1.05 Test circuitry built into DS 208A-L1A and -L1B permits the following self tests to be performed: lamp, analog loopback, digital loopback, and end-to-end. Additional tests require the use of external test equipment such as the 921A DTS. DS 208A-L1 has analog loopback and digital loopback test capabilities, but does not have the self-test capabilities provided by DS 208A-L1A and -L1B.

1.06 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 for the testing of serial data sets. The 921A DTS also provides additional testing capabilities that are described in Section 107-402-100. Input to the 921A DTS is made through a 20-button keyboard. A 32-character display provides operator prompting and test results.

B. Self Tests

Lamp Test

1.07 The lamp test (LP) nonlocking switch, when depressed, lights the MR, RS, CS, CO, and ER indicator lamps to verify proper operation of these lamps. The LP switch can be depressed at any time, since it does not affect normal data set operation.

Note: During the compromise equalizer test, the data set is optioned such that the LP switch, when depressed, shorts the transmitted signal. The lamps listed above will light. If the compromise equalizer test option is inadvertently installed during normal operation, the MR lamp will not be lighted and the CC (data set ready) lead at the customer interface will be off.

Analog Loopback Self Test (DS 208A-L1A or -L1B)

1.08 This test is initiated by depressing the analog loopback (AL) and self-test (ST)

locking switches. Depressing the AL switch connects the data set transmitter to the data set receiver through an internal pad. Depressing the ST switch turns **on** the internal request-to-send (CA) lead, transmits steady marks on the internal send data (BA) lead, and conditions the ER lamp to indicate received errors.

Digital Loopback Self Test (DS 208A-L1A or -L1B)

1.09 This test is performed from the local data set to a distant data set. The distant data set must be in the digital loopback (DL) mode. The local data set is placed in the self-test mode by depressing the ST locking switch. This turns on the local transmitter and applies steady marks to the internal send data (BA) lead. The steady marks are transmitted to the distant receiver, where the recovered data is looped back internally to the distant transmitter. The distant transmitter now transmits this data back to the local receiver, where the ER lamp indicates any errors made in transmission.

End-to-End Self Test (DS 208A-L1A or -L1B)

1.10 This test is initiated by depressing the ST locking switches on both data sets. This action conditions the respective transmitters to transmit steady marks. At both receivers, the ER lamps indicate any errors made in transmission.

C. Restrictions on Use of Self Tests

1.11 If DS 208A-L1A or -L1B is used as a remote extension of a DS 209A-L1 multiplex system or as a subrate off-net extension of the digital data system (DDS), the following restrictions apply to the use of the self tests:

(a) The analog loopback self test cannot be performed at a remote extension with options as installed. If the internal timing option is temporarily installed or the M23B cord is temporarily removed at the remote extension, this test can be performed.

(b) The digital loopback self test cannot be performed from a remote extension (with options as installed) in toward DS 208A-type collocated with DS 209A-L1. If the internal timing option is temporarily installed or the M23B cord is temporarily removed at the remote extension, this test can be performed.

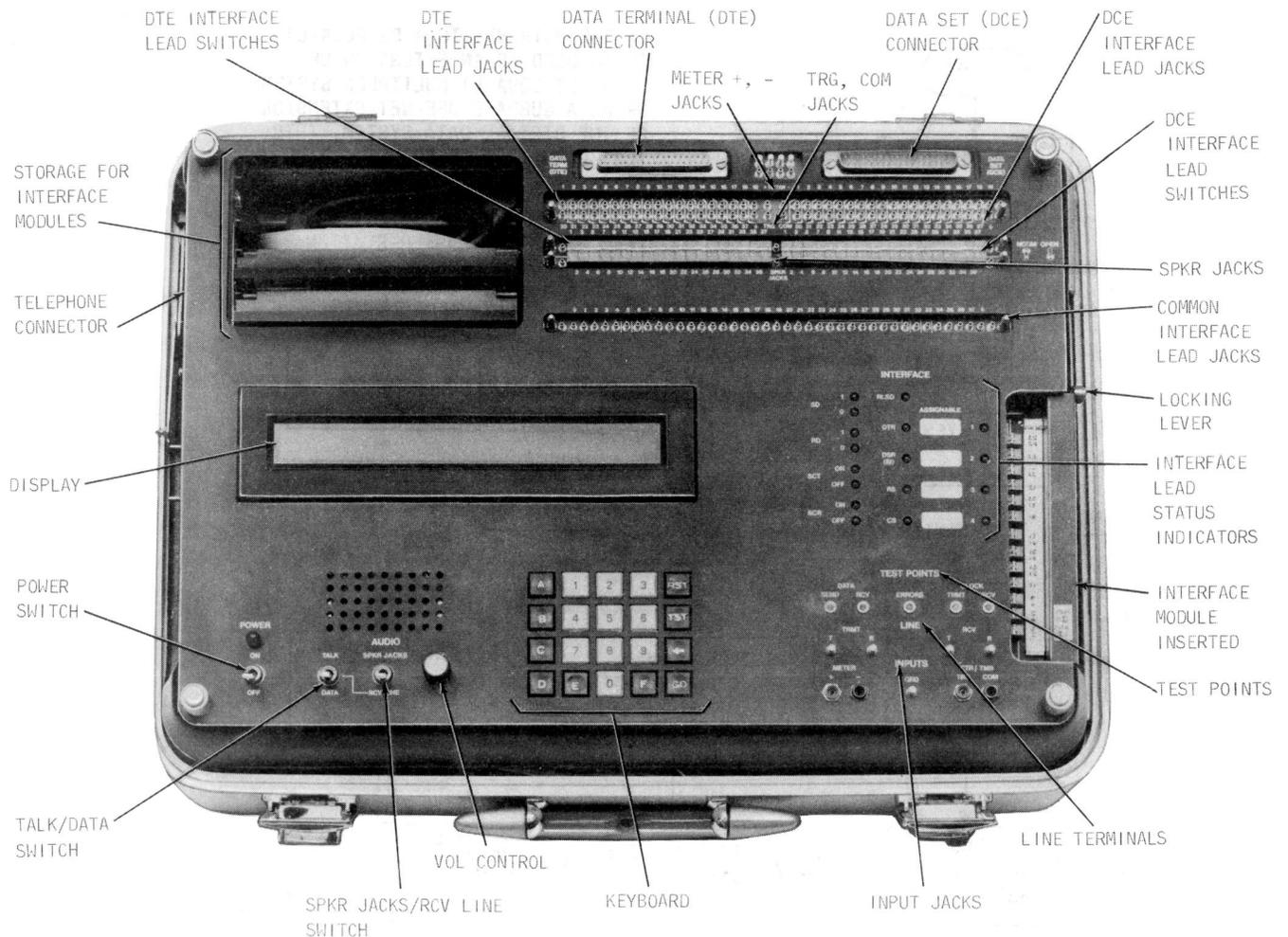


Fig. 1—921A Data Test Set—Front Panel

(c) The digital loopback self test cannot be performed from a remote extension (with options as installed) in toward a hub office of the DDS. If the internal timing option is temporarily installed or the M23B cord is temporarily removed at the remote extension, this test can be performed.

2. INSTALLATION TESTS

2.01 This part provides the sequence in which tests are to be performed following installation of the data set. This test sequence (Fig. 2) provides a method of verifying that the installation is satisfactory. Before proceeding with the tests, verify that the private line meets the requirements specified in Section 314-410-500.

2.02 If the system being installed is a multipoint system, it is recommended that the data set associated with the master station be installed first. Set the compromise equalizer option for symmetric compromise equalization, (S2B up; S2C up) and test the data set from a test center. As each of the remote data sets are installed, perform the compromise equalizer test and install the optimum setting. Perform a digital loopback start-up test from each remote data set to the master data set to verify that the system will operate with the installed settings.

3. MAINTENANCE TESTS

3.01 This part provides the sequence in which tests are to be performed when clearing a

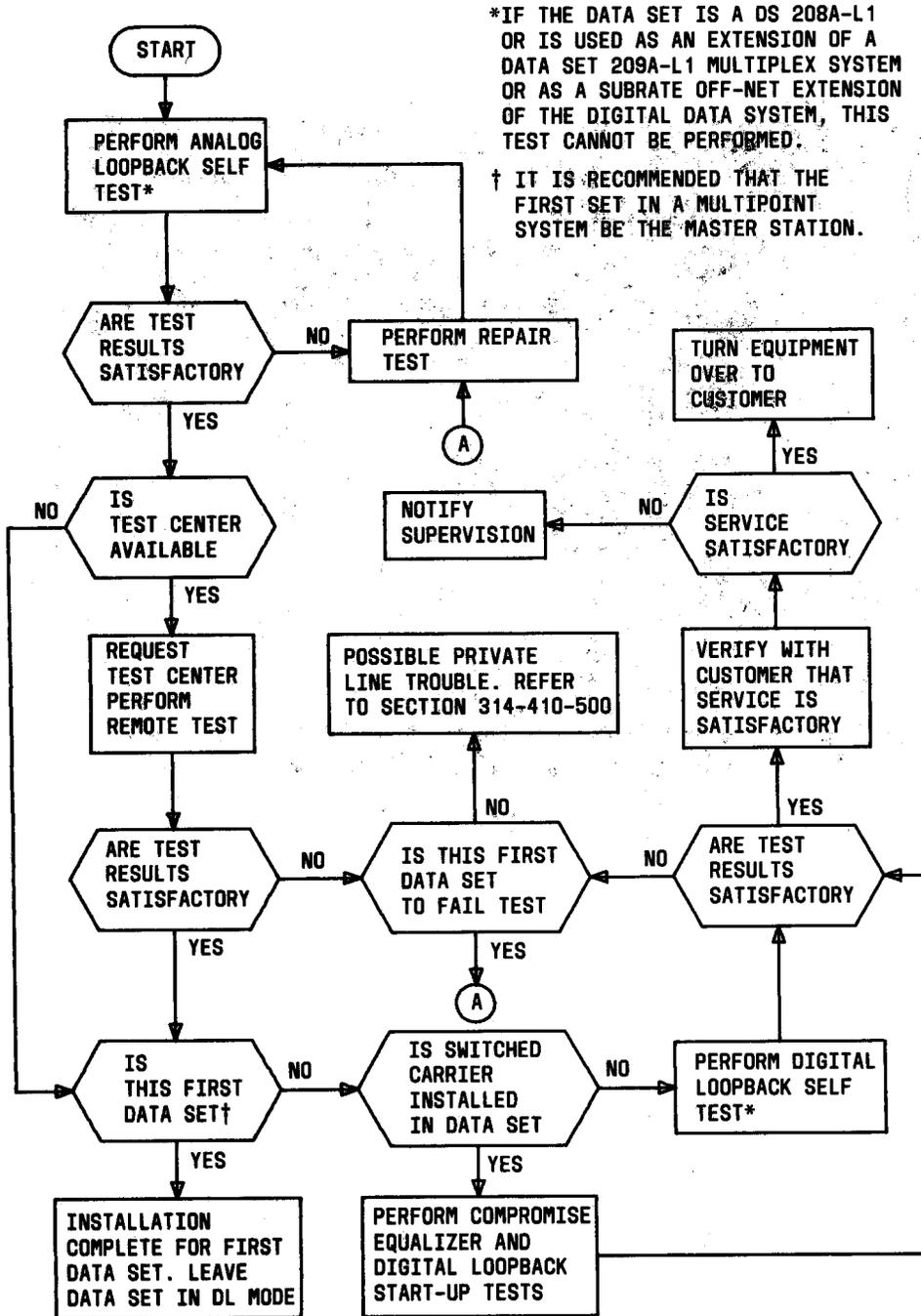


Fig. 2—Installation Test Sequence

trouble report and during a maintenance visit to the data station.

3.02 When a trouble report is received, a test center 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

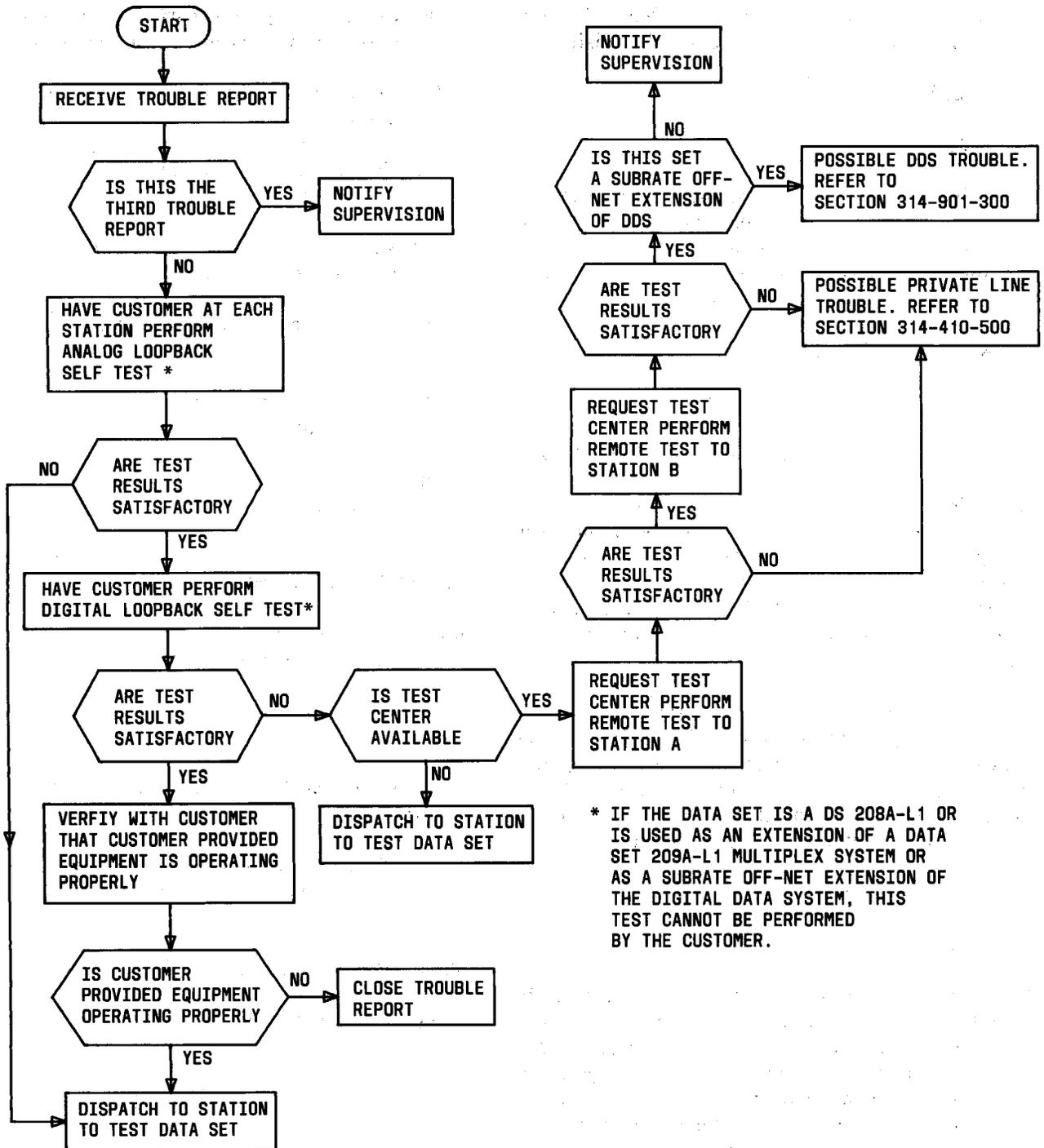


Fig. 3—Clearing Trouble Report

SECTION 592-027-501

extensive tests at the data station. The following equipment should be taken on a trouble visit:

- 921A DTS
- Maintenance Kit

3.04 The maintenance kits consist of replacement circuit packs for DS 208-type. Circuit packs in the maintenance kits not used in DS 208A-type are used to support DS 208B-type. The available maintenance kits are as follows.

- D-180497 for DS 208A-L1
- D-180657 for DS 208A-L1 or -L1A
- D-180718 for DS 208A-L1, -L1A, or -L1B

3.05 The sequence in which tests are to be performed by the telco employee at the data station is shown in Fig. 4. If the trouble is isolated to the data set, the repair test procedures in paragraphs 4.35 and 4.36 are to be performed to isolate the trouble to a circuit pack in the data set.

3.06 If a circuit pack is replaced, tag the defective circuit pack with a description of the trouble and carefully pack the circuit pack in the shipping carton supplied with the maintenance kit. Mark the carton with the data set code, circuit pack code, and date of manufacture. For example:

Data set 208A

HG11 IV 75

Send the properly packed and marked carton to the telco supplies operation group and notify that group in the normal manner that a replacement circuit pack is needed. The telco supplies operation group will place a requisition for a replacement circuit pack with the local Western Electric service center which will expedite the requisition to the Montgomery (ILL) merchandise organization to ensure its receipt within 24 hours. The Montgomery merchandise organization will ship the circuit pack (via fastest method) directly to the designated telco location within 24 hours after receiving the requisition.

3.07 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 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.

A. Analog Loopback Self Test (DS 208A-L1A or -L1B)

4.02 This test checks the data set transmitter and receiver. The customer interface is not checked.

4.03 Perform the test as follows.

- (1) Ensure that data set is not transmitting or receiving data.
- (2) Depress AL and ST switches on data set.

Requirements: ON, RS, CS, and CO lamps are lighted. MR and ER lamps are off.

- (3) Observe lamps on data set for at least 30 seconds.

Requirement: ER lamp is off continuously (does not blink).

- (4) Release ST and AL switches on data set.

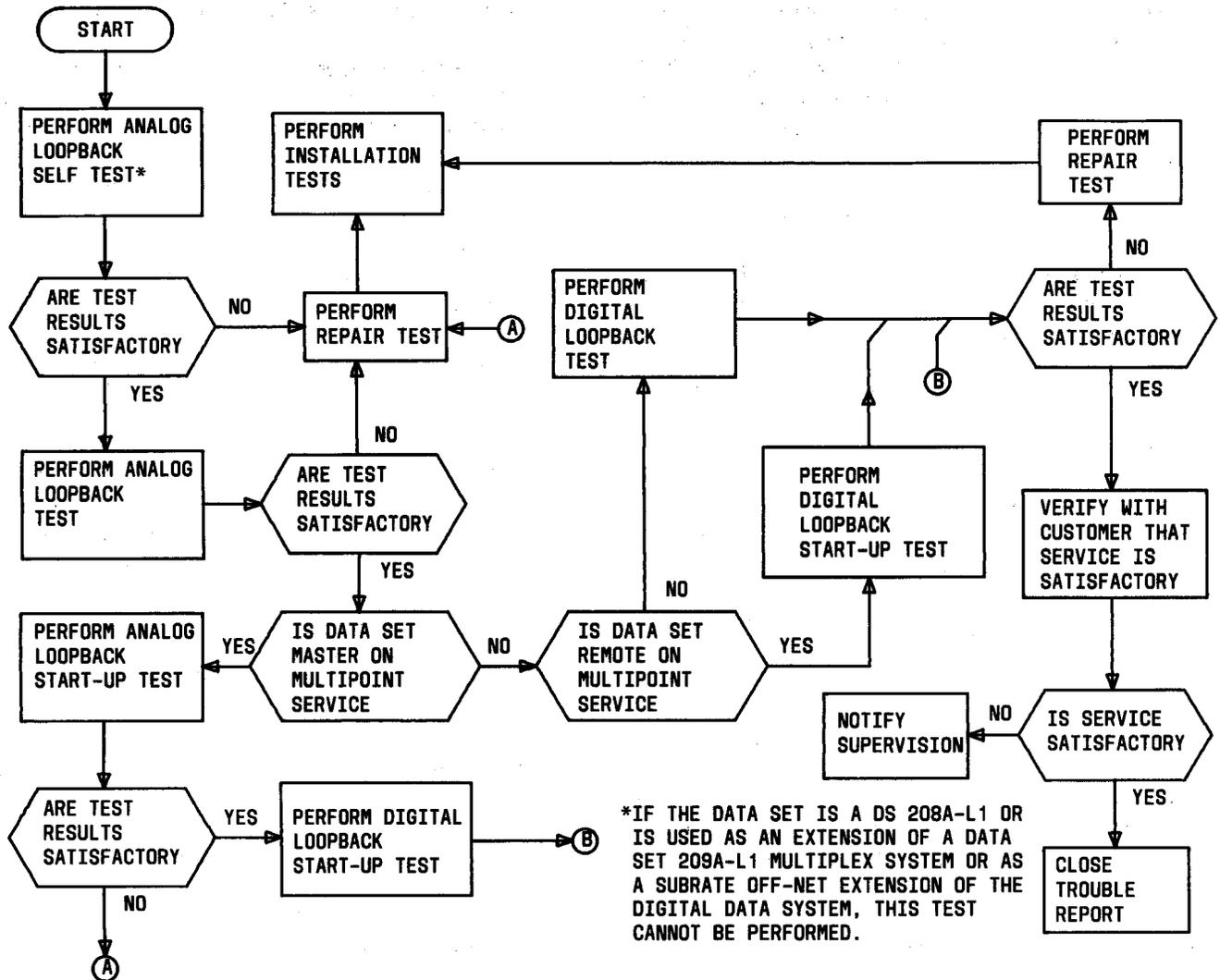


Fig. 4—Maintenance Test Sequence

B. Digital Loopback Self Test (DS 208A-L1A or -L1B)

4.04 This test checks the transmitter and receiver of both data sets and the facilities connecting the data sets. The customer interfaces are not checked.

4.05 Perform the test as follows.

- (1) Ensure that the following options are installed in local data set.
 - No compromise equalizer test (S1B up)
 - Switched request-to-send (S1C down)

- Switched carrier (S4B down)
 - Transmitter internally timed (S3A down)
 - DAS not used (S3C down)
 - New sync not used by customer (S4C down).
- (2) Ensure that distant data set is in DL mode.
 - (3) Apply power to local data set.

Requirements: On local data set, ON and MR lamps are lighted and RS and CS lamps are off. If distant data set is optioned for

continuous carrier (S4B up), CO lamp on local data set is lighted. If distant data set is optioned for switched request-to-send (S1C down) and switched carrier (S4B down) CO lamp on local data set is off and ER lamp is lighted.

- (4) Depress ST switch on local data set.

Requirements: On local data set, ON, RS, CS, and CO lamps are lighted. MR and ER lamps are off.

- (5) Observe ER lamp for ten 1-minute periods.

Requirement: ER lamp does not blink more than an average of three blinks per 1-minute period.

- (6) Release ST switch on local data set.
- (7) Have distant data set taken out of DL mode.
- (8) Restore local data set to pre-test condition.

C. End-to-End Self Test (DS 208A-L1A or -L1B)

4.06 This test checks the transmitter and receiver of both data sets and the facilities connecting the data sets. The customer interfaces are not checked.

4.07 Perform the test set as follows.

- (1) Establish voice communication between the data stations and arrange to conduct an end-to-end self test.
- (2) Ensure that neither data set is transmitting or receiving data.

- (3) On both data sets, depress ST switch.

Requirements: On both data sets, ON, RS, CS, and CO lamps are lighted. MR and ER lamps are off.

- (4) Observe ER lamp for ten 1-minute periods.

Requirement: ER lamp does not blink more than an average of three blinks per 1-minute period.

- (5) On both data sets, release ST switch.

D. Remote Test

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

4.09 Perform the test as follows.

- (1) Contact test center and request a remote test.
- (2) When directed by test center, place data set in DL mode.
- (3) Test center performs remote test.
- (4) When directed by test center, take data set out of DL mode.

E. Initial Test Setup for 921A DTS

4.10 Perform the initial test setup for the 921A DTS when used to test DS 208A-type as follows.

STEP	ACTION	VERIFICATION
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1	Connect data set to DTS using interface cable and EIA adapter cord provided with DTS.	
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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.

STEP	ACTION	VERIFICATION
2	Connect DTS to a 105- to 129-Vac 60-Hz power source.	
3	Apply power to data set.	ON lamp lights.
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 shelf tests. If DTS is defective, display reads— TEST FAILED If DTS is satisfactory, display reads— DATA SET:
6	Remove EIA RS-232-C 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 70 on keyboard. Note: To delete a wrong entry on keyboard during any test, press back arrow (←).	Display reads— DATA SET: 70
12	Press GO.	Display reads— BIT RATE:
13	Enter 48.	Display reads— BIT RATE: 48
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:

F. Analog Loopback Test

4.11 In this test, an analog loopback block error run is performed. The block error run checks the data set transmitter and receiver and the customer interface. Test data is generated by the 921A DTS and looped back internally from the

data set transmitter output to the receiver input. The received data is compared to the original data by the DTS. Data errors are indicated by the DTS display.

4.12 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	Place data set in AL mode.	
3	On DTS, enter 55.	Display reads— TEST SEQ: 55
4	Press GO.	Display reads (briefly)— SELECT ERROR TEST Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
5	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
6	Enter 2.	Display reads— ????? BITS IN A BLOCK
7	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS
8	Enter 0120. <i>Note:</i> To perform functions listed below, press associated key.	Display reads (briefly)— 0120 SECONDS Display then reads— BLK RCVD=0000 ERR=0000 From this point, display counts number of blocks received and number of blocks 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, total blocks received, and total blocks in error.
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.	

STEP	ACTION	VERIFICATION
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Requirement: No blocks in error.

9	Take data set out of AL mode.	
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G. Digital Loopback Test

4.13 This test checks the transmitter and receiver of both data sets and the facilities connecting the data sets. The customer interface at the distant data set is not checked. Test data is generated by the 921A 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 data by the DTS. Data errors are indicated by the DTS display.

4.14 Perform the test as follows.

STEP	ACTION	VERIFICATION
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1	Ensure that initial test setup described in paragraph 4.10 has been performed.	
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Display reads—
TEST SEQ:

2	Contact distant data station and have data set placed in DL mode.	
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3	On DTS, enter 55.	
---	-------------------	--

Display reads—
TEST SEQ: 55

4	Press GO.	
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Display reads (briefly)—
SELECT ERROR TEST
Display then reads—
D=DT 0=SP 1=MK 2=2047 5=511 6=63

5	Enter 5.	
---	----------	--

Display reads (briefly)—
511 BIT ERROR TEST
Display then reads—
1=BIT ERRORS 2=BLOCK ERRORS

6	Enter 2.	
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Display reads—
????? BITS IN A BLOCK

7	Enter 01024.	
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Display reads (briefly)—
01024 BITS IN A BLOCK
Display then reads—
????? SECONDS

STEP	ACTION	VERIFICATION														
8	Enter 0600.	Display reads (briefly)— 0600 SECONDS Display then reads— BLK RCVD=0000 ERR=0000 From this point, display counts number of blocks received and number of blocks 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, total blocks received, and total blocks in error.														
	<i>Note:</i> To perform functions listed below, press associated key.															
	<table border="0"> <thead> <tr> <th>KEY</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Repeat test.</td> </tr> <tr> <td>B</td> <td>Display time remaining in test.</td> </tr> <tr> <td>C</td> <td>Clear display.</td> </tr> <tr> <td>D</td> <td>End test.</td> </tr> <tr> <td>E</td> <td>Inject 8 errors into data stream.</td> </tr> <tr> <td>F</td> <td>Force out-of-sync condition.</td> </tr> </tbody> </table>	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.	<p>Requirement: Total blocks in error are less than 30.</p>
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.															
9	Contact distant data station and have data set taken out of DL mode.															

H. Start-Up Tests

4.15 The start-up tests check the ability of the data set to begin error-free transmission. In these tests, the 921A DTS (1) starts transmitting a 128-bit word, (2) stops transmitting the word, and (3) checks the word for errors. This sequence of operations is automatically repeated for the duration of the tests.

4.16 Three types of start-up tests can be performed.

- **Analog Loopback:** The local data set is placed in the analog loopback mode. The local data set must be equipped with switched carrier, switched request-to-send, and 1-second holdover disabled.
- **Digital Loopback:** The local data set is placed in the data mode and the distant data set is placed in the digital loopback mode. Both local and distant data sets must be equipped with switched carrier and switched request-to-send. If this test is a timed test, both local and distant data sets must also be equipped with 1-second holdover disabled.

For a multipoint circuit, to perform this test with the 921A DTS at the master station and the remote station in the digital loopback mode, the following conditions must be met.

- (a) Change the master station to switched carrier and switched request-to-send.
- (b) Perform the test manually with the 921A DTS, if the remote station is *not* changed to 1-second holdover disabled. Allow a 2-second interval between manual steps of the 921A DTS.
- (c) Perform the test timed or manually, if the remote station is changed to 1-second holdover disabled.

To perform this test with the 921A DTS at the remote station and the master station in the digital loopback mode, the preceding three conditions must be met. Therefore, normally this test can not be performed with the 921A DTS at the remote station unless a telco employee is dispatched to the master station to change the master station to switched carrier and switched request-to-send.

- **End-to-End:** Both local and distant data sets are placed in the data mode. Either the local or distant data set must be equipped with switched carrier, switched request-to-send, and 1-second holdover disabled.

Analog Loopback Start-Up Test

- 4.17 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	If continuous carrier (S4B up), continuous request-to-send (S1C up), and/or 1-second holdover (S4A down) are installed in data set, temporarily install switched carrier (S4B down), switched request-to-send (S1C down), and/or 1-second holdover disabled (S4A up).	
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Place data set in AL mode.	
4	On DTS, enter 67.	Display reads— TEST SEQ: 67
5	Press GO.	Display reads— 1=ONE WAY 2=IR SW 3=IR CONT
6	Enter 2.	Display reads— TRMT: 1=MAN 2=TIMED 3=SW CARR
7	Enter 2.	Display reads— PRESS A TO START
8	Press A. <i>Note 1:</i> When A is pressed, a count may appear on BLK RCVD, ERR, and/or * display. If this occurs, press C to clear displays. <i>Note 2:</i> To perform functions listed below, press associated key.	Display reads— BLK RCVD=0000 ERR=0000 * =0000 From this point, BLK RCVD display counts number of blocks received, ERR display counts number of received blocks in error, and * display counts number of times DTS transmitted a block but did not receive a block.
	KEY FUNCTION	
	A Restart test.	
	C Clear display.	
	D Stop test.	
9	At end of about 1 minute, press D.	Requirement: Zero count on ERR and * displays.

STEP	ACTION	VERIFICATION
10	Take data set out of AL mode.	
11	If switched carrier (S4B down), switched request-to-send (S1C down), and/or 1-second holdover disabled (S4A up) were temporarily installed in data set in Step 1, install continuous carrier (S4B up), continuous request-to-send (S1C up), and/or 1-second holdover (S4A down).	

Digital Loopback Start-Up Test

4.18 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	If continuous (S4B up) continuous request-to-send (S1C up), and/or 1-second holdover (S4A down) are installed in local or distant data set, temporarily install switched carrier (S4B down), switched request-to-send (S1C down), and/or 1-second holdover disabled (S4A up).	
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Contact distant data station and have data set placed in DL mode.	
4	On DTS, enter 70.	Display reads— TEST SEQ: 70
5	Press GO.	Display reads— 1=ONE WAY 2=IR SW 3=IR CONT
6	Enter 2.	Display reads (briefly)— ENTER HEX CHARS Display then fills with 32 “?”s.
7	Enter FF FF FF 16 16 01 31 32 33 02 53 54 41 52 54 03. Note: To delete last character entered, press back arrow (←).	Display reads (briefly)— FFFFFFF16160131323302535441525403 Display then reads— TRMT: 1=MAN 2=TIMED 3=SW CARR
8	Enter 2.	Display reads— PRESS A TO START

STEP	ACTION	VERIFICATION								
9	<p>Press A.</p> <p>Note 1: When A is pressed, a count may appear on BLK RCVD, ERR, and/or * display. If this occurs, press C to clear displays.</p> <p>Note 2: To perform functions listed below, press associated key.</p> <table border="1" data-bbox="300 535 568 703"> <thead> <tr> <th>KEY</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Restart test.</td> </tr> <tr> <td>C</td> <td>Clear display.</td> </tr> <tr> <td>D</td> <td>Stop test.</td> </tr> </tbody> </table>	KEY	FUNCTION	A	Restart test.	C	Clear display.	D	Stop test.	<p>Display reads— BLK RCVD=0000 ERR=0000 *=0000</p> <p>From this point, BLK RCVD display counts number of blocks received, ERR display counts number of received blocks in error, and * display counts number of times DTS transmitted a block but did not receive a block.</p>
KEY	FUNCTION									
A	Restart test.									
C	Clear display.									
D	Stop test.									
10	At end of about 1 minute, press D.	Requirements: Count of less than 2 on ERR display and zero count on * display.								
11	Contact distant data station and have data set taken out of DL mode.									
12	If switched carrier (S4B down) switched request-to-send (S1C down), and/or 1-second holdover disabled (S4A up) were temporarily installed in local or distant data set in Step 1, install continuous carrier (S4B up), continuous request-to-send (S1C), and/or 1-second holdover (S4A down).									

End-to-End Start-Up Test

operating control of the test. Perform the test as follows.

4.19 In this test, one end is arbitrarily selected as the controlling station. This station has

STEP	ACTION	VERIFICATION
1	<p>Establish voice communication between the data stations and arrange to conduct an end-to-end start-up test.</p> <p>Note 1: If continuous carrier (S4B up), continuous request-to-send (S1C up), and/or 1-second holdover (S4A down) are installed in data set at controlled station, temporarily install switched carrier (S4B down), switched request-to-send (S1C down), and/or 1-second holdover disabled (S4A up).</p> <p>Note 2: Procedure at controlled station must be performed first.</p>	

STEP	ACTION	VERIFICATION
At controlled station, perform Steps 2 through 7.		
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Enter 68.	Display reads— TEST SEQ: 68
4	Press GO.	Display reads— 1=ONE WAY 2=IR SW 3=IR CONT
5	If switched carrier (S4B down) is installed in data set at controlling station, enter 2. If continuous carrier (S4B up) is installed in data set at controlling station, enter 3.	Display reads— PRESS A TO START
6	Place data set in data mode.	On DTS, DSR indicator lights (data set ready lead <i>on</i>) Display continues to read— PRESS A TO START
7	Press A. <i>Note:</i> When A is pressed in Step 14, a count may appear on BLK RCVD, ERR, and/or * display. If this occurs, press C to clear displays.	Display reads— BLK RCVD=0000 ERR=0000 * =0000 After A is pressed at controlling station, BLK RCVD display counts number of blocks received, ERR display counts number of received blocks in error, and * display counts number of times DTS transmitted a block but did not receive a block. All displays stop counting when D is pressed at controlling station. Requirements: Count of less than 2 on ERR display and zero count on * display.
At controlling station, perform Steps 8 through 15.		
8	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
9	Enter 67.	Display reads— TEST SEQ: 67
10	Press GO.	Display reads— 1=ONE WAY 2=IR SW 3=IR CONT
11	If switched carrier (S4B down) is installed in data set at controlling station, enter 2. If continuous carrier (S4B up) is installed in data set at controlling station, enter 3.	Display reads— TRMT: 1=MAN 2=TIMED 3=SW CARR

STEP	ACTION	VERIFICATION
12	Enter 2.	Display reads— PRESS A TO START
13	Place data set in data mode.	On DTS, DSR indicator lights (data set ready lead <i>on</i>) Display continues to read— PRESS A TO START
14	Press A. <i>Note 1:</i> When A is pressed, a count may appear on BLK RCVD, ERR, and/or * display. If this occurs, press C to clear displays. <i>Note 2:</i> To perform functions listed below, press associated key.	Display reads— BLK RCVD=0000 ERR=0000 * =0000 From this point, BLK RCVD display counts number of blocks received, ERR display counts number of received blocks in error, and * display counts number of times DTS transmitted a block but did not receive a block.
	KEY FUNCTION	
	A Restart test.	
	C Clear display.	
	D Stop test.	
15	At end of about 1 minute, press D. <i>Note:</i> If switched carrier (S4B down), switched request-to-send (S1C down), and/or 1-second holdover disabled (S4A up) were temporarily installed in data set at controlled station, install continuous carrier (S4B up), continuous request-to-send (S1C up), and/or 1-second holdover (S4A down).	Requirements: Count of less than 2 on ERR display and zero count on * display.

I. Power Supply Test

4.21 Perform the test as follows.

4.20 This test measures the +12, +5, and -12 volt supply voltages at the customer interface.

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	Enter 12.	Display reads— TEST SEQ: 12

STEP	ACTION	VERIFICATION
3	Connect jumper wire from DCE interface lead jack 7 to - METER jack.	
4	Connect jumper wire from DCE interface lead jack 9 to + METER jack.	
5	Press GO.	Display reads voltage present on jack 9. Requirement: +11.0 to +13.0 volts.
6	Move jumper wire from jack 9 to jack 10.	Display reads voltage present on jack 10. Requirement: -11.0 to -13.0 volts.
7	Move jumper wire from jack 10 to jack 25.	Display reads voltage present on jack 25. Requirement: +4.5 to +5.5 volts.
8	Remove jumper wires from DCE interface lead and METER jacks.	

J. CA-CB (RS-CS) Interval Test

4.22 This test measures the interval between the time the request-to-send (CA) lead is turned **on** and the clear-to-send (CB) lead turns

on. If the data set is equipped with continuous carrier (S4B up) and continuous request-to-send (S1C up), this test cannot be performed.

4.23 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	Place data set in AL mode.	
3	On DTS, enter 30.	Display reads— TEST SEQ: 30
4	Press GO. Note: To repeat test, press A.	Display reads RS-CS (CA-CB) interval in milliseconds. Requirement: 7.0 to 8.7 ms if continuous carrier (S4B up) and switched request-to-send (S1C down) are installed in data set; 45 to 52 ms if switched carrier (S4B down) and switched request-to-send (S1C down) are installed in data set.
5	Take data set out of AL mode.	

K. Transmitter Output Test

4.25 Perform the test as follows.

4.24 This test measures the output level of the transmitted signal.

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	Connect data set to DTS using telephone interface cable and adapter cord provided with DTS. <i>Note:</i> The telephone interface cable is equipped with two 9-pin connectors. The 6-inch adapter cord is equipped with a 9-pin connector and a double-faced, 25-pin connector. Connect interface cable from 9-pin telephone connector on left side of DTS to 9-pin connector on adapter cord. Insert double-faced, 25-pin connector on adapter cord between telephone line connector on data set and telephone line cord.	
3	On front of DTS: (a) Connect meter leads from LINE—TRMT terminals T and R to INPUTS—METER jacks + and -. (b) Set TALK/DATA switch to DATA. (c) Set SPKR JACKS/RCV LINE switch to RCV LINE.	
4	Enter 36.	Display reads— TEST SEQ: 36 RS=? (0 OR 1)
5	Enter 1.	Display reads— TEST SEQ: 36 RS=1 (0 OR 1)
6	Enter 11.	Display reads— :11 R=? 1=135 6=600 9=900 0=N
7	Enter 6.	Display reads (briefly)— :11 R=6 1=135 6=600 9=900 0=N Display then reads— :
8	Press GO.	Display reads (briefly)— TEST COMPLETE Display then reads transmitter output level in mV ac and dBm.

STEP	ACTION	VERIFICATION
		Requirement: -1.5 to +1.0 dBm.
9	Disconnect meter leads, telephone interface cable, and adapter cord.	

L. Transmitter Clock Test**4.27** Perform the test as follows.

4.26 This test measures the frequency of the transmitter clock signal, DB (SCT), on the transmitter signal element timing lead.

STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	Enter 47 48 17 47.	Display reads— TEST SEQ: 47 48 17 47
3	Press GO.	Display reads (briefly)— TEST COMPLETE Display then reads— SW CONN: X=?? Y=??
4	Enter 04 03.	Display reads (briefly)— SW CONN: X=04 Y=03 Display then reads— SW CONN X=?? Y=??
5	Press GO.	Display reads (briefly)— TEST INTERRUPTED For Version 2 and higher DTS: Display then reads (briefly)— CROSS CONNECTIONS MANUALLY SET Display then reads transmitter clock frequency in hertz. Requirement: 4799 to 4801 Hz.
6	Press GO.	Display reads (briefly)— TEST INTERRUPTED For Version 2 and higher DTS: Display then reads (briefly)— CROSS CONNECTIONS MANUALLY SET Display then reads (briefly)— TEST COMPLETE

STEP	ACTION	VERIFICATION
		Display then reads— TEST SEQ:
M. CA-CF (RS-COD) Interval Test		4.29 Perform the test as follows.
4.28	This test measures the interval between CA (request-to-send) and CF (carrier on).	
STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	If continuous carrier (S4B up) and/or continuous request-to-send (S1C up) are installed in data set, temporarily install switched carrier (S4B down) and/or switched request-to-send (S1C down).	
3	Place data set in AL mode.	
4	On DTS, enter 31.	Display reads— TEST SEQ: 31
5	Press GO. <i>Note:</i> To repeat test, press A.	Display reads RS-RLSD (CA-CF) interval in milliseconds. Requirement: 47 to 55 ms.
6	Take data set out of AL mode.	
7	If switched carrier (S4B down) and/or switched request-to-send (S1C down) were temporarily installed in data set in Step 2, install continuous carrier (S4B up) and/or continuous request-to-send (S1C up).	

N. Compromise Equalizer Test

4.30 This test determines the correct setting of the compromise equalizer option and is required only if the data set under test is optioned for switched carrier (S4B down). This test is not required if the data set is optioned for continuous carrier (S4B up). In that case, set the compromise equalizer option for symmetric compromise equalization (S2B up; S2C up).

4.31 This test consists of a series of digital loopback tests from the remote data set to

the master data set on a multipoint network. Each series of digital loopback tests is performed with a different setting on the compromise equalizer. The setting with the fewest block errors is then selected. After this test is completed, perform a digital loopback start-up test to verify that the data set meets start-up requirements with the setting selected.

4.32 Perform the test as follows.

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STEP	ACTION	VERIFICATION
1	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
2	Ensure that the following options are installed in distant (master) data set: Symmetric compromise equalization (S2B up; S2C up) Retrain automatically (S3B up) 1-second holdover disabled (S4A up) Continuous carrier (S4B up).	
3	Ensure that distant data set is in DL mode.	
4	Ensure that the following options are installed in data set under test: Switched request-to-send (S1C down) Symmetric compromise equalization (S2B up; S2C up) Transmitter internally timed (S3A down) Retrain automatically (S3B up) 1-second holdover disabled (S4A up) Switched carrier (S4B down) New sync not used by customer (S4C down). If data set under test is a DS 208A-L1A or -L1B, install compromise equalizer test enabled option (S1B down).	
5	On DTS, enter 55.	Display reads — TEST SEQ: 55
6	Press GO.	Display reads (briefly)— SELECT ERROR TEST Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
7	Enter 1.	Display reads (briefly)— MARKING BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
8	Enter 2.	Display reads — ????? BITS IN A BLOCK
9	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS
10	Enter 9999.	Display reads (briefly)— 9999 SEC IS AN UNTIMED TEST

STEP	ACTION	VERIFICATION
		Display then reads— BLK RCVD=0000 ERR=0000
11	If testing DS 208A-L1, remove and then reinsert CP HG5. <i>Note:</i> CP HG5 must be withdrawn from connector before being reinserted.	When CP HG5 is reinserted, ERR counter starts counting. When ERR counter stops, test can be repeated.
12	If testing DS 208A-L1A or -L1B, momentarily depress and release nonlocking LP switch on data set.	When LP switch is released, ERR counter starts counting. When ERR counter stops, test can be repeated.
13	Repeat Step 11 or 12 for a total of six times and record cumulative reading from counter. Record position of option switches S2A, S2B, and S2C.	
14	Install compromise equalizer option ZT (S2C down).	
15	On DTS, reset counter by pressing C.	Display reads — BLK RCVD=0000 ERR=0000
16	Repeat Step 11 or 12 for a total of six times and record cumulative reading from counter. Record position of option switches S2A, S2B, and S2C.	
17	Install compromise equalizer option ZU (S2A up, S2B down, S2C up).	
18	On DTS, reset counter by pressing C.	Display reads— BLK RCVD=0000 ERR=0000
19	Repeat Step 11 or 12 for a total of six times and record cumulative reading from counter. Record position of option switches S2A, S2B, and S2C.	
20	Install compromise equalizer option ZV (S2A down, S2B down, S2C up).	
21	On DTS, reset counter by pressing C.	Display reads— BLK RCVD=0000 ERR=0000
22	Repeat Step 11 or 12 for a total of six times and record cumulative reading from counter. Record position of option switches S2A, S2B, and S2C.	

STEP	ACTION	VERIFICATION
23	Compare results of test for each equalizer setting. The compromise equalizer option that gives minimum reading on counter is optimum setting. Install that option in data set.	
24	If data set under test is a DS 208A-L1A or -L1B, install no compromise equalizer test option (S1B up).	
25	Disconnect test equipment and restore both data sets to pre-test condition. Have distant data set taken out of DL mode.	

O. End-to-End Block Error Test

4.33 This test checks the transmitter and receiver of both data sets and the facilities connecting the data sets. The customer interfaces are also checked. Identical test data is generated by 921A

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.

4.34 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	Establish voice communication between the data stations and arrange to conduct an end-to-end block error test. <i>Note:</i> If distant station is not equipped with a 921A DTS, use a test set that provides at least one of the test patterns provided by the 921A DTS and use the same word length at both stations.	
<i>At both stations, perform Steps 2 through 8.</i>		
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Enter 55.	Display reads— TEST SEQ: 55
4	Press GO.	Display reads (briefly)— SELECT ERROR TEST Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
5	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS

STEP	ACTION	VERIFICATION
6	Enter 2.	Display reads— ????? BITS IN A BLOCK
7	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS
8	Enter 0600. <i>Note:</i> To perform functions listed below, press associated key.	Display reads (briefly)— 0600 SECONDS Display then reads— BLK RCVD=0000 ERR=0000 From this point, display counts number of blocks received and number of blocks 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, total blocks received, and total blocks in error.
	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.
		Requirement: Total blocks in error are less than 30.

P. Repair Test

4.35 This test provides a method for isolating a data set trouble to a single circuit pack (CP). Table A lists the individual tests in the sequence in which they are to be performed, and also lists the associated CPs that might be defective if the test fails.

4.36 If the data set fails a test listed in Table A, proceed as follows.

- (1) Refer to list of CPs associated with test that failed.

- (2) Replace first CP in list and repeat test.
- (3) If data set still fails test, restore original CP in data set.
- (4) Continue replacing, testing, and restoring CPs in sequence in which they are listed until data set passes test. The last CP replaced is cause of trouble.

Note: If CP HG9 or HG23 is replaced, install correct options before proceeding.

- (5) If all CPs have been replaced and cause of trouble has not been found, notify supervision.

TABLE A
REPAIR PROCEDURES

TEST	CP REPLACEMENT SEQUENCE		
	DS 208A-L1	DS 208A-L1A	DS 208A-L1B
CA-CB (RS-CS) Interval	HG5 HG6 HG9 HG1 or HG21 HG2 HG17	HG5 HG6 HG23 HG21 HG2 HG17	HG26 HG23 HG21 HG2
Transmitter Output	HG9 HG16 or HG16B HG8 HG1 or HG21 HG5 HG6 HG17 HG2	HG23 HG16B HG8 HG21 HG5 HG6 HG17 HG2	HG23 HG16B HG8 HG21 HG26 HG2
Transmitter Clock	HG1 or HG21 HG5	HG21 HG5	HG21 HG26
CA-CF (RS-COD) Interval	HG9 HG3 HG17 HG4 HG7 HG14 or HG14B HG8 HG2	HG23 HG3 HG17 HG4 HG7 HG14B HG8 HG2	HG23 HG3 HG26 HG4 HG7 HG14B HG8 HG2
Analog Loopback	HG12 (No. 1) HG12 (No. 2) HG1 or HG21 HG13 HG15 or HG15B HG11 HG16 or HG16B HG2 HG3 HG7 HG4 HG14 or HG14B HG8 HG17 HG5 HG6 HG9	HG12 (No. 1) HG12 (No. 2) HG21 HG13 HG15B HG11 HG16B HG2 HG3 HG7 HG4 HG14B HG8 HG17 HG5 HG6 HG23	HG12 (No. 1) HG12 (No. 2) HG21 HG13 HG15B HG11 HG16B HG2 HG3 HG7 HG4 HG14B HG8 HG26 HG23

5. REFERENCES

5.01 Additional information concerning the testing of DS 208A-type is contained in the following publications:

SECTION	TITLE
107-402-100	921A Data Test Set—Description and Operation
314-410-500	Voice Bandwidth Private Line Data Circuits—Tests and Requirements
314-901-300	Digital Data System—Serving Test Center—Two-Point Private Line Circuit—Maintenance Procedures
314-919-300	Digital Data System—Subrate Off-Net Extension Arrangement—Maintenance
592-027-100	Data Set 208A-Type—Transmitter-Receiver—Description and Operation

SECTION	TITLE
592-027-150	Data Set 208A-Type—Transmitter-Receiver—Supplementary Information
592-027-200	Data Set 208A-Type—Transmitter-Receiver—Installation and Connections
592-027-500	Data Set 208A-Type—Transmitter-Receiver—Test Procedures Using 914-Type Data Test Set
592-032-300	Data Set 209A-L1—Transmitter-Receiver—Maintenance
666-511-503	Test of Data Services Provided by Data Set 208A-Type From a Private Line Testroom
666-511-504	Test of Data Services Provided by Data Set 209A-L1 From a Private Line Testroom
5.02	Detailed information concerning DS 208A-Type is contained in CD- and SD-1D232-01.