DATA SET 209A-L1

TRANSMITTER-RECEIVER

TEST PROCEDURES USING 921A DATA TEST SET

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1. GENERAL

1.01 This section contains test procedures using the 921A data test set (DTS) and the self-test capabilities of data set (DS) 209A-L1. Test procedures using the 914-type DTS and the self-test capabilities of DS 209A-L1 are contained in Section 592-032-500. These procedures are to be used when testing DS 209A-L1 on an initial installation or during a maintenance visit. The procedures to be used when investigating a trouble report are contained in Section 592-032-300. Procedures for testing DS

209A-L1 in point-to-point, point-to-point multiplexing, and digital data system subrate off-net installations are provided in this section. Also included in this section are procedures for testing DS 209A-L1, 208A-type, and 201C-type when installed in a 9600 bits-per-second (bps) multiplexing system. These tests are required in addition to tests normally required for installation and maintenance of these data sets.

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.

1.03 DS 209A-L1 is a synchronous, binary, serial, 9600-bps data set for use on basic 3002-type, 4-wire private line (PL) telephone channels equipped with high-performance data conditioning (HPDC) type D1. C-type conditioning is not required. Refer to Section 314-410-105 for information concerning HPDC type D1. DS 209A-L1 contains a multiplexing capability that provides data channels in multiples of 2400 bps up to 9600 bps as follows.

- One 9600-bps channel
- One 7200-bps channel and one 2400-bps channel
- Two 4800-bps channels
- One 4800-bps channel and two 2400-bps channels
- Four 2400-bps channels.

These channels can interface with customer-provided equipment (CPE) or can be extended with DS 201C-type or DS 208A-type.

A. Test Capabilities

1.04 Test circuitry built into DS 209A-L1 permits the following self tests to be performed: analog loopback, digital loopback, and end-to-end. The test circuitry also facilitates the remote test of the data set from a test center. The analog loopback, digital loopback, and end-to-end tests can also be performed by use of external test equipment such as the 921A DTS.

1.05 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 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

1.06 The lamp test (LP) nonlocking switch, when depressed, lights the multiplex and data set status 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.

Analog Loopback Self Test

1.07 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 attenuation network. 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 receiver errors. Since steady marks were transmitted, any spaces detected by the error circuitry constitute errors. Each bit error lights the ER lamp for approximately 100 ms. This test does not check the customer or telephone interface circuits.

Digital Loopback Self Test

1.08 This test is performed from the local data set to a distant-end data set. The distant-end data set must be in the digital loopback 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-end receiver, where the recovered data is looped back internally to the distant-end transmitter. The distant-end transmitter now transmits this data back to the local receiver, where the ER lamp indicates any errors made in transmission. The customer interface circuits are not checked.

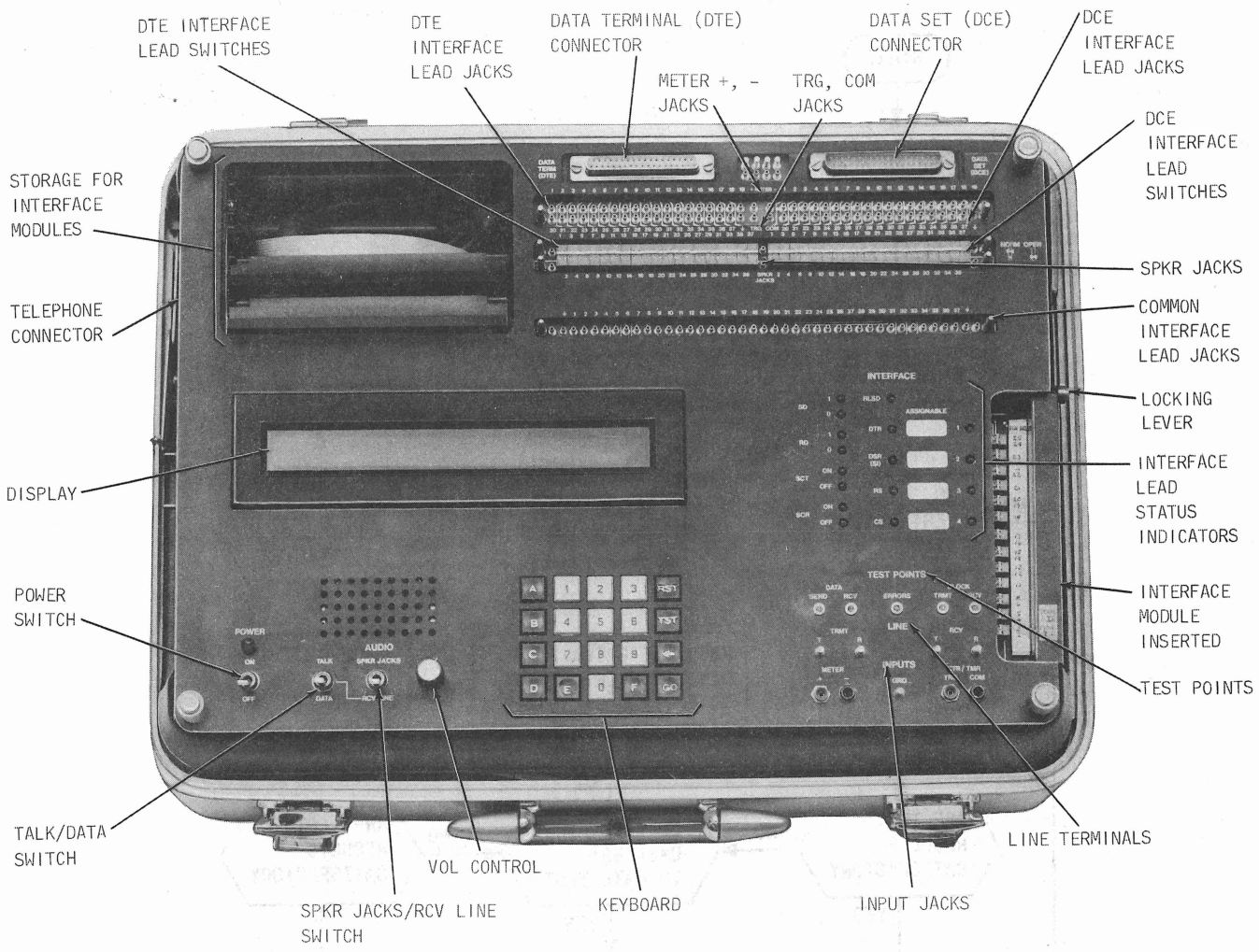


Fig. 1—921A Data Test Set—Front Panel

End-to-End Self Test

1.09 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. This test simultaneously checks the transmitter and receiver of both data sets and the two directions of transmission of the connecting facility. The customer interface circuits are not checked.

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 provides a method of verifying that the installation is satisfactory. Before proceeding with the tests, verify that the 4-wire private line meets the requirements specified in Section 314-410-500.

A. Point-to-Point, Point-to-Point Multiplexing, and Digital Data System Subrate Off-Net Installations

2.02 Refer to Fig. 2 for the sequence of tests to be performed and to Part 4 for the test procedures.

B. Many-Point Multiplexing Installations

2.03 When the entire multiplex system has been installed and all analog links have been tested individually, the system must be tested. A digital loopback (DL) test must be performed on each multiplex channel to its corresponding remote data

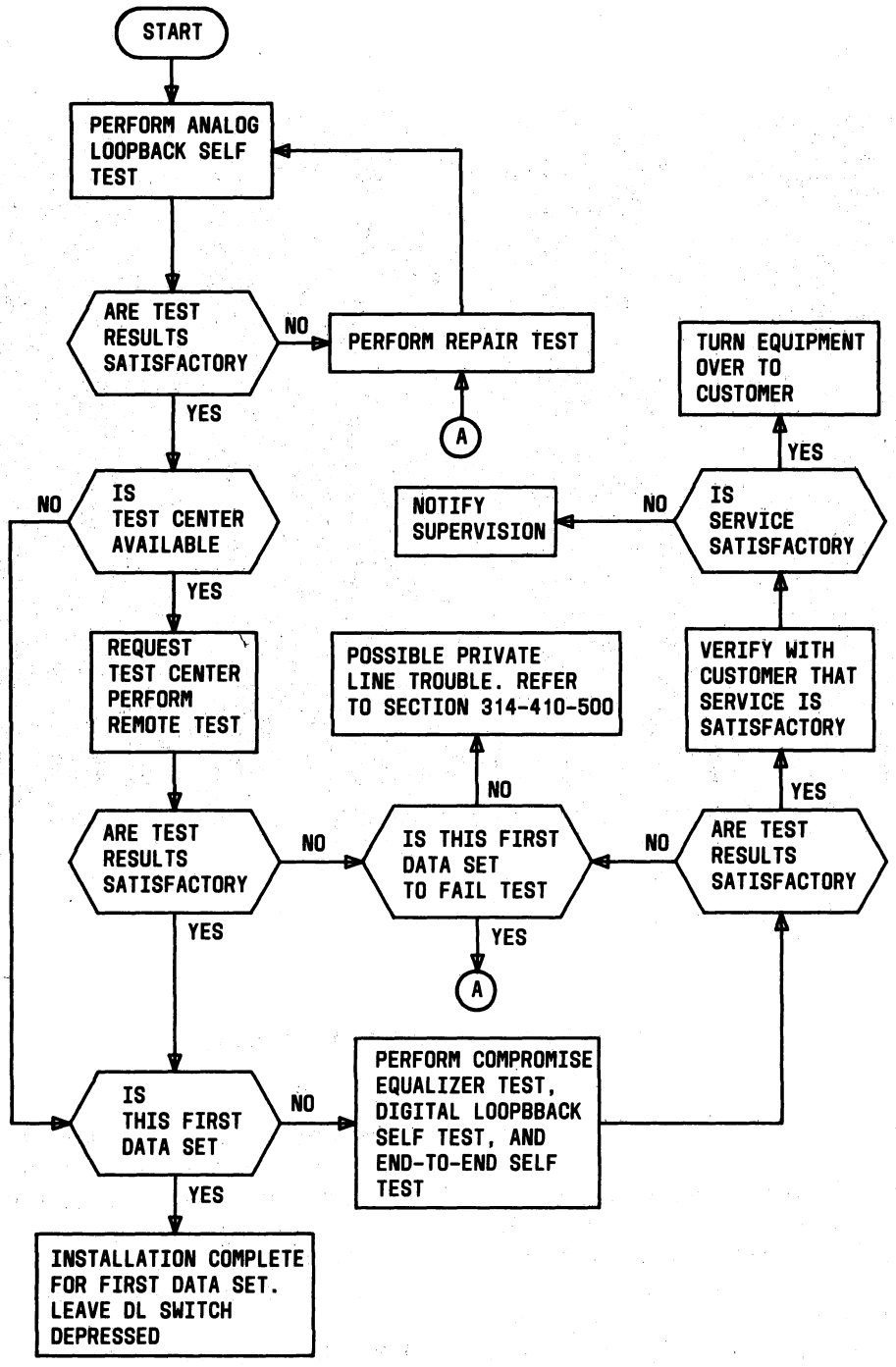


Fig. 2—Installation Test Sequence

set. For this test, the remote data set must be in the DL mode and all of the data sets between the remote extensions must not be in a test mode.

2.04 DL testing of the entire multiplex system can be performed from either end with one exception. ***A DL test (with external test equipment) from a slave DS 209A-L1 cannot be performed to a master DS 209A-L1 because the master DS 209A-L1 cannot be placed in the DL mode.***

Digital Loopback Testing From a DS 201C-Type Extension

2.05 If the extension data set (at the location originating the test) is a DS 201C-type, the self-test feature can be used to perform the digital loopback test to the distant-end data set. (The M23B cord must be connected while this test is being performed.)

2.06 Perform the test as follows.

(1) Contact distant-end data station and have DL switch on data set depressed.

(2) Depress ST switch on DS 201C-type.

Requirements: All lamps are lighted except MC.

(3) Observe MC lamp for five 1-minute periods.

Requirement: Maximum allowable blinks of MC lamp depend on system configuration. Refer to Fig. 3.

(4) If system does not meet requirement, refer to Section 592-032-300.

(5) Release ST switch on DS 201C-type.

(6) Contact distant-end data station and have DL switch on data set released.

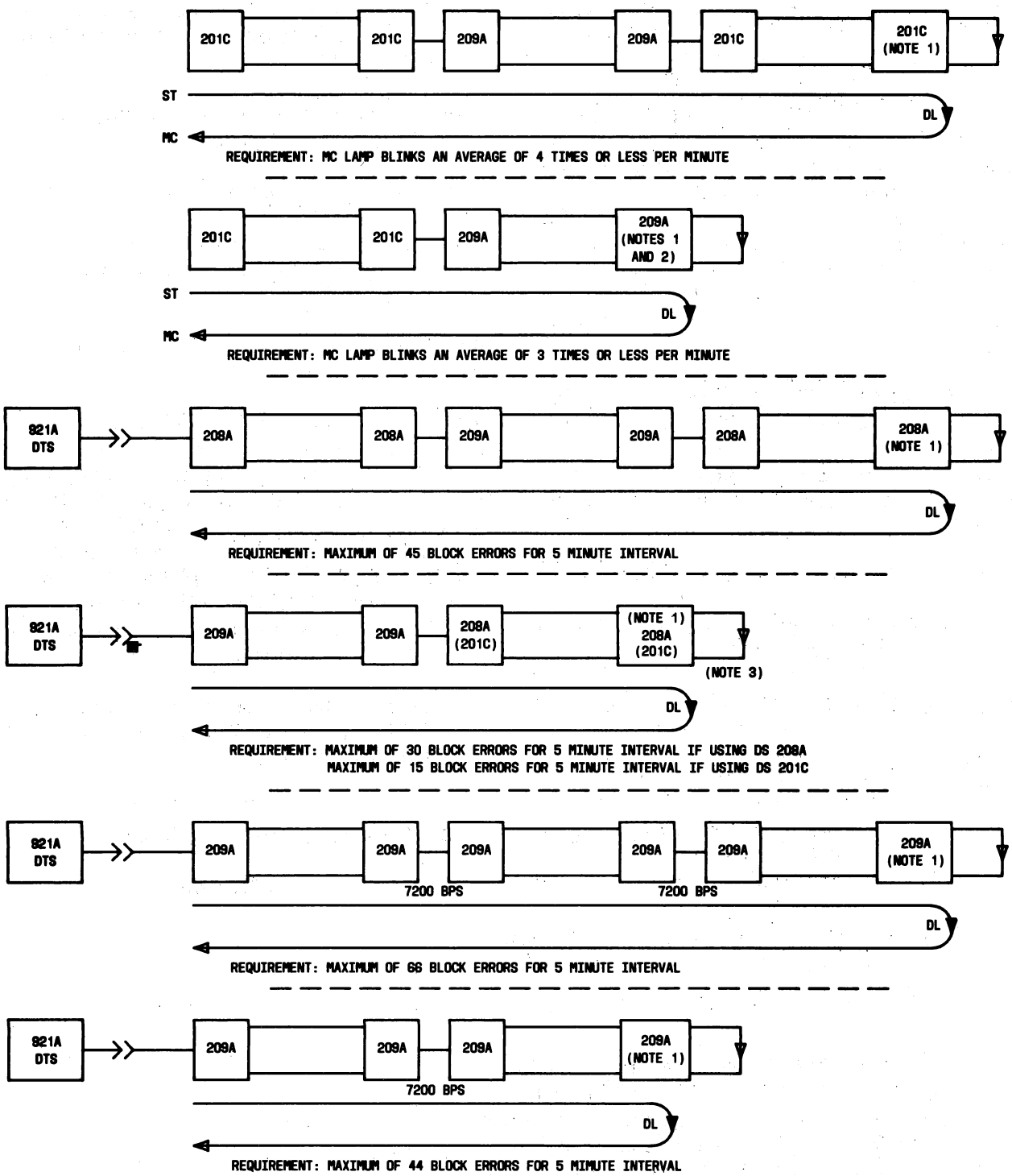
Digital Loopback Testing From a DS 208A-Type or DS 209A-L1 Extension

2.07 If an extension DS 208A-type is located at the station originating the test, the M23B cord must be connected while this test is performed. If testing from a DS 209A-L1, the 921A DTS must be located at the master DS 209A-L1. A DL test cannot be performed from a slave DS 209A-L1 to the master DS 209A-L1. If the slave in option (WI) is temporarily removed from the slave DS 209A-L1 and the slave out option (WJ) installed, a DL test can be performed.

Note: The self-test feature available on DS 208A-L1A or DS 209A-L1 must not be used for this DL test.

2.08 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	Connect data set to a 921A DTS, using interface cable and EIA adapter cord provided with DTS. ***Note 1:*** 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. ***Note 2:*** If testing from a DS 208A-type, an M23B cord must be connected between data set and adapter cord.	



NOTES:
1. DISTANT-END DATA SET
2. INVALID IF 209A IS OPTIONED FOR SLAVE OUT
3. 921A

Fig. 3—Loopback and Test Requirements

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 self tests. If DTS is defective, display reads— TEST FAILED If DTS is satisfactory, display reads— DATA SET:
6	Remove the 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	If testing from a DS 208A-type, enter 70 on keyboard. ***Note:*** To delete a wrong entry on keyboard during any test, press back arrow (←).	Display reads— DATA SET: 70
12	If testing from a DS 209A-type, enter 75.	Display reads— DATA SET: 75
13	Press GO.	Display reads— BIT RATE:
14	If testing from a DS 208A-type, enter 48.	Display reads— BIT RATE: 48
15	If testing from a DS 209A-L1, enter 72.	Display reads— BIT RATE: 72
16	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:

STEP	ACTION	VERIFICATION
17	Contact distant-end data station and have DL switch on data set depressed.	
18	On DTS, enter 55.	Display reads— TEST SEQ: 55
19	Press GO.	Display reads (briefly)— SELECT ERROR TEST Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
20	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
21	Enter 2.	Display reads— ????? BITS IN A BLOCK
22	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS
23	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— 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. ***Error Requirement:*** Maximum allowable block errors depend on system configuration. Refer to Fig. 3. ***Data Set Requirements:*** At local data set if testing DS 208A-L1A— ON, CO, MR, RS, and CS lamps are lighted; ER lamp is off.

STEP	ACTION	VERIFICATION
		At local data set if testing DS 208A-L1—ON, RS, CS, and CO lamps are lighted; ER, AL, and DL lamps are off. At local data set if testing DS 209A-L1—ON, RS, CS, CO, and MR lamps are lighted; ER and TM lamps are off.
24	If system does not meet requirements, refer to Section 592-032-300.	
25	Contact distant-end data station and have DL switch on data set released.	

C. One-to-Many Multiplexing Installations

2.09 When the entire multiplex system has been installed and all analog links have been tested individually, the system must be tested. A digital loopback (DL) test must be performed on each multiplex channel. When testing is originated from the master DS 209A-L1, the test must be performed from each connector of the DS 209A-L1 to each of the remote extension data sets. DL testing of the individual links comprising the multiplex system can be performed from either end with one exception. ***A DL test (with external test equipment) from a slave DS 209A-L1 cannot be performed to a master DS 209A-L1 because the master DS 209A-L1 cannot be placed in the DL mode.***

2.10 For this test, the remote extension data sets must be in the DL mode and all of the data sets between DS 209A-L1 and the remote extensions must not be in a test mode. In order to conduct the test through each interface connector in use, the local DS 209A-L1 (master) must have the multiplex selector switch positioned the same as the distant-end DS 209A-L1.

2.11 Perform the test as follows.

STEP	ACTION	VERIFICATION
1	Contact distant-end DS 209A-L1 station and determine position of multiplex selector switch. Ensure that data set is not in a test mode.	
2	Set multiplex selector switch on local DS 209A-L1 (master) to same position as distant-end DS 209A-L1.	
3	Connect local DS 209A-L1 to a 921A DTS, using interface cable and 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	

STEP	ACTION	VERIFICATION
	appropriate customer interface connector on data set. Refer to Table A.	
4	Connect DTS to a 105- to 129-Vac 60-Hz power source.	
5	Contact each remote extension data set location and have DL switch on data set depressed.	
6	Apply power to local DS 209A-L1.	ON lamp lights.
7	On front of DTS, set POWER switch to ON.	POWER lamp lights.
8	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:
9	Remove EIA RS-232-C interface module from storage and ensure that all 25 interface module switches are in TERM position.	
10	On right side of DTS, ensure that locking lever is in OPEN position.	
11	Insert interface module into slot.	

TABLE A

MULTIPLEX SELECTOR SWITCH POSITIONS AND ACTIVE INTERFACE CONNECTORS

MULTIPLEX SELECTOR SWITCH POSITION	MULTIPLEX STATUS LAMP		INTERFACE CONNECTOR			
	PL AND 9600-BPS DDD OPERATION	4800-BPS DDD BACKUP OPERATION	1	2	3	4
1	96	48	96*	—	—	—
2	72 & 24	24	72†	24	—	—
3	48	24	48†	48†	—	—
4	48 & 24	24	48†	24	24‡	—
5	24	24	24	24	24‡	24‡
6	None	None	—	—	—	—

* Operates at 4800 bps when DBU1 telephone interface lead is closed.
† Operates at 2400 bps when DBU1 telephone interface lead is closed.
‡ Not operational when DBU1 telephone interface lead is closed.

STEP	ACTION	VERIFICATION
12	Move locking lever to CLOSE position.	
13	On front of DTS, ensure that all 37 DCE interface lead switches are in NORM position.	
14	If remote extension data set is a DS 201C-type, enter 62 on keyboard. ***Note:*** To delete a wrong entry on keyboard during any test, press back arrow (←).	Display reads— DATA SET: 62
15	If remote extension data set is a DS 208A-type, enter 70.	Display reads— DATA SET: 70
16	If remote extension data set is a DS 209A-L1, enter 75.	Display reads— DATA SET: 75
17	Press GO.	Display reads— BIT RATE:
18	If remote extension data set is a DS 201C-type, enter 24.	Display reads— BIT RATE: 24
19	If remote extension data set is a DS 208A-type, enter 48.	Display reads— BIT RATE: 48
20	If remote extension data set is a DS 209A-L1, enter 72.	Display reads— BIT RATE: 72
21	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:
22	Enter 55.	Display reads— TEST SEQ: 55
23	Press GO.	Display reads (briefly)— SELECT ERROR TEST Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
24	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
25	Enter 2.	Display reads— ????? BITS IN A BLOCK

STEP	ACTION	VERIFICATION
26	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS
27	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— 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. ***Requirement:*** Maximum allowable block errors depend on system configuration. Refer to Fig. 3.
28	If system does not meet requirements, refer to Section 592-032-300.	
29	Contact each remote extension data set location and have DL switch on data set released.	
30	Set multiplex selector switch on local DS 209A-L1 to pretest position.	

3. MAINTENANCE TESTS

3.01 This part provides the sequence (Fig. 4) in which tests are to be performed during a maintenance visit to the data station. This test sequence provides a method of isolating a trouble to the data set or the customer-provided equipment (CPE). It is assumed that the maintenance procedures in Section 592-032-300 have been followed prior to dispatching a telco employee to the data station. If the data set is found to be defective, procedures are provided for isolating the trouble to a circuit pack (CP) in order to repair the data set.

4. TEST PROCEDURES

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

A. Analog Loopback Self Test

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

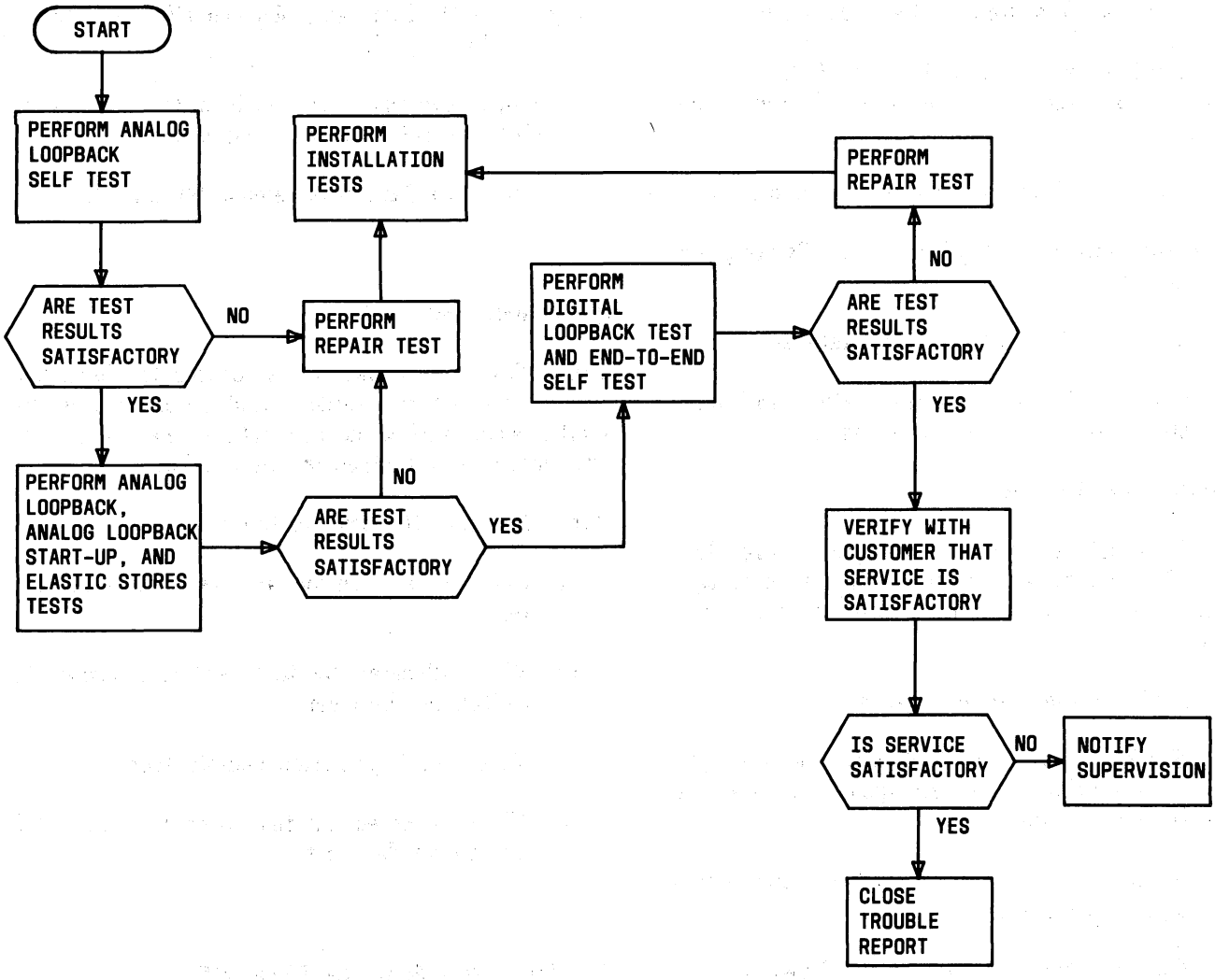


Fig. 4—Maintenance Test Sequence

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: After a brief retraining interval, ON, RS, CS, CO and TM lamps are lighted. ER and MR lamps are off.

Note: ER lamp goes off immediately. If ER lamp is lighted or blinks, data set has failed analog loopback self test.

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

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

B. Digital Loopback Self Test

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) Contact distant-end data station and have DL switch on distant-end data set depressed.

(2) Depress ST switch on local data set.

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

(3) Observe ER lamp for a 5-minute period.

Requirement: Total blinks of ER lamp are less than 31.

(4) Release ST switch on local data set.

(5) Contact distant-end data station and have DL switch on data set released.

C. End-to-End Self Test

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 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, TM, and CO lamps are lighted. MR and ER lamps are off.

(4) On both data sets, observe ER lamp for a 5-minute period.

Requirement: On both data sets, total blinks of ER lamp are less than 31.

(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, depress DL switch on data set.

(3) Test center performs remote test.

(4) When directed by test center, release DL switch on data set.

E. Initial Test Setup for 921A DTS

4.10 Perform the initial test setup for the 921 DTS when used to test DS 209A-L1 as follows.

STEP	ACTION	VERIFICATION
1	Connect data set to DTS using interface cable and 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 appropriate customer interface connector on data set. Refer to Table A.	
2	Connect DTS to a 105- to 129-Vac 60-Hz power source.	

STEP	ACTION	VERIFICATION
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 self 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 75 on keyboard. ***Note:*** To delete a wrong entry on keyboard during any test, press back arrow (←).	Display reads— DATA SET: 75
12	Press GO.	Display reads— BIT RATE:
13	Enter first two digits of bit rate corresponding to customer interface connector used in Step 1. Refer to Table A.	Display reads— BIT RATE: and digits entered
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:
15	Ensure that multiplex selector switch on data set is set to position corresponding to customer interface connector used in Step 1. Refer to Table A.	On data set corresponding multiplex status lamp lights.

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	Depress AL switch on data set.	
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 0060. ***Note:*** To perform functions listed below, press associated key. **KEY — FUNCTION** A Repeat test. B Dislay timing 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)— 0060 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. ***Requirement:*** No blocks in error.
9	Release AL switch on data set.	

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 If DS 209A-L1 is installed in a many-point or one-to-many multiplex system, a master/slave timing arrangement must be used. When performing a digital loopback test with external test equipment, the test cannot be conducted from a slave DS 209A-L1 to a master DS 209A-L1 with options as installed. If the slave in option (WI) is temporarily removed and the slave out option (WJ) is installed, this test can be performed.

4.15 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	If slave in option (WI) is installed in local data set, remove this option and temporarily install slave out option (WJ).	
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Contact distant-end data station and have DL switch on data set depressed. Verify that multiplex selector switch on distant data set is set to same position as multiplex selector switch on local data set.	
4	On DTS, enter 55.	Display reads— TEST SEQ: 55
5	Press GO.	Display reads (briefly)— SELECT ERROR TEST 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 Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
7	Enter 2.	Display reads— ????? BITS IN A BLOCK
8	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS

TABLE B

DS 209A-L1 OPTIONS

OPTION	FEATURE	REMOVE JACK		INSTALL JACK		PROVIDE
		SWITCH	POSITION	SWITCH	POSITION	
WA	ELASTIC STORE ENABLE 1 IN	S3	4	S2	1	ONE PER STATION
WB*	ELASTIC STORE ENABLE 1 OUT	S2	1	S3	4	
WC	ELASTIC STORE ENABLE 2 IN	S3	6	S2	3	ONE PER STATION
WD*	ELASTIC STORE ENABLE 2 OUT	S2	3	S3	6	
WE	ELASTIC STORE ENABLE 3 IN	S2	4	S2	5	ONE PER STATION
WF*	ELASTIC STORE ENABLE 3 OUT	S2	5	S2	4	
WG	ELASTIC STORE ENABLE 4 IN	S2	8	S2	7	ONE PER STATION
WH*	ELASTIC STORE ENABLE 4 OUT	S2	7	S2	8	
WI	SLAVE IN	S6	4	S6	5	ONE PER STATION
WJ*	SLAVE OUT	S6	5	S6	4	
WK*	COMPROMISE EQUALIZER RECEIVE SLOPE IN	S1	5	S1	4	ONE PER STATION
WL	COMPROMISE EQUALIZER RECEIVE SLOPE OUT	S1	4	S1	5	
WM	COMPROMISE EQUALIZER RECEIVE PHASE HI	S1	2 or 3	S1	1	
WN*	COMPROMISE EQUALIZER RECEIVE PHASE OUT	S1	1 or 3	S1	2	ONE PER STATION
WO	COMPROMISE EQUALIZER RECEIVE PHASE LO	S1	1 or 2	S1	3	
WP*	COMPROMISE EQUALIZER TRMTR SLOPE IN	S3	3	S3	1	ONE PER STATION
WQ	COMPROMISE EQUALIZER TRMTR SLOPE OUT	S3	1	S3	3	
WR	COMPROMISE EQUALIZER TRMTR PHASE HI	S1	7 or 8	S1	6	
WS*	COMPROMISE EQUALIZER TRMTR PHASE OUT	S1	6 or 8	S1	7	ONE PER STATION
WT	COMPROMISE EQUALIZER TRMTR PHASE LO	S1	6 or 7	S1	8	
XF	4W SWITCHED CARRIER (SWITCHED RS) AND AUTO RETRAIN	S5	6 or 7 or 8	S5	3	
XG*	4W CONTINUOUS CARRIER (SWITCHED RS) AND AUTO RETRAIN	S5	3 or 7 or 8	S5	6	ONE PER STATION
XH	4W SWITCHED CARRIER (SWITCHED RS) AND NO AUTO RETRAIN	S5	3 or 6 or 8	S5	7	
XI	4W CONTINUOUS CARRIER (CONTINUOUS RS) AND AUTO RETRAIN	S5	3 or 6 or 7	S5	8	
YC*	INTERNAL TIMING	S6	3	S6	2	ONE PER STATION
YD	EXTERNAL TIMING	S6	2	S6	3	
YI*	DAS 828- or 829-TYPE USED	S3	8	S6	6	ONE PER STATION
YJ	DAS 828- or 829-TYPE NOT USED	S6	6	S3	8	
YM	DSR ON IN ANALOG LOOP MODE	S6	8	S5	1	ONE PER STATION
YN*	DSR OFF IN ANALOG LOOP MODE	S5	1	S6	8	
YW	1-SECOND HOLDOVER OUT	S5	5	S5	4	ONE PER STATION
YX*	1-SECOND HOLDOVER IN	S5	4	S5	5	

* FACTORY INSTALLED

STEP **ACTION** **VERIFICATION**

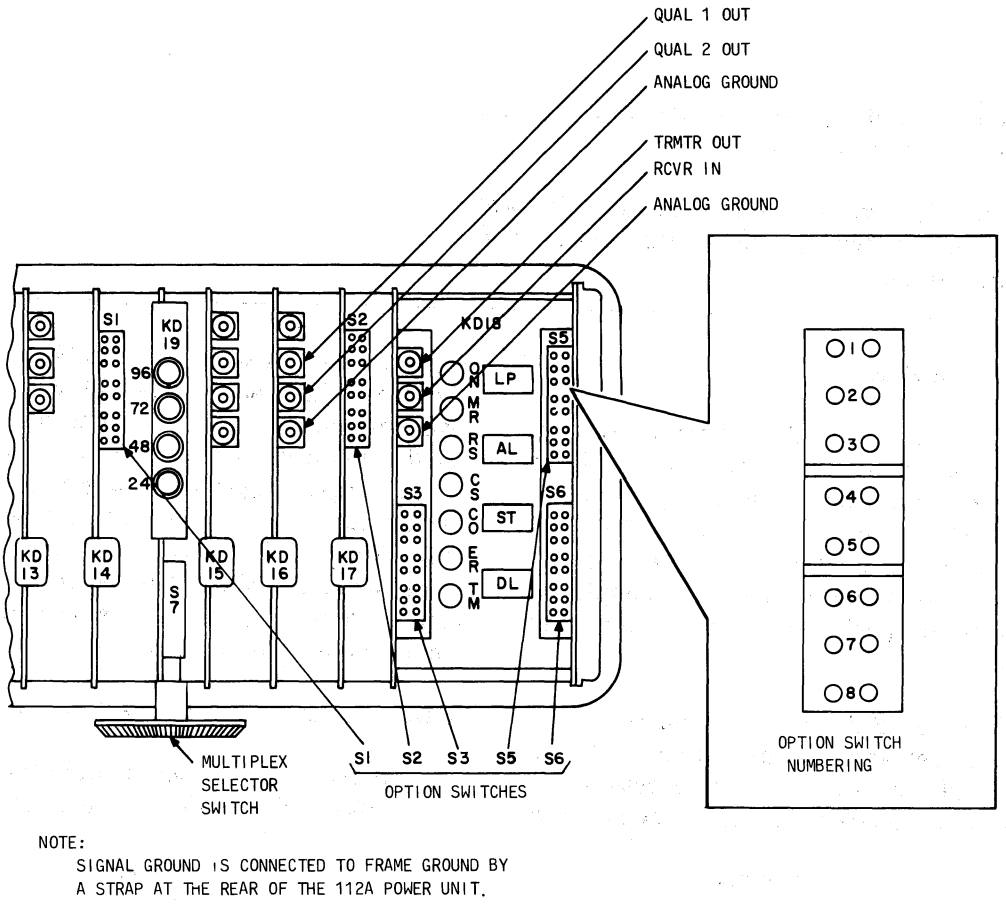


Fig. 5—Switch and Test Point Locations

9 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—
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.

Requirement: Total blocks in error are less than 30.

STEP	ACTION	VERIFICATION
10	Contact distant-end data station and have DL switch on data set released.	
11	If option WJ was temporarily installed in local data set in Step 1, remove this option and install option WI.	

H. Compromise Equalizer Test

4.16 This test determines the optimum setting of the compromise equalizer in the local data set. This test must be performed upon initial installation of the local data set and after the distant-end data set has been tested. An analog loopback self test of the local data set should be performed prior to performing the compromise equalizer test.

4.17 A VOM or a 921A DTS is required at the local data set and the distant-end data set must have the DL and ST switches depressed. In this test, an effort is made to minimize the negative test voltage at test points located on CP KD16 in the local data set. The voltages at these test points provide an indication of data set performance. Smaller negative voltages indicate better performance, while larger negative voltages represent poorer performance. If the factory-supplied options WK, WN, WP, and WS result in a test voltage of -1.25 volts or less, the data channel has adequate equalization for good performance and the complete compromise equalizer test need not be performed.

4.18 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	Contact distant-end data station and ensure that options WK (S1-4), WN (S1-2), WP (S3-1), WS (S1-7), and XG (S5-6) or XI (S5-8) are installed in distant-end data set.	
2	Have DL and ST switches on distant-end data set depressed.	
3	Ensure that options WK (S1-4), WN (S1-2), WP (S3-1), WS (S1-7), and XG (S5-6) or XI (S5-8) are installed in local data set.	

STEP	ACTION	VERIFICATION
4	Set multiplexer selector switch on local data set to 2400 bps. (This conditions the QUAL 2 OUT test point on KD16 of the local data set to indicate the quality of the received signal at the distant-end data set.)	24 lamp lights.
5	Depress ST switch on local data set. Ignore momentary blinking of status lamps.	
6	If a 921A DTS is used, ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
7	On DTS, enter 12.	Display reads— TEST SEQ: 12
8	Refer to Fig. 5 and connect a meter lead from analog ground test point on data set to INPUTS—METER - jack on DTS. ***Note:*** All voltage measurements in this test are negative with respect to analog ground. Therefore, if a VOM is used instead of the 921A DTS, the positive (+) terminal must be connected to the analog ground test point to obtain a positive meter indication.	
9	Refer to Fig. 5 and connect a meter lead from QUAL 1 OUT test point on data set to INPUTS—METER + jack on DTS.	
10	On DTS, press GO.	From this point, DTS display reads voltage present at QUAL 1 OUT test point.
11	Verify that option shorting jack is installed at S1-4. Record average value of first two digits displayed. ***Note:*** If requirement is met, omit Steps 12 through 17.	***Requirement:*** -1.25 volts or less negative.
12	Remove option shorting jack from S1-4 and install at S1-5. Record average value of first two digits displayed.	
13	Install option shorting jack at location (S1-4 or S1-5) that had average value nearest zero. ***Note:*** Good performance of the data channel is indicated by a test voltage less negative than -0.75 volts, while marginal performance	***Requirement:*** -2.00 volts or less negative.

STEP	ACTION	VERIFICATION
	is indicated by a test voltage more negative than -2.00 volts.	
14	Verify that option shorting jack is installed at S1-2. Record average value of first two digits displayed.	
15	Remove option shorting jack from S1-2 and install at S1-1. Record average value of first two digits displayed.	
16	Remove option shorting jack from S1-1 and install at S1-3. Record average value of first two digits displayed.	
17	Install option shorting jack at location (S1-1, S1-2, or S1-3) that had average value nearest zero.	***Requirement:*** -2.00 volts or less negative.
18	Refer to Fig. 5 and disconnect meter lead from QUAL 1 OUT test point on data set and connect to QUAL 2 OUT test point.	From this point, DTS display reads voltage present at QUAL 2 OUT test point.
19	Verify that option shorting jack is installed at S3-1. Record average value of first two digits displayed. ***Note:*** If requirement is met, omit Steps 20 through 26.	***Requirement:*** -1.25 volts or less negative.
20	Remove option shorting jack from S3-1 and install at S3-3. Record average value of first two digits displayed.	
21	Install option shorting jack at location (S3-1 or S3-3) that had average value nearest zero.	***Requirement:*** -2.00 volts or less negative.
22	Verify that option shorting jack is installed at S1-7. Record average value of first two digits displayed.	
23	Remove option shorting jack from S1-7 and install at S1-6. Record average value of first two digits displayed.	
24	Remove option shorting jack from S1-6 and install at S1-8. Record average value of first two digits displayed.	
25	Install option shorting jack at location (S1-6, S1-7, or S1-8) that had average value nearest zero.	***Requirement:*** -2.00 volts or less negative.

STEP	ACTION	VERIFICATION
26	Refer to Fig. 5 and disconnect meter lead from QUAL 2 OUT test point on data set and connect to QUAL 1 OUT test point. Record average value of first two digits displayed.	DTS display reads voltage present at QUAL 1 OUT test point. ***Requirement:*** -2.00 volts or less negative.
27	If option XF (S5-3) or XH (S5-7) was removed from local data set in Step 3, install removed option.	
28	Contact distant-end data station and have DL and ST switches on distant-end data set released.	
29	Ensure that options in distant-end data set are restored to pretest condition.	

I. Power Supply Test

4.19 This test checks that ac voltage appears at the power supply input and then measures the +12, +5, and -12 volt supply voltages at the customer interface.

4.20 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	Enter 12.	Display reads— TEST SEQ: 12
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	On data set, if ON lamp fails to light or lights momentarily and goes off, check ac source voltage with a VOM. ***Note:*** DS 209A-L1 is equipped with a circuit breaker that will trip under excessive current and thermal conditions. To reset circuit breaker, operate switch located inside rear faceplate. The data set cooling fan is under control of a fuse that is located near circuit breaker. A replacement fuse (AGC 1/2 ampere) is mounted at front of data set power unit, or one may be obtained from maintenance kit D-180555-L1. The data set is also provided with a self-resetting thermal overload switch	ON lamp is lighted. ***Requirement:*** 105 to 129 volts RMS.

STEP	ACTION	VERIFICATION
	that disconnects the power unit if the power unit temperature rises excessively.	
6	Press GO.	Display reads voltage present at jack 9. ***Requirement:*** +11.5 to +12.5 volts.
7	Move jumper wire from jack 9 to jack 10.	Display reads voltage present at jack 10. ***Requirement:*** -11.5 to -12.5 volts.
8	Move jumper wire from jack 10 to jack 25.	Display reads voltage present at jack 25. ***Requirement:*** +4.5 to +5.5 volts.
9	Remove jumper wires from DCE interface lead and METER jacks.	

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

4.21 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.***

4.22 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	Depress AL switch on data set.	
3	On DTS, enter 30.	Display reads __ TEST SEQ: 30
4	Press GO. ***Note 1:*** Only the option actually installed in the data set need be tested. Refer to Table B and Fig. 5. ***Note 2:*** To repeat test, press A.	Display reads RS-CS (CA-CB) interval in milliseconds. ***Requirement:*** Option XF—130 to 160 ms Option XG—6.0 to 9.0 ms Option XH—130 to 160 ms
5	Release AL switch on data set.	

K. CA-CF (RS-COD) and CA-CG (RS-COV) Intervals Test

4.23 In this test the interval between CA (request-to-send) and CF (carrier on) is measured. The interval between CA and CG (signal quality detector) is also measured.

4.24 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	If option XF is not installed in data set, remove option XG, XH, or XI and temporarily install option XF.	
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Depress AL switch on data set.	
4	On DTS, enter 31 and 32.	Display reads— TEST SEQ: 31 32
5	Press GO.	Display reads RS-RLSD (CA-CF) interval in milliseconds.
6	Record number indicated on display (for example, 135.0).	
7	Press GO.	Display reads RS-SQD (CA-CG) interval in milliseconds.
8	Subtract number indicated on display from number recorded in Step 6 (for example, 135.0 - 08.00 = 127.0 ms).	***Requirement:*** Result is between 120 and 140 ms.
9	Release AL switch on data set.	
10	If option XF was temporarily installed in data set in Step 1, remove this option and install option removed in Step 1 (XG, XH, or XI).	

L. Transmitter Output Test

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

4.26 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	If option XG is not installed in data set, remove option XF, XH, or XI and temporarily install option XG.	

STEP	ACTION	VERIFICATION
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads – TEST SEQ:
3	Refer to Fig. 5 and connect a meter lead from analog ground test point on data set to INPUTS—METER - jack on DTS.	
4	Refer to Fig. 5 and connect a meter lead from TRMTR OUT test point on data set to INPUTS—METER + jack on DTS.	
5	Insert a 600-ohm terminating resistor into INPUTS—METER + and - jacks.	
6	Enter 11.	Display reads (briefly)— TEST SEQ: 11 Display then reads— :11R=? 1=135 6=600 9=900 0=N
7	Enter 6.	Display reads (briefly)— :11R=6 1=135 6=600 9=900 0=N Display then reads— :
8	Press GO.	Display reads transmitter output level in mV ac and dBm. ***Requirement:*** More than 750 mV ac.
9	Disconnect meter leads from DTS and data set.	
10	If option XG was temporarily installed in data set in Step 1, remove this option and install option removed in Step 1 (XF, XH, or XI).	

M. End-to-End Block Error Test

4.27 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.

4.28 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.	

STEP	ACTION	VERIFICATION
	Note: 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.	
At both stations, perform Steps 2 through 8.		
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
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 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— 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. ***Requirement:*** Total blocks in error are less than 30.

N. External Timing Test

4.29 This test checks the external timing of DS 209A-L1 during normal and abnormal operation. This test is required ***only*** if external timing (option YD) is installed in the data set. Refer to Table B and Fig. 5.

4.30 During normal operation with external timing the data set phase locks to the serial clock transmitter external (DA) signal provided by the CPE or a DTS. The phase-locked signal produces the serial clock transmitter (DB) signal that is used to synchronize the transmitted data. The abnormal operation for this test is produced by disconnecting the DA signal provided by the DTS and connecting DA to DB. This causes the transmit phase-lock loop to be shifted to the end of its range. As a result, the serial clock receive (DD) signal cannot synchronize with the looped back transmitted signal and errors are produced.

4.31 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	Depress AL switch on data set.	
3	For Version 1 DTS, enter 43.	Display reads— TEST SEQ: 43
4	For Version 1 DTS, press GO.	Display reads— BIT RATE:
5	For Version 1 DTS, enter first two digits of bit rate corresponding to customer interface connector used in Step 1 of initial test setup (paragraph 4.10). Refer to Table A.	Display reads (briefly)— BIT RATE: and digits entered Display then reads (briefly)— TEST COMPLETE Display then reads— TEST SEQ:
6	Enter 55.	Display reads— TEST SEQ: 55
7	Press GO.	Display reads (briefly)— SELECT ERROR TEST Display then reads— D=DT 0=SP 1=MK 2=2047 5=511 6=63
8	Enter 5.	Display reads (briefly)— 511 BIT ERROR TEST Display then reads— 1=BIT ERRORS 2=BLOCK ERRORS
9	Enter 2.	Display reads— ????? BITS IN A BLOCK
10	Enter 01024.	Display reads (briefly)— 01024 BITS IN A BLOCK Display then reads— ???? SECONDS

STEP	ACTION	VERIFICATION
11	Enter 0060. ***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)— 0060 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. ***Requirement:*** No blocks in error.
12	Set DCE interface lead switch 24 to OPEN.	
13	Connect a jumper wire between DCE interface lead jacks 15 and 24.	
14	Repeat test by pressing A. ***Note:*** When display flashes OSYN, do not press A.	***Requirement:*** Total blocks in error are more than 100.
15	Press GO.	Display reads briefly— TEST INTERRUPTED Display then reads— TEST SEQ:
16	For Version 1 DTS, enter 46.	Display reads— TEST SEQ: 46
17	For Version 1 DTS, press GO.	Display reads (briefly)— TEST COMPLETE Display then reads— TEST SEQ:
18	Remove jumper wire from DCE interface lead jacks.	

O. Elastic Stores Test

4.32 This test checks the elastic stores of DS 209A-L1 during normal and abnormal operation. This test is required ***only*** if an elastic store enable in option (WA, WC, WE, and WG) is installed in the data set. Refer to Table B and Fig. 5. This test should be performed at each customer interface connector associated with an installed elastic store enable in option. The customer interface connectors and the associated elastic store enable in options are: connector 1, option WA; connector 2, option WC; connector 3, option WE; and connector 4, option WG.

4.33 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	If option XI is not installed in data set, remove option XF, XG, or XH and temporarily install option XI.	
2	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
3	Connect a jumper wire between DCE interface lead jacks 15 and 24.	
4	Depress AL switch on data set.	
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 5.	Display reads (briefly)— 511 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 0060. ***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)— 0060 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. ***Requirement:*** No blocks in error.

STEP	ACTION	VERIFICATION
11	Remove jumper wire from DCE interface lead jacks 15 and 24.	
12	Repeat test by pressing A. ***Note:*** When display flashes OSYN, do not press A.	***Requirement:*** Total blocks in error are more than 100.
13	Set DCE interface lead switch 4 to OPEN.	
14	Repeat test by pressing A.	***Requirement:*** No blocks in error.
15	Release AL switch on data set.	
16	If option XI was temporarily installed in data set in Step 1, remove this option and install option removed in Step 1 (XF, XG, or XH).	

P. Analog Loopback Start-Up Test

4.34 This test checks the ability of the data set to begin error-free transmission. The data set must be equipped with switched carrier and 1-second holdover out.

4.35 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	If continuous carrier (option XG or XI) is installed in data set, remove this option and temporarily install switched carrier (option XF or XH).	
2	If 1-second holdover in (option YX) is installed in data set, remove this option and temporarily install 1-second holdover out (option YW).	
3	Ensure that initial test setup described in paragraph 4.10 has been performed.	Display reads— TEST SEQ:
4	Depress AL switch on data set.	
5	On DTS, enter 67.	Display reads— TEST SEQ: 67
6	Press GO.	Display reads— 1=ONE WAY 2=IR SW 3=IR CONT
7	Enter 2.	Display reads— TRMT: 1=MAN 2=TIMED 3=SW CARR

STEP	ACTION	VERIFICATION
8	Enter 2.	Display reads— PRESS A TO START
9	Press A. ***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. ***Note 2:*** To perform functions listed below, press associated key. **KEY FUNCTION** A Restart test. C Clear display. D Stop test.	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.
10	At end of about 1 minute, press D.	***Requirement:*** Zero count on ERR and * displays.
11	Release AL switch on data set.	
12	If option YW was temporarily installed in data set in Step 2, remove this option and install option YX.	
13	If option XF or XH was temporarily installed in data set in Step 1, remove this option and install option removed in Step 1 (XG or XI).	

Q. End-to-End Start-Up Test

4.36 This test checks the ability of both data sets to begin error-free transmission. In this test, one end is arbitrarily selected as the controlling station. This station has operating control of the test. The controlled station must be equipped with switched carrier and 1-second holdover out.

4.37 Perform the test as follows.

Note: For option installation and removal information, refer to Table B and Fig. 5.

STEP	ACTION	VERIFICATION
1	Establish voice communication between the data stations and arrange to conduct an end-to-end start-up test.	

STEP	ACTION	VERIFICATION
	Note 1: If continuous carrier (option XG or XI) and/or 1-second holdover in (option YX) are installed in data set at controlled station, temporarily install switched carrier (option XF or XH) and/or 1-second holdover out (option YW). ***Note 2:*** Procedure at controlled station must be performed first.	
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	On DTS, 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 (option XF or XH) is installed in data set at controlling station, enter 2. If continuous carrier (option XG or XI) is installed in data set at controlling station, enter 3.	Display reads— PRESS A TO START On DTS, DSR indicator lights (data set ready lead ***on***) Display continues to read— PRESS A TO START
6	Place data set in data mode.	
7	Press A. ***Note:*** 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 depressed 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:

STEP	ACTION	VERIFICATION
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 (option XF or XH) is installed in data set at controlling station, enter 2. If continuous carrier (option XG or XI) is installed in data set at controlling station, enter 3.	Display reads— TRMT: 1=MAN 2=TIMED 3=SW CARR
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 ***on***) Display continues to read— PRESS A TO START
14	Press A. ***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. ***Note 2:*** To perform functions listed below, press associated key. **KEY FUNCTION** A Restart test. C Clear display. D Stop test.	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.
15	At end of about 2 minutes, press D. ***Note:*** If option XF or XH and/or option YW were temporarily installed in data set at controlled station, remove these options and install options that were removed (XG or XI and/or YX).	***Requirement:*** Count of less than 2 on ERR display and zero count on * display.

R. Repair Test

4.38 This test provides a method for isolating a data set trouble to a single circuit pack (CP). Table C 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.

4.39 If the data set fails a test listed in Table C, 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 KD14, KD17, or KD18 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 C

REPAIR PROCEDURES

TEST	CP REPLACEMENT SEQUENCE*	TEST	CP REPLACEMENT SEQUENCE*
Power Supply	112A Power Supply †	Analog Loopback Start-Up	KD1 KD2 KD3 KD4 KD5 KD6 KD7 KD13 KD15 KD17 KD19 KD8 KD9 KD10 KD11 KD12 KD14 KD16 KD18
CA-CB (RS-CS) Interval	KD18 KD9 KD11 KD10		
Transmitter Output	KD9 KD10 KD11 KD14 KD16 KD18		
CA-CF (RS-COD) and CA-CG (RS-COV) Intervals	KD18 KD16 KD14 KD12 KD8 KD6 KD10		

* Replace using the methods given in Section 592-032-200. AC power removal is not required.

† If the power supply test again fails after removing all CPs except KD15, measure the voltages present on the power supply terminal strip. Remove KD15 and again measure the power supply voltages. If the test fails, the power supply is defective. If the test passes, KD15 is defective.

5. REFERENCES

5.01 Additional information concerning the testing of DS 209A-L1 is contained in the following publications.

SECTION	TITLE
107-402-100	921A Data Test Set—Description and Operation
314-410-105	Voice Bandwidth Private Line Data Circuits—High Performance Data Conditioning (HPDC)—Description and Test Requirements
314-410-500	Voice Bandwidth Private Line Data Circuits—Tests and Requirements
592-032-100	Data Set 209A-L1—Transmitter-Receiver—Description and Operation
592-032-200	Data Set 209A-L1—Transmitter-Receiver—Installation and Connections
592-032-300	Data Set 209A-L1—Transmitter-Receiver—Maintenance
592-032-500	Data Set 209A-L1—Transmitter-Receiver—Test Procedures
666-511-504	Test of Data Services Provided by Data Set 209A-L1 From a Private Line Testroom
999-100-143	Data Set 209A-L1—How to Operate Manual

5.02 Detailed information concerning DS 209A-L1 is contained in CD- and SD-1D249-01.