

## 1A DATA STATION MULTICHANNEL ARRANGEMENTS

### TESTS

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#### 1. GENERAL

**1.01** This section describes the test procedures to be performed and the test requirements to be met when investigating trouble conditions associated with a 1A Data Station, Multichannel Arrangements (MCA), hereafter referred to as the 1A Data Station.

**1.02** This section has been reissued to add:

- (a) Data Auxiliary Set (DAS) 811J-L1
- (b) Station Balanced Interface (DP63 Circuit Pack) ( $\pm 3$  mA, 2-wire, HDX or FDX)

- (c) Station Current Interface (DP68 Circuit Pack) (62.5- or 20-mA, 2-wire, HDX, binary only)
- (d) Station EIA Interface (DP65 Circuit Pack) (EIA voltage, 3-wire, FDX or HDX, ternary or binary)

Since this reissue constitutes a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** The tests covered are as follows:

- (a) **Power Test:** This test verifies voltage levels and polarity.
- (b) **Remote Test:** This test permits a 1A Data Station to be tested from a remote 1A Data Station, using the baseband loop-around feature at the far 1A Data Station.
- (c) **End-to-End Test:** This test may be used to further isolate a troubled area such as the transmitter at the near end, receiver at the far end, or the transmission facilities. The end-to-end tests may be performed with the following configuration:

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

**1.04** This section should be used in conjunction with the installation and maintenance practices, 591-813-200 and 591-813-300, respectively, to locate troubles at the 1A Data Station.

**1.05** The components of the 1A Data Station (circuit packs, data auxiliary sets, rectifiers, etc) not meeting the installation test requirements

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should be replaced to restore customer service as quickly as possible.

**1.06** The defective component shall be sent to the nearest Service Center for repair. Maintenance on the components other than at the Service Center shall *not* be attempted.



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

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

- Trouble in customer-provided equipment is the responsibility of the customer.
- Trouble in Telco-provided terminal shall be referred to the designated trouble reporting center.
- Trouble in the transmission facilities shall be referred to the designated trouble reporting center.
- Trouble in the 43A1 or 43B1 terminal end when connected to 1A Data Station shall be referred to the designated trouble reporting center.

Trouble in both the transmit and receive sides of the 1A Data Station *is* covered in this section.

**1.08** Before proceeding with any tests of the 1A Data Station, verify the following:

- (a) Voice frequency facility has originally been tested and meets requirements as specified in the appropriate sections entitled either Private

Line Data Circuits, Voice Bandwidth Circuits for Miscellaneous Data, Overall Tests and Requirements (314-410-500), or Circuit Order or Trunk Order Tests for Carrier Telegraph Layouts (660-450-302).

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



*Before removing the line circuit (DP52 circuit pack), be sure all channels are removed from service.*

- (c) Trouble condition has been isolated using Section 591-813-300 as a guide.

- (d) All connections and connectors are properly made.

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

- J79901B List 3 Data Test Set (Interface Test Adapter—Cover of 901B Data Test Set) (for DAS 811G-L1 and 811H-L1)
- 15A Transmission Measuring Set, or equivalent\*
- Test Set 3550B or equivalent
- KS-20538-L1 Volt-Ohm-Milliammeter, or equivalent 20,000-ohms-per-volt meter
- KS-19935-L7 Telegraph Carrier Test Set (Stelma) (103-825-100).

\*May not be needed if KS-19935 is available unless an oscillator output is required, otherwise Western Electric Co. or Northeast Electronics TMS is suggested.

## 2. INSTALLATION TEST PROCEDURES

**2.01** The following installation test procedures may be found in the section entitled 1A Data Station, Multichannel Arrangements, Installation (591-813-200), and are *not* repeated in this section.

- Send level adjustment
- Receive gain adjustment
- Carrier fail adjustment

- Supervisory adjustment (ternary only)
- Receive bias adjustment—1A Data Station at each end of the system
- Receive bias adjustment—1A Data Station at one end and a 43-type terminal at the other end of the system
- Strapping options
- System alarm tests.

**2.02** The tests listed in 2.01 are performed during the initial installation of the 1A Data Station. Should any circuit pack be replaced which requires strapping or adjustments, the replacing circuit pack should be equipped with the same strapping option. If adjustments are required, reference should be made to the installation section.

**2.03** Although the preceding tests are primarily for use at the time of installation, they are also applicable during maintenance.

### **3. MAINTENANCE TEST PROCEDURES**

#### **A. GENERAL**

**3.01** In the procedures that follow, reference will be made to a primary end, a near end, and a far end. (Hereafter, for simplicity, the text will refer to both the primary and near ends as the near end). Figure 1 is presented for orientation and definition of the ends to be discussed. Table A is presented for a correlation of switch designations on DAS 811G-L1, 811H-L1, and 811J-L1. It will be noted that DAS 811J-L1 has designations CHAN MODE and VBLA, while DAS 811G-L1 has designations CHANNEL MODE and VOICE BAND LOOP AROUND, respectively.

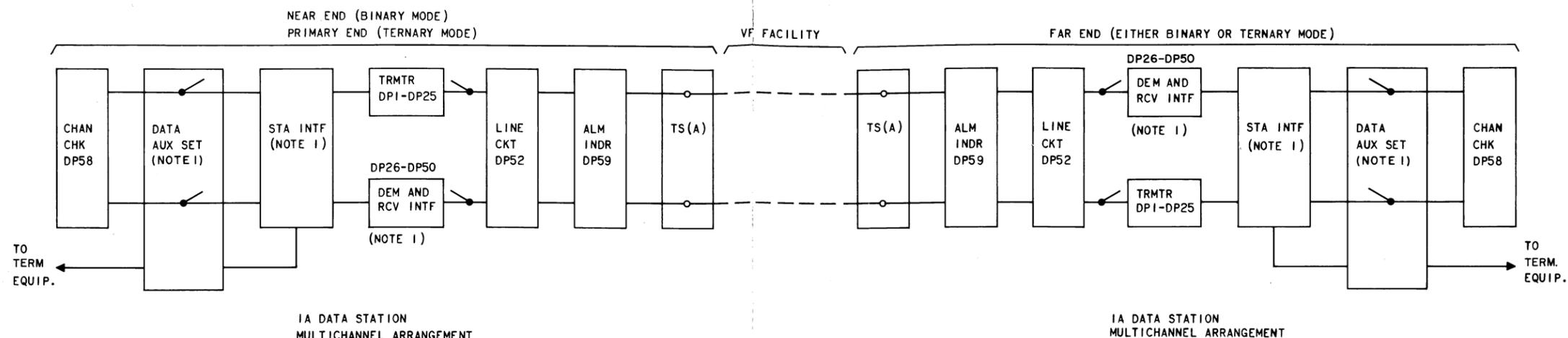
TABLE A

## SWITCH DESIGNATIONS ON DATA AUXILIARY SETS

811J-L1	811G-L1	811H-L1
CHANNEL SELECT (1-16) or (1-8 [BLK] and 1-8 [RED])	None	None
RLS-TEST*	None	None
CHAN CHK (SYS I or SYS II)	None	None
TEST MODE (CHAN CHK-DA LP)	TEST MODE (CHAN CHK-DA LP)	None
BAUD (75-150)	BAUD (75-150)	None
FUNCTION (REM-LOC-SIG)	FUNCTION (REM-LOC-SIG)	None
CHAN MODE (TEST-NORM-OFF)	CHANNEL MODE (TEST-NORM-OFF)	CHANNEL MODE (TEST-NORM-OFF)
VBLA (SYS I-NORM-SYS II)	VOICE BAND LOOP AROUND (TEST-NORM)	None

( ) Parentheses indicate positions.

- \* (a) RLS-TEST switch must be operated to RLS position before CHANNEL SELECT switch can be operated (mechanical interlock).
- (b) RLS-TEST switch must be operated to TEST position before test functions can be performed (electrical interlock).
- † For a single system, 1-16 channel terminal positions are possible. For a 2-system configuration, 1-8 channel terminal positions are possible for each system: the first system, 1-8, in black letters, and the second system, 1-8, in red letters.



NOTES:

1. THE INTERFACE CP'S USED IN THE BINARY AND TERNARY MODES ARE TABULATED IN THE FOLLOWING TABLE:

CIRCUIT PACK MODE	RCV INTF	STA INTF	DATA AUX SET	
			811G OR H	811J
BINARY	DP51	DP56, 20-mA, 3-WIRE, FDX	X	—
		DP63, ±3-mA, 2-WIRE, FDX	X	X
		DP65,* EIA 3-WIRE, FDX	X	—
		DP68, 62.5-/20-mA, 2-WIRE, HDX	X	X
TERNARY	DP57	DP63, ±3-mA, 2-WIRE, FDX	X	X
		DP65,* EIA 3-WIRE, FDX	X	—

\* EARLY STATIONS MAY HAVE CIRCUIT PACK DP55 (MD) INSTALLED. DP65 IS STANDARD.

2. THE DESIGNATION "NEAR END" IS ALWAYS USED IN A BINARY MODE.
3. THE DESIGNATION "PRIMARY END" IS ALWAYS USED IN A TERNARY MODE.
4. THE PRIMARY END IS THAT END WHICH HAS BEEN PREVIOUSLY DESIGNATED (AND STRAPPED) TO HAVE THE CAPABILITY OF FORCING THE STATION TO TRANSMIT AN ON SIGNAL WHEN THE CHANNEL MODE SWITCH IS OPERATED TO TEST. (THERE WILL NEVER BE MORE THAN ONE PRIMARY END IN A SYSTEM).
5. THE FAR END IS THAT END WHICH WILL LOOP BACK THE SUPERVISORY (IF TERNARY) AND DATA SIGNAL TRANSMITTED FROM THE OPPOSITE END (THERE MAY BE MORE THAN ONE FAR END IN A SYSTEM).

6. IF THE IA DATA STATION AT THE PRIMARY OR NEAR END IS IN TROUBLE, TELCO PERSONNEL WILL BE DISPATCHED TO THE PRIMARY OR NEAR END TO PERFORM TESTS WHILE CUSTOMER PERSONNEL WILL ASSIST BY LOOPING THE SIGNAL BACK AT THE FAR END.
7. IN THE BINARY MODE, THE END AT WHICH THE TELCO PERSONNEL IS TROUBLE SHOOTING WILL ALWAYS BE REFERRED TO AS THE "NEAR END".

TPA 553647

Fig. 1—Orientation and Definitions—1A Data Station, MCA

**B. Power Test**

**3.02** The only equipment required at the station to perform the power unit voltage test is a KS-20538 volt-ohm-milliammeter (VOM).

**3.03** The following procedure should be used to measure the voltage of the KS-20575 rectifier.

STEP	PROCEDURE
1	Connect the - (negative) test lead of the KS-20538-L1 VOM to the COMMON terminal of the KS-20575 rectifier.
2	Connect the + (positive) test lead of the KS-20538-L1 VOM to the +24 VOLTS terminal of the KS-20575 rectifier.  <b>Requirement:</b> +24 $\pm$ 2.4 volts.
3	Remove test leads connected in Steps 1 and 2.
4	Connect the + (positive) test lead of the KS-20538-L1 VOM to the COMMON terminal of the KS-20575 rectifier.
5	Connect the - (negative) test lead of the KS-20538-L1 VOM to the -24 VOLT terminal of the KS-20575 rectifier.  <b>Requirement:</b> -24 $\pm$ 2.4 volts.
6	Remove the test leads connected in Steps 4 and 5.
7	If the requirement of Step 2 or 5 is not met, verify that the maximum number of channel terminals per rectifier has not be exceeded. (See current drain, Table A, Section 591-813-100). A rule of thumb is to power up to 10 channel terminals plus common equipment per rectifier. Remove and replace KS-20575 rectifier, and repeat Steps 1 through 6.

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**C. Remote Test—1A Data Station at Each End**

**3.04 General:** This test will isolate the trouble to either the terminal equipment or to 1A Data Station equipment. The test will require the customer to perform certain operations at his location.

**3.05** The customer experiencing trouble will operate his 1A Data Station (at the far end) in the data loop mode while the customer at the near (or primary) end will operate his 1A Data Station in the test mode. In this operation, terminal equipment at both ends is disconnected from the 1A Data Station circuitry, and the integrity of the 1A Data Station may be determined.

**3.06 Equipment Required:** Only that equipment which is built into the 1A Data Station is required to perform the remote test.

**3.07 Preparation:** Operate the controls in the Data Auxiliary Sets (DAS) 811G-L1, 811H-L1, or 811J-L1 at the end having the data looped back, as specified in Table B. In multiplex use the customer must operate the test control switches.

**3.08** Operate the controls on the DAS 811G-L1, 811H-L1, or 811J-L1 at the end opposite the looped-back end,\* as specified in Table C.

\* Primary end, if operated in ternary mode.

**3.09 Test Procedure:**

STEP	PROCEDURE
1	Verify that switches at the loop-around end are operated as specified in Table B.
2	Verify that switches at the near end (opposite the loop-around end) are operated as specified in Table C.
3	<p>Observe the CHAN CHK meter at the near end* (opposite the loop-around end).</p> <p><b>Requirement:</b> The meter should indicate in the green area. If the meter does not indicate in the green area, see Part 4.</p> <p>* Primary end if operated in ternary mode.</p>

**TABLE B**  
**SWITCH POSITIONS AT FAR END**  
**FOR ESTABLISHING DATA LOOP (DA LP) MODE**  
**FOR THE REMOTE TEST**

SWITCH	SWITCH POSITION		
	811J-L1	811G-L1	811H-L1
RLS-TEST	TEST (Note 1)	—	—
CHANNEL SELECT	Channel Number Under Test (Note 2)	—	—
CHAN CHK	(Note 3)	—	—
CHANNEL MODE	TEST	TEST (Note 4)	TEST (Note 4)
VOICE BAND LOOP AROUND	NORM	NORM	—
TEST MODE	DA LP	DA LP	—
FUNCTION	Not Used	Not Used	—
BAUD	Not Used	Not Used	—

**NOTES:**

1. RLS-TEST switch must be operated to RLS position before CHANNEL SELECT switch can be operated (mechanical interlock).  
 RLS-TEST switch must be operated to TEST position before test functions can be performed (electrical interlock).
2. Color Code: Black channel numbers indicate System I; red channel numbers indicate System II.
3. CHAN CHK switch must be operated to the system (I or II) equipped with the channel check circuit pack (DP58). Should both systems contain a channel check circuit pack, either position (I or II) may be used. (The DAS 811J-L1 makes it possible to share a single channel check circuit pack between two systems.)
4. For channel under test only. All others shall be operated to NORM.

TABLE C

SWITCH POSITIONS AT NEAR END (NOTE 1)  
FOR ESTABLISHING CHANNEL CHECK MODE

SWITCH	SWITCH POSITION		
	811J-L1	811G-L1	811H-L1
RLS-TEST	TEST (Note 2)	—	—
CHANNEL SELECT	Channel Number Under Test (Note 3)	—	—
CHAN CHK	(Note 4)	—	—
CHANNEL MODE	TEST	TEST (Note 5)	TEST (Note 5)
VOICE BAND LOOP AROUND	NORM	NORM	—
TEST MODE	CHAN CHK	CHAN CHK	—
FUNCTION	SIG	SIG	—
BAUD	150 for SW 75 for DW	150 for DW 75 for SW	—

**NOTES:**

1. Primary end, if operated in ternary mode.
2. RLS-TEST switch must be operated to RLS position before CHANNEL SELECT switch can be operated (mechanical interlock). RLS-TEST switch must be operated to TEST position before test functions may be performed (electrical interlock).
3. Color Code: Black channel numbers indicate System I; red channel numbers indicate System II.
4. CHAN CHK switch must be operated to the system (I or II) equipped with the channel check circuit pack (DP58). Should both systems contain a channel check circuit pack, either position (I or II) may be used. The DAS 811J-L1 makes it possible to share a single channel check circuit pack between two systems.)
5. For channel under test only. All others shall be operated to NORM.

**D. End-to-End Test—1A Data Station at Each End**

**3.10 General:** This is a test of a channel from a near-end 1A Data Station to a far-end 1A Data Station. This test will isolate a trouble to one direction of transmission. The built-in test equipment at *each* end is used in this test. The channel check circuit applies a dotting test signal

to the transmit portion of the near-end 1A Data Station. The far-end channel check circuit monitors the far-end 1A Data Station receiver to determine if the signal is detected properly.

**3.11 Equipment Required:** Only that equipment which is built into the 1A Data Station is required.

**3.12 Preparation:**

- (a) Make a telephone call to the customer at the far-end 1A Data Station.
- (b) Operate the switches on the near-end DAS 811G-L1, DAS 811H-L1, or DAS 811J-L1 as specified in Table C.
- (c) Operate the switches on the far-end DAS 811G-L1, DAS 811H-L1, or DAS 811J-L1 as specified in Table D.

**TABLE D**  
**SWITCH POSITIONS AT FAR END**  
**FOR ESTABLISHING END-TO-END TEST**

SWITCH	SWITCH POSITION		
	811J-L1	811G-L1	811H-L1
RLS-TEST	TEST (Note 1)	—	—
CHANNEL SELECT	Channel Number Under Test (Note 2)	—	—
CHAN CHK	(Note 3)	—	—
CHANNEL MODE	TEST	TEST (Note 4)	TEST (Note 4)
VOICE BAND LOOP AROUND	NORM	NORM	—
TEST MODE	CHAN CHK	CHAN CHK	—
FUNCTION	LOC	LOC	—
BAUD	150 for DW 75 for SW	150 for DW 75 for SW	—

**NOTES:**

1. RLS-TEST switch must be operated to RLS position before CHANNEL SELECT switch can be operated (mechanical interlock).  
RLS-TEST switch must be operated to TEST position before test functions may be performed (electrical interlock).
2. Color Code: Black channel numbers indicate System I; red channel numbers indicate System II.
3. CHAN CHK switch must be operated to the system (I or II) equipped with the channel check circuit pack (DP58). Should both systems contain a channel check circuit pack, either position (I or II) may be used. The DAS 811J-L1 makes it possible to share a single channel check circuit pack between two systems.)
4. For channel under test only. All others shall be operated to NORM.

3.13 *Test Procedure:*

STEP	PROCEDURE
1	At this point, the data path should be complete in one direction and the test signal applied. Observe that no CF or alarm lamps are lighted and that the TEST lamp is lighted at the far end on the 18B-49 indicator.
2	At the far end, ask the customer to observe the CHAN CHK meter.  <b>Requirement:</b> The meter should indicate in the green area. If the meter does not indicate in the green area, see Part 4.
3	Reverse the procedure of 3.10 for testing in the opposite direction.

**E. Test—1A Data Station at One End and 43A1 or 43B1 Terminal at the Other End**

312-710-500. For the 43A1 VFCT System, refer to the 312-7YY-ZZZ series of practices.

**3.14 General:** When a 1A Data Station and a 43A1 or 43B1 terminal are at opposite ends, the channel will *always* be operated in the binary mode. (The 43A1 or 43B1 terminal can operate only in the binary mode.)

**3.17 Equipment Required:** At the 1A Data Station end—only that equipment which is built into the station is required. At the 43A1 or 43B1 terminals, refer to the 312-7YY-ZZZ series of practices.

**3.15** The 1A Data Station may be operated as either the near-end or far-end station for remote tests (Part 3C) or end-to-end tests (Part 3D).

**3.18 Preparation for Remote Tests (Remote Test of 1A Data Station From 43A1 or 43B1 Terminal):** Operate the controls on DAS 811G-L1 and 811H-L1 at the far end as specified in Table B.

**3.16** Should it become necessary to test the transmit or receive end located at the 43B1 VFCD System, refer to Sections 312-710-200 and

**3.19 Test Procedure:**

STEP	PROCEDURE
1	Verify that switches at the far end are operated as specified in Table B.
2	Tests will be run from the No. 2 serviceboard, No. 9B serviceboard, data observing test center (DOTC), or equivalent hub-type office as indicated in Section 312-710-200 or 312-710-201.

**3.20 Preparation for End-to-End Test (43A1 or 43B1 Terminal to 1A Data Station):**

- (a) Establish voice contact with the serviceboard serving the 43A1 or 43B1 terminal.

(b) In this case the 1A Data Station is the far end; therefore, operate the switches on DAS 811G-L1, 811H-L1, or 811J-L1 as specified in Table D.

**3.21 Test Procedure:**

STEP	PROCEDURE
1	At this point, the data path should be complete in one direction from the 43A1 or 43B1 to the 1A Data Station. Request a dotting signal be sent from the 43A1 or 43B1 terminal.
2	At the far (1A Data Station) end, observe the CHAN CHK meter.  <b>Requirement:</b> The meter should indicate in the green area. If the meter does not indicate in the green area, see Part 4 (Troubleshooting).

**3.22 Preparation for End-to-End Test (1A Data Station to 43A1 or 43B1 Terminal):**

- (a) Establish voice contact with the 43A1 or 43B1 end.

(b) In this case the 1A Data Station is the near end; therefore, operate the switches on the DAS 811G-L1, 811H-L1, or 811J-L1 as specified in Table C.

**3.23 Test Procedure:**

STEP	PROCEDURE
1	At this point, the data path should be complete in one direction from the 1A Data Station to the 43A1 or 43B1 terminal and a test signal applied at the 1A Data Station.
2	At the 43A1 or 43B1 terminal end, observe the received signal.  <b>Requirement:</b> The dotting signal should be received with distortion within tolerance specified in Sections 312-710-200 and 312-710-500. If the allowable distortion tolerance is not attained, see Part 4 (Troubleshooting).

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### 4. TROUBLESHOOTING

**4.01 General:** The preceding tests (Part 3) are designed to determine if the 1A Data Station is operating properly. If the 1A Data Station does not meet the conditions specified in Part 3, refer to the troubleshooting Tables E, F, G, H, and I for the normal condition to be expected at the various test points.

#### 4.02 *Equipment Required:*

- (a) KS-20538-L1 VOM or equivalent 20,000 ohms-per-volt meter
- (b) J79901B-L3 Interface Test Adapter (Cover only of 901B Data Test Set)
- (c) KS-19935-L7 Telegraph Carrier Test Set (Stelma).

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

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

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

#### 4.05 *Use of the Test Features:*

(a) The remote data loop (DA LP) test can be used to make certain checks of a station as an aid in isolating trouble. Although the remote tests do not check the control functions, they do provide a means of checking the station and transmission facilities. In the data loop (DA LP) mode, a signal can be sent from a distant station to the station under test. The signal is received, looped back at the customer interface, and transmitted back to the distant station. If the

signals received at the distant station are essentially the same as those transmitted, then the station under test is assumed to be operating properly. If the signals received at the distant station are not essentially the same as those transmitted, then the station under test or the facility is operating improperly. Usually, if the facility is in trouble, more than one channel will be affected.

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

#### 4.06 *Replacing Circuit Packs:*

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

(b) When replacing a circuit pack, verify that the correct options and no others are installed on the new circuit pack for that particular 1A Data Station arrangement.

(c) If the trouble cannot be isolated to a particular circuit pack within the 1A Data Station, replace all circuit packs as follows:

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

(2) Reinstall all original circuit packs that do not correct the trouble one at the time, except for the new one which corrected the trouble.

(3) If after replacing an original circuit pack the 1A Data Station does not function properly, the circuit pack being replaced is probably defective and should be returned to the Distribution House for repair.

TABLE E

TROUBLESHOOTING TABLE FOR DATA AND SUPERVISION SIGNALS

NORMAL CONDITION				TEST EQUIPMENT	PROBABLE TROUBLE AREA (NOTE 4)
MARK	SPACE	SUPERVISION			
		OFF	ON		
32 dBm ± 2 dB	-32 dBm ± 2 dB	—	—	KS-20538-L1 (Note 7)	DP26-DP50, DP52 (Note 3), Facility, or Other Station
16 Volts ± 3 Volts	+16 Volts ± 3 Volts	—	—		DP51 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
32 dBm ± 2 dB	-32 dBm ± 2 dB	-31 dBm ± 2 dB	—		DP26-DP50, DP52 (Note 3), Facility, or Other Station
13 Volts ± 2 Volts	+13 Volts ± 2 Volts	-1.4 Volts ± 0.2 Volts	+13 Volts ± 2 Volts		DP57 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
16 Volts ± 3 Volts	+16 Volts ± 3 Volts	-16 Volts ± 3 Volts	—		DP65 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
—	—	-0.2 Volts +0.0 Volts Tol. -0.2 Volts	-23 Volts ± 3 Volts		DP65 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
—	—	—	—		—
23 Volts ± 3 Volts	+23 Volts ± 3 Volts	—	—		DP63, DP26-DP50, DP52 (Note 3), Facility, or Other Station
0.44 Volts ± 0.15 Volts	-0.44 Volts ± 0.15 Volts	—	—		DP63, DP26-DP50, DP52 (Note 3), Facility, or Other Station
0.44 Volts ± 0.15 Volts	-1.32 Volts ± 0.25 Volts	—	—		DP63, DP26-DP50, DP52 (Note 3), Facility, or Other Station
16 Volts ± 3 Volts	+16 Volts ± 3 Volts	—	—		DP51 or DP57, DP26-DP50, DP52 (Note 3), Facility, or Other Station
13 dBm ± 0.5 dB	-13 dBm ± 0.5 dB	-12 dBm ± 0.5 dB	—		DP1-DP25, DP65, or DP57
0.2 Volts ± 0.2 Volts	+5.5 Volts ± 1.5 Volts	—	—		DP65
7 Volts ± 2 Volts	—	—	—		DP56, DP68
Note 2)	(Note 2)	(Note 2)	—	KS-20538-L1 for Composite Signal or KS-19935-L7 Telegraph Carrier Test Set (Stelma)	DP52 (Note 3), DP1-DP25, DP65, or DP56
12 dBm ± 2 dB	-12 dBm ± 2 dB	-11 dBm ± 2 dB	—	KS-19935-L7 Telegraph Carrier Test Set (Stelma)	Facility, Other End Station, DP59, or DP52
See TCLR for RCV Levels (Note 6)	—	—	—		Facility, Other End Station, or DP52
See TCLR for TRMT Levels (Note 6)	—	—	—	—	—

NOTES:

1. Values shown at TRMTR OUT test point are for DW channels. SW channels are 3 dB lower.
2. 600 Ω facility: 4 dB higher than that delivered to facility.  
900 Ω facility: 2 dB higher than that delivered to facility.
3. Only if LIM IN values for all channels are not normal.
4. Replace circuit packs per 4.06.
5. For distortion measurements, use 911-type Data Test Sets.
6. See Table H.
7. Or equivalent, for low level ac voltage measurements.
8. DP55 (MD) may be installed in early units. DP65 is standard.
9. High impedance meter at the designated (as per TCLR) reference channel.
10. Positive terminal of DC voltmeter at TP1, negative terminal at TP2. Mark signal incoming from far loop end.
11. Positive terminal of DC voltmeter at TP1, negative terminal at TP2. Space signal incoming from far loop end.
12. Station CUR interface (DP68 circuit pack) has no test points.

TABLE E

TROUBLESHOOTING TABLE FOR DATA AND SUPERVISION SIGNALS

CIRCUIT PACK	TEST POINT	NORMAL CONDITION				TEST EQUIPMENT	PROBABLE TROUBLE AREA (NOTE 4)
		MARK	SPACE	SUPERVISION			
				OFF	ON		
BINARY RCV INTF (DP51)	LIM IN	-32 dBm ± 2 dB	-32 dBm ± 2 dB	—	—	KS-20538-L1 (Note 7)	DP26-DP50, DP52 (Note 3), Facility, or Other Station
	EIA OUT (Note 5)	-16 Volts ± 3 Volts	+16 Volts ± 3 Volts	—	—		DP51 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
TERNARY RCV INTF (DP57)	LIM IN	-32 dBm ± 2 dB	-32 dBm ± 2 dB	-31 dBm ± 2 dB	—	KS-20538-L1 (Note 7)	DP26-DP50, DP52 (Note 3), Facility, or Other Station
	RS	+13 Volts ± 2 Volts	+13 Volts ± 2 Volts	-1.4 Volts ± 0.2 Volts	+13 Volts ± 2 Volts		DP57 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
STA EIA INTF (DP65) (Note 8)	RD (Note 5)	-16 Volts ± 3 Volts	+16 Volts ± 3 Volts	-16 Volts ± 3 Volts	—	KS-20538-L1 (Note 7)	DP65 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
	TS	—	—	-0.2 Volts +0.0 Volts Tol. -0.2 Volts	-23 Volts ± 3 Volts		DP65 plus DP26-DP50, DP52 (Note 3), Facility, or Other Station
STA BAL INTF (DP63)	TS	—	—	—	—	KS-20538-L1 (Note 7)	—
	TRS	+23 Volts ± 3 Volts	+23 Volts ± 3 Volts	—	—		DP63, DP26-DP50, DP52 (Note 3), Facility, or Other Station
	TP1-TP2 (Note 10)	+0.44 Volts ± 0.15 Volts	-0.44 Volts ± 0.15 Volts	—	—		DP63, DP26-DP50, DP52 (Note 3), Facility, or Other Station
	TP1-TP2 (Note 11)	-0.44 Volts ± 0.15 Volts	-1.32 Volts ± 0.25 Volts	—	—		DP63, DP26-DP50, DP52 (Note 3), Facility, or Other Station
	RD	-16 Volts ± 3 Volts	+16 Volts ± 3 Volts	—	—		DP51 or DP57, DP26-DP50, DP52 (Note 3), Facility, or Other Station
TRMTR (DP1-DP25)	TRMTR OUT (Note 1)	-13 dBm ± 0.5 dB	-13 dBm ± 0.5 dB	-12 dBm ± 0.5 dB	—	KS-20538-L1 (Note 7)	DP1-DP25, DP65, or DP57
TRMTR WITH STA EIA INTF (DP65)	EIA IN	+0.2 Volts ± 0.2 Volts	+5.5 Volts ± 1.5 Volts	—	—		DP65
TRMTR WITH STA CUR INTF (DP56 or DP68)		-7 Volts ± 2 Volts		—	—		DP56, DP68
LINE CKT (DP52)	SEND	(Note 2)	(Note 2)	(Note 2)	—	KS-20538-L1 for Composite Signal or KS-19935-L7 Telegraph Carrier Test Set (Stelma)	DP52 (Note 3), DP1-DP25, DP65, or DP56
	RCV	-12 dBm ± 2 dB	-12 dBm ± 2 dB	-11 dBm ± 2 dB	—		Facility, Other End Station, DP59, or DP52
TS (A) ON 29A1	TERM 1 AND 2	See TCLR for RCV Levels (Note 6)			—	KS-20538-L1 for Composite Signal or KS-19935-L7 Telegraph Carrier Test Set (Stelma)	Facility, Other End Station, or DP52
	TERM 3 AND 4	See TCLR for TRMT Levels (Note 6)					

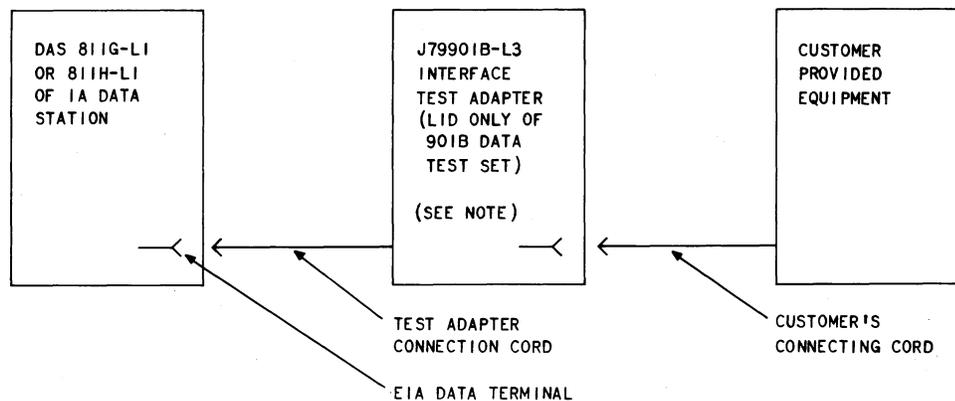
## NOTES:

- Values shown at TRMT
- 600 Ω facility: 4 dB high  
900 Ω facility: 2 dB high
- Only if LIM IN values for
- Replace circuit packs per
- For distortion measuremen
- See Table H.
- Or equivalent, for low le
- DP55 (MD) may be insta
- High impedance meter a
- Positive terminal of DC
- Positive terminal of DC
- Station CUR interface (

**4.07 EIA Connector on DAS 811G-L1 or DAS 811H-L1:** Table E gives the values expected at the customer connection at the EIA connector (25-pin) using a 901B test set adapter (Fig. 2).

**4.08 Procedure for Monitoring Voltage Signals at the EIA Connector Using a Station EIA Interface (DP65 Circuit Pack):**

STEP	PROCEDURE
1	Disconnect the customer plug from the EIA connector on the DAS 811G or 811H.
2	Connect the test adapter connection cord plug to the EIA connector (Fig. 2).
3	Connect the customer data plug to the connector on the face of the 901B interface test adapter (Fig. 2).
4	Connect the ground probe of a KS-20538-L1 VOM to pin 7 (signal ground) of the 901B interface test adapter.
5	Connect the positive probe of the KS-20538-L1 to the pin whose signal is to be measured.  <b>Requirement:</b> See Table F for voltages and polarity to be expected at the various pins for the mode under consideration.
6	Remove the VOM connections.
7	Disconnect the 901B interface test adapter.
8	Reconnect the customer plug to the EIA connector on the DAS 811G or 811H.



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

**Fig. 2—Connections for Gaining Access to EIA Data Terminal—IA Data Station, MCA**

**SECTION 591-813-500**

**4.09 Procedure for Monitoring the Transmitted and the Received Data Current at the EIA Connector on DAS 811G-L1 or 811H-L1 Using a Station CUR Interface (DP56 and DP68 Circuit Packs):**

STEP	PROCEDURE
1	Disconnect the customer plug from the EIA connector on the DAS 811G or 811H.
2	Connect the test adapter connection cord plug to the EIA connector on the DAS (Fig. 2).
3	Connect the customer data plug to the connector on the face of the 901B interface test adapter (Fig. 2).
<b>Monitoring of Transmitted Data Current For a DP56 Circuit Pack</b>	
4	Loosen screws and slide captive shorting clip number 2 of the test adapter to the open position.
5	Connect the positive probe of the VOM to the EQ terminal of number 2 clip.
6	Connect the negative probe of the VOM to TST terminal of number 2 clip.
7	Send a steady mark.
<b>Requirement:</b> 20 mA $\pm$ 3 mA	
<b>Remedial Action:</b> See Section 591-813-300.	
8	Remove VOM connections.
9	Restore the captive shorting clip to the closed position.
<b>Monitoring of Transmitted Data Current For a DP68 Circuit Pack</b>	
10	Loosen screws and slide captive shorting clip number 2 of the test adapter to the open position.
11	Connect the positive probe of the VOM to the TST terminal of number 2 clip.
12	Connect the negative probe of the VOM to EQ terminal of number 2 clip.
13	Send a steady mark.
<b>Requirement:</b> 20 mA $\pm$ 3 mA for DP68 strapped for 20-mA; 62.5 mA $\pm$ 3 mA for DP68 strapped for 62.5-mA.	
<b>Remedial Action:</b> See Section 591-813-300.	
14	Remove VOM connections.

TABLE F

VALUES TO BE EXPECTED AT CUSTOMER CONNECTION AT EIA CONNECTOR (25-PIN) ON DAS 811G-L1 AND DAS 811H-L1

PIN AND CLIP NUMBERS (NOTE 1)	LEAD	CIRCUIT NOMENCLATURE	STATION INTERFACE				
			MODE	EIA (DP65) (NOTE 3) (NOTE 4)	CUR (DP56) (3-WIRE)	CUR (DP68) (NOTE 5)	
						62.5 mA	20 mA
1	AA	Protective Ground	—	GRD	GRD	GRD	GRD
2	BA (Note 2)	Transmitted Data	MARK	-14 ±11V	—	—	—
			SPACE	+14 ±11V			
3	BB	Received Data	MARK	-15 ±3V	—	—	—
			SPACE	+15 ±3V			
4	CA	Request-to-Send	OFF	-17 ±3V	—	—	—
			ON	+24 ±3V			
5	CB	Clear-to-Send	Same as CC lead when E6 strapped to E7		—	—	—
6	CC	Data Set Ready	OFF	-17 ±3V	—	—	—
			ON	+24 ±3V			
7	AB	Signal Ground	—	GRD	GRD	GRD	GRD
8	CF	Received Line Signal Detector	OFF	+24 ±3V	+24 ±3V	+24 ±3V	+24 ±3V
			ON	-15 ±3V	-15 ±3V	-15 ±3V	-15 ±3V
9	+24V	Data Set Test	—	+24 ±3V	+24 ±3V	+24 ±3V	+24 ±3V
10	-24V	Data Set Test	—	-24 ±3V	-24 ±3V	-24 ±3V	-24 ±3V
20	CD (Note 2)	Data Terminal Ready	OFF	-14 ±11V	—	—	—
			ON	+14 ±11V			

**NOTES:**

1. The 1A Data Station EIA interface terminal numbers and the 901B interface test adapter captive shorting clip numbers are the same. (Numbers not listed are not used.)
2. From customer equipment.
3. Early stations may have DP55 (MD) installed. DP65 is Standard.
4. Voltage levels relative to pin 7, lead AB (Signal Grd).
5. Strap point A to point V for 62.5 mA. Points A and B are unstrapped for 20 mA.

STEP	PROCEDURE
15	Restore the captive shorting clip to the closed position.
16	Loosen screws and move captive shorting clip number 3 of the test adapter to the open position.
17	Connect the negative probe of the VOM to the TST terminal of number 3 clip.
18	Connect the positive probe of the VOM to the EQ terminal of number 3 clip.
19	Send a steady space. <b>Requirement:</b> 0 mA $\pm$ 2 mA for DP56 and DP68
20	Remove VOM connections.
21	Restore the captive shorting clip to the closed position.
22	Disconnect the 901B interface test adapter.
23	Reconnect the customer plug to the EIA connector on the DAS 811G or 811H.

**4.10 Procedure for Monitoring the Loop Current  
When Associated with a Station Balanced  
Interface (DP63 Circuit Pack) and DAS 811J-L1:**

Current levels and polarity in the loop are reflected as voltages at TP1 and TP2 test points on the

station balanced interface. These values are shown in Table E.

**4.11** Should it become necessary to monitor the current in the loop itself, proceed as follows:

STEP	PROCEDURE
1	At the connector block associated with the near 1A Data Station, identify the troubled channel and BA lead. See Table G.
2	At the connector block, open the BA lead.
3	Connect a 0-to-5 mA milliammeter in series with the BA lead with the positive probe towards the near-end J6 connector of the DAS 811J-L1. <b>Requirement:</b> Current values and polarities with tolerances as given in Table H.
4	Disconnect milliammeter.
5	Reconnect BA lead at connector block.

TABLE G

CORRELATION OF SYSTEM, DATA MOUNTING,  
J6 CONNECTOR ON DAS 811J-L1 (NOTE 1)

SYSTEM	DATA MOUNTINGS FROM TOP, DOWN	CHANNEL POSITION IN 29-TYPE DATA MOUNTING	DAS 811J-L1 J6 50-PIN CONN	
			BB LEAD PIN NO. (NOTE 2)	BA LEAD PIN NO. (NOTE 2)
I	1st 29A1	B	1	26
		C	2	27
	1st 29B1	A	3	28
		B	4	29
		C	5	30
		D	6	31
2nd 29B1 (Note 3)	A	7	32	
	B	8	33	
II	2nd 29B1 (Note 4)	C	9	34
		D	10	35
	29A1	B	11	36
		C	12	37
	3rd 29B1	A	13	38
		B	14	39
C		15	40	
D		16	41	

**Notes:**

1. For 2-system configuration, 8 channels each. Similar for other arrangements.
2. Pins 17 through 25 and 42 through 50, not used.
3. Shared with System II.
4. Shared with System I.

TABLE H

LOOP CURRENT IN A TRUNK OR LINE  
WHEN ASSOCIATED WITH A STATION  
BALANCED INTERFACE (DP63 CIRCUIT  
PACK) AND A DAS 811J-L1 IN mA

DP63 CIRCUIT PACK		FAR END 1A DATA STA	
		MARK	SPACE
NEAR END 1A DATA STATION	MARK	+3 ±0.5	-3 ±0.5
	SPACE	-3 ±0.5	-9 ±1.5

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

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

STEP	PROCEDURE
1	<p><b>For positive dc voltage (KS-20538-L1 VOM):</b></p> <p>Connect the black lead probe of the VOM to the GRD test point on the line circuit (DP52 circuit pack).</p>
2	<p>Operate the slide switch on the gray lead probe to the DCV position.</p>
3	<p>Connect the gray lead probe of the VOM to the desired circuit pack test point.</p> <p><b>Requirement:</b> Dc voltage levels and polarities with tolerances as given in Table E.</p>
4	<p><b>For negative dc voltages (KS-20538-L1 VOM):</b></p> <p>Reverse the probe connections of Steps 1 and 3.</p> <p><b>Requirement:</b> Dc voltage levels and polarities with tolerances as given in Table E.</p>

**4.14** Table I gives the power level in dBm of the composite signal above the per-channel level to be expected of a normally operating system when measured at terminal strip TS(A), located on 29A1 data mounting.

**4.15 Procedure for Measuring Power Levels at Terminal Strip TS(A) Located on the 29A1 Data Mounting with a KS-20538-L1 VOM:**

STEP	PROCEDURE
1	<p>Operate the slide switch on the gray lead probe to the ACV, <math>\Omega</math>, MA position.</p>
2	<p><b>Receive Composite Level:</b> Connect VOM probes to TS(A) terminals 1 and 2 on the 29A1 data mounting.</p> <p><b>Requirement:</b> Ac power level as required by Table H and TCLR.</p>
3	<p><b>Transmit Composite Level:</b> Connect VOM probes to TS(A) terminals 3 and 4 on the 29A1 data mounting.</p> <p><b>Requirement:</b> Ac power level as required by Table I and the TCLR.</p>

TABLE I

POWER IN dBm OF COMPOSITE SIGNAL\*  
ABOVE THE PER-CHANNEL LEVEL  $\pm 1$  dB

QUANTITY OF CHANNELS		POWER IN dBm OF COMPOSITE SIGNAL ABOVE THE PER-CHANNEL LEVEL
SW	DW	
1	—	0.0
2	1	3.0
3	—	4.8
4	2	6.0
5	—	7.0
6	3	7.8
7	—	8.5
8	4	9.0
9	—	9.5
10	5	10.0
11	—	10.4
12	6	10.8
13	—	11.0
14	7	11.5
15	—	11.8
16	8	12.0
17	—	12.3

\* Composite signal as specified on TCLR

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

**4.17** *Procedure for Measuring Voltages at the Test Points on the Alarm Circuit Pack as Shown in Table J:*

STEP	PROCEDURE
	<b><i>For positive dc voltages (KS-20538-L1 VOM):</i></b>
1	Connect the black lead probe of the VOM to the GRD test point on the line circuit (DP52 circuit pack).
2	Operate the slide switch on the gray lead probe to the DCV position.
3	Connect the gray lead probe of the VOM to the desired test point on the alarm circuit.
	<b><i>Requirement:</i></b> Dc voltage level and polarity with tolerances as given in Table J.

STEP	PROCEDURE
4	<p><i>For negative dc voltages (KS-20538-L1 VOM):</i></p> <p>Reverse the probe connections of Steps 1 and 3.</p> <p><b>Requirement:</b> Dc voltage level and polarity with tolerances as given in Table J.</p>

TABLE J

TROUBLESHOOTING TABLE FOR SYSTEM ALARM

CIRCUIT PACK	TEST POINT	NORMAL CONDITION	ALARM CONDITION
System Alarm (DP62)	$\bar{N}_1$	-12 ±1V	-0.1 ±0.1V
	$\bar{N}_2$	-12 ±1V	-0.1 ±0.1V
	CD	0.5 ±0.2V	+18.6 ±2V
	SAS	0.75 ±0.2V	-18.2 ±2V

## 5. CUSTOMER VERIFICATION

**5.01** When a test is completed, all test requirements have been met, and no further tests are to be made, suggest that the customer verify service as satisfactory. If the customer has data to deliver, verify that the service is satisfactory in this manner. If the customer has no data to deliver, consider the station satisfactory for interim service. When customer verification has been completed, return the station to normal service. If the service is not satisfactory, repeat the test procedures or refer to immediate supervisor.

## 6. REFERENCES

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

NUMBER	TITLE
SD-&CD-1D148-01	1A Data Station, Multichannel Arrangements
SD-&CD-81978	KS-20575 Rectifier
SD-&CD-70958-01	43B1 Voice Frequency Carrier Data System, Multichannel Arrangements.
<b>6.02</b>	For additional information relating to this section, also refer to the following Bell System Practices:

SECTION	TITLE
591-813-100	1A Data Station—Multichannel Arrangements—Description and Operation
591-813-200	1A Data Station—Multichannel Arrangements—Installation
591-813-300	1A Data Station—Multichannel Arrangements—Maintenance
591-813-180	Data System, 1A Data Station—Multichannel Arrangements—Summarizing Specification
312-710-100	43B1 Voice Frequency Carrier Data System—General Description
312-710-200	43B1 Voice Frequency Carrier Data System—Installation and Out-of-Service Tests

**SECTION 591-813-500**

312-710-201	43B1 Voice Frequency Carrier Data System—2- and 4-Wire Connections—Description and Installation	107-100-100	901A and 901B Data Test Sets—Identification and Operation
		103-635-100	4A Frequency Analyzer—Description
312-710-500	43B1 Voice Frequency Carrier Data System—Trouble Locating Tests	660-450-302	Circuit Order or Trunk Order Tests for Carrier Telegraph Layouts
314-410-500	Private Line Data Circuits—Voice Bandwidth Circuits for Miscellaneous Data—Overall Tests and Requirements	807-170-161	43B1 Voice Frequency Carrier and Associated Equipment—Data Systems
		AB27.350	Voice Bandwidth Circuits for Private Line Data Use—2000 Series and 3002 Channels—General Information
332-852-107	4066G Network—Description		
598-073-100	Data Auxiliary Set 811G—Identification		
		AB83.048.01	43B1 Voice Frequency Carrier Data System—General Engineering Considerations.
598-074-100	Data Auxiliary Set 811H—Identification		
590-102-125	29-Type Data Mounting—Identification		