10A DATA LINE CONCENTRATOR

TEST PROCEDURES

1. GENERAL

1.01 This test covers the procedures to be followed when testing the 10A Data Line Concentrator in order to locate a trouble condition. Installation testing is covered in the section entitled 10A Data Line Concentrator—Installation and Connections (591-811-200) and therefore will not be covered herein.

1.02 This section is reissued to include corrections as indicated by arrows.

1.03 The tests covered are:

A. Line Connection Test: This test checks the ability of the concentrator to connect a specific line to a specific trunk.

B. Switching Matrix Network Test: This test checks continuity between the tip and ring leads of a particular line circuit (AR365) and the tip and ring leads of a particular trunk circuit (AR368) through the switching matrix network crosspoints.

C. Control, Line and Switch, and Trunk Module Test: This test checks the voltages on the terminal boards of the control module (TB1), line and switch module ▶(TB3),◀ and trunk module ▶(TB2).◀

D. Circuit Pack Test: This test checks the voltages and signals present on the test points of the AR365, AR368, AR370, AR371, AR374, AR375, and AR384 circuit packs used in the concentrator.

E. Repeat Trunk Test: This test checks the ability of the concentrator to connect a specific trunk to any or all lines.

F. Q1 Test: This test checks transistor Q1 on the 23A1 Data Mounting.

1.04 These tests should be performed in accordance with the section entitled 10A Data Line Concentrator—Maintenance (591-811-300).

When the Data Auxiliary Set (DAS) 803E1 and AR464 circuit pack are used to establish a connection, the call request is placed in queue the same as any normal call. ▶Thus, if the line scanner is not working or if the test connection is attempted during periods of heavy traffic, it may take a long time to establish the test connection.◀ It is therefore advised that Tests A, B, and E be performed during a nonbusy hour.

2. APPARATUS

Tests A, B, and E

2.01 DAS 803E1 and AR364 circuit pack (manual test set supplied with concentrator).

Tests B, C, D, and F

2.02 KS-14510-L1 volt-ohm-milliammeter (VOM), or equivalent.

3. PROCEDURES

Test A. Line Connection Test

STEP	PROCEDURE
1	Plug AR464 circuit pack into slot 11 of the right-hand nest of the 23A1 Data Mounting.
2	Plug J5 of the AR464 circuit pack into P5 of the DAS 803E1.
3	Operate switch on DAS 803E1 to OFF.

STEP	PROCEDURE
4	Locate the AR365 circuit pack corresponding to the line circuit to be connected.
5	Connect the DAS 803E1 test cord (LINE CORD) to the test points of the line circuit to be tested. ***Note:*** Each red clip of the DAS 803E1 LINE CORD has two numbers on it and the black clip has four numbers. The numbers 1 and 9 on the black clip may be disregarded. The remaining two numbers and the two numbers on the red clips correspond to the test points on the AR365 circuit pack. Test points TP2, 3, 4, 5, and 6 of the AR365 circuit pack are associated with the circuitry for the odd-numbered lines and should be connected to the corresponding clip on the DAS 803E1 LINE CORD. Test points TP10, 11, 12, 13, and 14 of the AR365 circuit pack are associated with the circuitry for the even-numbered lines and should be connected to the corresponding clip on the DAS 803E1 LINE CORD.
6	Connect the AR464 circuit pack test cord (TRUNK CORD) to the test points of the AR368 circuit pack corresponding to the trunk circuit to be connected. ***Note:*** Each clip of the AR464 circuit pack TRUNK CORD has a number on it which corresponds to the test points on the AR368 circuit pack.
7	Operate switch on DAS 803E1 to TRK HOLD. ***Requirement:*** LB and TB lamps extinguished. ***A lighted LB lamp indicates that the line is in service, and a lighted TB lamp indicates that the trunk is connected to a line. If the LB and/or TB lamps are lighted, wait until both are extinguished before proceeding to Step 8.***
8	Operate switch of DAS 803E1 to LINE CONN. ***Note:*** For the connection to be established, the line must be served in the normal queue. If the test is made during a busy hour, it may take some period of time for the CONN, LB, and TB lamps to light after the DAS is switched to LINE CONN. ***Requirement:*** CONN, LB, and TB lamps lighted. If the CF lamp lights before the TB lamp, it indicates that the trunk circuit is not seeing the proper voltage across L1 and L2 of the trunk. This generally indicates a trouble condition (eg, trunk loop open, trunk loop shorted, or port data set squelching current). It is also possible that the trunk data set (or 1A Data Station) has been made busy. Although a line will normally be unable to connect to a trunk in this condition, the manual test equipment can force the connection of any line to this trunk. If the CF lamp lights after the TB lamp, it indicates that no current is flowing in the loop. This is a normal condition as long as the station on that line is not turned on.
9	If no further tests are to be performed, operate switch on DAS 803E1 to OFF and disconnect DAS 803E1 and AR464 circuit pack test cords from the line and trunk circuits. ***It is important to disconnect the test cords when the test is finished because as long as they are connected, the trunk will appear busy to the concentrator.***

Test B. Switching Matrix Network Test

STEP	PROCEDURE
1	Perform Steps 1 through 8 of Test A.
2	Operate switch on DAS 803E1 to TIP.
3	Condition VOM to measure 200 ohms.
	Caution: In order to avoid damaging the matrix contacts, do not use any instrument other than a VOM.
4	Connect VOM meter leads to RES and COM binding posts on the DAS 803E1.
	Requirement: Meter indicates 100 to 200 ohms.
5	Operate switch on DAS 803E1 to RING/LINE.
	Requirement: Meter indicates 100 to 200 ohms.
6	Disconnect VOM from DAS 803E1.
7	End of test; operate switch on DAS 803E1 to OFF, and disconnect DAS 803E1 and AR464 circuit pack test cords from line and trunk circuits.
	It is important to disconnect the test cords when testing is finished, because as long as they are connected, the trunk will appear busy to the concentrator.

Test C. Control, Line and Switch, and Trunk Module Test
Control Module (23A1 Data Mounting)

STEP	PROCEDURE
	Caution: Do not attempt to measure the voltage on terminal 1 of TB1 on the 23A1 Data Mounting. This is a 750-volt pulse of approximately 300 microseconds duration whenever a crosspoint switch is operated, and attempting to measure it may damage the equipment.
1	Condition the VOM to measure resistance.
2	Connect positive VOM lead to ground and negative lead to TB1-3.
	Requirement: Meter indicates zero ohms.

STEP	PROCEDURE
3	Condition VOM to measure 24 volts dc.
4	Disconnect positive VOM lead and connect it to TB1-2.
	Requirement: Meter indicates 22 to 26 volts.
5	Disconnect both VOM leads and connect positive lead to TB1-3 and negative lead to TB1-4.
	Requirement: Meter indicates 22 to 26 volts and within 2 volts of reading for Step 4.
6	When concentrator serves 64 lines or less, disconnect negative VOM lead and connect it to TB1-5.
	Requirement: Meter indicates 22 to 26 volts.
7	When concentrator serves 65 lines or more, condition VOM to measure 48 volts dc, disconnect negative VOM lead, and connect it to TB1-5.
	Requirement: Meter indicates 46 to 50 volts.
8	Disconnect both VOM leads.
	Line and Switch Module (18A1, 19A1, or 20A1 Data Mounting)
9	Condition VOM to measure resistance.
10	Connect positive VOM lead to ground and negative lead to TB3 GND.
	Requirement: Meter indicates zero ohms.
11	Condition VOM to measure 24 volts dc.
12	Disconnect positive VOM lead and connect it to TB3 +.
	Requirement: Meter indicates 22 to 26 volts.
13	Disconnect both VOM leads and connect positive lead to TB3 GND and negative lead to TB3—.
	Requirement: Meter indicates 22 to 26 volts and within 2 volts of reading for Step 12.
14	Disconnect both VOM leads.
	Trunk Module (21A1 or 22A1 Data Mounting)
	Caution: Do not attempt to measure the voltage on terminal 1 of TB2 on the 21A1 or 22A1 Data Mounting. This is a 750-volt pulse of approximately 300 microseconds duration whenever a crosspoint switch is operated, and attempting to measure it may damage this equipment.

STEP	PROCEDURE
15	Condition the VOM to measure resistance.
16	Connect the positive VOM lead to ground and the negative lead to TB2-3.
	Requirement: Meter indicates zero ohms.
17	Condition the VOM to measure 24 volts dc.
18	Disconnect positive VOM lead and connect it to TB2-2.
	Requirement: Meter indicates 22 to 24 volts.
19	Disconnect both VOM leads and connect positive lead to TB2-3 and negative lead to TB2-4.
	Requirement: Meter indicates 22 to 26 volts and within 2 volts of reading for Step 18.
20	End of test; disconnect both VOM leads.

Test D. Circuit Pack Test

STEP	PROCEDURE
1	Condition VOM to measure 24 volts dc.
	AR365 Circuit Pack (Line Circuit)
	Note: The test point (TP) number shown in parentheses in this part of the test corresponds to the TP number of the portion of the AR365 circuit pack that is associated with the even-numbered lines.
2	Connect negative VOM lead to TB3 GND of the line and switch module.
3	Connect positive VOM lead to TP2 (10) of the AR365 circuit pack.
	Requirement: Line idle—Meter indicates zero volts. Line busy—Due to possible ground potential, meter may or may not indicate voltage present.
4	Disconnect positive VOM lead and connect it to TP3 (11).
	Requirement: Line idle—Meter indicates voltage present. Line requesting service or busy—Meter indicates near zero volts.
5	Disconnect positive VOM lead and connect it to TP4 (12).
	Requirement: Line idle or requesting service and not scanned—Meter indicates zero or near zero volts. Line busy—Meter indicates voltage present.

STEP	PROCEDURE
6	Disconnect positive VOM lead and connect it to TP5 (13).
	Requirement: Line scanner on line—Meter indicates zero or near zero volts. Line scanner scanning—Meter indicates voltage present.
7	Disconnect positive VOM lead and connect it to TP6 (14).
	Requirement: Line idle—Meter indicates zero volts. Line busy—Due to possible ground potentials, meter may or may not indicate voltage present.
8	Disconnect both meter leads.
	AR368 Circuit Pack (Trunk Circuit)
9	Condition VOM to measure 24 volts dc.
10	Connect negative VOM lead to TB2-3 of 21A1 or 22A1 Data Mounting.
11	Connect positive VOM lead to TP1 of AR368 circuit pack.
	Requirement: Meter indicates zero volts.
12	Condition VOM to measure resistance.
	Requirement: Meter indicates zero ohms.
13	Condition VOM to measure 24 volts dc.
14	Disconnect positive VOM lead and connect it to TP2.
	Requirement: Trunk idle—Meter indicates zero volts. Line busy—Due to possible ground potentials, meter may or may not indicate voltage present.
15	Disconnect positive VOM lead and connect it to TP9.
	Requirement: Relay K1 operated—Meter indicates zero volts. Relay K1 ***not*** operated—Meter indicates 22 to 26 volts.
16	Disconnect positive VOM lead and connect it to TP10.
	Requirement: Trunk connected to a line—Meter indicates zero volts. Trunk ***not*** connected to a line—Meter indicates 22 to 26 volts.
17	Disconnect positive VOM lead and connect it to TP12.
	Note: TP11 is not used.
	Requirement: Trunk idle—Meter indicates zero volts. Trunk busy—Due to possible ground potentials, meter may or may not indicate voltage present.

STEP	PROCEDURE
	Note: Polarity of voltage appearing on TP13 (Step 18) will depend on whether or not marking battery is being received from the trunk (see requirement for Step 18).
18	Disconnect positive (or negative) VOM lead and connect it to TP13. ***Requirement:*** Trunk circuit receiving marking battery from trunk—Meter indicates ▶−16 to −20 volts.◀ Trunk circuit ***not*** receiving marking battery from trunk—Meter indicates ▶+22 to +26 volts.◀
19	Disconnect VOM positive lead and connect it to TP14. ***Requirement:*** Trunk idle—Meter indicates zero or near zero volts. Trunk busy or K1 relay operated—Meter indicates voltage present.
20	Disconnect both VOM leads. **AR370 Circuit Pack (Clock and Pulser Circuit)** ***The output of the free-running clock ▶(2000 Hz)◀ appears on TP13. If this signal should become unusually high in frequency, the concentrator will ignore all requests for service. This will be indicated by the inability of any station to gain access to the computer.***
21	Condition VOM to measure 24 volts dc.
22	Connect the negative VOM lead to a good signal ground.
23	Connect the positive VOM lead to TP2. ***Requirement:*** Line scanner scanning—Meter indicates voltage present. Line scanner stopped—Meter indicates zero or near zero volts.
24	Disconnect positive VOM lead and connect it to TP3. ***Requirement:*** Meter indicates approximately 3 volts.
25	Disconnect positive VOM lead and connect it to TP4. ***Requirement:*** Line scanner scanning—Meter indicates approximately 3 volts. Line scanner stopped—Meter indicates near zero volts.
26	Disconnect positive VOM lead and connect it to TP12. ***Requirement:*** Meter indicates zero volts when pulsing circuit is ready.
27	Disconnect positive VOM lead and connect it to TP14. ***Requirement:*** Meter indicates 18 to 24 volts. (Each time a line connection is attempted, a small negative voltage spike is shown on meter.)

STEP	PROCEDURE
28	Disconnect both VOM leads.
29	Connect positive VOM lead to a good signal ground.
30	Connect negative VOM lead to TP13.
	Requirement: Meter indicates 8 to 18 volts.
31	Disconnect both VOM leads.
	AR371 Circuit Pack (Alarms—Registers Circuit)
32	Condition VOM to measure 24 volts dc.
33	Connect negative VOM lead to a good signal ground.
34	Connect positive VOM lead to TP1.
	Requirement: Meter indicates approximately 3 volts.
35	Disconnect positive VOM lead and connect it to TP2.
	Requirement: Meter indicates 22 to 26 volts.
36	Disconnect positive VOM lead and connect it to TP6.
	Requirement: Meter indicates 22 to 26 volts.
37	Disconnect positive VOM lead and connect it to TP12.
	Requirement: Meter indicates 22 to 26 volts.
38	Disconnect both VOM leads and connect positive lead to a good signal ground and the negative lead to TP5.
	Requirement: Meter indicates 22 to 26 volts.
39	Disconnect both VOM leads.
	AR374 Circuit Pack (Line or Trunk Scanner Circuit)
40	Condition VOM to measure 24 volts dc.
41	Connect negative VOM lead to a good signal ground.
42	Connect positive VOM lead to TP9.
	Requirement: When testing line scanner and line scanner is scanning—Meter indicates approximately 3 volts. Line scanner is stopped—Meter indicates zero or near zero volts. When testing trunk scanner and trunk scanner is scanning—Meter indicates approximately 3 volts. Trunk scanner stopped—Meter indicates 4 to 7 volts.

STEP	PROCEDURE
43	Disconnect positive VOM lead and connect it to TP10. ***Requirement:*** See Table A.

TABLE A

WHEN TESTING LINE SCANNER AND LINE SCANNER IS STOPPED ON LINE	WHEN TESTING TRUNK SCANNER AND TRUNK SCANNER IS STOPPED ON TRUNK	METER INDICATES
1 through 16	1 through 16	Voltage present
33 through 48		
65 through 80		
97 through 103		
17 through 32	17 through 32	Zero or near zero volts
49 through 64		
81 through 96		
104 through 128		

44	Disconnect positive VOM lead and connect it to TP11. ***Requirement:*** Scanner stopped on odd-numbered line—Meter indicates voltage present. Scanner stopped on even-numbered line—Meter indicates zero or near zero volts.
45	Disconnect positive VOM lead and connect it to TP12. ***Requirement:*** See Table B.
46	Disconnect both VOM leads.
	AR375 Circuit Pack (Add-On Line Scanner)
47	Condition VOM to measure 24 volts dc.
48	Connect negative VOM lead to a good signal ground.
49	Connect positive VOM lead to TP10. ***Requirement:*** Scanner stopped on lines 49 through 56—Meter indicates voltage present. Scanner stopped on any other lines—Meter indicates zero or near zero volts.
50	Disconnect positive VOM lead and connect it to TP12. ***Requirement:*** Scanner stopped on lines 65 through 96—Meter indicates voltage present. Scanner stopped on any other lines—Meter indicates zero or near zero volts.

TABLE B

WHEN TESTING LINE SCANNER AND LINE SCANNER IS STOPPED ON LINE	WHEN TESTING TRUNK SCANNER AND TRUNK SCANNER IS STOPPED ON TRUNK	METER INDICATES
5 through 8	5 through 8	Voltage present
13 through 16	13 through 16	
21 through 24	21 through 24	
29 through 32	29 through 32	
37 through 40		
45 through 48		
53 through 56		
61 through 64		
69 through 72		
77 through 80		
85 through 88		
93 through 96		
101 through 104		
109 through 112		
117 through 120		
125 through 128		
1 through 4	1 through 4	Zero or near zero volts
9 through 12	9 through 12	
17 through 20	17 through 20	
25 through 28	25 through 28	
33 through 36		
41 through 44		
49 through 52		
57 through 60		
65 through 68		
73 through 76		
81 through 84		
89 through 92		
97 through 100		
105 through 108		
113 through 116		
121 through 124		

STEP	PROCEDURE
51	Disconnect both VOM leads.
	AR384 Circuit Pack (Camp-On Generator)
52	Condition VOM to measure 24 volts dc.
53	Connect negative VOM lead to a good signal ground.
54	Connect positive VOM lead to TP3.
	Requirement: Meter indicates positive voltage spike every 3 seconds (normally near zero volts).
55	Disconnect positive VOM lead and connect it to TP4.
	Requirement: Meter indicates near zero volts.
56	Disconnect both VOM leads.
57	Connect positive VOM lead to a good signal ground.
58	Connect negative VOM lead to TP14.
	Requirement: Meter indicates a variable voltage of from 18 volts to near zero volts.
59	End of test; disconnect both VOM leads.

Test E. Repeat Trunk Test

STEP	PROCEDURE
1	Perform Steps 1 through 8 of Test A.
2	Operate switch of DAS 803E1 to TRK HOLD.
3	Disconnect DAS 803E1 LINE CORD from line circuit.
4	Locate line circuit of next line to be tested with this trunk.
5	Perform Steps 5, 7, and 8 of Test A.
6	Repeat Steps 2 through 5 of this test until all lines to be tested with this trunk have been tested.
7	Operate switch on DAS 803E1 to OFF and disconnect LINE CORD and TRUNK CORD from line and trunk circuits.

Test F. Q1 Test

STEP	PROCEDURE
1	Condition VOM to measure 50 volts dc.
2	At 23A1 Data Mounting— Connect positive VOM lead to TB1-5.
3	At lower right-hand side of 23A1 Data Mounting (below circuit pack nest)— Connect negative VOM lead to the longer of two terminals on Q1 (W-BLK wire). ***Requirement:*** Small negative spike is indicated on meter each time a connection is made. ***Note:*** If Q1 fails, the meter will move in the reverse direction indicating a positive voltage spike each time a connection is made.
4	Disconnect both VOM leads.