DATA SET 103A3

TEST PROCEDURES

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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 installing and/or troubleshooting data set 103A3.

1.02 The tests described in this section and the equipment required are as follows:

(a) Impulse Noise Test

- 6H impulse counter
- 914-type data test set (DTS).

(b) Loop-Back Test

- Data Test Center (DTC).

(c) End-to-End Test

- 914B DTS (required at ***each*** station).

(d) Interface Test

- 914B DTS
- 904-Type DTC.

1.03 When the tests have been completed and the test requirements have been met, request the customer to verify that service is satisfactory. If the customer has messages to transmit, verify that the service is satisfactory. If the customer has no messages to transmit, consider data set 103A3 satisfactory for service.

1.04 Data sets which fail to meet the test requirements should be replaced and the replacement data set tested as outlined in this section. Data sets requiring repair must be tagged to indicate the nature of the trouble and returned to a distribution house.

1.05 A letter a, b, c, etc, added to a step number in Part 2 of this section indicates an action which may or may not be required, depending on local conditions. The condition under which a lettered step should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does ***not*** apply, all steps designated by that letter should be omitted.

2. TEST PROCEDURES

A. Impulse Noise Test

2.01 To minimize the possibility of data errors due to potential differences between the data set and data terminal grounds, the data set power receptacle should be served from the same power distribution panel as the receptacle for the data terminal. If this is not possible, a test should be made, using the 6H impulse counter, to determine if excessive noise is present. If the test requirements are not met, the data set and data terminal grounds must be bonded together in accordance with local regulations.

> ***Note:*** For information pertaining to the 6H impulse counter, refer to Section 103-620-101. If the 6H impulse counter is ***not*** available, a 6A impulse counter may be used. For information pertaining to the 6A impulse counter, refer to Section 103-620-100.

2.02 The following equipment is required for the impulse noise test.

- 914-type DTS
- 6H impulse counter.
- 2W43A test cord or equivalent (310 plug on one end, alligator clips connected to tip and sleeve on the other end).

2.03 ***Test Procedure:***

Install the grounding option specified on the service order before performing this test.

STEP	ACTION	VERIFICATION
1	At 914-type DTS— Remove all programming pins from matrix and pull up all A and B interface selector switches.	
2	Connect the A connector to the customer connector on the data set.	
3	Connect the B connector to the data set connector on the business machine.	
4	Connect one clip of the 2W43A cord to switch 7A and connect the other clip to switch 7B.	
5	Insert the 310 plug (one end of the 2W43A cord) into the 310 MEAS jack on the 6H impulse counter.	
6	At the 6H impulse counter— Set the DIAL-MEAS switch to MEAS and set the DBRN dial to 90.	
7	Apply power to the data set and the business machine.	
8	At the 6H impulse counter— Reset the counter to 0000 and set the MINUTES control to 15.	Counter remains at 0000 for 15 minutes. ***Note:*** If there is an indication on the counter, the grounds must be bonded together according to local instructions.
	Note: If the business machine provides protective ground at the interface, perform Steps 9 and 10.	
9	After the 15-minute time period required for Step 8— Remove the clips of the 2W43A cord from 7A and 7B and connect to 1A and 1B.	

STEP	ACTION	VERIFICATION
10	At the 6H impulse counter— Reset the counter to 0000 and set the MINUTES control to 15.	Same as for Step 8.
11	Disconnect test equipment and restore the data set to pretest condition.	

B. Loop-Back Test

2.04 The loop-back test checks the performance of both the receiver and transmitter of data set 103A3 from a DTC. Signals are sent from the DTC to data set 103A3, looped around at the dc end (terminal side), and sent back to the DTC to be analyzed.

2.05 No equipment is required at data set 103A3 for loop-back test.

2.06 ***Test Procedure:***

STEP	ACTION	VERIFICATION
1	Lift handset of associated telephone set, call the nearest DTC, and request a loop-back test for data set 103A3 (668-101-503), Addendum 1 to Issue 3). If data set 103A3 has been modified (data set 103E5 replaced with either data set 103E2 or 103E4 optioned to operate in the "inverted" frequency mode), inform the DTC of the change.	The DTC will provide instructions for the remainder of the test and restore the data set to normal operation at the end of the test.

C. End-to-End Test

2.07 The end-to-end test will be made only at the direction of the plant service center (PSC). The PSC will determine if an end-to-end test is necessary and will coordinate the test between the data sets. This test is to be performed only after all data apparatus and terminal equipment tests have been satisfactorily completed at both ends and the customer is still experiencing trouble.

2.08 Two 914B DTSs are required for this test (one at each data station). The type of overall arrangement is shown in Fig. 1. The switch settings to be made when performing the end-to-end test are given in Table A. Test switches that are not given in Table A or mentioned in the text are not required for the test. Lamp indications not mentioned are not pertinent to the test and may be disregarded.

Before making any test connections, ensure that all programming pins are removed from the 914B DTS matrix. Insert only those pins shown in Table A.

2.09 This test also may be performed by using a 903C DTS at the transmitting end as a word generator. If the 903C DTS is used, set the WORD LENGTH switch on the 914B DTS to 63.

Take necessary steps to ensure customer is not billed for test calls. Refer to the section entitled Crediting Charges on Test Calls (010-250-001).

2.10 ***Test Procedure:***

STEP	ACTION	VERIFICATION
1	At the transmit-end 914B— Set switches and program matrix as shown in Table A.	

STEP	ACTION	VERIFICATION

NOTE:
CONNECT CA1 AND CA2 FURNISHED WITH 914B DTS TO INTERFACE CONNECTOR OF DS 103A3 AND CONNECTOR A ON 914B DTS.

Fig. 1—End-to-End Test Using 914B Data Test Set

2	At the receive-end 914B DTS— Set switches and program matrix as shown in Table A.	
3	Originate a call from the receive terminal to establish voice communication between the two stations. ***Note:*** If the call cannot be originated from the receive terminal, originate the call from the transmit terminal.	
4	At both ends, data set 103A3— Operate the DATA key.	DATA lamps lighted, DS3 lamps lighted, DS4 lamps lighted; DS5 lamps lighted, DS6 lamps lighted. At receive terminal— DS2 flutters.
5	At the receive-end 914B DTS— Adjust the PHASE control for a zero meter reading.	
6	After the zero condition has been met— Set the FUNCTION switch to OFF.	
7	Momentarily operate the WORD SYNC switch to MAN. ***Note:*** If the station being tested is an originate-only or answer-only station, complete end-to-end tests (in one direction only) will involve one 15-minute and ten 1-minute calls.	

STEP **ACTION** **VERIFICATION**

TABLE A

END-TO-END TEST
914B DTS SWITCH SETTINGS AND MATRIX
PROGRAMMING PIN PLACEMENT

SWITCH	TRMT END	RCV END
PWR	ON	
SELECTOR	OPERATE ALL "A" SWITCHES	
S	S6 ON	
INTERFACE MODE	VOLTAGE	
TEST SET MODE	TRMT SER	RCV SER
COUNTER	BIT ERRORS	
BIT RATE	300	
SIGNAL LEVEL	±4V	
WORD LENGTH	511*	
SAMPLE WIDTH	.5μS	
FUNCTION	(Not Used)	PHASE ADJ
MATRIX PROGRAM-MING PIN PLACEMENT	GRD-1, SD-2, RD-3, DS2-3, DS3-5, DS4-6, GRD-7, DS5-8, DS6-20, S6-20, DS7-22	

* See 2.09.

STEP	ACTION	VERIFICATION
	If the station being tested is an originate/answer station, complete end-to-end tests (in one direction only) will involve two 15-minute calls and ten 1-minute calls. One of the 15-minute and five of the 1-minute calls must be originated from one end; the other 15-minute call and five 1-minute calls, from the other end. These tests should be made during busy hours to assure that all test calls do not use the same trunks and routes.	
8	At the end of one minute, record the number of errors shown on the 914B DTS counter.	
9	Repeat Steps 7 and 8 until 15 error recordings have been made, than terminate call.	Disregard the two test periods with the highest number of errors. Of the remaining thirteen test periods, ten must have no bit errors and three must have no more than two bit errors.
10a	If one location will not be originating all calls— Originate a call from the transmit terminal to establish voice communications and repeat Steps 4 through 9.	
11	Originate a call from the receive station to establish voice communication between the two stations. ***Note:*** If the call cannot be originated from the receive station, originate the call from the transmit station.	
12	Repeat Steps 4 through 7.	
13	At the end of one minute— Record the number of errors shown on the counter and terminate call.	
14b	If one station will be originating all calls— Repeat Steps 11 through 13.	
15b	Repeat Step 14b until ten 1-minute error recordings have been made.	Disregard the two test periods with the highest number of errors. No more than two bit errors per call shall occur for the remaining eight test periods.
16a	If one location will not be originating all calls— Repeat Steps 11 through 13 until five 1-minute error recordings have been made.	
17a	Originate a call from the transmit station to establish voice communication between the	

STEP	ACTION	VERIFICATION
	two stations and repeat Steps 4 through 7 and Step 13.	
18a	Repeat Step 17a until five calls have been recorded.	Same as for Step 15b.
19	To test the transmission facilities in the other direction, reverse the test setup and repeat the entire test.	
20	Disconnect all test equipment at both terminals and restore data set to normal operating conditions.	

D. Interface Test From 904-Type Data Test Center

2.11 The interface test verifies that valid signals sent by a 904-type DTC are received and are available to the customer at data set 103A3 interface connector J8. The interface test also verifies that valid signals are sent to the 904-type DTC from data set 103A3 when supplied by the customer to the interface connector J8.

2.12 The following equipment is required for the interface test:

- 914B DTS (J79914B-1)
- 904-Type DTC.

2.13 ***Test Procedure:***

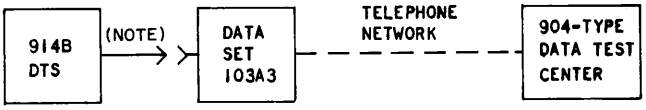
STEP	ACTION	VERIFICATION
1	At 914B DTS— Program matrix, set switches as given in Table B, and connect data set as shown in Fig. 2.	
2	At data set 103A3 and, if used, DAS 801-type (ACU)— Disconnect power plug(s) from ac receptacle(s).	
3	If option Q is not specified on order for data set 103A3— Install option Q in data set.	
4	If option V is specified on order for data set 103A3— Remove option V from data set.	
5	At 914B DTS— Operate POWER switch.	
6	Operate S7 switch to ON.	DS7 lamp lighted. ***Note:*** Interface lead CD is in the ON condition.
7	At data set 103A3— Lift handset from switchhook.	Dial tone is heard in handset receiver if loop-start telephone is used.

STEP **ACTION** **VERIFICATION**

TABLE B

914B DTS SWITCH SETTINGS AND MATRIX PROGRAMMING PIN PLACEMENT -- INTERFACE TEST USING 904-TYPE DATA TEST CENTER

SWITCH	POSITION
PWR	ON
SELECTOR	A1, A2, A3, A5, A6, A7, A8, A9, A10, A20, A22
S	ALL OFF
INTERFACE MODE	VOLTAGE
VERTICAL MONITOR	2
POLARITY	REV
FUNCTION	VOLT INT
RANGE	DCV 30
MATRIX PROGRAMMING PIN PLACEMENT	GRD-1, S1-2, DS2-3, DS3-5, DS4-6, DS5-8, DS7-20, S7-20, DS8-22



NOTE:
CONNECT CORD FURNISHED WITH 914B DTS TO INTERFACE CONNECTOR OF DS 103A3 AND CONNECTOR A ON 914B DTS.

Fig. 2—Interface Test Using 904-Type Data Test Center and 914B Data Test Set

STEP	ACTION	VERIFICATION
8	If ground-start telephone is used— Momentarily operate the DIAL TONE button.	Dial tone is heard in handset receiver.
9	Replace handset on switchhook.	
10	Set VERTICAL MONITOR switch to 3.	
11	Set RANGE switch to 10 VDC.	
12	At data set and, if used, ACU— Connect power plug(s) to ac receptacle(s).	Meter indicates between 5.2 and 7.2 Vdc. ***Note:*** Interface lead BB is in mark condition (mark hold).
13	Set FUNCTION switch to OFF.	
14	At 914B DTS— Set VERTICAL MONITOR switch to 22.	
15	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. ***Note:*** Interface lead CE is in OFF condition.
16	Set FUNCTION switch to OFF.	
17	Set VERTICAL MONITOR switch to 6.	
18	Set METER POLARITY switch to NOR.	
19	At data set under test— Operate DATA button.	DATA lamp lighted. All data sets ***except*** data set 103A3 using 103E6 not equipped with option ZD. DS4 lamp lighted. ***Note:*** Interface lead CC is in the ON condition. Data set 103A3 using data set 103E6 not equipped with option ZD. DS4 lamp extinguished. ***Note:*** Interface lead CC is in the OFF condition.
20	If the data set under test is a 103A3 using a data set 103E6 not equipped with option ZD— Set METER POLARITY switch to REV.	
21	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc.
22	Set FUNCTION switch to OFF. Operate CLEAR-TALK button.	DATA lamp extinguished. DS4 lamp extinguished.

STEP	ACTION	VERIFICATION
		Note: Interface lead CC is in the OFF condition.
23	At 914B DTS— Set METER POLARITY switch to REV.	
24	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. ***Note:*** Interface lead CC is in the OFF condition.
25	Set FUNCTION switch to OFF.	
26	Set VERTICAL MONITOR switch to 8.	
27	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. ***Note:*** Interface lead CF is in the OFF condition.
28	Set FUNCTION switch to OFF.	
29	Set VERTICAL MONITOR switch to 5.	
30	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. ***Note:*** Interface lead CB is in the OFF condition.
31	Set FUNCTION switch to OFF.	
32	At data set 103A3— Call the DTC and request continuous f_2 (f_1) mark be sent. ***Note:*** If data set 103A3 has been modified (data set 103E5 replaced with either data set 103E2 or 103E4 optioned to operate in the "inverted" frequency mode), request f_2 when f_1 is called for, f_1 when f_2 is called for, and inform DTC of the change. Frequencies in parenthesis are for "inverted" frequency mode.	
33	When tone is heard— Operate DATA button and leave handset off-hook.	DATA lamp lighted.
34	At 914B DTS— Set VERTICAL MONITOR switch to 3.	
35	Set FUNCTION switch to VOLT INT.	Meter indicates between 5.0 and 7.0 Vdc.

STEP	ACTION	VERIFICATION
		Note: Interface lead BB is in the MARK condition.
36	Set FUNCTION switch to OFF.	
37	Set VERTICAL MONITOR switch to 5.	
38	Set METER POLARITY switch to NOR.	
39	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. DS3 lamp lighted. ***Note:*** Interface lead CB is in the ON condition.
40	Set FUNCTION switch to OFF.	
41	Set VERTICAL MONITOR switch to 8.	
42	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. DS5 lamp lighted. ***Note:*** Interface lead CF is in the ON condition.
43	Set FUNCTION switch to OFF.	
44	Set VERTICAL MONITOR switch to 6.	
45	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. ***Note:*** Interface lead CC is in the ON condition.
46	Set FUNCTION switch to OFF.	
47	At data set 103A3— Operate CLEAR-TALK button.	CLEAR-TALK lamp lighted for three seconds, then DATA and CLEAR-TALK lamps extinguished.
48	Request DTC to retransmit f_2 (f_1) mark and sweep to f_2 (f_1) space when data set responds with f_1 (f_2) mark.	
49	When tone is heard— Operate DATA button.	When DTC sweeps to space— DS5 lamp lighted. ***Note 1:*** Interface lead CF is in the ON condition. ***Note 2:*** This test checks the carrier detector ability to hold during a space signal.
50	At 914B DTS— Set VERTICAL MONITOR switch to 3.	

STEP	ACTION	VERIFICATION
51	Set FUNCTION switch to VOLT INT.	Meter indicates between 6.0 and 7.5 Vdc. DS2 lamp lighted. ***Note:*** Interface lead BB is in the SPACE condition.
52	Set FUNCTION switch to OFF.	
53	At data set 103A3— Operate CLEAR-TALK button.	CLEAR-TALK lamp lighted for three seconds, then DATA and CLEAR-TALK lamps extinguished.
54a	If loss of carrier disconnect (option S) is provided— Request the DTC to send f_2 (f_1) mark until the data set responds with f_1 (f_2) mark, and then remove the f_2 (f_1) mark.	
55a	When tone is heard— Operate DATA button.	DATA lamp lighted. When DTC removes f_2 (f_1) mark— CLEAR-TALK lamp lighted for three seconds, then DATA and CLEAR-TALK lamps extinguished.
56	At data set and, if used, ACU— Disconnect power plug(s) from ac receptacle(s).	
57	If option Q is not specified on the order for data set 103A3— Remove option Q from data set.	
58	If option V is specified on the order for data set 103A3— Install option V in the data set.	
59	Ensure that all the correct options are installed in the data set.	
60	Connect power plug(s) to ac receptacle(s).	
61b	At data set 103A3, if space disconnect (option V or H) is provided— Request the DTC to send f_2 (f_1) mark, and when data set responds with f_1 (f_2) mark, sweep to f_2 (f_1) space.	
62b	When tone is heard— Operate DATA button.	DATA lamp lighted. When DTC sweeps to f_2 (f_1) space— DATA lamp extinguished.
63	Verify MANUAL ANS button is operated.	AUTO lamp extinguished.
64	At 914B DTS— Set VERTICAL MONITOR switch to 22.	

STEP	ACTION	VERIFICATION
65	At data set 103A3— Request DTC to place one call to the data set and then, when the disconnect occurs, place a second call and send f_1 (f_2) mark.	
66	During ringing intervals— Set FUNCTION switch to VOLT INT.	During ringing intervals— Meter indicates between 8.0 and 10.0 Vdc. DS8 lamp lighted during ringing intervals, extinguished during silent intervals.
67	Ensure that the FUNCTION switch is in the OFF position.	
68	Operate AUTO ANS button.	AUTO lamp lighted. When data set answers call— DATA lamp lighted. DS4 lamp lighted. ***Note:*** Interface lead CC is in the ON condition. Twenty to forty seconds after lighting, data set disconnects. DATA lamp extinguished. DS4 lamp extinguished. ***Note 1:*** Interface lead CC is in the OFF condition. ***Note 2:*** This checks the automatic abort feature (HSS timer).
69	When DTC hears the data set disconnect— DTC places second call.	When data set answers call— Data lamp lighted. Data set sends f_2 (f_1) mark. When DTC receives f_2 (f_1) mark— DTC sends f_1 (f_2) mark. DS4 lamp lighted. ***Note:*** Interface lead CC is in the ON condition. DS5 lamp lighted. ***Note:*** Interface lead CF is in the ON condition. DS3 lamp lighted. ***Note:*** Interface lead CB is in the ON condition. DS2 lamp extinguished. ***Note:*** Interface lead BB is in the MARK condition.

STEP	ACTION	VERIFICATION
		If answer mode indication (option X) is provided— DS8 lamp lighted. ***Note:*** Interface lead CE is in the ON condition.
70c	If answer mode indication (option W) is provided— Set METER POLARITY to REV.	
71c	Set FUNCTION switch to VOLT INT.	Meter indicates between 8.0 and 10.0 Vdc. ***Note:*** Interface lead CE is in the OFF condition.
72c	Set FUNCTION switch to OFF.	
73	If send disconnect (option T) is provided— Operate S7 to OFF.	At 914B DTS— DS7 lamp extinguished. ***Note:*** Interface lead CD is in the OFF condition. At data set 103A3— CLEAR-TALK lamp lighted for three seconds, then DATA and CLEAR-TALK lamps extinguished.
74	If send disconnect (option T) is not provided— Operate S7 to OFF.	At 914B DTS— DS7 lamp extinguished. ***Note:*** Interface lead CD is in the OFF condition. At data set 103A3— DATA lamp extinguished.
75	At data set 103A3 and, if used, ACU— Disconnect power plug(s) from ac receptacle(s).	
76	Disconnect 914B DTS from data set connector J8 and restore normal connection.	
77	Connect power plug(s) to ac receptacle(s).	