DATA SET 202C-TYPE TRANSMITTER-RECEIVER TEST PROCEDURES

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1. GENERAL

1.01 This section contains procedures to be used when testing data set (DS) 202C-type on an initial installation or during a maintenance visit.

1.02 This section is reissued to provide the following:

(a) Information on the use of an Automatic Data Test System (ADTS) with data set 202C-type.

(b) Procedures for using the 6H impulse counter instead of the 6A for the ground noise test.

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

1.03 Before proceeding with any tests of the data set, verify that:

(a) For switched network applications, the data loop meets requirements specified in Section 314-205-501.

(b) For private line applications, the data loop meets requirements specified in Section 314-410-500.

(c) Telephone portion of the installation meets standard dc talk, signaling, and supervision requirements.

(d) Data set strapping options agree with service order.

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).

1.04 Tests contained in this section are divided into three parts. Part 2 describes the test required to verify an installation. Part 3 describes the tests to be performed during a maintenance visit. Part 4 describes additional tests that ordinarily are not required during installation and maintenance visits.

2. INSTALLATION TEST PROCEDURE

2.01 The loop-back test in this part should be performed immediately after the data set has been installed to ensure that the installation is ready to be placed in service. If the data set fails to meet test requirements, replace the data set. The telephone company (telco) employee should also assure that data can be transmitted and/or received using the customer provided equipment

(CPE) and data sets at both the near-end and far-end data stations.

2.02 Although the loop-back test is primarily for use at time of installation, its use during maintenance visits should be considered if the nature of the trouble indicates that this type of test would be useful.

Data set 202C-type can be statically tested by ADTS. For information on communicating with the automatic data test center, refer to the section entitled J1P005 Automatic Data Test System (ADTS)—Operation From Field Locations (590-010-500).

Loop-Back Test

2.03 Perform the test as follows:

(1) Lift handset of associated telephone set, depress TALK button, and call nearest data test center (DTC).

(2) When instructed by DTC, depress TEST button and hold it depressed until TEST lamp lights.

(3) Replace handset on-hook.

(4) DTC originates test call to data set. (Disregard momentary ringing of bell.)

(5) Data set is now under control of DTC.

(6) At end of test, DTC releases data set from test mode (as indicated by TEST lamp going off).

3. MAINTENANCE TEST PROCEDURES

3.01 The tests in this part are to be used as a troubleshooting aid during maintenance visits. The interface tests, in combination with the loop-back test in Part 2, should enable the telco employee to isolate the trouble to either the CPE or the data set.

A. Voltage Interface Test

3.02 The voltage interface test checks the control signals supplied to the customer. The only test equipment required is a 914-type data test set (DTS).

3.03 Perform the test as follows:

(1) Connect and condition test equipment as shown in Fig. 1.

(2) Apply power to data set and then to test equipment.

Power Supply Test

(3) Set DTS FUNCTION to VOLT INT.

(4) DTS meter should indicate 17.0 to 20.0 Vdc (positive power supply).

(5) Set FUNCTION to OFF.

(6) Set POLARITY to REV.

(7) Set VERTICAL MONITOR to 10.

(8) Set FUNCTION to VOLT INT.

(9) DTS meter should indicate 17.5 to 20.5 Vdc (negative power supply).

(10) Set FUNCTION to OFF.

Auto Answer Test

Note: If auto answer option Q is not installed in data set, omit this test.

(11) Set VERTICAL MONITOR to 6.

(12) Set FUNCTION to VOLT INT.

(13) DTS meter should indicate 17.0 to 20.0 Vdc (CC ***off***). DS2 should be off.

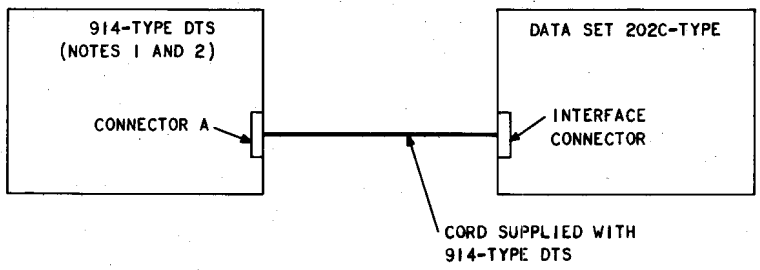
(14) Set VERTICAL MONITOR to 22.

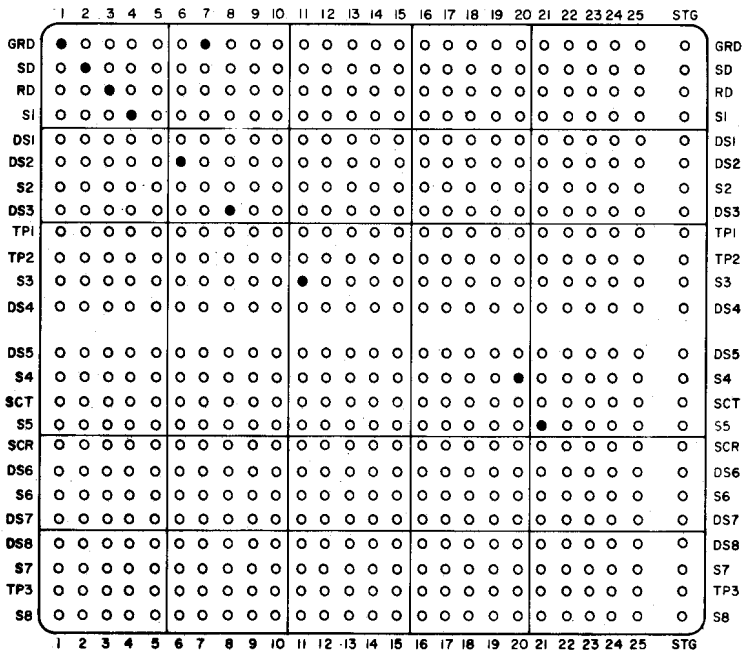
(15) DTS meter should indicate 14.5 to 18.5 Vdc (CE ***off***).

(16) Set FUNCTION to OFF.

(17) Set POLARITY to NOR.

(18) Request DTC to place call to data set.





NOTES:

1. SET SWITCHES ON 914-TYPE DTS AS FOLLOWS:

SWITCH	SETTING
INTERFACE SELECTOR A	ALL DEPRESSED
INTERFACE MODE	VOLTAGE
VERTICAL MONITOR	9
FUNCTION	OFF
RANGE	DCV-30
POLARITY	NOR
OUTPUT	OFF
SI (CA)	OFF
S3 (SA)	OFF
S4 (CD)	OFF
S5 (RY)	OFF

2. 914-TYPE DTS INDICATOR LAMPS CORRESPOND TO THE FOLLOWING INTERFACE LEADS:

LAMP	FUNCTION	EIA
DS2	INTERLOCK (INT)	CC
DS3	CARRIER ON-OFF (COO)	CF

Fig. 1—Voltage and Contact Interface Test Setup

(19) When ringing starts, set FUNCTION to VOLT INT. DTS meter should indicate 3.5 to 9.5 Vdc during ringing period. During silent period, meter should indicate off scale to the left.

(20) During silent period of ringing cycle, set S4 to ON. Ringing should stop and data set TALK and DATA lamps should light.

(21) Set VERTICAL MONITOR to 6.

(22) DTS meter should indicate 8.2 to 10.2 Vdc (CC ***on***). DS2 should be lighted.

Demodulator Test

(23) Request DTC to send 1190 to 1210 Hz at −10 dBm.

(24) Set VERTICAL MONITOR to 8.

(25) DTS meter should indicate 5.0 to 11.0 Vdc (CF ***on***). DS3 should be lighted.

(26) Request DTC to send 2190 to 2210 Hz at −10 dBm.

(27) Set VERTICAL MONITOR to 3.

(28) DTS meter should indicate 5.0 to 11.0 Vdc (BB ***space***).

Reverse Channel Test

Note: If reverse channel option T is not installed in data set, omit this test.

(29) Set FUNCTION to OFF.

(30) Set POLARITY TO REV.

(31) Set VERTICAL MONITOR to 12.

(32) Set FUNCTION to VOLT INT.

(33) DTS meter should indicate 5.0 to 11.0 Vdc (SB ***off***).

(34) Set FUNCTION to OFF.

(35) Request DTC to send 384 to 390 Hz at −10 dBm.

(36) Set POLARITY to NOR.

(37) Set FUNCTION to VOLT INT.

(38) DTS meter should indicate 8.0 to 14.0 Vdc (SB ***on***).

(39) Set FUNCTION to OFF.

(40) Set S3 to ON.

(41) Request DTC to measure reverse-channel tone frequency. Without carrier facilities, tone should be 384 to 390 Hz. With carrier facilities, tone should be 375 to 399 Hz.

(42) Set S4 to OFF to end call.

(43) Remove all test equipment and restore data set to pretest condition.

B. Contact Interface Test

3.04 The contact interface test checks the control signals supplied to the customer. The only test equipment required is a 914-type DTS.

3.05 Perform the test as follows:

(1) Connect and condition test equipment as shown in Fig. 1 except set DTS INTERFACE MODE to CONTACT.

(2) Apply power to data set and then to test equipment.

Power Supply Test

(3) Refer to 3.03 and perform (3) through (10).

Auto Answer Test

Note: If auto answer option Q is not installed in data set, omit this test.

(4) Set VERTICAL MONITOR to 6.

(5) Set FUNCTION to VOLT INT.

(6) DTS meter should indicate −0.7 to +0.7 Vdc (CC ***off***). DS2 should be off.

(7) Set FUNCTION to VOLT/OHM EXT.

(8) Set RANGE to ohms -X100.

(9) Short METER INPUT terminals and zero adjust meter.

(10) Connect METER INPUT red and black terminals to interface selector switches A(22) and A(23), respectively.

(11) DTS meter should indicate an open circuit (no movement of meter).

(12) Request DTC to place call to data set.

(13) When ringing starts, meter should indicate about 2000 ohms.

(14) During silent period of ringing cycle, set S4 and S5 to ON. Ringing should stop and data set TALK and DATA lamps should light.

(15) Set VERTICAL MONITOR to 6.

(16) DTS meter should indicate 8.2 to 10.2 Vdc (CC ***on***). DS2 should be lighted.

Demodulator Test

(17) Refer to 3.03 and perform (23) through (28).

Reverse Channel Test

Note: If reverse channel option T is not installed in data set, omit this test.

(18) Refer to 3.03 and perform (29) through (39).

(19) Place red programming pins in matrix positions TP3-9 and TP3-11.

(20) Request DTC to measure reverse-channel tone frequency. Without carrier facilities, tone should be 384 to 390 Hz. With carrier facilities, tone should be 375 to 399 Hz.

(21) Set S4 and S5 to OFF to end call.

(22) Remove all test equipment and restore data set to pretest condition.

4. SUPPLEMENTARY TEST PROCEDURES

4.01 These tests ordinarily are not required during installation and maintenance visits but should be performed when needed. The end-to-end test is performed when it is ncessary to identify facility troubles that the data set has been occasionally experiencing over a period of time. The ground noise test is performed to detect the presence of noise potentials caused by a potential difference between data set and CPE grounds.

A. End-to-End Test

4.02 The end-to-end 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 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 counter. The only test equipment required is a 914-type DTS at the transmitting and receiving stations.

4.03 A complete end-to-end test involves making two 15-minute and ten 1-minute test calls in both directions. These test calls should be made during busy hours to assure that all calls do not use the same trunks and routes. Perform the test as follows:

(1) Establish voice communication between the data stations and arrange to conduct an end-to-end test.

(2) At both stations, connect and condition test equipment as shown in Fig. 2.

(3) At both stations, apply power to data set and then to test equipment.

(4) Establish a 15-minute test call.

The receiving station should verify that the 914-type DTS NO DATA and NO CLOCK lamps are off. This indicates that a valid connection has been established between the stations. If either lamp lights during the test, the receiving station must contact the transmitting station and arrange to retest.

(5) At receiving station, operate DTS controls as follows:

(a) Set FUNCTION to PHASE ADJ.

(b) Adjust PHASE for zero indication on DTS meter.

(c) Set FUNCTION to OFF.

(d) Set WORD SYNC to MAN and release when counter stops.

(6) At receiving station, depress DTS RESET and allow counter to operate for 1 minute. Record total errors indicated.

(7) Repeat (6) above for a total of 15 one-minute runs. Eliminate the two runs with highest number of errors.

Requirement: Ten of the 13 remaining runs have less than 3 errors per run. The other 3 runs have less than 11 errors per run.

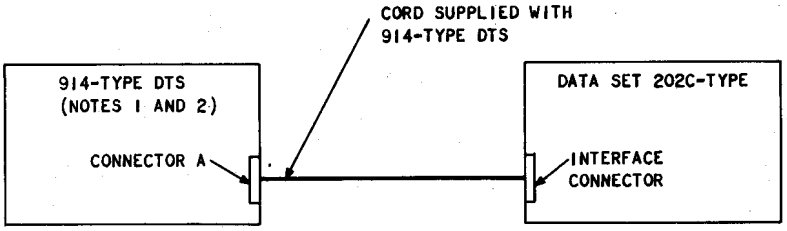
Note: Refer to Fig. 3 for an example of a form that can be used to record test results.

(8) Repeat (4) through (7) above.

(9) Establish a 1-minute test call.

(10) At receiving station, depress DTS RESET and allow counter to operate for 1 minute. Record total errors indicated.

(11) Repeat (9) and (10) above for a total of ten 1-minute runs.



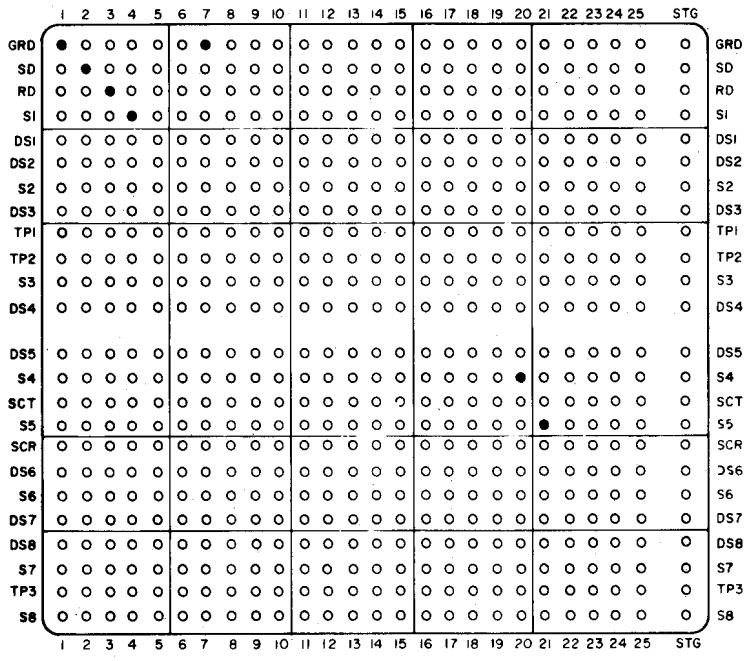
NOTES:

1. AT TRANSMITTING DATA STATION, SET SWITCHES ON 914-TYPE DTS AS FOLLOWS:

SWITCH	SETTING
INTERFACE SELECTOR A	ALL DEPRESSED
INTERFACE MODE	(NOTE 3)
TEST SET MODE	SER (914C) TRMT SER (914B)
COUNTER	BIT ERRORS
FUNCTION	OFF
TRANSMIT BIT RATE (914C)	(NOTE 4)
BIT RATE (914B)	(NOTE 4)
TRANSMIT WORD LENGTH (914C)	63
WORD LENGTH (914B)	63
SIG LEV (914C)	±4V
SIGNAL LEVEL (914B)	±4V
S1 (CA)	ON (NOTE 5)
S4 (CD)	ON
S5 (RY)	OFF (NOTE 6)

2. AT RECEIVING DATA STATION, SET SWITCHES ON 914-TYPE DTS AS FOLLOWS:

SWITCH	SETTING
INTERFACE SELECTOR A	ALL DEPRESSED
INTERFACE MODE	(NOTE 3)
TEST SET MODE	SER (914C) RCV SER (914B)
COUNTER	BIT ERRORS
FUNCTION	OFF
RCV BIT RATE (914C)	(NOTE 7)
BIT RATE (914B)	(NOTE 7)
RCV WORD LENGTH (914C)	63
WORD LENGTH (914B)	63
SAMPLE WIDTH	.5US
PHASE	MIDPOSITION (DOT POINTING UP)
S1 (CA)	OFF
S4 (CD)	ON
S5 (RY)	OFF (NOTE 6)



3. USE SETTING THAT CORRESPONDS TO DATA SET INTERFACE.
4. USE SETTING THAT IS NEAREST TO BIT RATE OF CUSTOMER PROVIDED EQUIPMENT, BUT NOT LOWER.
5. FOR CONTACT INTERFACE, REMOVE PIN FROM MATRIX POSITION S1-4 AND INSERT IN POSITION TP3-4; SET SELECT SWITCH TO +7.0; AND SET OUTPUT SWITCH TO TP3.
6. FOR CONTACT INTERFACE, SET SWITCH S5 TO ON.
7. USE SAME SETTING AS THAT OF 914-TYPE DTS AT TRANSMITTING DATA STATION.

Fig. 2—End-to-End Test Setup

Date: _____

Data Test Calls Placed Between:

	LOCATION	TEL. # OF TEST LINE OR STATION
(A)		
(B)		

Contemplated Customer
S.O. Number's _____

Under Control of Data
Test Center at _____

LONG DURATION TEST CALLS					BIT ERROR COUNT — MINUTE NUMBER														
ORIGINATED #	ORIGINATED AT	TIME	PEAK DISTORTION AT	PEAK DISTORTION %	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

SHORT DURATION TEST CALLS			SHORT CALL — NUMBER (READINGS AT _____)						(READINGS AT _____)					
ORIGINATED AT	TIME		1	2	3	4	5		1	2	3	4	5	
		Peak Dist. Reading (%)												
		One Minute Error Count (Bits in Error)												
		Peak Dist. Reading (%)												
		One Minute Error Count (Bits in Error)												

Billing Adjustment (if required) referred to: _____

Parties involved in Tests: _____

Coordinated with tests to other locations at: _____

Comments and Notes:

Fig. 3—Data Set Performance Test Record

Requirement: Eight of the 10 runs have less than 11 errors per run.

(12) Establish voice communication between the data stations and arrange to conduct an end-to-end test in the opposite direction. The transmitting station now becomes the receiving station.

(13) At both stations, condition test equipment as shown in Fig. 2.

(14) Repeat (4) through (11) above.

(15) At both stations, remove all test equipment and restore data sets to pretest condition.

B. Ground Noise Test

4.04 If the data set and the CPE are not connected to the same ground, errors may be caused by a potential difference between data set ground and CPE ground. To detect the presence of noise potentials, a test should be made using the 6-type impulse counter. This counter is used to count the number of impulse noise peaks during a measured time period. The counter registers only the peaks that exceed a preset amplitude and that are separated by about 150 ms or more.

4.05 The following test equipment is required:

1—6H impulse counter or equivalent

1—914-type DTS or interface test adapter (cover of 901B DTS)

1—2W6A test cord (310 plug on one end, alligator clips connected to tip and ring on other end).

Note: Refer to Section 103-620-101 for information on the 6H impulse counter. If the 6H impulse counter is not available, a 6A impulse counter may be used. Refer to Section 103-620-100 for information on the 6A impulse counter.

4.06 In this test, the impulse counter is connected between the grounds of the data set and the CPE. The impulse counter registers when potential differences of sufficient amplitude have developed between the separated grounds. The 914-type DTS is used to gain access to the ground interface leads. It is assumed that protective ground from the CPE appears at the customer interface.

4.07 Perform the test as follows:

(1) Using the interface cables provided with the 914-type DTS, connect the 914-type DTS connector A to the customer connector on the data set, and connect the 914-type DTS connector B to the data set connector on the CPE.

(2) On the 914-type DTS, remove all programming pins from the matrix. Pull up all A and B interface selector switches.

(3) Connect one clip of 2W6A cord to interface selector switch 1A and connect other clip to switch 1B.

(4) Verify that power is applied to data set and CPE.

(5) Insert 310 plug of 2W6A cord into 310 MEAS jack on 6H impulse counter.

(6) Set 6H impulse counter DIAL-MEAS switch to MEAS.

(7) Set 6H impulse counter DBRN dial to 90.

(8) Reset counter on 6H impulse counter to 0.

(9) Set 6H impulse counter MINUTES control to 15. At the end of the 15-minute period, record number of counter indications.

(10) Remove clips of 2W6A cord from 1A and 1B and connect to 7A and 7B.

(11) Repeat (8) and (9) above.

4.08 At the end of both 15-minute periods, there should be no indications on the counter of the 6H impulse counter. If there is an indication on the counter, the data set and CPE grounds must be bonded together according to local instructions. At the end of the test, remove all test equipment and restore the data station to pretest condition.

5. REFERENCES

5.01 Additional information concerning the testing of data set 202C-type is contained in the following publications:

SECTION	TITLE
103-620-100	J94006A(6A) Impulse Counter—Description, Operation, and Maintenance
103-620-101	6H and 6HR Impulse Counters (J9006H and J9006HR)—Description, Operation, and Maintenance
107-101-100	914-Type Data Test Sets—Description and Operation
107-200-100	903-Type Data Test Sets—Description and Operation
314-205-501	Data Systems—DATA-PHONE® Service and Data Access Arrangements on Direct Distance Dialing Network—Test Requirements for Subscriber, Foreign Exchange, and Remote Exchange Lines
314-410-500	Voice Bandwidth Private Line Data Circuits—Tests and Requirements
590-010-500	J1P005 Automatic Data Test System (ADTS)—Operation From Field Locations
592-015-100	Data Set 202C-Type—Transmitter-Receiver—Description and Operation
592-015-200	Data Set 202C-Type—Transmitter-Receiver—Installation and Connections
592-015-300	Data Set 202C-Type—Transmitter-Receiver—Maintenance
668-102-512	Data Test Center—904A/B and 904C/D—Test Procedure—Data Sets 202C- and 202D-Types—Loop-Back and Dynamic Tests