

**DATA SET 202D**  
**TRANSMITTER-RECEIVER**  
**TEST PROCEDURES**

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**1. GENERAL**

**1.01** This section covers test procedures which may be used at time of installation and on repair visits.

**1.02** This section is reissued to show use of the 6H impulse counter instead of the 6A impulse counter for the ground noise tests; to include procedures in the interface tests (914-type data test set) for testing carrier detect timing and the turn-on interval between request to send and clear to send in data sets 202D5 and 202D6; and to include a back-to-back test for all data sets 202D.

Due to extensive changes in text, change arrows will be omitted.

**1.03** The description and operation of the 914C data test set (DTS) will be found in Section 107-101-100.

**1.04** Any tests performed within this Bell System Practice (BSP) on the 914C DTS can also be accomplished with the combination of 914B DTS and a 903 DTS. Descriptions of both procedures are included in Part 3.

**1.05** Before proceeding with any test, verify that:

- For switched network applications, the loop has been tested and meets requirements specified in the section entitled Data Systems—DATA-PHONE® Service on Direct Distant Dialing Network—Overall Transmission Test Requirements (314-205-500).
- For private line applications, the loop has been tested and meets requirements specified in the section entitled Private Line Data Circuits—Voice Bandwidth Circuits for Miscellaneous Data—Overall Tests and Requirements (314-410-500).
- Telephone portion of installation meets standard dc talk, signaling, and supervision requirements.



*Confirm that data set strapping options agree with service order.*

**1.06** If the set fails to meet installation test requirements, replace the entire set. Maintenance test procedures are recommended as troubleshooting aids during maintenance visits.

**1.07** Figure 1 and Table A furnish printed wiring board assembly identification information. Figure 1 shows an older model of the data set. Newer models differ slightly in appearance.



*Take proper steps to ensure that customer is not billed for test calls. See section entitled Crediting Charges on Test Calls (010-250-001).*

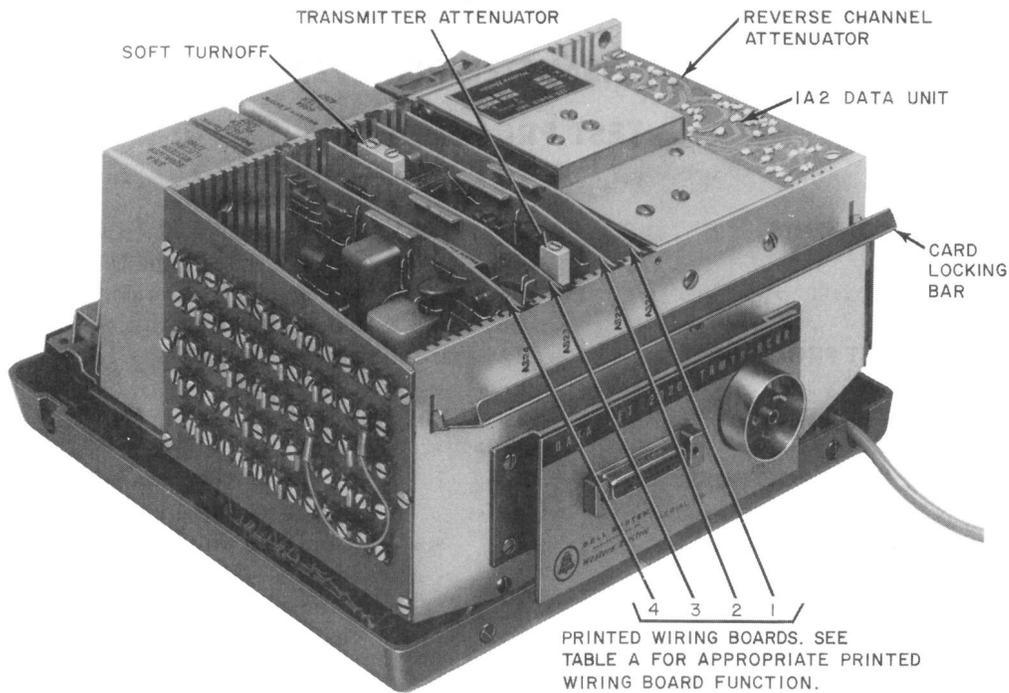


Fig. 1—Data Set 202D With Cover Removed—Printed Wiring Board Location

**2. INSTALLATION TEST PROCEDURES**

**2.01** The test in this part should be performed after the data set has been installed to ensure that the installation is ready to be placed in service. In addition to this test, the installer should assure that data can be transmitted and/or received using the business machine and data set at both the near-end and far-end data terminals.

**2.02** Although this test is primarily for use at time of installation, consideration should be given to use during maintenance visits if the nature of the trouble indicates that this type of test would be useful.

**LOOP-BACK TEST**

**2.03** The purpose of the loop-back test is to check sensitivity of the data set, frequency, and level of mark and space signals.

**2.04** Before testing the data set, call nearest data test center (DTC).

*Note:* On private line (PL) circuits, arrangements must be made to provide the DTC with access to the circuit.

**2.05** When instructed by DTC, depress TEST key. Hold it depressed until TEST lamp lights.

**2.06** If a DAS (804A-type) is used for communications, place the DAS handset on-hook.

**2.07** The DTC originates test call to data set. (Disregard momentary ringing of bell.)

**2.08** Data set is now under control of DTC.

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

**3. MAINTENANCE TEST PROCEDURES**

**3.01** Tests in this part are intended to be used as troubleshooting aids. The interface tests in combination with the loop-back test in Part 2 (INSTALLATION TEST PROCEDURES), should

**TABLE A**  
**PRINTED WIRING BOARD IDENTIFICATION**

PRINTED WIRING BOARD DESIGNATION IN FIG. 1	PRINTED WIRING BOARD FUNCTION	PRINTED WIRING BOARD ASSEMBLY NUMBER	
		OLD CODES	NEW CODES*
1	Test Circuitry	A-835166	AS 21
2	Modulator	A-835167 or A-835224†	AS 22, AS 39, AS 77, or AS 87
3	Carrier Detector	A-835168	AS 23, AS 40, or AS 86
4	Demodulator	A-835169	AS 24 or AS 41
	Miscellaneous (CPS 5 or FVL)	A-152939	

\* AS 22, AS 23, and AS 24 are found in data sets 202D1 and D2.

AS 39, AS 40, AS 41, and AS 77 are found in data sets 202D3 and D4.

AS 21 is found in both.

AS 86 and AS 87 are found in data sets 202D5 and 202D6.

† A-835167 was superseded by A-835224 and rated Manufacture Discontinued before the AS cards were produced.

enable the tester to isolate the trouble to either the business machine or data set. The back-to-back testing allows the output of a data set transmitter to be fed directly to its receiver for a full operational check. Dynamic tests permit end-to-end testing of a data system allowing evaluation of data set performance using the normal transmission facility. The dynamic test may be of value if attempting to isolate trouble to the data station or connecting facilities. If facility problems are suspected at the near end, a DTC near the far end should be called for a dynamic test.

**3.02** For PL installations, the requirements for the dynamic test apply on an end-to-end basis. On the switched network, the dynamic test requirements apply from the station to near-end DTC.

**3.03** A 914C DTS operates full duplex and may be utilized in back-to-back testing where the data set is strapped for local testing. If a 914C is not available, a 914B DTS may be used with a 903 DTS.

**A. Ground Noise Test**

**3.04** The purpose of the ground noise test is to detect the presence of noise potentials. If the data set and business machine are not at the same ground potential, errors may be caused by a potential difference between data set ground and business machine ground.

**3.05** The following equipment is required for the ground noise test:

- 6H impulse counter
- 914-type DTS
- 2W6A test cord.

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

**3.06** In the data set 202D, protective ground and circuit ground are permanently connected together. It will only be necessary to check the circuit ground.

**3.07** The 6H impulse counter is connected and the test is performed as follows.

- (1) Use a 2W6A test cord, or equivalent (310 plug on one end, alligator clips connected to tip and ring on the other end). Connect the 914-type DTS connector A to the customer connector on the data set. Connect the 914-type DTS connector B to the data set connector on the business machine. This test assumes that protective ground from the business machine appears at the customer interface.
- (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 the 2W6A cord to switch 1A and connect the other clip to switch 1B. Verify that power is applied to data set and business machine.
- (4) Insert the 310 plug into the 310 MEAS jack of the 6H impulse counter.
- (5) Set 6H impulse counter DIAL-MEAS switch to MEAS.
- (6) Set 6H impulse counter DBRN dial to 90.
- (7) Reset the counter on 6H impulse counter to zero.
- (8) Set MINUTES switch to 15. After 15-minute test has elapsed, record indications on counter.
- (9) Remove clips of 2W6A cord from 1A and 1B and connect to 7A and 7B.
- (10) Reset counter on 6H impulse counter to 0.
- (11) Set MINUTES switch to 15. After 15-minute test has elapsed, record number of indications on counter.
- (12) At the end of both of the 15-minute periods, there should be no reading on the counter. If there is a reading on the counter, the ground must be bonded together according to local instructions. At the end of the test, disconnect the test equipment and restore the data set to pretest conditions.

**B. Voltage Interface Test**

**3.08** The purpose of the voltage interface test is to measure the level of control signals supplied to the customer.

**3.09** A 914-type DTS is required at the station to be tested.

**3.10** Arrange the DTS setup as shown in Fig. 2. Make the necessary interface cable connection between the 914C DTS and the data set 202D as illustrated.

**Power Supply Tests**

- (1) Plug the 914-type DTS power cord into the 117-Vac outlet. Turn the 914 DTS on by depressing the POWER button.
- (2) Observe the meter. A reading of  $18.5 \pm 1.5$  Vdc should be obtained (positive power supply).
- (3) Set the controls of the 914 DTS as follows:
  - METER FUNCTION to OFF
  - METER POLARITY to REV
  - VERTICAL MONITOR to position 10
  - METER FUNCTION to VOLT INT.
- (4) Observe the meter. A reading of  $19.0 \pm 1.5$  Vdc should be obtained (negative power supply).
- (5) Switch VERTICAL MONITOR to position 3.

**RS-CS Interval Measurements**

- (6) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (BB *mark*).

**Note:** Steps (7) through (22) are to be performed when the data set is a 202D5 or D6.

- (7) Set FUNCTION switch to OFF.
- (8) Set TRIGGER TP1 and TRIGGER TP2 switches to +/OPEN.

- (9) Set START switch to A or B on 914C DTS. No action is necessary on 914B DTS.

- (10) Press RESET button to zero the counter.

- (11) Move the COUNTER switch to INTERVAL X1MS if the data set is strapped for the 30- or 60-millisecond clear-to-send time interval (option YS or YR). If the data set is strapped for the 200-millisecond clear-to-send time interval (option YP), set the COUNTER switch to INTERVAL X10. Refer to Section 592-016-200 for option installation.

- (12) Set switch S2 to ON. The counter will indicate the interval between request to send *on* and clear to send *on*.

**Requirement:**

TP1 FIRST lamp lighted—

25 to 35 ms for option YS

50 to 70 ms for option YR

175 to 225 ms for option YP [This will be indicated as 17 to 23 on the counter (interval X10) with option YP only.]

- (13) After the clear-to-send interval has been measured, verify with the service order that the data set is equipped with the correct interval. If it is not, refer to Section 592-016-200 for installing and removing options.

- (14) Remove T and R from existing connections on connecting block. Connect T to T1 and R to R1 to loop transmitter to receiver.

- (15) Set switch S3 to OFF.

**RS-CD Interval Measurements**

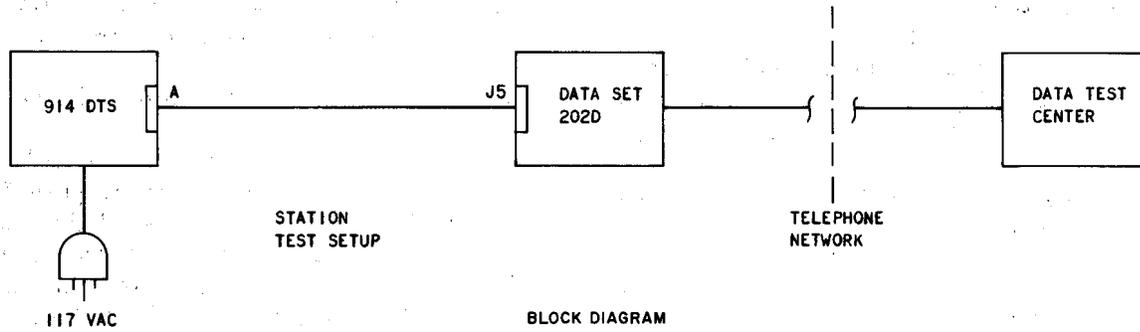
- (16) Move matrix pin from TP2-5 to TP2-8.

- (17) Press RESET button to zero counter.

- (18) Set COUNTER switch to INTERVAL X1.

- (19) Set switch S3 to ON.

- (20) Observe the counter. The interval required to turn *on* the carrier detector should be



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	STG	
GRD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
SD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
RD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
SI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
TP1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
TP2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
SCT	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
SCR	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
DS8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
TP3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

914 DATA TEST SET MATRIX FOR INTERFACE TESTS

914 DTS SWITCH SETTINGS

- DEPRESS ALL OF THE A INTERFACE SELECTOR SWITCHES
- INTERFACE MODE TO VOLTAGE
- METER FUNCTION TO VOLT INT.
- METER RANGE TO 30 DCV.
- METER POLARITY TO NOR.
- VERTICAL MONITOR TO POSITION 9.

**CAUTION:**

TURN THE METER FUNCTION SWITCH TO THE OFF POSITION BEFORE CHANGING THE VERTICAL MONITOR SWITCH SETTINGS TO PREVENT METER DAMAGE.

Fig. 2—Data Set 202D Interface Test Setup

displayed (15 to 25 ms with option YN or 30 to 50 ms with option YM).

(21) After the carrier detector acquisition time has been measured, verify with the service order that the data set is equipped with the correct option.

(22) Restore T and R to original connections on connecting block.

**Auto Answer Tests**

(23) Switch VERTICAL MONITOR to position 6.

**Note:** Steps (24) through (30) are to be performed when a DAS 804A-type is used with the data set 202D.

- (24) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (CC *off*).

**Note:** If the data set has a voltage interface and is not wired for AUTO ANSWER, option Q must be installed. Refer to Section 592-016-200 for option Q setup.

- (25) Temporarily install option Q with set wired for AUTO ANSWER.
- (26) Switch VERTICAL MONITOR to position 22.
- (27) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (CE *off*).
- (28) Turn METER FUNCTION switch to OFF. Switch METER POLARITY to NOR.
- (29) Request DTC to place call to data set.
- (30) When ringing starts, switch METER FUNCTION to VOLT INT. Observe the meter. A reading of  $6.5 \pm 3.0$  Vdc should be obtained during the ringing cycle. During the silent period of the ringing cycle, the meter pointer will read off scale to the left. Operate switch S5 to the ON position. Ringing will stop and the TALK and DATA lamps will light.
- (31) Set the controls of the 914-type DTS as follows:

- METER FUNCTION to OFF
- VERTICAL MONITOR to position 6
- METER POLARITY to NOR
- METER FUNCTION to VOLT INT.

- (32) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (CC *on*).

#### **Demodulator Tests**

- (33) Request the DTC to send  $1200 \pm 10$  Hz at  $-10$  dBm.

- (34) Switch the VERTICAL MONITOR to position 8.
- (35) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (CF *on*).
- (36) Request the DTC to send  $2200 \pm 10$  Hz at  $-10$  dBm.
- (37) Switch VERTICAL MONITOR to position 3.
- (38) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (BB *space*).

#### **Reverse Channel Tests**

- (39) If the reverse channel is not installed, option T is provided. Data sets 202D1, 202D3, and 202D5 do not contain reverse channels. Data sets 202D2, 202D4, and 202D6 contain reverse channels. Refer to Section 592-016-200 for option T setup. Care should be taken to maintain an off-hook condition on the circuit.
- (40) Set the 914-type DTS controls as follows:
- METER FUNCTION to OFF
  - METER POLARITY to REV
  - VERTICAL MONITOR to position 12
  - METER FUNCTION to VOLT INT.
- (41) Observe the meter. A reading of  $8.0 \pm 3.0$  Vdc should be obtained (SB *off*).
- (42) Turn the METER FUNCTION switch to OFF.
- (43) Request the DTC to send  $387 \pm 3$  Hz at  $-10$  dBm.
- (44) Switch the METER POLARITY to NOR.
- (45) Turn the METER FUNCTION switch to VOLT INT.
- (46) Observe the meter. A reading of  $11.0 \pm 3.0$  Vdc should be obtained (SB *on*). Return the METER FUNCTION switch to OFF.

- (47) Operate the S1 switch of the 914C DTS to the ON position.
- (48) Request the DTC to measure the reverse-channel tone frequency. Without carrier facilities, the tone should be  $387 \pm 3$  Hz. With carrier facilities, the tone should be  $387 \pm 12$  Hz. Operating the S5 switch to the OFF position will release the call.
- (49) Remove all temporary strapping and cords.

**C. Contact Interface Test**

**3.11** For data sets wired for *contact* interface, use the following test procedure.

- (1) Set the controls of the 914C DTS as follows:
  - Matrix will remain as in Fig. 2.
  - Depress *all* of the A interface selector switches.
  - INTERFACE MODE to VOLTAGE
  - METER FUNCTION to VOLT INT.
  - METER RANGE to 30 DCV.
  - METER POLARITY to NOR.
  - VERTICAL MONITOR to position 9.



*Turn the METER FUNCTION switch to the OFF position before changing the VERTICAL MONITOR switch.*

- (2) Refer to 3.10 and repeat Steps (1) through (22).

**Auto Answer Tests**

- (3) Observe the meter. A reading of  $0 \pm 0.7$  Vdc should be obtained (CC *off*).

**Note:** If the data set has a contact interface and is not wired for AUTO ANSWER, option ZD must be installed.

- (4) Temporarily install option ZD with set wired for AUTO ANSWER.

- (5) Turn INTERFACE MODE to CONTACT.
- (6) Turn the METER FUNCTION switch to VOLT/OHM EXT.
- (7) Turn the METER RANGE switch to X100 ohms.
- (8) Zero adjust the ohmmeter after shorting the input terminals.
- (9) Connect the METER INPUT terminals to pins 22 and 23 of the interface selector A terminals.
- (10) Check for an open circuit. This should be indicated by no movement of the meter.
- (11) Request DTC to place call to the data set.
- (12) When ringing starts, a reading of 2000 ohms should be obtained on the meter. During the silent period, operate switches S4 and S5 of the 914C DTS to the ON position. The ringing should stop and both TALK and DATA lamps should light on the DAS 804A.
- (13) Refer to 3.10 and repeat Steps (31) through (46).
- (14) Place a red pin in matrix 9-TP3 and 11-TP3.
- (15) Request DTC to measure the reverse-channel tone frequency. Without carrier facilities, the tone should be  $387 \pm 3$  Hz. With carrier facilities, the tone should be  $387 \pm 12$  Hz. Operating the S4 and S5 switches to the OFF position will release the call.
- (16) Remove all temporary strapping and cords. Restore the data set to normal.

**D. Back-to-Back Test**

**3.12** The purpose of the back-to-back test is to check the data set transmitter and receiver.

**3.13** This test measures the distortion and error rate of the data set. The data set transmitter is driven by a word generator in the 914-type DTS. The transmitted signal is looped back to the data set at the connecting block. The data signals are received by the data set and compared

to a second signal within the 914C DTS. The data signals are transmitted by a 903 DTS if a 914B DTS is utilized for receiving instead of a 914C DTS. The 914-type DTS synchronizes the two signals and counts the number of errors in the received data.

**3.14** A 914C (or a 914B and 903) DTS is required at the data station.

**3.15** Disconnect the telephone line wires of the system from the terminal block. If the system is a 2-wire PL, a 600-ohm termination must be added to terminate the facility.

**3.16** If 6017 AP key or DAS 828 is being used, it is not necessary to disconnect the telephone line wires of the system. Back-to-back tests can be performed using the facilities.

**3.17** If the system is a 4-wire system, temporarily connect a strap from T to T1 and R to R1 at the connector block.

**3.18** Set up the 914-type DTS matrix, as in Fig. 3, by placing the red shorting pins into the indicated position.

**3.19** Set the 914C DTS switches as in Fig. 3.

**3.20** Perform the steps as follows:

- (1) Plug the 914-type DTS power cord into a 117-Vac outlet. Connect the 914-type DTS (A connector) to the data set interface connector.
- (2) Apply power to the 914-type DTS by depressing the POWER buttons.
- (3) In the case of the 914B, also apply power to the 903 DTS.
- (4) A 5-minute run may be started by momentarily depressing RESET and MAN SYNC simultaneously. Timing will start when released.
- (5) After a 5-minute run, observe the occurrence of errors on the counter. If any errors exist, perform the test again for 5 minutes. If any errors occur on the second test, replace the 202D data unit.
- (6) Restore telephone line wires to original condition.

## **E. Dynamic Test**

**3.21** The purpose of the dynamic test is to check the data set transmitter and receiver and the connecting facilities.

**3.22** The following equipment is required at *each* station:

- 914-type DTS
- 1013 handset.

**3.23** Arrange the DTS as shown in Fig. 4. Make the necessary interface cable connections between the 914-type DTS and the data set 202D at both stations.

**3.24** The dynamic test is conducted between the transmitter at the near end and the receiver at the far end. These tests must be conducted in both directions but not necessarily simultaneously. One end can be a DTC.

**3.25** These tests measure the error rate of the data system. The transmitting data set is driven by a 914-type DTS (63-bit word generator). At the receiving end, the data set feeds the data signals to a 914-type DTS (error-checking set). Also at the receiving end, a 914-type DTS is used to provide a signal identical to the signal sent from the transmitting end. The 914-type DTS synchronizes these two signals and counts the number of errors in the received data.

**3.26** The following switch settings are to be made for switched network and PL testing.

### ***Transmitting End***

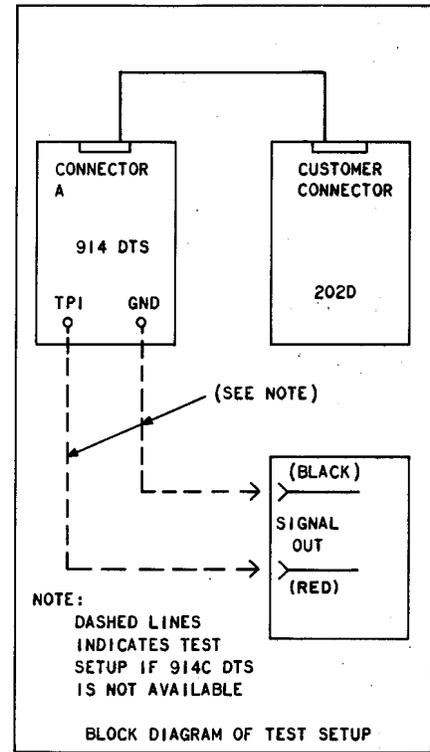
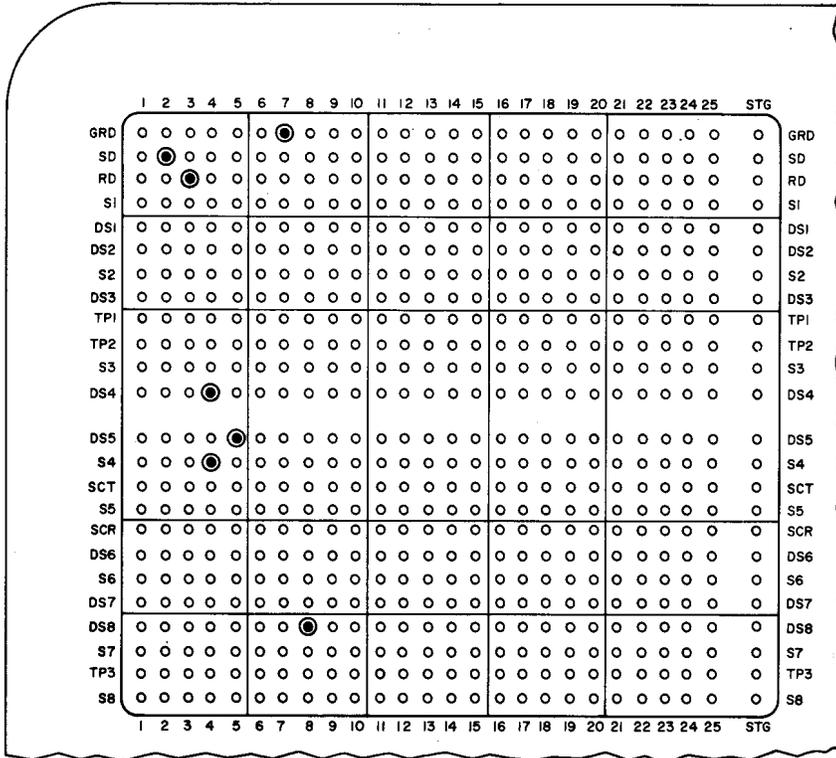
**3.27** See Fig. 4 for the 914 DTS controls.

**3.28** Plug the 914-type DTS power cord into the 117-Vac outlet. Turn the 914-type DTS on by depressing the POWER button.

### ***Receiving End***

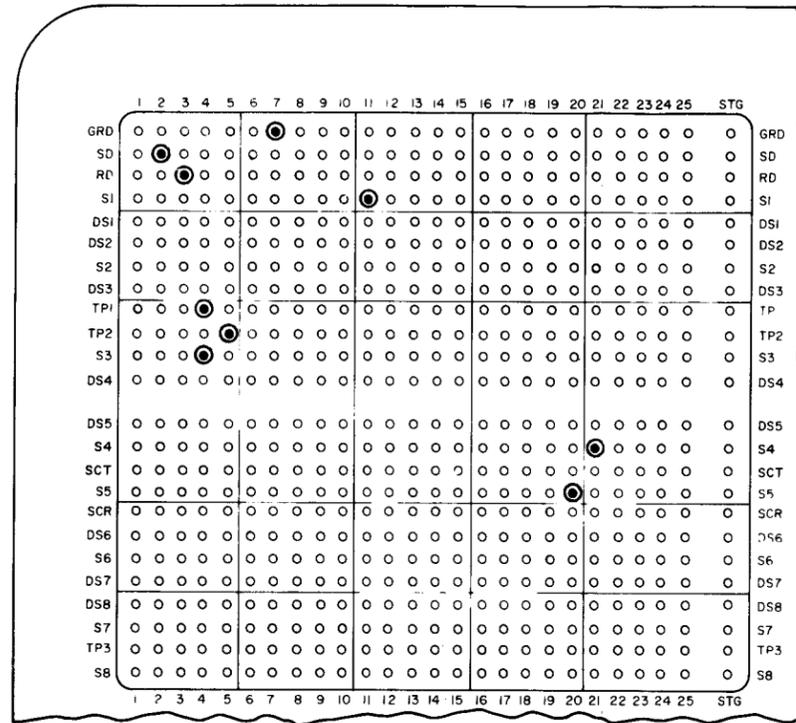
**3.29** Set the receiving 914-type DTS controls as in Fig. 4.

**3.30** Plug the 914-type DTS power cord into the 117-Vac outlet. Turn the 914-type DTS on by depressing the POWER button.

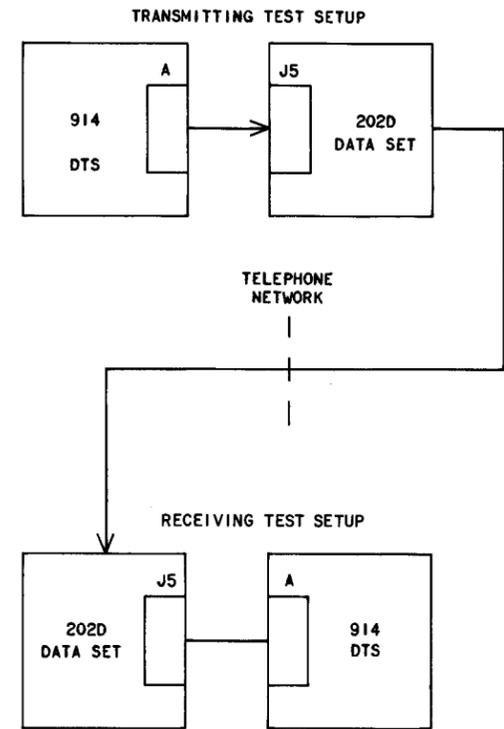


THE 914C DTS SWITCH SETUP											
<ul style="list-style-type: none"> <li>● INTERFACE MODE TO VOLTAGE</li> <li>● TEST SET MODE TO SER (914C DTS)</li> <li>● TEST SET MODE TO RCV SER (914B DTS)</li> <li>● TRANSMIT BIT RATE TO 1200 (914C)</li> <li>● TRANSMIT WORD LENGTH TO 63 (914C)</li> <li>● TRANSMIT SIG LEV TO ±4V (914C)</li> <li>● RCV BIT RATE TO 1200</li> <li>● RCV WORD LENGTH TO 63</li> <li>● COUNTER TO BIT ERRORS</li> <li>● SAMPLE WIDTH TO 0.5 μs</li> <li>● SWITCH S4 TO ON</li> <li>● WORD SYNC TO AUTO</li> <li>● PLACE FUNCTION SWITCH TO PHASE ADJ. OBSERVE METER FOR ZERO POSITION. ADJUST PHASE CONTROL IN ORDER TO ZERO METER.</li> <li>● PLACE FUNCTION SWITCH TO OFF.</li> </ul>	<p>IF 914B AND 903 DTS ARE USED, SET SWITCHES ON 903 DTS AS FOLLOWS:</p> <ul style="list-style-type: none"> <li>● BIT RATE TO 1200</li> <li>● TRIGGER TO + (PLUS)</li> <li>● RANDOM-DOT TO RANDOM</li> </ul> <p>914 DTS INDICATOR LAMPS CORRESPOND TO INTERFACE LEADS AS FOLLOWS:</p> <table border="0"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">LAMP</th> <th style="text-align: left; border-bottom: 1px solid black;">LEAD</th> </tr> </thead> <tbody> <tr> <td>DS1</td> <td>REQUEST TO SEND</td> </tr> <tr> <td>DS2</td> <td>CLEAR TO SEND</td> </tr> <tr> <td>DS3</td> <td>CARRIER DETECTOR</td> </tr> <tr> <td>DS4</td> <td>SECONDARY CARRIER DETECTOR</td> </tr> </tbody> </table>	LAMP	LEAD	DS1	REQUEST TO SEND	DS2	CLEAR TO SEND	DS3	CARRIER DETECTOR	DS4	SECONDARY CARRIER DETECTOR
LAMP	LEAD										
DS1	REQUEST TO SEND										
DS2	CLEAR TO SEND										
DS3	CARRIER DETECTOR										
DS4	SECONDARY CARRIER DETECTOR										

Fig. 3—Back-to-Back Test Setup for Data Set 202D



914 DTS MATRIX FOR TRANSMITTING AND RECEIVING



BLOCK DIAGRAM FOR DYNAMIC TESTS

TRANSMITTING 914 DTS SWITCH SETUP

- SET TEST SET MODE SWITCH TO SER.
- SET BIT RATE TO THAT NEAREST THE BUSINESS MACHINE, BUT NOT LOWER.
- SET SIGNAL LEVEL TO ±4V.
- SET WORD LENGTH TO 63.
- FOR VOLTAGE INTERFACE, SET SWITCHES S3 AND S5 TO ON.
- FOR CONTACT INTERFACE, SET SWITCHES S2, S4, AND S5 TO ON; SET REFERENCE VOLTAGE-SELECT SWITCH TO +7.0 AND OUTPUT SWITCH TO TP3; AND ON THE MATRIX, REMOVE PIN S3 BY 4 AND INSERT PIN TP3 BY 4.
- SET INTERFACE MODE SWITCH TO THAT OF THE DATA SET BEING TESTED (CONTACT OR VOLTAGE).

RECEIVING 914 DTS SWITCH SETUP

- TEST SET MODE TO SER
- COUNTER TO BIT ERRORS
- WORD LENGTH TO 63
- BIT RATE SET TO THE RATE OF THE TRANSMITTING END
- SWITCH S3 TO ON (FOR CONTACT INTERFACE ONLY)
- INTERFACE MODE TO CONTACT OR VOLTAGE DEPENDING ON THE TYPE INTERFACE OF THE DATA SET
- SWITCH S5 TO ON.
- METER FUNCTION TO PHASE ADJ. ADJUST PHASE TO ZERO METER AND RETURN METER FUNCTION TO OFF.

Fig. 4—Dynamic Test Setup

**Switched Network**

**3.31** Complete end-to-end tests will involve making two 10-minute and six 2-minute test runs. Establish voice communication in the manner normally used by customer.

**3.32** If the DAS 804A is available, alternately place calls from each end except where one customer location will always be originating the call. These test calls should be made during busy hours. This will give reasonable assurance that all test calls do not use the same trunks and routes. Perform the following procedure for each test call.

- (1) Establish voice communication between stations. The test sets should be prepared as shown in previous text.
- (2) The answering (called) station goes from the talk to data mode by depressing DATA key of DAS.

**Note:** This test checks circuitry furnished on 3A data unit.

- (3) When the originating (calling) station attendant hears the 2025-Hz tone change to a lower frequency (either 1200 or 387 Hz), he should go to the data mode by depressing the DATA key.

**3.33** The receiving station performs the following steps. Set 914-type DTS controls as follows:

- Set FUNCTION to PHASE ADJ.
- PHASE: Adjust for the zero point on METER.
- Set FUNCTION to OFF.
- Set SAMPLE WIDTH to 0.5  $\mu$ s.
- Operate WORD SYNC momentarily to MAN.
- Operate RESET and MAN SYNC momentarily to begin timing for the recorded error count on the counter display.

**3.34** See Fig. 5 for example of form for recording test results.

**Test Call Requirements**

**3.35** During 10-minute calls, count errors in 1-minute test periods.

**Note:** This test is used to determine acceptability of long-term error rate.

- Disregard the one test period with highest number of errors.
- Total errors in the remaining nine test periods should be no more than six.
- If test fails, repeat on a different connection. If test fails twice, call supervision.

**3.36** For 2-minute calls:

**Note:** This test is used to determine acceptability of randomly selected facilities available for routing data calls.

- If two or more calls have more than three errors each, the test fails.

**3.37** At the completion of the test, place data set in the talk mode and return handset to the on-hook condition.

**Private Line**

**3.38** The PL dynamic test will require a 5-minute test run if the customer complaint indicates excessive errors (more than three errors in ten bits) or a 15-minute test if the complaint indicates random errors. Perform the following procedure for the test call.

- (1) Establish voice communication between stations. This may require the use of an adjacent telephone or a 1013 handset.
- (2) The transmitting station will be set up as in Fig. 4.
- (3) The receiving station will set the controls of the 914C DTS as shown in Fig. 4.

**3.39** The receiving station will perform the steps shown in 3.33.

Date: \_\_\_\_\_

Data Test Calls Placed Between:

<u>LOCATION</u>	<u>TEL. # OF TEST LINE OR STATION</u>
(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		PEAK DISTORTION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	AT	TIME	AT	%															
_____	_____	_____	_____	_____															
_____	_____	_____	_____	_____															
_____	_____	_____	_____	_____															

SHORT DURATION TEST CALLS			SHORT CALL — NUMBER									
ORIGINATED AT	TIME		(READINGS AT _____)					(READINGS AT _____)				
			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. 5—Example of Log Sheet

**Test Call Requirements**

- 3.40** During a 10-minute test, count errors in 1-minute test periods.
- Disregard the one test period with the highest number of errors.
  - Total errors in the remaining nine test periods is a function of the bit rate and is shown in Table B.

TABLE B

MAXIMUM ERRORS ALLOWED

BPS	MAXIMUM NUMBER
1000	3
1200	5
1400	6
1600	7
1800	8

**E. Round Trip Dynamic Test**

- 3.41** The round trip dynamic test measures distortion and error rate of the data set 202D from a data station through a facility.
- 3.42** The test involves two stations. The test equipment is located at one station and the other station will provide a loop-back arrangement. Refer to Section 592-016-200 for terminal information.
- 3.43** The 914-type DTS is required at the testing data station.

- 3.44** Set up the 914-type DTS matrix as described in Fig. 3.
- 3.45** Set the 914-type DTS switches as described in Fig. 3.
- 3.46** At the station location that is not testing, a loop-back arrangement is made. The receiver output is looped to the transmitter input when TEST key is depressed on the data set 202D.
- 3.47** Establish voice communication between the stations.
- 3.48** Plug the 914-type DTS power cord into a 117-Vac outlet. Connect the 914 DTS (A connector) to the data set interface connector.
- 3.49** Perform the test as follows:
- (1) Apply power to 914 DTS by depressing the POWER buttons.
  - (2) Inform the far-end station to depress the TEST key.
  - (3) Momentarily depress RESET and operate WORD SYNC switch to MAN position.
  - (4) During a 10-minute run, count errors in 1-minute test periods. Disregard the one test period with the highest number of errors.
- Requirement:** Total errors in the remaining nine test periods should not be greater than five.