DATA SET 205B-TYPE TRANSMITTER-RECEIVER TEST PROCEDURES

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1. GENERAL

1.01 This section contains test procedures for Data Set 205B. The following tests are to be made at the time of installation (with the exception of the Maintenance Tests) and may be used for clearing routine trouble conditions. The tests are described in the following order:

●Remote test

(a) Remote test is normally accomplished by a 904E-type data test center (arranged for Data Set 205B tests). The customer may place the data set in remote test with an applicable signal on RMT interface lead, or the LOCAL TEST—LINE—REMOTE TEST key may be operated to the REMOTE TEST position. When preparing a Data Set 205B2, the signal may be originated from a console, control panel, or an associated telephone set as incorporated in a Data Auxiliary Set 804M-type (or equivalent).

(b) The remote test may be used at the time of a maintenance visit to check the accuracy of the oscillator when directed by the data test center.

(c) The remote test can determine the condition of the data set and can determine when a maintenance visit is necessary if a trouble report has been received.

●Installation test

(a) Ground noise test

(b) Power test

(c) Installation test

(d) End-to-end test

●Maintenance test.

1.02 This section is reissued to include test procedures using the 914B Data Test Set (DTS). Due to extensive revision, change arrows have been omitted.

1.03 Parts 6 and 7 of this section contain information for testing Data Set 205 using the 914B DTS. When the craft employee is equipped with the 914B DTS, omit Parts 4 and 5 and proceed to Parts 6 and 7.

2. CAUTIONS

2.01 The following cautions must be observed when working with the data set:

- Always disconnect the DC POWER cord before removing or installing printed wiring boards.

- It is very easy to accidentally short the +18 Vdc or −18 Vdc power supply voltages (appearing on the rear of the data set) to adjacent terminals. This must be avoided because application of either +18 Vdc or −18 Vdc to ***virtually any*** other wire on the back of the data set will result in transistor or diode destruction. DO NOT WORK ON THE TERMINAL SIDE OF THE EQUIPMENT—USE TEST POINTS AND THE INTERFACE CONNECTOR ONLY.

- In the event that it is necessary to repair or replace wires on the rear of the data set, extreme care is required to avoid pulling on the terminal pins. Pulling on the terminal pins will deform the contacts and destroy the terminal. Use wire wrapping and unwrapping tools only.

- Before attempting any tests, check that all printed circuit boards are pushed all the way in and are securely seated in their respective connectors.

- Before applying operating voltages to the data set, or troubleshooting (with power off), visually check the alignment of every terminal on the wiring side, and straighten if necessary, to be sure that adjacent terminals are not touching.

3. REMOTE TEST

3.01 Upon request of the operator of a 904E-type data test center (arranged for Data Set 205B tests), the data set under test is placed in the remote test mode by:

(a) Placing the LINE—REMOTE TEST key in the REMOTE TEST position, or

(b) Operating the remote test relay by means of an interface circuit controlled from a telephone or from the customer's equipment (through the RMT interface circuit lead).

3.02 In the remote test mode, the data test center may check the following:

(a) The RS-CS operation and time intervals.

(b) Data performance at 2400 and 1200 bps. (600-bps data performance is not presently checked by the data test center.)

(c) Effectiveness of the transmitter and receiver synchronization recovery circuits.

(d) The 1000 code which is generated internally when the data set is in the CONTINUOUS CARRIER mode and request-to-send (RS) is OFF.

Note: The data set may be remotely tested in either the CONTINUOUS CARRIER or the SWITCHED CARRIER mode or both. Inform the data test center operator concerning which option mode is selected.

(e) Local oscillator accuracy. The oscillator must be calibrated at least once every three years by the data test center if the 6-second holdover requirement is to be met.

3.03 The oscillator potentiometer is located at the top and to the front of the 65A oscillator printed wiring board 051.

Note: Do not attempt to adjust the potentiometer on the 65A oscillator unless ***expressly*** requested to do so by the data test center. If requested to make an adjustment, use the procedure given in 3.04. The potentiometer adjustment screw may be reached and adjusted without removal of the board.

3.04 One revolution of the oscillator potentiometer screw varies the oscillator frequency by

approximately 5.5 parts per million (ppm). The data set under test must have had power on for at least 15 minutes prior to the determination of frequency by the data test center.

(a) To ***increase*** the oscillator frequency, turn screw ***clockwise.***

(b) To ***lower*** the oscillator frequency, turn screw ***counterclockwise.***

3.05 The data test center determines when the 65A oscillator is in calibration.

3.06 ***If the remote test of the data set is successful, NO further testing need be done.***

3.07 If further testing is required, or a data test center is unavailable, test Data Set 205B as described in the remainder of this section.

3.08 Restore Data Set 205B to normal operation.

4. TESTS USING 901-, 902-, AND 903-TYPE DATA TEST SETS

4.01 The following tests are to be made either at the time of installation or under conditions given in 3.06 and 3.07 above. The tests can also be used to determine the condition of the data set during a maintenance visit.

4.02 The following test equipment is required to perform the tests contained in Part 4:

1—6A Impulse counter

1—901-type Data Test Set

1—902-type Data Test Set

2—903-type Data Test Sets

1—KS-16979 volt-ohm-milliammeter or equivalent

1—1011-type handset

6—Test probes—double end—WECo 735A (to mate with test points on data set printed wiring boards)

1—M25A cord (for testing Data Set 205B2 only).

A. Ground Noise Test

4.03 Measure the noise between data set ground and business machine ground using a 6A impulse counter as follows:

(a) Arrange the interface test adapter (part of the 901B Data Test Set) as shown in Fig. 1. This connects the test adapter between data set and customer business machine grounds through the interface connector.

(b) Connect the 6A impulse counter between TST 1 and EQ 1 on the test adapter. Follow the step procedure listed in Fig. 1.

4.04 If any counts are noted in a 15-minute period, grounding arrangements must be improved.

4.05 General description, calibration, and operating procedures for the 6A impulse counter are contained in J94006A (6A) Impulse Counter, Description, Operation, and Maintenance (Section 103-620-100).

B. Power Test

4.06 Measure the ac line voltage applied to the Data Auxiliary Set 819A (power supply), if it is used, with a KS-16979 test meter. The ac line voltage should measure between 105 and 129 volts at 60 Hz.

C. Installation Test

4.07 The following preparation procedures include instructions for both preparing Data Set 205B for succeeding tests and conditioning selected control leads to provide the desired operation. The test procedures are written for use with 900-type Data Test Sets listed in 4.02. To provide data set conditioning with equipment different from the 900-type Data Test Sets, the required condition of both control and data signal inputs for each test step is given. Regardless of test equipment used, the data set under test may be conditioned as required with the following instructions. Control settings of the 900-type Data Test Sets are described in sequential order.

4.08 Data Set 205B can be tested with a wide variety of operating conditions. There are four independent speed selections for both transmitter and receiver which are controlled through interface

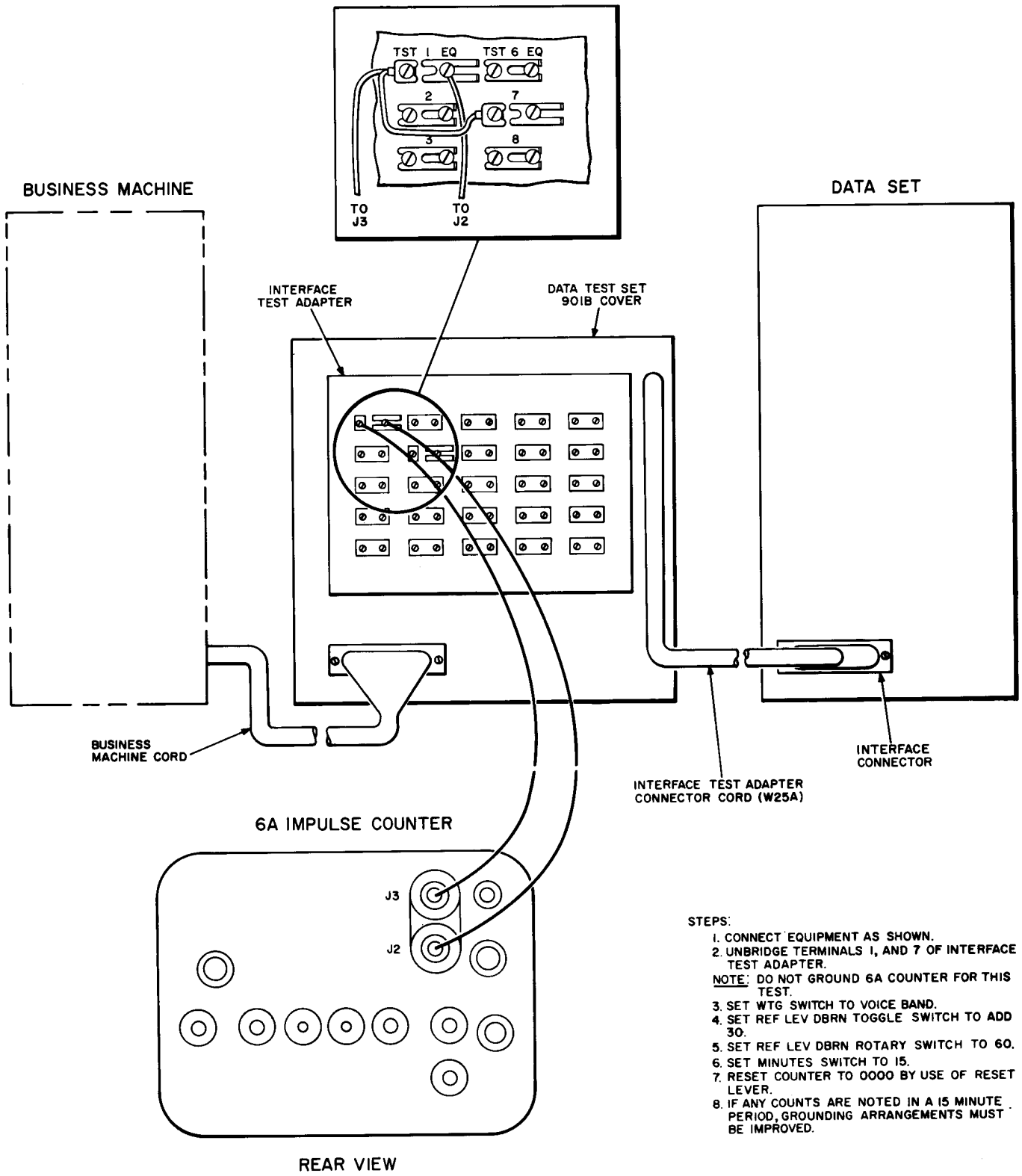


Fig. 1—Interface Test Adapter Connections for Measuring Noise Count

leads. All speed selections are available using either the CONTINUOUS CARRIER mode or SWITCHED CARRIER mode of operation. Independent speed selection is controlled through the following interface leads:

INTERFACE LEAD	ABBREVIATION	CIRCUIT DEFINITION
13	SAT	Speed A Transmit
14	SBT	Speed B Transmit
18	SAR	Speed A Receive
23	SBR	Speed B Receive

4.09 When the data set is operated in the CONTINUOUS CARRIER mode, the 1000 synchronization code is transmitted continuously when RS (request-to-send) is OFF. When RS is switched ON, the CS (clear-to-send) signal goes ON within 0.83 msec at 2400 and 1200 bps (or within 1.66 msec at 600 bps). In SWITCHED CARRIER mode, the transmitter carrier is turned on and off by the customer's RS signal. The CS signal is delayed to provide a sufficient time interval for a distant receiver to synchronize with the transmitted signals. Data Set 205B2 delays the CS signal for a time period long enough to allow an attendant to manually switch into the data mode while the 1000 synchronizing code is being received.

4.10 Independent transmitter and receiver speed selection is controlled through interface signal leads SAT, SBT, SAR, and SBR. Voltages applied on these signal leads to operate the data set circuits require a minimum of +3.0 to a maximum of +25 Vdc, or a minimum of −3.0 to a maximum of −25 Vdc. Table A shows the minimum required voltage on applicable control leads to produce a desired speed for both data set transmitter and receiver sections.

4.11 Prepare Data Set 205B as follows:

(a) In the following order, disconnect the DC POWER cord, the CUSTOMER cord, and the 4B1 Data Unit cord used on Data Set 205B1 (or CONTROL cord which is used with Data Set 205B2) from their respective connectors on the data set.

TABLE A

TRANSMITTER

MODE (bps)	SAT	SBT
2400	>+3.0 Vdc	>+3.0 Vdc
1200	<+3.0 Vdc	>+3.0 Vdc
600	>−3.0 Vdc	<−3.0 Vdc
REGEN	<−3.0 Vdc	<−3.0 Vdc

RECEIVER

MODE (bps)	SAR	SBR
2400	>+3.0 Vdc	>+3.0 Vdc
1200	<−3.0 Vdc	>−3.0 Vdc
600	>+3.0 Vdc	<+3.0 Vdc
REGEN	<−3.0 Vdc	<−3.0 Vdc

(b) Check that terminals E1 to E2 on the data set are strapped.

(c) Carefully remove and check TR-SW (181/019) circuit pack. Strap terminal 1 to 2 and terminal 3 to 4 (if not so strapped). The straps ground both RMT and SCTE interface signal leads.

(d) Operate the LINE—LOCAL TEST key to LOCAL TEST position.

Note: The following conditions up to 4.12 test the functions associated with the CONTROL connector and apply to Data Set 205B2 only. For testing Data Set 205B1, proceed directly to 4.12.

(e) For Data Set 205B2 only, make the following connections:

- Open shorting clips 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 20, 23, and 24 on the 901B test set cover.
- Connect the 901B test set cover to the CUSTOMER connector with the supplied W25A cord.
- Connect the female connector on the 901B test set cover to the CONTROL connector using the M25A cord. ONLY THE 901B COVER IS USED FOR THIS PART OF THE TESTS.

●Connect the DC POWER cord.

Caution: Be very careful to ensure that terminals TST 2 and TST 20 are not connected to any other terminal during the following tests. The terminals supply unprotected – 18 Vdc and + 18 Vdc, respectively.

(f) Measure the −18 Vdc and +18 Vdc power supply voltages as they appear on the CONTROL connector using the following test sequence:

(1) Condition the KS-16979 test meter to measure 60 Vdc full scale. Connect the negative test lead to TST 2 and the positive test lead to TST 16.

(2) The test meter should indicate −18 (±2.2) Vdc.

(3) Disconnect the meter test leads.

(4) Connect the positive test lead to TST 20 and the negative test lead to TST 16.

(5) The test meter should indicate +18 (±2.2) Vdc.

(6) Disconnect the meter test leads.

(g) Check the RI and DTRY circuits. Using two of the four wires attached to the 901B test set cover, make the following connections: EQ 21 to EQ 20 and TST 24 to TST 16.

(1) Condition the KS-16979 test meter to the 12 Vdc scale.

(2) Connect the positive test lead to TST 19 and the negative test lead to TST 16.

(3) The test meter should indicate +6.5 (±1.3) Vdc.

(4) Disconnect the meter test leads.

(5) Remove the connections between TST 24 and TST 16.

(6) Connect the positive test lead to TST 16 and the negative test lead to TST 19.

(7) The test meter should indicate −7.0 (±1.3) Vdc.

(8) Disconnect the meter test leads.

(9) Remove the connections between EQ 21 and EQ 20.

(h) Check the remote test feature as follows:

(1) Momentarily connect TST 13 to TST 16. Relays K2 and K3 should not operate.

(2) Operate the LINE—LOCAL TEST key to LINE position.

(3) Connect TST 13 to TST 16.

(4) Relays K2 and K3 should operate.

(5) Condition the KS-16979 to measure continuity. A resistance of less than two ohms should be measured between TST 1 and TST 16 when relays K2 and K3 are operated.

(6) A resistance of less than two ohms should be measured between TST 3 and TST 4 when relays K2 and K3 are operated.

(7) If the conditions for (1) through (6) are not met, replace the data set. If the conditions are met, remove the connections between TST 13 and TST 16.

(i) Check the LS and DSR functions as follows:

(1) Connect TST 15 to TST 16 and operate the data set rotary switch to CCA position.

(2) Condition the KS-16979 test meter to measure on the 12 Vdc scale.

(3) Connect the positive meter lead to EQ 6 and the negative meter lead to TST 16.

(4) The test meter should indicate +7.0 (±1.3) Vdc.

(5) Disconnect the meter test leads.

(6) Remove the connection between TST 15 and TST 16.

(7) Connect the negative meter lead to EQ 6 and the positive meter lead to TST 16.

(8) The test meter should indicate −6.5 (±1.3) Vdc.

(9) Disconnect the meter test leads.

(10) If the requirements of (4) and (8) are not met, replace the data set. If the requirements are met, proceed with the following steps.

(11) Operate the LINE—LOCAL TEST key to LOCAL TEST position.

(12) Disconnect the DC POWER cord, the W25A cord connecting the 901B test set cover to the data set, and the M25A cord connecting the CONTROL connector to the 901B test set.

(13) Restore all open shorting clips on the test set cover to the closed position in preparation for subsequent testing.

4.12 Connect and prepare the 901B Data Test Set as follows:

(a) Position both A TEST and B TEST switches to OFF.

(b) Connect the 901B test set cord to the interface test adapter (part of the 901B test set cover). Connect the interface test adapter to the data set CUSTOMER connector using the W25A cord provided. Set the SELECTOR switch to position 3.

(c) Make the following arrangements on the interface adapter:

- Open shorting clips 13, 14, 18, 20, 22, 23, 24, and 25.
- Strap 9 to 19, EQ 13 to EQ 18, EQ 14 to EQ 23, and EQ 14 to TST 20.
- Speed selection is determined by connections shown in Table B.

(d) Connect the DC POWER cord to the data set.

TABLE B

SPEED	EQ 13 TO	ATT-UNATT SWITCH TO
2400	9	UNATT
1200	10	UNATT
600	9	ATT
REGEN	10	ATT

4.13 Before attempting a data transmission test, such as back-to-back or end-to-end, measure the operating and interface voltages with the following procedures.

4.14 Measure the −18 Vdc and +18 Vdc power supply voltages using the following test sequence:

(a) Condition the KS-16979 test meter to measure 60 Vdc full scale. Connect the negative probe to terminal A (on the 901B test set) and the positive probe to terminal C. Set the ATT-UNATT switch to ATT.

(b) Position B TEST switch to 1.

(c) The test meter should indicate −18 (±2.2) Vdc.

(d) Disconnect test meter probes.

(e) Position B TEST switch to 2.

(f) Connect the positive test meter probe to terminal A and the negative probe to terminal C. The test meter should indicate +18 (±2.2) Vdc.

(g) Disconnect the test meter probes.

4.15 Measure the interface voltages. If voltage indications are measured at terminals on a 901B test set, take care to observe polarity. DC measurements are made between terminals A and C. Terminal C is always at ground potential. AC measurements are made between terminals B and C.

4.16 Measure the DSR (data set ready) interface voltage. Place the data set in the SWITCHED CARRIER (SC) mode. Set the 901B A TEST switch

to position 1 and B TEST switch to OFF. Position the LINE—LOCAL TEST key in LOCAL TEST position. Proceed as follows:

(a) With the equipment prepared as above, the DSR voltage measured between 901B test set terminals A and C (ground) should be −6.5 (±1.3) Vdc. Remove the test meter probes.

(b) Operate the LINE—LOCAL TEST key to LINE position.

(c) The DSR voltage measured between terminals A and C should be +7.0 (±1.3) Vdc.

(d) Repeat the (a) through (c) sequence with the data set in the CONTINUOUS CARRIER (CC) mode. If the above requirements are not met, refer to the maintenance test procedures (5.06).

4.17 After the requirements of 4.16 have been met, operate the data set into the SWITCHED CARRIER (SC) mode. Operate the LINE—LOCAL TEST key to LOCAL TEST position. Connect EQ 13 to 9 and position ATT-UNATT switch (on the 901B test set) to UNATT.

Note: The data set is now prepared to operate at 2400 bps. For alternate speed selection, refer to Table B.

4.18 Measure for the dc and ac interface voltage requirements listed in Table C. If the measurements exceed the listed tolerance, refer to the appropriate section (Table G) in maintenance test procedures. It is recommended that all dc voltage measurements be obtained first, then repeat the procedures to obtain ac voltage indications.

Note: Remove test meter leads and observe polarity before each measurement.

TABLE C

INTERFACE REQUIREMENTS: SWITCHED CARRIER

LEAD TESTED	A TEST POSITION	B TEST POSITION	RS LEAD CONDITION	SD LEAD CODE*	TEST METER INDICATION	
SCT	23	8	OFF	01	0.0 (±0.7) Vdc;	6.8 (±1.6) Vac
DTI	22	8	OFF	01	$0.0\,^{(+1.5)}_{(-0.7)}$ Vdc;	7.5 (±2.1) Vac
CS	21	8	OFF	01	−6.5 (±1.3) Vdc;	0 Vac
CS	21	5	ON	01	+7.0 (±1.3) Vdc;	0 Vac
RD	20	8	OFF	01	−6.1 (±0.7) Vdc;	0 Vac
RD	20	5	ON	01	0.0 (±0.7) Vdc;	6.8 (±1.6) Vac
RD	20	4	ON	00	+6.1 (±0.7) Vdc;	0 Vac
RD	20	3	ON	11	−6.1 (±0.7) Vdc;	0 Vac
SCR	19	8	OFF	01	0.0 (±0.7) Vdc;	6.8 (±1.6) Vac
COO	17	8	OFF	01	−6.5 (±1.3) Vdc;	0 Vac
COO	17	5	ON	01	+7.0 (±1.3) Vdc;	0 Vac

* With 900-type test equipment, the 01 code which appears on the DTI lead is connected to the SD lead for the test indicated.

4.19 Operate the REMOTE TEST—LINE—LOCAL TEST key to REMOTE TEST position. Relays K2 and K3 should operate and the K2 relay contacts should open the interface signal leads. Measure between 901B terminals A and C (ground) for dc voltages and between terminals B and C for ac voltages. Make both dc and ac measurements for each specified position of the A TEST switch. B TEST switch can be at any position. Measure for a voltage as shown on the following chart. If a voltage measurement is obtained, see 5.05. If the requirements are met, return the key to LOCAL TEST position.

A TEST SWITCH	DC VOLTAGE	AC VOLTAGE
23	0	0
21	0	0
20	0	0
19	0	0
17	0	0

4.20 Measure for the dc and ac interface voltage requirements listed in Table D. Operate the data set into the CONTINUOUS CARRIER (CC) mode. Refer to Table B for connections required to obtain the desired speed selection. The signal on SD lead is the 01 code of DTI. If the measurements exceed the listed tolerances, refer to the appropriate section (Table G) in maintenance test procedures.

4.21 Check frequency with handset.

(a) Connect a 1011-type handset across terminals B and C on the 901B test set.

Caution: Keep handset away from ear.

(b) Place the data set in the CONTINUOUS CARRIER (CC) mode.

(c) Turn the A TEST switch to 19 and the B TEST switch to 5. SCR is then connected to terminal B. Refer to Table B for speed selection connections. Refer to maintenance test procedures (Table G) if the correct tone is not heard.

(1) In the 2400-bps mode, a 2400-Hz tone should be heard.

(2) In the 1200-bps mode, a 1200-Hz tone should be heard.

(3) In the 600-bps mode, a 600-Hz tone should be heard.

(4) In the REGEN mode, a 1200-Hz tone should be heard.

4.22 Measure transmit output level.

(a) Disconnect DC POWER cord from the data set.

(b) Turn A TEST and B TEST switches to OFF.

(c) Operate LINE—LOCAL TEST key to LINE position.

(d) Place the data set in the SWITCHED CARRIER (SC) mode.

(e) Disconnect telephone line from the terminal strip. Carefully note the proper connection of the telephone line so that it may be reinstalled correctly at the end of this test.

(f) Strap T to T1 and R to R1 on the terminal strip.

(g) Turn B TEST switch to 5 and set up 2400-bps mode. (RS is ON and SD is 01 code.)

TABLE D

INTERFACE REQUIREMENTS: CONTINUOUS CARRIER

LEAD TESTED	A TEST POSITION	B TEST POSITION	RS LEAD CONDITION	SPEED (bps)	TEST METER INDICATION	
SCT	23	8	OFF	2400	0.0 (±0.7) Vdc;	6.8 (±1.6) Vac
RD	20	8	OFF	2400	+3.4 (±0.7) Vdc;	5.0 (±1.6) Vac
RD	20	5	ON	2400	0.0 (±0.7) Vdc;	6.8 (±1.6) Vac
RD	20	8	OFF	600	+3.4 (±0.7) Vdc;	5.0 (±1.6) Vac
RD	20	5	ON	600	+6.1 (±0.7) Vdc;	0.0 Vac
RD	20	8	OFF	1200	+3.4 (±0.7) Vdc;	5.0 (±1.6) Vac
RD	20	5	ON	1200	+6.1 (±0.7) Vdc;	0.0 Vac
SCR	19	8	OFF	2400	0.0 (±0.7) Vdc;	6.8 (±1.6) Vac

(h) Connect the DC POWER cord to the data set.

(i) Line readings should be as shown in Table E for the desired output level as stated on the service order. (Readings may be made with a KS-16979 volt-ohm-milliammeter, set to the 3 Vac scale, connected between T and R. If an RMS voltmeter is used to make these measurements, the tolerances shown in the second column should be used.)

TABLE E

VOLTS	TRANSMIT OUTPUT LEVEL	STRAPPING ON 044 CARD
0.70 ±0.15	0 (±1.5 dB)	1-4
0.50 ±0.15	—3 (±1.5 dB)	1-3
0.35 ±0.15	—6 (±1.5 dB)	1-2
0.25 ±0.15	—9 (±1.5 dB)	None

(j) Turn B TEST to 8. (RS is OFF.) A 0 Vac reading should be obtained. If an ac voltage is measured, check that the data set is in the SWITCHED CARRIER (SC) mode. If the ac voltage is still measured, refer to maintenance test procedures (5.07).

(k) Operate the LINE—LOCAL TEST key to LOCAL TEST position and reconnect telephone line.

(l) Remove DC POWER cord from the data set.

4.23 Perform a back-to-back test using the following preparations:

(a) Arrange the data set to the following conditions:

- LINE—LOCAL TEST key to LOCAL TEST position.
- Data set in the SWITCHED CARRIER (SC) mode.

(b) Arrange the 901B, 902B, and two 903B test sets to provide random data with RS to ON at 2400-bps speed. Connect the equipment as follows:

- 901B-type DTS

  SELECTOR switch to 3

  A TEST switch to 9

  B TEST switch to OFF

  ATT-UNATT switch to UNATT.

Connect terminals EQ 13 to 9 on the interface adapter to provide 2400-bps operation.

- 902B-type DTS

  BIT RATE to EXT SYNC

  SELECTOR switch to DIST MEAS

  TRIGGER to – (minus).

- 903B-type DTSs (both No. 1 and No. 2 test sets)

  BIT RATE to EXT CLOCK

  RANDOM-DOT to RANDOM

  TRIGGER to + (plus)

  POWER to OFF.

Note: For the following connections, mate red to red and black to black.

(c) Connect the SIGNAL OUT terminals of the No. 1 903B test set to the TRANSMIT DATA terminals on the 901B test set.

(d) Connect the EXT CLOCK terminals of the No. 1 903B test set to the TRANSMIT CLOCK terminals on the 901B test set.

(e) Connect the DATA IN terminals of the 902B test set to the RECEIVE DATA terminals on the 901B test set.

(f) Connect the EXT SYNC terminals on the 902B test set to the RECEIVE CLOCK terminals on the 901B test set.

(g) Connect the No. 2 903B test set to the 902B test set with the connector cord provided.

(h) Connect both 903B test set power cords to the ac voltage supply and turn each power switch to ON.

(i) Connect the data set DC POWER cord and perform the back-to-back test using the following sequence of operations.

(j) Momentarily press the START switch on both No. 1 and No. 2 903B test sets.

(k) Momentarily press the WORD SYNC & RESET switch on the 902B test set.

(l) The TOTAL ERRORS lamps on the 902B test set will indicate errors as they occur. To obtain total errors, add the values indicated by all lighted lamps. The bottom lamp will light when the error capacity of the counter has been exceeded and the indicated count is erroneous.

(m) To be sure the 902B test set is counting errors, momentarily press the START switch of the No. 1 903B test set. The 902B test set will light the bottom lamp indicating maximum errors.

(n) Momentarily press the WORD SYNC & RESET switch on the 902B test set. Allow the test to continue for 5 minutes. No errors should be recorded. If an error count is indicated, replace the data set. If the test is satisfactory, disconnect both test equipment and data set DC POWER cord. Restore required options in the data set before releasing for normal operation.

D. End-to-End Test

4.24 This test is similar to the back-to-back test except transmission between data set stations is tested in both directions simultaneously. Identical test equipment must be used at both stations. At the local station, a 903B test set provides signals through a 901B test set and cover to drive the data set. The signals are transmitted to the distant station data set, through a 901B test set and cover, to a connected 902B test set. Both local and distant stations have a second 903B test set generating a comparison signal and connected into the 902B test set. The 902B test set can synchronize the two signals and count the number of errors in the received data. The following test set arrangement allows simultaneous checking of data set transmission and reception.

4.25 Arrange the 901B, 902B, and two 903B test sets at both local and distant stations as follows:

- 901B-type DTS

  SELECTOR switch to 3

  A TEST switch to 9

  B TEST switch to OFF

  ATT-UNATT switch to UNATT.

- 902B-type DTS

  BIT RATE to EXT SYNC

  SELECTOR switch to DIST MEAS

  TRIGGER to – (minus).

- 903B-type DTSs (both sets at both stations)

  BIT RATE to EXT CLOCK

  RANDOM-DOT to RANDOM

  TRIGGER to + (plus)

  POWER to OFF.

Note: For the following connections, mate red to red and black to black.

(a) Connect the SIGNAL OUT terminals of the No. 1 903B test set to the TRANSMIT DATA terminals on the 901B test set.

(b) Connect the EXT CLOCK terminals of the No. 1 903B test set to the TRANSMIT CLOCK terminals on the 901B test set.

(c) Connect the DATA IN terminals of the 902B test set to the RECEIVE DATA terminals on the 901B test set.

(d) Connect the EXT SYNC terminals on the 902B test set to the RECEIVE CLOCK terminals on the 901B test set.

(e) Connect the No. 2 903B test set to the 902B test set with the connector cord provided.

(f) Connect the 901B test set to the interface adapter (on the 901B test set cover).

(g) Prepare the interface adapter as follows:

(1) Open shorting clips 13, 14, 18, 20, 22, 23, 24, and 25.

(2) Strap EQ 9 to EQ 19, EQ 13 to EQ 18, EQ 14 to EQ 23, EQ 14 to TST 20, EQ 13 to TST 9, and TST 9 to EQ 20.

(h) Carefully remove the TR-SW (181/019) circuit pack. Strap terminals 3 and 4 and 1 and 2 (if the board is not already strapped in this manner).

(i) If necessary, operate and lock the LINE—LOCAL TEST switch in LINE position. Check that the telephone line is properly terminated.

(j) Connect the interface adapter cord to the CUSTOMER jack on the data set.

(k) Place the data set in the CONTINUOUS CARRIER (CC) mode (or CCA mode if switched network auto answer is required).

(l) At each station, connect both 903B test set power cords to the ac voltage and turn both power switch controls to ON.

(m) Connect the data set DC POWER cord.

4.26 Perform the end-to-end test using the following sequence of operations. If possible, both local and distant stations should perform steps (a), (b), and (c) simultaneously.

(a) Momentarily press the START switch on the No. 1 903B test set.

(b) Momentarily press the START switch on the No. 2 903B test set.

(c) Momentarily press the WORD SYNC & RESET switch on the 902B test set.

(d) The TOTAL ERRORS lamps on the 902B test set will indicate errors as they occur. To obtain total errors, add the values indicated by all lighted lamps. The bottom lamp will light when the error capacity of the counter has been exceeded and the indicated count is erroneous.

(e) To be sure the 902B test set is counting errors, momentarily press the START switch on the No. 2 903B test set. The 902B test set will light the bottom lamp indicating maximum errors.

(f) Momentarily press the WORD SYNC & RESET switch on the 902B test set. Allow the test to continue for 5 minutes, note the indicated error count, and press the WORD SYNC & RESET switch again. Operate this test for three consecutive 5-minute intervals. The error rate can be considered average if a total of 20 errors are recorded for the three test periods. If the error count approaches 100 for the three test periods, the transmission parameters of the line should be checked in accordance with Section 314-410-500. If the line checks satisfactorily, refer to plant staff through lines of organization. If these tests are satisfactory, disconnect both data set DC POWER cord and test set ac power cords.

(g) Remove test equipment connections and replace original options in the data set before restoring to normal operation.

5. MAINTENANCE TEST PROCEDURES USING 901-TYPE DATA TEST SET

5.01 The installation tests should be used on maintenance visits to clear routine trouble conditions. If the trouble is not cleared, either replace the data set or proceed with the tests in this section. The following tests are designed to indicate which printed circuit board (or boards) should be replaced as a logical choice to repair a trouble condition.

5.02 Table F lists the dc voltages that appear on the printed wiring boards. If the reading given is not obtained, the board shall be replaced.

Note: The following paragraphs outline the instructions required to safely and accurately use the information contained in Table G. Read all instructions up to Table G and follow the sequence of procedure for every circuit board replacement or group of replacements specified by the table.

TABLE F

DC VOLTAGE READINGS ON DATA SET

DC VOLTAGE	TEST POINT ON CIRCUIT PACK	CIRCUIT PACKS IN EQUIPMENT LOCATIONS
+ 6.2 (±0.6)	TP8	001, 002, 003, 005, 006, 007, 008, 009, 036, 037, 038, 039, 040, 041, 042, 043, 048, 049, 050, 053, 054, 055, 056, 057, 058
	TP14	017
	TP6	012, 014
	TP2	021
	TP3	060
+ 6.8 (±1.0)	TP7 TP8	019 059
+ 8.2 (±0.9)	TP1	044
+12.0 (±1.5)	TP11 TP6	017 019
− 6.2 (±0.6)	TP6	060
− 6.8 (±1.0)	TP12	047, 059
− 8.2 (±1.1)	TP3	012, 014
−12.0 (±1.5)	TP10	016

Caution: Always be careful when removing, inserting, or handling the printed wiring boards. NEVER remove or insert a printed wiring board unless the DC POWER connector has been disconnected from the data set.

5.03 Table G provides correlation between the 901B A TEST and B TEST switch positions (used in Tables C and D) and the printed wiring boards that provide the function under test. The letters in the blocks of Table G are keyed to the groups of circuit boards following Table G. For example: Failure to meet voltage requirements of Table C, A TEST-21, B TEST-8 (see Groups B, C, D) would require that this test procedure be followed.

(a) Remove the DC POWER connector from the data set. Carefully remove the 185 (A835185) board from location 059. Carefully insert a different 185 board known to be good in location 059.

(b) Replace the DC POWER connector and retest for proper indications as required in Table C (and Table D, if applicable). If the voltage requirements are met, put the 059 board originally removed from the data set where it can be later identified, tagged, and returned for repair.

(c) If the voltage requirements are not met, remove the DC POWER connector from the data set; remove the 185 board from location 059 and place it where it cannot be mixed with circuit boards in question; replace the original 185 board in location 059.

(d) Repeat the procedure of (a), (b), and (c) with a 175 board using Group C and locations 057, 054, and 058, respectively. If the failure continues to exist, repeat the procedure of (a), (b), and (c), using Table D and a 175 (A835175) board in locations 048, 049, 038, and 043. If the failure has not been eliminated using the 175 board, repeat (a), (b), and (c) with a 176 (A835176) board in locations 050 and 040. If the failure has not been eliminated using the 176 board,

TABLE G

TEST SECTIONS FOR TABLES C AND D FAILURES

B TEST POSITION	A TEST POSITION					
	23	22	21	20	19	17
8	(A)	(A) (B)	(B) (C) (D)	(E) (F) (G)	(H) (I)	(F) (J)
5			(B) (C) (D)	(E) (F) (G)		(F) (J)
4				(E) (F) (G)		
3				(E) (F) (G)		

(A)

CIRCUIT PACK TYPE

LOCATION	186 AR94	175 AR85	185 AR92	176 AR86	65A	
	060	058 048 043	047	040 041 042 053	051	

(B)

CIRCUIT PACK TYPE

LOCATION	185 AR72	
	059	

(C)

CIRCUIT PACK TYPE

LOCATION	175 AR85	176 AR86	
	057 054 058	055 056	

TABLE G (Cont)

CIRCUIT PACK TYPE

(D)

LOCATION	175 AR85	176 AR86	185 AR92	
	048	050	047	
	049	040		
	038			
	043			

CIRCUIT PACK TYPE

(E)

LOCATION	186 AR94	175 AR85	177 AR91	180 AR96	
	060	007	008	012	
		009		014	

CIRCUIT PACK TYPE

(F)

LOCATION	179 AR89	178 AR88	181 AR95	
	016	017	019*	

CIRCUIT PACK TYPE

(G)

LOCATION	182 AR90	175 AR85	176 AR86	186 AR94	
	044*	038	037	060	
		039	040		
		058			
		057			
		036			

* Check to see that option strapping is identical to that on the original board.

TABLE G (Cont)

(H)

LOCATION	CIRCUIT PACK TYPE 186 AR94	175 AR85	185 AR92	
	060	057 049 058 048	047	

(I)

LOCATION	CIRCUIT PACK TYPE 175 AR85	176 AR86	
	006 001	003 053 005 002	

(J)

LOCATION	CIRCUIT PACK TYPE 185 AR92	175 AR85	177 AR91	
	059	036 009	008	

repeat (a), (b), and (c) with a 185 (A835185) board in location 047. If failure is still present, replace the data set.

5.04 Table G references a selected group of printed wiring boards under test for each position combination of both A TEST and B TEST switches. The procedure in 5.03 should be used for replacing boards in any selected group. Always replace the designated boards one at a time, repeating the voltage measurement each time, until the trouble board is found and replaced. When a replacement circuit board apparently corrects a requirement failure, retest by starting at the beginning of Table C (and/or D). Measure for each requirement to be sure a new or different failure has not developed.

5.05 If the remote test 0-Vdc (corresponding to B TEST switch in position 6) requirements are not met, replace printed wiring board 184 in location 021. If the trouble is still not cleared, replace the data set.

5.06 If the requirements of 4.16 are not met, replace the 185 board in location 059 and retest. If the requirements cannot be met, replace the data set.

5.07 If the requirements of 4.22 are not met, replace both the 182 board in location 044 (retest for requirements) and the 181 board in location 019 and retest for requirements. If the requirements cannot be met, replace the data set.

5.08 ***Information Note:*** The 901B test set performs the functions listed below:

(a) SELECTOR switch in position 3 prepares the A TEST and B TEST switches to control the data set.

(b) A TEST switch connects various interface leads to test terminals on the 901B test set (see Table H).

TABLE H

A TEST SWITCH

A TEST POSITION	CONNECTS		
	INTERFACE LEAD		901B A TERM. TO
	RS TO	SD TO	
1			DSR
2			RD
3			SCT
4			CS
5			COO
6	+18I	−18I	RD
7	+18I	+18I	RD
8	+18I	DTI	RD
9	+18I		SCR
10	+18I		CS
11	+18I		COO
12	+18I		
13	+18I		
14	+18I		SCR
15	+18I		
16	+18I		
17			COO
18			
19			SCR
20			RD
21			CS
22			DTI
23			SCT
OFF			

Note: Blank spaces indicate no connections.

(c) B TEST switch is used in conjunction with A TEST switch and in a similar manner (see Table I).

(d) The ATT-UNATT switch is used as shown in Table B as one of two control inputs for speed selection.

TABLE I

B TEST SWITCH

B TEST POSITION	CONNECTS		
	INTERFACE LEAD		901B A TERM. TO
	RS TO	SD TO	
1			−18I
2			+18I
3	+18I	−18I	
4	+18I	+18I	
5	+18I	DTI	
6	GRD	DTI	
7	GRD	DTI	
8	GRD	DTI	
9	GRD	DTI	
10	+18I	+18I	
11	GRD	+18I	
OFF			

Note: Blank spaces indicate no connections.

5.09 At the conclusion of MAINTENANCE TEST, perform the following steps:

(1) Disconnect ac power from the 903B test sets and the DC POWER connector from the data set.

(2) Remove all test equipment connections.

(3) Remove the strap between terminals E1 and E2 if required to do so by service order.

(4) Verify that original options are replaced in the data set.

(5) Operate and lock the LINE—LOCAL TEST key in LINE position.

(6) Perform one of the following steps for the appropriate data set:

(a) Data Set 205B1: Connect the 4B1 Data Unit cord to either SWITCHED CARRIER or CONTINUOUS CARRIER connector, whichever satisfies the original option.

(b) Data Set 205B2: Position the rotary switch to SC, SCA, CC, or CCA, whichever satisfies the original option.

(7) Connect DC POWER connector to the data set.

(8) Call the data test center for a final check before releasing the data set to customer service.

6. TESTS USING 914B DATA TEST SET

6.01 In this series of tests, the 914B DTS is used to check clock, control, and data signals. The following tests are to be made at the time of installation and may be used for clearing routine trouble conditions. The tests are divided into the following parts:

- Ground noise test
- Installation test
- End-to-end test
- Maintenance test.

6.02 The following test equipment is required to perform these tests:

1—914B Data Test Set

1—903-type Data Test Set (for back-to-back test)

1—6A Impulse counter

1—M25A Cord

6—Test probes—double end—WECo 735A or equivalent (to mate with test points on data set printed wiring boards).

A. Ground Noise Test

6.03 If the data set and business machine are not connected to the same ground, errors may be caused by a potential difference between data set ground and business machine ground. A test should be conducted using the 6A impulse counter to detect the presence of noise potentials.

6.04 The 6A impulse counter is connected and the test is performed as shown in Fig. 2. If any errors are counted in the 15-minute test period, the grounds must be bonded together according to local instructions. General description, calibration, and operating procedures for the 6A impulse counter are contained in the section entitled J94006A (6A) Impulse Counter, Description, Operation, and Maintenance (103-620-100).

Do not ground the 6A impulse counter while performing this test.

B. Installation Test

6.05 This test is to be performed after installing the data set or under conditions given in 3.06 and 3.07. This test checks the data set transmitter, receiver, clock signals, control signals, and transmitter output level. If the data set fails this test, it must be replaced or repaired as outlined in the maintenance tests (refer to Part 7).

6.06 Prior to being tested, Data Set 205B must be conditioned to provide specific operations as outlined in the test. The following preparation procedures include instructions on voltages to be supplied to control leads to provide the desired mode of operation.

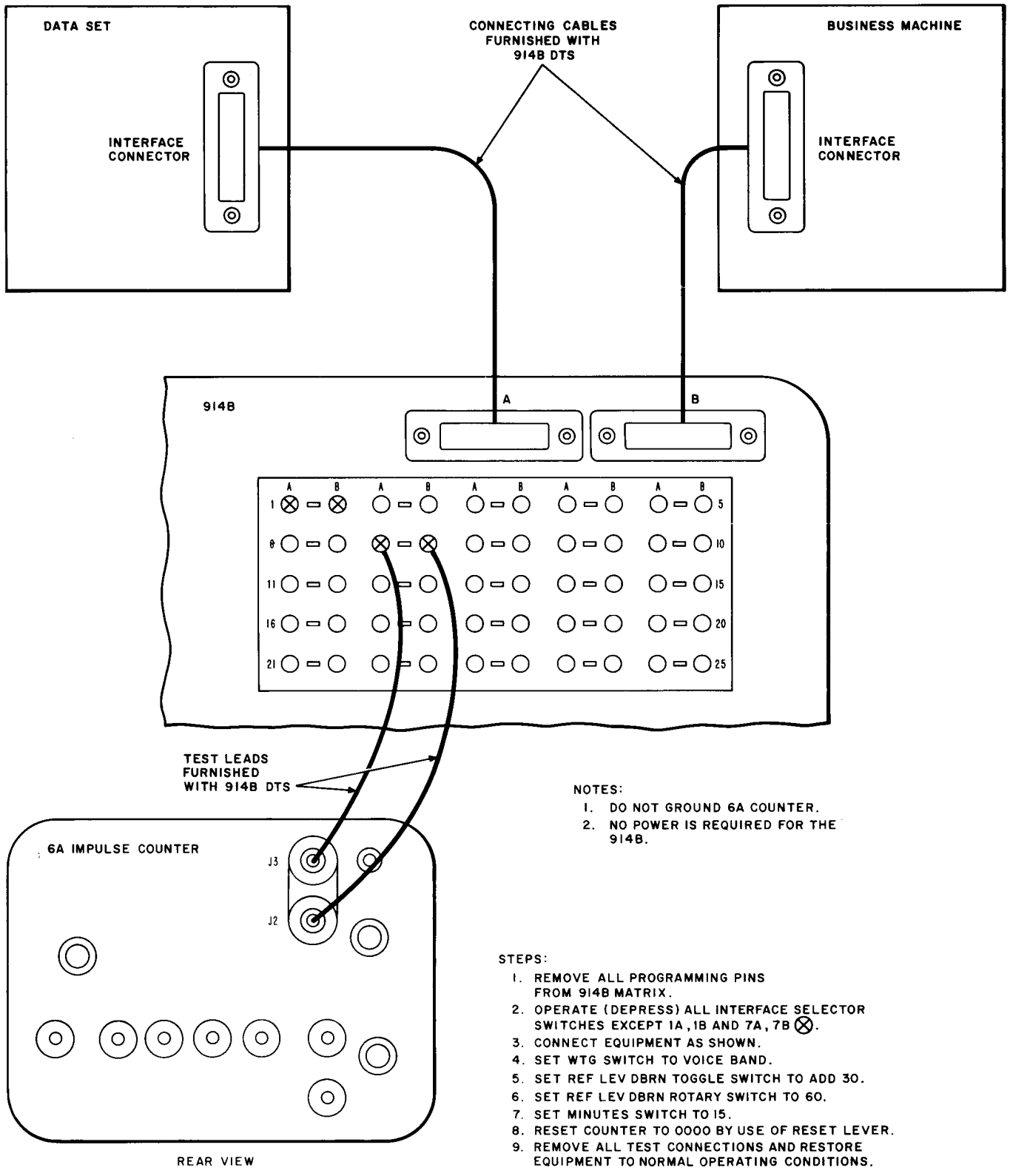


Fig. 2—Power Ground Noise Test Using 6A Impulse Counter and 914B Data Test Set

6.07 Data Set 205B can be tested with a wide variety of operating conditions. There are four independent speed selections for both transmitter and receiver which are controlled through interface leads. All speed selections are available using either the continuous carrier mode or switched carrier mode of operation. Independent speed selection is controlled through the following interface leads:

INTERFACE LEAD	ABBREVIATION	CIRCUIT DEFINITION
13	SAT	Speed A Transmit
14	SBT	Speed B Transmit
18	SAR	Speed A Receive
23	SBR	Speed B Receive

6.08 When the data set is operated in the continuous carrier mode, the 1000 synchronization code is transmitted continuously when RS (request to send) is OFF. When RS is switched ON, the CS (clear to send) signal goes ON within 0.83 msec at 2400 and 1200 bps (or within 1.66 msec at 600 bps).

6.09 In the switched carrier mode, the transmitter is turned on and off by the customer's RS signal. The CS signal is delayed to provide a sufficient time interval for a distant receiver to synchronize with the transmitted signals. Data Set 205B2 delays the CS signal for a time period long enough to allow an attendant to manually switch into the data mode while the 1000 synchronizing code is being received.

6.10 Independent transmitter and receiver speed selection is controlled through interface signal leads SAT, SBT, SAR, and SBR. Voltages applied to these interface leads require +3.0 to +25.0 volts dc for an ON condition and −3.0 to −25.0 volts dc for an OFF condition. Table J shows the combinations of ON and OFF voltages which will provide a specific speed.

6.11 Prepare Data Set 205B as follows:

(a) In the following order, disconnect the DC POWER cord, the CUSTOMER cord, and the 4B1 Data Unit cord (used on Data Set 205B1) or the CONTROL cord (used on Data Set 205B2) from their respective connectors on the data set.

TABLE J

MODE (bps)	TRANSMITTER		RECEIVER	
	SAT	SBT	SAR	SBR
2400	ON	ON	ON	ON
1200	OFF	ON	OFF	ON
600	ON	OFF	ON	OFF
REGEN	OFF	OFF	OFF	OFF

(b) Check that terminal E1 is strapped to terminal E2 on the front of the data set.

(c) Carefully remove and check the TR-SW (181/019) circuit pack AR95. Strap terminal 1 to 2 and terminal 3 to 4 (if not already strapped). The straps ground both the RMT and SCTE interface signal leads.

(d) Operate the LINE—LOCAL TEST switch to the LOCAL TEST position.

Note: The following conditions up to 6.13 test the functions associated with the CONTROL connector and apply to Data Set 205B2 only. For testing Data Set 205B1, proceed to 6.13.

6.12 For testing the functions associated with the control connector, proceed as follows.

(a) Connect the data set CUSTOMER connector to connector A on the 914B DTS using the cord supplied with the 914B DTS. All A interface selector switches must be pulled out except 20 and 22.

(b) Connect the data set CONTROL connector to connector B on the 914B DTS using the M25A cord. All B interface selector switches must be pushed in except switches 20 and 22.

(c) On the 914B DTS, place matrix pins in the following positions: 16—GRD, 24—GRD, 20—P1, and 22—TP1. This places the interface leads from the CONTROL connector at the matrix

board in all columns except 20 and 22, which go to the CUSTOMER connector.

(d) Set the controls on the 914B DTS as follows:

INTERFACE MODE switch to VOLTAGE

VERTICAL MONITOR switch to 19

FUNCTION switch to OFF

METER POLARITY switch to REV

RANGE switch to DCV—30.

(e) Connect the DC POWER cord to the data set. Apply power to the 914B DTS.

(f) Move the FUNCTION switch to VOLTS INT. Measure voltage on the DTRY lead from the control connector.

Requirement: +6.5 (±1.3) volts

(g) Move the FUNCTION switch to OFF. Move the POLARITY switch to REV.

(h) Remove the matrix pin from 24—GRD. Move the FUNCTION switch to VOLTS INT. and measure the voltage on the DTRY lead.

Requirement: −7.0 (±1.3) volts

(i) If the voltage requirements of (f) and (h) are met, proceed to (k). If the requirements are not met, proceed as follows:

(1) Disconnect the cord from the A connector on the 914B DTS and push in B interface selector switch 20.

(2) Move the FUNCTION switch to OFF. Move the VERTICAL MONITOR switch to 20. Move the POLARITY switch to NOR.

(3) Move the FUNCTION switch to VOLTS INT. Measure the positive power supply voltage as it appears on the CONTROL connector.

Requirement: +18 (±2.2) volts

(4) Move the FUNCTION switch to OFF. Move the VERTICAL MONITOR switch to 2. Move the POLARITY switch to REV.

(5) Move the FUNCTION switch to VOLTS INT. Measure the negative power supply voltage.

Requirement: −18 (±2.2) volts

(6) Move the FUNCTION switch to OFF. If the data set power supply does not meet these specifications, the data set must be replaced.

(j) Pull out B interface selector switch 20 and reconnect the cord to connector A on the 914B DTS.

(k) Insert a matrix pin in 13—GRD. On Data Set 205B2, place the LINE—LOCAL TEST switch in the LOCAL TEST position. Relays K2 and K3 should not operate.

(l) Move the LINE—LOCAL TEST switch to the LINE position. Relays K2 and K3 should operate.

(m) On the 914B DTS, move the RANGE switch to O—X1; move the FUNCTION switch to VOLT/OHM EXT.

(n) Using the leads supplied with the 914B DTS, connect the red INPUT terminal to pin 16 on the B interface selector switch.

(o) Connect the black meter INPUT terminal to B interface selector switch and measure continuity between terminal 1 and ground (terminal 16).

Requirement: Less than 2 ohms

(p) Connect the meter INPUT leads between terminals 3 and 4 on the B interface selector switch and measure the continuity.

Requirement: Less than 2 ohms

(q) If the requirements of (k) through (p) are not met, the data set remote test function is not functioning properly. The data set must be replaced.

(r) Move the FUNCTION switch to OFF. Remove the matrix pin from 13—GRD and place it in 15—GRD. On the data set, move the rotary switch to the CCA position.

(s) Move the RANGE switch to DCV—10, move the POLARITY switch to NOR, and move the VERTICAL MONITOR switch to 6.

(t) On the 914B DTS, pull out interface selector switch B6 and push in interface selector switch A6.

(u) Move the FUNCTION switch to VOLTS INT. Measure a positive voltage on the DSR lead.

Requirement: +7 (±1.3) volts

(v) Move the FUNCTION switch to OFF and remove the matrix pin in 15—GRD.

(w) Move the POLARITY switch to REV and move the FUNCTION switch to VOLTS INT. Measure negative voltage on the DSR lead.

Requirement: −6.5 (±1.3) volts

(x) Move the FUNCTION switch to OFF. On Data Set 205B2, move the LINE—LOCAL TEST switch to LOCAL TEST.

(y) Disconnect the DC POWER cord and the M25A cord connecting the data set CONTROL interface to the 914B DTS. On the 914B DTS, remove all matrix pins.

(z) If the data set fails the requirements of (u) and (w), the data set must be replaced.

6.13 The following tests measure voltages as they appear at the CUSTOMER interface. The equipment is set up and the test is performed as follows:

(a) On the 914B DTS, push in all A interface selector switches.

(b) Set up the equipment as shown on Fig. 3.

(c) Apply power to the data set and to the 914B DTS.

(d) Measure the positive and negative power supply voltages as follows:

(1) Move the FUNCTION switch to VOLTS INT. Measure the negative power supply voltage.

Requirement: −18.0 (±2.2) volts

(2) Move the FUNCTION switch to OFF. Move the VERTICAL MONITOR switch to 9, and move the POLARITY switch to NOR.

(3) Move the FUNCTION switch to VOLTS INT. Measure the positive power supply voltage.

Requirement: +18 (±2.2) volts

(4) Move the FUNCTION switch to OFF. If the power supply voltages do not meet requirements, the power supply must be replaced (or the possibility of shorted power connection should be investigated).

(e) On Data Set 205B, place the LINE—LOCAL TEST switch in the LOCAL TEST position and place the data set in the switched carrier (SC) mode.

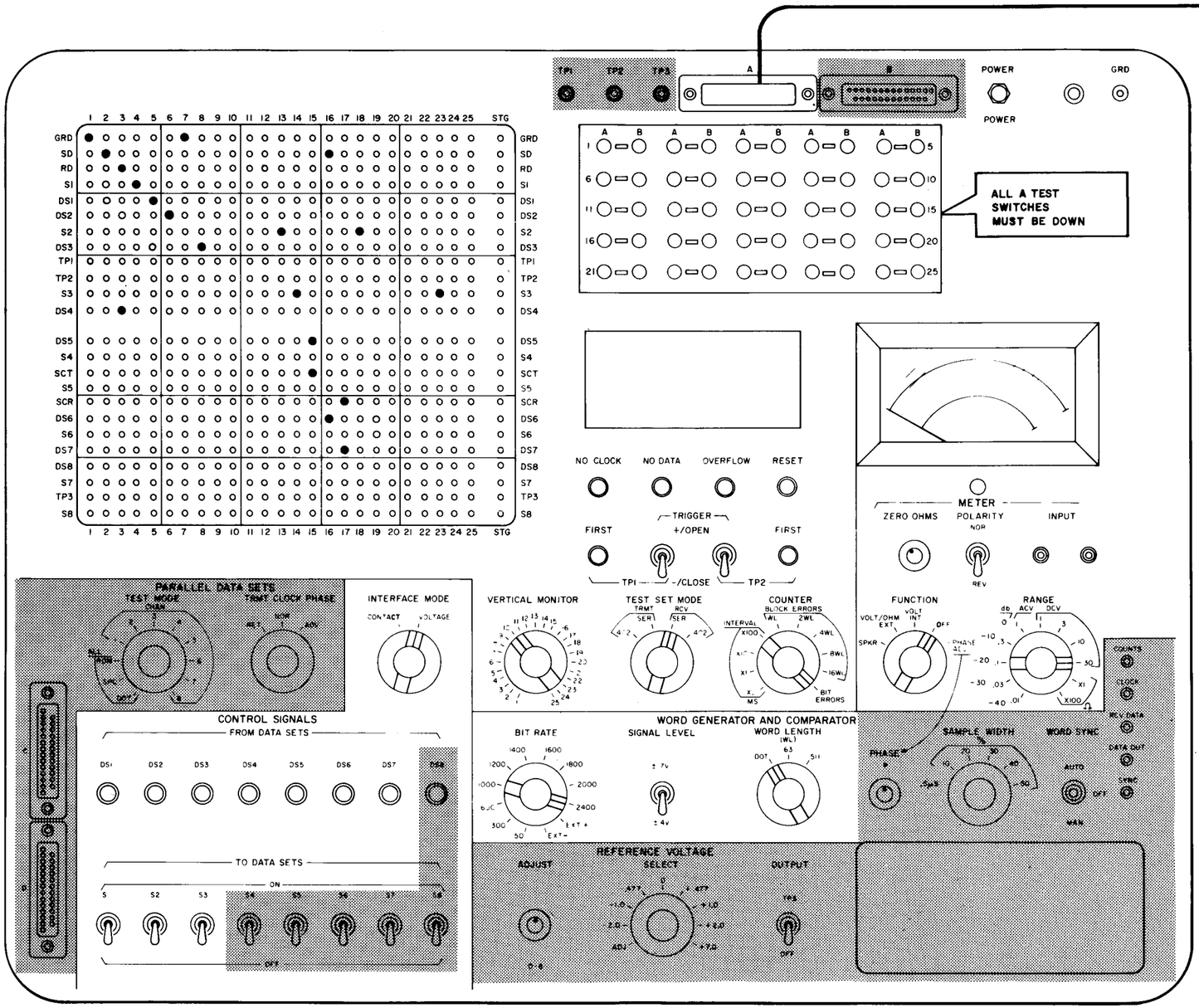
Note: On Data Set 205B1, this is done by connecting the cord from the 4B1 Data Unit to the SWITCHED CARRIER connector. On Data Set 205B2, this is done by placing the rotary switch in the SC position.

(f) Move the POLARITY switch to REV, the VERTICAL MONITOR switch to position 6, and move the FUNCTION switch to VOLTS INT. Measure the voltage on the DSR (data set ready) lead.

Requirement: More negative than −5.2 volts

(g) Move the FUNCTION switch to OFF. On the data set, move the LINE—LOCAL TEST switch to the LINE position. The DS2 lamp should light indicating that the DSR lead is more positive than +4 volts.

(h) Place the data set in the continuous carrier mode and repeat steps (f) and (g). The same results should be obtained.



NOTE:
INTERFACE LEADS ARE PRESENTED ON THE DS LAMPS AS SPECIFIED BELOW:

DS1	DS2	DS3	DS4	DS5	DS6	DS7
CS	DSR	COO	RD	SCT	DTI	SCR

Fig. 3—Initial Test Setup

(i) If the above requirements are not met, refer to the maintenance test procedures (7.03).

(j) Measure for the voltages as specified in Table K. Move the FUNCTION switch to OFF after every voltage measurement. Observe that the METER POLARITY switch is set correctly before placing the FUNCTION switch in the VOLTS INT position. If the DS lamps do not light as specified or if voltages do not meet requirements, refer to the maintenance test procedures.

(k) On Data Set 205B, operate the REMOTE TEST—LINE—LOCAL TEST switch to the REMOTE TEST position. Relays K2 and K3 should operate and the K2 relay contacts should open the interface signal leads. Move the VERTICAL MONITOR switch to positions 3, 5, 8, 15, and 17. DC voltage should not be present on any of these leads and all lamps except DS6 will extinguish. This indicates no ac voltage on interface leads 3, 5, 8, 15, and 17. If a voltage measurement is made, refer to maintenance test procedures.

(l) Move the FUNCTION switch to OFF. Verify that the 914B switch S1 is ON and that the 205 TEST switch is in the LOCAL TEST position. Place the data set in the continuous carrier (CC) mode. Measure for the voltages specified in Table L. On the 914B, move the FUNCTION switch to OFF after every voltage measurement. Observe that the METER POLARITY switch is set correctly before placing the FUNCTION switch in the VOLTS INT position. If the DS lamps do not light as specified or if the voltages do not meet requirements, refer to the maintenance test procedures.

TABLE K

INTERFACE REQUIREMENTS

SWITCHED CARRIER

LEAD TESTED	VERTICAL MONITOR SWITCH	LAMP ON	METER INDICATION VOLTS DC	REPLACE CIRCUIT BOARDS
RD	3	DS4*	0.0 (±0.5)	(E) (F) (G)
SCT	15	DS5*	0.0 (±0.5)	(A)
DTI	16	DS6*	0.0 (±0.5)	(A) (B)
SCR	17	DS7*	0.0 (±0.5)	(H) (I)
Move switch S1 to OFF.				
CS	5	—	−6.5 (±1.3)	(B) (C) (D)
RD	3	—	−6.1 (±0.7)	(E) (F) (G)
COO	8	—	−6.5 (±1.3)	(B) (C) (D)

* Because these lamps are being driven by ac voltages, they will be slightly dimmer than the other lamps.

TABLE L

INTERFACE REQUIREMENTS

CONTINUOUS CARRIER

LEAD TESTED	VERTICAL MONITOR SWITCH	LAMP ON	SWITCH S2	SWITCH S3	SPEED (bps)	METER INDICATION VOLTS DC	REPLACE CIRCUIT BOARDS
RD	3	DS4*	ON	ON	2400	0.0 (±0.7)	E F G
RD	3	DS4*	OFF	ON	1200	+6.1 (±0.7)	E H F G
RD	3	DS4*	ON	OFF	600	+6.1 (±0.7)	E H F G
SCT	15	DS5*	ON	ON	2400	0.0 (±0.7)	A
SCR	17	DS7*	ON	ON	2400	0.0 (±0.7)	H I
Move switch S1 to OFF. DSI should be off.							
RD	3	DS4*	ON	ON	2400	+3.4 (±0.7)	E F G
RD	3	DS4	OFF	ON	1200	+3.4 (±0.7)	E F G
RD	3	DS4	ON	OFF	600	+3.4 (±0.7)	E F G

* Because these lamps are being driven by ac voltages, they will be slightly dimmer than the other lamps.

(m) Perform a frequency check of Data Set 205B as follows:

(1) Place the FUNCTION switch in the SPKR position. Use the meter leads to connect the meter INPUT terminals to A interface selector switches 17 and 7 (GRD).

(2) Place the RANGE switch in the −40 db position. Move switch S1 to ON.

(3) Place the data set in the 2400-bps mode by moving switch S2 to ON and S3 to ON. A 2400-Hz tone should be heard.

(4) Place the data set in the 1200-bps mode by moving switch S2 to OFF and S3 to ON. A 1200-Hz tone should be heard.

(5) Place the data set in the 600-bps mode by moving switch S2 to ON and switch S3 to OFF. A 600-Hz tone should be heard.

(6) Place the data set in the REGEN mode by moving switches S2 and S3 to OFF. A 1200-Hz tone should be heard.

(7) Disconnect leads from interface selector switches 7 and 17 on the 914B DTS.

(n) Measure data set transmit output level as follows:

(1) Disconnect the DC POWER cord from the data set.

(2) Operate the LINE—LOCAL TEST switch to the LINE position. Place the data set in the switched carrier mode.

(3) Move the FUNCTION switch to OFF.

(4) Disconnect the telephone line from the terminal strip. Carefully note the proper connection of the telephone line so that it may be reinstalled correctly at the end of this test.

(5) Strap T to T1 and R to R1 on the terminal strip.

(6) On the 914B DTS, switch S1, S2, and S3 to ON. This conditions the data set for 2400-bps operation.

(7) Connect the DC POWER cord to the data set.

(8) Using the leads provided with the 914B DTS, connect the INPUT terminals across tip and ring (T and R).

(9) Line readings should be as shown in Table M for the desired output level which is stated on the service order. To make the measurements, the FUNCTION switch should be on VOLT/OHM EXT, the RANGE switch should be on ACV—1.

TABLE M

TRANSMIT OUTPUT LEVEL

AC VOLTS	STRAPPING ON 044 CARD
0.70 (±0.15)	1-4
0.50 (±0.15)	1-3
0.35 (±0.15)	1-2
0.25 (±0.15)	None

(10) Move switch S1 to OFF. This turns the RS lead off. An indication of 0 Vac must be obtained. If an ac voltage indication is obtained, check that the data set is in the switched carrier mode. If an ac voltage is still measured, refer to maintenance test procedures (7.04).

(o) Remove the DC POWER cord from the data set. Operate the LINE—LOCAL TEST switch to the LOCAL TEST position and reconnect the telephone line.

C. Back-to-Back Test

6.14 After the requirements of 6.13 (f), (g), and (h) have been met, place the data set in the switched carrier mode and move the LINE—LOCAL TEST switch to LOCAL TEST. Perform a back-to-back test as follows:

(a) Set up the equipment as shown in Fig. 4.

(b) Set the switches on the 903-type DTS as follows:

(1) BIT RATE to EXT CLOCK

(2) RANDOM-DOT to RANDOM

(3) TRIGGER to + (plus)

(4) POWER switch to ON.

(c) Apply power to Data Set 205 and to the 914B DTS. Press the START button on the 903 DTS and press the RESET button on the 914B DTS.

(d) Lamps DS1, DS3, DS4, DS5, DS6, and DS7 should be lighted. The NO CLOCK and NO DATA lamps should be extinguished.

Note: Refer to Fig. 4 for a description of which interface lead is presented on which lamp.

(e) Move the WORD LENGTH switch to DOT. The counter should count very rapidly. Set the WORD LENGTH switch to 63. The counter should stop.

(f) Depress the RESET button. The counter should indicate zero errors.

(g) Allow the test to continue for 5 minutes. No errors should be recorded. If an error count is indicated, replace the data set. If the test is satisfactory, disconnect the power and restore the data station to normal. Restore equipment options in the data set and remove the strap between E1 and E2 (if required to do so by the service order). Call the data test center for a final check before releasing the data set for customer service.

D. End-to-End Test

6.15 This is a test of the data set transmitter and receiver and of the connecting facilities. If the data set has been previously tested and found to be in operating condition, and errors are counted on the end-to-end test, it may be concluded that the transmission facilities are faulty.

6.16 Each direction of transmission is tested separately. The equipment setup is shown in Fig. 5. If the data set is to transmit, the TEST SET MODE switch must be in the TRMT SER position. If the data set is to receive, the TEST SET MODE switch must be in the RCV SER position.

6.17 The equipment is set up and the test is conducted as follows:

(a) Carefully remove the TR-SW (181/019) circuit pack. Strap terminal 3 to terminal 4 and terminal 1 to terminal 2 (if the board is not already strapped in this manner).

(b) If necessary, operate and lock the LINE—LOCAL TEST switch in the LINE position. Check that the telephone line is properly terminated.

(c) Place the data set in the continuous carrier (CC) mode (or CCA mode if switched network automatic answer is required).

(d) Apply power to the data set and to the 914B DTS.

(e) Depress the RESET button to clear the counter.

(f) The counter on the 914B DTS will indicate errors as they occur. The OVERFLOW lamp will light whenever the capacity of the counter is exceeded.

(g) This test is conducted in conjunction with a remote data station. The data set operator must call the remote data station and the test must be coordinated between the near-end and far-end data stations. Place calls alternately from each end. Allow the test to continue for 5 minutes, note the indicated error count, and press the RESET button. Operate the test for three consecutive 5-minute intervals. The error rate can be considered average if a total of 20 errors is recorded for the three test periods. If the error count approaches 100 for the three test periods, the transmission parameters of the line should be checked in accordance with Section 314-410-500. If the line checks satisfactorily, refer to the plant organization for further assistance.

(h) Disconnect the power, disconnect test equipment connections, and replace original options in the data set before restoring to normal operation.

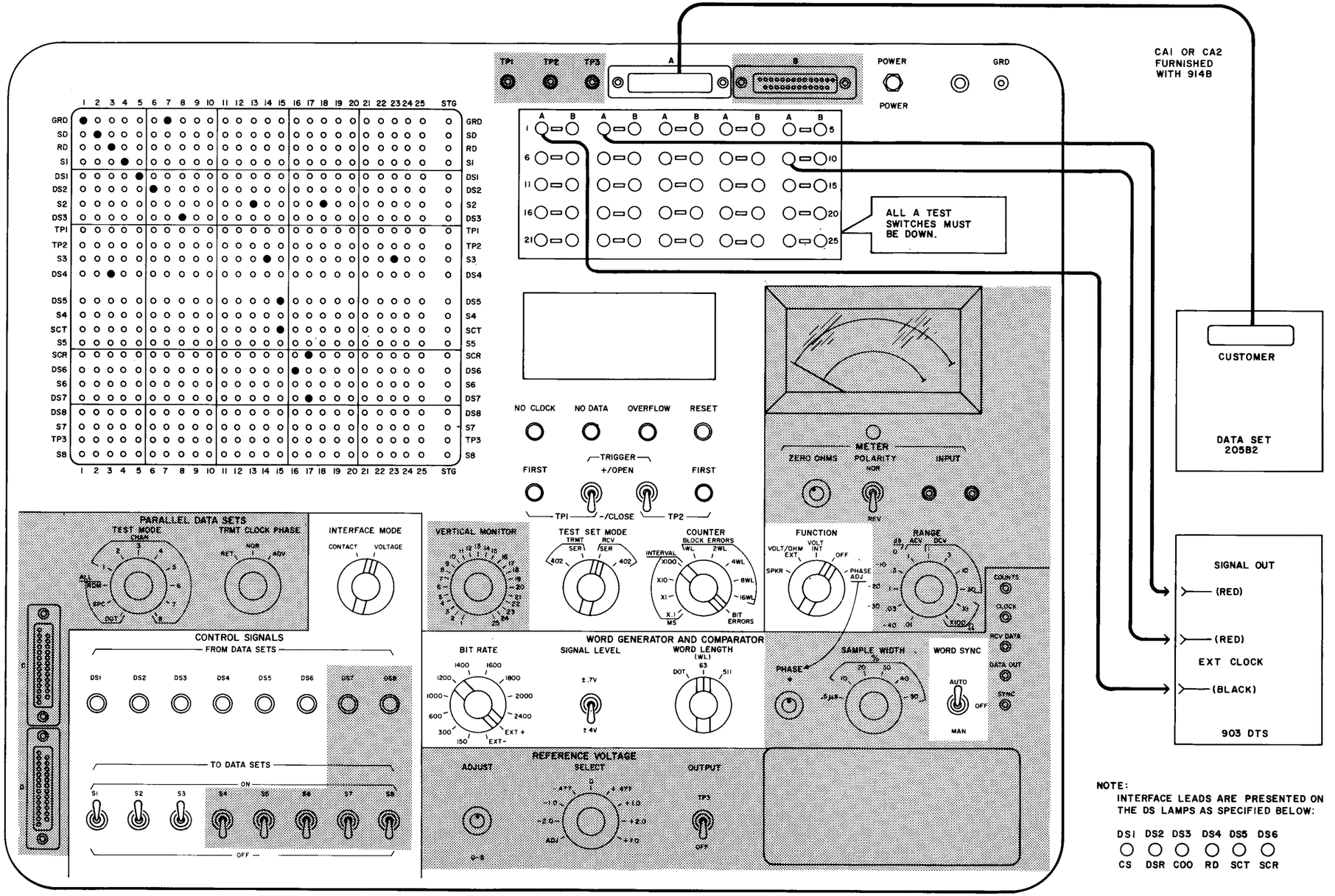
7. MAINTENANCE TESTS USING 914B DATA TEST SET

7.01 The installation tests should be used on maintenance visits to clear routine trouble conditions. If the trouble is not cleared, either replace the data set or proceed with the tests in this section. The following tests are designed to indicate which board (or boards) should be replaced as a logical choice to repair a trouble condition.

7.02 Table F lists the dc voltages that appear on the printed wiring boards. If the reading given is not obtained, the board must be replaced. Voltage measurements can be taken using the meter on the 914B DTS. Observe that the RANGE switch is set correctly and verify correct polarity before taking voltage measurements.

Caution: Always be careful when removing, inserting, or handling the printed wiring boards. NEVER remove or insert a printed wiring board unless the DC POWER connector has been disconnected from the data set.

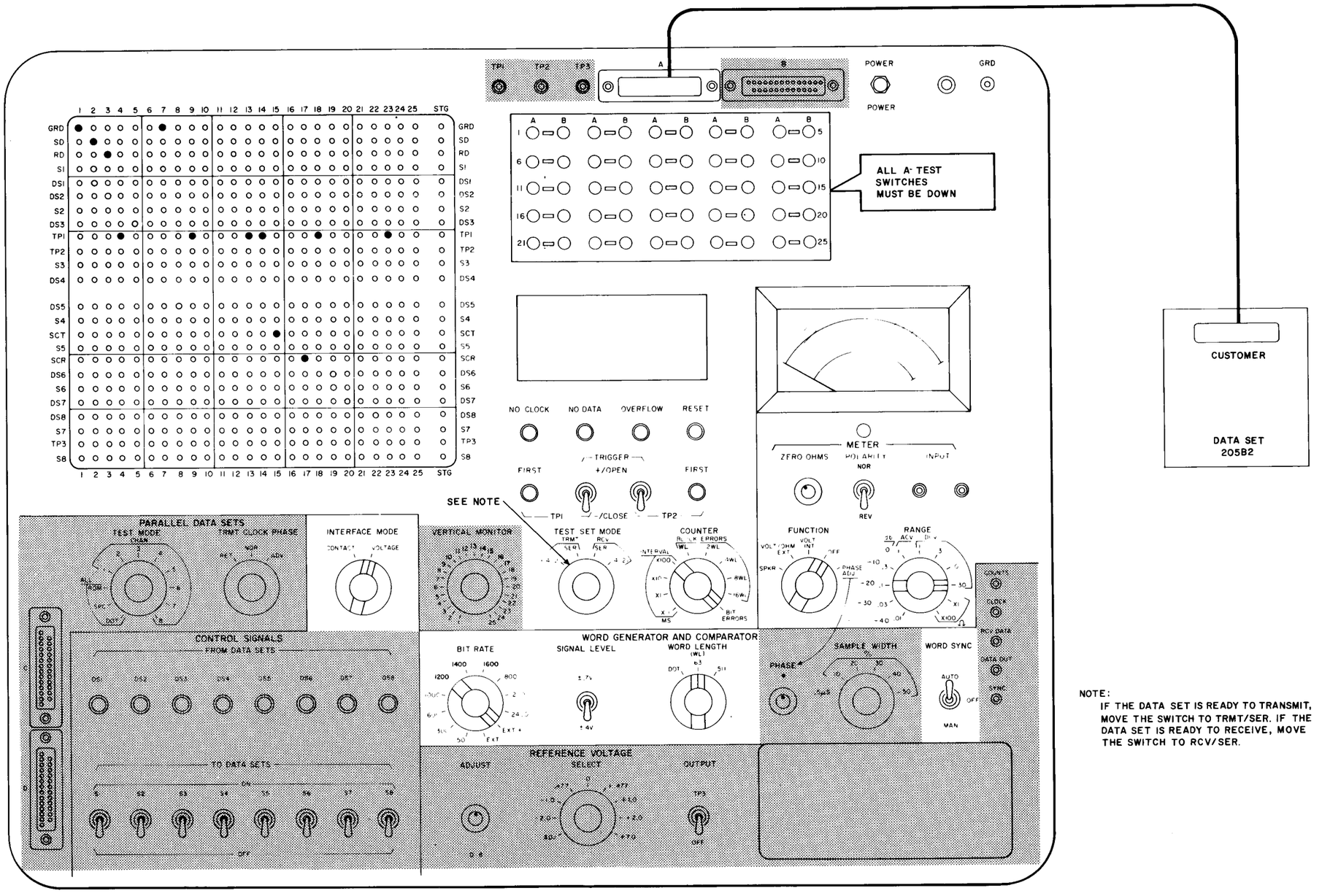
7.03 If the requirements of 6.13 (f), (g), and (h) are not met, replace the 185 board in location 059 and retest. If after retesting the requirements are not met, replace the data set.



NOTE:
INTERFACE LEADS ARE PRESENTED ON THE DS LAMPS AS SPECIFIED BELOW:

DS1	DS2	DS3	DS4	DS5	DS6
CS	DSR	COO	RD	SCT	SCR

Fig. 4—Back-to-Back Test



NOTE:
IF THE DATA SET IS READY TO TRANSMIT, MOVE THE SWITCH TO TRMT/SER. IF THE DATA SET IS READY TO RECEIVE, MOVE THE SWITCH TO RCV/SER.

Fig. 5—End-to-End Test

7.04 If the requirements of 6.13 (n) are not met, replace both the 182 board in location 044 (retest for requirements) and the 181 board in location 019 and retest for requirements. If the requirements cannot be met after retesting, replace the data set.

7.05 Table N provides correlation between the 914B DTS lamps, voltage indications shown on Table K, and the printed wiring boards that provide the function under test. The letters in the blocks of Table N are keyed to the groups of circuit boards in Table G. For example, if switch S1 is OFF, lamp DS3 OFF, but the meter does not indicate −6.5 volts on the COO lead, Table K indicates replacement according to group B, C, or D. The procedure for this replacement is as follows:

(a) Remove the DC POWER connector from the data set. Carefully remove the 185 (A835185) board from location 059. Carefully insert a different 185 board known to be good in location 059.

(b) Replace the DC POWER connector and retest for proper indications as required in Table K, Table L, and Table N. If the voltage requirements are met, put the 059 board originally removed from the data set where it can be later identified, tagged, and returned for repair.

(c) If the voltage requirements are not met, remove the DC POWER connector from the data set, remove the 185 board from location 059, and place the 185 board where it cannot be mixed with circuit boards in question. Replace the original 185 board in location 059.

(d) Repeat the procedure of (a), (b), and (c) with a 175 board (as indicated in group C) in locations 057, 054, and 058, respectively. If the failure continues to exist, repeat the procedure of (a), (b), and (c) using group D and a 175 board in locations 048, 049, 038, and 043. If the failure has not been eliminated using the 175 board, repeat (a), (b), and (c) with a 176 board in locations 050 and 040. If the failure has not been eliminated using the 176 board, repeat (a), (b), and (c) with a 185 board in location 047. If the failure is still present, replace the data set.

7.06 The procedure in 7.05 should be used for replacing boards in any selected group. Always replace the designated boards one at a time, repeating the voltage measurements each time, until the defective board is found and replaced. After a defective board has been replaced, perform the test beginning with 6.14 (a). Check for each requirement to be sure a new or different failure has not developed.

TABLE N

CIRCUIT BOARD REPLACEMENT

S1 SWITCH	DS5 OFF	DS6 OFF	DS1 OFF	DS4 OFF	DS7 OFF	DS3 OFF
OFF	(A)	(A) (B)	—	—	(H) (I)	—
ON	(A)	(A) (B)	(B) (C) (D)	(E) (F) (G)	(H) (I)	(F) (J)