DATA SET 202SR
TRANSMITTER-RECEIVER
SINGLE SET
TEST PROCEDURES AND MAINTENANCE

CONTENTS PAGE

1. GENERAL

1.01 This section contains information and procedures needed to test data set (DS) 202SR during installation, and prior to and during maintenance visits to the customer premises.

1.02 Whenever this section is reissued, the reason for reissue will be contained in this paragraph.

1.03 Data set 202SR does not require routine maintenance after installation tests and adjustments have been made.

1.04 This section is divided into four additional parts which concern test procedures: Part 2. INSTALLATION TESTS, Part 3. MAINTENANCE PROCEDURES AND TESTS, Part 4. SUPPLEMENTARY TEST, and Part 5. TEST PROCEDURES. Part 5 provides information on and procedures for all the tests associated with DS 202SR. This includes both tests which require no test equipment and those requiring such equipment as the 914C data test set (DTS). Parts 2 and 3 give the proper sequence in which to perform the various tests when installing DS 202SR or investigating a trouble report. The supplementary tests are not required for installation or maintenance under normal circumstances.

Caution: If the data set is removed from the housing, it should be handled by the nonconductive surfaces only. Otherwise, certain circuit components may be damaged.

Note: When inserting data set back into the housing, push it all the way in to ensure proper contact with the connectors in the rear of the housing.

2. INSTALLATION TESTS

2.01 This part provides the sequence in which tests are to be performed following an installation. Before proceeding with the tests, verify that the local loop meets the requirements specified in the sections entitled Data Systems—DATAPHONE® Service—Direct Distance Dialing Network—Test Requirements for Subscriber,

Foreign Exchange, and Remote Exchange Lines (315-205-501) and Data Systems—DATAPHONE® Service on Direct Distance Dialing Network—Overall Transmission Maintenance Procedures (314-205-500). Refer to Fig. 1 for the sequence of tests.

3. MAINTENANCE PROCEDURES AND TESTS

MAINTENANCE PROCEDURES

3.01 When investigating a trouble report, proceed as directed in Fig. 2.

3.02 If it becomes necessary to dispatch a telephone company (telco) employee to the data set location, the following equipment should be taken along:

- 914C DTS or 914B and 903 DTSs
- Spare DS 202SR-L1A/2/3B.

3.03 To minimize time on customer premises, the entire data set should be changed. If existing service includes reverse channel, make sure the JY3B circuit pack is included. If the service does not include reverse channel, make sure JY3B circuit pack is removed and option ZD is installed.

3.04 When the data set is replaced, tag the defective set, describing the nature of the trouble. Carefully pack and return to a service center for repair. After the data set has been replaced, verify with the customer that service has been restored.

3.05 If the trouble persists, proceed as follows:

(a) Check that options in the data set agree with the service order.

(b) Verify that customer-provided equipment has been tested and is operating satisfactorily.

(c) Check that all cords and connectors are properly connected.

(d) Check for physical damage.

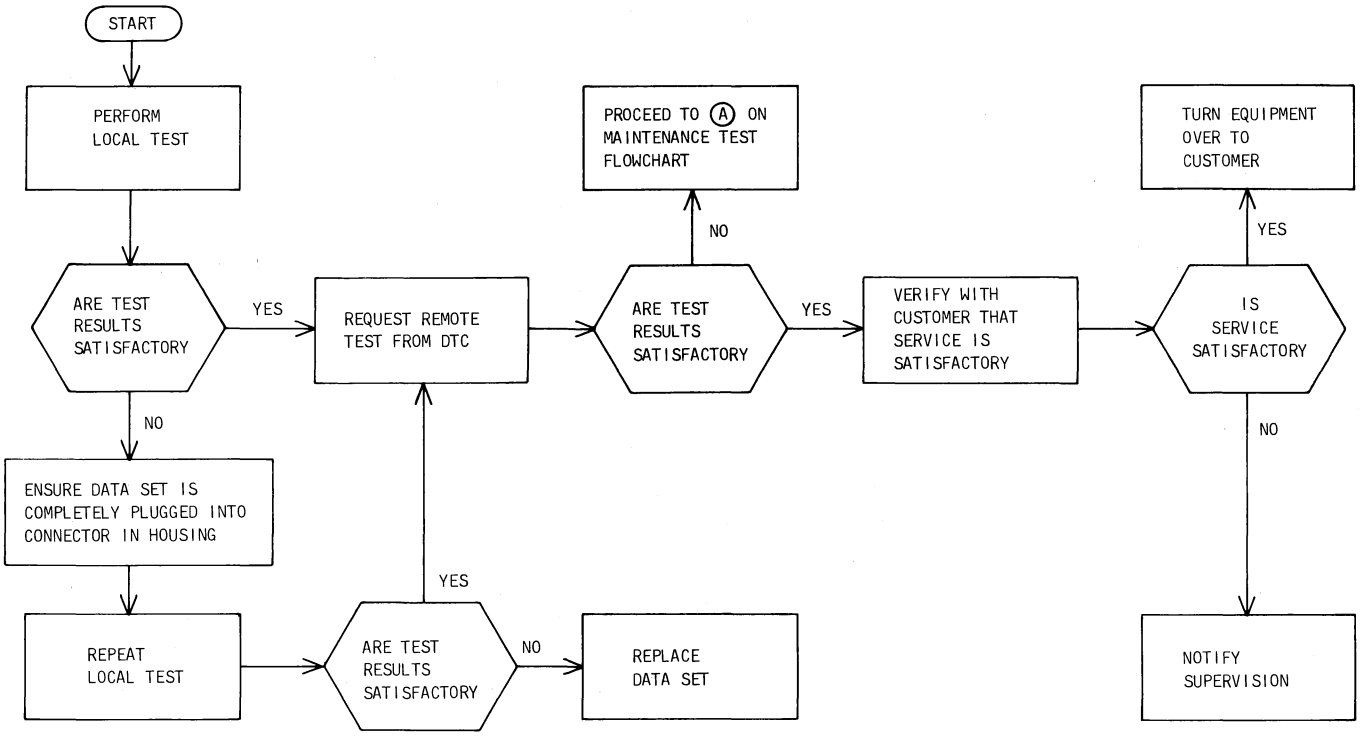


Fig. 1—Installation Test Sequence

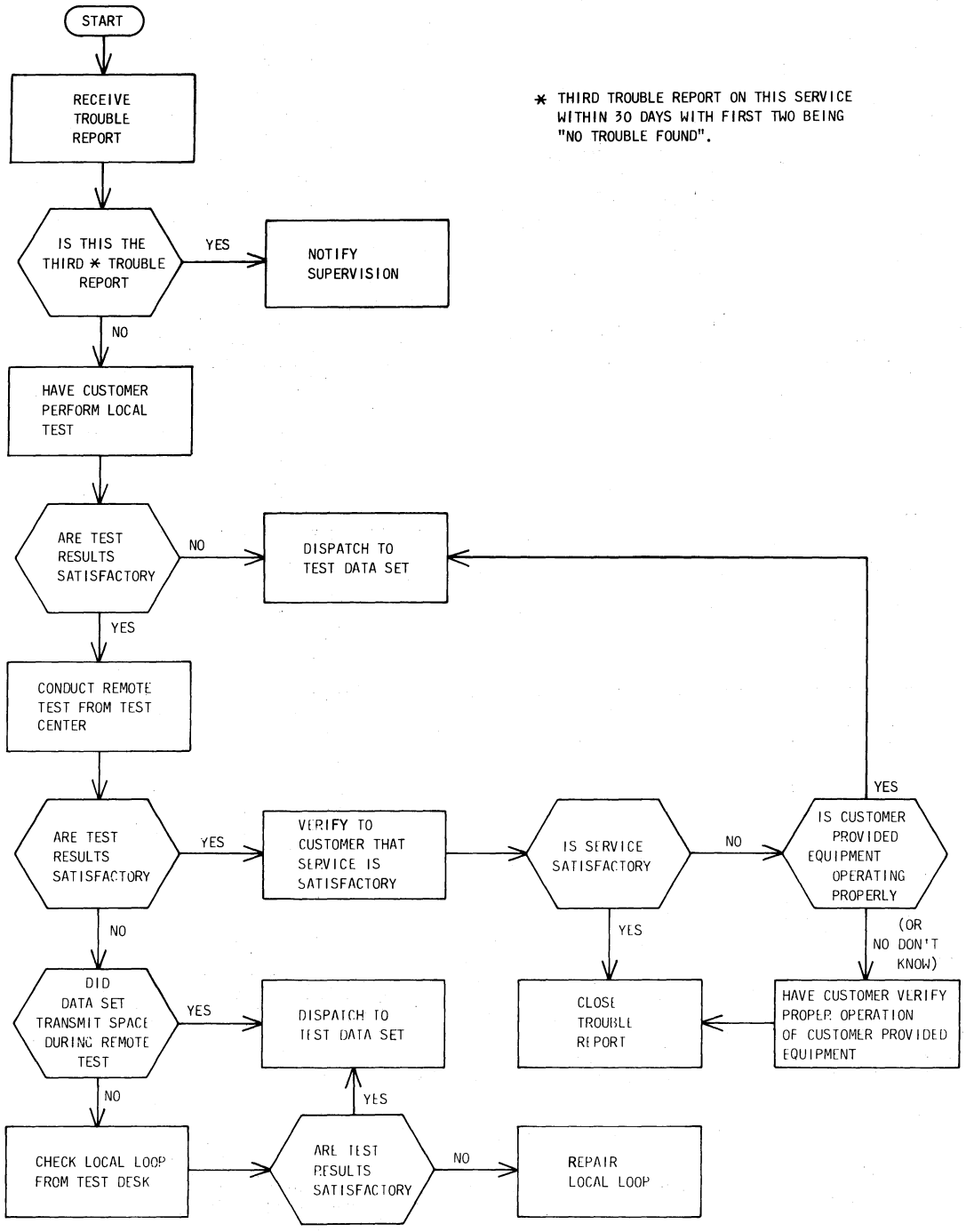


Fig. 2—Maintenance Flowchart (Before Dispatch)

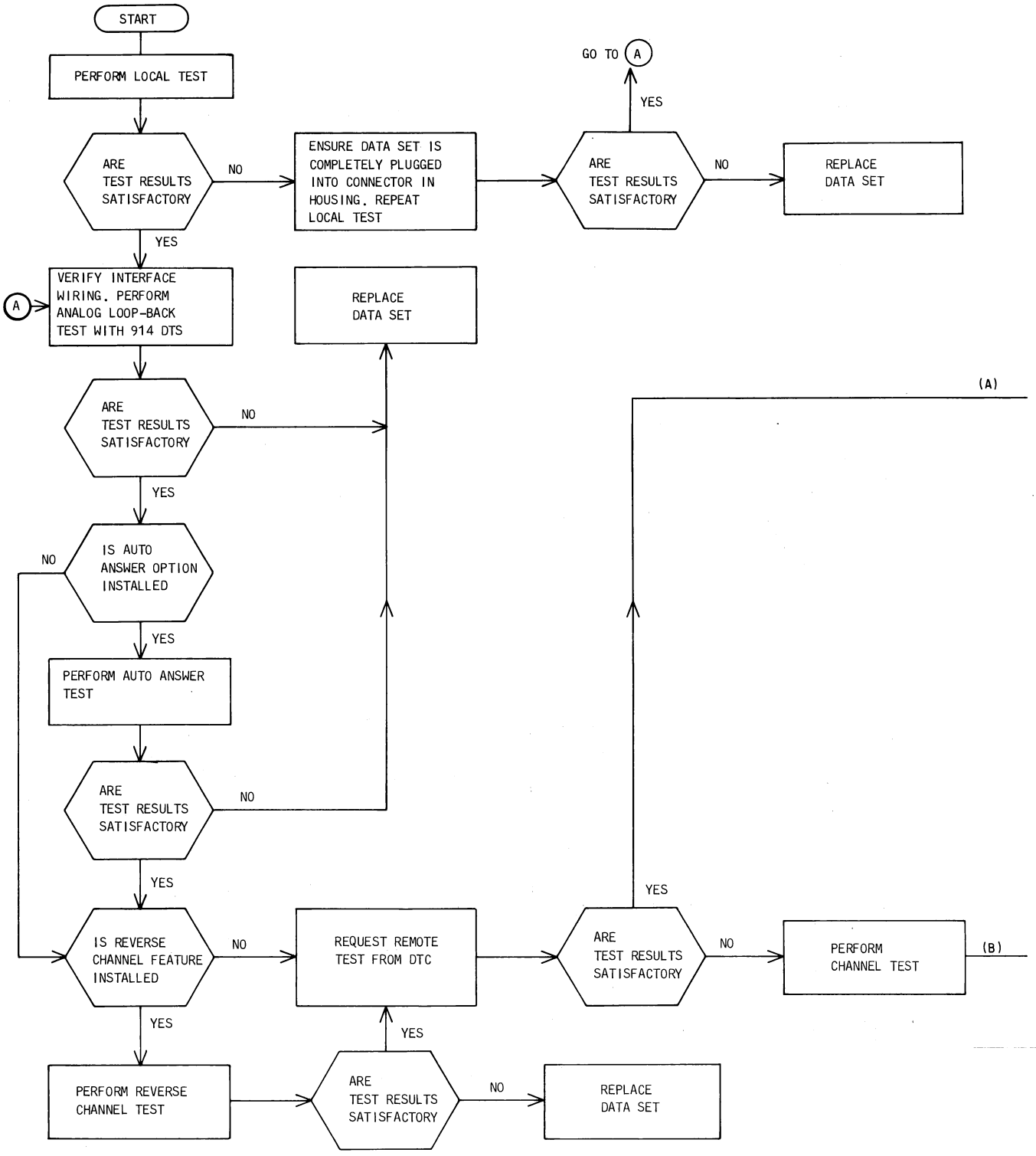


Fig. 3—Maintenance Test Flowchart (Sheet 1 of 2)

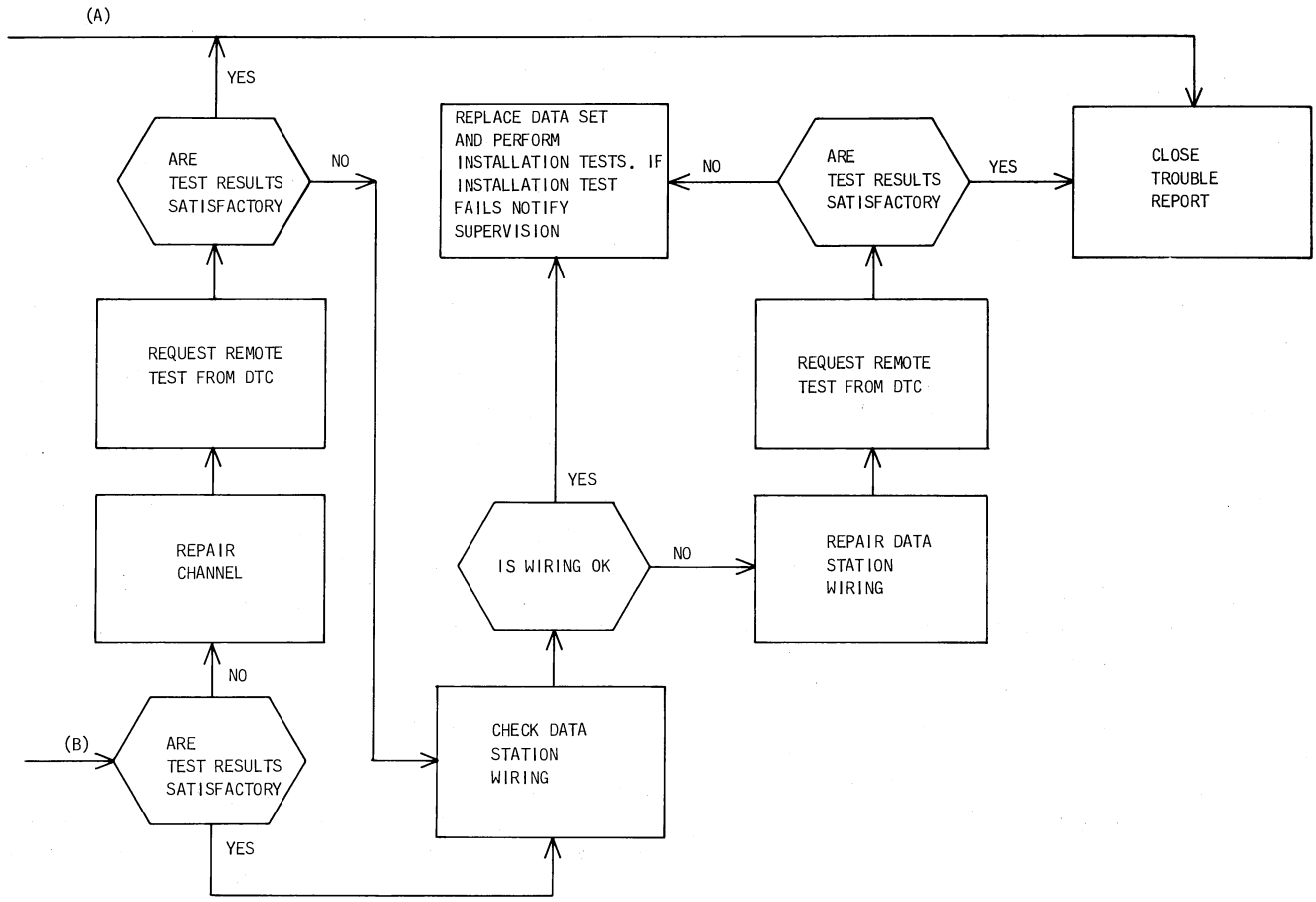


Fig. 3—Maintenance Test Flowchart (Sheet 2 of 2)

MAINTENANCE TESTS

3.06 This part provides the sequence in which tests are to be performed before and during a trouble visit. The procedure provides a method of isolating a trouble to either the data set or the transmission facility. Refer to Fig. 2 and 3 for the sequence of tests.

4. SUPPLEMENTARY TESTS

4.01 The following tests should be referred to as required:

- End-to-end test
- Ground noise test

5. TEST PROCEDURES

5.01 The test circuitry built into DS 202SR permits the following tests to be performed.

Note: Only the local self test and the remote test should be performed at the time of installation, as indicated by Fig. 1, unless unsatisfactory results are obtained.

A. Local Self Test

5.02 Depressing the LT key on the front of the data set initiates the local self test. A repeating 63-bit pseudo-random word is generated at 1547 bps and looped from the transmitter to the receiver through an attenuating circuit. The received word is compared to the original word. Under normal conditions, all the LEDS (light-emitting diodes) are lighted; however, in the event an error is detected, the TM LED is extinguished. Perform the test as follows:

Note: All customer interface leads are made inoperative and are not tested during the test; however, all LEDs are lighted.

(a) Ensure that the data set is not in the data mode.

(b) Depress and hold the nonlocking LT key for approximately 15 seconds.

Requirement: The TM LED remains lighted while the LT key is depressed.

(c) If the requirement of (b) is not met, repeat (b) four times.

Requirement: The TM LED remains lighted throughout the four trials.

B. Remote Test

5.03 The remote test mode allows the attendant at the data test center (DTC) to test the data set circuitry (with the exception of the customer interface). After contacting the DTC, press the RT key and observe that all LEDs are lighted. The remaining test functions are performed by the DTC. At the end of the test, press and release the RT key.

Note: All customer interface leads are made inoperative and are not tested during the test; however, LEDS are lighted.

5.04 Proceed with the test as follows:

(a) Contact the DTC and request a remote test.

(b) When instructed to do so by the DTC, depress the RT key and observe that all the LEDs are lighted.

(c) When instructed to do so, press and release the RT key to take the data set out of the remote test mode. If the data set enters the data mode (MR lighted), depress and release the analog loopback (AL) key to return the data set to the idle mode.

C. Analog Loopback Tests

5.05 The purpose of these tests is to check the interface circuits not checked by the local self test or the remote test. Figure 4 shows the test equipment setup for the following tests:

- Error Run and Power Supply Test
- Clear-to-Send Turnon Interval
- Received Line Signal Detector Interval
- Analog Loopback Reverse Channel Test.

In the analog loopback mode, the data signal applied to the transmitted data interface lead is processed through the transmitter, looped to the receiver

where it is demodulated, and transmitted to the received data lead. Pressing the AL key until it locks performs the following:

- Connects the transmitter and receiver.
- Overrides the local copy control circuit to provide local copy.
- Illuminates the TM LED.
- Disables the auto-answer feature, if installed.
- Turns the data-set-ready lead ***off*** (all other customer interface leads are operative and may be tested). This feature is optional.

The following test equipment is required:

- 914C DTS (1) ***or***
- 914B DTS (1) ***and*** 903-type DTS (1).

5.06 ***Error Run and Power Supply Test:*** This test verifies that the data set will transmit and receive a 63-bit random word error-free for 5 minutes. Both the positive and negative 14-volt power supply voltages are also checked during this test. The test equipment is set up as shown in Fig. 4. Proceed as follows:

(1) Disconnect customer-provided equipment (CPE) and connect the 914-type DTS to DS 202SR.

(2) Insert red pins in the matrix and position switches as shown in Fig. 4.

(3) Apply power to the data set and DTS.

(4) Depress locking AL key on the data set.

Note: The receiver contains a first mark circuit which clamps the received data and received line signal detector circuits ***off*** during the answer sequence. At least 3 ms of marking signal must be received by the receiver before the clamp is removed.

(6) Operate switch S1 to ON. Depress and release START button on 903 DTS if it is being used.

Requirement: DS1 and DS3 lamps are lighted. DS2 is lighted if option YI is installed.

(7) Move FUNCTION switch to VOLTS INT and measure the positive supply voltage.

Requirement: +12 to +17 volts.

(8) Move FUNCTION switch to OFF, POLARITY switch to REV, and VERTICAL MONITOR switch to 10.

(9) Move FUNCTION switch to VOLTS INT and measure the negative power supply voltage.

Requirement: -12.5 to -17.5 volts.

(10) Move FUNCTION switch to OFF.

(11) Move FUNCTION switch to PHASE ADJ.

(12) Adjust PHASE control until the meter indicates zero. Move FUNCTION switch to OFF.

(13) Operate WORD SYNC on the 914 DTS and release when the counter stops.

(14) Reset the counter on the 914 DTS.

(15) Allow the test to continue for 5 minutes.

Requirement: No errors.

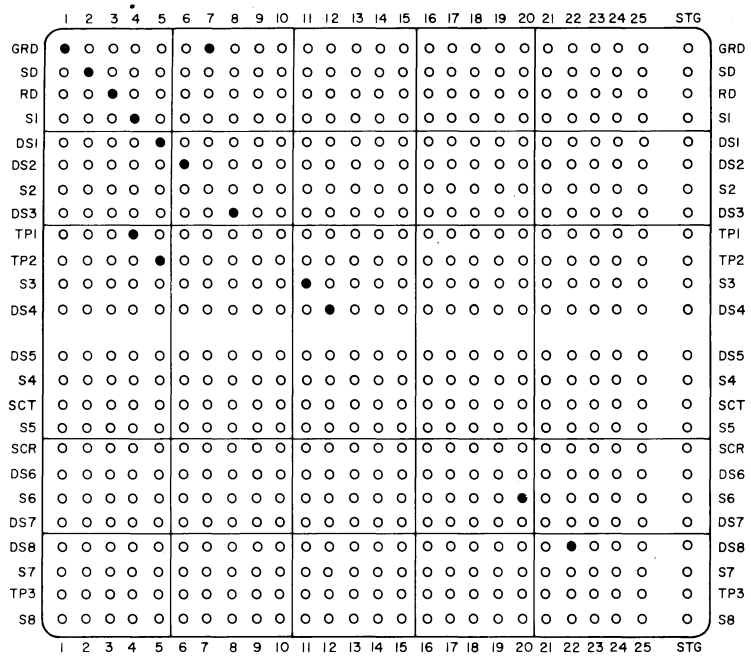
(16) If no more tests are to be conducted, disconnect test equipment and press and release AL Key.

(17) If a clear-to-send response test is to be conducted, operate S1 to OFF, then proceed to paragraph 5.07 (3).

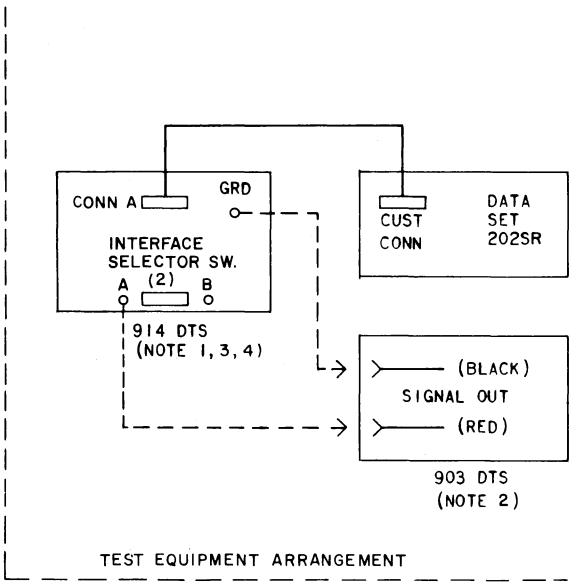
5.07 ***Clear-to-Send Response Test:*** This test measures the interval between the time when the CA (request-to-send) lead is turned ***on*** and when the CB (clear-to-send) lead turns ***on.*** Proceed as follows:

(1) Disconnect the CPE and connect the 914-type DTS to DS 202SR.

(2) Insert red pins in the matrix and position switches on the DTS as shown in Fig. 4,



914 DTS MATRIX



TEST EQUIPMENT ARRANGEMENT

NOTES:

1. SET SWITCHES ON 914 DTS AS FOLLOWS:

SWITCH	SETTING
INTERFACE MODE	VOLTAGE
TEST SET MODE	SER (914C) RCV SER (914B)
COUNTER	BIT ERRORS
TRANSMIT BIT RATE (914C)	1200
TRANSMIT WORD LENGTH(914C)	63
VERTICAL MONITOR	9
FUNCTION	OFF
RANGE	DCV-30
POLARITY	NOR
BIT RATE	1200
SIG LEV	±4
WORD LENGTH	63
SAMPLE WIDTH	30%
S1, S3	OFF
S6	ON
TP1	+/OPEN
TP2	+/OPEN

2. THE 903 DTS IS REQUIRED IN CONJUNCTION WITH THE 914B DTS ONLY. POSITION THE SWITCHES ON THE 903 DTS AS FOLLOWS:

SWITCH	SETTING
BIT RATE	1200
TRIGGER	(+) POSITIVE
RANDOM-DOT	RANDOM

3. 914 DTS INDICATOR LAMPS AND SWITCHES CORRESPOND TO INTERFACE LEADS AS FOLLOWS:

SWITCH	LAMP	LEAD
S1		REQUEST TO SEND
	DS1	CLEAR TO SEND
	DS2	DATA SET READY
	DS3	RECEIVED LINE SIGNAL DETECTOR
S3		SECONDARY REQUEST TO SEND
	DS4	SECONDARY RECEIVED LINE SIGNAL DETECTOR
S6		DATA TERMINAL READY
	DS8	RING INDICATOR

4. ALL A INTERFACE SELECTOR SWITCHES MUST BE PUSHED IN EXCEPT 2A WHEN USING A 903 DTS.

Fig. 4—Analog Loopback Test Setup

except the COUNTER switch should be positioned to INTERVAL X1. Position TEST SET MODE switch to INTERVAL.

(3) Place the data set in analog loopback test mode by depressing the AL key until it locks.

(4) Reset the counter. Move switch S1 to ON; the clear-to-send turn-on interval appears on the counter.

Requirements:

- Option M—6 to 12 ms
- Option K—22 to 40 ms
- Option J—52 to 70 ms
- Option G—140 to 200 ms.

Note: Only the option actually installed in the data set should be tested. In order to measure the interval for Option G, the interval switch must be moved to X10. The counter should indicate 14 to 20.

(6) To remeasure the interval, move S1 to OFF, reset the counter, then move S1 to ON.

(7) If a received line signal detector response test is to be performed, move switch S1 to OFF. Proceed to paragraph 5.08(2).

5.08 ***Received Line Signal Detector Response Test:*** This test verifies that the received line signal detector circuit will respond properly within one of the time intervals given as requirements in this test. Only the option actually installed in the data set should be tested. Proceed as follows:

(1) Disconnect the CPE and connect the 914-type DTS to DS 202SR.

(2) Insert red pins in the matrix and position switches on the DTS as shown in Fig. 4, ***except the pin at TP2-5 should be moved to TP2-8.*** Also, remove pin SD-2 and disconnect the 903 DTS (if used). Push interface selector switch 2A in and insert a red matrix pin in position S2-2. Leave switch S2 OFF. Position TEST SET MODE switch to INTERVAL.

(3) Place the data set in analog loopback test mode by pressing the AL key until it locks.

(4) Reset the counter. Move switch S1 to ON and the response time will appear on the counter.

Requirements:

- Data set equipped with Option Q—5 to 9 ms.
- Data set equipped with Option N—18 to 24 ms.

Note: Check only the interval corresponding to the option installed in the data set.

(6) To remeasure the interval, move switch S1 to OFF, reset the counter, then move S1 to ON. The interval will appear on the counter.

5.09 ***Analog Loopback Reverse Channel Test:*** This test checks the interface circuits used with reverse channel. Proceed as follows:

(1) Disconnect the CPE and connect the 914-type DTS to DS 202SR.

(2) Insert red pins in the matrix and position switches as shown in Fig. 4.

(3) Apply power to the data set and DTS.

(4) Depress locking AL key on the data set.

(5) Operate switch S3 to ON.

Requirement: DS4 lamp lights.

(6) Operate switch S1 to ON.

Requirement: DS4 lamp extinguished.

(7) Operate switches S1 and S3 to OFF.

Requirement: DS4 lamp remains extinguished.

D. Automatic Answer Test

5.10 This test verifies that DS 202SR will automatically answer and terminate a call.

The test checks the data-terminal-ready and ring indicator leads. Proceed as follows:

(1) Ensure that the automatic answer option is installed (contact 1 on option switch S2 closed).

(2) Connect the data set to the 914 DTS. Use either the 914C or 914B; the 903 is not required.

(3) Insert red pins into the matrix and position switches as shown in Fig. 4, ***except switch S6 should be moved to OFF.*** Apply power to the data set and the 914 DTS.

(4) Have a call made to the data station.

Note: If a reverse channel test is to be performed, a DTC should be contacted and asked to initiate the call, since the DTC will probably perform the reverse channel test as part of the call.

Requirements: DS8 lamp lights (RI is ***on***) during ringing. DS8 extinguishes (RI is ***off***) during the quiet period. The data set does ***not*** answer the call.

(5) Position switch S6 to ON (DTR ***on***) during the quiet period of the ringing cycle.

Requirements: At the end of the next ringing cycle, the data set answers the call. After approximately 3 seconds, DS2 (data set ready) lights. This indicates that the data set is in the data mode.

(6) If a reverse channel test is to be performed, proceed to paragraph 5.11 (3).

(7) If a reverse channel test is not to be performed, terminate the call by moving switch S6 to OFF (DTR ***off***).

Requirement: DS2 extinguishes.

E. Reverse Channel Test

5.11 This test checks the interface circuits used with reverse channel. It will be necessary to contact a DTC for this test. The DTC should be capable of transmitting a tone (387 Hz) to the data set and measuring the frequency of the tone received from the data set. Proceed as follows:

(1) Disconnect the CPE and connect the 914 DTS in its place in accordance with Fig. 4. Insert red pins into the matrix and position switches as shown in Fig. 4, ***except switch S1 should be ON.***

(2) Apply power to the data set and then to the 914 DTS.

(3) Request the DTC to send 387 Hz at -12 dBm at the 0 TLP.

Requirement: DS4 lamp lights (SCF ***on***).

(4) Move S3 to ON and S1 to OFF. This transmits 387 Hz to the DTC.

(5) Request the DTC to measure the frequency of the reverse channel tone.

Requirement: 377 to 397 Hz.

F. Supplementary Tests

5.12 ***End-to-End Test:*** This test should be used to identify problems in the transmission facilities. Proceed as follows:

Note: It will be necessary to establish voice communication during the test.

(1) Set up the test equipment and the data sets in accordance with Fig. 5.

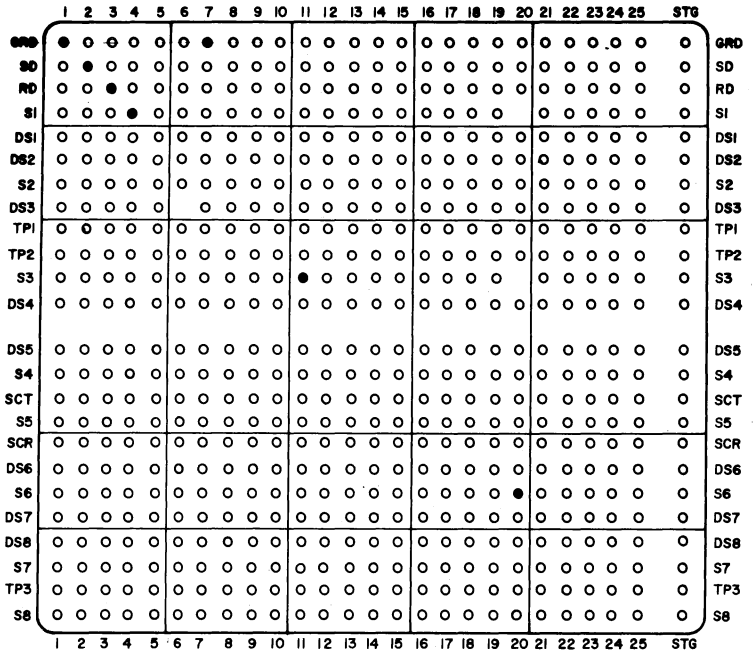
(2) Set switch S1 to ON at the transmitting end and switch S1 to OFF at the receiving end.

(3) Apply power to the data set and test equipment. Establish a data call between the data sets. Momentarily depress START button on the 903 DTS.

Note: Steps (4) through (8) are for the receiving end only.

(4) On the 914 DTS, set FUNCTION switch to PHASE ADJ.

(5) Adjust PHASE control to zero the meter.



914 DTS MATRIX

NOTES:

1. SET SWITCHES ON THE 914 DTS AS FOLLOWS:

SWITCH	SETTING
INTERFACE MODE	VOLTAGE
TEST SET MODE	SER (914C DTS)
	RCV SER (914B DTS)
COUNTER	BIT ERRORS
RCV BIT RATE	1200
RCV WORD LENGTH	63
TRANSMIT BIT RATE (914C)	1200
TRANSMIT WORD LENGTH (914C)	63
SIG LEV	±4V
SWITCH S1, S3	OFF
SWITCH S6	ON
SAMPLE WIDTH	30%

2. 914 DTS INDICATOR LAMPS AND SWITCHES CORRESPOND TO THE FOLLOWING INTERFACE LEADS.

SWITCH	LEAD
S1	REQUEST TO SEND
S3	SECONDARY REQUEST TO SEND
S6	DATA TERMINAL READY

3. ALL A INTERFACE SELECTOR SWITCHES MUST BE PUSHED IN EXCEPT 2A WHEN USING A 903 DTS.

Fig. 5—End-to-End Test Setup

(6) Move FUNCTION switch to OFF.

(7) Operate WORD SYNC switch momentarily to MAN.

(8) Press RESET button to clear the counter.

(9) Complete end-to-end tests involve making two 10-minute and six 2-minute test runs. Establish voice communications between tests, using the associated telephone set. Place calls alternately from each end except where one customer location will always be originating the call. These test calls should be made during

busy hours. This gives reasonable assurance that all test calls do not use the same trunks and routes.

Requirement: During the 10-minute test calls, count errors at the end of 1-minute intervals. Disregard the test period with the highest number of errors. Total errors in the remaining nine test periods should be no more than six. Four of the six 2-minute calls should have no more than three errors each.

Note: Refer to Fig. 6 for an example of a form which can be used to record test results.

(10) Upon completion of tests, record the results and disconnect the test equipment.

5.13 ***Ground Noise Test:*** If the data set and CPE are not at the same ground potential, errors may be caused by a potential difference between data set ground and business machine ground. To detect the presence of noise potentials at the time of installation or during troubleshooting, a test should be made using the 6H impulse counter.

Note: For information pertaining to the 6H impulse counter, refer to the section entitled 6H and 6HR Impulse Counters (J94006H and J94006HR)—Description, Operation, and Maintenance (103-620-101). If the 6H impulse counter is not available, a 6A impulse counter may be used. For information pertaining to the 6A impulse counter, refer to the section entitled J94006A (6A) Impulse Counter—Description, Operation, and Maintenance (103-620-100).

5.14 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 on the 6H impulse counter.

(5) On the 6H impulse counter, set the DIAL-MEAS switch to MEAS and set the DBRN dial to 90.

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

(7) Set the minutes control to 15. After the 15-minute test has elapsed, record the number of indications on the counter.

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

(9) Reset the counter on the 6H impulse counter to 0.

(10) Set the minutes control to 15. After the 15-minute test has elapsed, record the number of indications on the counter.

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

Date: _____

Data Test Calls Placed Between:

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

Contemplated Customer S.O. Number's _____

Under Control of Data Test Center at _____

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

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

Billing Adjustment (if required) referred to: _____

Parties involved in Tests: _____

Coordinated with tests to other locations at: _____

Comments and Notes:

Fig. 6—Data Set Preservice Performance Test Record