DATA STATION USING DATA SETS 202S

TEST PROCEDURES

CONTENTS PAGE

1. GENERAL

1.01 This section describes the test procedures to be followed when installing and maintaining data sets (DS) 202S in multiple data set installations. This information pertains to those installations using 40A1 data mountings. Refer to the section entitled Data Station Using Data Sets 202S—Maintenance Procedures (592-860-300) for additional information that may be used to isolate problems in the data station.

1.02 This section is reissued primarily to add information on testing DS 202S-L1A and L1A/3A. The 914 data test set matrix pin arrangement has also been simplified.

1.03 A known good DS 202S equipped with reverse channel and enclosed in a single set housing (DS 202S-L1/2/3 ▶or -L1A/2/3A)◀ should be taken to the customer location by the repair personnel. The purpose of the housing is to protect the data set in transit. If a DS 202S must be replaced, it should be placed in the housing of the set used to replace it.

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

2. TEST CAPABILITIES

2.01 The test circuitry built into DS 202S permits the tests described in the following paragraphs to be performed.

A. Local Self Test

2.02 Depressing the LT key on the front of the data set initiates the local self test. A repeating 63-bit pseudorandom word is generated at 1547 bps and looped from the transmitter to the receiver through an attenuating circuit. The word received by the receiver is compared to the original word. Under normal conditions, all the indicators (ON, TR, MR, RS, CS, CO, and TM) are lighted; however, in the event an error is detected, the TM indicator goes off. Perform the test as follows:

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

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

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

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

(3) If the requirements of (2) are not met, repeat (2) four times.

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

B. Remote Test

2.03 Depressing the locking RT key on the data set places that particular set in the remote test mode. The set will then automatically answer a call from the data test center (DTC), since the auto-answer feature is enabled regardless of the option switch setting. As with the self test, a repeating 63-bit pseudorandom word is generated and looped back internally, where it is compared to the original word. In the remote test, the word is also transmitted to the DTC. If the set detects an error, constant spacing is transmitted instead of the random word. This allows an attendant at the DTC to test the data set circuitry (except the customer interface). After the set is placed in the remote test mode, no more action is required until the DTC requests that the data set be returned to normal (by depressing and releasing the RT key).

Note: All the customer interface leads are made inoperative and are not tested during the test; however, the indicators (ON, TR, MR, RS, CS, CO, and TM) are lighted.

2.04 Proceed with the test as follows:

(1) Contact the DTC and request a remote test of the affected data set.

Note: If the set is used with line hunting equipment, the DTC must conduct the test over the service line. In this case, the data set is connected to the service line when the RT key is depressed.

Only one data set at a time should be connected to the service line.

(2) When instructed to do so by the DTC, depress the RT key until it locks and observe that all the indicators on the data set are lighted.

(3) When instructed to do so, press and release the RT key to release the data set from the remote test mode. If the data set enters the data mode (MR lighted), depress and release the analog loop-back (AL) key to return the data set to the idle mode.

C. Analog Loop-Back Tests

2.05 The purpose of these tests is to check the interface circuits not checked by the local self test or the remote test. When the data set is in the analog loop-back mode, the data signals applied to the transmitted data interface lead are processed through the transmitter, looped through an attenuator ▸(202S-L1 only)◂ to the receiver where they are demodulated, and connected to the received data lead. Pressing the AL key until it locks performs the following:

- Connects the transmitter and receiver ▸for DS 202S-L1A. An attenuator is inserted in this path for DS 202S-L1 only.◂
- Overrides the local copy control circuit to provide local copy.
- Illuminates the TM indicator.
- Disables the auto-answer features, if installed.
- Turns the data-set-ready lead and the MR indicator ***off*** (all other customer interface leads and indicators are operative and may be tested) ▸on DS 202S-L1 only. This is optional for DS 202S-L1A.◂

The following test equipment is required to perform these tests:

- A 914C Data Test Set (DTS)

or

- A 914B ***and*** 903-type DTS.

2.06 ***Error Run and Power Supply Test:*** This test verifies that the data set will transmit and receive a 63-bit pseudorandom 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. 1. Proceed as follows:

(1) Remove the cover from the back of the KS-20018 cabinet to gain access to the

customer interface connector. (Pull out at the top of the cover.)

(2) Disconnect the customer-provided equipment (CPE) and connect the 914-type DTS to the customer interface connector on the rear of the data mounting.

(3) Insert the red pins in the 914 matrix and position the switches as shown in Fig. 1.

(4) Close the make-busy switch (toggle down) for the data set being tested (if make-busy feature is installed).

(5) Press the AL key until it locks. Wait at least 3 seconds ▶(with DS 202S-L1 only)◀ before proceeding to allow the answer sequence to be generated in 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 the START button on the 903 DTS if it is being used.

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

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

Requirement: +12 to +17 volts.

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

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

Requirement: −12.5 to −17.5 volts.

(10) Position the FUNCTION switch to PHASE ADJ.

(11) Adjust the PHASE control until the meter indicates zero, then move the FUNCTION switch to OFF.

(12) Momentarily position the WORD SYNC to MAN.

(13) Reset the counter on the 914 DTS.

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

Requirement: No errors.

(15) If no more tests are to be conducted, disconnect the test equipment and depress and release the AL key.

(16) If a clear-to-send response test is to be conducted, position S1 to OFF, then proceed to 2.07 (6).

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

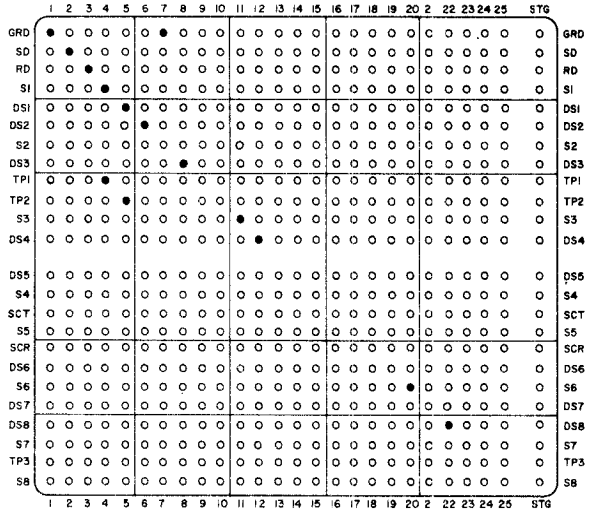
(1) Remove the cover from the back of the KS-20018 cabinet to gain access to the customer interface connector. (Pull out at the top of the cover.)

(2) Disconnect the CPE and connect the 914-type DTS to the customer interface connector on the rear of the data mounting.

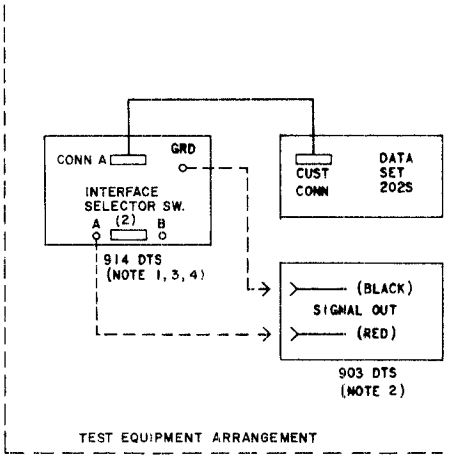
(3) Insert red pins in the matrix and position the switches on the DTS as shown in Fig. 1, ***except the COUNTER switch should be positioned to INTERVAL X1 for options M, K, and J, or X10 for option G.*** Position TEST SET MODE switch to INTERVAL.

(4) Close the make-busy switch (toggle down) for the data set being tested (if the make-busy feature is installed).

(5) Place the data set in the analog loop-back test mode by depressing the AL key until it locks. Wait at least 3 seconds ▶(with DS 202S-L1 only)◀ before proceeding.



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
TPI	+/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
SI		REQUEST TO SEND
	DSI	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. 1—Analog Loop-Back Test

(6) Reset the counter. Position switch S1 to ON, and the clear-to-send turn-on interval will appear 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 installed option requires testing.

(7) To measure the interval, move S1 to OFF, reset the counter, then move S1 to ON.

(8) If a received line signal detector response test is to be performed, move switch S1 to OFF. Proceed to 2.08 (3).

2.08 ***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 with the test as follows:

(1) Remove the cover from the back of the KS-20018-type cabinet to gain access to the customer interface connector. (Pull out at the top of the cover.)

(2) Disconnect the CPE and connect the 914-type DTS to the customer interface connector on the rear of the data mounting.

(3) Insert red pins in the matrix and position the switches on the DTS as shown in Fig. 1, ***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.

(4) Close the make-busy switch (toggle down) for the data set being tested (if the make-busy feature is installed).

(5) Place the data set in the analog loop-back test mode by depressing the AL key until it locks. Wait at least 3 seconds ▶(with DS 202S-L1 only)◀ before proceeding.

(6) Reset the counter. Move switch S1 to ON; the response time appears 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: Only the installed option need be checked.

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

2.09 ▶***Analog Loop-Back Reverse Channel Test*** (DS 202S-L1A/3A only): This test checks the interface circuits used with the reverse channel. Proceed as follows:

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

(2) Insert the red pins in the matrix and position the switches as shown in Fig. 1.

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

(4) Depress the 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 goes off.

(7) Operate switches S1 and S3 to OFF.

Requirement: DS4 lamp remains off.◀

D. Automatic Answer Test

2.10 This test verifies that DS 202S will automatically answer and terminate a call. The test checks the data-terminal-ready and ring indicator leads. Proceed with the test as follows:

(1) Close the make-busy switch (toggle down) for the data set being tested (if the make-busy feature is installed).

(2) Remove the data set from the mounting and verify that the automatic answer option is installed (contact 8 on switch S2 closed.) ***Power to the data set need not be removed.***

(3) Replace the data set in the mounting.

(4) Open the busy switch.

(5) Remove the rear cover from the KS-20018 cabinet to gain access to the customer interface connector (pull out at the top of the cover).

(6) Disconnect the CPE and connect the 914-type DTS to the customer interface connector on the rear of the data mounting.

(7) Insert red pins into the matrix and position the switches as shown in Fig. 1, ***except switch S6 should be OFF.*** Apply power to the 914-type DTS.

(8) Have a call made to the data set.

Note: A DTC should be contacted and asked to initiate the call if the data set is being used with line hunting equipment ***or*** if a reverse channel test is to be performed. The DTC operator will know the procedure required to call up a particular line in a hunting group.

Requirement: DS8 lamp lights (RI is ***on***) during the time when ringing voltage is present. DS8 goes off (RI is ***off***) during the quiet period. The data set does ***not*** answer the call.

(9) Position switch S6 to ON (DTR ***on***).

Requirement: 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.

(10) If a reverse channel test is to be performed, proceed to 2.11 (5).

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

Requirement: DS2 lamp goes off.

E. Reverse Channel Test

2.11 This test checks the interface circuits used with reverse channel. It will be necessary to use a DTC for this test. Proceed with the test as follows:

(1) Remove the rear cover from the KS-20018 cabinet to gain access to the customer interface connector (pull out at the top of the cover).

(2) Disconnect the CPE and connect the 914-type DTS to the data set under test.

(3) Insert the red pins in the matrix and position the switches as shown in Fig. 1, ***except switch S1 should be ON.***

(4) Apply power to the 914-type DTS.

(5) Request the DTC to send 387 Hz at −12 dBm at 0 TLP.

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

(6) Move S3 to ON and S1 to OFF. This transmits the reverse channel tone to the DTC.

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

Requirement: 377 to 397 Hz.

F. Supplementary Tests

2.12 ***End-to-End Test:*** This test should be performed to identify problems in the

transmission facilities. The following test equipment is required at both locations performing the test:

- A 914C *or* 914B DTS

Note: If a distant data set is not available, this test may be performed with a DTC.

2.13 Proceed with the test as follows:

(1) Set up the test equipment at both locations in accordance with Fig. 2. ***If a 914B DTS is being used at the transmitting end, position the TEST SET MODE switch to TRMT SER.*** Connect the 914-type DTS to the customer interface connector of the data set under test.

(2) Position switch S1 to ON at the transmitting station and switch S1 to OFF at the receiving station.

(3) Apply power to the test equipment.

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

(4) Establish a data call between data sets.

Note: Steps (5) through (9) are for the receiving end only.

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

(6) Adjust the PHASE control to zero the meter.

(7) Move the FUNCTION switch to OFF.

(8) Operate the WORD SYNC switch momentarily to MAN.

(9) Press the RESET button to clear the counter.

(10) 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. 3 for an example of a form which can be used to record test results.

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

2.14 ***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 CPE ground. To detect the presence of noise potentials at the time of installation or during troubleshooting, a test should be made using the 6-type impulse counter. This counter is used to count the number of impulse noise peaks during a measured time period. The counter registers only the peaks which exceed a preset amplitude and which are separated by 150 ms or more.

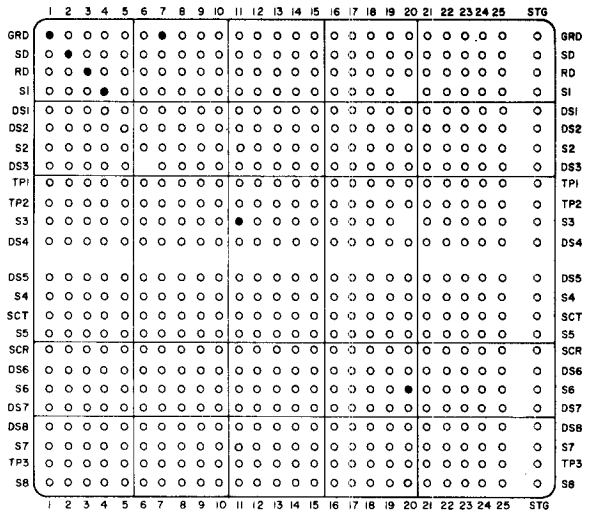
2.15 Test equipment required for this test is as follows:

1—6H impulse counter (or equivalent)

1—914-type DTS

1—2W6A test cord for 6H impulse counter (310 plug on one end, alligator clip connected to tip and ring on the other end).

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).



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.

Fig. 2—End-to-End Test

Date:_____

Data Test Calls Placed Between:

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

Contemplated Customer
S.O. Number's_____

Under Control of Data
Test Center at_____

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

SHORT DURATION TEST CALLS			SHORT CALL — NUMBER (READINGS AT _____)						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. 3—Data Set Performance Test Record

2.16 The 6H impulse counter is connected and the test is performed as follows:

(1) 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 CPE. This test assumes that protective ground from the business machine appears at the customer interface on pin 1.

Protective ground from the data mounting does not appear on the customer interface connector. Protective ground connections are made to the frame of the data mounting.

(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 1B and the other clip to any clean bare metal surface on the data mounting. Verify that power is applied to the data set and business machine.

Note: A clip lead may be needed to extend the 2W6A cord into the cabinet.

(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 the clips of the 2W6A cord from the switch and frame of the data mounting.

(9) Connect one clip to switch 7A and the other to 7B.

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

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

2.16 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 the test equipment and restore the data set to pretest condition.

3. INSTALLATION TESTS

3.01 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 and the end-to-end facilities meet the requirements specified in the sections entitled Data Systems—DATA-PHONE® Service—Direct Distance Dialing Network—Test Requirements for Subscriber, Foreign Exchange, and Remote Exchange Lines (314-205-501) and Data Systems—DATA-PHONE® Service on Direct Distance Dialing Network—Overall Transmission Maintenance Procedures (314-205-500). Refer to Fig. 4 for the sequence of tests.

4. MAINTENANCE TESTS

4.01 This part provides the sequence in which tests are to be performed during a trouble visit. The procedure provides a method of isolating a trouble to either the data set or the transmission facility. It is assumed that the maintenance procedures outlined in Section 592-860-300 have been followed prior to dispatching the craft employee. Refer to Fig. 5 for the sequence of tests.

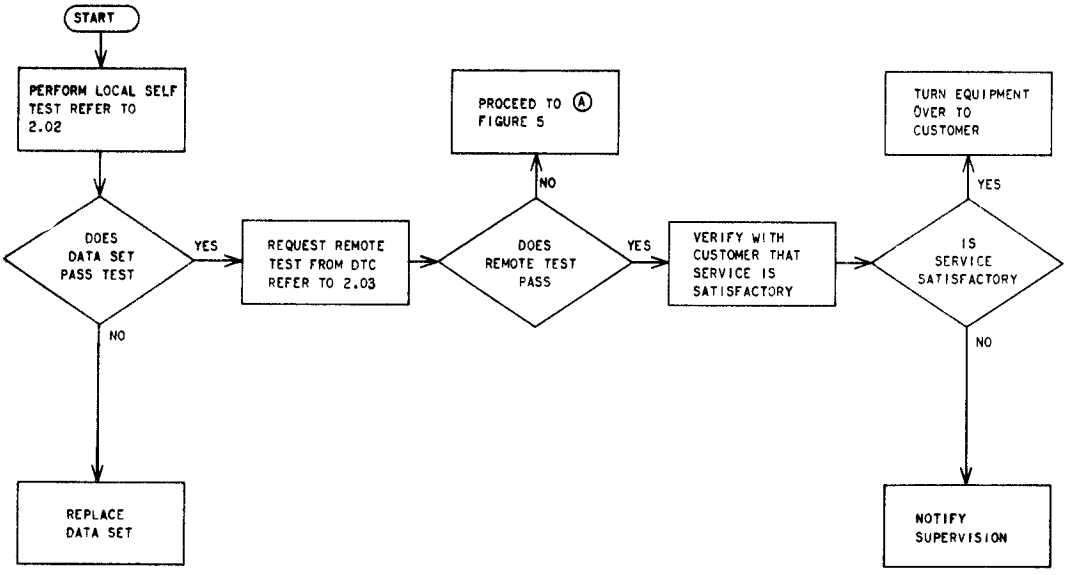


Fig. 4—Installation Tests Flowchart

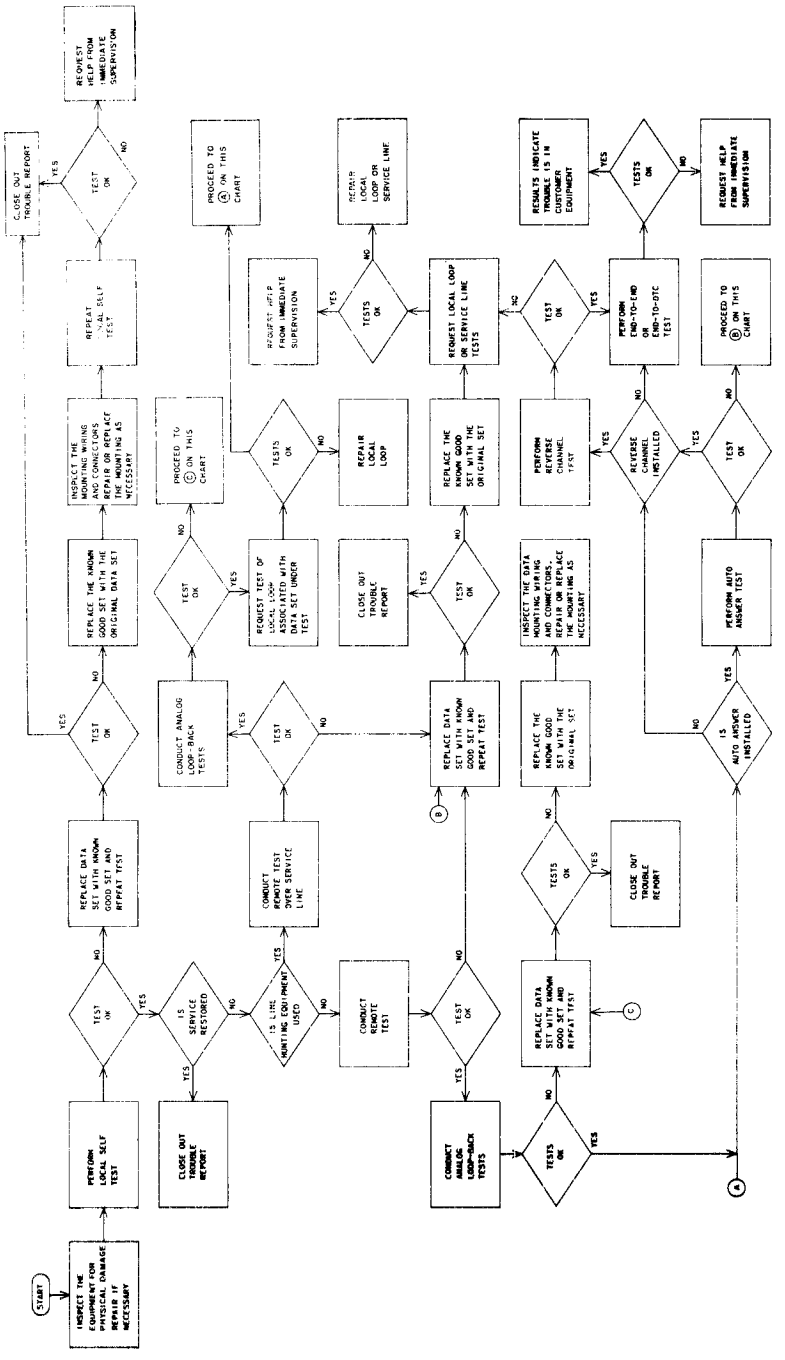


Fig. 5—Maintenance Tests Flowchart