DIGITAL DATA SYSTEM

550A-TYPE CHANNEL SERVICE UNIT

TEST PROCEDURES

CONTENTS PAGE

1. GENERAL

1.01 This section contains the procedures to be used when testing the 550A-type channel service unit (CSU). Procedures for investigating a trouble condition are given in Section 595-100-300, entitled Digital Data System—Channel Service Unit—Maintenance.

1.02 This section is reissued to provide information on version 2 of the 921A data test set (DTS) and additional information on the test requirements. Since this is a general revision, arrows ordinarily used to denote changes have been omitted.

1.03 The tests covered in this section are listed and defined as follows.

- ***CSU Functional Test:*** This test verifies operation of the CSU power supply, while a partial test of customer interface leads is also accomplished.

- ***CSU Straightaway Test:*** The purpose of this test is to evaluate the performance of the digital data system (DDS) channel through an error performance run. A maximum of 3-bit errors counted at the serving test center (STC) and 3-bit errors counted at the station during a 15-minute interval is permitted for the DDS channel to be acceptable. This test also verifies operation of the CSU by measuring the isochronous distortion present at the CSU interface.

1.04 The tests given in this section are to be performed in the order given for installation testing. For maintenance testing, the tests may be performed individually or in any combination. The tests are designed to verify that the 550A-type CSU has been properly installed and is operative with the DDS. For maintenance purposes, the tests will isolate equipment malfunctions and evaluate the overall performance of the CSU. Each test procedure given in this section requires voice coordination with the STC.

1.05 Upon failure of any one test, the maintenance philosophy for the CSU is immediate replacement with a known operable CSU of the same speed and equipped with the same options. Therefore, no remedial action is given in the test procedures to follow. If the replacement CSU fails any one of the tests, the cable pairs or associated central office transmission equipment may be the trouble source and must be analyzed as specified in Section 314-410-310, entitled Digital Data System—Local Loop—Maintenance Procedures.

Customer permission should be obtained to ensure that the data channel is idle prior to conducting any test given in this section.

2. APPARATUS

2.01 The apparatus required to perform the CSU functional test (Test A) is as follows:

- 914C DTS (J79914C-L1)

and

- Auxiliary cabling supplied with the DTS must include a short adapter cord (ED-73578)

and

- VOM (KS-16979-L1), or equivalent, meter with frequency response good to 28 kHz

or

- 921A DTS (J79921A).

2.02 A 921A DTS is the only test equipment required at the customer location to perform the CSU straightaway test.

3. TEST PROCEDURES

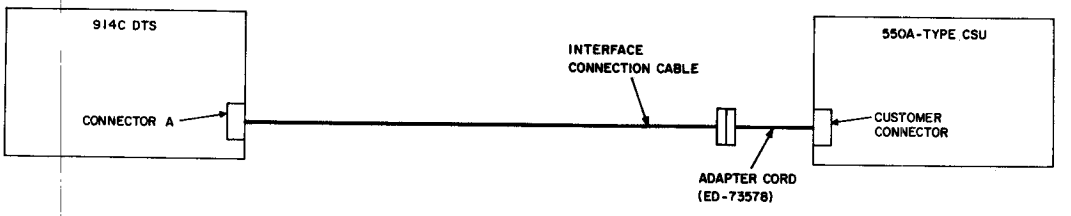
3.01 The test procedures presented in this part should be performed after the CSU has been installed to ensure that the installation is ready to be placed in service. In addition, the telephone company (telco) employee should, if possible, assure that data can be transmitted and received between the local and remote customer terminals.

Take appropriate action as given in Section 010-250-001, entitled Crediting Charges on Test Calls, to ensure that the customer is not billed for test calls. Before starting either test, establish voice communication with the STC and verify that the DSU under test is the correct list code and that customer options specified on the circuit layout record card (CLRC) are installed in the DSU.

A. CSU Functional Test Using 914A DTS

3.02 The following procedure provides information on testing a CSU using a 914 Data Test Set.

STEP	ACTION	VERIFICATION
1	Construct an adapter cable by attaching the interface connection cable supplied with the DTS to the short adapter cord (ED-73578), also provided with the DTS.	
2	Connect adapter cord end of adapter cable to the customer interface connector on the CSU, and the other end to connector A on the DTS.	
3	Insert the DTS power plug into a 117-volt 60-Hz ac outlet.	
4	Program the DTS with seven matrix pins and position the switches in accordance with Fig. 1.	
5	Press the DTS POWER switch.	POWER indicator is lighted.
6	Ensure that the CSU is supplied with a source of 117-volt 60-Hz ac power.	At the CSU— PWR indicator is lighted. At the DTS— DS1 indicator is lighted.



914C DTS MATRIX PROGRAM

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

914C DTS SWITCH SETTINGS
(ALL OTHER SWITCHES NOT USED)

SWITCH	SETTING
INTERFACE MODE	VOLTAGE
OUTPUT (TP3)	OFF
TEST SET MODE	SER
COUNTER	BIT ERRORS
RCV BIT RATE	EXT +
ALL INTERFACE SELECTOR SWITCHES	DEPRESSED
TRANSMIT BIT RATE	EXT +

INDICATOR LIGHT DESIGNATIONS

DSI	STATUS INDICATOR

Fig. 1—914C DTS Testing Configuration

STEP	ACTION	VERIFICATION
7	Place the VOM function switch in the DCV 30 position.	
8	Place the VOM polarity reversing switching the + (positive) position.	
9	Connect + test lead and - test lead of VOM to TP1 and GRD, respectively, on DTS.	VOM indicates between 5 and 8 Vdc.
10	Remove matrix pin connecting DS1 and connector pin 2.	VOM indicates between 7 and 9 Vdc.
11	Disconnect the + test lead of the VOM from TP1.	
12	Place the VOM polarity reversing switch in the - (negative) position.	
13	Request the STC to transmit a repeated CHAN loopback control code and to compare the received data to the transmitted data.	TST indicator on CSU is lighted. DS1 lamp on DTS is off.
14	Reconnect the + test lead of the VOM to TP1 on the DTS.	VOM indicates between -7 and -9 Vdc.
15	Reinsert DTS matrix pin connecting DS1 and connector pin 2.	VOM indicates between -5 and -8 Vdc.
16	Disconnect the VOM test leads.	
17	Place the VOM function switch in the ACV 15 position.	
18	Connect the VOM test leads across TP2 and TP3 of the DTS.	VOM indicates zero Vac.
19	Request the STC to transmit all "1s" data.	VOM indicates between 1 and 2 Vac. TST indicator on CSU is off. DS1 indicator on DTS is lighted.
20	Request the STC to transmit the office channel unit (OCU) loopback code.	VOM indicates zero Vac.
21	Request the STC to transmit a repeated zero suppression code (00000001).	
22	Request the STC to transmit repeated idle control code.	STC receives repeated idle control code.
23	Remove DTS adapter from customer interface connector on CSU.	

STEP	ACTION	VERIFICATION
24	If no further test are to be performed, reconnect the CSU to the CPE.	

3.03 Perform the following steps to make a functional test of the CSU using a 921A Data Test Set.

B. CSU Functional Test Using 921A DTS

STEP	ACTION	VERIFICATION
1	Connect the DTS to the customer interface connector on the CSU using the interface cords provided with the DTS. ***Note:*** The interface cord is equipped with a 37-pin connector on each end. A 6-inch adapter cord matches the interface cord to the 15-pin interface connector on the CSU.	
2	Verify that all 37 DCE-interface selector switches (white bow-tie) on the front of the DTS are in the TERM position.	
3	Insert the 921A DTS power cord plug into a 117-volt 60-Hz ac outlet.	
4	Remove the 550 CSU interface card from the storage area in the DTS and ensure that all interface lead switches are in the TERM position.	
5	Insert the interface card into the slot on the right side of the DTS and close the latch.	
6	Operate the POWER switch on the 921A DTS to ON.	POWER ON indicator is lighted.
7	Press RST key on the DTS.	Display indicates— 921A VERS #01 (or higher) then indicates DATA SET: if the DTS is not defective. If the DTS is defective, TEST FAILED appears on the display.
8	Select the 550A CSU by entering 50 on the DTS input keyboard. ***Note:*** To delete a wrong entry on the input keyboard, press the backspace arrow.	Display indicates— DATA SET: 50.

STEP	ACTION	VERIFICATION
9	Press GO key.	Display indicates— BIT RATE:
10	Select the CSU service rate by entering one of the following on the DTS input keyboard: • 24 for 2.4-kb/s service • 48 for 4.8-kb/s service • 96 for 9.6-kb/s service • 56 for 56-kb/s service.	Display indicates— BIT RATE: followed by either 24, 48, 96 or 56.
11	Press GO key. ***Note:*** If GO or TST key is pressed at an unauthorized point in a test, the test is terminated and the DTS recycles to this step.	Display indicates— TEST SEQ:
12	Ensure that the CSU is supplied with a source of 117-volt 60-Hz ac power.	PWR indicator on CSU lighted.
13	Request the STC to transmit a repeated CHAN loopback control code and to compare the received data to the transmitted data.	Interface indicator DSR is off TST indicator on CSU is lighted.
14	Request the STC to transmit a repeated zero suppression code (00000001) for this part of the test.	
15	Select DDS zero suppression code by entering 62 on the DTS.	Display indicates— TEST SEQ: 62.
16	Press GO key.	Display indicates—ZERO: May briefly show ENTERED=00 DROPPED=00. The DTS displays the number of times the zero suppression code in entered and dropped. ***Requirement:*** The final display shows the number for ENTERED is one more than the number indicated as DROPPED STC receives zero data.
17	Request the STC to transmit repeated idle control code.	

STEP	ACTION	VERIFICATION
18	Press GO key.	Display briefly indicates—TEST INTERRUPTED then indicates TEST SEQ:
19	Select DDS idle control code by entering 63 on the DTS.	Display indicates— TEST SEQ: 63.
20	Press GO key.	Display indicates— IDLE: May briefly show ENTERED=00 DROPPED=00. The DTS displays the number of times the idle control code is entered and dropped. ***Requirement:*** The final display shows the number for entered is one more than the number indicated as DROPPED. STC receives idle control code.
21	Press GO key.	Display indicates—TEST INTERRUPTED then indicates TEST SEQ:
22	Request the STC to transmit out-of-sync code (mux out-of-sync).	
23	Select DDS out-of-sync code by entering 64 on the DTS.	Display indicates— TEST SEQ: 64.
24	Press GO key.	Display indicates— OOS: May briefly show ENTERED=00 DROPPED=00. The DTS displays the number of times the out-of-sync code is entered and dropped. ***Requirement:*** The final display shows the number for ENTERED is one more than the number indicated as dropped.
25	Press GO key.	Display indicates—TEST INTERRUPTED then indicates TEST SEQ:
26	Select DDS NOT READY (CSA) control code by entering 65 on the DTS.	Display indicates— TEST SEQ: 65.
27	Press GO key.	Display indicates— SENDING CSA. STC receives NOT READY control code (01111010). ***Note:*** Since the NOT READY control code is used only in SDDS, if the channel being tested is a private line channel using an HL1,

STEP	ACTION	VERIFICATION
		HL2, HL3, or HL3 OCU CP, the STC will not receive the NOT READY control code (01111010).
28	If no additional tests are to be made place the DTS POWER switch in the OFF position.	POWER ON indicator on DTS is off.
29	Remove DTS adapter cable from customer interface connector on the CSU.	
30	If no further tests are to be performed, reconnect the CSU to the CPE.	
31	Remove the 550 CSU interface board from the DTS and place in the proper storage area.	

3.04 Perform the following steps to make a straightaway test of the CSU using a 921A Data List Set.

C. CSU Straightaway Test Using 921A DTS

STEP	ACTION	VERIFICATION
1	Connect the DTS to the customer interface connector on the CSU using the interface cords provided with the DTS. ***Note:*** The interface cord is equipped with a 37-pin connector on each end. A 6-inch adapter cord matches the interface cord to the 15-pin interface connector on the CSU.	
2	Verify that all 37 DCE-interface selector switches (white bow-tie) on the front of the DTS are in the TERM position.	
3	Insert the 921A DTS power cord plug into a 117-volt 60-Hz ac outlet.	
4	Remove the 550 CSU interface card from the storage area in the DTS and ensure that all interface lead switches are in the TERM position.	
5	Insert the interface card into the slot on the right side of the DTS and close the latch.	
6	Operate the POWER switch on the 921A DTS to ON.	POWER ON indicator is lighted.
7	Press RST key on the DTS.	Display indicates— 921A VERS #01 (or higher) briefly, then

STEP	ACTION	VERIFICATION
		indicates DATA SET: if the DTS is not defective. If the DTS is defective, TEST FAILED appears on the display.
8	Select the 550A CSU by entering 50 on the DTS input keyboard. ***Note:*** To delete a wrong entry on the input keyboard, press the backspace arrow.	Display indicates— DATA SET: 50.
9	Press GO key.	Display indicates— BIT RATE:
10	Select the CSU service rate by entering one of the following on the DTS input keyboard: ● 24 for 2.4-kb/s service ● 48 for 4.8-kb/s service ● 96 for 9.6-kb/s service ● 56 for 56-kb/s service.	Display indicates— BIT RATE: followed by either 24, 48, 96 or 56.
11	Press GO key. ***Note:*** If GO or TST key is pressed at an unauthorized point in a test, the test is terminated and the DTS recycles to this step.	Display indicates— TEST SEQ:
12	Request the STC to transmit 2047-bit word.	
13	Select error test (DOT, SPACE, MARK, and PSEUDORANDOM WORD) by entering 55 on the DTS.	Display indicates— TEST SEQ: 55.
14	Press GO key.	Subrate CSU— Display indicates— SELECT ERROR TEST, briefly, then D=DT 0=SP 1=MK 2=2047 5=511 6=63 is displayed. 56-kb/s CSU— Display indicates— SELECT ERROR TEST, briefly, then D=DT 0=SP 1=MK 2=2047 is displayed.
15	Press key number 2.	Display indicates— 1 = BIT ERRORS 2 = BLOCK ERRORS.

STEP	ACTION	VERIFICATION
16	Press key number 1.	Display indicates— ???? SECONDS.
17	Select 15 minutes by entering 0900 on the DTS.	Display indicates— 0900 SECONDS, briefly, then 0000 BITS in ERROR is displayed. From this point, the DTS counts the number of errors received. At the end of the test, the display indicates TEST COMPLETE, then total SYNC LOSSES, and then the total BITS IN ERROR, repeatedly. ***Requirement:*** Maximum number of errors is three counted by the 921A DTS and three counted by the STC KS-20908 DTS.

KEY	FUNCTION
A	Restart test
B	Display time remaining in test
C	Clear display
D	End test
E	Insert errors into the data stream
F	Force out-of-sync

Note 1: If sync is lost during test, right portion of display flashes OSYN. If this occurs, test must be restarted by pressing key ***A.***

Note 2: To perform the following functions, press associated key.

18	If more than three errors are counted on either counter— Repeat the test by pressing the ***A*** key on the DTS, requesting the STC to reset error counter and timing another 900-second interval.	Same as Step 17.
19	If more than three errors are counted within the first 5 minutes of the second attempt— Wait 5 minutes. Then repeat the test by pressing the ***A*** key on the DTS, requesting the STC to reset error counter and timing another 900-second interval.	Same as Step 17.

STEP	ACTION	VERIFICATION
	Note: An extraordinary condition, such as a severe electrical storm or an intermittent failure of customer-supplied ac power, may affect the performance of the DDS channel. The straightaway test cannot properly be performed until these conditions have cleared.	
20	If three attempts fail to achieve the 900-second requirement, the channel must be rejected as unsuitable for customer service. Refer to Section 595-100-300 for appropriate action.	
21	Press TST key on DTS to stop repetition of display.	Display indicates— TEST SEQ:
22	Select isochronous distortion test by entering 78 on the DTS.	Display indicates— TEST SEQ: 78.
23	Press GO key. ***Note 1:*** The interval between measurements or display updates may be as long as 20 seconds. To indicate that the test is in progress, assignable LED 1 will flash. ***Note 2:*** An * may appear as the first character in the message. This is a result of receiving, during one measurement interval, 25 or more pulses classified by the DTS as invalid and discarded from the measurement. EXCESS DP will be displayed if the number of invalid pulses equals or exceeds 1000.	Display indicates— ISO DIS LE= % PULSES= %. When enough data is gathered for the first measurement, the blanks will be filled and LE (leading edge) may change to TE (trailing edge). ***Requirement:*** The ISO DIS reading should not be greater than 28%.
24	Request the STC to perform a 15-minute CHAN loopback error run. The number of errors counted by the STC should be recorded on the circuit layout record card (CLRC) as a benchmark for future use.	
25	Place the DTS POWER switch in the OFF position.	POWER ON indicator on DTS is off.
26	Remove DTS adapter cable from customer interface connector on the CSU.	
27	If no further tests are to be performed, reconnect the CSU to the CPE.	
28	Remove the 550 CSU interface board from the DTS and place in the proper storage area.	