BATS (BIT ACCESS TEST SYSTEM)
AND LATS (LINE ACCESS TEST SYSTEM)
MANUAL TEST PROCEDURES
DIGITAL DATA SYSTEM

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1. GENERAL

1.01 This practice provides the manual test procedures to be followed by a DDS (digital data system) hub office to isolate trouble on a DDS point-to-point or multipoint circuit. Additionally, preservice and maintenance tests using the BATS (bit access test system) and LATS (line access test system) are included.

Note: It will be necessary for the BATS/LATS control panel technician to become familiar with Practice AT&T 314-901-520 before attempting to use this practice.

1.02 This practice is reissued for the following reasons:

(a) To delete reference to TEST INHIBIT

(b) To delete reference to 500A, 500B, and 550A DSU (data service unit) and 550A CSU (channel service unit)

(c) To make minor changes to Fig. 6, 10, and 11. Change arrows are used to emphasize the more significant changes.

1.03 The ***DDS overall service objective*** is to provide circuit availability ▶99.90◀ percent of the time for channels terminated in DSUs or CSUs. In order to meet this objective, the following maintenance goals have been established.

(a) An SSC/CTC (Special Service Center/Centralized Test Center) should isolate a trouble to one of the following areas within 15 minutes after receipt of a customer trouble report:

- DSU
- 4-wire local cable pairs including 56-kb/s repeaters and the CSU
- Facilities between the hub and the OCU (office channel unit) — short haul
- Interhub facilities — long haul.

(b) Maximum outage intervals for the various DDS transmission facilities should not exceed the following:

- TD/TH radio terminated in the 1A or 2A RDT (1A or 2A radio digital terminal)— 20 minutes
- T1 line terminated in the T1DM (T1 data multiplexer) or T1WB4/B5 (T1 voice-data multiplexer)—30 minutes
- Private line 4-wire local cable and OCU local channel (including DSU/CSU)—120 minutes.

1.04 The ***DDS performance objective*** is to provide a level of efficiency of 99.5 percent error-free seconds or greater. Procedures contained in this practice verify the performance of a DDS circuit and are also designed with the intention of meeting the objective listed in paragraph 1.03, and minimizing the number of outage intervals that exceed two hours.

1.05 Maintenance responsibility for the various DDS facilities is assigned to a number of maintenance centers which may be administered by either an associated operating company or an AT&T maintenance organization. These centers are the

SSC/CTC, TRCC (T-Carrier Restoration Control Center), TCAC (T-Carrier Administration Center), and RFMC (Regional Facilities Management Center) or FMAC (Facility Maintenance and Administration Center). For a description of the SSC/CTC, TRCC, TCAC, and RFMC or FMAC responsibilities and functions, refer to Practice AT&T 314-900-300 and the appropriate AT&T Practices in the 190-200 and 190-202 layers.

1.06 The protection switching and automatic monitoring that are provided in the DDS for the T1 lines, 1A RDS (Radio Digital System), and multiplexing equipment are described in Practice AT&T 314-900-300.

1.07 The DDS network status, control code signaling, and alarm indications are described in Practice AT&T 314-900-300.

1.08 Most troubleshooting and maintenance tests can be performed from an ABATS (Automated Bit Access Test System) test terminal. However, to realize maximum benefits with ABATS, local tests that are required should be done manually. For this reason, manual test procedures are included in this practice.

1.09 Whether tests are initiated from the ABATS test terminal, the BATS control panel, or the LATS control panel, this practice is used in conjunction with Practice AT&T 314-901-300 to completely isolate the trouble. Practice AT&T 314-901-300 is written in terms of testing from the 950-type testboard; therefore, the following points must be considered when using that practice in conjunction with BATS:

(1) BATS accesses the network at the DS-1 level via a DSAU (DS-1 signal access unit) on long-haul circuits between DSA (digital serving areas) as compared to accessing at the DS-0 level by the 950A testboard.

(2) If Practice AT&T 314-901-300 requires a loopback or straightaway test, use Part 4 of this practice for manual testing.

(3) If Practice AT&T 314-901-300 requires local loop testing (when there is LATS access), refer to Part 5 of this practice.

1.10 In most cases, customer-reported trouble will be caused by faulty DSUs/CSUs, 4-wire local cable pair, or OCUs. If isolation is required on the hub to hub facilities, the technician may need to refer to Practice AT&T 314-901-300.

1.11 A manual self-test of the BATS [also referred to as KS-21899 DTS (data test system)] should be performed after installation and at other times to ensure operational readiness. The self-test procedures are given in Practice AT&T 107-605-200. These tests check and exercise all major functions and circuits of the DTS. Performing the self-test is also a good way to become familiar with the BATS control panel.

2. TROUBLE ISOLATION PROCEDURES

2.01 The following principles apply to the trouble isolation procedures in paragraphs 2.02 through 2.16. In all cases, a circuit that has been reported in trouble should be monitored with the KS-21899 DTS. This will indicate whether or not the customer has stopped transmitting data. In addition, the type signal monitored will give a clue as to the direction of transmission that is faulty, such as follows:

- The NS (no signal), MCOS (multiplexer channel out of sync), or UMC (unassigned multiplexer channel) code indicates that a failure has occurred between the access point and the OCU and that the direction of failure is incoming. In this case, the hub uses the OCU loopback control code for signal tracing purposes to locate the probable trouble source.

- The IC (idle code), ASC (abnormal station condition), A1 (all ones data), or A0 (all zeros data) indicates the point of failure is not located on the incoming portion of the circuit from the OCU.

PRELIMINARY HUB TROUBLE ISOLATION PROCEDURES

2.02 Determine the number of circuits experiencing trouble. If more than one circuit is in trouble, look for a common failure, such as a facility, multiplexer, fuse bay, etc.

2.03 When a trouble report is received, interrogate the SSC/CTC to determine what tests were done to sectionalize the trouble. Thorough analysis

will eliminate duplicate testing and aid in trouble isolation. Some points to remember are:

- Isolate trouble to the smallest circuit segment containing all the stations experiencing trouble.
- Obtain release of the circuit and test the entire circuit (2-point or multipoint) to locate the stations experiencing trouble.

2.04 Figure 1 provides preliminary hub trouble isolation procedures for manual testing. Part 5 provides local loop trouble-clearing procedures for those circuits that can be accessed by the LATS. The flowchart shown in Fig. 1 is used to isolate the trouble to either the NE (near-end) DSA, FE (far-end) DSA, DDS network, or no TELCO (telephone company) trouble. When a trouble is isolated, continue as follows:

- ***UMC or MCOS code from NE***—According to Fig. 2 and paragraph 2.11.
- ***NE OCU loopback test failure***—Continue NE trouble isolation in accordance with Fig. 2.
- ***FE OCU loopback test failure when another hub is associated with the FE***—Refer to FE hub to commence trouble isolation with Fig. 2.
- ***FE OCU loopback test failure when another hub is not associated with FE***—Continue FE trouble isolation with Fig. 2.
- ***Looped circuit indication***—Continue trouble isolation in accordance with Practice AT&T 314-901-300.

2.05 If the FE local channel meets the DSU/CHAN loopback requirements when the test is performed by the FE hub, continue trouble isolation according to Practice AT&T 314-901-300.

2.06 If the local channel fails one or more of the loopback tests given in Part 4, dispatch a TELCO employee as follows:

(a) If the station is equipped with a DSU and the DSU loopback test fails—Replace OCU and repeat DSU loopback test. If DSU loopback test fails again, dispatch to station to replace DSU per Practice AT&T 595-200-300.

(b) If station is equipped with a DSU and the DSU and CHAN loopback tests fail and OCU loopback test is satisfactory—Perform 1-employee tests per Part 5 (if equipped with LATS) or dispatch to OCU location to perform 1-employee tests per Practice AT&T 314-410-310. If trouble is not found, dispatch to station to replace DSU per Practice AT&T 595-200-300. If trouble persists, perform the 2-employee tests.

(c) If station is equipped with a CSU and the CHAN loopback test fails and OCU loopback test is satisfactory—Replace OCU and, if trouble still exists, perform 1-employee tests of local 4-wire cable pairs per Part 5 (if equipped with LATS) or dispatch to OCU location to perform 1-employee tests per Practice AT&T 314-410-310. If trouble is not cleared, dispatch to station to replace CSU per Practice AT&T 595-100-300. If trouble persists, perform the 2-employee tests.

2.07 There are points within a DSA where circuits can be manually looped either toward the DAP (digital access point), at the hub, or toward the station location. ♦Determine which point of access should be used for DS-0 or DS-1.♦ The possible loop access points, beginning at the hub DS-0 digital access point and progressing toward the station, are as follows:

(a) DSX-0A cross-connection (via a looping plug)

Note: Loop access points (b) through (f) will cause multiple channel troubles.

(b) SRDM (Subrate data multiplexer) common CP HL37 in hub or end office (via a loopback switch located behind the faceplate of HL37)

(c) DSX-0B cross-connection (via a looping plug)

(d) T1DM common CP HL10 or HL90 (via a looping switch on the faceplate of HL10 or HL90)

(e) T1 line at DSX-1 cross-connection, high-frequency cross-connection, or any span terminating office (via jumper cables)

(f) M-JCP (multiplexer jack and connector panel) at intermediate or end office (via jumper cable)

(g) SM-JCP (submultiplexer jack and connector panel) in end office (via jumper cable).

(h) Jack access on the faceplate of CP HL78 of a T1WB4/5. (Verify that patch cords are completely plugged into the jacks.)

2.08 If analysis of the circuit trouble indicates that a looped condition exists, refer to Practice AT&T 314-901-300 for procedures to aid in locating the trouble area.

2.09 When a looped condition is suspected in the long-haul portion of a circuit, check the DSX-1 cross-connection for a looping plug and the 1A RDT for a patch cord causing a looped condition. If a looped condition is isolated to the long-haul portion of the circuit but the loop cannot be found, refer to Practice AT&T 314-903-300.

INTRA-LATA (LOCAL ACCESS AND TRANSPORT AREA) HUB-TO-OCU CIRCUIT ANALYSIS

2.10 When the trouble is between the hub and OCU, the facility arrangement for this part of the circuit should be identified and then analyzed per Fig. 2 to determine which of the flowcharts should be used to complete the trouble isolation procedure. The facility arrangement should be shown on the CLRC/COLR (circuit layout record card/circuit order layout record), or equivalent.

INTERMITTENT TROUBLE ISOLATION PROCEDURES

2.11 After performing all necessary trouble isolation procedures in this practice following a trouble report and trouble cannot be found on the circuit, Fig. 3 should be used as an aid in isolating intermittent trouble. The procedure to be followed in Fig. 3 depends upon the number of times trouble has been reported on the same circuit within a 30-day period. Loopback tests are used in an attempt to isolate troubles on the first three trouble reports with each successive test being longer in duration. If the trouble is reported a fourth time, the trouble should be reported to the responsible supervisor, who has the option of requesting that a long-term, end-to-end test be performed or referring the trouble to DATEC (Data Technical support).

HUB-TO-HUB TROUBLE ISOLATION

2.12 Practice AT&T 314-901-300 contains the procedures to be followed when both hubs find no trouble in the hub-to-station portions of the circuit. The trouble is assumed to be in the long-haul portion of the network (between hubs). Text is provided in Practice AT&T 314-901-300 as support for the trouble isolation procedures.

HUB-TO-OFF-NET EXTENSION STATION TROUBLE ISOLATION

2.13 When trouble is isolated to the loop and the loop contains 56-kb/s regenerative repeaters, continue trouble isolation using Fig. 4. When the station experiencing trouble is an off-net extension served by a DDGT (digital data group terminal) or a subrate off-net extension, Fig. 5 and 6, respectively, should be used as aids in isolating troubles on the circuit.

2.14 To locate the trouble on a circuit containing an off-net extension station served by a DDGT, the presence of a signal at the digital access point and the DDGT in the hub office must be monitored to determine the direction of transmission that is faulty. If the fault cannot be found by monitoring in the hub office, loopback tests must be performed to the DDGT in the hub and serving offices and to the DSU or CSU at the station.

2.15 When isolating troubles on a circuit containing a subrate off-net extension station, loopback tests should first be performed over the DDS portion of the circuit, toward both ends of the circuit. This avoids involvement of the customer or personnel at a private line analog data test center when the trouble is not in the off-net portion of the circuit.

2.16 Isolation procedures to be used on the off-net portion of the circuit will depend upon whether or not the data set at the station location is LEC (local exchange company) equipment. If the data set at the station is LEC owned, loopback tests can be performed to this data set. When the data set at the station is customer provided, tests should be performed to the data set in the hub office only, and if no trouble is encountered, the responsible private line analog data test center should be instructed to continue trouble isolation on the remaining off-net portion of the circuit.

3. MULTIPOINT PRIVATE LINE CIRCUIT MAINTENANCE AND TEST PROCEDURES

3.01 This part provides procedures for isolating troubles and performing tests on a multipoint circuit, including off-net extensions on a multipoint circuit, from a DDS hub office.

3.02 Chart 1 should be used during trouble isolation in an attempt to establish a 2-point test connection to an outlying station, using the point of failure as an aid in trouble isolation. Once a 2-point test connection has been established, the trouble on the channel can be isolated using the 2-point procedures in Part 4.

3.03 The performance objective for multipoint service, which is 99.5 percent EFS (error-free seconds), applies to communication between the control station and each outlying station, which is not an off-net extension, while all inactive outlying stations remain in the idle mode.

3.04 Maintenance responsibility for a multipoint circuit is allocated to the control SSC/CTC, the hub that serves the control station, the hubs serving the outlying stations, and any SSC/CTC which has a station within its area. The responsibility for each office is assigned as follows:

(a) ***Control or Noncontrol SSC/CTC***—See ▶Practice AT&T 660-230-100◀ for responsibilities.

(b) ***Hub Serving Stations***

- Perform tests during installation and trouble isolation on midlinks and end links served by the hub
- Isolate troubles on specified branches and test MJUs (multipoint junction units) located in the hub at the request of an SSC/CTC
- Report to the control SSC/CTC the results and conclusion of tests performed during trouble isolation, including outages in excess of 30 minutes.

3.05 The maintenance responsibility of the additional maintenance centers located throughout the various DDS facilities is given in Practice AT&T 314-900-300.

MAINTENANCE ACTIVITIES

3.06 If the control SSC/CTC is not included in the isolated circuit segment containing the stations experiencing trouble, the trouble should be referred to the first hub downstream. The hub receiving the trouble report should use Fig. 7 to isolate troubles in the segment, if equipped with ABATS, or should use Practice AT&T 314-901-300, if testing must be done from the 950A testboard.

3.07 The MSU (multipoint signaling unit), located in the control panel, is used when a 2-point test connection between the MSU and a particular downstream station is desired. In order to establish a test connection to a station, the MSU is used to select a particular branch at each MJU between the MSU and the station, one at a time, until the connection is made. Verification of a test connection to a selected branch is accomplished by observing that the MSU displays the HUB ID (hub identification) code and branch number received from the selected MJU.

3.08 Once connection to the station has been established using the MSU, tests can be performed to the station using the 2-point procedures in Part 4. If any of these tests should fail, trouble isolation should continue, using Practice AT&T 314-901-300 that pertains to a hub serving the affected stations.

3.09 The tests requested in the trouble isolation flowcharts are contained in ▶Chart 1. Chart 1 must be performed to establish a 2-point connection between the hub and the station to be tested.◀ Refer to the procedures in Chart 1 concerning the restoral of the circuit and the MSU to their pretest state.

3.10 The MJU remote test given in Practice AT&T 314-901-500 checks the operation of an MJU from the channel and branch jacks. This test cannot be performed from the BATS control panel. If this test is required, it must be performed from the 950A testboard. The tests presented here will primarily isolate the trouble to a particular office or MJU.

4. 2-POINT PRIVATE LINE CIRCUIT TEST PROCEDURES

4.01 This part describes the procedures to be followed by a hub when performing preservice and maintenance tests on the DDS private line circuits. This part can be used as a substitute for Practice AT&T 314-901-500, which is written in terms of testing from the 950A testboard. In the case of the

DDS initial system, installation and testing will normally be performed by the installation force. However, since circuit installations are to be handled by local telephone company personnel, the preservice tests are included in this part for testing circuits added to the DDS after the initial system is installed.

4.02 Any or all of the tests listed in paragraph 4.03 may be used for troubleshooting a DDS channel. However, the various tests are intended for use as described in paragraphs 4.04 and 4.05. Refer to Practice AT&T 314-901-531 for a description of the type of tests that can be performed from an ABATS test terminal. This part is primarily concerned with manual operations from the BATS control panel.

4.03 The tests covered are as follows:

(a) ***Monitor Test (Chart 2):*** In this procedure, the BATS is bridged to the selected circuits but the data stream passes through the access module without interruption. All testing should begin with a monitor test.

(b) ***Loopback Tests for DSU/CHAN/OCU or OCU DP (Chart 3):*** The DSU loopback test checks the ability of a DSU to loop back a channel at the customer interface (Fig. 8B). The CHAN loopback test checks the ability of a DSU to loop back a channel at the DSU local channel interface (Fig. 8A) or a CSU to loop back a channel at the customer interface (Fig. 8B). The OCU loopback test checks the ability of an OCU or OCU dataport channel unit to loop back a channel at the OCU or OCU DP local channel interface. Figures 8C and 8D show the loopback test locations for an OCU DP and a DS-0 DP channel unit. A 15-second block error run is performed for maintenance tests, and a 15-minute block error run is performed for installation and extensive maintenance tests. Assistance at the station or OCU or OCU DP location ***is not*** required except for old DS-0 DP loopback tests. The new DS-0 DP has a loopback feature capability.

(c) ***DSU Functional Test:*** This test (Chart 4) checks the function of a DSU and the customer interface leads. This test responds to the standard DSU loopback codes.

Note: This test must be performed manually from the BATS control panel.

(d) ***DSU Straightaway Test:*** This test (Chart 5) checks the error performance of a channel terminated in a DSU on BATS access-to-station basis. A 15-minute bit error run is simultaneously made in both directions of transmission.

(e) ***CSU Functional Test:*** This test (Chart 6) checks the error performance of a channel terminated in the CSU and the customer interface leads.

Note: This test must be performed manually from the BATS control panel.

(f) ***CSU Straightaway Test:*** This test (Chart 7) checks the error performance of a channel terminated in the CSU on BATS access-to-station basis. A 15-minute bit error run is simultaneously made in both directions of transmission.

(g) ***Test Channel Between DSAU and SRDM:*** This test (Chart 8) checks the error performance of a channel between the DSAU access point and an SRDM. A 5-minute block error run is simultaneously made in both directions of transmission. In hub offices, the test is performed on a loopback basis by use of a loopback plug at the DSX-0B cross-connect bay. In local offices, the assistance of and coordination with a TELCO employee (using portable KS-20908 and KS-20909 data test sets) at the SRDM bay ***are*** required.

Note: This test requires that all channels of an SRDM be out of service.

(h) ***Hub-to-Hub Straightaway Test:*** This test (Chart 9) checks the error performance of a channel between hubs via DSAUs. A 5-minute block error run is simultaneously made in both directions of transmission.

(i) ***DDGT Loopback Error Performance Test:*** This test (Chart 10) checks the error performance of a channel between a DAP and a DDGT at a hub or serving office. A 5-minute block error run is simultaneously made in both directions of transmission. The manual loopback switch on the HL85 circuit pack of the DDGT will be in the REM position if testing to a DDGT in a serving office, or in the LOC position if testing to a DDGT

in the hub office. Assistance of a TELCO employee at the DDGT location ***is*** required.

(j) ***Subrate Off-Net Extension Loopback Error Performance Test:*** This test (Chart 11) checks the error performance of a subrate off-net extension channel between the DAP (DS-0A or DS-1) and the DS (data set) or DAS (data auxiliary set) at the hub office or at the station. A 5-minute block error run is simultaneously made in both directions of transmission with the DS (201C, 208A, or 209A) or DAS 831A in the loopback test mode. When the data set at the station is customer provided, DDS testing is performed only to the data set located in the hub office. Figure 9 shows the various loopback points in a subrate off-net extension arrangement. Assistance of a TELCO employee at the DS or DAS location ***is*** required.

(k) ***56-kb/s Repeater Loopback Test:*** This test (Chart 12) checks the ability of a 56-kb/s repeater to loop back a line and checks the error performance of the repeater and the line between the access point and the repeater. A 5-minute block error run is made from the access point.

(l) ***Hub-to-Hub Loopback Error Performance Test:*** This test (Chart 13) checks the error performance of an entire DDS circuit which contains two or more hubs. The hubs at the end of the circuit under test make a 50-minute block error run simultaneously by transmitting the CHAN or DSU loopback test code signal to the far-end station and checking for errors in the signal from the distant hub as it is received from the near-end station. The far-end hub may or may not be equipped with a BATS.

Note: This test must be performed manually from the BATS control panel.

4.04 ***Maintenance Tests:*** The maintenance tests are to be performed in the sequence and as directed in the trouble isolation procedures in this practice or in Practice AT&T 314-901-300. The maintenance tests and their purpose are as follows:

(a) Isolation of trouble in the local channel (OCU to DSU/CSU)

(b) Isolation of troubles in the DDS backbone network on a hub-to-hub basis.

4.05 ***Preservice Tests:*** All of the tests in this practice are for testing equipment added to a DDS network following the initial installation. The sequence in which the tests are to be performed is as follows:

- ***DSU***
  - (1) Chart 3 (DSU loopback)
  - (2) Chart 4 (DSU functional)
  - (3) Chart 5 (DSU straightaway)
- ***CSU***
  - (1) Chart 3 (CHAN loopback)
  - (2) Chart 6 (CSU functional)
  - (3) Chart 7 (CSU straightaway)
- ***SRDM***
  - (1) Chart 8 (SRDM test)
- ***OCU/OCU DP***
  - (1) Chart 3 (OCU/OCU DP loopback)
- ***DDS Private Line Circuit—Hub-to-Hub***
  - (1) Chart 9 (hub-to-hub straightaway)
  - (2) Chart 13 (hub-to-hub loopback error performance)
- ***Off-Net Extension***
  - (1) Chart 10 (DDGT loopback error performance)
  - (2) Chart 11 (subrate off-net extension loopback error performance)
- ***56-kb/s Regenerative Repeater***
  - (1) Chart 12 (56-kb/s repeater loopback).

4.06 Some tests require the assistance of and the coordination with a technician at the station location or at the DSX-0B cross-connect bay (hub offices) or SRDM bay (local offices). Chart 9 requires

the assistance of a TELCO employee at the DDGT shelf location. Chart 10 requires the assistance of the customer or TELCO employee at the station location or assistance of a TELCO employee at the hub office.

4.07 The tests are in step-procedure format and are listed under PROCEDURES (Charts 1 through 19).

4.08 ▶If the BATS equipment fails to function properly during a test sequence, perform the self-test procedures in Practice AT&T 107-605-200. The self-test procedure verifies proper equipment operation in an off-line condition without special test equipment. The self-test capability checks and exercises all major functions and circuits of the BATS.◀

5. PRIVATE LINE LOCAL LOOP—TEST PROCEDURES AND REQUIREMENTS

5.01 This part describes the test procedures using the LATS to locate a trouble condition on a DDS PL (private line) local loop. It also provides the test procedures to be performed on the local loop cable pairs during installation and maintenance periods to ensure that the cable pairs are suitable for DDS service. ▶These procedures are explained in more detail in Practice AT&T 314-410-510.◀

5.02 The various tests are outlined under the headings Serving Central Office (1-Employee) Tests and Serving Central Office (2-Employee) Tests. The step-by-step procedures and apparatus required for performing these tests are given in Charts 14 through 19.

SERVING CENTRAL OFFICE (1-EMPLOYEE) TESTS

5.03 The SCO (serving central office) tests are made from the hub and consist of dc measurements performed by one employee at the LATS control panel, except for the OCU simplex voltage check which can be made at the LTD (local test desk) or MDF (main distributing frame). The 1-employee tests to be performed are listed and briefly summarized in Table A. The DSU or CSU will normally be transmitting a data signal on the T1-R1 pair during these tests. The alternating current of the data signal will not interfere with the dc measurements.

5.04 The following information is required before starting the tests:

- The cable pair loop resistance, measured during initial installation tests and recorded on the LLRC (local loop record card) Form E-6528. If the measurement results are not available, measure the loop resistance and record on the card.

- The option selected for the FLBO (fixed line build-out) network in the DSU or CSU and the OCU and the bit rate of the data service.

5.05 ***Foreign Voltage:*** This test (Chart 15) is made to verify that no foreign voltage is present on the line. A foreign voltage indicates that a cable fault exists. The test is made between the following test points: T to R; T1 to R1; and T, R, T1, and R1 to ground. There should be no significant voltage indication between any of these points except for possibly a low ac level between T1-R1.

5.06 ***Insulation Resistance:*** The insulation resistance test (Chart 15) measures the resistance from line terminals T, R, T1, and R1 to ground to ensure adequate isolation between conductors and ground.

5.07 ***Loop Plus Terminal Resistance:*** Loop resistance measurement (Chart 15) is the sum of the cable pair and the line circuit resistance of the DSU or CSU and the resistance of any bypassed 56-kb/s repeaters in the loop. Both the transmit and receive cable pairs are measured. The DSU or CSU line circuit resistance is a function of the bit rate if the FLBO network is installed. A CO (central office) repeater adds approximately 36 ohms to the line resistance when bypassed. An OP (outside plant) repeater adds 5758 ohms to the line resistance when bypassed.

5.08 ***Open-Loop Capacitance:*** This test (Chart 15) measures the capacitance of a T-R or T1-R1 pair that was known to be open. The capacitance indication can then be converted graphically into the cable pair length to the open fault. The graph used for this conversion is based upon characteristic cable pair capacitance of 0.083 μF/mile which is applicable to the majority of telephone cable.

5.09 ***OCU Simplex Voltage:*** The OCU simplex voltage measurement (Chart 16) requires the use of the multimeter to measure the office battery

voltage which is used as a simplex line voltage. This test is made at the OCU location and at the MDF or LTD. The source voltage is measured between the BAT and GRD points on the 789A tool. The simplex voltage is measured at the MDF. If no voltage is measured, check the simplex current fuse associated with the OCU shelf in the BCPA unit or LTS.

5.10 If the simplex voltage measurement is made at the LTD or MDF, the simplex voltage is measured between T and T1 and also between R and R1, looking toward the OCU. The first measurement is made by accessing the line and transmitting a 2047 bit word toward the OCU; the second measurement is made while transmitting the channel loopback code. The polarity of the simplex voltage must reverse in the second measurement. If the voltage fails to reverse, replace the OCU. If no voltage is measured, check the following:

(a) The OCU (may have been removed from the bay)

(b) Cable pair continuity between the OCU and MDF or LTD

(c) Simplex current fuse in the BCPA or LTS.

If no problems were found with (a), (b), and (c) above, replace OCU (install the FLBO network option listed on the LLRC).

SERVING CENTRAL OFFICE TO STATION (2-EMPLOYEE) TESTS

5.11 Serving central office to station tests consist of dc, ac, and resistance measurements performed by two employees between the station and the LATS access test point in the central office. These measurements will require that the pairs be opened, shorted, or terminated. The DSU or CSU is removed from the local loop before these tests are performed. The tests are performed between the LATS test panel and the station terminal block. The tests to be performed are listed and briefly summarized in Table B.

5.12 As an initial installation test, Charts 17, 18, and 19 should be performed before the installation of DDS customer apparatus on each pair of the 4-wire loops. The preliminary testing of the cable pairs should be completed far enough in advance to allow time to locate and correct problems that may exist. Perform these tests in the order given. Perform maintenance tests as required.

5.13 The following information is required before starting the tests:

- The cable pair loop resistance, measured during initial installation tests and recorded on the LLRC. If the measurement results are not available, measure the loop resistance (Chart 17) and record on the LLRC.

- The EML (expected measured loss) for the cable pair.

5.14 ***Foreign Voltage:*** Remove DSU or CSU at the station end. For loops containing 56-kb/s repeaters, the repeaters must be bypassed. ▶This test (Chart 17) is made to verify that no foreign voltage is present on the line.◀

5.15 ***Insulation Resistance:*** Measure the insulation resistance between the following test points:

T and R; R and R1

T and T1; R and T1

T1 and R1; T and R1

and

T and GRD; R and GRD

T1 and GRD; R1 and GRD.

This test (Chart 17) requires that the DSU or CSU be removed at the station end and the pairs be opened.

5.16 ***Loop Resistance:*** Loop resistance measurements (Chart 17) check the dc resistance of the transmit and receive cable pairs (T-R and T1-R1) while they are shorted together at the station end. If this is an initial installation test, record the value on the LLRC. For loops containing 56-kb/s repeaters, bypass the repeaters.

5.17 If the dc measurements do not meet requirements, the cable fault-locating procedures given in Practice AT&T 634-310-501 can be used to locate the trouble. This procedure is normally done by the cable repair crew.

5.18 ***Insertion Loss:*** This measurement (Chart 18) is made at two test frequencies for 2.4- and 4.8-kb/s service, one test frequency for 9.6-kb/s service, and three test frequencies for 56-kb/s service. The subrate insertion loss measurements are made at a frequency equal to one-half of the bit rate to check that the receive signal level will be within the normal operating range of the line receiver. In addition, it is made at 4.8 kHz to check that all load coils have been removed and no long-bridged taps are on the pairs. For 56-kb/s service, the insertion loss measurement is made at 28, 48, and 82 kHz.

5.19 During initial installation, the AML (actual measured loss) is compared with the EML on the CLRC. The AML is recorded on the CLRC as a benchmark value. Insertion loss measured during a maintenance test must be within ±3 dB of the value measured at installation; however, insertion loss at one-half the bit rate must always be less than or equal to 34 dB. Insertion loss at one-half the 56-kb/s rate must be less than or equal to 31 dB on a loop section with a repeater or 29 dB on a loop section with a simplex power unit.

5.20 If the insertion loss measurement on the cable pairs fails to meet the test requirements, as based on the EML, the problem may be due to inaccurate cable records, load coils which were not removed, or excessive bridged taps.

5.21 ***Background Circuit Noise:*** This test (Chart 19) is made using the 6F voiceband NMS (noise measuring set) equipped with a 50-kHz weighting network. This set is used to measure both background circuit noise and impulse noise counts. For best results, the measurement should be made during a busy-hour period in the central office. The measurement is made on the T-R pair at the station and the T1-R1 pair at the hub.

> ***Note:*** The background circuit noise and impulse noise tests must be made separately for each segment of a loop with 56-kb/s repeaters; for example, each loop section from OCU to first repeater, first repeater to second repeater, and second repeater to DSU/CSU.

5.22 Instructions for operating the 6F NMS are given in Practice AT&T 103-626-100. Noise measurements can be made at any time; however, it is preferable that they be made during a peak traffic load or busy-hour period.

5.23 ***Impulse Noise:*** The impulse noise measurement (Chart 18) is normally made after the background circuit noise test is completed and uses the noise counter of the 6F NMS. The NMS is set to operate for a period of 15 minutes at a threshold value that is a function of the bit rate.

TEST ACCESS AT 56-KB/S REPEATERS

5.24 Test access at the CO repeater to the local loop providing 56-kb/s service is provided by four jacks mounted on the front of the repeater housing. Additional information on test access and tests on the CO repeater is given in Practice AT&T 314-920-500.

5.25 Test access at the OP repeater to the local loop providing 56-kb/s service is provided by terminals on the 31A connector block.

> ***Note:*** Circuit pack LA5 must be removed from the 468F apparatus case before performing the dc or ac tests on the local loop pairs. Additional information on test access and repeater tests is given in Practice AT&T 640-251-107.

5.26 The SCO (1-employee) dc tests on loops providing 56-kb/s service require that the repeaters in the loop section be bypassed. This must be done in order to provide continuity to the station and back to the CO. The CO or OP repeater is bypassed either by manually operating the bypass switch on the front of the CO repeater housing or powering unit or by removing simplex current to the loop at the OCU bay. Simplex current is removed at the OCU bay by removing the appropriate circuit pack in the OCU bay and inserting the 789A tool in its place. This removes the simplex current to the CO repeater or powering unit which automatically bypasses all repeaters (CO or OP) in the loop. The ac tests are made on a per-repeater-section basis and do not require operation of the repeater bypass.

TROUBLE REPORTING AND ISOLATION

5.27 No routine maintenance is required for DDS local loops. Procedures for clearing trouble are normally initiated by receipt of a trouble report.

5.28 Transmission faults on the local loop are not alarmed and will normally be detected and reported to the SSC/CTC by the customer. The cus-

tomer may be notified by lamp or interface lead indications on the DSU in the event of circuit trouble.

5.29 No routine maintenance is required for the digital 56-kb/s repeater. All circuit packs are installed on a plug-in basis. In the event of a repeater failure, the defective circuit pack can be easily replaced.

5.30 Two green LEDs (light emitting diodes) on the CO mounted repeater monitor for the presence of data transmitted through the repeater in each direction. The TRMT DA LED, when lighted, indicates the presence of data toward the station DSU or CSU. The RCV DA LED, when lighted, indicates the presence of data toward the DDS network. The absence of data, due to facility trouble or component failure, will cause one or both of the LEDs to be off. A fuse failure will cause an office alarm.

5.31 Four jacks located on the CO mounted repeater shelf provide access for dc and ac testing of the local loop from the repeater location. The repeater can also be bypassed by operating a switch located at the front of the repeater or by removing simplex current in the newer versions of the repeater. In the bypassed condition, testing of the entire loop (except the repeater) can be performed from the central office containing the OCU.

> ***Note:*** The OP repeater can be remotely bypassed to allow dc tests to be performed by removing the dc simplex current from the loop. Normal OP repeater operation is restored by applying dc simplex current to the loop.

5.32 When a trouble report is received from the SSC/CTC, the technician at the SCO must perform the 1-employee tests on the local loop within 15 minutes in order to meet the overall maintenance objectives for DDS service. The SSC/CTC should then be notified of the test results. If dispatch to the customer station is required, the hub will coordinate the dispatch.

6. TEST RECORDS

6.01 Four local loop record cards, one for each bit/rate speed, are available and should be used to record measurement results by the technician at the hub or SCO. These cards are designated as E-6528-1, E-6528-2, E-6528-3, E-6528-4 (and E-6528-4R), and are shown in Practice AT&T 314-410-510.

6.02 Each card lists the various measurements to be made and provides blocks of spaces to be used for recording measurement results. Any additional information which may be helpful in maintaining the local loop should also be recorded on the card.

7. REFERENCES

7.01 The following practices contain additional information on test equipment and maintenance procedures:

DOCUMENT	DESCRIPTION
100-520-101	KS-14510 Meter (Portable Volt-Ohm-Milliammeter) — Description and Operation
103-626-100	6F and 6FR Voiceband Noise Measuring Sets—(J94006F and J94006FR)—Description, Operation, and Maintenance
107-600-100	Digital Data System—KS-20909 Data Test Set (Transmitter)
107-601-100	Digital Data System—KS-20908 Data Test Set (Receiver)
107-605-100	KS-21899 Data Test System, Description
107-605-200	KS-21899 Data Test System, Installation
107-605-300	KS-21899 Data Test System, Operation
107-605-500	KS-21899 Data Test System, Maintenance
314-901-520	Automated Bit Access Test System (ABATS)—Description and Operation—Digital Data System
314-901-531	Automated Bit Access Test System—Remote Test Procedures—Digital Data System
314-901-532	Automated Bit Access Test System—Remote Update Proce-

DOCUMENT	DESCRIPTION
	dures for Data Base—Digital Data System
314-903-300	Digital Data System—DS1 to DS1—Maintenance
314-910-100	Digital Data System—Office Channel Unit (OCU)—Description
314-910-300	Digital Data System—Office Channel Unit—Maintenance
314-920-100	Digital Data System—Digital 56-kb/s Repeater—Description
314-920-500	Digital Data System—Digital 56-kb/s Repeater—Test Procedures
595-100-100	Digital Data System—550A-Type Channel Service Unit—Description
595-100-300	Digital Data System—550A-Type Channel Service Unit—Maintenance
595-100-500	Digital Data System—550A-Type Channel Service Unit—Test Procedures
595-200-100	Digital Data System—500A-Type Data Service Unit—Description and Operation
595-200-101	500B-Type Data Service Unit, Description and Operation, Digital Data System
595-200-300	Digital Data System—500A-Type Data Service Unit—Maintenance
595-200-301	500B-Type Data Service Unit, Maintenance, Digital Data System
595-200-500	Digital Data System—500A-Type Data Service Unit—Test Procedures
595-200-501	500B-Type Data Service Unit, Test Procedures, Digital Data System
660-230-100	Office Responsibilities, Administrative Methods, Digital Data System

8. PROCEDURES

8.01 ▶An important general note concerning the BATS equipment during testing must be remembered and is as follows:

> ***Note:*** When the TEST DIRECTION/TRAN toggle switch is placed to FAR, the BATS will transmit a selected ***test pattern*** to the far direction. When the TEST DIRECTION/RCV toggle switch is placed to FAR, data will be examined from the far direction and ***test code*** will be transmitted to the opposite (near) direction. Conversely, placing the TEST DIRECTION/TRAN and /RCV toggle switches to NEAR causes the selected test pattern to be transmitted to the near direction, with data examined from the near direction. Test code will be transmitted to the far direction. When the TEST DIRECTION/TRAN and /RCV toggle switches are placed to FAR and NEAR, respectively, the selected test pattern is transmitted to the far direction and received from the near direction. When the TEST DIRECTION/TRAN and /RCV toggle switches are placed to NEAR and FAR, respectively, the selected test pattern is transmitted to the near direction and received from the far direction. A straight-through path is established for customer data in the near-to-far or far-to-near directions, respectively. Test code is not transmitted.◀

CHART 1

ESTABLISHING A 2-POINT TEST CONNECTION

STEP	PROCEDURE
1	Place the BATS in the monitor state by performing Chart 2, Steps 1 through 15.
2	While the BATS is still in the monitor state, depress the desired pushbutton in the CUSTOMER RATE group. ***Requirement:*** Selected lamp is lighted. The selected rate must not be higher than that displayed in the CHANNEL RATE group in the display area and should be the rate used by the customer according to his record card. ***Note:*** See general note under PROCEDURES, Part 8.
3	Place the TEST DIRECTION/TRAN and /RCV toggle switches to the desired position. ***Requirement:*** When a switch is placed to FAR, the FAR lamp lights.
4	Select 511 (subrate) or 2047 (56-kb/s) code length. ***Requirement:*** 511 lamp lights when the switch is in the 511 position.
	MJU Branching
5	Depress the MSU pushbutton in the TEST MODE group. ***Requirement:*** MSU lamp is lighted.
6	In the TEST CONTROL group, depress the TEST pushbutton. ***Requirement:*** TEST lamp is lighted. The DTS will transmit the UMC code until a branching code is generated. ***Note:*** If a mistake is made while performing Steps 7 through 9, depress the CLR key at the multipoint signaling unit and start again.
7	To select a signaling path through an MJU to one branch of the MJU, depress the desired BRANCH pushbutton. ***Requirement:*** The selected branch (1, 2, 3, or 4) is connected and transmission to other branches is blocked. The new HUBID and BR displays indicate the selected MJU and branch number.
8	To extend the signaling path to another MJU branch, depress the next desired BRANCH pushbutton. ***Requirement:*** The first selected MJU and branch number now appear in the old HUBID and BR displays, and the newly selected MJU and branch number appear in the new HUBID and BR displays.

CHART 1 (Contd)

STEP	PROCEDURE
9	Repeat Step 8 until the desired MJU branch is reached by branching to the desired point in the multipoint circuit.
10	Enter the MSU mode by depressing the MSU pushbutton in the TEST MODE group, and proceed to step 11 through 14. ***Requirement:*** MSU lamp is lighted. **Blocking and Unblocking Branches (Not Available on Existing MJUs)**
11	***To block a selected MJU branch*** displayed in the new HUBID and BR displays, depress the BLK pushbutton in the MSU group. ***Requirement:*** When the branch has been blocked (less than 1 second later), the BLK lamp will light and the entire MULTIPOINT SIGNALING UNIT display will go off within 2 seconds.
12	***To release all blocked branches*** and return all MJUs to normal, depress simultaneously the RLSE and OVERRIDE pushbuttons. ***Requirement:*** After 1 second, the display will be cleared.
13	***To clear a selected blocked branch,*** select the blocked branch as indicated in Steps 7 through 10; then depress the CLR pushbutton while the selected branch is displayed in the new HUBID and BR displays. ***Requirement:*** After 1 second, the displays will be cleared.
14	***To drop accessed circuit completely,*** depress the DISC pushbutton in the TEST CONTROL group (for DS-0 accessed circuits, also depress RLSE and EXT MEAS pushbuttons on the LATS control panel). ***Rquirement:*** All displays will clear, and all lamps, except the DISC and POWER lamps, will go off.

CHART 2

MONITOR TEST

APPARATUS:

Oscilloscope With Tip Probes (optional)

DOCUMENT: Network Routing Directory containing information such as customer rate, SRDM, and T1DM channel routing, etc.

CHART 2 (Contd)

STEP	PROCEDURE
	Equipment Turn-on
1	Verify that BATS control panel is powered. ***Requirement:*** CONTROL UNIT ON lamp is lighted.
2	Depress the LAMP TEST pushbutton. ***Requirement:*** All lamps light and all displays show all 8s.
3	Release LAMP TEST pushbutton.
4	***Verify that the system is not in self-test.*** ***Requirement:*** SELF TEST lamp is off.
5	If accessing at DS-0A level, proceed to Step 6; and, if accessing at DS-1 level, proceed to Step 13.
	Circuit Addressing—DS-0A Circuits
	At the LATS control panel:
6	Verify that the MIC lamp is off.
7	At the BAY/CKT area, enter the 2-digit number selecting the desired Matrix II unit (BAY), followed by another 2-digit entry selecting the OCU (CKT) within the Matrix II unit (BAY). ***Requirement:*** Verify that the 4-digit keyboard entry displayed on the LED readout is correct.
8	Depress the MON pushbutton (self-locking). ***Requirement:*** MON lamp is lighted.
9	Depress the EXT MEAS pushbutton (self-locking). ***Requirement:*** EXT MEAS lamp is lighted.
	At the BATS control panel:
10	Depress the touch-pad DS-0 button. ***Requirement:*** DS-0A SELECTED lamp is lighted.
11	Depress the TEST CONTROL/MON pushbutton. ***Requirement:*** MON lamp is lighted.

CHART 2 (Contd)

STEP	PROCEDURE
12	Proceed to circuit monitoring, Step 15.
	Circuit Addressing—DS-1 Circuits
13	Obtain the GROUP, SHELF, DSAU number, DM CHAN number, and SRDM CHAN number of the desired customer from CLRC.
	Caution: Be sure to accurately insert the customer addressing numbers, as the customer circuit will be interrupted and test data will be inserted onto his line when the system enters the test state.
14	Using the touch-pad buttons on the BATS control panel, insert the GROUP number (0 or 1) followed by the SHELF number (0-5), the DSAU number (00-15), the DM CHAN number (01-24), and the SRDM CHAN number (01-20), sequentially.
	Note 1: The entire CIRCUIT SELECT display will flash at a 1-Hz rate if an invalid number is entered. If this occurs, depress the touch-pad CE button, determine the error, and enter the correct set of numbers.
	Note 2: If an SR CHAN is selected that is incompatible with the channel rate (i.e., channels 6 through 20 for 9.6 kb/s and channels 11 through 20 for 4.8 kb/s), the BATS will not enter the monitor or test state.
	Circuit Monitoring
15	In the TEST CONTROL group, depress the MON pushbutton if not already depressed.
	Requirement: MON lamp is already lighted.
	Note 1: If data is being transmitted and/or received on the selected customer line, lamps in the display area will display the activity. No alarm lamps should be lighted. Check for proper DS-1 STATUS and SYNC (if applicable) and CHANNEL RATE lamp displays.
	Note 2: In the DECODED BYTE group of the display area, a lighted DSU L/B, CHAN L/B, or OCU L/B lamp or a lighted TEST CODE lamp signifies that another BATS is being used to test a customer line (NEAR or FAR). To monitor the test pattern being used, depress the corresponding pushbutton in the TEST MODE group. Depress the appropriate CUSTOMER RATE pushbutton. Place the TEST DIRECTION/RCV toggle switch to the ***opposite*** direction of the lighted loopback lamp in the DECODED BYTE group. Then place the 511/2047 toggle switch to the position that matches the pseudorandom word pattern being transmitted by the other operator. When the 511/2047 toggle switch is placed to the proper position, the BATS synchronizes on the received test pattern and the BIT ERRORS and BLOCK ERRORS displays indicate the accumulated errors. If the OVERFLOW lamps are lighted, momentarily place the HOLD/COUNT/RESET toggle switch to RESET.
16	Interpret the RECEIVED DATA BYTE and DECODED BYTE indicator display for proper activity.

CHART 2 (Contd)

STEP	PROCEDURE
17	In the display area, if desired, connect the oscilloscope to the SINGLE ERRORS DS-1 FAR, SR FAR, DS-1 NEAR, and/or SR NEAR jacks, and the GRD jack. The oscilloscope can be connected to CUST BIT and/or CUST BLK jacks and the GRD jack to monitor bit and block errors displayed on the BIT ERRORS and BLOCK ERRORS displays in the CUSTOMER CIRCUIT group.
18	To drop the accessed circuit completely, depress the DISC pushbutton in the TEST CONTROL group at the BATS control panel (for DS-0A accessed circuits, also depress RLSE and EXT MEAS pushbuttons on the LATS control panel). ***Requirement:*** All displays will clear, and all lamps, except the DISC and POWER lamps, will go off.

CHART 3

LOOPBACK (DSU/CHAN/OCU) TEST

STEP	PROCEDURE
1	If not already in the monitor mode, perform the applicable Chart 1 or 2.
2	Verify that DECODED BYTE IDLE lamp is lighted.
3	While the BATS is still in the monitor state, depress the desired pushbutton in the CUSTOMER RATE group. ***Note:*** See general note under PROCEDURES in Part 8. ***Requirement:*** Selected lamp is lighted. The selected rate must not be higher than that displayed in the CHANNEL RATE group of the BATS display area and should be the rate used by the customer according to his CLRC or COLR. ***Note:*** The OCU L/B test procedure is also used to test subrate dataport OCU DPs. The subrate speeds are 2.4, 4.8, and 9.6 kb/s. The 56-kb/s circuits initially use a unique dataport arrangement consisting of a DS-0 DP and an external 56-kb/s OCU. One loopback test code cannot be used for both. Therefore, the 56-kb/s OCU is looped back in the normal manner using the OCU loopback code. The DS-0 DP requires that a loopback connector ED-3C793 be manually plugged into the front faceplate of the DS-0 DP at the D3 or D4 channel bank. The two loopbacks allow trouble to be sectionalized between a T-carrier system and an external OCU.
4	Place the TEST DIRECTION/TRAN and /RCV toggle switches to the desired position. ***Requirement:*** If a switch is placed to FAR, the FAR lamp lights.
5	Select 511 (subrate) or 2047 (56-kb/s) code length. ***Requirement:*** Lamp lights when the switch is in the 511 position.

CHART 3 (Contd)

STEP	PROCEDURE
6	Select TEST MODE/DSU L/B, CHAN L/B, or OCU L/B. ***Requirement:*** Selected lamp is lighted.
7	In the TEST CONTROL group, depress the TEST pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps light and the OUT OF SYNC lamp should be off. RECEIVED DATA BYTE lamp will flicker 2 through 8 for subrate, 1 through 8 for 56 kb/s. DECODED BYTE DATA and selected loopback lamps light. ***Note:*** If a channel loopback is being performed on a line that contains 56-kb/s repeaters, momentarily depress the TEST MODE/ALL 1s button once for each repeater in the line to bypass that repeater.
8	Momentarily operate HOLD/COUNT/RESET switch to RESET. ***Requirement:*** OVERFLOW lamp goes off. ERROR counter resets to 000.
9a	When performing installation test, operate HOLD/COUNT/RESET switch to HOLD—wait 15 minutes. ***Requirement:*** ERROR counter displays no more than two block errors.
9b	When performing maintenance test, operate HOLD/COUNT/RESET switch to HOLD—wait 15 seconds. ***Requirement:*** ERROR counter displays zero block errors.
10	If another loopback is required, depress that loopback button and repeat Steps 8 and 9a or 9b. ***Requirement:*** The system will remain in the test mode as indicated by TEST IN PROG lamp.
11	When testing is complete, depress TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps go off.
12	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear, and lamps, except the POWER and DISC lamps, will go off.

CHART 4

DSU FUNCTIONAL TEST

STEP	PROCEDURE
1	If not already in monitor mode, perform the applicable Chart 1 or 2.
2	Depress appropriate CUSTOMER RATE pushbutton (may be different from the SRDM channel rate). ***Requirement:*** Selected lamp is lighted.
3	Select NEAR or FAR TEST DIRECTION. ***Requirement:*** FAR lamp lights if selected. ***Note:*** See general note under PROCEDURES in Part 8.
4	Establish communication with technician at the station location.
5	Determine which of the following will be used in the DSU functional test, and proceed to step indicated. • Subrate DSU using 914C DTS—Step 6 • Subrate DSU using 921A DTS—Step 55 • 56 kb/s DSU using 912A WDTS—Step 31 • 56 kb/s DSU using 921A DTS—Step 55
	Subrate DSU Using 914C DTS
6	Request station to verify the initial test setup per Fig. 10.
7	On the BATS control panel, set the MANL BYTE switches for idle code (01111110) and depress the TEST MODE/MANL pushbutton. ***Requirement:*** The MANL lamp lighted.
8	Request station to operate DSU slide switch to center position. ***Requirement:*** DSU PWR lamp is lighted; NS, LL, and RT lamps are off.
9	◗Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps light.◖
10	Request station to operate S1 to ON at 914C BATS control panel.

CHART 4 (Contd)

STEP	PROCEDURE
	Requirement: Lamps DS-1 and DS-2 light; lamp DS-3 goes off. If DSU is equipped with option YQ—lamp DS-1 will not light.
11	Set the MANL BYTE switches for mux out of sync code (00011010).
12	Request station to observe lamp DS-2 on 914C DTS.
	Requirement: If DSU is equipped with option XK—DS-2 goes off.
13	Set MANL BYTE toggle switches for OCU loopback code (00101010).
	Requirement: RECEIVED DATA BYTE lamp 8 and one other lamp lighted; all others are off.
14	Request station to observe NS lamp on DSU after one to two seconds.
	Requirement: NS lamp is lighted.
15	Set MANL BYTE toggle switches to (00000001).
16	Request station to remove the SD programming pin and insert it in row S2, column 2.
17	Request station to operate S2 to ON.
	Requirement: At DSU—NS lamp is off. At 914C DTS—DS-3 lamp is lighted. If DSU is equipped with option XK—lamp DS-2 is lighted. If DSU is equipped with option YQ—lamp DS-1 is lighted.
18	Set the 511/2047 switch to 511 and depress the TEST MODE/STWY pushbutton.
	Requirement: MANL lamp is off; STWY lamp is lighted.
19	Request station to momentarily operate RESET button on 914C DTS.
	Requirement: After 10 seconds—914C DTS counter indicates 00.
20	Request station to operate DSU slide switch to RT.
	Requirement: At 914C DTS, lamps DS-1, DS-2 and DS-3 are off. At DSU, RT lamp is lighted.
21	Momentarily operate HOLD/COUNT/RESET switch to RESET.
	Requirement: After 10 seconds, BIT ERROR counter indicates zero errors.
22	Request station to operate DSU slide switch to the center position.
	Requirement: RT lamp is off.
23	Set the MANL BYTE toggle switches for DSU loopback code (00101100).

CHART 4 (Contd)

STEP	PROCEDURE
24	Depress TEST MODE/MANL pushbutton. ***Requirement:*** MANL lamp is lighted. RECEIVED DATA BYTE lamp 8 and one other lamp is lighted; all other lamps are off.
25	Request station to verify that DSU RT lamp is lighted.
26	Set the MANL BYTE toggle switches for channel loopback code (00101000). ***Requirement:*** RECEIVED DATA BYTE lamp 8 and two other lamps are lighted; all other lamps are off.
27	Request station to verify that lamps DS-1 and DS-3 are lighted. ***Requirement:*** At the DSU—RT lamp is off and LL lamp is lighted.
28	Depress TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off. MON lamp is lighted.
29	Request station to disconnect 914C DTS and restore DSU to normal operation if no further testing is required.
30	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear, and all lamps, except DISC and POWER lamps, will go off.
	56-kb/s DSU Using 912A WDTS
31	Request station to verify initial test setup as follows: • Interface connector cable connected between DSU interface connector and high-speed interface unit of 912A WDTS • Power cord plugged into a 117-volt 60-Hz outlet • 912A WDTS controls set in accordance with Practice AT&T 595-200-500 or 595-200-501
32	On the BATS control panel, set the MANL BYTE toggle switches for idle code (01111110) and depress the TEST MODE/MANL pushbutton. ***Requirement:*** MANL lamp is lighted.

CHART 4 (Contd)

STEP	PROCEDURE
33	◗Depress the TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are lighted.◖
34	Request station to operate DSU slide switch to the center position. ***Requirement:*** The DSU PWR lamp is lighted; NS, LL, and RT lamps are off.
35	Request station to operate 912A WDTS REQ TO SEND switch to ON. ***Requirement:*** DATA SET READY and CLEAR TO SEND lamps are lighted. RCVD LINE SIG DETR lamp is off. If DSU is equipped with option YQ—CLEAR TO SEND lamp will not light.
36	Set MANL BYTE toggle switches for mux out of sync code (00011010).
37	Request station to observe READY lamp on 912A WDTS. ***Requirement:*** If DSU is equipped with option XK—DATA SET READY lamp on 912A WDTS is lighted.
38	Set MANL BYTE toggle switches for OCU loopback code (00101010). ***Requirement:*** SYNC lamp is lighted. RECEIVED DATA BYTE lamp 8 and one other lamp are lighted; all other lamps are off.
39	Request station to observe NS lamp. ***Requirement:*** After one to two seconds—NS lamp on DSU is lighted.
40	Set MANL BYTE toggle switches to (00000001).
41	Request station to operate 912A WDTS OUTPUT switch to SPACE. ***Requirement:*** At DSU, NS lamp is off. 912A WDTS RCVD LINE SIG DETR lamp is lighted. If the DSU is equipped with option XK—DATA SET READY lamp on 912A is lighted. If the DSU is equipped with option YQ—CLEAR TO SEND lamp on 912A is lighted.
42	Set 511/2047 switch to 2047.
43	Depress the TEST MODE/STWY pushbutton. ***Requirement:*** MANL lamp is off; STWY lamp is lighted.
44	Request station to operate 912A WDTS COUNTER switch to ON and then reset the counter. ***Requirement:*** After 10 seconds, 912A WDTS counter indicates zero errors.

CHART 4 (Contd)

STEP	PROCEDURE
45	Request station to operate DSU slide switch to RT. ***Requirement:*** The 912A WDTS CLEAR TO SEND, DATA SET READY, and RCVD LINE SIG DETR lamps are off. DSU RT lamp is lighted.
46	Momentarily operate HOLD/COUNT/RESET switch to RESET. ***Requirement:*** After 10 seconds, BIT ERROR counter indicates zero errors.
47	Request station to operate DSU slide switch to center position. ***Requirement:*** RT lamp is off.
48	Set MANL BYTE toggle switches for DSU loopback code (00101100) and depress TEST MODE/MANL pushbutton. ***Requirement:*** RECEIVED DATA BYTE lamp 8 and one other lamp are lighted; all other lamps are off.
49	Request station to observe that the DSU RT lamp is lighted.
50	Set the MANL BYTE toggle switches for channel loopback code (00101000). ***Requirement:*** RECEIVED DATA BYTE lamp 8 and two other lamps are lighted; all other lamps are off.
51	Request station to observe lamp. ***Requirement:*** The 912A WDTS CLEAR TO SEND and RCVD LINE SIG DETR lamps are lighted. DSU RT lamp is off and LL lamp is lighted.
52	Depress TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off; MON lamp is lighted.
53	To drop accessed circuit completely (see note), press the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.
54	Request station to disconnect 912A WDTS and restore DSU to normal operation.

CHART 4 (Contd)

STEP	PROCEDURE

Subrate DSU and 56 kb/s DSU Using 921A DTS

55 Request station to perform initial test setup as follows:

Note: Interface lamp DTR on the 921A DTS should be disregarded when performing any test in this practice.

- Connect the DTS to the customer interface connector on the desired port 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 25-pin interface connector on the DSU port CP.

- Verify that all 37 interface selector switches [white bow-tie] on the front of the DTS are in the NORM position.
- Insert the 921A DTS power cord plug into a 117-volt 60-Hz ac outlet.
- Remove the EIA RS-232-C interface card from the storage area in the DTS and ensure that all 25 interface lead switches are in the MON position.
- Insert the interface card into the slot on the right side of the DTS and close the latch.
- Operate the POWER switch on the 921A DTS to ON and POWER ON lamp is lighted.
- Apply power to the DSU if power has been removed and observe that POWER ON lamp on KD21 CP is lighted.
- Depress RST key on the DTS. Display indicates briefly—921A VERS #01, then indicates DATA SET—if the DTS is not defective. If the DTS is defective, TEST FAILED appears on the display.

56 Set the manual byte switches for idle code (01111110), and depress the TEST MODE/MANL pushbutton.

Requirement: MANL lamp is lighted.

57 Request station to select the RS lead by entering 36 on the 921A DTS.

Requirement: Display indicates TEST SEQ : 36 RS=? (0 or 1).

58 Depress TEST CONTROL/TEST pushbutton.

Requirement: TEST and TEST IN PROG lamps are lighted.

59 Request station to depress 1; then select error test (DOT, SPACE, MARK, and PSEUDORANDUM WORD) by entering 55 on DTS.

CHART 4 (Contd)

STEP	PROCEDURE
	Requirement: Display briefly indicates TEST SEQ : 36 RS=1 (0 or 1) 55.
60	Request station to depress GO key.
	Requirement: For Subrate DSU — Display briefly indicates TEST COMPLETE, then D=DT 0=SP 1=MK 2=2047 5=511 6=63. Interface lamps DSR, RS, and CS on the DTS are lighted; RLSD lamp is off.
	Requirement: For 56 kb/s DSU — Display briefly indicates TEST COMPLETE, then display becomes D=DT 0=SP 1=MK 2=2047. Interface lamps DSR, RS, and CS on the DTS are lighted; RLSD lamp is off.
61	Set MANL BYTE switch for mux out of sync code (00011010).
62	Request station to observe DSR lamp on DTS.
	Requirement: DSR lamp goes off.
63	Set MANL BYTE toggle switches for OCU loopback code (00101010).
	Requirement: RECEIVED DATA BYTE indicator 8 and one other are lighted; all other lamps are off.
64	Request station to observe NS indicator on DSU after one to two seconds.
	Requirement: NS lamp lights.
65	Set MANL BYTE toggle switches to (00000001).
66	Request station to observe NS, DSR, RS, CS, and RLSD lamps.
	Requirements: NS lamp on the DSU goes off. Interface lamps DSR, RS, CS, and RLSD on the DTS are lighted.
67	Request station to depress number 0 on DTS.
	Requirement: Display briefly indicates SPACING BIT ERROR TEST, then 1=BIT ERRORS 2=BLOCK ERRORS.
68	Request station to depress number 1 on DTS.
	Requirement: Display indicates ???? SECONDS.
69	Request station to select 10 seconds to count bit errors.

CHART 4 (Contd)

STEP	PROCEDURE

Requirement: ◗BIT ERROR counter indicates zero errors.◖

Note: From this point, the DTS counts the number of errors received. At the end of the test, the display repeatedly indicates TEST COMPLETE, then total SYNC LOSSES, then total BITS IN ERROR.

70 Momentarily operate HOLD/COUNT/RESET switch to RESET.

Requirement: After 10 seconds—BIT ERROR counter indicates zero errors.

71 Set 511/2047 switch to 2047 and depress the TEST MODE/STWY pushbutton.

Requirement: MANL lamp is off; STWY lamp is lighted.

72 Request station to select RS lead (enter 36).

Requirement: Display indicates TEST SEQ : 36 RS? (0 or 1).

73 Request station to depress 1 then select error test (DOT, SPACE, MARK, PSEUDORANDUM WORD) by entering 55 on DTS.

Requirement: Display briefly indicates TEST SEQ : 36 RS=1 (0 or 1) 55.

74 Request station to depress GO key.

Requirement: For Subrate DSU —
If the DSU is equipped with option YT (switched request to send), display briefly indicates TEST COMPLETE. Then display indicates D=DT 0=SP 1=MK 2=2047 5=511 6=63. Interface lamps RLSD, RS, and CS on DTS are off. If the DSU is equipped with option YS (continuous request to send), display briefly indicates TEST COMPLETE. Then display indicates D=DT 0=SP 1=MK 2=2047 5=511 6=63. Interface lamps RLSD and CS on DTS are lighted; RS lamp is off.

Requirement: For 56 kb/s DSU —
If the DSU is equipped with option YT (switched request to send), display briefly indicates TEST COMPLETE. Then display indicates D=DT 0=SP 1=MK 2=2047. Interface lamps RLSD, RS, and CS on DTS are off. If the DSU is equiped with option YS (continuous request to send), display briefly indicates TEST COMPLETE. Then display indicates D=DT 0=SP 1=MK 2=2047. Interface lamps RLSD and CS on DTS are lighted; RS lamp is off.

75 Request station to depress number 2 on DTS.

Requirement: Display briefly indicates 2047 BIT ERROR TEST, then 1=BIT ERRORS 2 = BLOCK ERRORS.

76 Request station to depress number 1 on DTS.

CHART 4 (Contd)

STEP	PROCEDURE
	Requirement: Display indicates ???? SECONDS.
77	Request station to select 10 seconds to count bit errors.
	Requirement: ♦BIT ERROR counter indicates zero errors.♦
	Note: From this point, the DTS counts the number of errors received. At the end of the test, the display briefly indicates TEST COMPLETE, then total SYNC LOSSES, then total BITS IN ERROR.
78	Momentarily operate HOLD/COUNT/RESET switch to RESET.
	Requirement: After 10 seconds, BIT ERROR counter indicates zero errors.
79	Request station to operate DSU slide switch to center position.
	Requirement: The RT lamp on the DSU goes off. Interface lamps RLSD, DSR, and CS on the DTS are lighted.
80	Set MANL BYTE toggle switches for DSU loopback code (00101100).
81	Depress TEST MODE/MANL pushbutton.
	Requirement: MANL lamp is lighted. RECEIVED DATA BYTE indicator 8 and one other lamp is lighted; all others lamps are off.
82	Request station to observe that RT lamp is lighted and DSR, CS, and RLSD lamps are off.
83	Set MANL BYTE toggle switches for channel loopback code (00101000).
	Requirement: RECEIVED DATA BYTE lamp 8 and two others are lighted; all other lamps are off.
84	Request station to observe that LL indicator on DSU is lighted and RT lamp is off and CS and RLSD lamps on DTS are lighted.
85	Depress TEST CONTROL/MON pushbutton.
	Requirement: TEST and TEST IN PROG lamps are off; MON lamp is lighted.
86	Request station to disconnect 921A DTS and restore DSU to normal operation if no further testing is required.

CHART 4 (Contd)

STEP	PROCEDURE
87	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.

CHART 5

DSU STRAIGHTAWAY TEST

STEP	PROCEDURE
1	If not already in monitor mode, perform the applicable Chart 1 or 2.
2	Depress appropriate CUSTOMER RATE pushbutton (may be different than the SRDM channel rate). ***Requirement:*** Selected lamp is lighted.
3	Select NEAR or FAR TEST DIRECTION. ***Note:*** See general note under PROCEDURES in Part 8.
4	Establish communication with technician at the station location.
5	Request station to operate DSU slide switch to center position. ***Requirement:*** DSU PWR lamp is lighted; NS, LL, and RT lamps are off.
6	Determine which of the following will be used in the DSU straightaway test and proceed to step indicated. • Subrate DSU using 914C—Step 7 • Subrate DSU using 921A DTS—Step 33 • 56 kb/s DSU using 912A WDTS—Step 20 • 56 kb/s DSU using 921A DTS—Step 33

CHART 5 (Contd)

STEP	PROCEDURE
	Subrate DSU Using 914C DTS
7	Request station to verify the initial test setup as follows: • Interface connector cable connected between DSU interface connector and connector A of 914C DTS • Power cord plugged into 117-volt 60-Hz outlet and power applied to set • Matrix programmed and controls set in accordance with Practice AT&T 595-200-500 or 595-200-501
8	Set 511/2047 switch to 511 and depress TEST MODE/STWY pushbutton at BATS control panel. ***Requirement:*** STWY lamp is lighted.
9	Request station to operate 914C DTS switch S1 to ON. ***Requirement:*** 914C DTS lamps DS1, DS2, and DS3 lighted.
10	◗Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST, TEST IN PROG, and SYNC lamps are lighted.◖
11	Momentarily set HOLD/COUNT/RESET switch to RESET. ***Requirement:*** ERROR counters reset to zero.
12	Request station to momentarily operate 914C DTS RESET button. ***Requirement:*** 914C DTS counter resets to zero. OVERFLOW lamp is off.
13	Start timing a 15-minute interval. ***Requirement:*** After 15 minutes, the BIT ERROR counter indicates no more than three errors.
14	Request station to start timing a 15-minute interval. ***Requirement:*** 914C DTS counter indicates no more than three errors.
15a	If more than one error is counted by either the station or the hub, reset the ERROR counter (inform station to reset) and start timing another 15-minute interval. ***Requirement:*** After 15 minutes, the BIT ERROR counter indicates no more than three errors.
15b	If more than one error is counted by either the station or the hub during the first 5 minutes of the second 15-minute interval, wait five minutes and then repeat Step 14.

CHART 5 (Contd)

STEP	PROCEDURE

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.

15c If three 15-minute error runs fail to meet the requirement, troubleshoot the channel in accordance with Practice AT&T 314-901-300.

16 Perform a 15-minute DSU and channel loopback error run as follows:

(a) Depress TEST MODE/DSU L/B pushbutton.

Requirement: DSU L/B and DECODED BYTE DSU L/B lamps are lighted.

(b) Momentarily operate the HOLD/COUNT/RESET switch to RESET and start timing a 15-minute interval.

Requirement: ERROR counter indicates 000.

(c) After 15 minutes, operate the HOLD/COUNT/RESET switch to HOLD and record the BLOCK ERROR counter indication on the appropriate record card (E-6527).

Requirement: Counter displays no more than two block errors.

(d) Depress TEST MODE/CHAN L/B pushbutton.

Requirement: The CHAN L/B and DECODED BYTE CHAN L/B lamps are lighted.

(e) Momentarily operate the HOLD/COUNT/RESET switch to RESET and start timing a 15-minute interval.

Requirement: BLOCK ERROR counter indicates 000.

(f) After 15 minutes, operate the HOLD/COUNT/RESET switch to HOLD and record the ERROR counter indication on the appropriate card (E-6527).

Requirement: Counter displays no more than two block errors.

17 Depress the TEST CONTROL/MON pushbutton.

Requirement: TEST and TEST IN PROG lamps are off; MON lamp is lighted.

18 To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.)

Note: On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit.

CHART 5 (Contd)

STEP	PROCEDURE
	Requirement: All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.
19	Request station to disconnect DTS and restore DSU to normal operation.
	56-kb/s DSU Using 912A WDTS
20	Request station to verify 912A WDTS initial test setup: • Interface cable connected between DSU interface connector and high-speed interface unit of 912A WDTS • Power cord plugged into 117-volt 60-Hz outlet • 912A WDTS controls set in accordance with Practice AT&T 595-200-500 or 595-200-501
21	Set 511/2047 switch to 2047 and depress TEST MODE/STWY pushbutton.
	Requirement: STWY lamp is lighted.
22	Request station to operate 912A WDTS REQ TO SEND switch to ON.
	Requirement: CLEAR TO SEND, RCVD LINE SIG DETR, and DSR lamps are lighted.
23	⧫Depress TEST CONTROL/TEST pushbutton.
	Requirement: TEST lamp is lighted. ⧫
24	Request station to operate 912A WDTS COUNTER switch to ON.
25	Momentarily set HOLD/COUNT/RESET switch to RESET.
	Requirement: ERROR counter resets to zero and OVERFLOW lamp goes off.
26	Request station to momentarily operate 912A WDTS RESET button.
	Requirement: Counter resets to zero and OVERFLOW lamp goes off.
27	Start timing a 15-minute interval.
	Requirement: After 15 minutes, BIT ERROR counter indicates no more than three errors.
28	Request station to start timing a 15-minute interval.
	Requirement: Counter indicates no more than three errors.

CHART 5 (Contd)

STEP	PROCEDURE
29a	If more than one error is counted by either the 912A WDTS or the hub, momentarily operate the HOLD/COUNT/RESET switch to RESET (inform station to reset), and start timing another 15-minute interval. ***Requirement:*** After 15 minutes, BIT ERROR counter indicates no more than three errors.
29b	If more than one error is counted by either the 912A WDTS or the hub during the first five minutes of the second 15-minute interval, wait five minutes and then repeat Step 29a. ***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.
29c	If three 15-minute error runs fail to meet the requirement, troubleshoot the channel in accordance with Practice AT&T 314-901-300 and begin test at Step 16.
30	Depress the TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off; MON lamp is lighted.
31	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROl group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbutton on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.
32	Request station to disconnect WDTS and restore DSU to normal operation.
	Subrate DSU and 56 kb/s DSU Using 921A DTS
33	Set 511/2047 switch to 2047 and depress TEST MODE/STWY pushbutton. ***Requirement:*** STWY lamp is lighted. ***Note:*** If this is the first test, notify station to perform the initial setup described in Chart 4, Step 55.
34	◗Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST lamp is lighted.◖
35	Request station to operate interface lead switch 19 on the interface card to the TERM position. ***Requirement:*** Interface lamps DSR and RLSD are lighted.

CHART 5 (Contd)

STEP	PROCEDURE
36	Momentarily set HOLD/COUNT/RESET switch to RESET. ***Requirement:*** ERROR counters reset to zero.
37	Request station to select the control for the RS lead by entering 36 on the DTS. ***Requirement:*** Display indicates TEST SEQ: 36 RS=? (0 or 1).
38	Start timing a 15-minute interval. ***Requirement:*** After 15 minutes, BIT ERROR counter indicates no more than three errors.
39	Request station to depress key number 1 on DTS and then select error test (DOT, SPACE, MARK, and PSEUDORANDUM WORD) by entering 55. ***Requirement:*** Display indicates TEST SEQ: 36 RS=1 (0 or 1).
40	Request station to depress GO key. ***Requirement:*** For Subrate DSU — Display briefly indicates TEST COMPLETE; then TEST SEQ: D=DT 0=SP 1=MK 2=2047 5=511 6=63. DTS interface lamps RLSD, RS, and CS are lighted. ***Requirement:*** For 56 kb/s DSU — Display briefly indicates TEST COMPLETE; then display indicates D=DT 0=SP 1=MK 2=2047. Interface lamps RLSD, RS, and CS on the DTS are lighted.
41	Request station to depress key number 2 on 921A DTS. ***Requirement:*** Display briefly indicates 2047 BIT ERROR TEST, then 1=BIT ERRORS and 2= BLOCK ERRORS.
42	Request station to depress key number 1. ***Requirement:*** Display indicates ? ? ? ? SECONDS.
43	Request station to select 900 seconds by entering 0900 on DTS. ***Note:*** The keys and associated functions are as follows: **KEY FUNCTION** A — Restart test B — Display time remaining in test C — Clear display

CHART 5 (Contd)

STEP	PROCEDURE

D — End test

E — Insert errors into the data stream

F — Force out of sync.

Requirement: Display indicates three errors or less.

Note: From this point, the DTS counts the number of errors received. At the end of the test, the display repeatedly indicates TEST COMPLETE, then total SYNC LOSSES, then total BITS IN ERROR.

44a If three or less errors are counted on either counter, proceed to Step 45. If more than three errors are counted, repeat the test by resetting error counter and by notifying station to time another 900-second interval.

44b If three or less errors are counted on either counter within the first 5 minutes of the second attempt, proceed to Step 45. If more than three errors are counted, wait 5 minutes; then repeat the test by resetting error counter and by notifying station to time another 900-second interval.

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.

44c If three attempts fail to achieve the 15-minute test requirement, the hub must commence trouble-shooting the channel in accordance with Practice AT&T 314-901-300. ***The channel loopback test should not be performed by the hub in the following step unless all ports of the DSU are experiencing trouble and/or all ports have been released for testing. If the channel loopback test is performed by the hub, it should be performed on the 56-kb/s (multiplexed) channel.***

45 Depress the TEST CONTROL/MON pushbutton.

Requirement: TEST and TEST IN PROG lamps are off; MON lamp is lighted. To drop accessed circuit completely (see note), press the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.)

Note: On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit.

Requirement: All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.

46 Request station to disconnect the DTS and restore the DSU to the pretest state if no other tests are to be performed.

CHART 6

CSU FUNCTIONAL TEST

STEP	PROCEDURE
1	If not already in monitor mode, perform the applicable Chart 1 or 2.
2	Request station to verify that CSU power cord is plugged into a 117-volt 60-Hz outlet. ***Requirement:*** CSU PWR lamp is lighted, and TST lamp goes off.
3	Depress appropriate CUSTOMER RATE pushbutton (may be different from the SRDM channel rate. ***Requirement:*** Selected lamp is lighted.
4	Select NEAR or FAR TEST DIRECTION (TRAN and RCV). ***Note:*** See general note under PROCEDURES in Part 8. ***Requirement:*** FAR lamp lights when FAR direction is selected.
	Subrate CSU and 56 kb/s CSU Functional Test
5	Request station to disconnect the customer provided equipment from the CSU.
6	Establish communication with technician at the station location.
7	Determine which of the following test sets will be used at station location, and proceed to step indicated. 914C DTS—Step 8 921A DTS—Step 35.
	CSU Functional Test Using 914C DTS
8	Request station to verify the initial test setup per Fig. 11.
9	Request station to place the VOM function switch in the DCV 30 position.
10	Request station to place the VOM polarity switch in the positive position.
11	Request station to connect the + test lead and − test lead of VOM to TP1 and GRD, respectively, on DTS.
12	Request station to depress the POWER switch on the DTS. ***Requirement:*** POWER and DS1 lamps are lighted; VOM indicates between 5 and 8 V dc.
13	Request station to remove the matrix pin connecting DS1 and connector pin 2.

CHART 6 (Contd)

STEP	PROCEDURE
	Requirement: VOM indicates between 7 and 9 V dc.
14	Depress TEST MODE/MANL pushbutton.
	Requirement: MANL lamp is lighted.
15	Request station to disconnect the + test lead of the VOM from TP1.
16	Set the 8-bit manual toggle switches for channel loopback code (00101000).
17	Request station to place the VOM polarity switch in the negative position.
18	Depress TEST CONTROL/TEST pushbutton.
	Requirement: TEST lamp is lighted.
19	⧫Request station to verify TST lamp on CSU lighted and DS1 lamp on DTS is off.⧫
20	Request station to reconnect the + test lead of the VOM to TP1.
	Requirement: VOM indicates between −7 and −9 V dc.
21	Request station to reinsert the matrix pin connecting DS1 and connector pin 2.
	Requirement: VOM indicates between −5 and −8 V dc.
22	Request station to disconnect the VOM test leads.
23	Request station to place the VOM function switch in the ACV 15 position.
24	Request station to connect the VOM test leads across TP2 and TP3 of the DTS.
	Requirement: VOM indicates zero volts.
25	Operate and hold the TEST MODE/ALL 1s pushbutton.
	Requirement: All the receiver DTS BYTE PATTERN lamps are lighted.
26	Request station to verify that VOM indicates between 1 and 2 V ac, TST lamp on CSU is off, and DS1 lamp on DTS is lighted.
27	Set the manual byte toggle switches for OCU loopback code (00101010).
28	Request station to verify that meter indicates zero volts.
29	Set the MANL BYTE toggle switches to (00000001).

CHART 6 (Contd)

STEP	PROCEDURE

Requirement: RECEIVED DATA BYTE lamp 8 is lighted; all other lamps are off.

30 Set the MANL BYTE toggle switches for idle code (01111110).

Requirement: For Subrate CSU —
RECEIVED DATA BYTE lamps 1 and 8 are off; all other lamps are lighted.

Requirement: For 56-kb/s CSU —
RECEIVED DATA BYTE lamp 8 is off; all other lamps are lighted.

31 Depress TEST CONTROL/MON pushbutton.

Requirement: TEST and TEST IN PROG lamps are off; MON lamp is lighted.

32 Request station to unplug the DTS adapter cord (ED-73578) from the customer interface connector on CSU.

33 To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.)

Note: On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit.

Requirement: All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.

34 Request station to restore the CSU to normal operation.

CSU Functional Test Using 921A DTS

35 Request station to 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.

36 Request station to verify that all 37 DCE-interface selector switches (white bow-tie) on the front of the DTS are in the TERM position.

37 Request station to insert the 921A DTS power cord plug into a 117-volt 60-Hz ac outlet.

38 Request station to remove the CSU interface card from the storage area in the DTS and ensure that all interface lead switches are in the TERM position.

39 Request station to insert the interface card into the slot on the right side of the DTS and close the latch.

CHART 6 (Contd)

STEP	PROCEDURE
40	Request station to operate the POWER switch on the 921A DTS to ON. ***Requirement:*** POWER ON lamp is lighted.
41	Request station to depress RST key on the DTS. ***Requirement:*** Display indicates 921A VERS #01 (or higher); then DATA SET: if the DTS is not defective. If the DTS is defective, TEST FAILED appears on the display.
42	Request station to select the CSU by entering 50 on the DTS input keyboard. ***Requirement:*** Display indicates DATA SET: 50. ***Note:*** To delete a wrong entry on the input keyboard, depress the backspace arrow.
43	Request station to depress GO key. ***Requirement:*** Display indicates BIT RATE:
44	Request station to 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. ***Requirement:*** Display indicates BIT RATE: followed by either 24, 48, 96, or 56.
45	Request station to depress GO key. ***Requirement:*** Display indicates TEST SEQ:
46	Request station to verify that the CSU is supplied with a source of 117-volt 60-Hz ac power. ***Requirement:*** PWR lamp on CSU is lighted.
47	Depress TEST MODE/MANL pushbutton. ***Requirement:*** MANL lamp is lighted.
48	Set the MANL BYTE toggle switches for channel loopback code (00101000).
49	Depress TEST CONTROL/TEST pushbutton.

CHART 6 (Contd)

STEP	PROCEDURE
	Requirement: TEST lamp is lighted.
50	Request station to verify that interface lamp DSR is off and TST lamp on CSU is lighted.
51	Set the MANL BYTE toggle switches for OCU loopback code (00101010).
52	Request station to select DDS zero suppression code by entering 62.
	Requirement: Display indicates TEST SEQ: 62.
53	Request station to depress GO key.
	Requirement: The final display shows the number for ENTERED is one more than the number indicated as DROPPED.
54	Set MANL BYTE toggle switches to 00000001.
	Requirement: RECEIVED DATA BYTE lamp 8 is lighted; all other lamps are off.
55	Set MANL BYTE toggle switches for idle code (01111110).
	Requirement 1: For Subrate CSU — RECEIVED DATA BYTE lamps 1 and 8 are off; all other lamps are lighted.
	Requirement 2: For 56-kb/s CSU — RECEIVED DATA BYTE lamp 8 is off; all other lamps are lighted.
56	Request station to depress GO key.
	Requirement: Display briefly indicates TEST INTERRUPTED, then TEST SEQ:
57	Request station to select DDS idle code by entering 63.
	Requirement: Display indicates TEST SEQ: 63.
58	Request station to depress GO key.
	Requirement: The final display shows the number for ENTERED is one more than the number indicated as DROPPED.
59	Request station to depress GO key.
	Requirement: Display indicates TEST INTERRUPTED, then TEST SEQ:
60	Request station to select DDS out-of-sync code (enter 64).
	Requirement: Display indicates TEST SEQ: 64.

CHART 6 (Contd)

STEP	PROCEDURE
61	Request station to depress GO key. ***Requirement:*** Display indicates OOS: The final display shows the number for ENTERED is one more than the number indicated as DROPPED.
62	Request station to depress GO key. ***Requirement:*** Display indicates TEST INTERRUPTED, then TEST SEQ:
63	Set MANL BYTE toggle switches to mux out-of-sync code (00011010). ***Requirement:*** RECEIVED DATA BYTE lamps 4, 5, and 7 are lighted; all other lamps are off.
64	Request station to select DDS NOT READY (CSA) control code (enter 65). ***Requirement:*** Display indicates TEST SEQ: 65.
65	Request station to depress GO key. ***Requirement:*** Display indicates SENDING CSA.
66	Verify that RECEIVED DATA BYTE lamps 1, 6, and 8 are off, and all other lamps are lighted.
67	Depress TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off; MON lamp is lighted.
68	To drop accessed circuit completely (see note), press the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear, and all lamps, except the POWER and DISC lamps, will go off.

CHART 7

CSU STRAIGHTAWAY TEST USING 921A DTS

STEP	PROCEDURE
1	If not already in monitor mode, perform the applicable Chart 1 or 2.
2	Depress appropriate CUSTOMER RATE pushbutton (may be different from the SRDM channel rate). ***Requirement:*** Selected lamp is lighted.
3	Select NEAR or FAR TEST DIRECTION (TRAN and RCV). ***Requirement:*** FAR lamp lights when FAR direction is selected. ***Note:*** See general note under Procedures in Part 8.
4	Establish communication with technician at station location.
5	Request station to disconnect the customer provided equipment from the CSU.
6	Request station to verify initial test setup as follows: • DTS is connected to CSU using appropriate cords • All 37 DCE-interface selector switches are in TERM position • Power cord is plugged into 117-volt 60-Hz outlet for DTS. • CSU interface cord is inserted in the slot on the right side of the DTS and latch is closed • Power is ON to DTS.
7	Set 511/2047 switch to 2047 and depress TEST MODE/STWY pushbutton at BATS control panel. ***Requirement:*** STWY lamp is lighted.
8	Request station to depress RST key. ***Requirement:*** Display briefly 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.
9	Request station to select CSU (enter 50). ***Requirement:*** Display indicates DATA SET: 50.
10	Request station to depress GO key.

CHART 7 (Contd)

STEP	PROCEDURE
11	Request station to select CSU service rate by entering one of the following: • 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. ***Requirement:*** Display indicates BIT RATE: followed by either 24, 48, 96, or 56.
12	Request station to depress GO key.
13	Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST, TEST IN PROG, and SYNC lamps are lighted.
14	Request station to enter 55 and depress GO key. ***Requirement:*** For Subrate CSU — Display briefly indicates SELECT ERROR TEST, then D=DT 0=SP 1=MK 2=2047 5=511 6=63 is displayed. ***Requirement:*** For 56-kb/s CSU — Display briefly indicates SELECT ERROR TEST, then D=DT 0=SP 1=MK 2=2047 is displayed.
15	Request station to depress number 2 key for 2047 word, and then depress number 1 key for BIT ERRORS. ***Requirement:*** Display indicates ???? SECONDS.
16	Request station to enter 0900 seconds (15 minutes). ***Requirement:*** Display indicates 0900 SECONDS briefly; then 0000 BITS in ERROR is displayed. From this point, the DTS counts the number of errors received.
17	Start timing a 15-minute interval. ***Requirement:*** After 15 minutes, the BIT ERROR counter indicates no more than three errors.
18	Request station to notify you if more than three errors occur within the 15-minute interval.
19a	If three or less errors are counted on either counter, proceed to Step 20. If more than three errors are counted, repeat the test by resetting the error counter and by notifying the station to time another 900-second interval.

CHART 7 (Contd)

STEP	PROCEDURE
19b	If three or less errors are counted on either counter within the first 5 minutes of the second attempt, proceed to Step 20. If more than three errors are counted, wait 5 minutes; then repeat the test by re-setting the error counter and by notifying the station to time another 900-second interval. ***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.
19c	If three attempts fail to achieve the 900-second requirement, the hub must commence troubleshooting the channel in accordance with Practice AT&T 314-901-300.
20	Depress the TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off; MON lamp is lighted.
21	Request station to depress TST key to stop repetition of display. ***Requirement:*** Display indicates TEST SEQ:
22	Request station to select isochronous distortion test (enter 78). ***Requirement:*** Display indicates TEST SEQ: 78
23	Request station to depress GO key. ***Requirement:*** ISO DIS reading should not be greater than 28 percent. ***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.
24	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbutton on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear and all lamps, except the POWER and DISC lamps, will go off.
25	Request station to disconnect DTS and restore CSU to normal operation.

CHART 8

TEST CHANNEL BETWEEN DSAU AND SRDM

APPARATUS:

1 —Loopback Plug (consists of a male quad jumper plug where the red wire is shorted to the white wire and the green wire is shorted to the black wire. See Practice AT&T 314-914-100 for additional information).

1 —KS-20908 DTS required at end, intermediate, or collection office

1 —KS-20909 DTS required at end, intermediate, or collection office

STEP	PROCEDURE
1	If channel to be tested is not already in monitor mode, perform Chart 2 (DS-1 access assumed).
2	Depress appropriate CUSTOMER RATE pushbutton. ***Requirement:*** Selected lamp is lighted.
3	Set 511/2047 switch to 511. ***Requirement:*** 511 lamp is lighted.
4	Select FAR TEST DIRECTION (TRAN and RCV) when testing toward an end, intermediate, and collection office.
5	Select NEAR TEST DIRECTION (TRAN and RCV) when testing the SRDM located in this hub office. ***Note:*** See general note under PROCEDURES in Part 8.
6	Depress TEST MODE/STWY pushbutton. ***Requirement:*** STWY lamp is lighted.
7	If testing an SRDM located in an end, intermediate or collection office, operate the switches on the portable transmitter and receiver DTSs as given below. **Transmitter DTS Switches** FUNCTION to TEST WORD 511 OUTPUT to BIPOLAR DATA RATE to customer service rate of channel to be tested. MODE to REPEAT.

CHART 8 (Contd)

STEP	PROCEDURE
	Receiver DTS Switches INPUT to BIPOLAR CHANNEL to SINGLE TEST WORD to 511 COUNTER to BLOCK ERRORS DATA RATE to customer service rate of channel to be tested.
8	Plug the receiver and transmitter DTS power cords into 117-volt 60-Hz outlets and operate the POWER ON switch on both DTSs. ***Requirement:*** POWER ON lamps are lighted on both DTSs.
9	Connect the clock cords of the transmitter and receiver DTSs to clock connectors of the BCPA (bay clock, power, and alarm) unit or LTS (local timing supply) shelf. ***Requirement:*** CLOCK lamps on both DTSs lighted.
10	Plug the receiver DTS input cord into the SM-JCP (submultiplexer jack and connector panel) FROM FAR jack of the channel under test.
11	Plug the transmitter DTS output cord into the SM-JCP TO FAR jack of the channel under test.
12	If testing an SRDM located in this hub office, have a technician disconnect the cross-connection in the DSX-0A at the selected SRDM port location, and then install a loopback plug.
13	◗Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are lighted.◖
14	Momentarily operate the HOLD/COUNT/RESET switch to RESET and start timing a 5-minute interval.
15	If testing an SRDM located in an end, intermediate, or collection office, momentarily operate the portable receiver DTS COUNTER MODE switch to RESET and start timing a 15-minute interval.
16	After five minutes, operate COUNTER MODE switch to HOLD. ***Requirement:*** Counter indicates less than two BLOCK errors.
17	At BATS control panel, after five minutes, operate HOLD/COUNT/RESET switch to HOLD. ***Requirement:*** ERROR counter indicates less than two BLOCK errors.

CHART 8 (Contd)

STEP	PROCEDURE
18	Depress DISC pushbutton and select next channel to be tested per Chart 2. Repeat Steps 4, 6 through 11, and 13 through 17 (end, intermediate, and collection offices). ***Requirement:*** DISC lamp is lighted. All other lamps, except the POWER lamp, are off.
19	Depress DISC pushbutton and select next channel to be tested per Chart 2. Repeat Steps 4 through 6, 12 through 14, 16, and 17 (hub office). ***Requirement:*** DISC lamp is lighted. All other lamps, except the POWER lamp, are off.
20	Remove the loopback plug from the DSX-0A cross-connection and restore the original cross-connection.
21	Disconnect the portable receiver DTS and transmitter DTS input and output cords from the SM-JCP.

CHART 9

HUB-TO-HUB STRAIGHTAWAY TEST

STEP	PROCEDURE
	Note: The following procedures apply only to the hub. The far-end hub should be performing this test at the same time in accordance with the procedures given in Practice AT&T 314-901-500. The BATS technician must coordinate the testing activity with the far-end hub.
1	If not already in the monitor mode, perform Chart 1 (DS-1 access assumed).
2	Select FAR TEST DIRECTION (TRAN and RCV). ***Requirement:*** FAR lamps are lighted. ***Note:*** See general note under PROCEDURES in Part 8.
3	Set 511/2047 switch to 511 for subrate channels or 2047 for 56-kb/s channels. ***Requirement:*** 511 lamp is lighted if 511 selected.
4	Depress TEST MODE/STWY pushbutton. ***Requirement:*** STWY lamp is lighted.
5	◗Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are lighted.◖

CHART 9 (Contd)

STEP	PROCEDURE
6	When the OUT OF SYNC lamp is off (indicates receipt of data from far-end hub), momentarily operate HOLD/COUNT/RESET switch to RESET and start timing a 5-minute interval.
7	After five minutes, operate HOLD/COUNT/RESET switch to HOLD. ***Requirement:*** BLOCK ERROR counter indicates less than two errors.
8	If no further tests are to be made, depress TEST CONTROL/MON pushbutton; then DISC pushbutton. ***Requirement:*** All lamps on front panel, except DISC and POWER lamps, are off.

CHART 10

DDGT LOOPBACK ERROR PERFORMANCE TEST

STEP	PROCEDURE
	Note: The manual loopback switch at the DDGT must be in the REM position if the DDGT is in a serving office, or in the LOC position if the DDGT is in a hub office, before this test is performed.
1	If not already in the monitor mode, perform the applicable Chart 1 or 2.
2	Depress CUSTOMER RATE 56K pushbutton. ***Requirement:*** 56K lamp is lighted.
3	Select 2047 code length.
4	Place the TEST DIRECTION/TRAN and /RCV toggle switches to the desired position. ***Requirement:*** When a switch is placed to FAR, the FAR lamp lights. ***Note:*** See general note under PROCEDURES in Part 8.
5	Select TEST MODE/STWY pushbutton. ***Requirement:*** STWY lamp is lighted.
6	In the TEST CONTROL group, depress the TEST pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps light, and OUT OF SYNC lamp should be off.
7	Momentarily operate the HOLD/COUNT/RESET switch to RESET. ***Requirement:*** Counters reset to zero. OVERFLOW lamp is off.

CHART 10 (Contd)

STEP	PROCEDURE
8	Start timing a 5-minute interval. ***Requirement:*** After 5 minutes, if testing a DDGT at a serving office, the BLOCK ERROR counter indicates no more than two errors. If testing a DDGT at a hub office, the BLOCK ERROR counter indicates zero errors.
9	Depress TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off; MON lamp is lighted.
10	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear and all lamps, except POWER and DISC lamps, will go off.

CHART 11

SUBRATE OFF-NET EXTENSION LOOPBACK ERROR PERFORMANCE TEST

STEP	PROCEDURE
	Note: When performing this test to the data set at the station or at the hub office, the data set must be in the DL (digital loopback) mode or AL (analog loopback) mode, respectively. If this test is performed to the DAS 831A, the loopback switch on the DAS 831A must be in the operated position.
1	If not already in the monitor mode, perform the applicable Chart 1 or 2.
2	Depress appropriate CUSTOMER RATE pushbutton. ***Requirement:*** Associated lamp is lighted.
3	Select 511 code length. ***Requirement:*** 511 lamp is lighted.
4	Place the TEST DIRECTION/TRAN and /RCV toggle switches to the desired position. ***Requirement:*** When a switch is placed to FAR, the FAR lamp lights. ***Note:*** See general note under PROCEDURES in Part 8.
5	Select TEST MODE/STWY pushbutton.

CHART 11 (Contd)

STEP	PROCEDURE
	Requirement: STWY lamp is lighted.
6	In the TEST CONTROL group, depress the TEST pushbutton.
	Requirement: TEST and TEST IN PROG lamps light, and OUT OF SYNC lamp should be off.
7	Momentarily operate the HOLD/COUNT/RESET switch to RESET.
	Requirement: Counters reset to zero. OVERFLOW lamp is off.
8	Start timing a 5-minute interval.
	Requirement: After 5 minutes, if testing a data set at a serving office, the BLOCK ERROR counter indicates no more than two errors. If testing a data set at a hub office, the BLOCK ERROR counter indicates zero errors.
9	Depress TEST CONTROL/MON pushbutton.
	Requirement: TEST and TEST IN PROG lamps are off; MON lamp is lighted.
10	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.)
	Note: On multipoint circuits, refer to Chart 1 for procedures to release a multipoint customer circuit.
	Requirement: All displays will clear and all lamps, except POWER and DISC lamps, will go off.

CHART 12

56-KB/S REPEATER LOOPBACK TEST

STEP	PROCEDURE
1	If not already in the monitor state, perform the applicable Chart 1 or 2.
2	Depress CUSTOMER RATE 56K pushbutton.
	Requirement: 56K lamp is lighted.
3	Select NEAR or FAR TEST DIRECTION (TRAN and RCV).
	Requirement: FAR lamp lights when FAR direction is selected.
	Note: See general note under PROCEDURES in Part 8.

CHART 12 (Contd)

STEP	PROCEDURE
4	Depress TEST MODE/MANL pushbutton. ***Requirement:*** MANL lamp is lighted.
5	Set the 8-bit toggle switches for channel loopback code (00101000).
6	♦Depress TEST CONTROL/TEST pushbutton. ***Requirement:*** TEST, TEST IN PROG, and DECODED BYTE CHAN L/B lamps are lighted. RECEIVED DATA BYTE lamp 8 and two other lamps are lighted.♦
7	Depress TEST MODE/CHAN L/B pushbutton. ***Requirement:*** All received DATA BYTE lamps flicker.
8	Start timing a 5-minute interval by momentarily operating the HOLD/COUNT/RESET switch to RESET. ***Requirement:*** After 5 minutes, BLOCK ERROR counter displays zero errors.
9	If testing the second repeater beyond the hub, momentarily depress the TEST MODE/ALL 1s pushbutton. ***Note:*** This removes the loopback condition from the first repeater and places the second repeater in the loopback condition.
10	Momentarily operate the HOLD/COUNT/RESET switch to RESET and start timing a 5-minute interval. ***Requirement:*** After 5 minutes, BLOCK ERROR counter displays zero errors.
11	If the line contains two repeaters and the second repeater beyond the hub is to be tested at this time, perform Steps 7 and 8.
12	Depress TEST CONTROL/MON pushbutton. ***Requirement:*** TEST and TEST IN PROG lamps are off; MON lamp is lighted.
13	To drop accessed circuit completely (see note), depress the DISC pushbutton in the TEST CONTROL group. (For DS-0A accessed circuits, also depress the RLSE and EXT MEAS pushbuttons on the LATS control panel.) ***Note:*** On multipoint circuits, refer to Chart 1 for procedures to release a customer circuit. ***Requirement:*** All displays will clear and all lamps, except the POWER and DISC lamps, will go off.

CHART 13

HUB-TO-HUB LOOPBACK ERROR PERFORMANCE TEST

STEP	PROCEDURE
	Note: The following procedures apply only to the hub. The far-end hub should be performing this test at the same time in accordance with the procedures given in Practice AT&T 314-901-500. The BATS technician must coordinate the testing activity with the far-end hub.
1	If not already in the monitor mode, perform Chart 1 (DS-1 access assumed).
2	Depress the appropriate CUSTOMER RATE pushbutton.
	Requirement: Selected lamp is lighted.
3	Select 511 (subrate) or 2047 (56 kb/s) code length.
	Requirement: If selected, the 511 lamp will light.
4	Place the TEST DIRECTION/TRAN toggle switch to FAR and the RCV toggle switch to NEAR.
	Requirement: TRAN FAR lamp is lighted.
	Note: See general note under PROCEDURES in Part 8.
5a	If the far-end station contains a CSU, depress TEST MODE/CHAN L/B pushbutton.
	Requirement: CHAN L/B lamp is lighted.
5b	If the far-end station contains a DSU, depress TEST MODE/DSU L/B pushbutton.
	Requirement: DSU L/B lamp is lighted.
6	Depress TEST CONTROL/TEST pushbutton.
	Requirement: TEST and TEST IN PROG lamps are lighted.
	Note: If the data rate of the line being tested is 56 kb/s and the line contains 56-kb/s repeaters, momentarily depress the TEST MODE/ALL 1s pushbutton for each repeater in the line. Step 6 must be performed before pushing the ALL 1s button (must be in test mode).
7	When the OUT OF SYNC lamp is off (indicates receipt of loopback code from far-end hub), momentarily operate HOLD/COUNT/RESET switch to RESET and start timing a 50-minute interval.
8	After 50 minutes, operate HOLD/COUNT/RESET switch to HOLD.
	Requirement: BLOCK ERROR counter displays no more than 14 errors.
9	Depress TEST CONTROL/MON pushbutton.

CHART 13 (Contd)

STEP	PROCEDURE
	Requirement: TEST and TEST IN PROG lamps are off; MON lamp is lighted.
10	To drop accessed circuit completely, depress the DISC pushbutton in the TEST CONTROL group.
	Requirement: All displays will clear, and all lamps, except the DISC and POWER lamps, will go off.

CHART 14

MANUALLY ACCESSING THE LOCAL LOOP

STEP	PROCEDURE
1	Verify that MIC lamp is not lighted on the LATS control panel. Manual operation cannot occur if the system is under the control of the SC (sequence controller).
2	At the circuit select portion of the LATS control panel, enter the 2-digit number selecting the desired bay (BAY), followed by another 2-digit entry selecting the OCU or circuit within the bay (OCU).
3	Verify that the 4-digit BAY/OCU keyboard entry displayed on the LED readout is correct.
4	Depress the BRK pushbutton on the BATS control panel. ***Requirement:*** BRK lamp lights and remains lighted. The FAULT lamp should flash momentarily but remain off thereafter. ***Note:*** Should the FAULT lamp remain lighted after the BRK pushbutton is depressed, system troubleshooting will be required.
5	Turn the meter on by depressing the MTR ON switch.

CHART 15

1-EMPLOYEE TESTS—FOREIGN VOLTAGE, INSULATION RESISTANCE, LOOP PLUS TERMINAL RESISTANCE, AND OPEN-LOOP CAPACITANCE

STEP	PROCEDURE
	Note: If any of the test requirements are not met, proceed according to instructions given in Practice AT&T 314-410-310.
1	Perform Chart 14.
	Foreign Voltage
2	Set the meter range control to 19.9 VDC/VAC.
3	Depress the T-R pushbutton. ***Requirement:*** The T-R lamp lights along with a corresponding LED in the mapping area.
4	Depress the VAC pushbutton.
5	Depress, in sequence, the T-R, T1-R1, GND-T, GND-R, GND-R1, and GND-T1 pushbuttons and measure the voltage. Allow a few seconds for each indication to stabilize.

CHART 15 (Contd)

STEP	PROCEDURE

Requirement: Voltage indication is less than 1 V ac (less than 4 V ac on T1-R1). If a voltage indication exceeds the requirement, the faulty pair must be repaired or replaced. Perform Step 6, but do not attempt resistance measurements.

6 Depress the VDC pushbutton and repeat Step 5.

Requirement: Voltage indication is less than ±1 V dc. If a voltage indication exceeds the requirement on any wire or pair, the faulty pair must be repaired or replaced.

Insulation Resistance

7 Set the meter range control to 199 kΩ.

8 Depress the RES pushbutton.

9 Depress, in sequence, the GND-T1, GND-R1, GND-T, and GND-R pushbuttons and measure the resistance.

Requirement: The insulation resistance at each test point must be greater than 120 kΩ.

Loop Plus Terminal Resistance

10 Depress the T-R pushbutton.

11 Set the meter range control to 19.9 kΩ.

12 With the T-R pushbutton depressed, measure the resistance, then depress the T1-R1 pushbutton and measure the resistance.

Note: A CO repeater inserts approximately 36 ohms in the bypass mode. An OP repeater inserts 5758 ohms in the bypassed mode.

Requirement: The measured resistance must be as follows:

R (T1 to R1) = (R_{L2} + 35) ohms ±30%

R (T to R) = (R_{L1} + R_I) OHMS ±30%.

Note: On repeatered loops, the resistance of the bypassed repeaters in the loop must be included. Refer to appropriate local loop record card for the value of this resistance. The values of R_{L1} and R_{L2} are from installation measurements recorded on the loop record cards. The values of input resistance (R_I) are as follows:

- If DSU/CSU FLBO, option WW is installed, R_I is 35 ohms.

CHART 15 (Contd)

STEP	PROCEDURE

- If DSU/CSU FLBO, option WV is installed, R_1 is as follows:

BIT RATE (kb/s)	RESISTANCE ohms (R_1)
2.4	1030
4.8	920
9.6	475
56.0	220

13 If the resistance measured in Step 12 indicates an open loop (greater than 200 kΩ), perform the open-loop capacitance test.

Open-Loop Capacitance

14 With the proper cable pair configuration pushbutton selected (T-R or T1-R1), depress the UF pushbutton and measure the capacitance of the open loop. Use the graph in Fig. 12 to determine the distance to the open loop and then refer the trouble to the appropriate cable repair crew.

Note: Figure 12 is based upon a characteristic cable pair capacitance of 0.083 μF/mile which is applicable to the majority of telephone cables.

CHART 16

1-EMPLOYEE TEST—OCU SIMPLEX VOLTAGE

APPARATUS:

1 —KS-14510,L1 Multimeter or equivalent

1 —789A Tool

STEP	PROCEDURE

1 At the OCU location, install the 789A tool.

2 Set the voltmeter to the 60 VOLT DC scale.

3 Connect the + probe to the GRD test point and the − test probe to the BAT test point on the 789A tool.

4 Measure the simplex voltage.

CHART 16 (Contd)

STEP	PROCEDURE
	Requirement: If office supply is −48 V dc, measured voltage should be −40 V dc minimum and −54 V dc maximum. If office supply is −24 V dc, measured voltage should be −18 V dc minimum and −30 V dc maximum.
5	To measure simplex voltage at the MDF or LTD, reinsert the OCU in its original slot and put test probes across T-T1 or R-R1.
6	At the BATS control panel, access the circuit and send 2047 bit word toward the OCU (this is similar to the DSU straightaway test, Chart 5).
7	Measure the simplex voltage.
	Requirement: If office supply is −48 V dc, measured voltage should be −40 V dc minimum and −54 V dc maximum. If office supply is −24 V dc, measured voltage should be −18 V dc minimum and −30 V dc maximum.
8	At the BATS control panel, send CHAN loopback code (00101000).
9	Measure the simplex voltage.
	Requirement: If office supply is −48 V dc, measured voltage should be −40 V dc minimum and −54 V dc maximum. If office supply is −24 V dc, measured voltage should be −18 V dc minimum and −30 V dc maximum. ***The polarity of the simplex voltage must be reversed in Step 9 compared to Step 7.***

CHART 17

2-EMPLOYEE TESTS—FOREIGN VOLTAGE, INSULATION RESISTANCE, AND LOOP RESISTANCE

STEP	PROCEDURE
1	Perform Chart 14.
	Foreign Voltage
2	Request station to disconnect the DSU or CSU from the 42A connecting block and leave the cable pairs open-circuited.
3	Set the meter range control on the LATS control panel to 19.9 VDC/VAC.
4	Depress the T-R pushbutton.
	Requirement: The T-R lamp and corresponding LED in the mapping area lights.
5	Depress the VAC pushbutton.

CHART 17 (Contd)

STEP	PROCEDURE
6	Depress, in sequence, the T-R, T1-R1, GND-T, GND-R, GND-R1, and GND-T1 pushbuttons and measure the voltage. Allow a few seconds for each indication to stabilize. ***Requirement:*** Voltage indication is less than 1 V ac. If a voltage indication exceeds the requirement, the faulty pair must be repaired or replaced per Practice AT&T 314-410-310. Step 7 may be performed, but resistance measurements should not be attempted.
7	Depress the VDC pushbutton and repeat Step 6. ***Requirement:*** Voltage indication is less than ±1 V dc. If a voltage indication exceeded the requirement on any wire or pair, the faulty pair must be repaired or replaced.
	Insulation Resistance
8	Request station to verify that the two cable pairs are open-circuited and not shorted to each other or ground.
9	Set the meter range control to 1.99 MΩ.
10	Depress the RES pushbutton.
11	Depress, in sequence, the T1-R1, T1-T, GND-T1, GND-R1, R1-T, GND-T, GND-R, T1-R, R1-R, and T-R pushbuttons and measure the resistance. ***Requirement:*** The insulation resistance at each test point must be greater than 300 kΩ. If the requirements are not met, the faulty cable pair must be repaired or replaced per Practice AT&T 314-410-310.
	Loop Resistance
12	Request station to short T to R at the 42A connecting block.
13	Set the meter range control to 19.9 kΩ; depress the T-R pushbutton and measure the loop resistance. ***Requirement:*** The resistance must be less than 4200Ω and the value recorded as RL1 on the LLRC. If the test is not an initial installation, the loop resistance must equal RL1 ±30 percent. ***Note:*** On repeatered loops, the resistance of the bypassed repeaters in the loop must be included. Refer to appropriate LLRC for the value of this resistance.
14	Request station to remove the short from T to R and place short across T1 to R1 pair on the 42A connecting block.
15	Depress the T1-R1 pushbutton and measure loop resistance. ***Requirement:*** The resistance must be less than 4200Ω and the value recorded as RL2 on the LLRC. If the test is not an initial installation test, the loop resistance must equal RL2 ±30 percent.

CHART 17 (Contd)

STEP	PROCEDURE
16	If the requirements of Steps 13 and 15 are met, remove the short on the cable pair and proceed to Chart 18.
17	If the requirements of Steps 13 and 15 are not met, the faulty cable pair must be repaired or replaced per Practice AT&T 314-410-310.

CHART 18

2-EMPLOYEE TESTS—INSERTION LOSS

APPARATUS:

2 —HP* -3550B Communications Test Set or equivalent (one at each end). If test set is not available at station, an HP* -403B ac voltmeter and a 146A repeat coil can be substituted. The connection arrangement for this case is shown in Fig. 13.

1 —P2ES Cord at hub office

1 —Twisted pair, guage 26 is required at station.

1 —310A plug type patch cord

STEP	PROCEDURE
	Note 1: It is recommended that this test be performed using the 789A access tool instead of the LATS control panel. The reason is to avoid tying up the LATS equipment on tests that are expected to exceed 5 minutes. ***Note 2:*** This test must be done manually from the OCU bay using the 789A access tool or from the LATS control panel.
1	Set controls on the HP-3550B as follows: ***Oscillator:*** FREQ to applicable test frequency (Table C) RANGE to X100 for 2.4-, 4.8-, and 9.6-kb/s service X1 K for 28- and 48-kHz service or X10 K for 82 kHz

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CHART 18 (Contd)

STEP	PROCEDURE
	AMPLITUDE to minimum (CCW).
2	Connect one side of the oscillator OUTPUT to the oscillator ground terminal and set following controls: ***Voltmeter:*** FUNCTION to ON RANGE to 0 dB.
3	Connect the black terminal on the voltmeter input to the voltmeter ground terminal and set patch panel controls: MEAS—CAL to CAL IMPEDANCE to 135 OHMS (input and output) FREQ to < 5 KC for 2.4-, 4.8-, and 9.6-kb/s service > 5 KC for 56-kb/s service DB to 0.
4	Connect the OUTPUT and INPUT CTs (center taps) to the voltmeter ground terminal.
5	Connect the output of the HP-3550B to the T, R jack on the LATS test panel using the P2ES cord.
6	In the calibrate position, adjust the oscillator AMPLITUDE control to obtain a 0-dBm indication on the voltmeter.
7	Set the patch panel MEAS—CAL switch to MEAS.
8	Request station to connect the HP-3550B test set input to the T, R line pair at the customer terminal block with a twisted pair, make connections to ground terminals as given in Step 1, and set the test set controls as follows: ***Patch Panel:*** MEAS—CAL to MEAS IMPEDANCE to 135 OHMS (input and output) FREQ to < 5 KC for 2.4-, 4.8-, or9.6-kb/s service > 5 KC for 56-kb/s service.

CHART 18 (Contd)

STEP	PROCEDURE
	Voltmeter:
	FUNCTION to ON
	RANGE to 0 dB.
9	If the 4-wire loop has not been accessed, perform Chart 14.
10	Decrease the voltmeter RANGE setting until a meter indication is obtained.
11	Read the received level and record the results at each applicable frequency setting on the CLRC.
	Requirement: Refer to Table C.
	Note: The insertion loss (dB) = 0 dBm (transmit level) − received level (dBm). For example, received level = −20 dBm, the insertion loss = +20 dB.
12	Repeat Steps 1 through 11 at each test frequency for the T1-R1 pair per Table C. If the test results are good, disconnect the test equipment from both ends and proceed to the noise measurement test procedures, Chart 19. If the test results do not meet the requirements, notify the cable assignment desk and have the value of EML checked on the records or replace cable pair per Practice AT&T 314-410-310.

CHART 19

2-EMPLOYEE TESTS—BACKGROUND CIRCUIT NOISE AND IMPULSE NOISE

APPARATUS:

At the Hub

1 —6F or 6FR NMS with 50-kHz Network (497F)

1 —135-ohm Resistor

1 —386B Plug (310 plug with 135-ohm resistor termination)

1 —P2ES Cord or equivalent

CHART 19 (Contd)

APPARATUS:

At the Station

1 —6F NMS with 50-kHz Network (487F)

2 —135-ohm Resistor

1 —Twisted pair, guage 26.

STEP	PROCEDURE
	Note: It is recommended that this test be performed using the 789A access tool instead of the LATS control panel. The reason is to avoid tying up the LATS equipment on tests that are expected to exceed 5 minutes.
1	Request station to connect the 6F NMS to the T-R pair as shown in Fig. 14.
2	Request station to connect the 135-ohm resistor to the BP (binding post) input of the 6F NMS.
3	Request station to connect a 135-ohm resistor between the T1-R1 pair on the customer terminal block.
4	Insert the 386B plug into the T, R jack on the LATS test panel.
5	Connect the 135-ohm resistor to the BP input of the 6F NMS.
6	Using the P2ES cord, connect the 6F NMS to the T1, R1 jack on the LATS test panel.
7	Plug in the 50-kHz weighting network on the 6F NMS and calibrate the set. Request station to do same.
8	After calibration is complete, set FUNCTION switch to 600 OHM BRIDGING on the 6F NMS and request station to do same.
9	Adjust the DBRN dial to obtain a meter indication in the upper half of the meter scale and request station to do same. The background noise level is the sum of the DBRN dial setting and the meter indication.
	Requirement: Refer to Table D.
10a	If the background circuit noise requirement is met, proceed to the impulse noise test procedures, Step 11.
10b	If the background circuit noise requirement is ***not*** met, begin trouble repair work on the cable pair or request a new assignment per Practice AT&T 314-410-310.
11	Verify that the equipment is connected as given in Steps 1 through 8.

CHART 19 (Contd)

STEP	PROCEDURE
12	Adjust the 6F NMS for the impulse noise threshold given in Table E and request station to do same.
13	Reset the counter to 00 and make a 15-minute run. Request station to do same. ***Requirement:*** Refer to Table E.
14a	If the impulse noise requirement is met, disconnect all test equipment and test leads from the circuit and request station to do same.
14b	If the impulse noise requirement is ***not*** met, request a new DDS pair assignment.
15	When all testing is complete, depress the RLSE pushbutton on the LATS test panel (this will release the bay and OCU).
16	Request station to connect DSU or CSU to the 42A connecting block per Table F.

9. ISSUING ORGANIZATION

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the AT&T Documentation Management Organization.

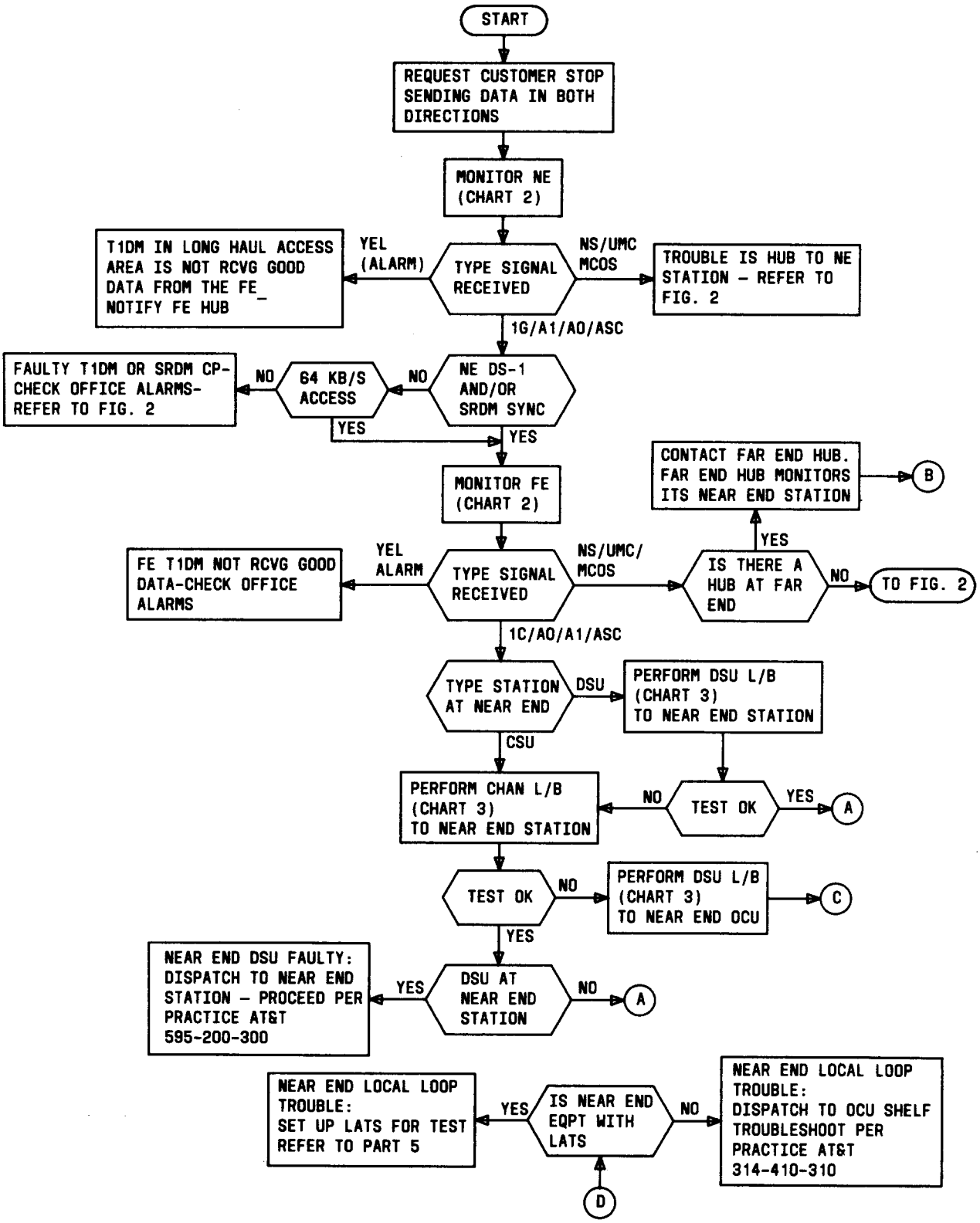


Fig. 1—Preliminary Hub Trouble Isolation Procedures (Sheet 1 of 3)

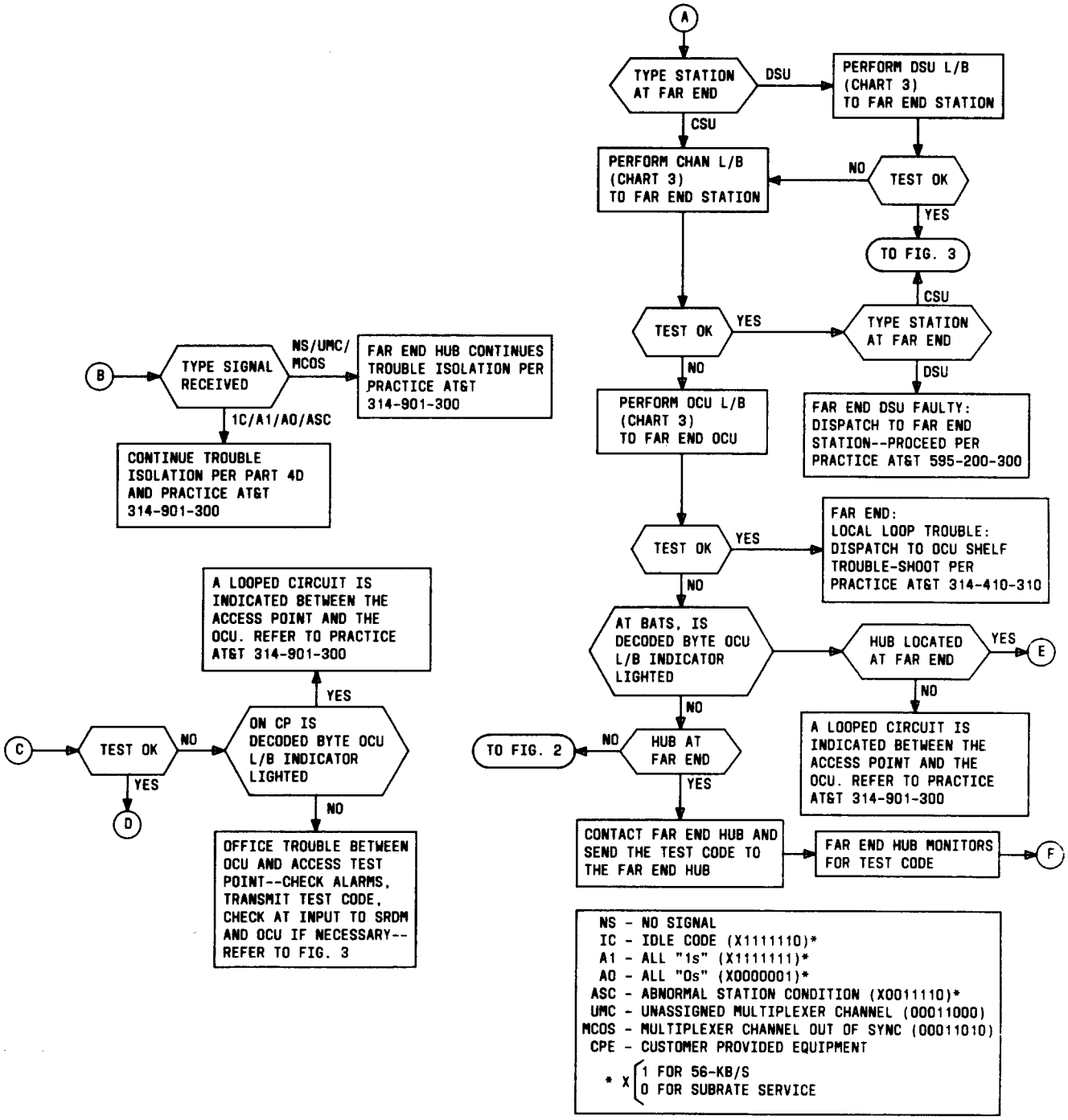


Fig. 1—Preliminary Hub Trouble Isolation Procedures (Sheet 2 of 3)

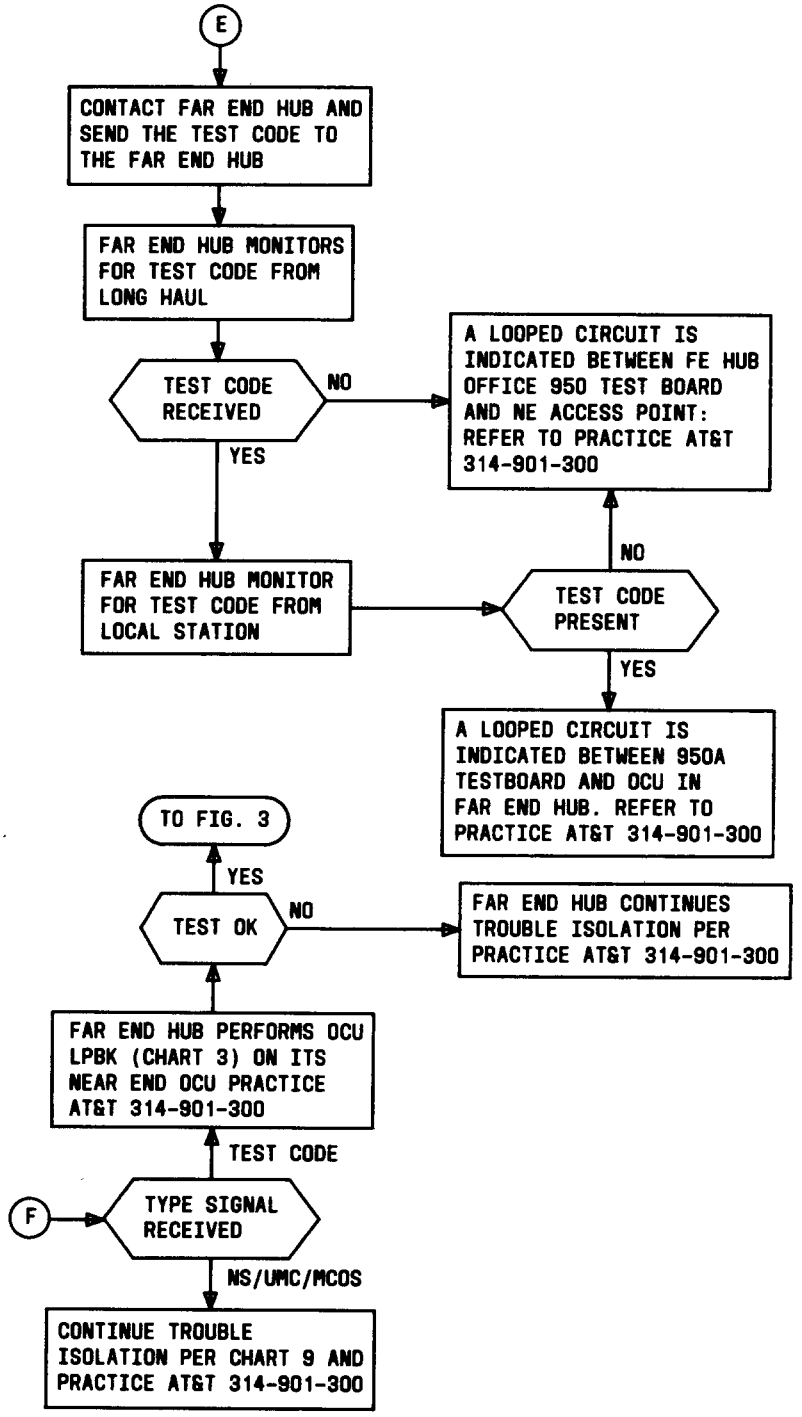
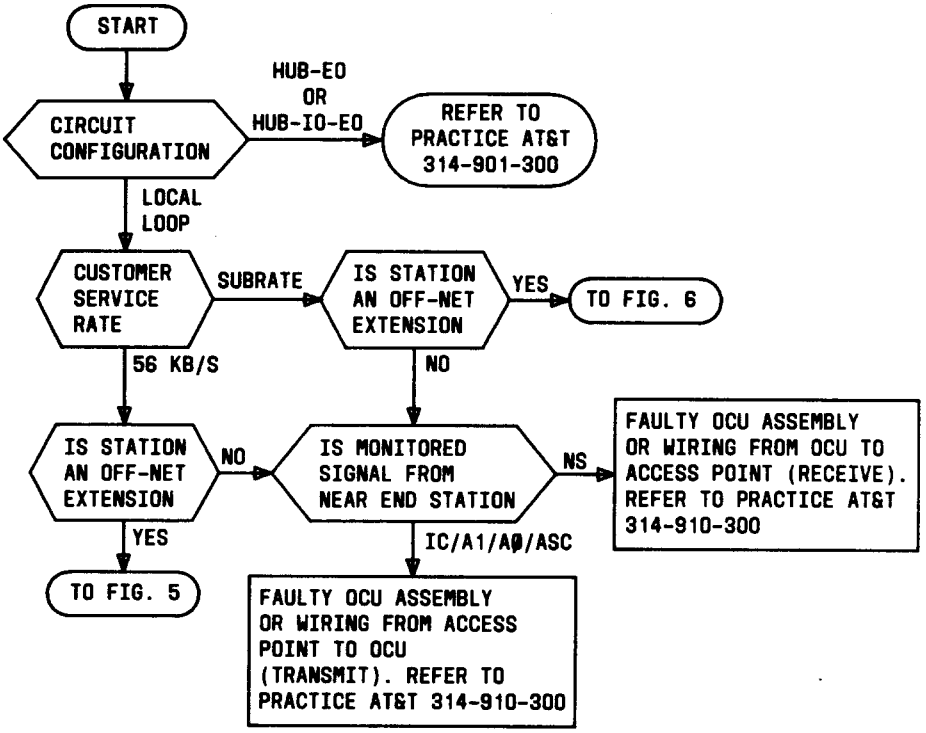


Fig. 1—Preliminary Hub Trouble Isolation Procedures (Sheet 3 of 3)



LEGEND:
NS - NO SIGNAL
IC - IDLE CODE (X1111110)*
A1 - ALL "1s" DATA (X1111111)*
AO - ALL "Os" DATA (XOOOOOO1)*
ASC - ABNORMAL STATION CONDITION (XOO11110)*

*X { 1 FOR 56-KB/S
0 FOR SUBRATE SERVICE

EO - END OFFICE
IO - INTERMEDIATE OFFICE

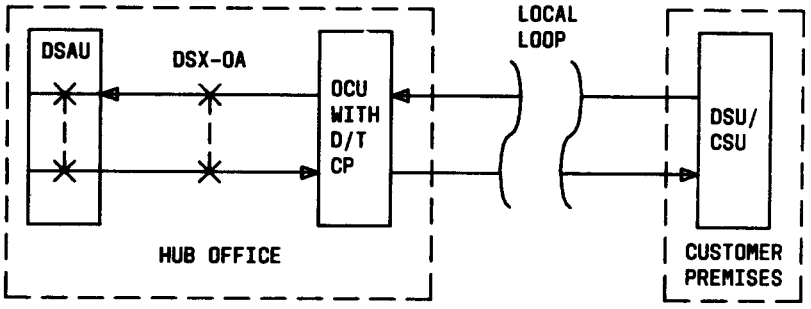
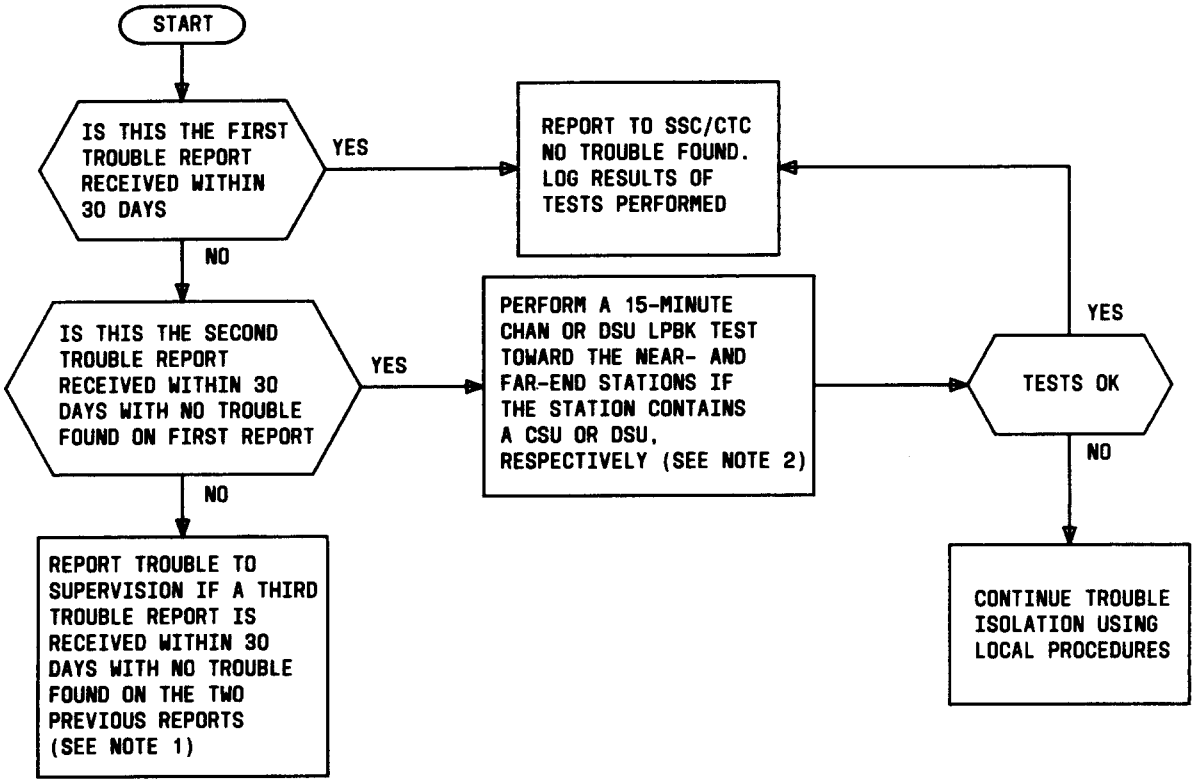


Fig. 2—Hub to OCU Circuit Analysis



NOTES:

1. AT THIS POINT THE SUPERVISOR SHOULD MAKE THE DECISION TO EITHER PERFORM AN END-TO-END TEST OR REQUEST ASSISTANCE FROM DATEC.
2. THE MAXIMUM NUMBER OF ERRORS ALLOWED FOR THE 15-MINUTE LOOPBACK TEST IS 2, AND 6 WHEN TESTING TOWARD THE NEAR-END AND FAR-END STATIONS, RESPECTIVELY.

Fig. 3—Intermittent Trouble Isolation Procedures

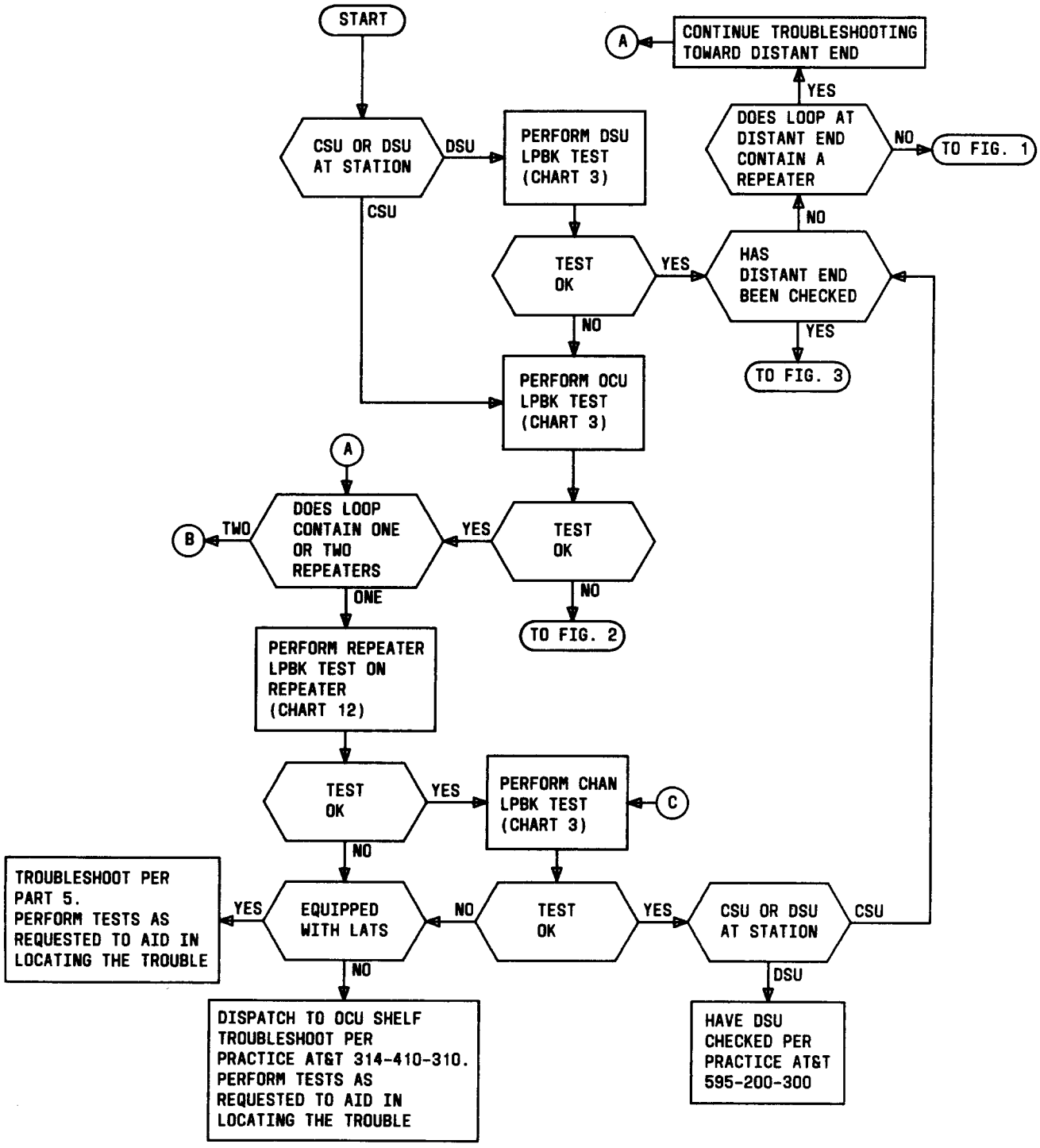


Fig. 4—Trouble Isolation Procedures for Loop Containing 56-kb/s Repeaters (Sheet 1 of 2)

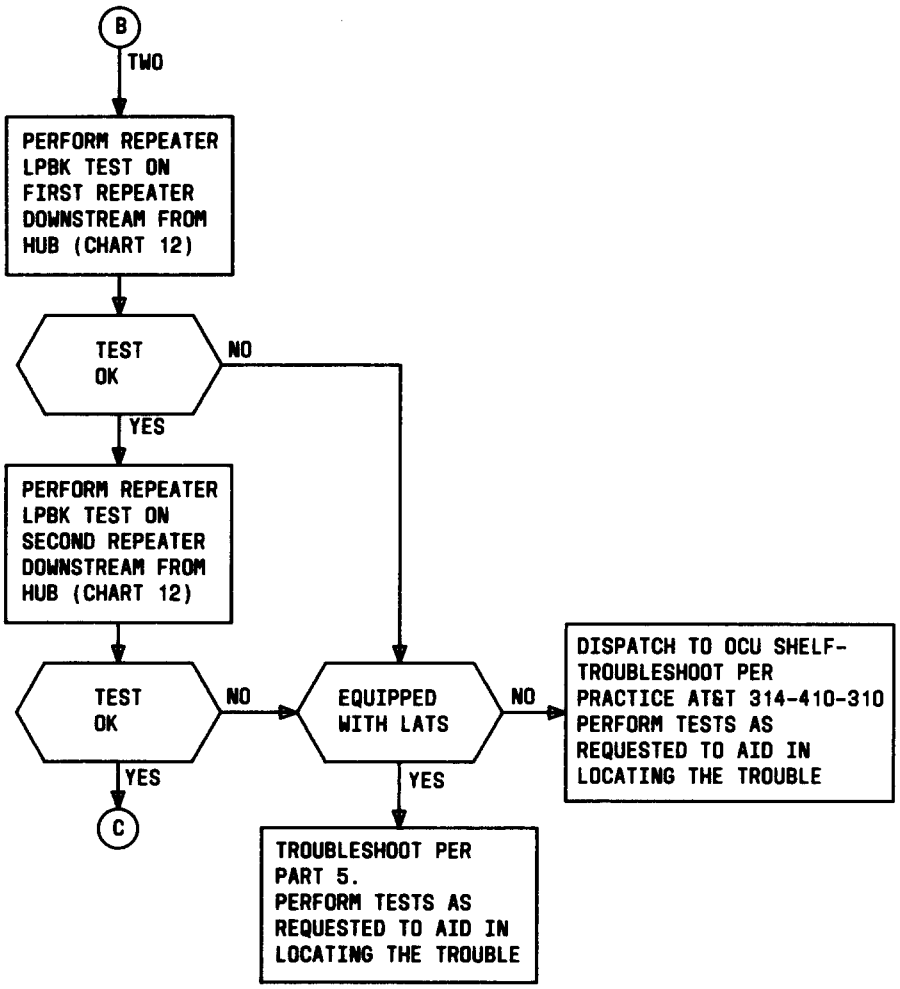


Fig. 4—Trouble Isolation Procedures for Loop Containing 56-kb/s Repeaters (Sheet 2 of 2)

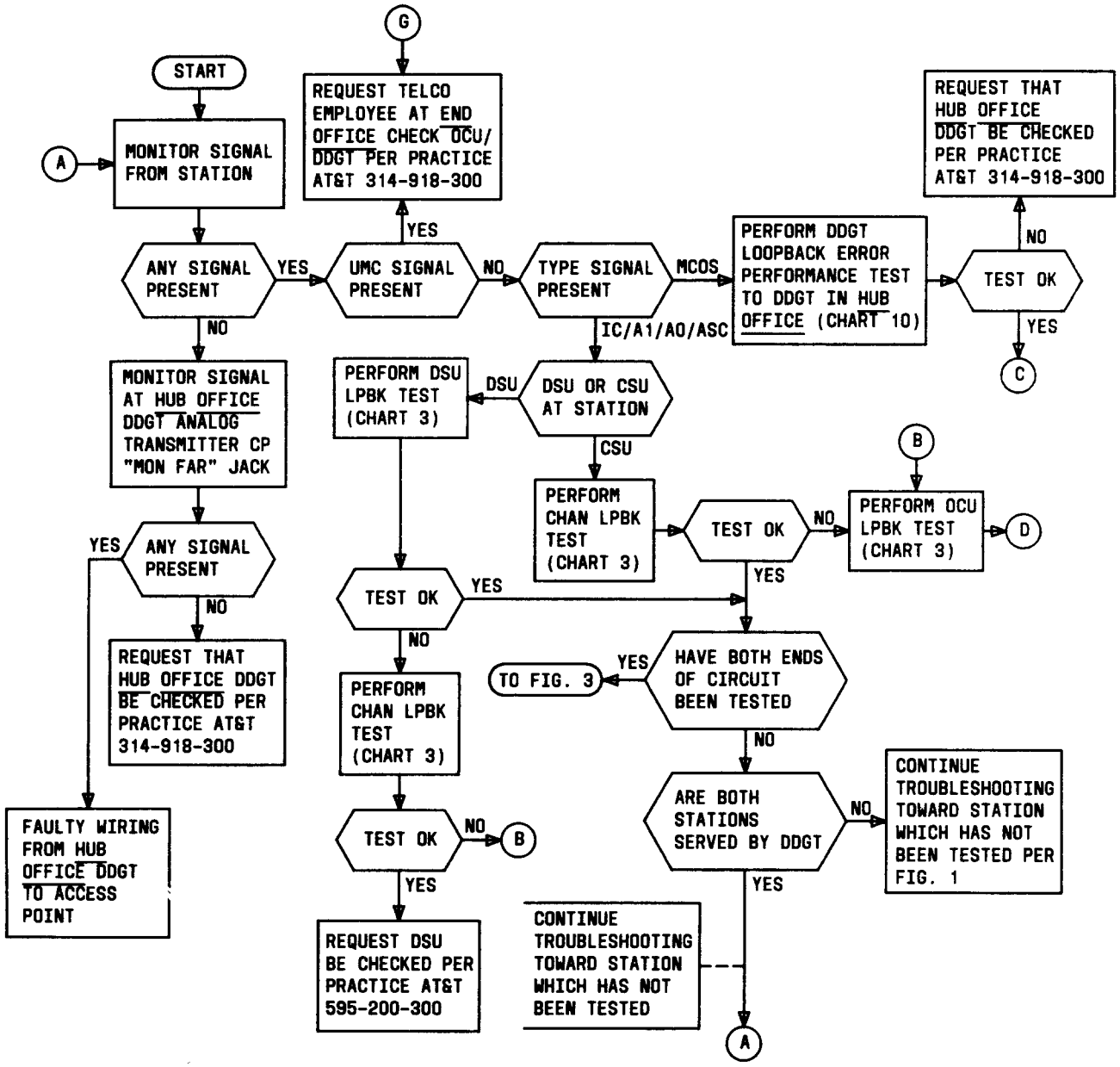


Fig. 5—Trouble Isolation Procedures for Stations Served by DDGT (Sheet 1 of 2)

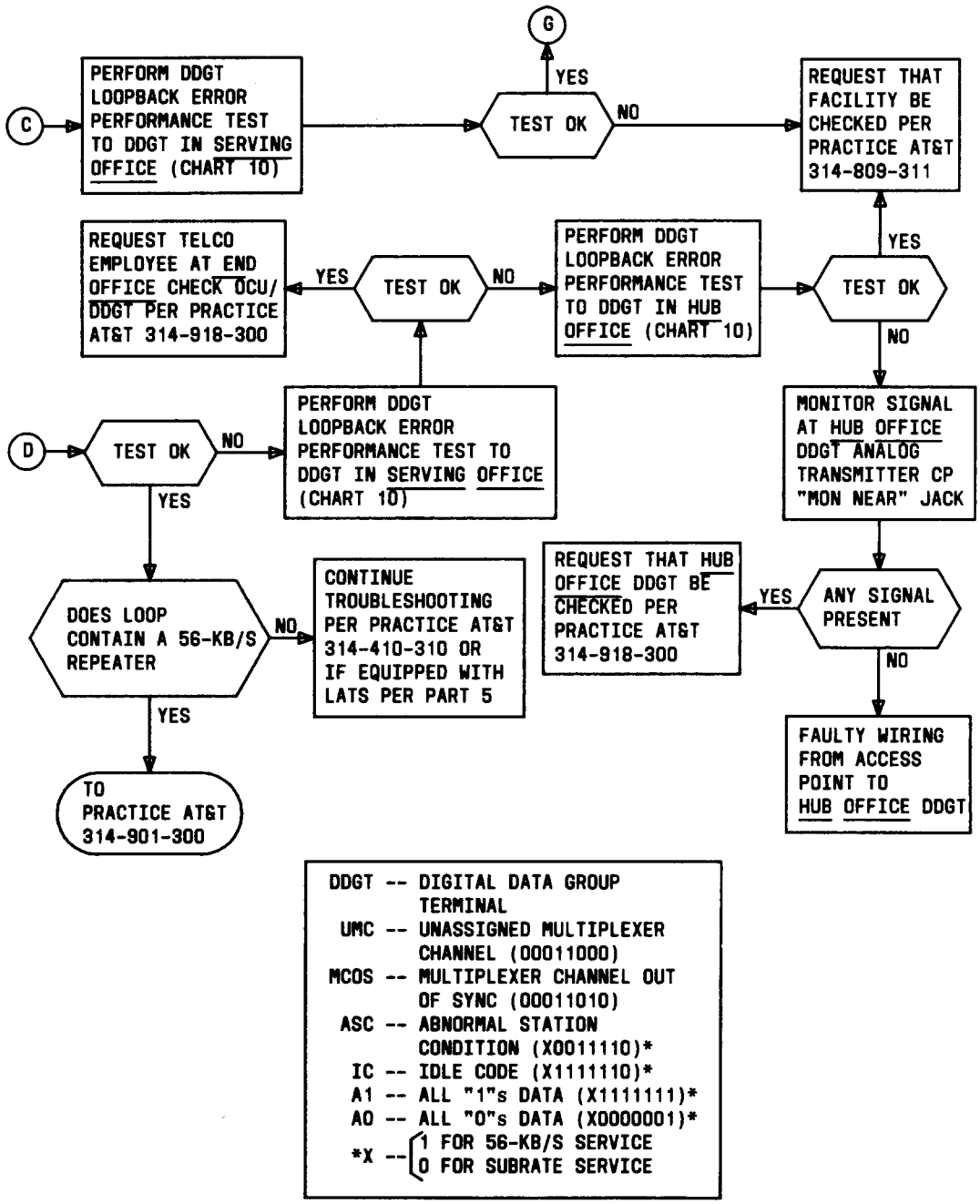


Fig. 5—Trouble Isolation Procedures for Stations Served by DDGT (Sheet 2 of 2)

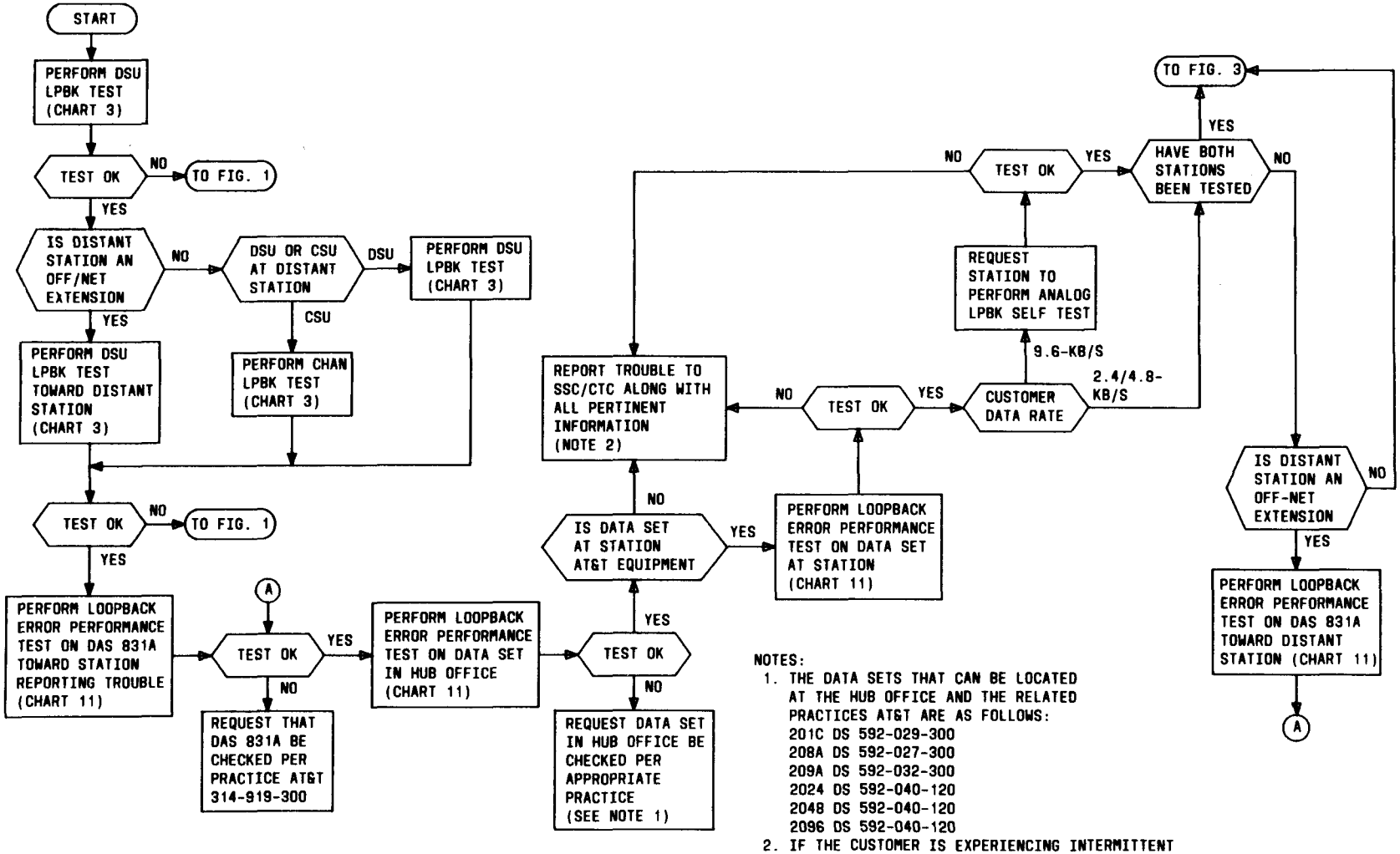


Fig. 6—Trouble Isolation Procedures for Stations Which Are Subrate Off-Net Extensions

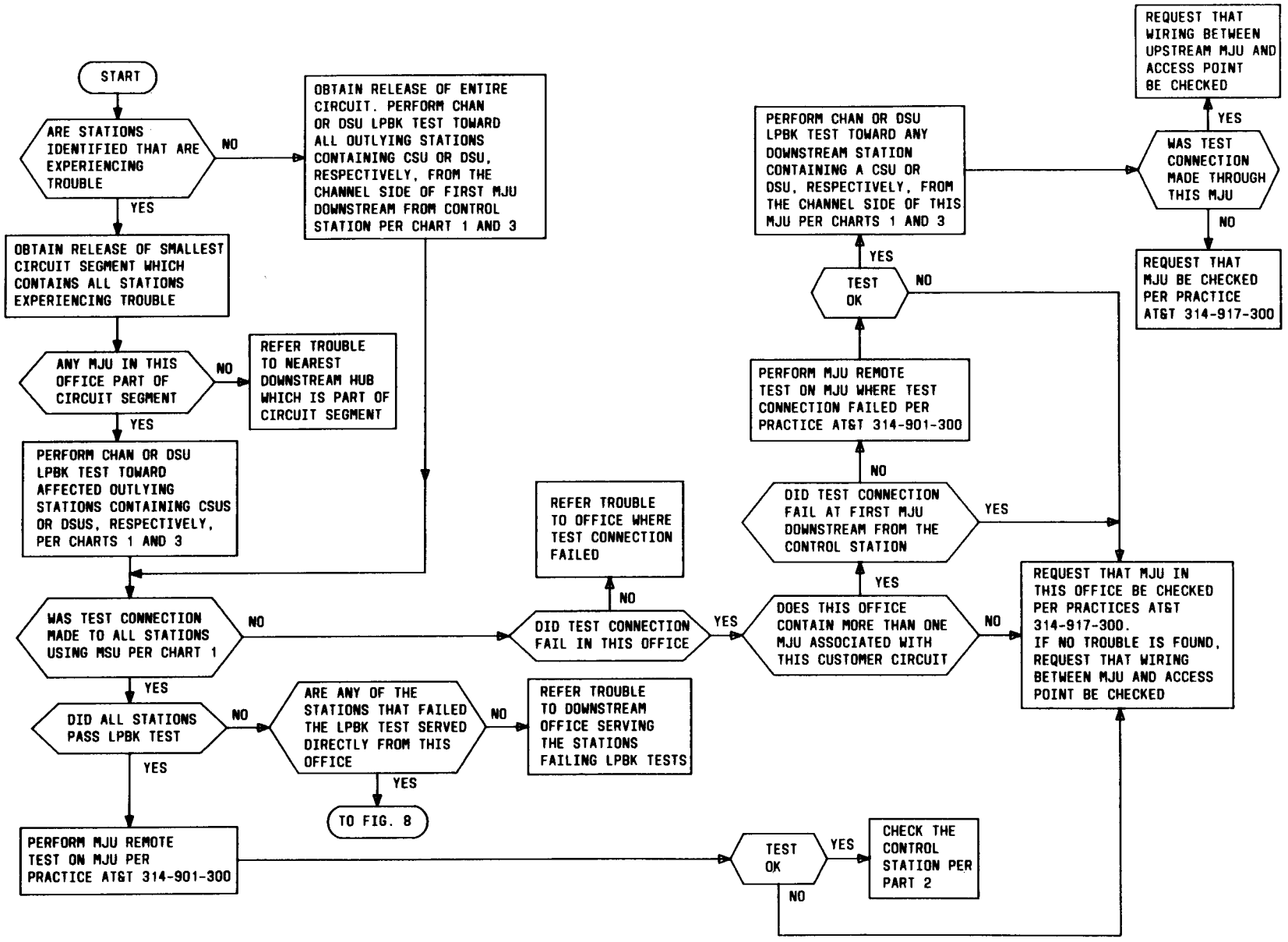


Fig. 7—Hub Trouble Isolation Procedures for a Multipoint Circuit (Sheet 1 of 2)

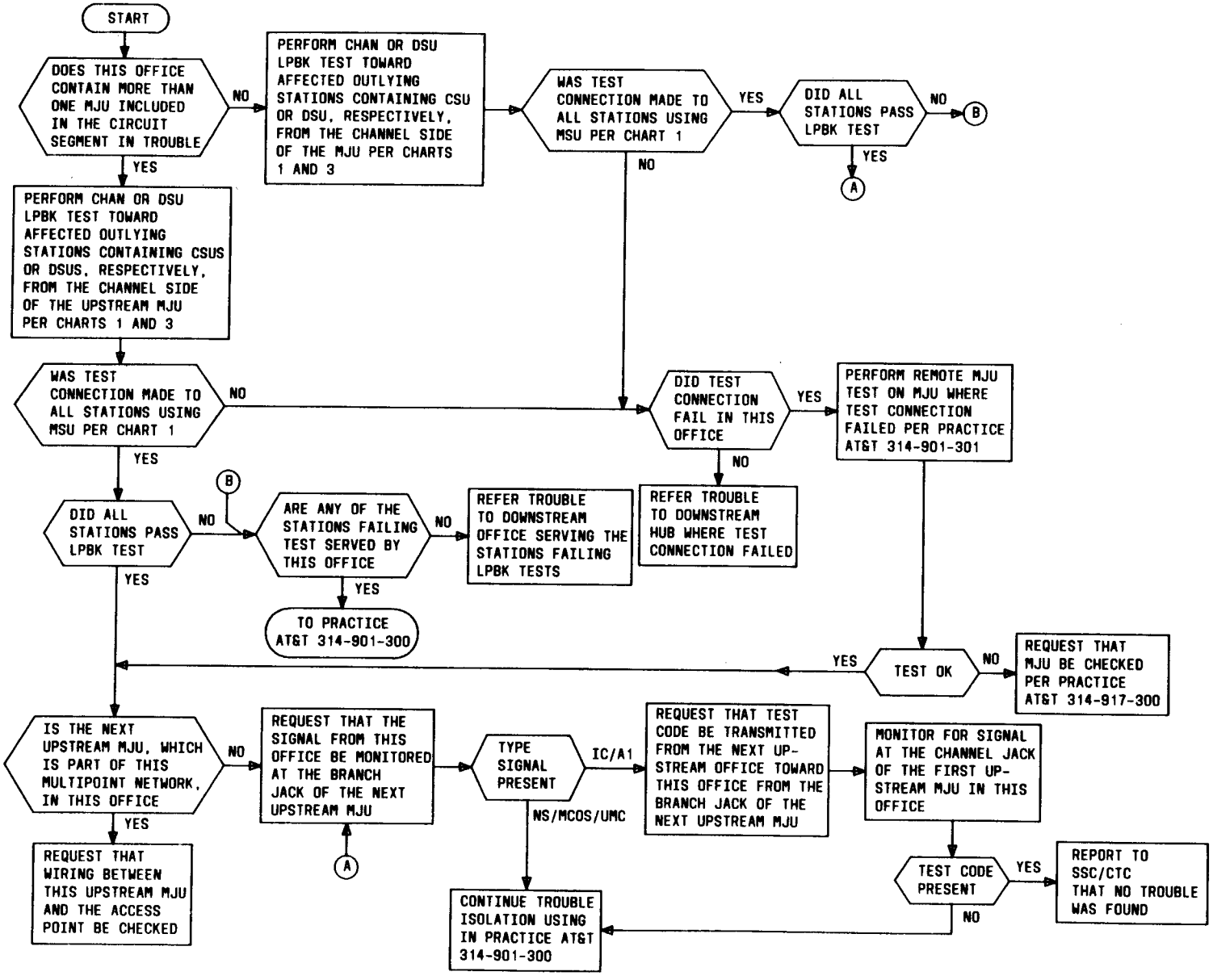
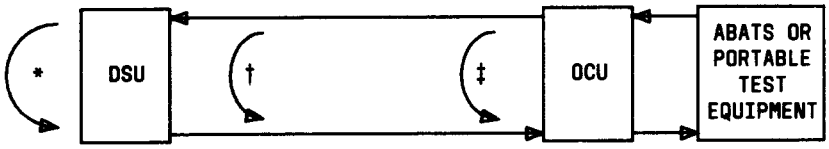
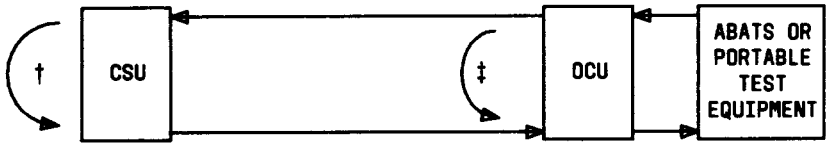


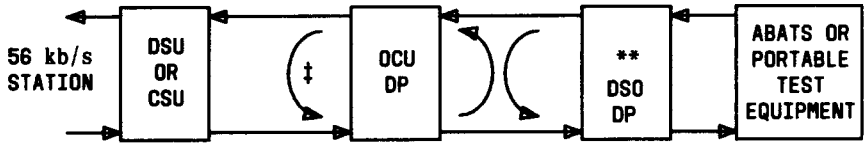
Fig. 7—Hub Trouble Isolation Procedures for a Multipoint Circuit (Sheet 2 of 2)



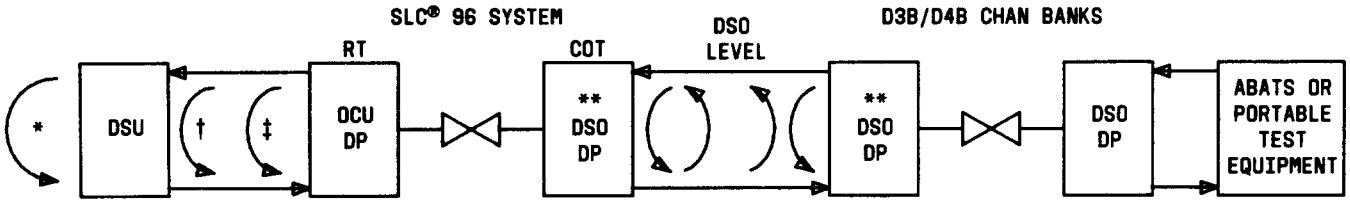
A. LOCAL CHANNEL WITH DSU



B. LOCAL CHANNEL WITH CSU



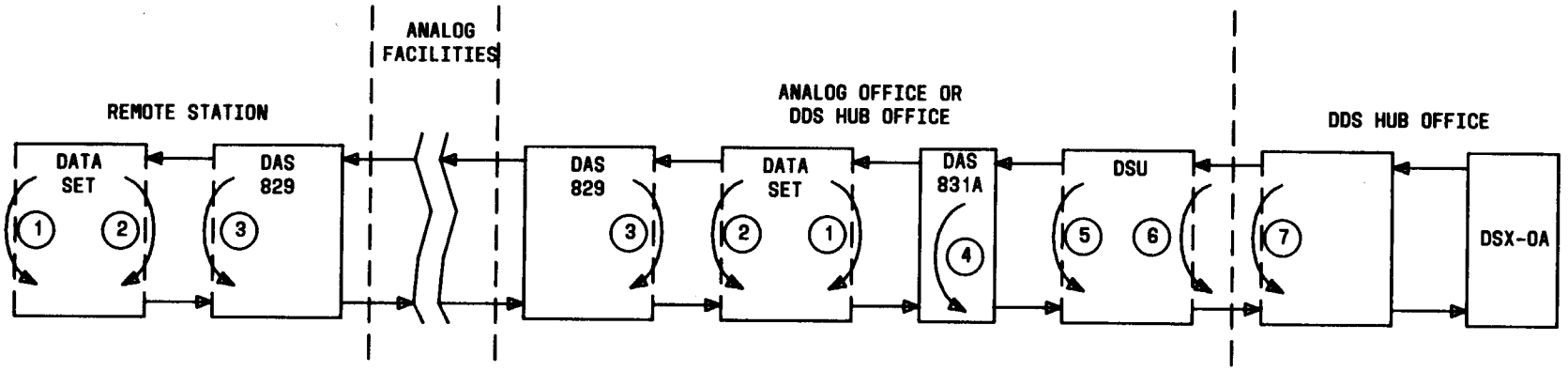
C. LOCAL 56 kb/s CHANNEL W/DSO DP



D. LOCAL CHANNEL W/DSO DPS AND SLC® 96

* DSU LOOP-BACK POINT
† CHAN LOOP-BACK POINT
‡ OCU OR OCU DP LOOP-BACK POINT
** DSO DP LOOP-BACKS IN BOTH DIRECTIONS SIMULTANEOUSLY - MANUAL TEST ONLY

Fig. 8—Local Channel Loopback Test Locations (Simplified)



(1) DIGITAL LOOPBACK POINT

(2) ANALOG LOOPBACK POINT

(3) FACILITY LOOPBACK POINT AT DAS 829

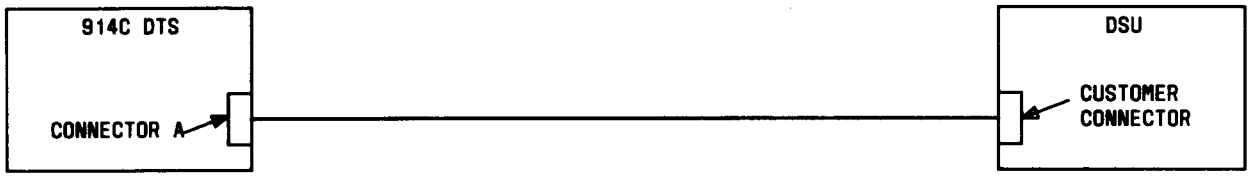
(4) DAS 831A LOOPBACK POINT

(5) DSU LOOPBACK POINT

(6) CHAN LOOPBACK POINT

(7) OCU LOOPBACK POINT

Fig. 9—Loopback Locations on a Subrate Off-Net Extension Arrangement



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	●	o	o	o	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	GRD
SD	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SD
RD	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	RD
SI	o	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SI
DS1	o	o	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS1
DWS	o	o	o	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DWS
S2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S2
DS3	o	o	o	o	o	o	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS3
TP1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP1
TP2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP2
S3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S3
DS4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS4
DS5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS5
D4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	D4
SCT	o	o	o	o	o	o	o	o	o	o	o	o	o	o	●	o	o	o	o	o	o	o	o	o	o	SCT
S5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S5
SCR	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	●	o	o	o	o	o	o	o	o	SCR
DS6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS6
S6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S6
DS7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS7
DS8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS8
S7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S7
TP3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP3
S8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S8
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		20	21	22	23	24	25	STG

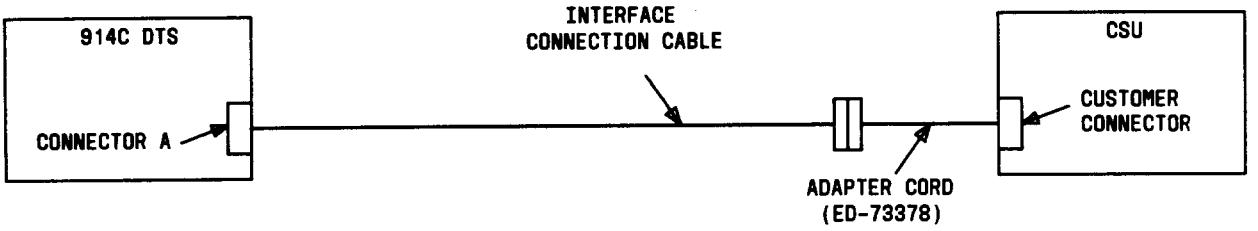
914C DTS SWITCH SETTINGS
(ALL OTHER SWITCHES NOT USED)

	SWITCH	SETTING
	INTERFACE MODE	VOLTAGE
	SI	OFF
	TEST SET MODE	SER
	COUNTER	BIT ERRORS
	FUNCTION	OFF
RCV	BIT RATE	EXT+
RCV	WORD LENGTH	511
	WORD SYNC	AUTO
	ALL INTERFACE SELECTOR SWITCHES	DEPRESSED
	TRANSMIT BIT RATE	EXT+
	TRANSMIT WORD LENGTH	511
	TRANSMIT SIG LEV	±4V

INDICATOR LIGHT DESIGNATIONS

DS1	CLEAR TO SEND
DS2	DATA SET READY
DS3	RECEIVED LINE SIGNAL DETECTOR

Fig. 10—Test Set-up for DSU and 914C DTS



914C DTS MATRIX PROGRAM

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GRD	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	GRD
SD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SD
RD	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	RD
SI	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SI
DS1	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS1
DWS	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DWS
S2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S2
DS3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS3
TP1	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP1
TP2	o	o	●	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP2
S3	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S3
DS4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS4
DS5	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS5
D4	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	D4
SCT	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SCT
S5	o	o	o	o	o	o	o	o	o	o	o	o	o		o	o	o	o	o	o	o	o	o	o	o	S5
SCR	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	SCR
DS6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS6
S6	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S6
DS7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS7
DS8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	DS8
S7	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S7
TP3	o	o	o	●	o	●	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	TP3
S8	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	S8
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		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

DS1	STATUS INDICATOR

Fig. 11—Test Set-up for CSU and 914C DTS

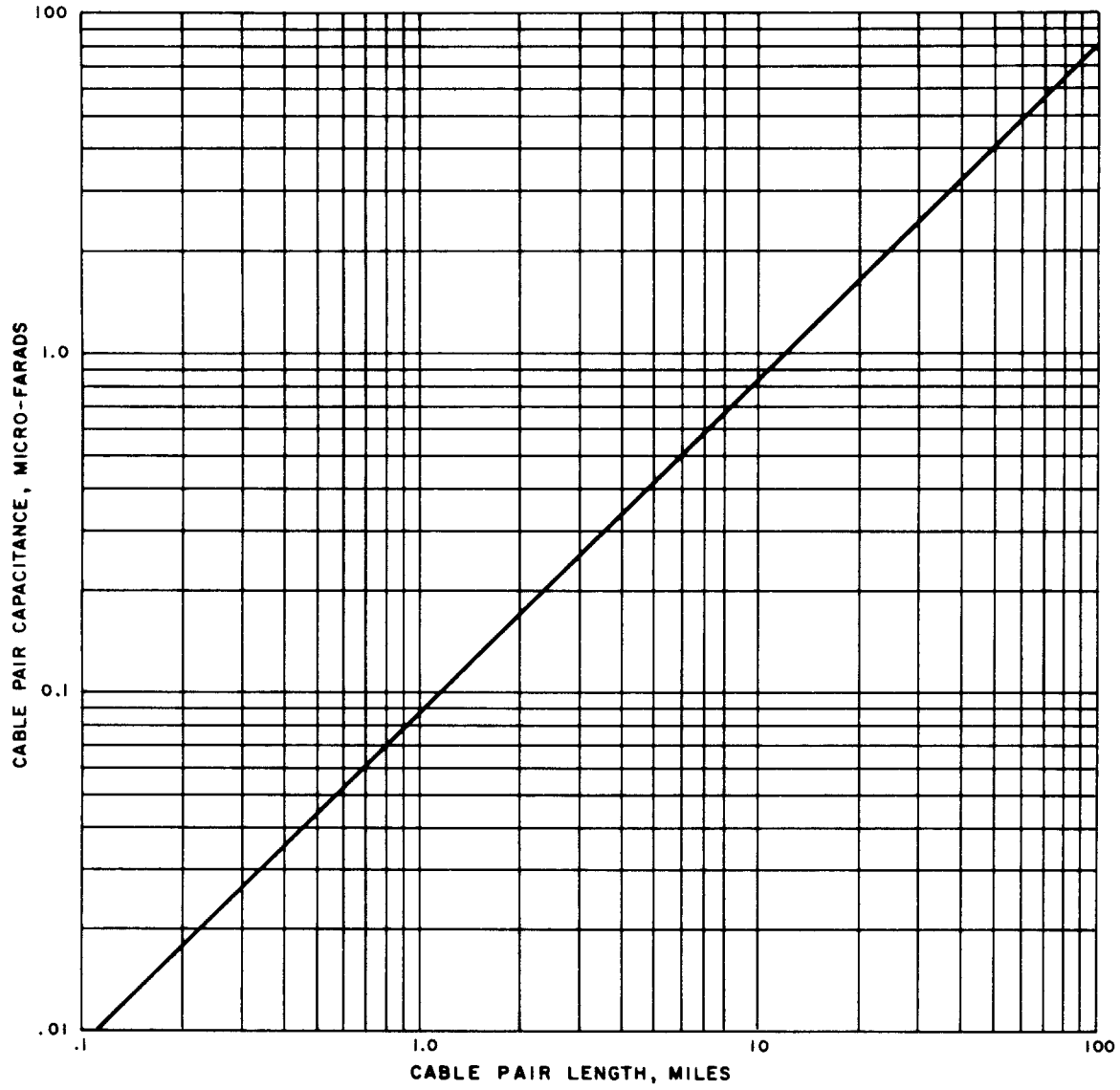


Fig. 12—Capacitance/Mileage Nemograph

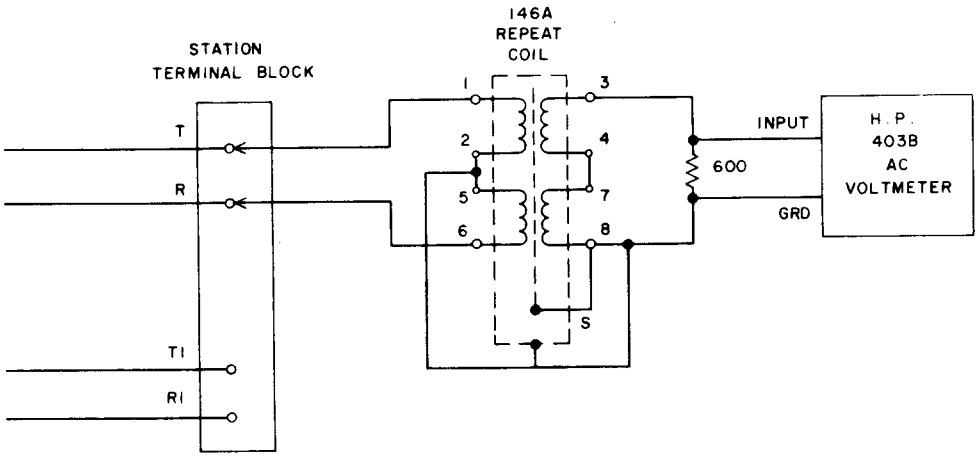
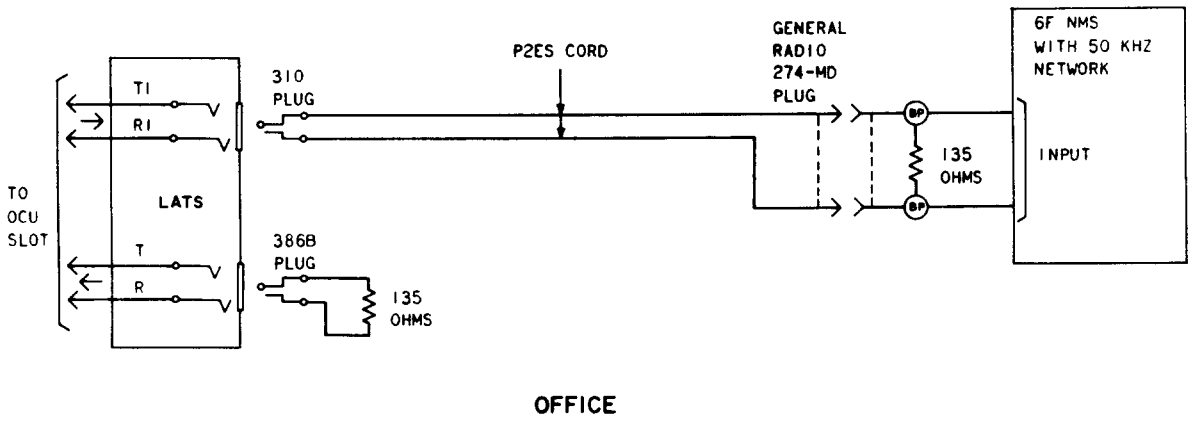


Fig. 13—Connection Arrangement for Insertion Loss Measurement at Station Using HP-403B



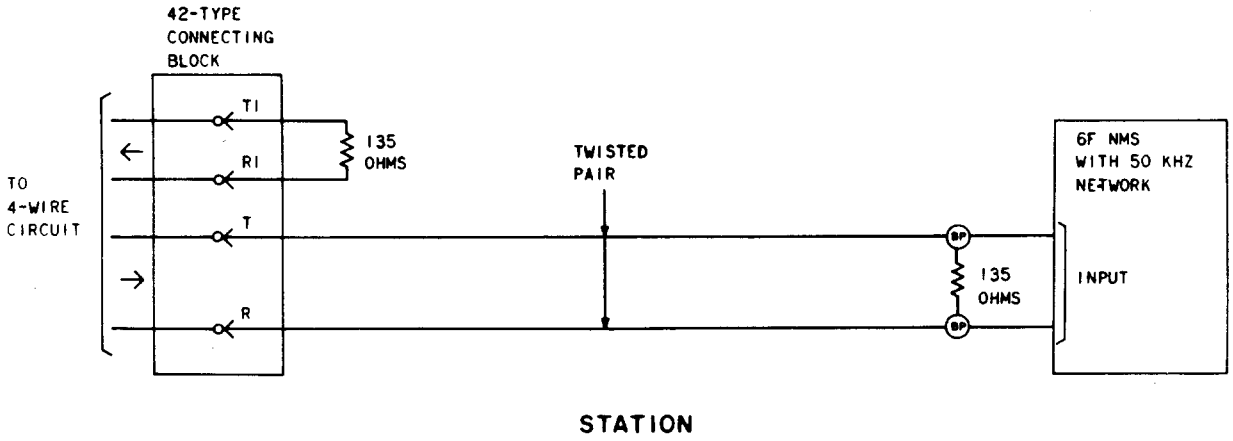


Fig. 14—Test Connection for Noise Measurement Tests

TABLE A

SERVING CENTRAL OFFICE (1-EMPLOYEE) TESTS

TEST	WHEN PERFORMED	PROBABLE CAUSE OF TEST FAILURE
Foreign Voltage	During maintenance periods	Short circuit to another cable pair
Insulation Resistance	During maintenance periods	Short or ground in cable pairs
Loop resistance	During maintenance periods	Open or short in cable pairs
Open loop capacitance	During maintenance periods	Open in cable pairs
OCU simplex voltage	During maintenance periods	Fuse in BCPA unit or battery wiring

TABLE B

SERVING CENTRAL OFFICE TO STATION (2-EMPLOYEE) TESTS

TEST	WHEN PERFORMED (NOTE 1)	PROBABLE CAUSE OF TEST FAILURE
Foreign voltage	During installation and, when directed, during trouble periods	Short circuit to another cable pair
Insulation Resistance	During installation and, when directed, during trouble periods	Short or ground in cable pairs
Loop resistance	During installation and, when directed, during trouble periods	Open or short in cable pairs
Insertion loss	During installation and, when directed, during trouble periods	Inaccurate cable records, load coils, bridged taps
Background circuit noise	During installation and, when directed, during trouble periods	Pair imbalance
Impulse noise	During installation and, when directed, during trouble periods	Pair imbalance

Note 1: It is recommended that the test exceeding 5 minutes be made using a 789A access tool instead of LATS control panel.

TABLE C

INSERTION LOSS REQUIREMENTS FOR INITIAL INSTALLATION TESTS (NOTE 1)

BIT RATE (kb/s)	TEST FREQ (kHz)	MEASURED LOSS REQUIREMENT (dB)
2.4	1.2	AML is less than or equals 34, and AML equals the EML value +5 or –2.5
	4.8	AML is less than or equals twice the value of the AML measured at 1.2 kHz
4.8	2.4	AML is less than or equals 34, and AML equals the EML value +5 or –2.5
	4.8	AML is less than or equals AML value at 2.4 kHz +15
9.6	4.8	AML is less than or equals 34, and AML equals the EML value +5 or –2.5
56.0*	28.0	AML is less than or equals 34, and AML equals the EML value +5 or –2.5
	82.0	AML is less than or equals the AML value at 28 kHz +20
	48.0	AML equals the sum of the AML at 28 kHz plus the AML at 82 kHz divided by 2. This quantity may vary ±2.5

Note 1: The insertion loss (dB) = 0 dBm (transmit level) – received level (dBm). For example, received level = –20 dBm, the insertion loss = +20 dB.

* For 56-kb/s repeatered loops, the requirement applies to each repeater section.

TABLE D

BACKGROUND CIRCUIT NOISE REQUIREMENTS

BIT RATE	MAXIMUM NOISE (kb/s)
56.0	28
9.6	31
4.8	39
2.4	42

TABLE E

IMPULSE NOISE REQUIREMENTS

BIT RATE (kb/s)	THRESHOLD (dBrn)	MAXIMUM NUMBER OF IMPULSE NOISE COUNTS PER 15 MINS.
56.0*	44	7
9.6	47	7
4.8	55	7
2.4	58	7

* For 56-kb/s repeatered loops, the requirement applies to each repeater section.

TABLE F

LOCAL LOOP CONNECTION COLOR CODE AT DSU AND CSU

	DSU		CSU
WIRE	L1/2, L1/3 L1/5 SERIES 2	L1/4 SERIES 3	L1/2, L1/3 L1/4, L1/5
T	B	G	B
R	Y	R	Y
T1	G	B	G
R1	R	Y	R