

UNITED STATES DEPARTMENT OF AGRICULTURE  
Rural Utilities Service

**BULLETIN 1753E-201**

**SUBJECT: Acceptance Tests for Digital, Stored Program Controlled  
Central Office Equipment**

**TO:** All RUS Telecommunications Borrowers  
RUS Telecommunications Staff

**EFFECTIVE DATE:** Date of Approval

**EXPIRATION DATE:** Seven years from effective date

**OFFICE OF PRIMARY INTEREST:** Central Office Equipment Branch, Telecommunications Standards Division.

**FILING INSTRUCTIONS:** This bulletin provides information formerly contained in Bulletin 384-2, Closeout Documents for Central Office Contracts, issued September 13, 1961, and rescinded February 23, 1990. File with 7 CFR 1753 and is available to RUS staff on RUSNET.

**PURPOSE:** This bulletin provides acceptance tests that demonstrate compliance with the requirements of RUS Form 522 General Specification for Digital, Stored Program Controlled Central Office Equipment.

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Administrator

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Date

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Testing, Acceptance

**ABBREVIATIONS**

AMA	Automatic Message Accounting
ANI	Automatic Number Identification
BV	Busy Verification
CFR	Code of Federal Regulations
CRT	Cathode Ray Tube
dB	Decibel
dBmO	Decibels at 1 milliwatt measured at 0 transmission level
dBrnC	Decibels above reference noise, C-message weighted
Hz	Hertz
I/O	Input/Output
IP	Informational Publication
LATA	Local Access and Transport Area
MF	Multifrequency
NXX	General term for central office codes
REN	Ringer Equivalence Number
ROH	Receiver Off-Hook
RST	Remote Switching Terminal
RUS	Rural Utilities Service
SS7	Signaling System 7
VF	Voice Frequency

## 1. INTRODUCTION

**1.1** The switching system acceptance tests specified in this bulletin should be made by the Owner or its Engineer before the equipment is placed into service or accepted for final payment. The acceptance test instructions, checklists, and guidance presented in this bulletin are based on the requirements of Part 1 of RUS Bulletin 1753E-001, "General Specification for Digital, Stored Program Controlled Central Office Equipment (Form 522)." Paragraph references in this bulletin refer to Bulletin 1753E-001, Part I, unless specifically stated otherwise. Although this bulletin was developed with new digital switches in mind, much of the material is also applicable for acceptance testing of additions and upgrades.

**1.2** Certification should be obtained from the supplier that the equipment is ready for testing, and arrangements should be made with all connecting companies before starting any call tests. The configuration of system software and equipment and the complexity of operating and diagnostic tests make it desirable to conduct a number of these tests with the assistance of the equipment supplier's representative. The diversified design and applications of the various makes of digital switches require flexibility in the implementation of acceptance tests. Special considerations should be made for test processes on additions and upgrades to "on-line" systems on a case by case basis. Any acceptance test procedures provided by the switch supplier should be reviewed and used if deemed satisfactory.

**1.3** In addition to the tests included in this bulletin the Owner or its Engineer should develop procedures and methods to test special features in the particular system.

**1.4** Before any system acceptance tests are conducted, a physical inspection of the quality of workmanship and appearance of the installation should be made. This is to be followed by an inventory to ascertain that all required equipment has been installed.

## 2. SWITCH ACCEPTANCE TESTS

**2.1 Load Box Testing:** For an overall test that the system is ready to start handling traffic, a load box is a powerful test instrument.

**2.1.1** There are two basic load box testing methods:

- a. A number of originating lines are randomly seized and a group of directory numbers are randomly dialed and;
- b. Multiple originating lines are seized simultaneously and a single directory number is dialed by all originating lines.

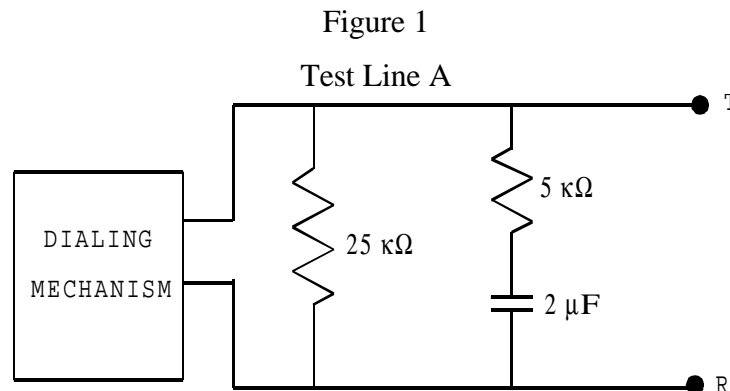
Method (a) is an excellent means to test the system's ability to complete normal subscriber calls. A minimum of ten (10) lines originating and ten (10) lines terminating are recommended. Method

(b) is normally used for testing system distribution and queuing functions but is not a true indication of the system's overall ability to handle random traffic.

**2.1.2** A load box is not required for owner acceptance testing (paragraph 3.3). However, it is advantageous to observe the operation of the supplier's load box and make an analysis of the data from the test equipment, rather than the central office equipment, to determine that the machine is meeting the requirement of no more than two lost calls in 10,000 (paragraph 3.2). If the machine fails the two lost calls in 10,000 criterion, corrective action by the supplier should be taken.

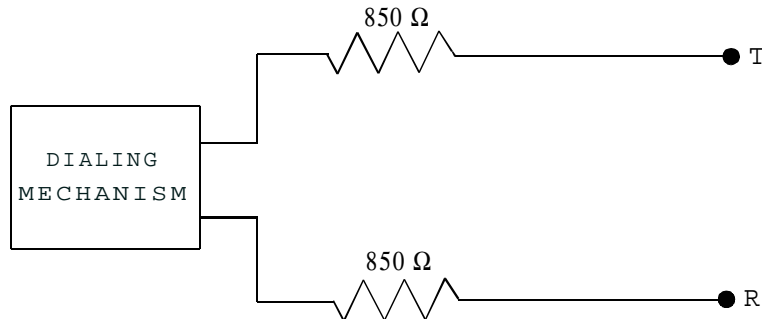
**2.2 Test Line Requirement:** For acceptance testing, two test lines are required; one to simulate a short loop and one to simulate a 1900 ohm loop.

**2.2.1** Test line A is shown in Figure 1. The dialing mechanism consists of two 500 type telephone sets (one dial-pulse, one DTMF) equipped with ringers of the lowest frequency supplied by the switching equipment, or test equipment with the capability of dial-pulse and DTMF signaling and an equivalent ringer impedance of a 500 type telephone set. It should be possible to connect this test line to various lines throughout the switching system. This line is equivalent to a short loop.



**2.2.2** Test line B is shown in Figure 2. This test line provides a nominal 1900 ohm loop resistance when connected to a dialing mechanism with a 200 ohm resistance. The dialing mechanism consists of two telephone sets or test equipment capable of both dial-pulse and DTMF signaling. The mechanism should also include a sufficient number of bridged high impedance ringers to provide a Ringer Equivalence Number (REN) of five. This test line should also be movable from line to line throughout the system.

Figure 2  
Test Line B



**2.3 Sample Sizes:** The number of lines or trunks to be tested should be determined from Table 1. The complexity and amount of time consumed in making each individual test should also be considered when choosing the test sample sizes.

TABLE 1

Minimum Number of Lines, or Trunks in a Trunk Group by Size (Two-Trial method)

Total Number of Lines in Office or Trunks in a Group	Trial 1 Lines or Trunks (1)	Trial 2 Lines or Trunks (2)	Threshold of System Failure (3)
1 - 25	All	--	0
26 - 50	26	--	0
51 - 100	33	17	1
101 - 200	43	22	1
201 - 300	47	28	1
301 - 400	49	31	1
401 - 600	50	30	1
601 - 800	50	35	1
801 - 1,000	55	30	1
1001 - 2,000	55	35	1
2001 - 3,000	65	80	2
3001 - 20,000	70	80	2

Notes:

1. Minimum quantity to be tested. If a single failure is encountered during Trial 1, complete Trial 1 and then perform Trial 2.
2. Additional quantity to be tested if a failure is encountered during Trial 1.
3. Total number of failures permitted for both trials.

**2.3.1** Table 1 call volumes will produce results with a 99 percent confidence level that a system which has gone through all manufacturer's tests will meet the criterion of having only a 0.02 percent (2 calls failed per 10,000 attempts) or less expected defective rate (paragraph 3.2). This is a two-trial test and should be considered the minimum sample size to be tested in a system. If the system passes Trial 1, Trial 2 is omitted. Table 1 is to be considered a minimum sample size for the number of subscriber lines in the office or trunks in trunk groups. A larger sample may be used if considered necessary.

**2.3.2** The number of test calls that should be made per test line are described in item 3.1 of this bulletin.

**3. LINE TESTING PROCEDURE:** Determine which of the line terminals will be used for originating calls and which will be used for terminating calls. The number of lines to be tested using dial-pulse or DTMF signaling can be determined in accordance with the percentage of lines configured for such signaling in the office but no less than 25% of the tests should be made using dial-pulsing.

**3.1 Test Line A:** Use test line A for originating test calls on a randomly selected group of lines in agreement with the quantities spelled out in Table 1. The originating calls should be directed to as many terminations and types of terminations as time permits. Each line should be directed to no less than one terminating subscriber line and at least two calls should be routed through all available trunk groups to check for proper trunk selection. Follow the requirements of Table 1 for failures. Use Checklist A.

**3.2 Test Line B:** Using test line B for terminating tests, check the sample lines for proper termination operation. These are ring, ring trip, supervision and talking. Follow the requirements of Table 1 for failures. Use Checklist A.

**3.3 1900 Ohm Loop:** Reverse test lines A and B and make enough tests to ensure that the system will work with an originating 1900 ohm loop. Use Checklist A.

**3.4 Progress Tones:** Check for call progress tones. Use Checklist A.

**3.5 Lockout:** The line equipment should be seized but no digits dialed. When time-out occurs, the sequence of tones should be observed. The line on lockout should be automatically cleared from that condition and arranged for normal line seizure on a subsequent off-hook condition when the permanent off-hook condition is cleared. Refer to paragraph 6.4. Use Checklist B.

**3.6 Timing Checks:** The following timing checks should be made. Use Checklist B.

**3.6.1** Check ringing cycle. Refer to paragraph 19.6.2.

**3.6.2** Check for permanent signal timing by seizing the line equipment but not dialing. Refer to paragraph 18.3.

**3.6.3** Check for partial dial timing by dialing the first two digits and waiting for lockout. Refer to paragraph 18.4.

**3.6.4** Check for called party disconnect. Refer to paragraph 18.7.

**3.7 Vertical Services:** Where vertical services are available, test these from a properly class marked line. Since the RUS specification does not spell out the exact operating procedure for these services, it is necessary to use the supplier's description of their operation, how to place them in service, and activate them from the subscriber's telephone. Refer to paragraph 5.5. Use Checklist B.

**3.8 Nuisance Trap:** Where a nuisance trap is provided, make a call to a terminating line that has been so marked and check the operation. Refer to paragraph 7.9. Use Checklist B.

**3.9 911 Service:** When basic 911 emergency service is provided, make a 911 call and verify that 911 is routed to the proper lines or trunks. If additional 911 features are provided, refer to paragraphs 5.19 through 5.19.9 for parameters. Use Checklist B.

**3.10 Semi-Postpay Pay Stations:** Check the operation of semi-Postpay pay stations if they are equipped. If the pay stations use the regular toll trunks, originate a call to the operator and check for spurt of low tone to the operator and make certain it cannot be heard at the pay station. The operator should be able to repeat this tone. Check that conversation with the operator, 911 or other emergency numbers is possible without depositing a coin. On local-to-local calls, check that the calling pay station cannot talk without deposit of coin after answer by the called party. Check that all calls to pay stations class marked to receive calls can be answered without coin deposit. Check that the pay station can handle 1+ and 0+/0- calls in the appropriate manner, the operator can ring back the pay station, and deposited coins are collected. Use Checklist C.

**3.11 Prepay Pay Stations:** On calls to the operator, if regular operator trunks are used, check for spurt of low tone to the operator and make sure it cannot be heard at the pay station. Make a call to the operator from the pay station and to a local number and check for collect and refund in each instance. Check that conversation with an operator, 911 or other emergency or coin-free numbers is possible without coin deposit. Check for transmission in both directions. Check for operator ringback to the pay station. Check that all calls to pay stations class marked to receive calls can be answered without coin deposit. Check that the pay station can handle 1+ and 0+/0- calls in the appropriate manner. Use Checklist C.

**3.12 Intercept:** Dial unassigned directory numbers and office codes to determine if the calls are routed to intercept. The calls are to be routed as required in RUS Form 522, Part III, item 10.2. Place an assigned directory number on changed number intercept and dial it to determine that the



proper option as required in RUS Form 522, Part III paragraph 10.2, is provided and is operating satisfactorily. Refer to paragraph 7.8. Use Checklist C.

**3.13 PBX Rotation:** Establish a PBX group in the system. The minimum number of lines in the group should be three for the test. Connect a telephone to each line. Dial the assigned PBX directory number from the test line. When the first phone rings, answer and leave off-hook. Continue to dial the PBX access number until all lines have been busied out, then test for line busy tone. Check the ability to assign one line in the PBX group as non-hunting for night service. Use Checklist C.

**4. INTEROFFICE TRUNK TESTS:** The minimum sample size is determined from Table 1.

**4.1 Outgoing:** Access the two-way and one-way outgoing trunk groups from subscriber lines in several different line groups. Attempt seizure of all trunks in the trunk group. On VF trunks, access the signaling circuit, check out pulsing of dial pulses or MF tones to determine that the registers are operating properly. Make a talking test by connecting a telephone instrument with proper impedance matching equipment to the frame side of the trunk. This can be done at the jacks provided. Use Checklist D.

**4.1.1** If the trunks are direct digital connected (no channel bank) and the connecting office is not ready for tests, the trunks can be connected to a portable channel bank, or appropriate test equipment, in order to make the proper voice frequency and signaling tests.

**4.2 Incoming:** If the connecting office is prepared for tests, this is obviously the simplest method of making inward trunk tests. This is not likely to be the case; therefore, other methods should be used and the connecting company equipment simulated. For inward voice frequency trunk testing, a test set can be plugged into the line side jack of two-way or incoming trunks and the tests made inward on loop dial trunks. For E & M trunks, the E & M leads are to be accessed with the test set for signaling inward; and calls completed to a local line and or another trunk in case of tandem switching. In each case, a talking test should be made to ensure continuity. Use Checklist E.

**4.2.1** If the trunks are direct digital connected and the connecting company is not ready for tests, a portable channel bank, or appropriate test equipment, can be used to simulate the distant end. The trunk should be pulsed with the proper mode. For dial pulse signaling, a simple telephone will suffice; but if MF signaling is required, an MF sending test set is needed.

**4.3 Busy Verification:** Place a call between test lines or from one line to the milliwatt terminal. If possible, have the connecting company verify the connection. If this is not possible, access the busy verification trunk (or toll completing trunk) from the distant office end either by a portable channel bank if the trunk is direct digital connected or jack access if the trunk is VF. Dial the BV access code shown in RUS Form 522, Part III, item 10.1.2. Also access the call from the

maintenance center or appropriate test center. Check that proper transmission can take place between all parties. Use Checklist E.

## 5. ALARMS

**5.1 Alarm Sending and Checking:** Check alarms by causing a trouble indication in each level of alarm. Determine that the alarm is sent to the proper trunk or trunks, that on answer of these trunks a distinctive tone is given and that the operator, or equivalent, can release the trunk by dialing the alarm checking number over another trunk. Determine that a higher priority alarm will override an alarm seizure by a lower priority alarm. Dial the alarm checking number, and determine that the proper alarm indication is given. Refer to paragraph 15.1. Use Checklist F.

## 6. POWER EQUIPMENT

**6.1 Charger Voltage Settings:** Check the operation of the charger against the operating instructions supplied by the manufacturer. The equalizing voltage should not exceed the upper limit of the operating voltage specified by the central office equipment supplier. Use Checklist G.

### 6.2 Charger Noise

**6.2.1 Electrical:** Measure electrical noise as indicated in paragraph 19.3.3. Use Checklist G.

**6.2.2 Audible:** A conclusive test of acoustic noise is detailed in paragraph 19.3.5. Use Checklist G.

**6.3 Charger Inventory:** The number of chargers supplied are to meet the requirements of paragraph 19.3.8 for central offices and 23.6.1 for remote switching terminals. Use Checklist G.

**6.4 Batteries:** Inspect the condition of the batteries, especially the items in the following paragraphs. Use Checklist G for all battery tests.

**6.4.1** Check cell voltages. If low voltage conditions exist, an equalizing charge should be applied in accordance with manufacturer's recommendations.

**6.4.2** Check the specific gravity of each cell. Refer to paragraph 19.2.4 and the manufacturer's recommendations.

**6.4.3** Check that the electrolyte level is within the limits prescribed by the manufacturer.

**6.4.4** Make certain the initial conditions of the battery are recorded on the maintenance record and that the proper instruments (RUS Form 522, Part III, items 12.1.3 and 12.1.4) are supplied if required.

**6.4.5** Check for faulty or cracked containers.

**6.4.6** Cells or units should be checked for proper spacing and to ensure that they are not touching (approximately 1/2 inch spacing between cells is customary).

**6.4.7** Check that all connections are tight and torqued to the supplier's specifications.

**6.4.8** Ensure that no cell top touches the metal of a rack or cabinet or any other piece of equipment.

**6.4.9** Check that each cell is equipped with an explosion control device.

## **7. MAIN DISTRIBUTING FRAME**

**7.1** Check that the main frame protectors furnished are listed in RUS Informational Publication 344-2, "List of Materials Acceptable for Use on Telecommunications Systems of RUS Borrowers." Ensure that the distributing frame provides adequate facilities for testing all lines. Check that all outside plant pairs are equipped with acceptable protector mountings and arresters or grounding modules. Check that the distributing frame can terminate the number of cable pairs listed in RUS Form 522, Part III, item 13.1. Use Checklist H.

## **8. SUBSCRIBER LOOP TEST FACILITY**

**8.1** A subscriber loop test set, or equivalent, should be used to make the tests shown in paragraph 15.2.3.1. Test each function and record the results. Use Checklist H.

**8.2** If the same tests of subscriber lines in remote switching terminals (RST's) are not possible from a centralized location, then a separate means of making these tests should be provided. Use Checklist H.

## **9. RINGING GENERATORS**

**9.1** The ringing generators should be provided in accordance with paragraph 19.5. If the ringing power is generated integral to the switching system, it should meet the required output voltages, voltage regulation, cross ring requirements, frequency stability and other parameters specified in paragraph 19.5. Use Checklist H.

**9.2** Check the output voltage of each frequency to determine that they meet the values specified in item 19.5. Use Checklist H.

## 10. TONES AND TONE LEVELS

**10.1** Listen to and measure the various call progress tone levels. The levels are to be measured at the MDF with a suitable dB measuring device. Refer to paragraph 9.2. Use Checklist I.

## 11. LINE LOAD CONTROL

**11.1** When line load control is specified, the Owner should specify which lines are to be assigned to each level of line load control priority provided. It should be tested in whichever mode is supplied and the lines for each priority tested for ability to originate and complete calls. Make certain that lines without priority cannot originate calls or tie up circuits in any manner. Use Checklist I.

## 12. SWITCHED ACCESS SERVICE

**12.1 Feature Groups:** Verify that the proper Feature Groups have been furnished. Use Checklist I.

**12.1.1** Verify that all appropriate carriers have been assigned to the proper feature group.

**12.1.2** Place a call to all assigned carriers and verify the proper signaling sequence and carrier identification.

**12.1.3** Verify that calls originating from coin lines toward switched service provide TSPS-type signaling or are blocked.

**12.2 Equal Access:** In Feature Group D, verify equal access capability. Use Checklist I.

**12.2.1** Verify that presubscribed customers do not have to dial the carrier access code.

**12.3 Automatic Number Identification Equipment (ANI):** The ANI equipment should be connected to a suitable test set. If required, a portable channel bank, or appropriate test equipment, can be used to convert the digital signal to analog. There is a possibility that a digital to analog trunk, such as an intercept trunk to a recorder, can be temporarily assigned to the AMA trunk group and used for this test. Use Checklist I.

**12.3.1** Verify the calling and called numbers.

**12.3.2** Verify that the proper billing information is sent to the AMA equipment.

**12.3.3** Verify remote polling capability if that feature is required.

### **13. PLANT REGISTERS**

**13.1** In stored program controlled central offices, the traffic recording is done in the processor memory. If there are traffic or other types of registers supplied with the system, determine that they perform the function for which they are supplied. Refer to paragraph 16.4. Use Checklist I.

### **14. FIRE CALL EQUIPMENT**

**14.1** The fire call equipment and features should be checked in accordance with the operation of the system provided. Use Checklist I.

### **15. DRAWINGS AND PRINTED MATERIAL**

**15.1** Check that the required sets of drawings and instructions are available. Refer to paragraph 24.3. Use Checklist I.

**15.2** Make certain that there is sufficient detailed material to allow the maintenance people to operate the I/O information terminal of the system. Use Checklist I.

**15.3** Check that the floor plan includes space reserved for future additions and make certain the dimensions shown on the drawing coincide with the equipment as installed and the actual dimensions of the building. Use Checklist I.

### **16. PROCESSOR TESTS**

#### **16.1 Common Processor Equipment Transfer (Manual and Automatic):**

Ensure that all manufacturer's instructions for verifying redundant systems and inducing failures in the system are adhered to prior to making any redundancy checks. If possible, these tests should be made before the central office is cut into service. The purpose of this test is twofold: first, to verify that automatic and manual transfer of redundant equipment operates; and secondly, to verify that the redundant processor equipment functions properly. Test calls should be made before and after each transfer. Check that established calls are not lost due to the transfer. Typically, the following circuits should be checked, as applicable: processor, memory, clock, and time slot interchange. This listing is not meant to be all-inclusive. Every redundant circuit should be tested, where practicable. Use Checklist J for all processor and synchronization tests.

**16.1.1** The above test should also be made to check the operation of the automatic transfer features.

## **16.2 Clock Synchronization:**

**16.2.1** The central office clock and network synchronization system requires the ability to synchronize with external clocks for network synchronization, including detection of slips, timing, jitter and wander, in a digital-to-digital environment. It is also required to operate in an independent mode without significant loss of accuracy or stability when there is an external loss of frequency reference. Checklist J includes tests that will verify the above.

**16.3 Administrative Functions:** All the following functions should be able to be performed locally as well as remotely if required.

### **16.3.1 Directory Service Orders**

**16.3.1.1** Verify that the list of directory numbers can be printed out in numerical order with their assigned class of service;

**16.3.1.2** Verify that all information regarding directory numbers can be printed out. This should include lines on lockout, intercept, unassigned, etc., as described in paragraph 14.4.

**16.3.1.3** Enter a directory number and alter the information. Verify that the change is made; and

**16.3.1.4** Verify that a list of equipment's busied out for maintenance can be printed out.

### **16.3.2 Trunk Group Information**

**16.3.2.1** Verify that the trunk group numbers can be printed out in numerical order.

**16.3.2.2** Enter the hunt group number of any assigned trunk hunting group and verify that the system prints out all the information for that group;

**16.3.2.3** Enter a valid trunk hunt group number and delete a trunk from that group. Verify that it was deleted; and

**16.3.2.4** Add the trunk deleted in paragraph 16.3.2.3 above to the appropriate trunk hunt group. Verify that the trunk has been added to the trunk group.

### **16.3.3 Line Class of Service Information**

**16.3.3.1** Verify that a numerical list of all line classes of service can be printed out by the system;

**16.3.3.2** Enter a valid line class of service number and verify that all the information for that number is printed out;

**16.3.3.3** Enter information necessary to create a new class of service. Verify that the system responds appropriately;

**16.3.3.4** Verify that the system deletes the class of service number created in paragraph 16.3.3.3 above;

**16.3.3.5** Enter an existing line class of service number and modify its characteristics. Verify that the changes have been made; and

**16.3.3.6** Enter a valid line class of service number and verify that the system prints out all equipment numbers referencing that line class of service number.

#### **16.3.4 Translator Table Information**

**16.3.4.1** Verify that all applicable office codes (NXX) are printed out by the system in numerical order;

**16.3.4.2** Enter a valid NXX code and verify that all information for that code is printed out; and

**16.3.4.3** Enter a valid NXX code and modify the information for that code. Verify that the system entered the changes.

**16.3.5 Memory Reload Test:** Clear the switch database memory. Follow the manufacturer's procedures to reload the switch database memory. Check the amount of time necessary to reload. This should be within the manufacturer's parameters for that switch. Also check the accuracy of the stored information.

**16.3.6 System Diagnostics Tests:** Check the major diagnostics programs following the procedures given by the manufacturer. Print outs should be checked for proper information.

**16.3.7** Check the traffic output on the I/O device.

**16.3.8** Care should be taken to ensure that whenever valid information is changed during these tests it is restored to its original form.

## **17. REDUNDANCY**

**17.1** Ensure that all manufacturer's instructions for verifying redundant systems and inducing failures in the system are adhered to when making any redundancy checks. If possible, these tests should be made before the central office is cut into service. Check that all redundant systems operate properly on failure of the on-line system. Simulated failures should be made in each redundant item, such as processors, clocks, time slot interchanges, ringing machines, and power converters. Determine that the system is still functioning, that the proper alarm, if required, is

sent, and a printout is provided on any display equipment that is used for maintenance. Use Checklist J.

## 18. TRANSMISSION TESTS

**18.1 General:** The tests shown here are a minimum and do not preclude the making of other transmission tests if time and instruments are available. These tests are intended to spot check the system to make certain that the quality control of the switch manufacturer is consistent with the parameters described in the specification. A minimum of 10 lines and 10 trunks, randomly selected, should be tested. Refer to paragraph 17 for transmission tests guidelines when needed. Use Checklist K for all transmission tests.

**18.2 Insertion Loss:** All insertion loss tests should be made in both directions. The number of lines tested are to be equally divided between originating and terminating. During trunk tests to and from subscriber lines it is satisfactory to use a line which is known to have satisfactory transmission ability from the line tests. If the trunk to be tested is direct digitally connected, a portable channel bank, or appropriate test equipment, may be used. It is suggested that a 3 dB loss be set in the channel bank and then a 3 dB to 3.5 dB loss should be measured through the office to the subscriber line terminal. Refer to paragraph 17.3.

**18.3 Frequency Response:** The frequency response measurements are made in the same manner as the insertion loss measurements but with an input that varies over the required frequency range. Refer to paragraph 17.4.

**18.4 Idle Channel Noise:** This test is best made with as much traffic as possible on the system. If a load box or other device is operating, this will be ideal. Make a call to a line terminated in a 900 ohm impedance and connect a noise measuring set to the originating line. Refer to paragraph 17.10.

**18.5 Quantizing Distortion:** The quantizing distortion test should be made in both directions. The number of lines tested are to be equally divided between originating and terminating. The test is made by inserting a 0 dBm 1004 Hz signal in the send line and measuring C-msg noise using a 1004 Hz notch filter at the receive end. Refer to paragraph 17.13.

**19. RST UNITS:** Use Checklist L for all RST tests.

**19.1** Check the lines in the same manner as the host office, using the same criteria for the number of lines tested.

**19.1.1** Make tests for all operational features made on the host office, such as tones, intercept, trunk access, and time-outs.



**19.1.2** If the RST unit is required to complete calls within itself when the link to the host office has been severed, this will be shown in Form 522, Part IV, paragraph 6. Check that the RST will operate as described when the link to the host office is disabled.

**19.1.3** Check the amount of equipment supplied and determine that the traffic per line is met or exceeded by the links to the host office and interlinking if applicable.

**19.1.4** Check charger(s) and batteries, including required battery size.

**19.1.5** Check the equipment housing for proper environmental control, such as temperature, humidity, and air cleanliness, in accordance with the manufacturer's specification.

## **20. ADDITIONAL TESTS: Use Checklist M**

**20.1** The borrower or its engineer may develop procedures and methods for additional tests. Checklist M has been prepared as a vehicle for listing these additional tests and verifying that they have been performed.

## **21. SS7 TESTING**

**21.1** Because the Rural Utilities Service (RUS) has not yet written a specification for SS7 equipment, no RUS test acceptance procedures have been developed. However, it is recommended that all acceptance procedures of the SS7 equipment manufacturer be performed, as well as any additional tests recommended by the terminating office of the SS7 equipment.

**MASTER CHECKLIST**

The following is a summary of tests covered by this bulletin and the checklist with which they are associated. It is meant as an aid in recording who is responsible for making the tests and if they were completed. The Paragraph column in this checklist only refers to paragraph numbers in this bulletin. The completion of this checklist is not a requirement of the test acceptance procedure.

Paragraph	Test	Checklist	Assigned to:	Completed
3.	<b>LINE TESTING PROCEDURES</b>			
3.1	Test Line A - Originating	A		
3.2	Test Line B - Terminating	A		
3.3	1900 Ohm Loop - Line reversal	A		
3.4	Progress Tones	A		
3.5	Lockout	B		
3.6	Timing Checks	B		
3.7	Vertical Services	B		
3.8	Nuisance Traps	B		
3.9	911 Service	B		
3.10	Semi-Postpay Pay Stations	C		
3.11	Prepay Pay Stations	C		
3.12	Intercept	C		
3.13	PBX Rotation	C		
4.	<b>INTEROFFICE TRUNK TESTS</b>			
4.1	Outgoing	D		
4.2	Incoming	E		
4.3	Busy Verification	E		
5.	<b>ALARMS</b>			
5.1	Alarm Sending and Checking	F		
6.	<b>POWER EQUIPMENT</b>			
6.1	Charger Voltage Settings	G		
6.2	Charger Noise	G		
6.3	Charger Inventory	G		
6.4	Batteries	G		
7.	<b>MAIN DISTRIBUTING FRAME</b>			
7.1	Main Frame	H		
8.	<b>SUBSCRIBER LOOP TEST FACILITY</b>			
8.1	Subscriber Loop Test Facility	H		
8.2	Remote Switching	H		
9.	<b>RINGING GENERATORS</b>			
9.1	Ringling Generators	H		
9.2	Output Voltage	H		
10.	<b>TONES AND TONE LEVELS</b>			
10.1	Tone Measurements	I		

**MASTER CHECKLIST**  
(Continued)

Paragraph	Test	Checklist	Assigned to:	Completed
11.	<b>LINE LOAD CONTROL</b>			
11.1	Priority	I		
12.	<b>SWITCHED ACCESS SERVICE</b>			
12.1	Feature Groups	I		
12.2	Equal Access	I		
12.3	ANI Equipment	I		
13.	<b>PLANT REGISTERS</b>			
13.1	Plant Registers	I		
14.	<b>FIRE CALL EQUIPMENT</b>			
14.1	Fire Call Equipment	I		
15.	<b>DRAWINGS &amp; PRINTED MATERIAL</b>			
15.1	Quantity as required	I		
15.2	I/O Information	I		
15.3	Floor Plan Information	I		
16.	<b>PROCESSOR TESTS</b>			
16.1	Common Processor Equipment Transfer	J		
16.1.1	Automatic Transfer	J		
16.2	<b>CLOCK SYNCHRONIZATION</b>			
16.2.1	Synchronization Tests	J		
16.3	<b>ADMINISTRATIVE FUNCTIONS</b>			
16.3.1	Directory Service Orders	J		
16.3.2	Trunk Group Information	J		
16.3.3	Line Class of Service Information	J		
16.3.4	Translator Table Information	J		
16.3.5	Memory Reload Test	J		
16.3.6	System Diagnostics Tests	J		
16.3.7	Traffic Output	J		
16.3.8	Information Restored	J		
17.	<b>REDUNDANCY</b>			
17.1	Redundant Systems	J		
18.	<b>TRANSMISSION TESTS</b>			
18.1	General	K		
18.2	Insertion Loss	K		
18.3	Frequency Response	K		
18.4	Idle Channel Noise	K		
18.5	Quantizing Distortion	K		
19.	<b>RST UNITS</b>			
19.1	Lines	L		
20.	<b>ADDITIONAL TESTS</b>			
20.1	Borrower Requirements	M		



**CHECKLIST B**

During the previous tests (Checklist A), conduct the following checks on several of the lines. Use the same indicators as before to indicate test OK.

TEST ( FORM 522, PART I REFERENCE)	TEST LINE AND RESULTS					
<b>Lockout</b> (6.4.1 & 6.4.2)						
Enter Test Line Number						
Activated - LO level & ROH Tone						
Cleared - Automatic Reconnect						
<b>Timing Checks</b> (19.6.2, 18.3, 18.4, 18.6 & 18.7)						
Enter Test Line Number						
Ring Cycle (1.25 to 2 Sec.; 4 Sec. Silent)						
Lockout (20 to 30 sec.)						
Partial Dial (15 to 37 sec.)						
"Called Party" Disconnect (10 to 32 Secs)						
Distance Dialing						
<b>Vertical Services</b> (5.5)						
Enter Test Line Number						
Call Forwarding						
Call Waiting						
Abbreviated Dialing						
3-Way Calling						
Other						
<b>Nuisance Trap</b> (7.9)						
Enter Test Line Number						
Held by Called Party						
Printout						
<b>911 Emergency Service</b> (5.19.1)						
Enter Test Line Number						
Routing verified						

**CHECKLIST C**

TEST ( FORM 522, PART I REFERENCE)	TEST LINE AND RESULTS					
<b>Pay Station (Semi-Postpay) (6.5, 8.3.1 &amp; 11.2.5)</b>						
Enter Test Line Number						
Operator Tone						
911 Emergency						
Coin Deposit Before Talk (Local-Local)						
Dial Tone First						
Pay Station Answer w/o Coin						
1+, 0+/0- handled appropriately						
Operator Ringback						
Coin Collect						
<b>Pay Station (Prepay) (6.5, 8.3.1 &amp; 11.2.5)</b>						
Enter Test Line Number						
Operator Tone						
Coin Collect						
Coin Return						
911 Emergency						
1+, 0+/0- handled appropriately						
Dial Tone First						
Pay Station Answer w/o Coin						
Operator Ringback )						
<b>Intercept (7.9.2 &amp; 7.9.3)</b>						
Enter Test Line Number						
Vacant Code & Unassigned Number						
Changed Number						
Discontinued Number						
<b>PBX Rotation (7.3.4, 7.3.5, &amp; 7.3.6)</b>						
Enter Test Line Number						
Night Service Number						
Trunk Hunts						
All Lines Busy						

### CHECKLIST D

**Outgoing:** The "translation tables" should be reviewed and considered in developing the test calls. They should be logged and subsequently checked against the "billing" department's records of such calls. Access trunk groups from random subscriber lines and, as applicable, check operator service trunks from both coin and non-coin lines.

TRUNK NO.	DP/MF SIG. OK	RING BACK	ANS. SUPV	TALKS OK	NO NOISE	IDENTIFICATION		TRUNK TIMED DISC.	CALL FAIL IND. (1)	ALL TRUNKS BUSY
						CLG. NO.	CLD.NO.			

Notes:

1. Enter the failure indication: such as reorder tone (RT), intercept announcement (IA), operator (OP).





**CHECKLIST F**

**Alarms:** Check two or more alarms in each classification by simulating a trouble or failure in that category. (Form 522, Part I, paragraph 15.1)

CLASSIFICATION	TROUBLE	LOCAL ALARM INDICATION		ALARM CHECK		PRIORITY OVERRIDE
		AUD.	VIS.	TONE	TRK. REL.	
CATASTROPHIC:	LOSS OF SERVICE					
	LOSS OF RST					
	LOSS OF NETWORK CONTROL					
	LOSS OF BOTH PROCESSORS					
MAJOR:	LOSS OF SUBSCRIBER GROUP					
	LOSS OF TRUNK GROUP					
	GROUP FUSE					
	REDUNDANT EQPT. FAILURE					
	CHARGER FAIL (1)					
MINOR:	CUMULATIVE LINE LOCKOUT					

(1) Alarm delayed 15 min.

**CHECKLIST G**

CHARGERS						
CHARGER NUMBER	VOLTAGE APPLIED TO BATTERIES		CHARGER NOISE			
	LEAD ANTIMONY	LEAD CALCIUM	ELECTRICAL		ACOUSTICAL	
1						
2						
3						
COMB.						
BATTERIES						
CELL NO.	CELL VOLTS	BATTERY FLOAT READINGS				
		SPECIFIC GRAVITY	ELECTROLYTE		CORRECTED READINGS	
			TEMP.	LEVEL	VOLTAGE	SPEC. GRAVITY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
ADDITIONAL BATTERY PLANT CHECKS						
Instruments	Container (Not faulty or cracked)	Proper Spacing	Tight Connections	Top of Cell Clearance	Explosion Control Device (per cell)	

**CHECKLIST H**

<b>Main Distributing Frame (20.)</b>				
Accepted Protectors (RUS IP 344-2)				
Adequate Testing Facilities				
Sufficient Protector Mountings and Arresters or Grounding Modules				
Sufficient Cable Pair Terminations				
<b>Subscriber Loop Test Facilities (15.2.3.1)</b>				
Test each function below and verify:				
Bridged Foreign EMF				
Line Battery				
Open Circuit				
Shorts				
Tip Ground				
Ring Ground				
Tip & Ring Negative Potential				
Subscriber Line Capacitance				
Talk Battery to Line				
Supply Talk Battery to Line w/Booster				
Supply Talk Battery to Line w/o Booster				
Test In to Central Office				
Test Out of Central Office				
Reverse Polarity for Voltage Readings				
Ring Subscriber w/Test Access Circuit				
Ring Subscriber w/Test Shoe				
Test for Booster Battery Voltage and Polarity through Test Shoe				
Test RST from Host office				
<b>Dial Speed Test (15.2.3.4 &amp; 15.2.3.5)</b>				
Returns proper signals to calling station				
<b>Ringling Generators (19.5.2.3)</b>				
Measure output voltage of each frequency				
	TAPS (Volts)			
FREQUENCY (Hz)	L	M	H	MEASURED
16 2/3 - 20	90	105	120	
21 - 30	95	110	120	
31 - 42	100	115	130	
43 - 54	110	125	140	

**CHECKLIST I**

<b>Tone Levels (9.2)</b>		
Measure various call progress tone levels at switchboard end of MDF line cable.		
<b>TYPE</b>	<b>REQUIREMENTS</b>	<b>MEASURED</b>
Dial Tone	-10 dBm0	
Low Tone	-21 dBmO	
High Tone	-17 dBmO	
Ringback Tone	-16 dBmO	
ROH Tone	+ 3 dBmO	
<b>TEST</b>		<b>CHECKS OK</b>
<b>Line Load Control (7.11)</b>		
Verify line load control activation		
Check that priority lines function		
Check that non-priority lines cannot function.		
<b>Switched Access Service (11.)</b>		
<b>Feature groups</b>		
Verify proper Feature Groups have been furnished		
Verify appropriate carriers have been assigned		
Call all assigned carriers and verify signaling sequence and carrier identification		
Verify calls from coin lines send TSPS format or are blocked		
<b>Equal Access</b>		
Verify equal access capability		
Verify that presubscribed customers do not have to dial carrier access code		
<b>Automatic Number Identification (ANI)</b>		
Verify called numbers		
Verify calling number		
Verify billing information		
Verify remote polling capability (if applicable)		
<b>Plant, Traffic and Separations Registers (16.4)</b>		
Verify software administration of memory counter assignments, data collection, readout and reset functions as specified/required.		
<b>Fire Call Equipment</b>		
Verify operation of supplier's equipment		
Other		
<b>Drawings and Instructions (24.3)</b>		
Verify required quantity		
Verify 2 sets I/O material		
Verify floor plan drawing		

**CHECKLIST J**

TEST	CHECKS OK
<b>Processor Tests (7.6.2, 14.)</b>	
<b>Common Processor Equipment Transfer</b>	
Test calls established before transfer	
Test calls made after transfer	
Established calls not lost after transfer	
<b>Redundant circuits checked</b>	
Processors	
Memories	
Time Slot Interchanges	
Clocks	
<b>Clock Synchronization (10.)</b>	
Check minimum long-term accuracy (ability to synchronize to external reference) (10.2.1 or 10.3.1)	
Check minimum stability upon loss of all frequency references (10.2.2 or 10.3.2)	
Check alarm thresholds ( LSSGR, Issue 2, July 1987, Section 18.3.5)	
Check ability to switch to and synchronize with a secondary reference	
Check for one slip or less on switched reference (BOC Notes on the LEC Networks - 1990, Issue 1, March 1991, Section 11.9.2, Table 11-2) (Stratum 3 only)	
Automatic Transfer Function	
Manual Transfer Function	
<b>Administrative Functions Check:</b>	
<b>Directory Service Orders</b>	
Verify that the list of directory numbers can be printed out in numerical order.	
Verify that all information regarding directory numbers can be printed out.	
Enter a directory number and alter the information. Verify that the change is made.	
Verify that a list of equipment "made busy"/"busied out" for maintenance can be printed out.	
<b>Trunk Group Information (14.3 and 14.4)</b>	
Verify that the trunk group numbers can be printed out in numerical order.	
Enter the hunt group number of any assigned trunk hunting group and verify that the system prints out all information for that group.	
Enter a valid trunk hunt group number and delete a trunk from that group. Verify.	
Add the trunk deleted above to the appropriate trunk hunt group. Verify.	
<b>Line Class of Service Information</b>	
Verify that a numerical list of all line classes of service can be printed out by the system.	
Enter a valid line class of service number and verify that all the information for that number is printed out.	
Enter information necessary to create a new class of service. Verify that the system responds appropriately.	
Verify that the system deletes the class of service number created above.	
Enter an existing line class of service number and modify its characteristics. Verify.	
Enter a valid line class of service number and verify that the system prints out all equipment numbers referencing that line class of service number.	

**CHECKLIST J**  
(Continued)

TEST		CHECKS OK
<b>Translator Table Information</b>		
Verify that all applicable office (NXX) codes are printed out by the system in numerical order.		
Enter a valid NXX code and verify that all information for that code is printed out.		
Enter a valid NXX code and modify the information for that code. Verify that the system entered the changes.		
<b>Memory Reload Test</b>		
Clear the database memory. Check time necessary to reload and check accuracy of the information.		
<b>System Diagnostics Tests</b>		
Check the major diagnostics programs following the procedures given by the manufacturer. Printouts should be checked for proper information.		
Check the traffic output on the I/O device.		
<b>Redundant Equipment (7.6.2, 7.6.6, 14.1, 19.4.2, 19.5.1, 23.6.2, &amp; 23.6.3)</b>		
Simulate failures in all redundant items and verify switchover or specified minimum requirements		
Item	Switched OK	Meets Minimum Requirements
Ringling Machines		
Power Converters		
Ringling Machine - Single		
Power Converter - Single		

**CAUTION:**

Care should be taken to ensure that whenever valid information is changed during these tests it is replaced in its original form.



**CHECKLIST L**

**RST ACCEPTANCE TESTS**

<b>TEST</b>	<b>CHECKS OK</b>
Check lines in same manner as host.	
Make tests for all operational features.	
Check that the RST will operate as described with link(s) disabled.	
Check amount of equipment supplied and verify traffic requirement is met or exceeded.	
Check chargers and batteries	
Check system housing for environmental control requirements specified.	



