NO. 3 ESS
OPERATIONAL TESTING
VOLUME MAINTENANCE

CONTENTS

---

1. GENERAL INFORMATION

1.1 Purpose

1.11 The basic purpose of this section is to verify office operation under conditions of stress:

Induced diagnostic procedures and
Lowered operating voltage

1.12 The simulated volume applied to the office during the maintenance volume tests is similar to that simulated volume later required during the integrated volume test.

1.13 The maintenance volume is designated as 500 calls per network frame. Refer to Section 660 of this handbook for more information on BHC (busy hour calls) and loads and how they apply to volume testing.

1.2 Sequence

This section should be the first volume test performed on the office. Refer to Handbook 269, Section 1; No. 3 ESS Test Planning for an overall sequence of No. 3 ESS testing.

1.3 Test Prerequisites

1.31 All previous testing requirements, as designated in Section 1 of this handbook, should have been successfully completed.

1.32 All equipment should be in service and all other installation, test and maintenance activity should be suspended during the running of this section.

1.33 The batteries should be accepted by the telephone company prior to the start of the low voltage portion of this test. This is required due to the excessive interval needed to fully recharge the batteries after they have been discharged to 47 volt level.

1.33 The batteries should be accepted by the telephone company prior to the start of the low voltage portion of this test. This is required due to the excessive interval needed to fully recharge the batteries after they have been discharged to 47 volt level.

1.4 References

1.41 General - Refer to Sections 1, 500, 600 and 660 of this handbook for reference to general documentation which may be useful in conducting the testing procedures of this section.

1.42 Specific - Refer to Section 660.01 of this handbook for reference to specific information which may be useful or required in conducting the testing procedures of this section.

2. WORKSHEETS, RECORDS AND REQUIREMENTS

2.1 Worksheets

2.11 The worksheets prepared for Section 660 of this handbook should normally be sufficient for purposes of this section. However, slight modification may be required to satisfy the requirements of maintenance volume testing. See Section 660, paragraph 4.

2.12 The following additional worksheet should be helpful in performing the testing procedures in this section.

FORM	TITLE
269.660.31-1	No. 3 ESS Volume Test Summary Record

NOTE: A sample of the 269.660.31-1 worksheet is presented as an exhibit in this section.

EXHIBIT	FORM
1	269.660.31-1

2.2 Records

2.21 The testing results of this section shall be recorded on Forms SD-97-1313 and SD-97-1315. For detailed information on filling out test records, refer to Section 6B of Handbook 3.

2.22 Form SD-97-1313, Test Trouble Record is used to record TTY trouble printouts (and their associated causes) received during the test interval.

2.23 Form 269.660.31-1, Volume Test Summary Record (refer to Exhibit 1 of this section) is used to record running totals associated with the call generation (volume test set) and processing (office under test) functions associated with the test interval.

2.24 These records and all associated TTY printouts will be saved as part of the office records.

2.3 Requirements

This section's testing is intended to satisfy (in part) BSP-820-650-180, Performance Requirements, No. 3 ESS, General Equipment Requirements, Electronic Switching Systems.

3. TEST EQUIPMENT

3.1 Test Sets Required

Amt.	ITE Code	Title	Part of
1	5649	Computerized Volume Test Set	
1	5390-CC6	Control Board	ITE 5649
8	5390-CC7	Line Circuit	ITE 5649
SET	5664	Computerized Volume Test Set Program Tapes	ITE 5649
1	5689	33 ASR TTY	ITE 5649
		or	
1	5956	SCOATS	
1	5942	Low Voltage Switch Assembly	

Note: If the ITE 5942 Low Voltage Switch Assembly is used, follow the procedures in TMO 5942 included with the Switch for lowering the voltage at the battery plant. The use of ITE 5942 does not change any requirements of this section. Continue to observe caution note (1) at paragraph 5.031.

3.2 Possible Troubleshooting Test Equipment

ITE Code	Title
4511	Whistler Test Set
4525B	Tone Buzzer Test Set
4631	Test Receiver Set
4659	Volt - Ohm - Milliammeter
4669	Tektronix 135 Amplifier and P6020 Current Probe
4732	Clip-on DC Milliammeter
5237B	Oscilloscope Tektronix No. 465
PK-3H301	Network Troubleshooting Manual

4. TEST PREPARATION

4.1 General

4.11 That load presented to the office during intraoffice testing and that load presented to the office during interoffice testing are combined during maintenance volume testing. The office is subjected to various types of stress while supporting this load. Error rates, no greater than that permitted for the integrated volume test, are required.

4.12 The stress which the office will be subjected to during maintenance volume testing procedures is as follows:

Various diagnostic procedures are induced and the operating voltage is lowered.

4.13 This test should be conducted in a manor that does not jeopardize any in-service equipment. At no time shall the voltage at the -48 volt distribution bus of the power frame be allowed to drop below -43.75 volts.

4.14 Allow the volume test set and the No. 3 ESS to stabilize after test set start before official volume test is begun. This stabilization period may be up to 15 minutes.

4.15 The following outline presents a general guide for maintenance volume test procedures:

a) Determine the intraoffice test calling rate. Verify that available test lines can support this calling rate.

b) Determine the interoffice test calling rate. Select that trunk group (or groups) configuration to be used for integrated volume testing.

c) Verify that available service circuits are capable of supporting the maintenance volume calling rate. (Refer to Section 660 of this handbook for additional information.)

d) Verify volume test set connections at the CDF.

e) Verify that those CDF trunk-to-trunk test interconnections required for the maintenance volume test are available and proper.

f) Apply the maintenance volume load.

g) Shut off the office 100 amp rectifiers from the -48V "charge bus"

h) Conduct the Daisy Chain on one SYC. Determine if problems are present. Maintain records during the test interval. Continuously evaluate system performance against the performance requirements. If the error rate is excessive (above allowable error rates) isolate cause of error, correct and restart the test.

i) Conduct the test on the opposite SYC. (Refer to Step h preceeding.)

j) Determine that the test successfully passed performance requirements.

k) End the test.

4.2 Fill Out Worksheet

4.21 The worksheet prepared during Section 660 and the worksheet available for maintenance volume testing (refer to paragraph 2.1 of this section) should be helpful in planning and preparing for maintenance volume testing.

4.22 Test Line Worksheets, prepared during Section 660 should be analyzed to verify that the originating and terminating test lines available from intraoffice testing are adequate for maintenance volume testing. (Modification may have to be made to the test line configuration to completely satisfy maintenance volume testing requirements.)

4.221 The test lines required during intraoffice testing support line-to-line calls while those test lines required during interoffice testing support line-to-trunk-to-trunk-to-line calls.

4.222 The test lines required during maintenance volume testing must support some combination of line-to-line calls and line-to-trunk-to-trunk-to-line calls. The ratio of intraoffice to interoffice calling should reflect 500 calls per hour per network frames as closely as possible.

4.23 Worksheets prepared during Section 660 should contain that trunk testing information suitable for maintenance (and integrated also) volume testing. However, the calling rate over the selected trunk test configuration may have to be modified to satisfy overall volume testing.

4.24 Form 269.660.31-1, Volume Test Summary Record, records information generated by the volume test set. Designated information periodically output on the test set. Anaylsis of this information (soon after it is received) should indicate if troubles are being encountered.

4.3 Maximum Applied Maintenance Volume

Hardware limits the intraoffice and interoffice calling rates in an in-service environment. The office is engineered to support estimated demand for service which indicates the number of network terminals and trunk and service circuits required.

4.4 Test Line Requirements

4.41 Maintenance (and integrated) volume testing tests intraoffice and interoffice calling. Each intraoffice call requires one originating and one terminating test line. An interoffice outgoing call requires one originating test line and an interoffice incoming call requires one terminating test line.

4.42 There should be about 8 test lines assigned per concentrator group (network frame). If these are not sufficient, additional test lines may be established via Recent Change TTY input messages. Refer the IMOM for details on the use of these messages.

4.5 Trunk Circuit Requirements

4.51 As many different trunk groups as can be used should be included in the maintenance (and integrated also) volume test.

4.52 Those basic trunk circuit utilization requirements presented in Section 660 of this handbook should be applicable during volume testing.

4.6 System Test Configuration

The system test configuration consists of the proper combination of those parts of the intraoffice and interoffice tests applicable to volume testing. If proper planning was carried out during Section 660, physical rearrangement of the test-set/CDF and trunk-to-trunk interconnections should be minimal.

4.7 Volume Test Set Preparations

4.71 Volume test set preparations consist of proper interconnection to the office under test. All hardware interconnection is via test lines.

4.72 Preparations for previous load testing should be useful in volume test set preparations. It is not expected that test-set/office-under-test interconnection should have to be modified.

NOTE: Information on use of computerized volume test set may be found in Sections 660 and 660.01 of this handbook.

4.8 Automatic Diagnostic Testing

4.81 Automatic diagnostic testing on the Ringing and Tone Plant may cause lost calls.

4.82 Diagnostics are not allowed on those trunk circuits designated as TEST.

4.83 Failures which can be attributed to diagnostics of the circuit listed in paragraph 4.81 may be discounted.

4.84 Prevent ALIT from executing during the nightly routines by unseating either the FB525 pack at 06-29 or the FB669 pack at 06-33 in the PTU of the test frame. Prevent Network Fabric from executing by typing in:

INH:MSF 9! (Generic Program SØ2)
or INH:MSF 8! (Generic Program 3E3)

5. TEST PROCEDURES

5.01 General

5.011 The off-line CU should normally run in the standby and update mode (except during scheduled diagnostics or when manually induced or prescribed procedures force the CU out of such state). The off-line CU may be manually taken out of standby for purposes of running diagnostics or for troubleshooting purposes. (Care should be taken to insure that the CU is not out-of-service (OOS) at those times when a CU switch is scheduled to automatically occur.)

5.012 System failures encountered during test may be neutralized during the test interval. "Neutralized" in this sense means that the malfunctions causing such errors may be either corrected or eliminated from the system. Hardware faults are permitted under the following circumstances:

a) They cannot interfere or preempt other system test performance requirements (such as time requirements on SYC0 and SYC1, error rate or lost calls).

b) All hardware (other than SYC) may be placed OOS or otherwise relieved of call processing responsibilities. Such equipment does not have to be repaired during test nor subjected to subsequent call processing loads provided associated operational test procedures or diagnostics are available and used to reverify the circuit. It must, of course, be repaired and retested ATP, in accordance with available and pertinent handbook sections, before turnover to the telephone company.

5.013 Set or verify system clock such time as automatic diagnostics will not be conducted until ready to do so (refer to paragraph 5.04 of this section).

NOTE: Curtail all other test activity during the maintenance volume test.

5.02 Start Volume Test Set

Start the test set and permit the traffic to continue until such time as no apparent errors from initial excessive BHC are currently being generated. Wait an additional five minutes.

5.03 Remove -48 Volt Rectifiers

5.031 The -48 volt rectifiers of the 151A power plant are removed, one at a time, until none remain. (This procedure is invoked only when following test combination number 2 or 3).

NOTES:

1) If the No. 3 ESS office under test is deriving power from any distribution system common to other equipment, then the lowered operating voltage portion of the test must not be accomplished. Such exception will be given to the telephone company in writing at least 10 days before scheduled turnover.

2) If emergency AC power is available, it should be inhibited from coming on line (when or if it is engineered to do so upon the low voltage condition).

5.032 The reduced voltage portion of the test must cover a period of at least 2 daisy chains. (It is expected that automatic diagnostic testing will take more than 3 hours per SYC.)

5.033 The test may commence only after the voltage has reached a value of less than -47 volts at the -48 volt distribution bus (charge bus) of the power frame.

At no time shall the voltage at the -48 volt distribution bus of the power frame be permitted to drop below the No. 3 ESS emergency limits of -43.75 volts.

5.034 All -48 volt rectifiers have been removed from the No. 3 ESS office charge bus.

5.035 It is advisable to take voltage measurements at frequent intervals during this test as dictated by actual voltage readings and the discharge rate (but no less than hourly).

5.04 Forced System-Time Updates

5.041 Set system machine time and date with the following TTY input message:

SET:CLK:TIME (hh, mm, ss), day (mo, dd, yy)!

NOTES:

1) The system time should be set to some convenient time before the Daily (D) schedule is to be printed out. The D schedule triggers the automatic diagnostic test sequence. The D scheule should have been set to some time between 10 p.m. to 6 a.m. Check the Traffic Work Schedule, ESS Form 3400, to ascertain that exact "system time" when the D schedule is to appear. If the D scheule time has not been previously manually selected, recent change should be used to set the D schedule to some system selected time (02 30 00).

2) The system is forced through the automatic diagnostic tests; first one one SYC and then again on the alternate SYC.

3) PU exercises failing to complete does not terminate the maintenance volume test provided the exercise was not accomplished by a major alarm printout. Simply manually restart the PU exercises via appropriate TTY input requests. It should be noted that if, while running that portion of PU exercises from the offline CU (CU temporarily removed from normal the PU exercises are aborted for some non-major alarm producing reason, the CU will be left out of normal. If this situation occurs, the CU should first be restored to normal and then restart the PU exercises. This situation does not terminate the test. You are required to successfully complete the PU exercises twice (one with each CU active).

5.042 Wait for the automatic diagnostic testing to complete.

5.043 Set machine time and date with the following TTY input message:

SET:CLK:TIME (hh, mm, ss), day* (mo, dd*, yy)!

* The next day from that entered in paragraph 5.041 of this section.

NOTE: This returns the system to the automatic diagnostic period and forces tests on the alternate SYC and again on the peripherals.

5.05 Volume Test Set Observations

5.051 The volume test set registers gives outputs of certain trouble conditions which it encounters. The TTY printouts should be observed for any indications of these encountered trouble conditions.

5.052 Enter the volume test set totals on Form 269.660.33-1, Volume Test Summary Records.

5.053 Those Volume Test Set outputs should be observed for indication of lost calls. If there are lost calls, then those measurements included in the office under test TTY printout schedules may be useful in isolating or helping to isolate the problem.

5.06 Office Under Test Observations

5.061 Generally, when the office is performing at or near the designated test requirements, most clues or indication of problems will come via the TTY. System malfunction indications via sounder alarms and lamps should be few or none. It is, therefore, suggested that close scruitiny of the TTY be made at periodic intervals to detect "non-normal" printouts. Every "non-normal" printout should be accounted for its impact upon test requirements.

5.062 An evaluation must be made as to the cause of every non-normal or trouble printout. If the print out is the result of an equipment malfunction and it is not a major alarm printout, the equipment should be removed from service (if not already automatically accomplished by the system) in order to prevent its further use and more trouble printouts. The equipment must be repaired and ATP before turnover to the telephone company.

5.07 Excessive Trouble Indications

If the observed "error rate" on three separate occurrences exceeds the "error rate," it is suggested that the test be terminated (for verification purposes). The test may be continued on a trouble-locating basis however (not for record) in an attempt to isolate the fault or faults.

5.08 End Test

5.081 The office should be restored to normal after completion of any maintenance volume testing. This includes returning the rectifiers to service and charging the batteries back up to optimum voltage. This procedure should be conducted in an orderly manner with periodic observations made of critical indicators (alarms, lamps and TTY) to insure that faults which may develop when returning the office to normal will be detected and corrected before subsequent testing commences.

5.082 Do not remove the simulated traffic as generated by the computerized volume test set during restoration to normal. Such traffic could provoke fault indications which otherwise would not occur.

5.083 Return the -48 volt rectifiers to service. Permit each -48 volt rectifier (after it has been placed back on-line) to settle down properly before returning any subsequent -48 volt rectifier on line. Readjust the output voltage of each rectifier to prescribed limits.

5.084 Charge batteries to their optimum prescribed limits.

5.085 Continue to make observations of office for fault indication at least 1 hour after all conditions have returned to normal. (This does not include battery recharge.)

6. TEST REQUIREMENTS

6.1 General

Section 660 of this handbook lists general load application and volume test requirements which apply to this section (and other load application and volume test sections). These requirements are in addition to or supplement those listed in paragraph 6.2 of this section.

6.2 Additional Maintenance Volume Test Requirements

6.21 Time Requirements

The time requirement for the lowered operating voltage test stated in this section is a minimum time only.

6.22 Lowered Operating Voltages

6.221 The lower operating voltage portion of this test must run for a minimum of 4 hours.

6.222 SYC0 and SYC1 must each be on line for at least a minimum of 2 hours while lowered operating voltage procedures are in effect.

6.23 Continuous and Contiguous

Once the lowered operating voltage is reached, the test may commence. The testing of one SYC and then the other SYC will be continuous and contiguous.

6.24 Test Time Measurements

The test interval time should be measured by other than the office system clock.

6.25 Volume Requirements

The total office traffic cannot drop lower than about 500 calls per hour per network frame at any time during the maintenance volume test interval.

6.26 Error Rate Requirements

6.261 There can be no more than 1 in 10,000 calls failing to complete (or lost calls) as indicated by the volume test set.

NOTE:

This requirement is based on failure to terminate due to system errors. Failure due to malfunctioning test equipment and human error may be discontinued.

6.262 No more than 5 system troubles per 10,000 calls are allowed. A system trouble may be indicated by a maintenance or diagnostic TTY printout, by any adverse or unexpected system reaction, system alarms, or by inability to properly process the applied load. It should be noted that a single system trouble can cause multiple trouble indications but should be counted as only one system trouble.

6.27 Alarms

6.271 No major alarms are permitted except for:

1) Major alarms caused by the improper or inadequate allotment or use of office facilities in support of or during test (such as trunk service circuits, etc.) may be discounted.

2) Major alarms required or expected due to required test procedures may be discounted.

6.272 Minor alarms associated with system troubles are allowed. Also, those minor alarms associated with manually induced procedures conducted within the limitations of this section are permitted.

6.28 Lost Call Impact on Test Requirements

6.281 Those lost calls which can be positively attributed to improper operator procedures may be subtracted from total lost calls to arrive at the number of lost calls used to determine success or failure of a test interval.

6.282 Those lost calls which can be positively attributed to improper volume test set operation may be subtracted from total lost calls to arrive at the number of lost calls used to determine success or failure of a test interval. This assumes that the other provisions of associated test requirements are not preempted.

6.29 MRFs (Maintenance Reset Functions)

No unscheduled MRFs are permitted.

ATTACHMENT
Exhibit 1 on page 9.

No arrows shown due to extensive changes

Reason for Reissue:
Major revisions.

7. TROUBLESHOOTING PROCEDURE

7.1 It is possible that conditions are present which do not cause major alarms or system initializations but which could cause lost calls. Data or information on lost calls could be associated between that furnished by the com-volume test set and the office under test. It would be very helpful, therefore, to be able to set up and maintain a very accurate time reference between the two systems.

Manager, Development Engineering and Installation -2/2B, 3, 4, and 5 ESS

2-8-80

EXHIBIT 1

NO. 3 ESS
VOLUME TEST SUMMARY RECORD

FORM 269.660.31-1 PAGE ___ OF ___ PAGES

TIME TEST SET