

NO. 3 ESS  
 OPERATIONAL TESTING  
 LOAD APPLICATION  
 INTEROFFICE CALLING

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1. GENERAL INFORMATION1.1 Purpose

1.11 The basic purpose of this section is to accomplish two objectives. First, it contributes toward the total working configuration (in combination with Section 660.11 of this handbook) for later more inclusive volume testing. The second objective is to verify the operational integrity of specified 2-way, 1-way outgoing, and 1-way incoming trunk circuits; and MF transmitters and MF receivers.

## 1.12 Trunk-Circuit-Types which are tested in this section:

a. Incoming (IC) Trunks

<u>SD/CD</u>	<u>CPS-</u>	<u>SUPV</u>	<u>SIGNALING</u>
3H220-01	FB 370	RB(2)	DP and MF
3H220-01	FB 371	RB(1)	DP and MF

NOTE: RB = Reverse Battery

b. Outgoing (OG) Trunks

<u>SD/CD</u>	<u>CPS-</u>	<u>SUPV</u>	<u>SIGNALING</u>
3H220-01	FB 399	RB HI/LO	DP and MF

c. Two-Way (2W) Trunks

<u>SD/CD</u>	<u>CPS-</u>	<u>SUPV</u>	<u>SIGNALING</u>
3H220-01	FB 361	E and M(1)	DP and MF
3H220-01	FB 382	E and M	DP and MF
3H220-01	FB 391	E and M	DP and MF

1.13 All of those trunk circuits not tested by tests in this section must be tested as described in the 612 series sections of this handbook.

1.14 Trunk circuit transmitters which are tested in this section:

<u>SD</u>	<u>CPS</u>	<u>Title</u>
3H404-01	FB 362, FB 363 & FB 364	Multifrequency (MF) Transmitter (MFT)

1.15 Trunk circuit receivers which are tested in this section:

<u>SD</u>	<u>CPS</u>	<u>Title</u>
3H902-01	A152, A260, A263, A264, A265, 266, & A1024	Multifrequency (MF) Receiver (MFR)

NOTE: The dial pulse interoffice receiving function is generally performed in the associated trunk circuits.

1.16 One objective of this section is to arrive at a test configuration which can reasonably be expected to support later volume testing (as required in Sections 660.31 and 660.41 of this handbook). This interoffice call load when combined with the intraoffice call load, should reflect the approximately 500 calls per hour per network frame.

1.2 Sequence - Refer to Handbook 269, Section 1; No. 3 ESS Test Planning for an overall sequence of No. 3 ESS testing.

1.3 Test Prerequisites - All previous testing requirements, as listed in Section 1 of this handbook, should have been successfully completed.

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 - The following documents are needed to obtain required information in preparation for the testing procedure in this section:

<u>3 ESS TG-3 INPUT FORM</u>	<u>TITLE</u>
3100	Telephone Number Table
3201	Trunk Assignment Table
3202	Trunk Group Table
3204	Trunk Feature Table
3209	Incoming Trunk Digit Translation Table
3300	Three and Six Digit Translation Table
3303	Route Index Expansion Table
3304	Code Index Table

2. WORKSHEETS, RECORDS, AND REQUIREMENTS

2.1 Records - 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, Handbook 3.

2.2 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

<u>Amt.</u>	<u>ITE Code</u>	<u>Title</u>	<u>P/O</u>
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	5489	33 ASR TTY	ITE-5649
		or	
*	5956	SCOATS	
*	1 For Each 4 Network Frames		

#### 4. TEST PREPARATION

##### 4.1 General

4.11 The main objective of this test section is preparation for later volume testing required in Sections 660.31 and 660.41 of this handbook. A trunk test configuration should be set up which will adequately support such subsequent testing.

4.12 The second objective of this test section is to verify the operation of as many of the office trunk circuits as it is practical to do so. Also, all of the trunk Multifrequency Transmitters (MFT's), and Multifrequency Receivers (MFR's) are operationally tested.

4.13 Trunk transmitters and trunk receivers should not have to be taken out of service during interoffice testing.

4.14 Interoffice testing uses a volume test set which originates "interoffice" calls on designated originating test lines. Each call is routed to an outgoing trunk. This trunk has been previously tied back-to-back with some other selected trunk which then operates as an incoming trunk to the office under test. The office routes this call to the terminating test line. The volume test set conducts certain checks at various stages of call progression, such as dial tone, audible ring, ringing, and continuity. Successful completion of all checks counts as two calls during interoffice testing (originating test line to outgoing trunk is one call and incoming trunk to terminating test line is the second call).

4.15 There is no requirement that all trunk circuits, trunk transmitters, and trunk receivers be given any one test. The circuits which are tested during any one test, the number of tests conducted, and the various combinations of circuits included in individual tests is dependent upon the office configuration under test. Some test parameter "quantities" which should be taken into consideration when planning interoffice testing are as follows:

- a. Office Originating Test Lines
- b. Office Terminating Test Lines
- c. Volume Test Set Originating Lines

d. Volume Test Set Terminating Lines

e. Office Customer Dial Pulse Receivers

f. Ringing Circuits

g. MF Transmitters (MFR's)

\*h. MF Receivers (MFR's)

4.16 The following outline presents a general guide for preparation of the interoffice tests. It cannot be overly stressed that careful planning is required to maintain actual total testing effort to a minimum.

- a. Review those test lines and volume test set connections which are to be used during interoffice testing. (If sufficient lines are not available, additional test lines will have to be designated via recent change procedures and connected to the volume test set via the Combined Distributing Frame (CDF).
- b. Determine which trunk groups are to be tested.
- c. Determine the number of trunk transmitters and trunk receivers in the office. The number of interoffice calls at any one time cannot exceed the capacity of trunk transmitters or trunk receivers which will be required during test.
- d. Derive trunk configuration which may support subsequent volume testing. Fill out Worksheets.
- e. Make trunk-to-trunk interconnections on the CDF. Two-way trunk circuits, may be interconnected within the same trunk group. A suggested interconnection configuration (refer to paragraph 4.52,a.c of this section) eliminates the possibility of glare (simultaneous seizure of a 2-way trunk circuit on both ends). (It should be noted that even though a trunk circuit is capable of 2-way usage, it may still be set up and used, during test, as either a 1-way outgoing or a 1-way incoming trunk circuit. Under

such circumstances these trunk circuits must occupy a different trunk group from those to which they are interconnected to at the CDF.

- f. Determine if prefix digits must be added or deleted to the outgoing trunk members. If so, make changes via Recent Change (RC) TTY input message. Outgoing trunk groups should be changed to be compatible with incoming trunk groups. If changes are made to expected incoming digits the office may not be capable of routing such calls to the proper terminating test line.
- g. Determine the office code (or codes) which will route calls to a designated trunk group. The "direct route index" will be used by the office in trunk group selection unless some overload condition is encountered for that trunk group during interoffice testing. It is possible that an outgoing trunk group will have more than one office code associated with it. For purposes of interoffice testing, only one code per trunk group can be designated to the volume test set. Care must be exercised to insure that the sum total of all trunk group calls does not exceed the "real" trunk group capacity
- h. Determine which trunk groups are to be tested at one time.
- i. Conduct the interoffice test on the designated trunk group (or groups).
- j. Obtain call totals from volume test set and verify that minimum call requirements were met. (Refer to paragraph 6 of this section.)
- k. Determine that the test successfully passed or that errors were encountered. It may be possible to isolate the error (or errors) to some specific trunk group, trunk member number, trunk transmitter or trunk receiver from the test results.

#### 4.2 Fill Out - Worksheet

4.21 Those worksheets prepared during intraoffice testing worksheets for interoffice testing should be helpful in planning and preparing for interoffice load application.

4.22 Test Line Worksheets prepared for intraoffice testing should be analyzed to verify that the originating and terminating test lines, available from intraoffice testing, are adequate here.

4.23 Incoming Trunk Groups Worksheet is used to list those incoming trunk groups suitable for testing under this section. Refer to the appropriate TG-3 Input Forms listed in paragraph 1.42 of this section to obtain the required information in filling out this worksheet.

- a. Select those trunk groups which contain trunk circuits suitable for testing in this section. One-way incoming only and two-way trunk groups are applicable here.)
- b. Record the trunk group number and the number of members for each group.
- c. Obtain and record the remaining associated information listed on the worksheet.

#### 4.24 Outgoing

Trunk Group Worksheet, is used to list those outgoing trunk groups suitable for testing under this section. Refer to the appropriate TG-3 Input Forms listed in paragraph 1.42 of this section to obtain the required information in filling out this worksheet.

- a. Select those trunk groups which contain trunk circuits suitable for testing in this section. (Two-way and 1-way outgoing only trunk groups are applicable here.)
- b. Record the trunk group number and the number of members for each group.
- c. Obtain and record the remaining associated information listed on the worksheet.

4.25 Loop Around Trunk Worksheet, is prepared from the information contained on other worksheets. The information contained on this worksheet lists

those individual trunk circuits which have been selected to be tied back-to-back. Those trunk circuits contained within one 2-way trunk group may be connected back-to-back. Such interconnection (back-to-back interconnection of 2-way trunk groups within the same trunk group) is advantageous because it eliminates the need to satisfy interconnection of odd trunk groups and possible wide difference of member numbers within trunk groups and should therefore provide more efficient testing and require less intertest procedures. Generally 1-way outgoing trunk groups should be interconnected back-to-back to 1-way incoming trunk groups destined to have a common external office termination. The number of members in such 1-way outgoing trunk groups and 1-way incoming trunk groups should normally be very close to each other.

- a. One set (one or more pages) of Worksheets should be prepared for each set of outgoing and incoming trunk groups to be interconnected. Note that one 1-way outgoing trunk group may be interconnected to one or more incoming trunk groups, or that one 1-way incoming trunk group may be interconnected to one or more 1-way outgoing trunk groups, or that any combination 1-way trunk group interconnection may be used (provided trunk compatibility is maintained throughout). Such interconnection is not desired nor provided for in this section for 2-way trunk groups when actually used as 2-way trunk groups.
  - b. Record the member number for the group in the appropriate column. In the case of 2-way trunk groups, record the lower-numbered members as outgoing and the higher-numbered members as incoming.
  - c. Record the trunk member equipment location (may be found on ESS ODA Form 3201). The trunk member equipment location can be used to locate the tip/ring (T/R) terminals at the CDF. The office cabling drawings and office records should provide the necessary information to correlate the trunk member equipment location with the appropriate CDF terminals.
  - d. Record the CDF terminations as derived from the trunk member equipment location and the pertinent cable drawings and office records.
- NOTE: The real trunk circuit outside plant CDF cross-connections should not have been made. If such cross-connections are in place have these trunk circuit outside plant CDF cross-connections must be removed. Under such circumstances, the required real trunk cross-connections cannot be installed until after the test-connections have been removed.

#### 4.3 Test Line Verification

- 4.31 Originating and terminating test line information may be found on the appropriate ESS ODA input forms.
- 4.32 Conduct the following verification of test lines to determine if they are adequate for interoffice load application. Refer to the test line worksheets prepared for intraoffice testing and the ODA Input Form, "Directory Number Table".
  - a. The total number of originating test lines available must be equal to the number of outgoing trunk calls it is intended to place at any one time.
  - b. The total number of terminating test lines available must be equal to than the number of incoming trunk calls it is intended to place at any one time.
  - c. Refer to Sections 503.34 and 660 of this handbook for additional information on translation test line assignment.
  - d. All office originating and terminating test line access must be loop start.

#### 4.4 Selection of Trunk Groups

- 4.41 Trunk group information may be obtained from the associated office data input forms and office records. After it has been decided which trunk groups are to be used for interoffice testing the associated worksheets should be filled out. The information contained

in these worksheets should be helpful in conducting subsequent procedures during trouble isolation, and in determining if individual test requirements have been satisfied.

4.42 There are no requirements placed upon the numbers or combination of trunk groups which are selected for test at one time (provided the volume test trunk group and test line capacity is not exceeded).

4.5 Outgoing/Incoming Trunk Circuit Test

4.51 Verify the compatibility of those trunk groups which have been selected for CDF back-to-back interconnection. The information on Worksheets 269.660.21-1 and 269.660-21-2 should be compared to determine if there is proper compatibility match of the following:

- a. Start Dial
- b. Outpulsing versus Impulsing
- c. Supervision
- d. Digits outpulsed versus digits expected on incoming trunk circuit

4.52 The two general types of trunk circuit back-to-back interconnections involve (a) 2-way E&M lead interconnection, and (b) an outgoing 1-way RB with an incoming 1-way RB interconnection as follows:

a. Two-way E & M Lead Inter-Connection

<u>OG/IC</u>		<u>OG/IC</u>	
<u>CPS</u>	<u>SUPV</u>	<u>CPS</u>	<u>SUPV</u>
FB361	E&M	FB361	E&M
FB382	E&M	FB382	E&M
FB382	E&M	FB391	E&M
FB391	E&M	FB391	E&M

a.a This section suggests that the 2-way E&M interconnections can be made with members of the same trunk group. It should be noted that when different trunk groups are used, one trunk group must be used as outgoing and the other trunk group must be used as incoming. Therefore, when 2 different trunk groups are used, one must act as incoming only.

a.b When interconnection of 2-way trunk members within the same group is made, the following interconnection rules should be used to eliminate glare.

a.ba An even number of members only can be used. If the trunk group has an odd number of members, one member number (any one) must be placed out-of-service.

a.bb Divide the trunk group members into 2 parts with one part containing only the lower-numbered members and the other part containing only the higher-numbered members.

a.bc Pair off the lowest numbered available members of each part. These two members are to be physically interconnected at the CDF. Pair off the next two higher and available member numbers in each part. Continue this pairing sequence until all members have been paired.

b. One-Way RB Interconnection

<u>OG</u>		<u>IC</u>	
<u>CPS</u>	<u>SUPV</u>	<u>CPS</u>	<u>SUPV</u>
FB361	E&M	FB361	E&M
FB399	E&M	FB370	RB
FB399	E&M	FB371	RB

4.53 All trunk circuit interconnections should be made at one time and maintained for the duration of all volume testing (when possible).

4.54 All trunk circuit test interconnections should be removed before turnover to the TELCO unless the customer specifically requests that interconnections be maintained. In such event a detailed list of such interconnections should be presented to the TELCO.

4.6 Maximum Applied Interoffice Load Application

a. Care should be exercised that testing parameters are not imposed during any test that will exceed office limitations.

#### 4.71 Trunk Circuits

4.711 The maximum number of simultaneous originating test calls can be no greater than the number of interconnected trunk-to-trunk pairs available to support such originations.

4.712 If any trunk group member is placed out-of-service for any reason, the associated trunk group member with which it is interconnected should be placed out-of-service.

#### 4.72 Volume Test Set

4.721 The volume test set calling rate is a function of the number of test lines made available during test and the average length of time required per call. The number of test lines which the test set is capable of servicing is totally a test set limitation. The average length of time required for each call is both a test set limitation, and an office under test limitation. An office under test can slow down the calling rate by slow response (up to permissible limits) in supplying dial tone, setting up network paths, reserving service circuits, and outputting digits.

#### 4.73 Multifrequency (MF) Transmitters

4.731 The number of MFTs will limit the number of MFT calls which may be placed at any one time. All members of a trunk group will be connected to a MFT. The trunk group tied back-to-back with the originating trunk group must be connected to MFRs via the network.

#### 4.75 Multifrequency (MF) Receivers (MFRs)

4.751 The number of MFRs will limit the number of MFR calls which can be placed at any one time.

4.752 Since DP digits are received in the associated trunk member circuits, the number of interoffice DP calls which may be placed at any one time is limited only by the number of trunk circuits available to receive such digits.

#### 4.8 System Test Configuration

4.81 The system test configuration should be viewed as that total configuration required to support all the test requirements of this section. It consists of (but is not limited to) the number of tests to be conducted and what

the individual elements are for each test. These elements include, but are not limited to, the following:

- a. The volume test set.
- b. Those trunk groups and members involved.
- c. Service circuit requirements.

4.82 If there is a compatible match of test set capability and office test lines, trunk groups and service circuits, it may be possible to conduct all interoffice test requirements with one test setup and actual test. This should be the objective when planning interoffice testing

4.83 The association between originating and terminating test lines and the trunk groups during test is via the office dialing codes which direct calls to outgoing trunk groups. The test set selects originating and terminating test lines, made available to it, for any interoffice call, independently of specific trunk dialing codes. The test set will cycle through all available originating and terminating test lines thus eventually selecting all of them.

#### 4.9 Volume Test Set preparations

4.91 After it has been decided what specific test is to be conducted, information contained on the worksheets prepared most of the data required to input volume test set translations.

### 5. TEST PROCEDURE

#### 5.1 Start Volume Test Set

5.11 Refer to Section 660.01 of this handbook for procedures on how to set up volume test set generation of a call load.

#### 5.2 Observation of the Volume Test Set and System Reaction

5.21 All volume test set registers should be analyzed for trouble indications.

5.22 All office maintenance TTY printouts should be analyzed for trouble indications. Refer to the No. 3 ESS IMOM and TLM for interpreting No. 3 ESS TTY printouts.

#### 5.3 Observed Trouble Indications

5.31 If any trouble indications are encountered, go to paragraph 7 of this section.

#### 5.4 End Test

5.41 The test is ended by the volume test set when the number of calls have been completed, or when excessive problems are encountered.

#### 6. TEST REQUIREMENTS

6.1 General (Listed in Section 660 of Handbook 269) - Section 660 of this handbook lists general test requirements which apply to this section. (These

requirements are in addition to those testing requirements listed in paragraphs 6.2 and 6.3 of this section.)

#### 6.2 Subsequent Volume Test Preparation Test Requirements

6.21 The test shall run for a minimum of 30 minutes. The maximum calling rate for the configuration under test should be imposed upon the system.

6.22 No mishandled calls are permitted.

No arrows shown due to extensive changes.

Manager, ESS Installation & Field Engineering

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