

Bell System Practices

Trans. Testing  
a

-K 13-01

# TRANSMISSION MAINTENANCE PRACTICES

SECTION VIII-A  
ROUTINE FOR MAKING  
TRANSMISSION TESTS  
ON  
MANUAL EXCHANGE AREA  
CIRCUITS AND EQUIPMENTS

AMERICAN TELEPHONE AND TELEGRAPH COMPANY  
DEPARTMENT OF OPERATION AND ENGINEERING  
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### General.

This routine outlines the items which should be looked for and the tests which should be made in carrying on a transmission maintenance investigation on manual exchange area circuits and equipment, and gives a method of classifying troubles and for keeping records of tests. Sample record forms as described in this routine are attached.

Exchange area circuits and equipment as covered herein involve all of the telephone equipment used in connection with manually operated local, toll, private branch exchange and miscellaneous switchboards, toll test boards and miscellaneous desks located within a given city or district with the exceptions of operators' telephone sets, subscribers' loops and telephone sets and call circuits. Routines for covering these latter items as well as for making transmission maintenance tests on toll circuits extending between cities or districts are covered in separate routines.

### Preliminary Data Required.

In starting a transmission maintenance investigation in any city or town certain preliminary information should be obtained before any actual tests are made. This information for an office should be kept on file at that office and should be kept up to date by the local forces. Information on trunks which does not concern any particular office should be kept on file at some central point in the city or town and should also be kept up to date by someone responsible for this work. In this way, all preliminary data would be available for continuing routine transmission maintenance tests after a city had once been covered.

The preliminary data which should be obtained are as follows:

(1) Drawings of all circuits to be tested in an office. These drawings should be marked to show the location of the circuits covered by them. A study of the drawings should be made to determine if the proper types of circuits are being used, and to insure that the tests are made properly.

(2) Data on all trunks and lines to be tested, giving lengths, makeups and information on circuits at the distant end. These data should be used in advance of the tests to compute the equivalent of circuits, as indicated on Form No. E-273 attached to these notes.

### Toll Switchboard.

#### 1. Cord and Operators' Telephone Circuits.

(a) Test all cords with keys normal with a transmission measuring set. Using one cord on

each position, measure the transmission loss with the talking key thrown to the talking position and also to the monitoring position.

(b) Test all cords for cut-outs by shaking (especially at the plug end). Test all keys associated with each cord in the normal position and also all keys except ringing keys in the operated position for cut-outs.

(c) Make tests of operators' telephone circuits as described in Section VI-A of the "Transmission Maintenance Practices."

#### 2. Line Circuits.

(a) Measure the transmission loss on all toll line circuits between the test board and the toll switchboard. These measurements should be made at a position of the switchboard to include all of the multiple and without any equipment on the lines at the toll test board.

#### 3. Trunk Circuits.

(a) Measure the current supply of toll switching trunks at the "B" board. The 3-A transmission measuring set is equipped to measure this current directly by throwing key 5 which puts the tip and ring of the cord in series with 400 ohms and the meter. Where transmission maintenance work is being done with a 1-A transmission measuring set these current tests can be made with a mil-ammeter connected in series with 400 ohms. The current readings obtained should fall within the limits given below:

24-volt battery, 45 mils to 65 mils.

48-volt battery, 80 mils to 100 mils.

#### NOTE—

A Weston Model 280 mil-ammeter can be satisfactorily used for this purpose.

(b) Make transmission measurements on all toll switching trunks. In making these measurements the set should preferably be located at the "B" board and the trunks looped at the toll switchboard. When it is necessary to loop the trunks at the "B" board, a jack arrangement wired tip to tip and ring to ring with the necessary sleeve connections can be used for making the loop.

(c) Make transmission measurements on all recording, tandem and miscellaneous trunks.

(d) At "B" positions where toll switching trunks terminate, make tests of operators' telephone circuits as described in Section VI-A of the "Transmission Maintenance Practices."

#### 4. Toll Service Observing Board.

(a) Listen in with and inspect the receivers used on this board.

(b) Measure bridge transmission loss of all service observing sets.

#### 5. Desks (Chief Operators' Ticket Writing, Etc.)

(a) Measure bridge transmission loss of all monitoring arrangements.

#### Toll Test Board.

##### 1. Transmission Tests on Test Board Equipment.

(a) Measure the transmission loss of all composite sets, composite ringers, simplex coils and phantom coils. These measurements should be made at the test board, picking up the terminals of the equipment in the proper jacks and cutting off all lines and drops.

(b) All monitoring arrangements should be checked up with a transmission measuring set to make certain that the proper types are being used and that these are wired correctly.

#### Local Switchboard.

##### "A" Board

##### 1. Cord and Operators' Telephone Circuits.

(a) Make transmission tests of all cords with the keys normal. Use one cord on each position and measure the transmission loss with the talking key operated. On all cords equipped to make common battery to common battery, magneto to common battery, and magneto to magneto connections, transmission tests should be made for each type of connection.

(b) Test all cords for cut-outs by shaking (especially at the plug end). Test all keys, associated with each cord, in the normal position and also all keys except ringing keys, in the operated position for cut-outs.

(c) Make tests of operators' telephone circuits as described in Section VI-A of the "Transmission Maintenance Practices."

(d) Measure the current supply for each cord circuit as described under (a) for toll trunk circuits.

##### 2. Trunk Circuits.

(a) Make transmission tests on information and multiple marking trunks; trunks to rural positions, and official P. B. X. boards.

(b) Make current measurements on multiple marking trunks, trunks to rural positions and trunks to official P. B. X. boards. These trunks have the tip and ring conductors reversed for supervision and should be equipped with a network of 400 or 500 ohms in parallel with 4 mf. condenser wired in each conductor.

To make these tests an "A" cord should be

plugged into the trunks at the "A" board and the current measured at the distant end by means of a mil-ammeter. The current readings obtained should fall within the limits given below:

400 ohms in parallel with 4 mf., 23 mils to 33 mils.

500 ohms in parallel with 4 mf., 19 mils to 27 mils.

#### "B" Board

##### 1. Operators' Telephone Circuits.

(a) Make tests of operators' telephone circuits as described in Section VI-A of the "Transmission Maintenance Practices."

##### 2. Trunk Circuits.

(a) Make transmission measurements on all inter-office and multiple marking trunks; trunks to rural positions and official P. B. X. boards.

(b) Measure the current supply of inter-office trunks at the "B" end as described under 3 (a) for toll switchboard trunk circuits.

(c) Make current measurements on multiple marking trunks, trunks to rural positions and official P. B. X. boards as described under 2 (b) for "A" board trunk circuits.

#### Miscellaneous Desks and Switchboards.

##### 1. Information, Managers', Chief Operators', Wire Chiefs', Etc.

Measure bridge transmission loss of all monitoring arrangements.

##### 2. Service Observing.

(a) Listen in with and inspect the receivers used on this board.

(b) Measure bridge transmission loss of all service observing sets.

#### Private Branch Exchanges.

##### 1. Cord and Operators' Telephone Circuits.

(a) Make transmission tests of local cords with the keys normal and with a key in the talking position for one cord at each operating position. Where cords have different normal losses depending on whether they are connected extension to extension or trunk to extension, transmission tests should be made for each type of connection.

(b) Test all cords for cut-outs by shaking (especially at the plug end). Test all keys associated with each cord in the normal position and also all keys except Ringing Keys, in the operated position for cut-outs.

(c) Measure the current supply for each cord.

circuit as described under 3 (a) for Toll Switchboard trunk circuits.

(d) Where toll cords are provided the battery voltage should be noted and the current supply of all cords measured as described under 3 (a) for Toll Switchboard trunk circuits. Transmission measurements should be made with keys normal and also with the talking keys thrown to both the talking and the monitoring position.

(e) Make tests of operators' telephone circuits as described in Section VI-A of the "Transmission Maintenance Practices."

## 2. Central Office Trunks.

(a) Make transmission measurements of all central office trunks.

## 3. Tie Trunks.

(a) Make transmission measurements of all tie trunks.

### Classification of Troubles.

The various kinds of trouble which may be expected to cause most of the poor transmission found in testing manual exchange area circuits and equipment in accordance with this routine are listed below. Each kind of trouble has been given code letters, with the idea that in recording the results of tests, the use of these code letters will simplify the work of the testers.

#### 1. P. D. Physical Defects.

Includes all cases in which equipment is found by inspection to have physical defects which are not now causing trouble, but which are so likely to cause trouble that the condition requires to be remedied. For example, the insulating bushings on plugs may be in such condition as to allow contact between the various conductors attached to the plug.

#### 2. E. D. Electrical Defects.

Includes all cases in which equipment shows an abnormal loss when measured with the transmission measuring set, and such abnormal loss is indeterminate by visual inspection. For example, these losses in repeating coils, retardation coils and relays may be due to short-circuited turns or low permeability iron.

#### 3. I. W. Incorrect Wiring.

This classification is self-explanatory and should include all troubles due to the incorrect wiring of apparatus in circuits. The most common cases of trouble are reversed ring and sleeve conductors of cord circuits, incorrect wiring of induction coils

and busy-test repeating coils in operators' telephone circuits.

#### 4. W. T. Wrong Type of Equipment or Circuit.

The most common cases of wrong type of equipment are wrong type induction coils in operators' telephone circuits, phantom repeating coils instead of battery supply repeating coils, etc. When a piece of equipment, such as a condenser or a resistance, is made up of several units, and some, but not all, of these are missing, the trouble is classed as wrong type rather than missing equipment.

By wrong type of circuit is meant the employment of the wrong type of loading or gauge of conductors. When the error is only one of geographical routing, the circuit is not classed as wrong type, but this classification is given when the circuit is on the correct route but in a circuit group of construction other than that specified.

#### 5. M. E. Missing Equipment.

Covers all cases in which a piece of equipment is entirely missing.

#### 6. O. Opens.

Troubles falling into this class involve those due to the discontinuity of either or both sides of a circuit, such, for example, as open cords, unsoldered connections and the failure of relays to function properly.

#### 7. G. Grounds.

Covers troubles due to ground connections, foreign to the circuit, which are judged to be of less than one thousand ohms resistance. Common troubles are grounded carbons on the M. D. F. and grounded relays due to damaged relay covers making contact with the relay springs connected in the transmission circuit.

#### 8. C. R. Crosses.

Covers troubles due to foreign connections other than grounds, between the wires of two circuits or the two sides of one circuit.

#### 9. C. O. Cut-outs.

Covers troubles due to loose connections, bad adjustment of relay contacts or dirty contacts.

#### 10. H. R. High Resistance.

Covers troubles due to high resistance permanently connected in series with one or both sides of a circuit. These troubles may be due to resin or non-soldered connections, light tension on relay springs or heat coil contacts, etc.

#### 11. L. I. Low Insulation.

Covers troubles due to low insulation resistance

to ground of either or both wires of a circuit, not classed as a ground, and low insulation between wires.

#### 12. W. R. Wrong Routing.

Applies only to outside wiring and covers cases where trunks or lines have the wrong geographical routing, thereby giving a measured equivalent differing from that obtained by computation from the records.

#### 13. B. C. Bridged Conductors.

Covers cases where conductors are bridged on to a circuit contrary to specifications for the circuit.

#### Types of Equipment and Wiring Involved in Transmission Circuits.

For the purpose of this work, the various types of equipment and wiring which enter into the transmission circuits involved in manual exchange area circuits and equipment as outlined in this routine are classified as follows:

1. Repeating coils.
2. Retardation coils.
3. Relays, including drops and signals.
4. Condensers.
5. Resistances.
6. Autotransformers.
7. Induction coils.
8. Loading coils.
9. Cords.
10. Plugs.
11. Jacks.
12. Keys.
13. Heat coils, including fuses.
14. Carbons, including all other types of protectors used in place of carbons.
15. Wiring, switchboard to m. d. f.
16. Wiring, cross-connecting.
17. Outside wiring.

#### Troubles Commonly Found

Each of the types of equipment and wiring listed above may be found to have one or several of the various classes of troubles. Below is given a list of the troubles which will most generally be encountered in connection with each type of equipment or wiring.

##### Repeating Coils.

1. Electrical defects.
2. Incorrect wiring.
3. Wrong type of equipment.

##### Retardation Coils.

1. Electrical defects.
2. Incorrect wiring.

3. Wrong type of equipment.

##### Relays.

1. Electrical defects.
2. Physical defects.
3. Wrong type of equipment.
4. Cut-outs.
5. High resistance.

##### Condensers.

1. Incorrect wiring.
2. Wrong type of equipment.
3. Missing equipment.
4. Opens.
5. Crosses.

##### Resistances.

1. Incorrect wiring.
2. Wrong type of equipment.
3. Missing equipment.
4. Opens.
5. Crosses.

##### Autotransformers.

1. Electrical defects.
2. Incorrect wiring.
3. Wrong type of equipment.
4. Missing equipment.

##### Induction Coils.

1. Electrical defects.
2. Incorrect wiring.
3. Wrong type of equipment.

##### Loading Coils.

1. Electrical defects.
2. Incorrect wiring.
3. Wrong type of equipment.
4. Missing equipment.

##### Cords.

1. Opens.
2. Cut-outs.

##### Plugs.

1. Physical defects.
2. Cut-outs.
3. Crosses.
4. High resistance.

##### Jacks.

1. Physical defects.
2. Cut-outs.
3. Crosses.
4. High resistance.

##### Keys.

1. Physical defects.
2. Cut-outs.

**Heat Coils.**

1. High resistance.
2. Grounds.

**Carbons.**

1. Grounds.

**Wiring—Switchboard M. D. F. and Cross-Connecting.**

1. Opens.
2. Grounds.
3. Crosses.
4. High resistance.
5. Low insulation.
6. Bridged conductors.

**Outside Wiring (Cable or Open-Wire Conductors).**

1. Opens.
2. Grounds.
3. Crosses.
4. High resistance.
5. Low insulation.
6. Wrong routing.
7. Bridged conductors.

**Description of Record Forms**

For the purposes outlined under this heading five record forms have been drawn up which are described in detail below. The first three forms provide a convenient means for systematically recording testing data as the tests are made and for classifying and clearing troubles as they are located. The fourth form provides a means for classifying and summarizing testing data from time to time and gives about the information which it is thought the people directly supervising this work in any territory should have to properly follow it up. The fifth form is a general summary form which has been drawn up to give about the information which the people interested in this work in the general office will require to keep in touch with its progress and the results being obtained. All of these forms have been made up to fit in with the classification of equipment and troubles which may be involved in this testing work, as outlined above.

**Form No. E-272—Operators' Cord and Telephone Circuits.**

This form has been made up for the use of testers in recording data on operators' cord and telephone circuits. The headings apply to central office and toll circuits but can be adapted to P. B. X. work also. For this latter work, tests on extension to extension connections can be recorded under the heading "Common Battery to Common Battery," and tests on central office to extension connections

can be recorded under the heading "Magneto to Common Battery."

Referring to the sample of this form attached, the headings which are to be filled in at the top are, with a few exceptions, self-explanatory. The table under the heading "Limiting Loss Values Specified" should be filled in before starting the tests. The limiting loss values for any circuits tested are those values above which the circuits may be considered to be in trouble and should therefore be investigated. Limiting loss values for various types of circuits and equipment are being prepared and will be issued for use in connection with this testing work.

The first column headed "Pos. Nos." (Positions Numbers) allows space for recording the positions tested, and the second column under the heading "Cord Nos." (Cord Numbers) is for recording the numbers of the cords under test. These two columns may be used as follows: For cords and operators' telephone circuits on positions which give readings under the specified limiting values the data can be summarized on one line, for example:

Positions Nos. 1 to 6—Cords Nos. 1 to 15.

Whenever a defective cord or operator's telephone circuit is found a separate line should be devoted to this, for example:

Position No. 7—Cord No. 1.

In the case of a defective operator's telephone circuit, this should also be recorded on a separate line, leaving the space under "Cords" blank.

Columns 3, 4 and 5 should be used for recording the measured loss of the cord circuits with all keys normal for the particular type of connections which are involved. Column 6 should give the current supply when measured through a 400-ohm resistance. Columns 7 to 10 are for recording the measured losses in operators' telephone circuits. Where losses are encountered which are in excess of the limiting value specified, the amount of excess loss should be recorded in column 11. If it is impossible to get a quantitative measure of a transmission trouble, this should be indicated by a check mark in column 12. If a trouble cannot be cleared immediately by the tester or equipment people, which might be the case where new equipment has to be ordered for replacements, the trouble should be referred to the Wire Chief or whoever is responsible for this work and the date of referring recorded in column 13. The date when troubles are cleared, as indicated by a retest, should be recorded in column 14. Column 15 should give the specific items of

equipment or wiring which are found in trouble. The items which will most generally be found to be causing trouble were classified earlier in this routine. In column 16 the kinds of troubles which are found should be indicated in accordance with the classification of troubles given above. Where the exact nature of a trouble would not be made clear by this classification, additional information should be given in the "Remarks" column. This column can also be used for noting any particular items which the tester wishes to keep in mind in preparing his summary forms.

#### Form No. E-273—Circuit and Trunk Data for Computing Transmission Equivalents.

This record form is suggested for tabulating the detail makeups of trunks and the computed equivalents of these trunks. Before making measurements of trunk circuits, it is necessary to know the computed equivalents in order to have some figure by which to check the measured equivalents. In using this form one sheet should be started for each trunk or each group of trunks between any two offices which have the same routing and are identical as regard gauge, loading and equipment. Different sections of the trunks which have different makeups should be listed in the first two columns, for example, as follows:

"Switchboard to Main Frame,"  
"Main Frame to Main Frame,"  
etc.

Whenever any section of the circuit includes items of equipment which may affect transmission, these items should be listed in column 3, corresponding to the section of circuit in which they are located. Column 4 is provided for listing the numbers of the standard equipment circuit drawings which show the wiring of equipment into the circuits under test. Columns 5, 6, 7 and 8 should be filled in to give the makeups and lengths of the various sections of circuits listed in the first two columns. The transmission equivalent of each section should then be computed and recorded in column 9. The "Remarks" column provides space for making any notes which should be called to the testers' attention at the time they are using these computed data.

In order to have "Limiting Loss Values" to work to in the testing of trunks and toll lines, the computed values of equivalent, based on average constants, are in each case increased by a "Tolerance." These "Tolerance" figures are added to the computed figures on this form, and the resulting "Limiting Loss Values" for the trunk or lines under test transferred to Form No. E-274.

#### Form No. E-274—Trunk and Line Circuits.

This form provides a means for recording the results of transmission tests made on various types of trunk circuits. The data at the top of the sheet should be filled in as indicated. In this connection, space has been provided for recording weather, insulation and loop resistance. In general, it will not be necessary to obtain this information in testing the local plant. Where trouble is encountered, however, it may be necessary to make insulation and loop resistance tests, in order to determine the cause of the trouble.

In using this form, the tester should, before testing compute the transmission equivalent of each trunk or loop depending upon whether the test is to be made on a straightaway or loop basis, using the corresponding data given on form No. E-273. The numbers of the trunks under test should be recorded in column 1. Columns 2, 3, 4 and 5 should be filled in as indicated. If the tests are made at the "B" board, this should be indicated in column 3. The computed loss should be recorded in column 6 and the measured loss in column 7. If the tests are made on a loop basis, a line should be drawn through the word "Trunk" in the heading over the two columns 6 and 7. If the tests are made on a straightaway basis then a line should be drawn through the word "loop" and the results of measurements in one direction recorded in column 7 and those made in the opposite direction recorded in column 8, if check measurements are made on the trunk.

In order to obtain the equivalents of individual trunks when tests are made by looping two trunks together, it is necessary to make triangulation measurements on three trunks and from these three loop measurements compute the individual losses after subtracting the loss of the looping cord. When the equivalent of an individual circuit has been determined in this manner, this circuit can be taken as a standard and used in making loop tests with other circuits in a group. The equivalent of individual trunks obtained in this manner should be recorded in column 8. Where the measurements are made at the "B" end, these should also include a measurement of current supply through 400 ohms, and the measurements recorded in column 9. The remaining columns on this form correspond to those described above under Form No. E-272 and should be filled out in the same manner.

#### Form No. E-275—Summary of Tests in an Office or Group of Offices.

This form has been drawn up with particular

regard for the needs of the people directly supervising transmission tests of the local plant. It provides space at the top of the sheet for showing the total number of switchboards, positions, trunks and circuits of various types which are tested during a given period. The lower half of the form gives in the left-hand vertical column a list of the various types of equipment and wiring which will be most frequently encountered in this testing work. The horizontal headings classify the various types of troubles which will be found in this testing work and also provide a means for recording quantitative values of the losses which are obtained. It will be noted that this quantitative analysis divides the troubles into four classes, viz.: Number under 2 miles, number between 2 and 5 miles, number more than 5 miles and number indeterminate, which show at a glance just how severe the troubles are and give an indication of their reaction on service.

One of these summary sheets if so desired by the people supervising this work can be filled out for any given territory at periodic intervals, say, each month. When testing work is first started the people supervising this work may find it to advantage to have one of these summary forms made out for each office. In this way a comparison of maintenance conditions at various offices in a territory can readily be made.

#### Form No. E-276—General Summary Sheet.

This form has been drawn up to give a general summary of the testing work covered during a certain period of time and incorporates the items which it is thought will be of particular value and interest to the Plant Superintendents and Chief Engineers of the various companies. It gives information which will be helpful to the executives in keeping in general touch with the transmission maintenance conditions of the plant. Copies of this form should be forwarded to the Plant Superintendents and Chief Engineers periodically, preferably every month.

Referring to the sample of this form attached, the left-hand column on the lower part of the sheet divides the plant into four parts, viz.: Toll, Local, P. B. X. and Toll Test Boards. Each of these is in turn divided into headings showing the important types of circuits which will be encountered. Headings for "Totals" are also provided under each type and at the bottom of the sheet a heading for adding up the "Grand Total" for all circuits tested.

In the first column for recording data should be given average figures showing the number of months which have elapsed since a previous test of the same circuits has been made. In cases of a first

test this column should be marked "First Test." Where a part of the circuits are tested for the first time and others are retested this can be noted in the "Remarks" column. Columns 2, 3 and 4 should be filled in as indicated, the percentage figure for column 4 being computed from the data given in columns 2 and 3. The columns under "Excess Losses—Above Limiting Values Specified" should be filled in by summarizing the corresponding information recorded by the testers on the first three data forms. It will be noted that with the exception of the heading for excess losses under 2 miles, each of the other excess loss columns is followed by a column showing the number of losses falling in this class multiplied by a factor. These factors have been chosen for use in determining the total weighted loss values for troubles falling in each class. For the class of losses under 2 miles the weighting factor has been taken as 1 and no additional column for indicating the multiplication is required. The totals for this column should, of course, be added to the others in determining the figures to be recorded in the column headed "Total Weighted Losses." For indeterminate troubles for which no quantitative loss measurements can be made a weighting factor or multiplier of 5 has been chosen.

The column headed "Index Figure" preceding the "Remarks" column is for use in recording index figures for transmission maintenance conditions in the plant. If the transmission maintenance conditions were perfect the index figure would be 100. Using this as a standard, the index figures where losses are involved are determined as follows: The figure for the total weighted losses as given in column 12 is divided by the corresponding figure given in column 2 "No. of Ccts. Tested." This ratio is then subtracted from 1 and the result multiplied by 100. The resulting figure indicates the condition of the plant from a transmission maintenance standpoint. Expressed by formula:

$$\text{Index Fig.} = 100 \left\{ 1 - \frac{\text{Total Weighted Losses}}{\text{No. Circuits Tested}} \right\}$$

The above index figures should be computed for each type of circuit tested and recorded in the corresponding "Index Figure" column. To obtain the index figure to fill in under the heading "Summary of Grand Totals" at the top of the sheet the grand total figures obtained by adding up the columns for "No. Ccts. Tested" and "Total Weighted Losses" should be used in the above formula. This will give the index figure for the exchange area or territory covered by the summary form.

**Testers' Note Books.**

In addition to the forms described above, each group of transmission testers should keep a note book for recording general items which cannot be covered by the forms. When testers, working in the various offices, find such items as wrong types of circuits installed for particular kinds of service, files of standard circuit drawings for an office not

provided or incomplete, generally bad maintenance conditions in an office, etc., these should be recorded in the note book and reported when the summary forms are forwarded to the supervising forces. Forms have not been provided for recording any tests that may be made on toll test board equipment. Tests which are made on this equipment should be recorded in the note books and reported on the summary forms.

**Attached:**

Five Record Forms on Transmission Maintenance Tests, E-272 to E-276, Inclusive.







SHEET NO. \_\_\_\_\_  
 TOTAL SHEETS \_\_\_\_\_

# TRANSMISSION MAINTENANCE OF EXCHANGE AREA CIRCUITS

FORM E 275

SUMMARY OF TESTS IN AN OFFICE OR GROUP OF OFFICES

CITY OR TERRITORY \_\_\_\_\_  
 \_\_\_\_\_  
 OFFICES \_\_\_\_\_  
 \_\_\_\_\_

PERIOD OF TIME COVERED BY SUMMARY

FROM \_\_\_\_\_ TO \_\_\_\_\_ (DATES INCL.)

PREPARED BY \_\_\_\_\_

DATE \_\_\_\_\_

TYPES OF SWITCHBOARDS & CKTS.  
 SUMMARIZED ON THIS FORM

TOLL \_\_\_\_\_ LOCAL \_\_\_\_\_ P.B.X. \_\_\_\_\_

**TOTALS COVERED BY THIS SUMMARY**

ITEMS	NO. TESTED	ITEMS	NO. TESTED
SWITCHBOARDS		TRUNKS	
POSITIONS		TOLL TEST BOARDS	
OPERATORS' CKTS.		TOLL LINE EQUIP.	
CORDS		MISC. CKTS.	

MAN HOURS TIME REQUIRED  
 TO MAKE TESTS \_\_\_\_\_

NOTE:- ONE SUMMARY SHEET SHOULD  
 BE MADE OUT FOR EACH OF  
 THE ABOVE TYPES.

TYPES OF EQUIPMENT AND WIRING	NO. OF TROUBLES FALLING IN EACH CLASS													EXCESS LOSSES ABOVE LIMITING VALUES SPECIFIED				REMARKS
	P.D.	E.D.	I.W.	W.T.	M.E.	O.	G.	CR.	C.O.	H.R.	L.I.	W.R.	C.B.	NO. UNDER 2 MI.	NO. BETWEEN 2 & 5 MI.	NO. MORE THAN 5 MI.	NO. INDETERMINATE	
REP. COILS																		
RET. COILS																		
RELAYS																		
CONDENSERS																		
RESISTANCES																		
AUTO-TRANS.																		
IND. COILS																		
LOADING COILS																		
CORDS																		
PLUGS																		
JACKS																		
KEYS																		
HEAT COILS																		
CARBONS																		
WIRING	SWBD. - M.D.F.																	
	CROSS CONNECT.																	
	OUTSIDE																	
TOTALS																		

