PANEL SWITCHING SYSTEM
CONTROLLED MAINTENANCE PLAN

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List of Figures

1. GENERAL

1.01 This section describes the plan for the maintenance of the Panel Switching System and applies to all Panel offices.

1.02 "Controlled Maintenance" is the name given the plan described in this section for managing upkeep maintenance in the Panel Switching System. Control, as used here, means to direct, regulate, and coordinate central office activities. The objective of Controlled Maintenance is to maintain the designed switching capability of the equipment in a manner that will provide customers with excellent service while keeping expenses to a minimum.

1.03 Parts 1 through 15, as shown in the table of contents, contain the principles, definitions, descriptions, explanations, and examples necessary to apply Controlled Maintenance. Part 2 defines central office equipment trouble, explains causes of trouble, and identifies common trouble-influencing factors. Part 3 describes the integrated plan for managing upkeep mainte-

nance in the Panel Switching System. Parts 4 through 15 contain the required details of the different maintenance records, files, and techniques which are all part of Controlled Maintenance.

2. TROUBLES — THEIR CAUSES AND INFLUENCING FACTORS

2.01 Part 2 defines "trouble". It describes various causes and influencing factors. Some ideas on the proper use of environmental and personnel control are included. A full comprehension of trouble-influencing factors and the administration of corrective measures are vital to the understanding and application of Controlled Maintenance.

2.02 A "trouble" is said to occur when switching equipment fails to function as designed. The existence of the "trouble" is noted when a service or test call is applied to the affected equipment and results in an alarm, a report, a trouble ticket, or other observed indication. Customer service may be affected. This would depend on circuit design provision for a second trial.

2.03 Not all equipment troubles are immediately evident. Circuit design does not always provide for an alarm or other trouble indication because of cost limitations. When troubles occur in common equipment and trouble-identification circuitry is not provided, Plant forces may be unaware of their existence. Methods, explained later, are required for detecting these troubles.

Kinds of Troubles

2.04 ***Intermittent and Transient Troubles:*** "Intermittent troubles" are those which continue to appear and disappear until they are cleared. For example, wire clippings cause intermittent faults and may also cause trouble indications to appear in different locations. The operation of switches and relays causes sufficient vibration to disturb wire clippings, resulting in the trouble-causing contact being broken intermittently. "Transient troubles" are those which appear once and disappear. For example, momentary opens or crosses caused by improper procedures on distributing frames may result in transient troubles such as noise, "clicks", or cutoffs.

2.05 ***Common Equipment Troubles:*** Many troubles occur in common equipment. "Common equipment troubles" produce reports and other indications which may originate from different sources. In addition, the indications often vary in amount and kind of information received. When this is the case, the different trouble indications may be misleading or obscure. However, in some cases of common equipment trouble, reports or indications received may disclose a common element. These cases are usually referred to as "patterns."

2.06 ***Marginal Troubles:*** "Marginal troubles" are failures of equipment under marginal tests applied by test frames or test sets. These tests are more severe than demands usually encountered in service connections. Marginal tests (either electrical or mechanical) are applied to apparatus to determine if the required reserve is present. If marginal test failures occur, it is an indication that normal deterioration has used up the reserve and that corrective action must be taken before it becomes service-affecting.

2.07 Fig. 1 illustrates different kinds of conditions which may affect calls. Calls affected by central office equipment troubles are shown in more detail.

Causes of Troubles

2.08 Plant forces responsible for maintaining switching equipment must be familiar with the following causes of troubles, most of them the result of electrical or mechanical failures.

Dirt — Dirt may come from within or from outside the central office. Lint from clothing or other textiles, fibers from paper or cardboard boxes and packing material are common kinds of dirt. Dirt may also be due to dust carried in the air or brought into the building by people or on equipment. Solid particles or other residue, caused by contact arcing, are also called "dirt."

Wear — The continual operation of relays, switches, motor drives, brushes, etc, results in deterioration. Wear can be accelerated by dirt and faulty workmanship. Dirt can increase the friction between moving parts. Faulty workmanship which results in improper adjustment can accelerate wear.

Work Error — Central office troubles can be caused by faulty workmanship or by improper procedures. Work errors may be caused by central office people or by others working in the office. In addition, work errors are found in central office record information (service orders, transfer orders, circuit layout cards, etc) as a result of work errors by employees in other departments.

Defects — Failures of apparatus or of components such as open relay windings, nonconducting electron tubes, internal crosses or grounds in spring assemblies, are called "defects".

Trouble-Influencing Factors

2.09 Plant forces must also recognize the key factors of central office maintenance which reduce dirt and work errors to a minimum and serve to diminish trouble due to wear. These factors are basic and should be ***thoroughly*** understood. They are described in 2.10 through 2.16.

2.10 ***Installation Activity:*** One of the controllable factors which influence central office equipment trouble rates is installation activity. It is essential that central office people and the installation forces be thoroughly familiar with proposed work before the job is started. They must be familiar with instructions relating to central office equipment installation, which are found in Section 201-112-001 and the attached Western Electric Handbook sections. These instructions explain in detail the procedures for protecting service and equipment during installation work.

2.11 ***Central Office Personnel Activity:*** Activities by maintenance people may cause trouble by disturbing existing dirt or by introducing more dirt. They may also cause failures if they do not follow prescribed methods for adjusting apparatus or do not follow proper procedures for doing other work.

2.12 ***Housekeeping:*** Section 069-603-801 contains instructions for cleaning equipment without causing service reaction. Surface dusting and pressure cleaning procedures should be followed to remove dirt from equipment. Material should not be stored, unpacked, or crated in equipment areas. Tools, test equipment, drawings, and supplies should not be allowed to become dirt collectors. Except when work is in progress, all equipment covers should be in place.

2.13 ***Contractor and Visitor Activity:*** During building alterations, large amounts of dust and dirt can be brought into the equipment areas. Special protection, such as temporary, dustproof partitions and special control of windows, doors, and ventilating equipment may all be required. Central office people should be on the alert for service or safety hazards and should inform the contractor's representative or the Chief Engineer, as appropriate, of the need for preventive requirements. Coordination with other departments and control of visitors during "Open House" and other activities also help to reduce dirt.

2.14 ***Other Force Activities:*** When it is necessary for other forces to work in the central office, the nature and duration of their visit and the details of work to be performed should be reported in accordance with local instructions. Central office forces are responsible for seeing that the work is performed in such a way that customer service is not jeopardized.

2.15 ***Environmental Control:*** Some central offices are provided with equipment for filtering air and regulating humidity. Its effective use, coupled with controlled use of windows, outside doors, and openings between building areas will reduce the introduction and circulation of dirt.

2.16 ***Application of Bell System Practices:*** Bell System Practices prescribe proper procedures for testing, removing from service, adjusting, and repairing equipment. Work performed in accordance with these instructions should result in effective repairs without service reaction. Nonstandard adjustments or repairs must be avoided.

The Trouble Problem

2.17 Control of central office equipment troubles is made up of three main categories as follows:

Handling Trouble Reports — Prompt response and proper handling of reports, including fast restoral of service, is a key part of the central office trouble control job.

Detection of Obscure Troubles — It must be recognized that other equipment troubles exist and are affecting service but are not evidenced by associated indications. Scheduled, trouble-seeking procedures must be an integral part of the total maintenance plan for controlling these troubles.

Control of Trouble-Causing Factors — Control of dirt, limitation of wear, equipment protection, work errors, and outages are the main factors. This is the essence of the maintenance job. The maintenance people should thoroughly understand the operation of the equipment, the use of the test gear, and the true significance of trouble reports.

3. CONTROLLED MAINTENANCE — CORRECTIVE AND PREVENTIVE

3.01 ***Controlled maintenance*** is the term applied to the maintenance plan described in this section. It consists of an appropriate balance of corrective and preventive maintenance, tailored to the needs of the Panel Switching System. The terms "corrective maintenance" and "preventive maintenance" are defined as follows:

Corrective maintenance consists of the activities of logging reports, locating, repairing, and recording details of troubles reported by trouble ticketers or by indicators, customers, operators, alarms, other offices, testboards, and other sources.

Preventive maintenance is the term applied to the activities of finding, repairing, and recording troubles, service-affecting or not, which are not associated with indicators received, and for other troubles for which there are inadequate indicators. For convenience of description, these activities are separated into two divisions: (1) The examination of corrective maintenance records for evidence of increasing trouble and the testing of associated equipment for further evidence and (2) The scheduling of manual or test frame tests for locating other troubles for which indications are obscure, or for the purpose of affirming the correct operation of selected, critical equipment items for which in-service failures cannot be tolerated.

3.02 In the Controlled Maintenance Plan, corrective maintenance procedures are used for handling trouble reports from all sources. These procedures are aimed at: (1) providing an effective means for controlling the prompt handling of trouble reports, (2) dispatching these reports for trouble location and repair, and (3) providing for orderly but simplified records which present information in an effective way for possible later use. It should be recognized that corrective maintenance is an adequate method for handling reports and indicators of trouble where information supplied contains sufficient detail for locating the trouble. The information is accurate, and it is received promptly.

3.03 The prompt receipt of adequate trouble details for trouble location depends largely on internal circuitry designed to ***detect*** and ***report*** failures or on the ability of the user (customer or operator) to provide accurate and sufficient description of the ***noticed*** effects of the trouble. In Panel, the latter is limited to customer line equipment and trunks used directly by operators.

3.04 For Panel equipment, where the conditions stipulated in 3.03 are not met, other means for detecting troubles must be used so that troubles and deterioration, not yet affecting service, do not accumulate. Preventive maintenance, as outlined in this section, provides an ***effective*** and ***economical*** method for locating and repairing these troubles.

3.05 The key to the balanced use of corrective and preventive maintenance in the Controlled Maintenance Plan is the Equipment Test List. This list contains all the test requirements for the Panel Switching System. Tests are classified according to criteria established along the lines described in 3.03 and 3.04. The test classifications are defined in Section 215-001-011, Panel Switching System Equipment Test List Instructions.

3.06 The test classifications used in the Equipment Test List provide for the following: (1) Where the failure of equipment could result in severe service reaction ***and*** where trouble details are missing or obscure, periodic tests are required. (2) For other equipment, where failures do not result in serious failures or reactions, scheduled reviews are required. The reviews are

made for the purpose of determining the need to perform complete tests of the equipment. The Plan allows for only one review to be passed. On the next review, some action must be taken. (3) The Equipment Test List also provides for full use of test frame tests. These tests are designed to detect failures or near failures of equipment which, in most cases, are not readily detected by trouble reports and indications.

3.07 Fig. 2 depicts an overall view of the Controlled Maintenance Plan. The objective of the Plan is to maintain the designed capabilities of switching equipment. Quality control measures applied to manufacture and installation processes are intended to ensure that Telephone Companies are provided with equipment installations which meet the standards established by the design. In the Controlled Maintenance portion of Fig. 2, three "legs" can be seen. One is for corrective maintenance and the other two are for preventive maintenance. The center of Fig. 2 depicts the preventive maintenance activities which are the result of examination of corrective maintenance details. This process is limited to those circuits where indicators are received and they provide sufficient detail for examination and recognition of evidence of other troubles not yet reported or associated with reports received.

3.08 The right-hand part of Fig. 2 depicts the preventive maintenance activities which originate from the Equipment Test List. Both manual and test frame tests are represented here. This leg covers equipment where trouble indicators are missing, misleading, or obscure and accordingly require other means for recognizing trouble.

4. FORM E-5466, PANEL TROUBLE TICKET

General

4.01 Part 4 describes Form E-5466, Panel Trouble Ticket, and its use in Panel offices. Included are instructions for making entries on trouble tickets, as well as examples of completed trouble tickets.

4.02 The Controlled Maintenance Plan applies to switching equipment. Troubles associated with switchboards and toll terminal equipment are described in other sections.

4.03 Trouble tickets are corrective maintenance work orders and records for central office maintenance people. Tickets are source documents for details of trouble reports and resultant found or not-found troubles. It is important that tickets be written for all trouble reports and that ***entries be complete, accurate, and legible.***

Description

4.04 Form E-5466, Printed on white paper, measures 3-1/2 by 6-1/2 inches.

4.05 The front of the trouble ticket provides space for entering information concerning reports, trouble indications, detailed descriptions of action taken, and troubles found (see Fig. 3). The back of the trouble ticket provides space for recording tracing information (see Fig. 4).

Use

4.06 The trouble ticket is used in all cases to record details of trouble reports or of related work operations. Trouble tickets are indicated as "T" or "Memo", according to 4.07 through 4.14.

4.07 "T" tickets are issued for reports from customers, employees, other departments, other offices, alarms requiring corrective action, trouble indicators, and trouble ticketers as shown in Fig. 5, Table A.

4.08 "Memo" tickets are issued as memoranda of tracing information on permanent signals and interoffice or intraoffice connections. They are also used as memoranda of referred work, such as replacement and adjustment of apparatus and for transmitting information to another employee. Troubles seen as a result of casual observation, not related to any scheduled tests or trouble-seeking activity, are recorded on "Memo" tickets. Also, installation or other work activity in a large central office building may require advice to the maintenance center through the use of a "Memo" ticket.

4.09 "Memo" tickets may be issued to cover pending work operations as a result of closed-out trouble reports ("T" tickets) where repairs are to be made later. When the report is closed out and service is restored by removing the defective equipment from service, the asso-

ciated "T" ticket is retained in a special file for pending work. Later, when a craftsman is assigned to clear up these items, a "Memo" ticket is issued for recording details of the repair or replacement work operation. When the equipment is restored to service, the "T" and "Memo" tickets are completed and filed.

4.10 Trouble tickets are ***not*** issued for recording troubles disclosed by preventive maintenance activities such as tests, inspections, and samples. Procedures for handling these troubles are discussed in Parts 11 and 12.

4.11 All "T" tickets, as well as "Memo" tickets issued for traces, are serially numbered for identification and for relating them to reports or troubles.

4.12 When "T" tickets are closed out, details of found or not-found troubles are recorded for future studies. The right-hand part of the ticket is arranged for coding trouble data. Fig. 6, Table A, illustrates entries to be made in the "Equipment" and "Apparatus" spaces. Fig. 6, Tables B and C, illustrate entries to be made in the "Cause" and "NTF" spaces. A trouble-coding decision chart for different trouble-coding situations is shown in Fig. 7. Fig. 8 through 19 illustrate ticket use. "Memo" tickets ***are not*** to be coded.

4.13 Each "T" ticket must have an entry in the "Equipment" space. Enter the equipment and number, "NTF", or "REF OUT", whichever is applicable as explained in Fig. 6, Table A. All troubles which are found in the apparatus or wiring of an equipment frame should be coded to that equipment. Troubles which "came clear while testing", but which have been isolated to a particular equipment frame, are also coded to that equipment.

4.14 When several reports or indications received at the same time are found to be the result of one equipment trouble, the "T" tickets should be associated for correctly recording trouble information. Part 8, Form E-5463, Trouble Summary, describes how equipment trouble counts are used for maintenance administration. It is vital that on the Trouble Summary only one count be made for each equipment fault.

Plant Service Center Referrals

4.15 Form E-4086, Inspection and Routine of Central Office Equipment, is used by Plant Service Centers to refer trouble patterns to central offices. When one of these tickets is received, a Form E-5466, Panel Trouble Ticket, should be associated with Form E-4086. Only action taken, coding, and close-out details need be entered on Form E-5466. Fig. 20 is an illustration of Form D-4086.

4.16 Plant Service Centers use a code on Form E-4086 for customer reports. Similar types of customer reports are grouped. The coding system is called ***Group Classification.*** Form E-4736, Classification Codes and Definitions, for the Manual Handling of Trouble Reports illustrated in Fig. 21, depicts and explains the codes.

5. FORM E-5457, CENTRAL OFFICE LOG

General

5.01 Part 5 describes Form E-5457, Central Office Log, and its use in Panel offices. Illustrations of the form and typical examples are included.

5.02 The log is used for recording trouble reports, traces, and central office activities which could result in trouble reports. Information such as volume, origin, coding, and status of trouble is readily available for alerting central office forces to unfavorable changes or reactions in switching performance.

Description

5.03 Form E-5457, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

Use

5.04 Fig. 22 illustrates the use of Form E-5457, Central Office Log, by means of typical examples and explanatory notes.

5.05 The log may be closed out daily or periodically, depending on the volume of trouble reports and other entries. In either case, any trouble reports which are not closed out on one sheet of a log should be carried over to the log for the next day.

5.06 The log may also be used for noting central office activity, such as installation, contractor, or preventive maintenance activities. These kinds of entries are useful for investigating trouble increases which may be associated with central office activity.

5.07 Some offices require only one log for recording all reports and other activities. In large offices, it may be better to use separate logs for trouble reports, alarms, installation work, or other activities.

6. FORM E-5467, PANEL CONTROL RECORD

General

6.01 Part 6 describes Form E-5467, Panel Control Record, and its use in Panel offices. Included are illustrations of the form, with typical examples.

6.02 Columns are provided for recording data pertaining to service, certain performance, and administrative trouble indicators. Several blank columns are provided for recording data for locally selected trouble indicators. The bottom three lines of the control record are arranged for entering partial and total objectives for selected indicators. See Fig. 23 and 24 for illustrations of Form E-5467.

Description

6.03 Form E-5467, printed on both sides on white paper, measures 8-3/8 by 10-7/8 inches. It is made for tumble-turn filing and is punched for standard ring binders.

Use

6.04 Form E-5467, Panel Control Record, provides a current picture of trouble data accumulated for a month, usually on a daily basis. In small offices, it may be more convenient to accumulate this data on a partial month or weekly basis.

6.05 Cumulative entries are made for each of the indicators under "Central Office Service Index." This is done to facilitate partial or total month comparison with an established bench mark, in this case the service index.

6.06 Where "Objective" spaces are provided for other indicators, entries may be recorded cumulatively or by actual totals. Cumulative entries are more easily compared with partial or total month objectives when trouble rates are large. Adverse changes or trends, deviating from the performance objectives, can be promptly recognized (see Fig. 23 and 24).

6.07 Blank columns are provided under "Special Studies" to record data for indicators selected locally. These columns may be used for plant registers not already listed, or to collect trouble data for a particular problem area. For example, readings of "intersender timing" registers may be recorded here.

6.08 The data recorded on Form E-5467 is taken from the central office logs, "T" trouble tickets, plant and traffic registers, plant service centers and service observing forces. Plant registers provide some of the data and should be read at the same time each day, so that comparisons made apply to equal time periods. Use Form E-4744, Register Readings, for recording data (see Fig. 25).

Setting Objectives

6.09 Significant deviations in the levels of service can be readily detected through the use of preset objectives. For this reason, it is necessary to establish objectives that are meaningful and attainable.

6.10 Objectives shall be established for each of the indicators listed under "Central Office Service Index" and "Stuck Senders." The service index indicators include all the components of the Dial Central Office Service Index.

6.11 The following example illustrates a method for setting a Code 5 and 8 objective, using the rate shown in the index table in Section 201-102-002 for BCO Panel.

(a) The index table shows that 2.75 reports per 100,000 originating calls is equivalent to a 97 component index. This is selected as the objective.

(b) Last month, the total originating peg count was 5,000,000. It is assumed that next month the peg count will be similar, and can be used as the base figure.

(c) The objective failure rate (2.75 reports per 100,000 originating calls), multiplied by the originating peg count in units of 100,000 (50 x 2.75), equals 137 reports. This is the maximum number of Code 5 and 8 reports that will produce a 97 component index for the month.

(d) To compute the partial month objectives (10 days, 20 days), the figure 137 is divided by 3. One-third (45) is the 10-day objective, two-thirds (90) is the 20-day objective, and the total (137) is the objective for the month (see Fig. 23).

6.12 As the cumulative Code 5 and 8 reports are posted, the figures for the tenth and twentieth days are compared with the objective. It is unnecessary to wait for the tenth or twentieth days before making comparisons. The fifth day or any other day may be chosen and a simple mental division made to ascertain the objective. For example, in 6.11 (d), the ten-day figure of 45 equates to 22 for five days. This procedure permits prompt recognition of adverse service and control of results by the application of remedial action.

6.13 Objectives are set for all service components, using the Dial Central Office Service Index Tables. Objectives should also be set for stuck senders and the number traced and percent traced. Trends and comparisons with past performance may be used when setting objectives for stuck senders registered, the equipment groups under "Trouble Trend Data," and the 3 "NTF" classifications.

7. TICKET FILE

General

7.01 Part 7 describes the ticket file which is used in Panel offices. The file provides for systematic storage of all trouble tickets. They are readily available for reference or study. The file should be located where the maintenance records are kept.

Description

7.02 Fig. 26 shows a ticket file. Ordering information is included. Each ticket file unit is equipped with two fixed and two snap-on designation strip holders and 26 bin dividers. The bin sizes can be established in increments of 3/4 inches. This feature provides for various filing arrangements. In addition, file units may be connected together to provide the required size for an office.

Use

7.03 In the ticket file, ticket bins should be arranged to correspond to the equipment groups listed on Form E-5463, Trouble Summary (see Part 8). All "T" tickets should be filed together, according to the equipment group in which the troubles were found except that line finder and district selector equipment groups may be combined if so desired. All "NTF" tickets which cannot be associated with a particular unit of equipment should be filed in one of the three bins designated as "NTF" (originating, terminating, and other).

7.04 Trouble tickets should be retained in a three-month moving file. At the end of each report period, tickets for the oldest month should be removed (see Part 15 for Retention of Records).

7.05 Fig. 26 illustrates a suggested ticket file arrangement. Trouble tickets filed in each equipment group bin (line finder, district, office, etc), should be filed sequentially by equipment number. For example, line finder frames 201, 202, 203; district frames 201, 203, 206 might represent trouble tickets filed in these equipment bins for troubles that had occurred in this equipment. During the course of a month, as tickets are filed by equipment number, repeat troubles may be easily seen through this filing method. That is, as each ticket is filed by equipment group and number, the tickets for the current month are examined quickly to see if the latest ticket is a repeated trouble.

7.06 Separate bins should be designated for filing "Memo," "Hold for Repair," and "Pending" trouble tickets issued during the current month. In most cases, Memo tickets need not be retained beyond the end of the month. For special studies, spare bins may be used.

8. FORM E-5463, TROUBLE SUMMARY

General

8.01 Part 8 describes Form E-5463, Trouble Summary, and its use in Panel offices. Included are examples of its use and instructions for recording information on the Trouble Summary and for interpreting data.

8.02 Form E-5463 is provided for recording each month the number of troubles associated with designated equipment groups. The form is arranged for comparison of troubles by months (trends), comparison of troubles with the past year's average, and comparison with an objective level of trouble.

Description

8.03 Form E-5463, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

8.04 Fig. 27 is an illustration of Form E-5463. It contains examples of entries to be made. A column is provided for listing major groups of equipment. Other columns are provided for recording the average number of troubles for the previous year, the current objective, and the number of troubles coded to each equipment group each month.

8.05 The back of the form provides space for entering remarks or explanatory notes which refer to entries made on the front of the form.

Use

8.06 The Trouble Summary provides space for recording trouble data by months so that the trouble trends are readily apparent. The data recorded on this summary is obtained from Panel trouble tickets which are described in Part 4. "T" tickets are totaled and recorded daily as "Trouble Trend Data" and "NTF" on Form E-5467, Panel Control Record. "Memo" tickets are not recorded on the Control Record. The total monthly figures for each equipment group shown under "Trouble Trend Data" and "NTF" should be transcribed to the Trouble Summary. Additional spaces are provided in the "Equipment" column, in case a further breakdown of equipment troubles is required for special studies.

8.07 All equipment frames are grouped under the recommended major headings listed in Fig. 27. Any equipment not covered by a specific heading is considered as "Miscellaneous."

8.08 Two columns, "Avg. Prev. Year" and "Cur. Obj.," are provided on the Trouble Summary for comparing current trouble trends with past trouble results and for comparing also with an objective figure. As the number of troubles are entered each month for each equipment group, comparisons are made. If the number of troubles for a particular equipment group should rise unexpectedly, or if a gradual rising trend is noticed, investigation to determine the cause is required.

8.09 The "Avg. Prev. Year" column is provided for entering the average month's trouble figure for the previous year. It is expressed as a whole number opposite each entry listed in the "Equipment" column. The number entered in this column should not in all cases be the arithmetical average of last year's trouble history. If for one or more months of the previous year, the trouble rates were excessively high or low for known reasons, then the average should represent only the other months of the year, so as not to distort the figure shown on the Trouble Summary. The point here is that the average of the previous year is intended to be a benchmark for making comparisons with present trouble rates. In order for such comparisons to be realistic, it is required that the figure shown in the "Avg. Prev. Year" column also be a realistic figure.

8.10 The "Cur. Obj." column is provided for entering the current year monthly objective figure. It is expressed as a whole number opposite each entry listed under the "Equipment" column on the Trouble Summary. When the objective for the next year is being calculated, consideration must be given to current trends of trouble rates and conditions known or expected

to exist next year which might affect trouble rates. For example, the addition of more frames, the transfer in or out of customer lines, the addition of new services or features, and the result of a reconditioning program would all have an effect on future trouble rates. The objective should be set with these in mind. In addition, the objective figure should be adjusted if actual results obtained are ***far out of line*** with the previously set current objective and the cause is known.

8.11 Form E-5463, Trouble Summary, is used for presenting trouble data in large enough pieces (monthly for each equipment group) so that developing trends can be recognized. When adverse trends are seen, investigation should be made for determining cause. The manner in which this is done is described in Part 9. Action taken as a result of investigation made should be noted on the back of the Trouble Summary, as shown in Fig. 27.

9. FORM E-5469, PANEL TROUBLE TALLY SHEET

General

9.01 Part 9 describes Form E-5469, Panel Trouble Tally Sheet. Included are explanations of entries made on Form E-5469 and illustrations of its use in Panel offices.

9.02 Form E-5469 may be used when the Trouble Summary or the control record indicates that detailed examination of trouble data, coded on trouble tickets, is required.

Description

9.03 Form E-5469, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

9.04 Entries on Form E-5469 correspond to the "Apparatus," "Cause," and "NTF" coding spaces on Form E-5466, Panel Trouble Ticket. The tally sheet is arranged so that coded trouble data on tickets may be easily transferred to a tally sheet when required. Space is provided for recording totals of troubles for equipment units, for apparatus, and for various causes. Fig. 28 illustrates the use of Form E-5469, Panel Trouble Tally Sheet.

9.05 The back of the form is ruled for ease in making entries or remarks which pertain to knowledge gained from making the tally or from causes determined, as well as for action taken or not taken as a result of tallies made.

Use

9.06 Whenever the trouble data recorded on Form E-5467, Panel Control Record, or on Form E-5463, Trouble Summary, exceeds objectives or is observed to be a rising trend, an investigation should be made to determine the cause. The first step is to select the trouble tickets filed under the affected equipment group for the period during which the trouble increased and tally them on the trouble tally sheet. Next, a group of tickets covering the preceding period of the same length as the first group are tallied on the same tally sheet, but in a different color or column. Usually a quick comparison of the tallies will be sufficient to identify the main contributor to the increase in trouble.

9.07 After the tickets have been tallied and the cause determined, they should be returned to the ticket file and arranged as before. Instructions for filing trouble tickets are covered in Part 7.

9.08 When the use of the tally sheet does not clearly identify the cause of an increase in trouble, it might be necessary to make use of sample inspections or tests to determine the exact nature and extent of the trouble condition. It is possible that an increase in total troubles noted on the control record or on the Trouble Summary could be caused by small increases in one or more trouble causes in different apparatus. It is likely that this will occur infrequently.

9.09 It could be argued that, within an equipment group, a trouble increase in one kind of apparatus due to one cause could be offset by an equal trouble decrease in the equipment group for another kind of apparatus and cause in the same time frame. If such an unlikely event should occur, the total number of troubles, for the month, would be unchanged and normally undetected on the Trouble Summary.

9.10 After maintenance activities aimed at reducing trouble rates have been started, indicators should be watched for a drop in trou-

ble. If the drop occurs, the extent of it should be considered when evaluating trouble levels on the Trouble Summary. If the expected drop in trouble does not occur, it is necessary to examine additional trouble data to determine the nature of the new situation.

9.11 Fig. 29 is a block diagram of the corrective maintenance process describing Parts 4 through 9. All corrective maintenance flows from trouble reports or indications and ends with the service restoral and report closeout. Information is collected and recorded on the control record and Trouble Summary for preventive maintenance reference.

10. FORM E-5450, EQUIPMENT TEST LIST, AND FORM E-5451, SCHEDULE

General

10.01 Part 10 describes Form E-5450, Equipment Test List, and Form E-5451, Schedule. These forms are provided for listing and scheduling all equipment tests and inspections found in Bell System Practices. Included are examples of the use of the forms.

Description

10.02 Forms E-5450 and E-5451, printed on white paper, measure 8-3/8 by 10-7/8 inches. Form E-5450 is punched in the ***right-hand*** margin for filing in standard ring binders, whereas Form E-5451 is punched in the ***left-hand*** margin. These forms are arranged this way so that Form E-5450 can be filed as a left-hand facing sheet and associated Form E-5451 can be filed as a right-hand facing sheet. Fig. 30 illustrates the filing method of Forms E-5450 and E-5451.

10.03 Form E-5450 is provided with columns for listing section, test requirement or paragraph, work description, test classification, frequency, and job number assigned in the office. Form E-5451 provides a column for listing the job numbers assigned to the tests. Other columns are provided for indicating the particular period of time when requirement is scheduled. Most scheduling is done on a monthly basis and assignments can be indicated by a diagonal line in the appropriate spaces. The completion of an assignment is usually shown by a second diagonal line, forming an "X." Test frequencies not assigned by the month (weekly, biweekly, etc) can be indicated by a horizontal line in the appropriate spaces. Vertical lines can then indicate the number of times the test has been completed in the month. Tests with daily frequencies can be assigned by simply entering the word "Daily" on the schedule, next to the job number.

Use

10.04 Form E-5450 is the format for a series of Bell System Practices, known as ***test lists,*** specifying classifications and frequencies, where applicable, for BSP tests and other requirements related to standard central office equipment. For each major switching system, there is one test list which contains the tests and requirements for that system and for directly associated apparatus. The test list for Panel is Section 215-001-011.

10.05 In order to provide a complete record of all tests and inspections found in the section, the equipment test lists contain tests which may not apply to some offices. Where this is the case, the pages which do not apply should be retained for later needs. Parts of other pages which do not apply are indicated by writing "NA" in the associated scheduling sheet spaces on Form E-5451.

10.06 Other tests not included in Division 215, but which apply to other equipment, are to be entered on blank Forms E-5450. Examples are building security and safety items and requirements for step-by-step type switches used in concentrating circuits. Form E-5451 is associated as described.

10.07 All of the tests and requirements in the Equipment Test List are given one of the following four classifications: MW, MR, TF, or

TT. These classifications are defined in the section Equipment Test List. MW (Mandatory Work) tests ***must be performed*** at least as often as the frequency specified in the Equipment Test List. MR (Mandatory Review) tests ***must be reviewed,*** for the need to do them, at least as often as the frequency specified in the Equipment Test List. A record of the review must be made on the Test and Inspection Summary, even if no action is taken. A mandatory review at the next interval requires further action. Fig. 31, Table A, shows the MR Review Procedure.

10.08 TF (Test Frame) tests are scheduled according to a test frame program developed locally. The test frequency for each TF test, as specified in the office program, is posted in the "FREQ" column on Form E-5450 of the Equipment Test List. Every TF test must be included in the office program and must be performed accordingly. Completed TF tests are indicated by appropriate marks on Form E-5451.

10.09 Tests classified as TT (Trouble Test) are not scheduled. These tests are listed on separate pages in the Equipment Test List, for filing separately. TT tests are included in the published Equipment Test List so that every test and requirement has an assigned classification, and to provide a ready reference for selecting tests for trouble clearing and equipment testing purposes.

10.10 The frequencies at which tests are scheduled are indicated by the following symbols:

SYMBOL	FREQUENCY
D	Daily
W	Weekly
M	Monthly

Less frequent intervals are indicated by a number prefix, for example, 6W for once in 6 weeks.

11. FORMS E-5453, E-5454, AND E-5455, TEST AND INSPECTION SUMMARIES

General

11.01 Part 11 describes Forms E-5453, E-5454, and E-5455, Test and Inspection Summaries. Included are illustrations of the use of these forms.

11.02 These forms are sources of information for preparing Form E-5452, Test and Inspection Work Order and Record, which is described in Part 12. The information on Forms E-5453, E-5454, and E-5455 is obtained from the Equipment Test List and also from office equipment records. In addition, spaces are provided for summarizing found troubles and craft work time.

Description

11.03 The three test and inspection summary forms are described below:

FORM	TITLE	SIZE	SIDES PRINTED	PAPER STOCK	MARGIN PUNCH
E-5453	Test and Inspection Summary	8-3/8" x 10-7/8"	Both	Bond	7 holes
E-5454	Test and Inspection Summary	5" x 8"	Both	Card	No
E-5455	Test and Inspection Summary	11" x 17"	One	Bond	7 holes

11.04 Form E-5453 provides spaces on the front for recording assignment data, section number, equipment, work description, number of equipment units involved, estimate of work time, and results of work done (see Fig. 32). The back of the form provides more spaces for results. Form E-5454 is a smaller version of Form E-5453 (see Fig. 33); Form E-5455 has more spaces for summarizing multiple assignment work details for certain jobs in large offices (see Fig. 34). These are jobs which must be broken down into smaller assignments because the amount of overall work is too great for scheduling at one time.

Use

11.05 A Form E-5453, E-5454, or 5455 must be prepared for each MW, MR, or TF test or requirement specified on the Equipment Test List. For nonmultiple jobs a Form E-5453 or E-5454 may be used, depending on the filing system used in the office. Form E-5455 is used where large multiple assignments are required and a considerable amount of summary information is collected.

11.06 Generally, it is preferable that Equipment Test List job assignments be made so that the work may be completed within a work tour. However, there are cases where these assignments are used as fill-in work to round out a fixed-work job assignment. In these cases, the work may be spread over several days. For tests and inspections which are scheduled at longer intervals, it may be better to divide the work into several job assignments. This has the advantage of providing a constant check on equipment performance and also produces a more even distribution of work load. The equipment involved in a yearly requirement might be divided into parts, for example, with consideration given to vacation periods or other factors. This is a typical multiple job assignment which would use several lines on a Form E-5455. When large jobs are divided into smaller job assignments, a limiting factor which must be considered is the setup time. If the setup time is appreciable, the minimum job assignments must be long enough so that the setup time is only a small part of the total.

11.07 Form E-5453, E-5454, or E-5455 provides the necessary information for preparing Form E-5452, Test and Inspection Work Order and Record. When the work is completed, trouble details, time spent, and initials of the workman are to be entered on Form E-5453, E-5454, or E-5455.

11.08 There may be tests for which few troubles are expected and where the work can normally be completed in one tour. In these cases, Form E-5453 or E-5454 may be used as both the work order and the summary, and the test results may be posted directly on these forms (see Fig. 33).

11.09 Form E-5455 is used for tests or inspections where multiple job assignments are required. This form provides spaces for 35 individual assignments. In these cases individual work orders, Forms E-5452, are issued as each assignment is due. When the assignment is completed, details are taken from Form E-5452 and are posted in the appropriate spaces on Form E-5455 (see Fig. 34). It may be desirable to illustrate progress on extended programs. This can be accomplished by coloring the "Work Compl." spaces as completion dates are entered. A light-colored pencil, such as yellow, will provide the effect without obliterating the entries (see Fig. 34).

12. FORM E-5452, TEST AND INSPECTION WORK ORDER AND RECORD

General

12.01 Part 12 describes Form E-5452, Test and Inspection Work Order and Record. Included are illustrations of the use of the form.

12.02 Form E-5452 is used as a preventive maintenance work order and as a record of work performed.

Description

12.03 Form E-5452, printed on both sides, on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

12.04 The front of Form E-5452 provides spaces at the top for recording assignment data, section number, equipment, work de-

scription, units involved, and progress made. The bottom part of the form is for recording details of troubles found and action taken. The back of the form provides more spaces for recording trouble details.

Use

12.05 Form E-5452 is issued for job assignments listed on the Equipment Test List, except as noted in 11.08. Assignment and reference data are obtained from the test and inspection summaries for each preventive maintenance job shown on the Equipment Test List. Form E-5452 is a work order for craftsmen. It specifies work to be performed. Details of test failures and troubles found are to be entered in the spaces provided. Complete or partial details of a job are entered in the "Progress Report" portion of the form (see Fig. 35).

12.06 Form E-5452 is also used for recording results of test frame operation. It is the work order for each test program. Details of test failures and troubles found are recorded in the "Work Record" part of the form. Progress of tests and time spent by craftsmen assigned to test frames are entered in the "Progress Report" part of the form.

12.07 It is important that maximum use be made of test frames because they are provided for detecting troubles which cannot be detected easily by other means. Forms E-5452 for test frames should be used until space for recording details of progress is used up (see Fig. 36).

12.08 Form E-5452 is also used for other work not specified by the Equipment Test List. Examples are special equipment tests, inspections, or samples.

12.09 Some tests and inspections do not ordinarily result in many found troubles and also do not require numerous separate work operations. In these cases, it is not necessary to use Form E-5452. Test or inspection results may be recorded on Form E-5453 or on Form E-5454.

12.10 Fig. 37 is a diagram of the preventive maintenance process described in Parts 10, 11, and 12. The left-hand portion of the diagram illustrates the use of the results of corrective maintenance. This part of the process depends on adequate trouble indicators which are related to similar equipment troubles not associated with reports. The right-hand portion of the diagram shows the use of the Equipment Test List to initiate preventive maintenance work. This is done for checking the performance of other equipment which, otherwise, cannot easily be checked. This part of preventive maintenance makes use of manual and Test Frame tests.

13. SAMPLING MAINTENANCE CONDITIONS

General

13.01 Part 13 describes the use of sampling for evaluating performance or condition of switching equipment. It includes definitions of terms, tables of random numbers, and an example of sampling applied to Panel.

13.02 Sampling, as explained in this part, is called ***scientific sampling.*** This refers to the fact that certain rules govern the sample size as well as the selection of the particular items to be sampled. The reasons for these rules are:

(1) To minimize the possibility of bias or distortion affecting sample results.

(2) To allow certain definite conclusions to be drawn about the particular universe when the sample results are known.

13.03 When things are sampled without adherence to the rules governing sample size and selection, it is called ***judgment sampling.*** Under certain conditions, judgment samples, carefully taken by knowledgeable persons, can be useful. However, no accurate statement of the nature of the entire lot can be made from the results of judgment samples.

13.04 Although scientific sampling is widely used in industry, it is sometimes viewed as being complicated. The information which follows shows how scientific sampling can be applied to evaluation of central office equipment conditions. The method described consists of simple steps which, if followed carefully, will produce useful results of known reliability.

Definitions

13.05 Defined below are sampling terms which are commonly used.

Universe — The total number of items under investigation is called the universe. For instance, all the clutches in an office or the A springs of all of the district selector sequence switches would be samples of universes.

Sample — A sample is that part of the universe which is selected for examination.

Sample Size — The number of items selected for the sample is dependent on three things: (1) the size of the universe (2) a rough approximation of the percentage of existing defects, and (3) the degree of accuracy required. As the universe becomes larger, its size is less of a factor for determining sample size.

Ordering — All items in the universe must be numbered for identifying each one separately. In the central office, for example, the existing equipment numbering (frame, circuit number, or designation) lends itself readily to association with random numbers.

Random Selection — In scientific sampling, random selection means selection governed wholly by laws of chance. The selection of the individual sample items must be independent of human decision. In drawing a sample from a group of items, each of the items must have an equal chance of being selected.

Random Number Tables — Lists of numbers which are generated by a computer and are completely random, with each digit being independent of any other. They are used for selecting sample items, in order to ensure that all items in a universe have an equal chance of being selected in a sample taken.

Criteria — It is necessary that the defective items be precisely identifiable, so that the determination of good and bad may be consistent. Tests and inspections should be made according to standards in Bell System Practices, whenever applicable. In other cases, standards for determining good and bad items must be determined locally.

Use

13.06 There are three reasons for use of sampling in central offices. First, sampling can reduce the cost of obtaining information about the condition of equipment. Second, sampling can be used to gain information more quickly than a 100% inspection. Third, sampling can be used to determine which parts of a large group of equipment need attention sooner than others.

13.07 Sampling can be applied to a large number of equipment components when information is sought about the extent of a specific condition. Usually, contact or apparatus wear is the equipment condition about which information is required. However, there are other applications where sampling may be used, such as determining the number of tubes with low emission.

13.08 There are instances when the use of sampling is not recommended because little or no savings may be gained. For instance, if the time required for taking the sample is large, when compared with the time required for a 100% inspection, little may be gained by taking a sample. This is the case when the number of items in the sample is a large portion of the total, as is the situation for small universes. It is also the case when setup time required to test the sample items is large, when compared with time to test the sample.

13.09 If three rules are followed, sampling can and should be used to reduce maintenance costs. First, it should be used only in appropriate situations, avoiding those described in 13.08. Second, procedures for taking samples must be followed exactly. Third, results must be understood for what they represent and must be used accordingly.

Application

13.10 Sampling may be used effectively to ascertain the extent of wear when normal trouble-reporting information indicates that wear may be widespread or "MR" review action is required. A typical case would be the need to learn the extent of wear of the A springs of the district selector sequence switches. The suspicion that wear is a widespread problem would arise through trouble-locating and repair procedures

and the use of corrective maintenance procedures described in other parts of this section.

13.11 The following example illustrates the use of sampling in a Panel office. The "MR" test listed in Equipment Test List Section 215-001-015, Page 4, in Section 030-801-201, Paragraph 2.18, Sequence Switches, Replace Worn A Springs, becomes due for review in the district equipment. This is a large job and the decision is made to sample.

13.12 Next, the sample size must be determined. In order to do this, the size of the universe must be determined. This can be done by multiplying the number of district frames by 60. This applies only if all district frames are fully equipped. In this example, the unit has 43 districts fully equipped. Therefore, the size of the universe is 2580 switches (43 x 60). The next step is to use the table in Fig. 38. The sample size in this example is 100.

13.13 Next, the sample must be determined in terms of the ***particular*** items (A springs) in the universe which are to be inspected. It is important that this step be done as described. If proper procedures are not followed, results obtained are not reliable. It must be understood that the random sample selection method described will properly weight the effect of variables such as first choice, age, and location.

13.14 Tables of random numbers are provided in Fig. 39. Numbers are selected from the tables and used for selecting the sample items. The numbers shown contain five digits, but may be used to provide random numbers of one digit, two digits, etc. To use tables, start at the top left-hand side of one of the columns (the same starting point should not be used for successive samples). Select one digit, two digits, or more, depending on the size of the universe. The number of digits must correspond to the number of digits in the universe.

13.15 The following illustrates the use of random number tables.

(a) Universe size — 2580

(b) Sample size (from Fig. 38) — 100

(c) Random numbers to be selected — 100

(d) Items in universe are numbered 0001 to 2580

(e) Refer to Fig. 39, Table C. Start at the top left-hand side of column designated (1). Inspect first four columns of digits (digits seen are 0643, 3929, 8988, etc).

(f) Scan down the first four digits of the first column and select any four-digit number between 0001 and 2580. Selections made are: 0643, 0241, 1896, 1745, 0370, 2153, 1534, 0415, etc.

(g) Repeat, starting at the top of column (2), selecting the first four digits. Selections made are: 1108, 0603, 1311, etc.

(h) Repeat until one hundred numbers have been selected.

(i) Arrange the one hundred random numbers in convenient order. If repetitions are encountered, discard all but one of set and select more random numbers. A locally designed conversion table, as illustrated in Fig. 40, may be useful in arranging the selected numbers and converting to equipment to be sampled.

13.16 If the items in the universe do not possess unique numbers, they must be numbered so that they may be associated with the random numbers selected. In this example of fully equipped frames, a conversion sheet as illustrated in Fig. 40 could be used to determine actual circuit number to be sampled. Spare equipment locations should not receive unique number assignment. For example, if the first frame has only 54 circuits, the first circuit on the next frame would be assigned number 55. Items whose position number corresponds with one of the random numbers selected become one of the sample.

13.17 The above description sounds more complicated than the actual procedure. However, if reliable sampling results are to be obtained, these preliminary steps must be followed. Experience gained from use of sampling greatly helps to simplify and speed up the process.

13.18 Now that the specific items to be sampled have been selected, it is necessary to establish clearly the criteria for deciding good and bad items in the sample. Bell System Prac-

tice standards should be used where applicable. Examples of worn contacts, labeled "good" or "bad" as appropriate, are useful for comparing with items in the sample. The next step is to prepare Form E-5452, Test and Inspection Work Order and Record, showing the specific test and inspection to be made and the identity of each sample item. As work is completed on each item the result, in appropriate detail, is entered on the form. This type of sampling will result in the ability to determine the overall condition of the lot sampled. However, the results do not identify the particular frame which requires attention.

13.19 When it is necessary to sample a maintenance condition in several bays or frames, it is also practical to treat the individual frames as separate universes so that results can be compared. When this is done, the universes are smaller and require a larger number of samples to be checked than if all frames were considered as one universe. However, there is an overall saying in maintenance work when the results of the separate frames are compared ***and*** it is properly concluded that no further work is required in some frames.

Consider, for example, ten frames each equipped with 60 sequence switches. The sample size for 60 is 15. The random numbers are obtained from the tables (as outlined in 13.14 and 13.15) and are used to select the particular switches to be sampled. Use the same 15 numbers for each bay.

After all ten frames have been sampled, results are compared as illustrated. This is called ***stacking.***

FRAME NO.	NUMBER OF DEFECTS
103	11
106	10
104	10
101	9
109	9
108	4
102	4
105	3
110	3
107	2

The total switches sampled in the ten frames is 150, of which 65 are defective. This represents a rate of 43% defects in the entire universe. However, stacking the results from worst to best indicates that frames 103, 106, 104, 101, and 109 contain more defective switches. In this example, a local maintenance decision is made to do a 100% check of these frames. The remaining frames receive no more attention, except that known defects in the samples taken are repaired.

If the ten frames in this example had been considered as a universe (1200 switches) and a random sample taken of the ***entire*** lot, results would have indicated the need for maintenance work ***but*** the worst and best frames would not have been identified.

14. STUCK SENDER ADMINISTRATION

General

14.01 A stuck sender is caused by a sender time-out which occurs when a sender is unable to transmit its stored, called-number information to the receiving end within an allotted time period. Each sender is equipped with a CTR (canceled time release) or a CP (cancel priming) key located at the sender make-busy board. The operated CTR key causes a sender and the associated equipment to remain held until the key is manually released. With the CTR key normal, the sender is not held. In either case, dial tone will return to the customer's line and a stuck sender register is scored.

14.02 A stuck sender is usually caused by trouble in the sender, the associated equipment, the trunk facility, or the incoming equipment in the called office. Experience indicates that most troubles can be associated with outgoing trunks. However, there is another situation which could cause stuck senders which is not a trouble condition. If there is a shortage of incoming registers or terminating senders at the called office (caused by high calling load or register and terminating sender outages), the start signal for senders will be delayed. If the delay is long enough, senders will time out.

14.03 When a sender sticks, it causes a dial tone to be returned to the calling customer. This usually results in another attempt by

the customer, which increases the load on the common equipment. Therefore, it is necessary to hold the number of stuck senders to a minimum. In order to do this, it is necessary to trace as many stuck senders as practicable. The object is to locate and clear troubles causing stuck senders.

14.04 In addition to the problems described above, a high stuck sender rate reduces the sender group capacity by significantly increasing individual sender holding time. This is especially serious for a sender with its CTR or CP key operated. When this sender sticks, it is held out of service until maintenance forces release the sender. Also, a trunk in trouble which causes a stuck sender will have a shorter than normal holding time when the CTR or CP key is normal. The result is that the trunk in trouble is selected more frequently, which increases the trouble rate, sticks more senders, and produces customer reaction. The need for prompt and adequate attention to stuck senders is of utmost importance. Trunks and equipment causing stuck senders must be located and removed from service.

Sender Tracing Program

14.05 When preparing or reviewing a stuck sender tracing program, the following considerations are important:

Operation of CTR or CP keys — The number of CTR or CP keys to be operated in a Panel office is dependent on the rate of stuck senders, whether or not sender group busy alarms are being received, and the available manpower for tracing stuck senders. ***CTR or CP keys should not be operated if senders are not being traced promptly.*** If senders are held by operated CTR or CP keys and are not promptly traced, the service reaction is likely to be worsened because of slow dial tone and trunk group overflows to customers.

Number of senders to be traced — The number of senders to be traced is related to the objective stuck sender rate for the office. The available manpower for tracing senders must certainly be considered. This is not to say that tracing stuck senders is not an important job. However, it must be recognized that other office work may be considered equally or, perhaps more important for a short period of time, limiting the amount of manpower available for tracing stuck senders. In any case, there must be a continuing program for tracing stuck senders, and for locating and clearing troubles, as well as for studies of trouble records aimed at finding other troubles not yet identified.

Tracing Senders

14.06 Section 215-130-301, Stuck Senders, Method of Tracing, Panel Offices, outlines the procedure to be followed when tracing stuck customer or keypulsing senders in Panel offices. The information obtained during the trace is recorded on Form E-5466. This information is required for studies to determine repeat trouble conditions.

Studies

14.07 Two methods for handling stuck sender data are in common use: logs and trouble tickets. The recommended method is described here and makes use of trouble tickets and the ticket file. For each stuck sender traced, information is recorded on a trouble ticket which is filed in the ticket file for later use. Stuck sender trouble tickets are stored in a separate part of the ticket file reserved for stuck sender studies. The layout of this file for a typical office is shown in Fig. 41.

14.08 When stuck sender trouble tickets are closed out, they are filed under the particular trunk group involved in the connection. Tickets are filed sequentially by trunk number, for ease in spotting "repeaters." This method requires little clerical work. Repeated failures on trunks show up quickly as tickets are filed in the trouble bins. Common troubles are indicated by marked increases in the number of tickets in one or more bins. Trouble in a sender should be noticed by the man who is assigned to tracing senders. However, for detecting obscure sender or sender link troubles, it is recommended that tickets be tallied periodically. The need for doing this tally will vary according to the amount of tickets or, of course, the amount of troubles of an office. However, it is suggested that tickets be tallied at least monthly for discovering any repeated troubles. In addition, tallies should be

made more frequently if the tally figures on the control record indicate the need. Fig. 42 illustrates Form E-5477, Stuck Sender Tally Sheet, which is used for tallying stuck sender trouble tickets.

14.09 Methods of stuck sender administration using logs are not recommended. Logs require more clerical work and do not provide sufficient space for recording the necessary information. Therefore, subsequent study is restricted by the limited information available.

15. RETENTION OF RECORDS, AND ORDERING INFORMATION

Retention of Records

15.01 The forms described in this section have been designed for containing useful information in an orderly fashion. The need for retaining the different forms for maintenance administration varies. However, it may be visualized that other uses, such as for audits, may require longer retention.

15.02 A simple method for retaining these records is to establish twelve large folders or mailing envelopes, each marked for a month of the year. As each report month ends, records may be removed from binders and filed in the appropriately marked envelope. The records already in the envelope, now a year old, are discarded.

Ordering Information

15.03 Forms are packaged as shown below. Forms should be ordered in multiples of the quantities shown. Requisitions should be worded as follows:

(Quantity) Form (Number)

FORM NO.	FORMS PER PACKAGE
E-4744	25
E-5450	25
E-5451	50
E-5452	50
E-5453	25
E-5454	25
E-5455	25
E-5457	50
E-5458	25
E-5463	25
E-5466	50
E-5467	25
E-5477	25

Attached:

Figs.

TROUBLE DIAGRAM

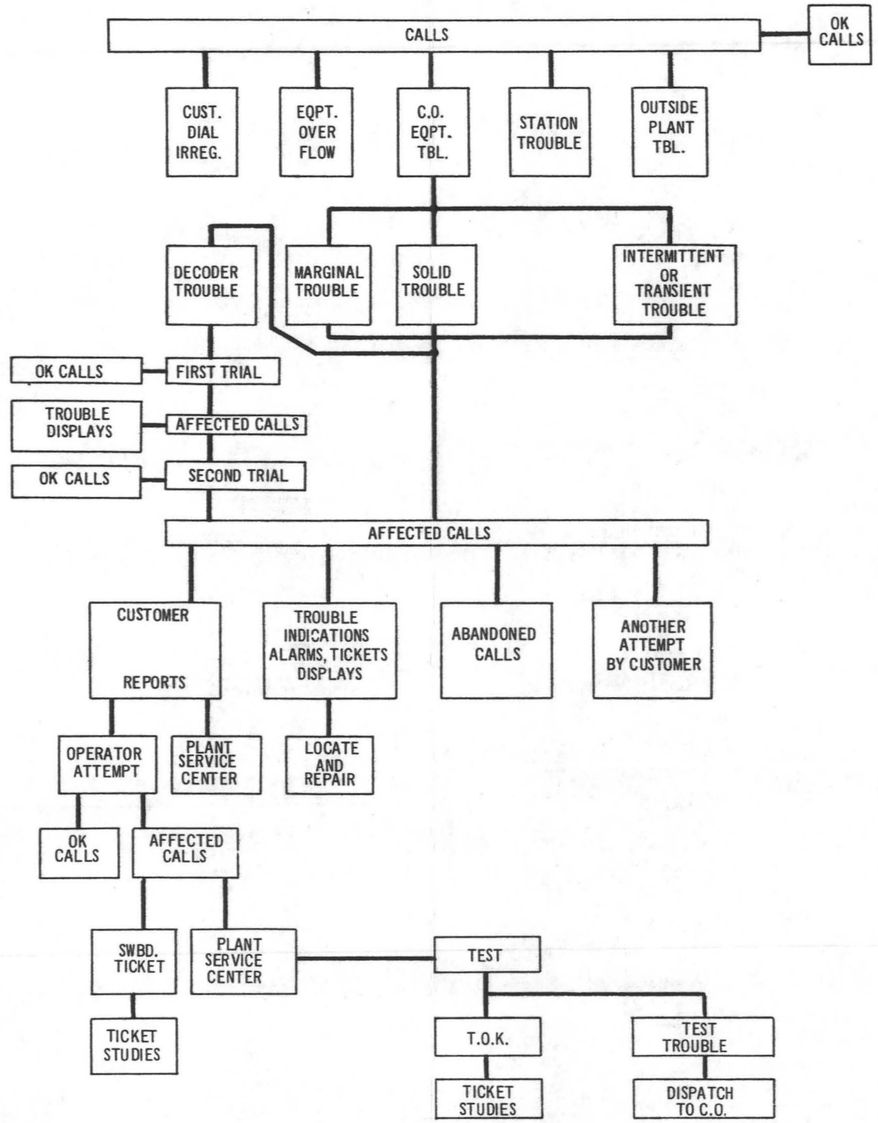


Fig. 1

CONTROLLED MAINTENANCE DIAGRAM

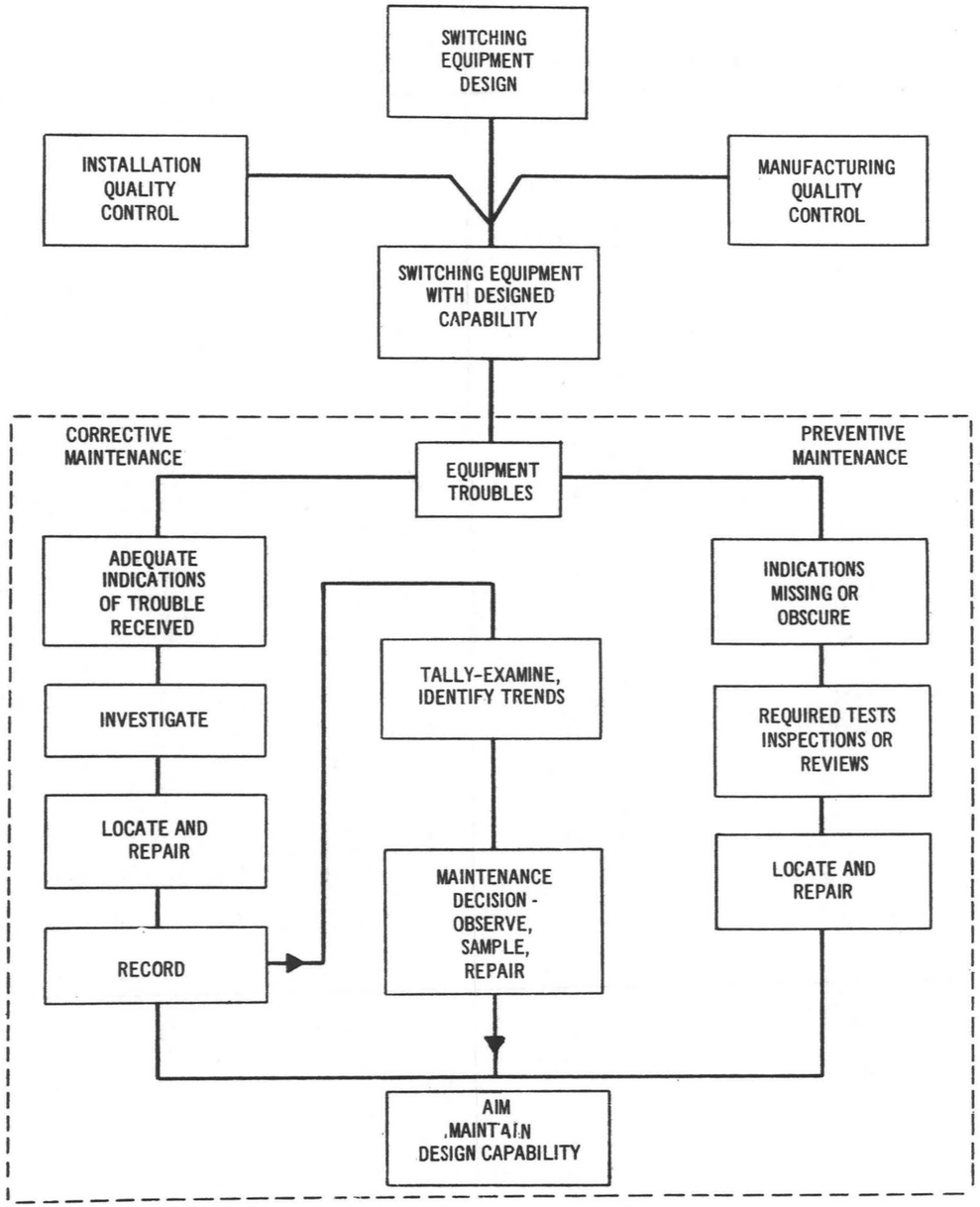
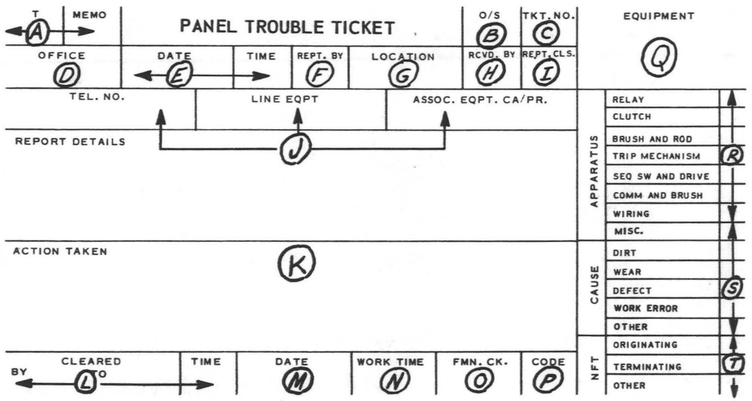


Fig. 2

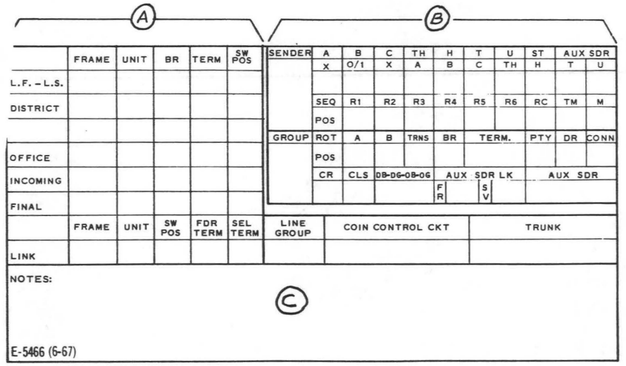


FORM E-5466 (6-67)

Note	Explanation
A	Check "T" or "Memo."
B	Check O/S (out of service) if equipment is removed from service.
C	Serial number of ticket.
D	Central office name or designation.
E	Date and time report received in central office.*
F	Initials of person reporting or equipment designation if from alarm, trouble ticketer or trouble indicator.
G	Origin of report.
H	Initials of person receiving report.
I	Report class (see Fig. 5, Table A).
J	Details of trouble report.
K	Details of action taken including referrals.
L	Initials of person clearing trouble, person report cleared to and time.*
M	Date report closed out.
N	Time spent on this trouble.
O	Foreman's initials upon review of ticket.
P	Central office trouble code.(Disposition Fig. 21)
Q	Equipment group abbreviation and location (see Fig. 6, Table A and Fig. 7).
R	Check apparatus where trouble is located (see Fig. 6, Table A and Fig. 6).
S	When apparatus is identified check cause of trouble (see Fig. 6, Table B and Fig. 7).
T	If N.T.F. check according to report (see Fig. 6, Table C and Fig. 7).

* Recommend use of 24-hour clock.

Fig. 3



(Back)

Note	Explanation
A	Spaces provided for recording trace information.
B	Spaces provided for recording sender trace information.
C	Spaces provided for additional remarks.

Fig. 4

Fig. 3 & 4

TABLE A – REPORT CLASSIFICATIONS		
The major sources of trouble reports are assigned the following alphabetical designations for ease of identifying report sources on trouble tickets.		
Type of Ticket	Report Class	Report Source
T	A	Plant Service Center or Testboard
T	B	Traffic Department
T	C	Sender
T	D	Alarm
T	E	Trouble Ticketer or Trouble Indicator
T	J	Other office or other source of report
Memo	No Class	All "Memo" Tickets

Fig. 5

TABLE A – CODING "T" TICKETS – EQUIPMENT AND APPARATUS

Trouble Coding Spaces		Situations
Equipment		Enter equipment, frame, and number, (see Fig. 24 for abbreviations) for cases of found trouble and for cases where trouble disappears. If equipment is not determined or no trouble is tested enter NTF. Enter Ref. Out (Referred Out) when trouble report is referred to another office PSC or testboard.
Apparatus		Score one for each case of found trouble.
	Relay	Score "relay" for all troubles caused by relay failures.
	Clutch	Score "clutch" for troubles caused by failures in clutch or associated rack.
	Brush and Rod	Score "brush and rod" for troubles caused by multiple brush, selector rod or associated bearings.
	Trip Mechanism	Score "trip mechanism" for troubles caused by tripping apparatus such as tripping fingers, rods, retractile springs, etc.
	Seq. SW and Drive	Score "seq. sw and drive" for troubles caused by sequence switch or associated driving or driven disc.
	Comm. and Brush	Score "comm and brush" for elevator apparatus trouble caused by commutator or commutator brush.
	Wiring	Score "wiring" for loose connections, opens, crosses, transpositions or low insulation resistance, either in wiring, cabling or between wiring terminals. Includes cases where solder or wire clippings cause short circuits, grounds or crosses. Also includes troubles caused by missing, open, crossed, grounded, transposed or left-in cross-connection.
	Misc.	Score "misc." (miscellaneous) for troubles that cannot be assigned to one of the above apparatus categories, i.e., lamps, transformers, transistors, capacitors, resistors, etc.

Fig. 6 A

TABLE B – CODING "T" TICKETS – CAUSE

	Situations	Examples
Cause	Score one cause for each case of found trouble	
Dirt	Score "dirt" for troubles caused by failure of contacts to complete a circuit when the reason for the failure is the presence of non-conducting material between the contacts and the contacts and springs meet the minimum requirements specified by Bell System Practices or circuit requirement tables.	Locking path of relay tests open. Cause is lint between contacts in locking path. Follow meets requirements. Contacts are cleaned.
Wear	Score "wear" for troubles caused by apparent normal deterioration or aging. Includes contact erosion, loss of tension, low emission, metal fatigue or mechanical wear. Also includes cases where replacement is necessary because mechanical requirements can no longer be met. Wear includes troubles due to changes in electrical characteristics of tubes, diodes, transistors, varistors, etc. where the trouble can be cleared by circuit adjustment.	E repeater has reduced gain. Trouble is found to be tube with low emission.
Defect	Score "defect" for troubles corrected by replacement of apparatus or component for reasons other than "wear" or "work error." Includes electrical or mechanical failures of apparatus or components, such as open windings, non-conducting tubes, "shorted" spring assemblies or broken pawls.	E repeater has no gain. Trouble is found to be tube with open heater.
Work Error	Score "work error" for troubles likely or known to have been caused by maintenance personnel, installation forces, contractor's forces or others. For example, blocking tools not removed, broken sequence switch cam insulators incorrectly adjusted apparatus and most wiring troubles should be scored as "work error."	M.D.F. jumper tip wire loose at V.M.D.F. terminal. Ring wire is properly connected and soldered. Conclusion is that tip wire was inadvertently left unsoldered.
Other	Score "other" for troubles where the cause can not be included in one of the above. The "Action Taken" portion of trouble ticket must show a complete explanation whenever "other" is checked.	In clearing a case of trouble, sleeve wire is found to be open in cable between two terminations. Open is under sheath and cause of open is unknow.

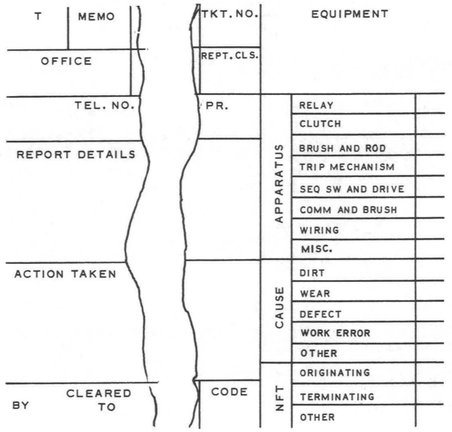
Fig. 6B

TABLE C – CODING "T" TICKETS – NTF

Trouble Coding Spaces		Situations
NTF (No Trouble Found)		Score one when cause of trouble cannot be determined.
	Originating	Score when trouble report describes originating service (Can't Call, NDT).
	Terminating	Score when trouble report describes terminating service (No Bell, Don't Get Calls, Bell Rings After Answer).
	Other	Score when trouble report relates to completed connections (Noise, Can't Hear, Cutoffs). Also includes reports from alarms, trouble ticketers or indicators where no trouble was found or trouble came clear while testing.

Fig. 6 C

Figs. 6A, 6B, 6C



Part of Form E-5466
Panel Trouble Ticket

Coding "T" Tickets			
Trouble Coding Situations			
If trouble is found, enter equipment and number	If trouble disappears while testing and equipment is determined, enter equipment and number	If equipment is not determined, or no trouble is tested; enter "NTF"	If trouble locates outside of C.O., enter "REF. OUT"
Score one apparatus	Apparatus and cause not known		No other entries
Score one cause			
	Score one NTF		

Fig. 7

T ✓ | MEMO | PANEL TROUBLE TICKET | O S | TKT. NO. 1

OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.
853	10-1-	0815	RS	LTD	DH	A

TEL. NO.	LINE EQPT	ASSOC. EQPT. CA PR.
853-8835	4617	7/1566

EQUIPMENT: LF 231

REPORT DETAILS: NDT - NO BAT OR GRD

ACTION TAKEN: BLOCKING TOOL IN (CO) RELAY - REMOVED

BY	CLEARED TO	TIME	DATE	WORK TIME	FMN. CK.	CODE
DH	RS	0820	10-1-	5 MIN	EF	5

APPARATUS: RELAY ✓; CLUTCH; BRUSH AND ROD; TRIP MECHANISM; SEQ SW AND DRIVE; COMM AND BRUSH; WIRING; MISC.

CAUSE: DIRT; WEAR; DEFECT; WORK ERROR ✓; OTHER

NFT: ORIGINATING; TERMINATING; OTHER

"T" Ticket – Relay Work Error

Customer reports NDT, Test Center. Tests NDT, referred to Central Office for correction. Equipment, apparatus and cause are identified.

Fig. 9

	FRAME	UNIT	BR	TERM	SW POS
L.F. – L.S.					
DISTRICT	215	25			
OFFICE					
INCOMING					
FINAL					

SENDER	A	B	C	TH	H	T	U	ST	AUX SDR
	X	O/I	X	A	B	C	TH	H	T U
6C	SEQ	R1	R2	R3	R4	R5	R6	RC	TM M
	POS								
GROUP	ROT	A	B	TENS	BR	TERM.		PTY	OR CONN
	POS								
	CR	CLS	DB-DG-DB-DG		AUX R	SDR LK T		AUX SDR	

	FRAME	UNIT	SW POS	FDR TERM	SEL TERM	LINE GROUP	COIN CONTROL CKT	TRUNK
LINK	215	5	2	3	1	37A		

NOTES:

E-5466 (5-67)

"T" Ticket – Relay Dirt

Alarm information recorded and trouble corrected. The equipment. apparatus and cause are identified.

Fig. 10

T ✓ | MEMO | PANEL TROUBLE TICKET | O S | TKT. NO. 2

OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.
	10/11	1010	—	—	DC	D

TEL. NO.	LINE EQPT.	ASSOC. EQPT. CA PR.

EQUIPMENT: LINK 215-5

REPORT DETAILS: LINK ALARM

ACTION TAKEN: DIRT LOWER 3/4 (SW) RELAY FOLLOW OK

BY	CLEARED TO	TIME	DATE	WORK TIME	FMN. CK.	CODE
DC	—	1020	10-1-	10 MIN	E.F.	—

APPARATUS: RELAY ✓; CLUTCH; BRUSH AND ROD; TRIP MECHANISM; SEQ SW AND DRIVE; COMM AND BRUSH; WIRING; MISC.

CAUSE: DIRT ✓; WEAR; DEFECT; WORK ERROR; OTHER

NFT: ORIGINATING; TERMINATING; OTHER

T ✓ | MEMO | PANEL TROUBLE TICKET | O S | TKT. NO. 4

OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.
882	10/11	1100	BG	LTD	DH	A

TEL. NO.	LINE EQPT	ASSOC. EQPT. CA PR.
882-2616	23-73	5-181

EQUIPMENT: NTF

REPORT DETAILS: NDT AT TIMES (REPEAT REPORT)

ACTION TAKEN: CHECKED MDF, IDF X-CONNS, L AND CO RELAYS, ROUTINED ALL L.F. SELECTORS, INSP. MULT. BR. AND TERMINALS (BK)

BY	CLEARED TO	TIME	DATE	WORK TIME	FMN. CK.	CODE
DH	BG	1145	10/11	45	EF	8

APPARATUS: RELAY; CLUTCH; BRUSH AND ROD; TRIP MECHANISM; SEQ SW AND DRIVE; COMM AND BRUSH; WIRING; MISC.

CAUSE: DIRT; WEAR; DEFECT; WORK ERROR; OTHER ✓

NFT: ORIGINATING ✓; TERMINATING; OTHER

"T" Ticket – NTF Originating

Test center refers a repeat report of "No Dial Tone at Times" to central office for investigation. No trouble is found in central office. "NTF" is entered in equipment space and "NTF originating" is scored.

Fig. 12

T ✓ | MEMO | PANEL TROUBLE TICKET | O S ✓ | TKT. NO. 164

OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.
882	9-30-	1645	LP	892	HJ	J

TEL. NO.	LINE EQPT	ASSOC. EQPT. CA PR.

EQUIPMENT: INC 164-8

REPORT DETAILS: 892 #16-882 INC 164-8 WON'T START

ACTION TAKEN: NO FOLLOW LOWER 1/2 (L) RELAY – ADJUSTED

BY	CLEARED TO	TIME	DATE	WORK TIME	FMN. CK.	CODE
HJ	LP	0920	10-1-	20MIN	EF	

APPARATUS: RELAY ✓; CLUTCH; BRUSH AND ROD; TRIP MECHANISM; SEQ SW AND DRIVE; COMM AND BRUSH; WIRING; MISC.

CAUSE: DIRT; WEAR ✓; DEFECT; WORK ERROR; OTHER

NFT: ORIGINATING; TERMINATING; OTHER

"T" Ticket – Relay Wear

The 892 office can't get through on trunk #16 to 882 office. The trouble is identified by equipment, apparatus and cause.

Fig. 8

T ✓ | MEMO | PANEL TROUBLE TICKET | O S | TKT. NO. 3

OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.
882	10-1-	1030	BG	LTD	JB	A

TEL. NO.	LINE EQPT	ASSOC. EQPT. CA PR.
882-1646	16-141	6/1801

EQUIPMENT: NTF

REPORT DETAILS: BDR AT TIMES - REPEATER

ACTION TAKEN: CHECKED CROSS CONNECTIONS, BRUSH CONTINUITY TEST, FINAL CHOICE #3, BR #1 - NTF

BY	CLEARED TO	TIME	DATE	WORK TIME	FMN. CK.	CODE
EC	BG	1130	10-1-	50 MIN	EF	8

APPARATUS: RELAY; CLUTCH; BRUSH AND ROD; TRIP MECHANISM; SEQ SW AND DRIVE; COMM AND BRUSH; WIRING; MISC.

CAUSE: DIRT; WEAR; DEFECT; WORK ERROR; OTHER

NFT: ORIGINATING; TERMINATING ✓; OTHER

"T" Ticket – NTF Terminating

A customer reports bell doesn't ring at times, (a repeat report) test center tests no trouble and dispatches to Central Office for investigation.
No trouble is found and report is closed out to the test center. "NTF" is written in the equipment space and the "NTF Terminating" space is scored.

Fig. 11

T ✓ | MEMO | PANEL TROUBLE TICKET | O S ✓ | TKT. NO. 5

OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.
882	10-1-	1430	HD	LTD	DG	A

TEL. NO.	LINE EQPT	ASSOC. EQPT. CA PR.
882-1954	9-63	3/670

EQUIPMENT: REF OUT

REPORT DETAILS: CAN'T CALL 796 NUMBERS

ACTION TAKEN: ROUTINED 796 TRUNKS - #6 FAILS, STEADY RING - MADE BUSY AND REF'D TO C.J. AT 796 AT 1510 HRS.

BY	CLEARED TO	TIME	DATE	WORK TIME	FMN. CK.	CODE
EC	HD	1515	10-1-	30MIN	EF	0

APPARATUS: RELAY; CLUTCH; BRUSH AND ROD; TRIP MECHANISM; SEQ SW AND DRIVE; COMM AND BRUSH; WIRING; MISC.

CAUSE: DIRT; WEAR; DEFECT; WORK ERROR; OTHER

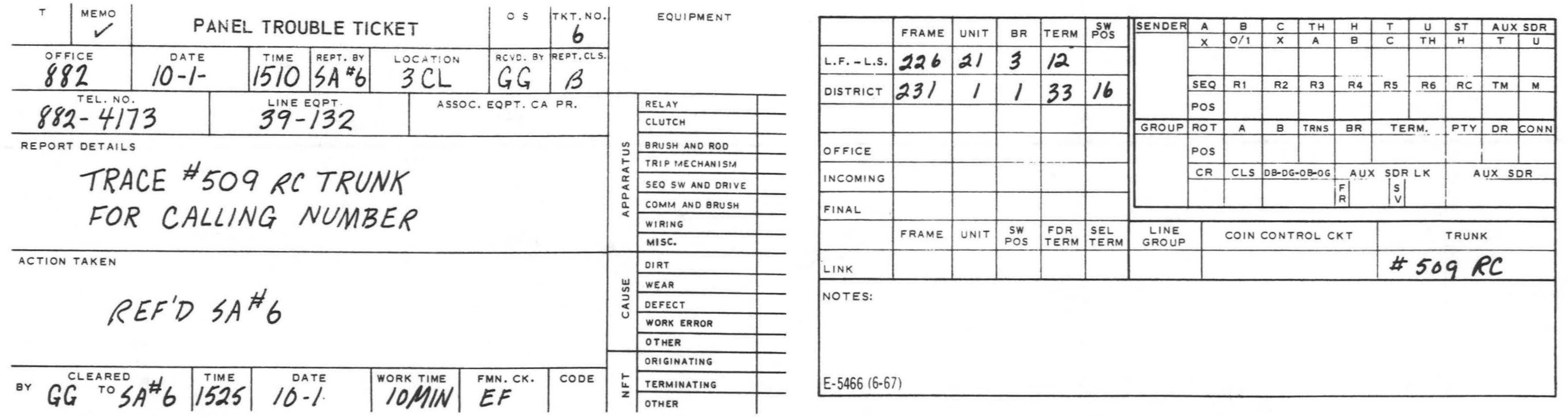
NFT: ORIGINATING; TERMINATING ✓; OTHER

"T" Ticket – Referred Out

Trunk #6 to 796 office is made busy and entered on trunk outage log. Trouble is referred out to terminating office. Ticket can be closed out and filed in "Referred Out" bin of ticket file.

Fig. 13

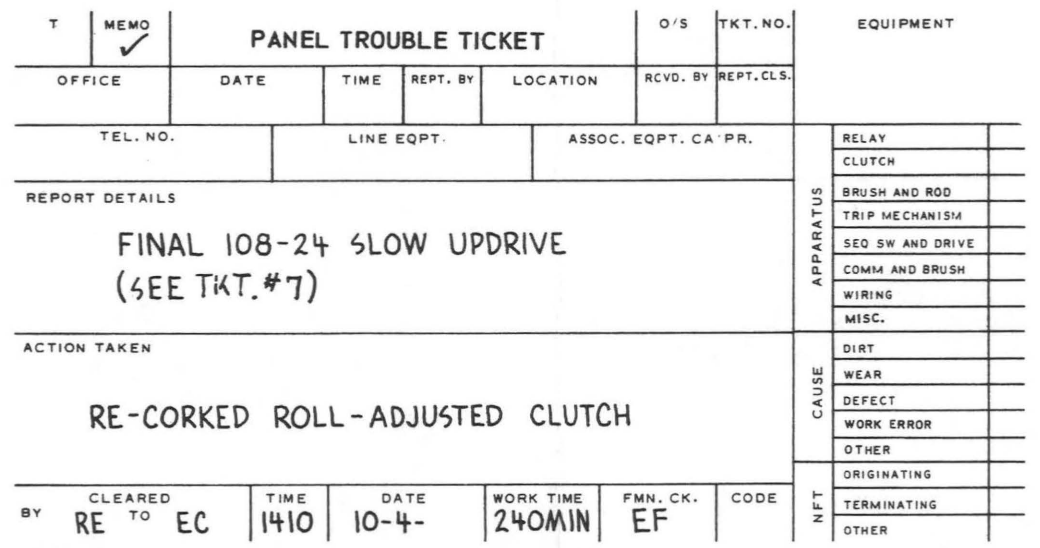
Figs. 8 Thru 13


PANEL TROUBLE TICKET — MEMO ✓ — TKT. NO. 6
OFFICE 882 | DATE 10-1- | TIME 1510 | REPT. BY SA#6 | LOCATION 3CL | RCVD. BY GG | REPT. CLS. B
TEL. NO. 882-4173 | LINE EQPT. 39-132
REPORT DETAILS: TRACE #509 RC TRUNK FOR CALLING NUMBER
ACTION TAKEN: REF'D SA#6
CLEARED BY GG TO SA#6 | TIME 1525 | DATE 10-1 | WORK TIME 10MIN | FMN. CK. EF
L.F.–L.S.: FRAME 226, UNIT 21, BR 3, TERM 12
DISTRICT: FRAME 231, UNIT 1, BR 1, TERM 33, SW POS 16
TRUNK: #509 RC
E-5466 (6-67)

"Memo" Ticket – Traffic Trace

Information recorded and referred to originating source.

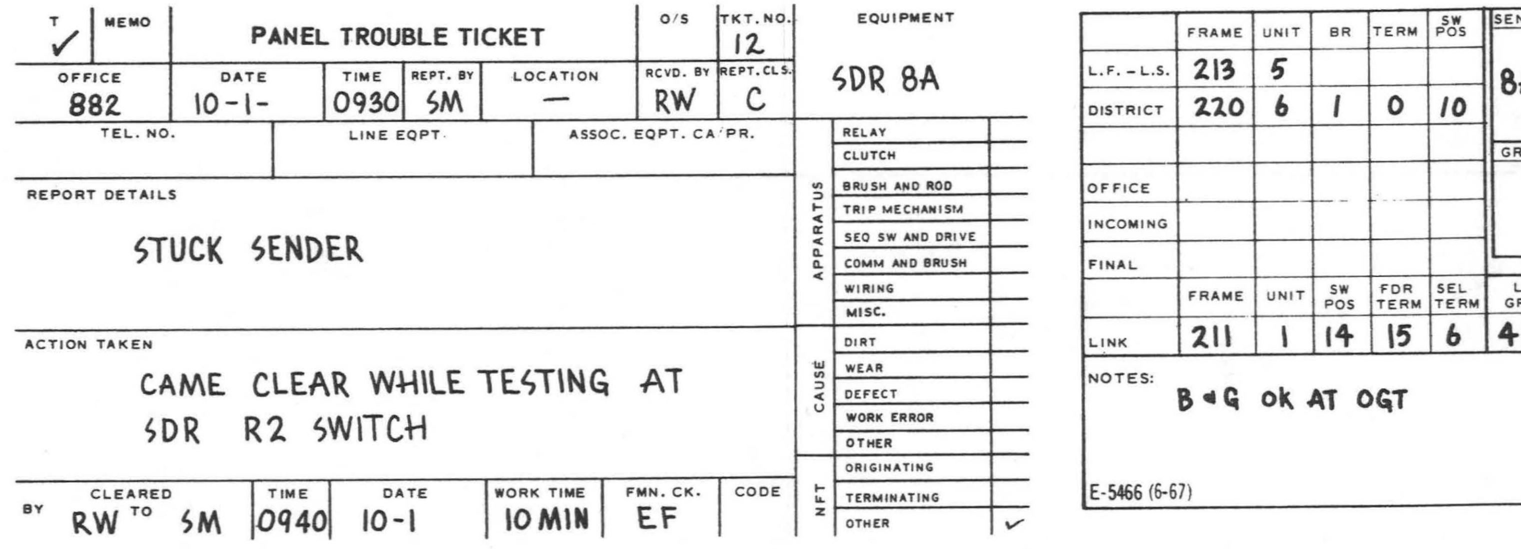
Fig. 14


PANEL TROUBLE TICKET — MEMO ✓
REPORT DETAILS: FINAL 108-24 SLOW UPDRIVE (SEE TKT. #7)
ACTION TAKEN: RE-CORKED ROLL-ADJUSTED CLUTCH
CLEARED BY RE TO EC | TIME 1410 | DATE 10-4- | WORK TIME 240MIN | FMN. CK. EF

"Memo" Ticket – Repair

A memo ticket is used here for recording details of a deferred repair. When the repair is done the memo is associated with the "T" ticket and coding details are entered on the "T" ticket, unless previously supplied (see Fig. 15).

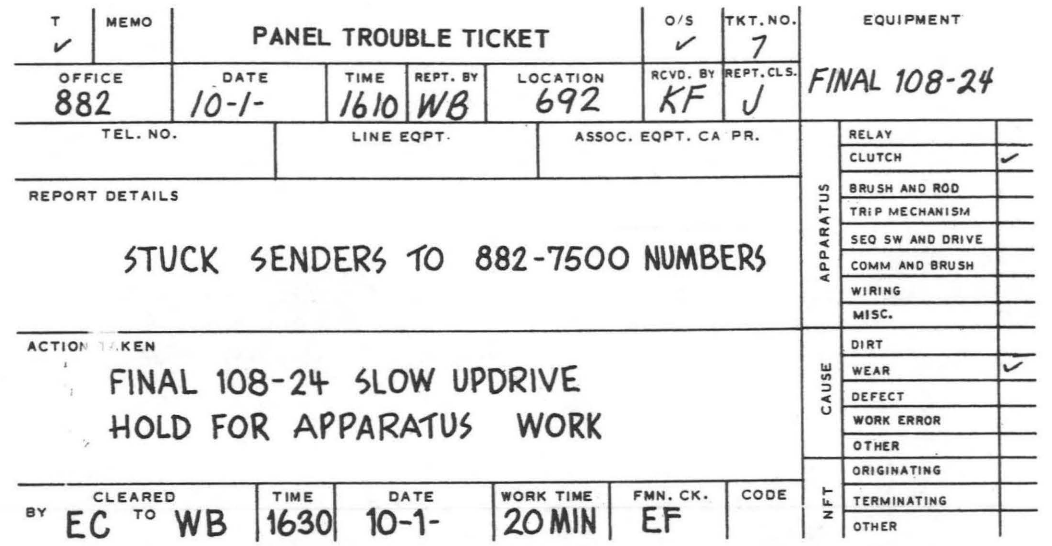
Fig. 16


PANEL TROUBLE TICKET — T ✓ — TKT. NO. 12
OFFICE 882 | DATE 10-1- | TIME 0930 | REPT. BY SM | LOCATION — | RCVD. BY RW | REPT. CLS. C
EQUIPMENT: SDR 8A
REPORT DETAILS: STUCK SENDER
ACTION TAKEN: CAME CLEAR WHILE TESTING AT SDR R2 SWITCH
CLEARED BY RW TO SM | TIME 0940 | DATE 10-1 | WORK TIME 10 MIN | FMN. CK. EF | NFT: OTHER ✓
L.F.–L.S.: FRAME 213, UNIT 5
DISTRICT: FRAME 220, UNIT 6, BR 1, TERM 0, SW POS 10
SENDER 8A: 8 8 3 1 4 2 2; SEQ POS 18 7 1
LINK: FRAME 211, UNIT 1, SW POS 14, FDR TERM 15, SEL TERM 6, LINE GROUP 45A; TRUNK #281-883
NOTES: B & G OK AT OGT
E-5466 (6-67)

"T" Ticket – NTF Other

Trouble had been localized to sender, came clear while testing. The sender is entered in equipment space. Apparatus and cause are unknown. "NTF Other" is scored.

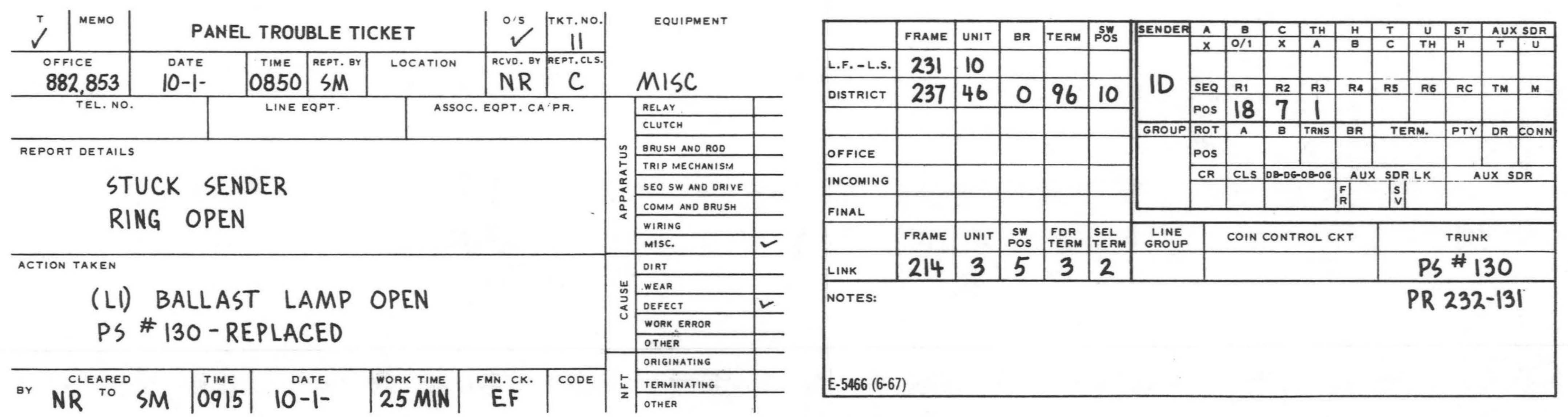
Fig. 18


PANEL TROUBLE TICKET — T ✓ — O/S ✓ — TKT. NO. 7
OFFICE 882 | DATE 10-1- | TIME 1610 | REPT. BY WB | LOCATION 692 | RCVD. BY KF | REPT. CLS. J
EQUIPMENT: FINAL 108-24
REPORT DETAILS: STUCK SENDERS TO 882-7500 NUMBERS
ACTION TAKEN: FINAL 108-24 SLOW UPDRIVE HOLD FOR APPARATUS WORK
APPARATUS: CLUTCH ✓ | CAUSE: WEAR ✓
CLEARED BY EC TO WB | TIME 1630 | DATE 10-1- | WORK TIME 20 MIN | FMN. CK. EF

"T" Ticket – Held For Repair

Trouble caused by worn cork roll. Circuit made busy and ticket held for repair in pending file. When repair is made later, work details are entered on memo ticket (see Fig. 16). "T" ticket may be coded to show trouble found if sufficient information is available when trouble report is investigated.

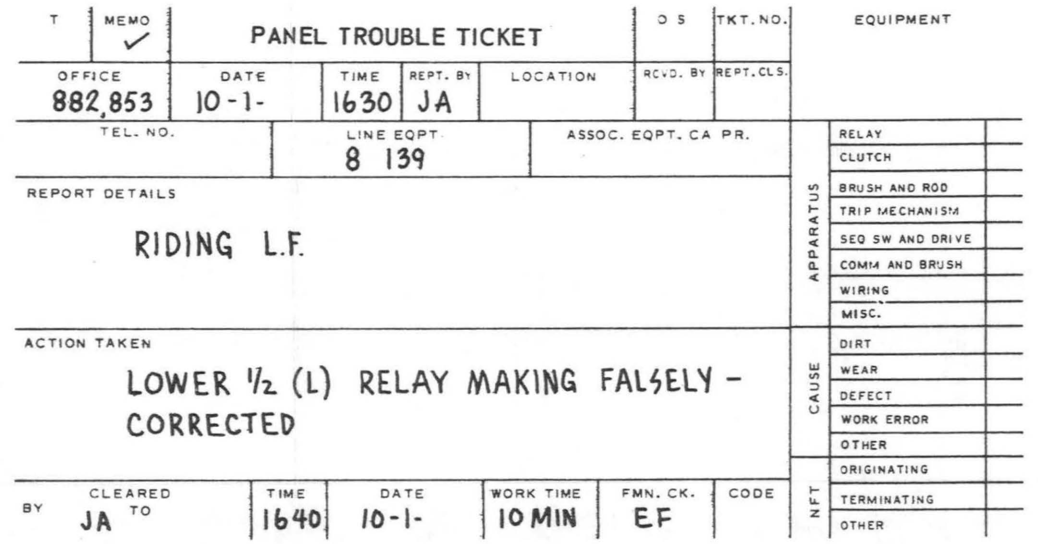
Fig. 15


PANEL TROUBLE TICKET — T ✓ — O/S ✓ — TKT. NO. 11
OFFICE 882,853 | DATE 10-1- | TIME 0850 | REPT. BY SM | RCVD. BY NR | REPT. CLS. C
EQUIPMENT: MISC
REPORT DETAILS: STUCK SENDER RING OPEN
ACTION TAKEN: (L1) BALLAST LAMP OPEN PS #130 - REPLACED
APPARATUS: MISC. ✓ | CAUSE: DEFECT ✓
CLEARED BY NR TO SM | TIME 0915 | DATE 10-1- | WORK TIME 25 MIN | FMN. CK. EF
L.F.–L.S.: FRAME 231, UNIT 10
DISTRICT: FRAME 237, UNIT 46, BR 0, TERM 96, SW POS 10
SENDER 1D; SEQ POS 18 7 1
LINK: FRAME 214, UNIT 3, SW POS 5, FDR TERM 3, SEL TERM 2; TRUNK PS #130
NOTES: PR 232-131
E-5466 (6-67)

"T" Ticket – Miscellaneous Defect

Trouble is identified by equipment, apparatus and cause.

Fig. 17


PANEL TROUBLE TICKET — MEMO ✓
OFFICE 882,853 | DATE 10-1- | TIME 1630 | REPT. BY JA
LINE EQPT. 8 139
REPORT DETAILS: RIDING L.F.
ACTION TAKEN: LOWER 1/2 (L) RELAY MAKING FALSELY - CORRECTED
CLEARED BY JA | TIME 1640 | DATE 10-1- | WORK TIME 10 MIN | FMN. CK. EF

"Memo" Ticket – Observed Trouble

While performing another task, craftsman noticed a riding line finder and cleared the trouble. Memo ticket is made out by craftsman to indicate work done, and account for time spent. Memo tickets are not coded.

Fig. 19

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FORM E-4086
(4-66)

INSPECTION AND ROUTINE OF
CENTRAL OFFICE EQUIPMENT

TICKET NO. _____

DATE	TIME	RPT'D BY	C.O. TRBL CODE
C.O. DESIGNATION		CABLE & PR	

DATE	TIME	LINE OR EQUIPMENT	TYPE REPORT CODE	DATE	TIME	LINE OR EQUIPMENT	TYPE REPORT CODE

REMARKS:

(FRONT)

ORIG. EQUIP. (INSP. & ROUT.)		TERM EQUIP. (INSP. & ROUT.)	
CLEARED BY TIME DATE	TIME SPENT LOCATING & CLEARING	CLEARED BY TIME DATE	TIME SPENT LOCATING & CLEARING
MDF (INSP.)		IDF OR LDF (INSP.)	
CLEARED BY TIME DATE	TIME SPENT LOCATING & CLEARING	CLEARED BY TIME DATE	TIME SPENT LOCATING & CLEARING
RTN TO	DATE	TIME	TOTAL TIME LOC. & CLEARING

(BACK)

Form E-4086

Fig. 20

FORM E-4736 (9-65 REV)

CLASSIFICATION CODES AND DEFINITIONS FOR THE MANUAL HANDLING OF TROUBLE REPORTS

	CODE	TYPES OF REPORTS
Originating Call	1 CC – NDT CAN'T CALL NO DIAL TONE	Does not hear Central Office Dial Tone, Can't Raise the Operator, or receives Slow Dial Tone.
Originating Call	2 CC – OTH CAN'T CALL OTHER	Hears Central Office Dial Tone but Cannot Originate or Complete a Call. Includes reports of Cannot Call on circuits that do not furnish dial tone.
Originating or Terminating Call	3 TRAN-NOISE TRANSMISSION NOISE	Reports Poor Transmission, Noise, or Interference.
Terminating Call	4 CBC CAN'T BE CALLED	Reports Can't Be Called, e.g., Bell Doesn't Ring, Bell Rings and Can't Answer, Bell Rings No Answer, Bell Rings After Answer, Bell Rings and Can't Trip Ring, Called For Wrong Number, or Gets Busy Incoming.
	5 MEM SVCS FAIL. MEMORY SERVICES FAILURE	Reports trouble with Customer Calling Services features, such as Speed Calling, Call Transfer, Three-way Calling, Call Waiting, Dial Pickup, Dial Hold, or Camp-On Busy of an Automatic Switching System
	6 DATA FAIL. DATA FAILURE	Reports Can't Send Data or Can't Receive Data. Includes reports on Automatic Call Unit failures.
	7 PHY COND PHYSICAL CONDITION	Reports Worn, Damaged, Loose, or Missing Equipment, etc.
	8 MISC MISCELLANEOUS	Any type trouble report not included in the other codes.

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DISPOSITION CODES

1 STATION SET
All troubles in the station set used for any class of service. It includes Teletypewriter station sets, Call Directors, station sets associated with Speakerphones, PICTUREPHONES, PBXs, or Order Turrets, and Mobile Telephones. The subset of the two-piece telephone set is considered a part of the station set. Troubles on that portion of a coin telephone involving coin apparatus are included in Other Station Equipment.

2 OTHER STATION EQUIPMENT
All troubles in station equipment other than the station set such as Data Sets, BELLBOY Receiver Units, Auxiliary Signaling Equipment, Key Telephone Units, Key Cabinets or Turrets, Supplementary Station Equipment, Switchboards, Switching Equipment, Booths, and Coin Apparatus.

3 STATION WIRING
All troubles in Drop and Block Wire, Station Protectors, Inside Wire, Inside Wiring Cable used in lieu of Inside Wire, and Ground Wires.

4 OUTSIDE PLANT
All troubles in Cable, Cable Terminals, Amplifiers, Line Wire, Load Coils and their protection; Concentrators, Carrier Equipment, Base and Coast Stations in General Mobile Service and BELLBOY Personal Signaling Service located in places other than central offices.

5 CENTRAL OFFICE
All troubles in central office equipment. Includes troubles in central office equipment permanently associated with customer lines, and troubles in equipment common to customer lines.

6 CUSTOMER ACTION
All troubles caused by customer action or error affecting Company-owned and customer-owned equipment or attachments. Also includes trouble on customer-owned equipment or attachments.

60 RECEIVER OFF HOOK
All troubles caused by customers leaving the receiver off the hook.

7 TEST OK
Trouble reports are closed as Test OK when the trouble-causing condition cannot be determined and the report is not referred to the central office or outside forces for further investigation. Includes central office and concentrator overload conditions.

8 FOUND OK-IN
All trouble reports Found OK by central office forces, and not dispatched to outside forces. Reports where there is substantial evidence that the report was caused by lockup conditions, equipment off normal, etc. are classified to the central office.

9 FOUND OK-OUT
All trouble reports Found OK by outside forces. Reports that were Found OK by central office forces before dispatching are included.

0 REFERRED-OUT
All trouble reports referred to other forces or agencies for further handling. This does not apply to trouble reports on TWX and WATS Classes of Service when the trouble locates in near-end plant (Station Apparatus, Access Lines, and Serving Central Office).

CAUSE CODES

1 MAN MADE-TELEPHONE EMPLOYEE
Trouble was caused by a Telephone Company employee or overlooked by an employee on a previous report.

2 MAN MADE-OTHER
Trouble was caused by other than Telephone Company employees–intentionally or unintentionally. Includes troubles caused by Western Electric employees.

3 PLANT OR EQUIPMENT
Trouble was caused by overload, failure or breakdown of plant or equipment–independent of any direct human action.

4 WEATHER
Trouble was caused by weather conditions. Includes troubles caused by a tree being blown into the route of cables or wires.

5 OTHER
Covers cases not included in codes 1 thru 4.

6 UNKNOWN
Covers cases where it is impossible to determine the cause of a trouble or trouble report.

Fig. 21

E-5457 (6-67)

CENTRAL OFFICE LOG

OFFICE (A) 882, 853 PERIOD (B) 10-1-66

	DATE	TKT. NO.	TIME RCVD.	FROM OR REPORT CLASS	NATURE OF REPORT OR ACTIVITY	DISP. TO	CLOSED OUT	EQPT. GROUP
(C)	9-30-66	164	1645	J	892 #16-882 INCOMING 164-8 WON'T START	HJ	0930	INC
(D)	10-1-66	1	0815	A	NDT 853-8835	DH	0825	LF
	10-1-66	2	1010	D	LINK ALARM	DC	—	LINK
	10-1-66	3	1030	A	BDR AT TIMES (REPEATER) 882 1646	EC	1130	NTF
	10-1-66	4	1100	A	NDT AT TIMES (REPEATER) 882-2616	DH	1155	NTF
	10-1-66	—	—	—	W.E. CO. WORKING SDR FR, 10 MAR #7	AJ	—	—
	10-1-66	5	1430	A	882-1954 CAN'T CALL 796 NUMBERS	EC	1515	RO
	10-1-66	6	1510	B	TRACE #509 R.C. FOR CALLING NUMBER	GG	—	MEMO
	10-1-66	7	1610	J	692-STUCK SENDERS TO 882-7500 NUMBERS	EC	—	FINAL
	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)

Typical Entries, Form E-5457, Central Office Log

NOTE	EXPLANATION
A	Central office name or unit designation.
B	Period covered by form.
C	The date in this example indicates report is carried over.
D	Current date indicates the end of carried over reports.
E	Date of report or activity.
F	Central office trouble ticket serial number.
G	Time report received.
H	Trouble report source or report classification.
I	Details of reports or activities.
J	Initials of individual to whom report is dispatched.
K	Enter close out time and/or date.
L	Trouble ticket filing information. Record in this column the information entered in the Equipment space of "T" tickets. For MEMO tickets, enter "MEMO."

Fig. 22

E-5467 (6-67)

PANEL CONTROL RECORD

OFFICE (A) 882, 853 — REPORT MONTH (B) OCTOBER, 1966

(C) DATE	CENTRAL OFFICE SERVICE INDEX (D) CODE 5&8	CODE 7	EQ. IRREG.	STUCK SENDERS — SUBSCRIBER NO. REG.	NO. TR.	% TR.	K.P.-DIALING NO. REG.	NO. TR.	% TR.	AUXILIARY NO. REG.	NO. TR.	% TR.	TBL. IND. DR. TBL. REG.	C.C. TBL. REG.	A.N.I. OP. TBL. REG.	ID. TBL. REG.	COIN ALMS	SPECIAL STUDIES (I)
1	23	5		210	39								3					
	24	8		361	50								2					
	25	10		463	50								5					
	26	16		746	104								*25 (H)					
5	27	23		1006	159								6					
	28	27		1277	182								1					
	29	32		1581	233													
	30	38		1828	292													
	1	40		1997	307													
10	2	42		2094	307	15												
	3	49		2425	378													
	4	55		2716	423													
	5	61		3010	466													
	6	66		3280	524													
15	7	76		3522	538													
	8	80		3665	560													
	9	81		3765	560													
	10	89		4092	608													
	11	93		4396	659													
20	12	101		4665	209	15												
	13	107		4951	736													
	14	111		5212	767													
	15	113		5346	767													
	16	113		5438	767													
25	17	122		5737	817													
	18	127		6016	873													
	19	133		6317	932													
	20	141		6574	973													
	21	146		6817	1022													
30	22	149		6964	1027													
31																		
	Total	149		6964	1027	15												
OBJ.	10 Days	45		2200	440	20												
	20 Days	90		4400	880	20												
	Total	137		6600	1320	20												

(E) (G)

REMARKS: * N.T.F. - Cleaned contacts and inspected (CK-2) Relay - Decoder #1

A – Office Designation
B – Report Month
C – Calendar Dates Included in Report Month
D – Service Indicators Recorded Cumulatively
E – Cumulative Entries For Stuck Senders And Number of Senders Traced. Also Computed Figures Three Times Each Month For % Traced.
F – Daily Totals From Plant Registers
G – Partial And Total Month Objectives
H – Example of Significant Variation, With Related Remarks in Proper Space At Bottom of Form.
I. – Spaces Provided to Record Data For Indicators Selected Locally.

Fig 23

(A) DATE	TEST FRAMES DISTRICT CKTS. TSTD.	DISTRICT N.L. CYCLE	SUB. SDR. CKTS. TSTD.	K.P. SDR. CKTS. TSTD.	OFF. CKTS. TSTD.	INC. CKTS. TSTD.	I.D.R. CKTS. TSTD.	I.D.R. CKTS. RST.	FINAL CKTS. TSTD.	TROUBLE TREND DATA L FDR.	DIST.	OFF.	INC.	FINAL	LINK	SDR.	DR CC	A.N.I.	DIST. FRAME	MISC.	N.T.F. ORIG.	TERM.	OTHER
1	(A)									1													
					(B)					1							(C)						
										2													
										3													
5										6													
										(F)→(11)													
10																							
15																							
20																							
25																							
30																							
31																							
Total																	(D)						

REMARKS: (11) MULT. BR. TBL. - INEXPERIENCED CRAFTSMAN'S ACTIVITY-TRAINING RESUMED (E)

OBJ. 10 DAYS / 20 DAYS / TOTAL

A – Calendar Dates included in Report Month
B – Data Obtained From Plant Registers
C – Daily Totals of Coded Trouble Tickets
D – Totals Should Be Transcribed to Form E-5463, Trouble Summary
E – Information Pertaining to Trends And Major Deviations
F – Example of significant deviation pertinent facts are recorded under "Remarks"

Fig. 24

Figs. 23 & 24

REGISTER READINGS

OFFICE

PAGE No.
PERIOD COVERED

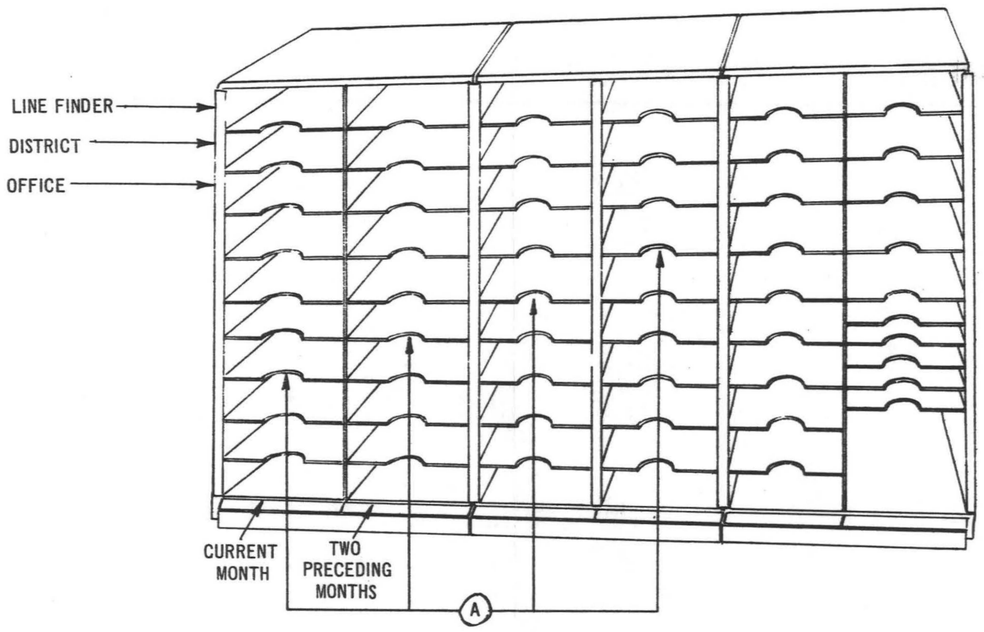
E-4744 (6-67)

	EQUIPMENT TYPE	
	REGISTER	
1	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
5	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
10	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
15	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
20	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
25	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
	READING	
	DIFF.	
30	READING	
	DIFF.	
	READING	
31	DIFF.	
START	READING	
	TOTAL	

Blank Spaces For Date When Report Month is Other Than Calendar Month

Fig. 25

TICKET FILE



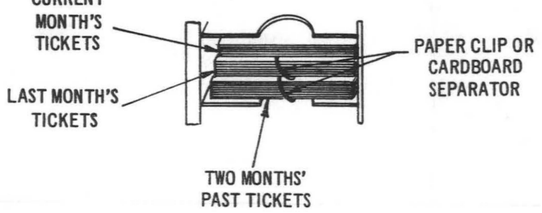
SEE FIG. 41

NOTE

A–MAJOR ITEMS OF EQUIPMENT
- LINE FINDER
- DISTRICT
- OFFICE
- INCOMING
- FINAL
- LINK
- SENDERS
- DECODER/CODE COMP.
- ANI
- DISTRIBUTING FRAME
- MISCELLANEOUS
- NTF – ORIGINATING, TERMINATING, OTHER

(SEE FIG. 27)

TWO SUGGESTED METHODS



TICKET FILE ORDERING INFORMATION;

(QUANTITY) – TICKET ANALYSIS FILE – DRAWING 38-Y-3868
(QUANTITY) – SNAP ON 8G DESIGNATION STRIP, TICKET ANALYSIS FILE – DRAWING 38-Y-3868
(QUANTITY) –DIVIDER, TICKET ANALYSIS FILE, DRAWING 38-Y-3868

Fig. 26

E-5463 (6-67)

TROUBLE SUMMARY

Office 882-853 Period Covered 1966

EQUIPMENT	AVG PREV. YEAR	CUR OBJ	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
LINE FINDER	33	30													
DISTRICT															
OFFICE															
INCOMING															
FINAL	34	30	32	17	28	23	34	28	31	②39	37				
LINK	19	16	16	21	14	12	19	24	①32	23	20				
SENDER															
DECODER/CODE COMP.															
ANI															
DISTRIBUTING FRAMES															
MISCELLANEOUS															
NTF ORIGINATING															
NTF TERMINATING															
NTF OTHER															

O SEE REMARKS ON BACK OF FORM

(FRONT)

REMARKS

① JULY - LINK-TALLIED - ALL ON DEFERRED UNTIL AUGUST SUMMARY FIGURE IS AVAILABLE

② AUGUST - FINAL - TALLIED - WORN COMMUTATOR BRUSHES - SAMPLED - REPLACEMENT WORK TO COMPLETE ABOUT 10-1-66.

(BACK)

Fig. 27

E-5469 (6-67)

PANEL TROUBLE TALLY SHEET

(A) 882,853

(B) PERIOD COVERED AUGUST, 1966

	EQUIPMENT FINAL (C)	101	102	103	104	105	106	107	108	109	110	(D)	TOTAL
RELAY	DIRT	/							//				3 (G)
	WEAR					/		/					2
	DEFECT										/		/
	WORK ERROR												
	OTHER											E	
CLUTCH	DIRT												
	WEAR		/	/					/				3
	DEFECT												
	WORK ERROR				(E)								
	OTHER												
BRUSH AND ROD	DIRT							/					/
	WEAR	/								/			2
	DEFECT				/								/
	WORK ERROR												
	OTHER			/									/
TRIP MECHANISM	DIRT												
	WEAR					/							/
	DEFECT												
	WORK ERROR												
	OTHER												
SEQ SW AND DRIVE	DIRT					/							/
	WEAR		/	/									2
	DEFECT												
	WORK ERROR												
	OTHER			/									/
COMM. AND BRUSH	DIRT		/										/
	WEAR		//	/	//		///		/	/	////		14
	DEFECT												
	WORK ERROR												
	OTHER												
WIRING	WORK ERROR												
	OTHER												
MISC.	DIRT					/							/
	WEAR								//				2
	DEFECT												
	WORK ERROR									/			/
	OTHER		/										/
N.T.F.	ORIG:											E	
	TERM.												
	OTHER												
TOTAL (F)		2	6	5	3	4	3	2	6	3	5		39

A – OFFICE DESIGNATION.
B – PERIOD COVERED BY TICKETS TALLIED.
C – EQUIPMENT GROUP UNDER SCRUTINY.
D – FRAME, BAY, EQUIPMENT NUMBER.
E – DETERMINE "APPARATUS" AND "CAUSE" OR "NTF" FROM TROUBLE TICKET AND TALLY IN APPROPRIATE SPACE UNDER EQUIPMENT HEADING. COMPARISON WITH A PREVIOUS PERIOD OF EQUAL TIME MAY BE MADE BY USING A DIFFERENT COLOR OR COLUMN ON THE SAME SHEET (NOT ILLUSTRATED).
F – TOTAL TROUBLES BY EQUIPMENT HEADING.
G – TOTAL TROUBLES BY APPARATUS AND CAUSE OR NTF CLASSIFICATION.

Fig. 28

CORRECTIVE MAINTENANCE DIAGRAM

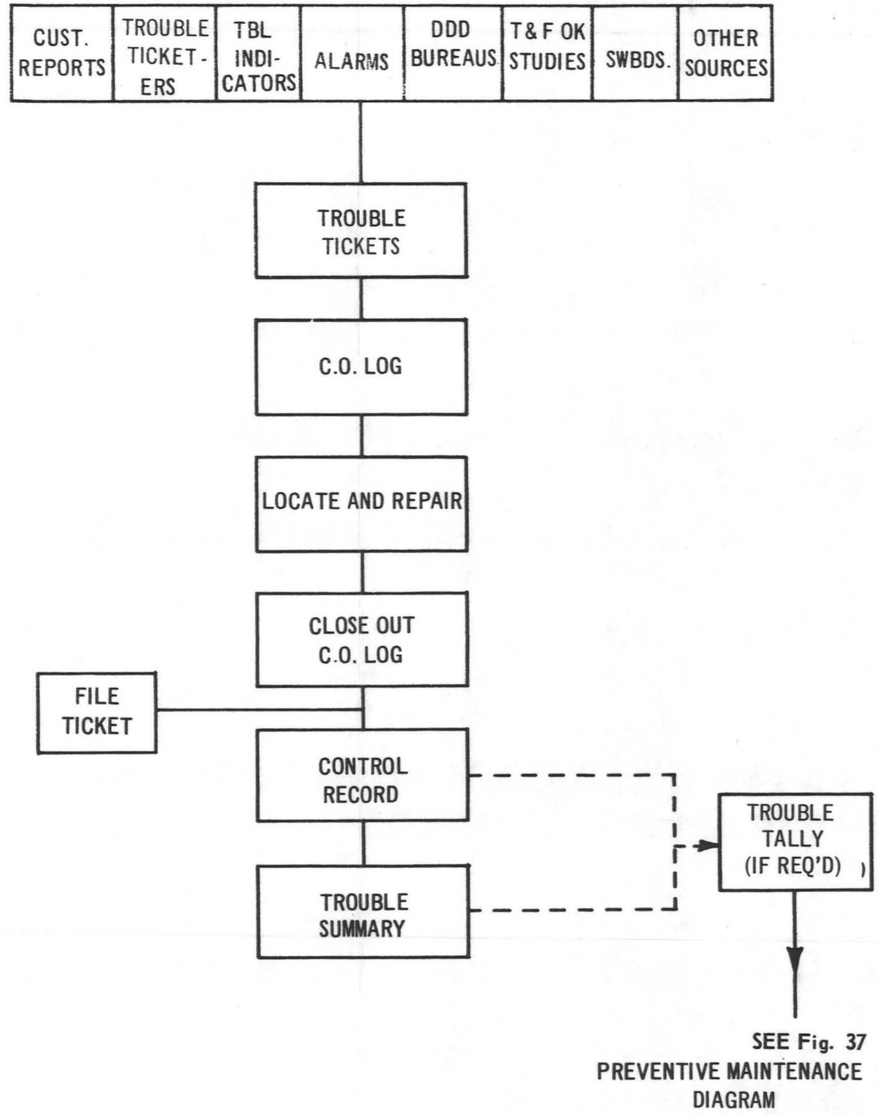


Fig. 29

E5450 (6-67)

EQUIPMENT TEST LIST

B.S.P.	TEST OR REQT.	EQUIPMENT AND WORK DESCRIPTION	CLASS	FREQ.	JOB NO.
030-801-501		SEQUENCE SWITCHES – TEST FOR SLIPPING			
		DRIVES			
	A	Switches That Auto Restore	MW	6M	1
	B	Switches That Do Not Auto Restore	MW	6M	
030-801-701		SEQUENCE SWITCHES – A AND B TYPES			
	2.01	Clean Cams	MR	18M	2
	2.03	Lubricate A Cam Roller	MW	6M	3
	2.18	Replace Worn A2 Springs	MR	36M	4
026-706-701		200 TYPE SELECTORS			
	1.09	Steady and Uniform Operation	MW	12M	5
	2.02	Treatment of Banks and Rotors	MW	12M	6
	2.03	Lubricate	MW	36M	7
026-740-701		POWER DRIVEN ROTARY SELECTORS			
	2.02	Lubricate Rotor Bearings	MW	6M	8
	2.02	Lubricate Stop Magnet Armature Bearings	MW	24M	9
163-651-701		INTERRUPTERS – RECIPROCATING BAR TYPE			
	2.02	Lubricate	MW	12M	10
215-203-501		LF AND DIST SEL CKTS – LINK TYPE-TSTS			
		USING AUTO.TST CKT SD-20240-01, SD-20240-01,			
		SD-20240-02, SD-20240-03 or ES-261152			
	A	Repeat Coil Out – Call to Operator	TF	* W	11
	B	Repeat Coil In – Nonchg and Chg on Non-	TF	* W	12
		chg Class			
	C	Repeat Coil In – Busy Back and Charge	TF	*2W	13
	J	No Link	TF	* D	14

E5451 (6-67)

SCHEDULE

OFFICE 882, 853 SHIFT YEAR 1966

JOB NO.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1					X						/	
NA												
2	DUE	2/67										
3			X						/			
4										/		
5									X			
6									X			
7									X			
8				X						/		
9	DUE	11/67										
10		X										
11	~~////~~	~~///~~	~~////~~	~~///~~	~~////~~	~~///~~	~~///~~	~~///~~	~~////~~			
12	~~///~~	~~////~~	~~////~~	~~////~~	~~///~~	~~///~~	~~///~~	~~///~~	~~////~~			
13	~~//~~	~~//~~	~~//~~	~~//~~	~~//~~	~~//~~	~~//~~	~~//~~	/			
14	DAILY											

SHEET NO. _____

Fig. 30

TABLE A
MR REVIEW PROCEDURE

FORM E-5453 E-5454 OR E-5455 INDICATES	AVAILABLE INFORMATION INDICATES NEED TO DO	SIZE OF JOB	
		SMALL	LARGE
WORK PERFORMED LAST TIME OR SINCE	YES	PERFORM WORK	SAMPLE*
	NO	PASS ϕ	PASS ϕ
WORK NOT PERFORMED LAST TIME OR SINCE	YES	PERFORM WORK	SAMPLE*
	NO	PERFORM WORK	SAMPLE*

*THE SIZE OF THE JOB AS WELL AS THE NATURE OF THE WORK MAY OR MAY NOT LEND ITSELF TO SAMPLING PROCEDURES. INSTRUCTIONS FOR MAKING THIS DETERMINATION AND FOR TAKING SAMPLES ARE COVERED IN PART 13.

ϕA RECORD OF EACH REVIEW MUST BE MADE ON THE TEST AND INSPECT SUMMARY EVEN IF NO ACTION IS TAKEN.

Fig. 31

E5453 (6-67)

TEST AND INSPECTION SUMMARY

(A) OFFICE 882,853 (B) ASSIGNMENT OR JOB NO. 1

BSP NO. AND TEST LETTER OR PAR. (C)						WORK DESCRIPTION (G)			
030-801-501 A						TEST FOR SLIPPING SEQUENCE SWITCH DRIVES			
EQUIPMENT (D)									
DISTRICT SEQ. SW.									
FROM (E)	TO (E)			TOTAL UNITS (F)		TEST (H)		ESTIMATED TIME (I)	
DIST. 1	DIST. 43			2580		CLS MW	6M FREQ	PER UNIT 6	258 PER ASGN.
DATE (J)		(K)	(L)	TIME SPENT (M)		SUMMARY OF TESTS, INSPECTIONS, SAMPLES, REVIEWS (N)			
E-5452 ISSUED	WORK COMPL.	BY	TROUBLES	TEST	REPAIR				
5/2/66	5/6	RH	65	240	325	65 SLIPPING SWITCHES - GROUND IN			

Note	Explanation
A	Designation of Central Office
B	Locally Assigned – Cross-referenced to Equipment Test List
C	Test Reference Information
D	Description of Equipment
E	Show First and Last Unit of Equipment on This Assignment
F	Total Circuits Covered by This Assignment
G	Description of Test or Inspection
H	Test or Inspection Class and Frequency – From Equipment Test List
I	Estimated Test Time Per Unit and Assignment
J	Date Form E-5452 Issued and Date this Assignment Completed
K	Workman's Initials
L	Total Trouble Appearances – Taken From Form E-5452
M	Total Test and Repair Time – Taken From Form E-5452
N	Space for Summarizing Trouble Detail – Shown on Form E-5452 When Used

Fig. 32

E-5454 (6-67)

INSPECTION SUMMARY

ASSIGNMENT OR JOB NO. 14

RK DESCRIPTION

DIST. TEST FRAME
TEST J -NO LINK

TEST			ESTIMATED TIME		
S. TF	D	FREQ.	PER UNIT	10	PER ASGN.

SUMMARY OF TESTS, INSPECTIONS, SAMPLES, REVIEWS

Fig. 33

TEST AND INSPECTION SUMMARY
MULTIPLE JOB ASSIGNMENTS

E-5455 (6-67)

(A) OFFICE 882,853 — ASSIGNMENT OR JOB NO. (B) 23-42-57-63-71

(C) EST. TIME PER ASSGN. 720 — PER UNIT 1 MIN — TEST FREQ. 12 M — CLASS MW

(D) EQUIPMENT LF.-DIST.-OFF.-INC.-FINAL

(E) WORK DESCRIPTION CHANGE COMM. PADS

(C) BSP NO. AND TEST LETTER OR PAR. 026-120-701 201

(H) JOB NO.	(I) MO. DUE	(J) FROM EQPT. UNIT	TO EQPT. UNIT	(K) NO. UNITS	DATE (L) E-5452 ISS.	DATE (L) WORK COMPL.	(M) BY	(N) NO. OF TBL.	TIME SPENT (O) TEST	TIME SPENT (O) RE-PAIR	DATE (L) E-5452 ISS.	DATE (L) WORK COMPL.	(M) BY	(N) NO. OF TBL.	TIME SPENT (O) TEST	TIME SPENT (O) RE-PAIR	DATE E-5452 ISS.	DATE WORK COMPL.	BY	NO. OF TBL.	TIME SPENT TEST	TIME SPENT RE-PAIR	DATE E-5452 ISS.	DATE WORK COMPL.	BY	NO. OF TBL.	TIME SPENT TEST	TIME SPENT RE-PAIR	DATE E-5452 ISS.	DATE WORK COMPL.	BY	NO. OF TBL.	TIME SPENT TEST	TIME SPENT RE-PAIR
1	J	LF1-1	LF 12-60	720	1/4/66	1/24/66	HG		800		1/4/67	1/16/67	ETO		745																			
2	F	LF13-1	LF 24-60	720	2/1/66	2/14/66	ETO		750		2/1/67	2/24/67	HG		730																			
3	M	LF 25-1	DIST 4-60	720	3/1/66	3/19/66	RC		775		3/1/67																							
4	A	DIST 5-1	DIST 17-60	720	4/1/66	4/21/66	RC		740																									
5	M	DIST 18-1	DIST 30-60	720	5/2/66	5/12/66	RC		730																									
6	J	DIST 31-1	OFF 10-60	720	6/1/66	6/30/66	ETO		740																									
7	J	OFF 11-1	INC 110-60	720	7/1/66	7/27/66	HG		720																									
8	A	INC 201-1	INC 211-60	660	8/1/66	8/29/66	HG		675																									
9	S	INC 301-1	INC 310-60	600	9/1/66	9/27/66	RC		610																									
10	O	FINAL 101-1	FIN 112-60	720	10/3/66	10/19/66	RC		730																									
11	N	FINAL 201-1	FIN 211-60	660	11/1/66	11/18/66	RC		650																									
12	D	FIN 301-1	FIN 312-60	720	12/1/66	12/19/66	ETO		720																									
13																																		
14																																		
15																																		
16																																		
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29																																		
30																																		
31																																		
32																																		
33																																		
34																																		
35																																		

Note	Explanation
A	Designation of Central Office
B	Locally Assigned and Cross-Referenced to Equipment Test List
C	Test Reference Information
D	Description of Equipment
E	Description of Tests or Inspections
F	Test or Inspection Class and Frequency – From Equipment Test List
G	Estimated Test Time per Unit and Assignment
H	Number Suffixed to Assignment or Job No. to Identify Individual Assignments
I	Month Work Assignment is Scheduled for Review, Sample or Completion
J	Snow First and Last Unit of Equipment for Each Assignment
K	Enter Number of Units Per Assignment
L	Enter Date Form E-5452 was Issued and Date the Assignment was Completed, Reviewed or Sampled
M	Workman's Initials
N	Total Trouble Appearances – Taken From Form E-5452
O	Total Test and Repair Time – Taken From Form E-5452
P	This Assignment Scheduled and Completed
Q	Assignment is Scheduled, but not Completed. Coloring is Optional. The Colored Half Block Can Also be Used to Illustrate "MR" Tests Sampled and Passed with Appropriate Entries

Fig. 34

E-5452 (6-67)

TEST AND INSPECTION WORK ORDER AND RECORD

(A) OFFICE 882, 853 (B) ASSIGNMENT OR JOB NO. 1

ASSIGNMENT DATA

(C) B.S.P. NO. TEST LETTER OR PAR. 030-801-501 A

(D) EQUIPMENT: DISTRICT SEQUENCE SWITCHES

(E) WORK DESCRIPTION: TEST FOR SLIPPING SEQUENCE SWITCH DRIVES

(F) FROM EQPT. UNIT		(F) TO EQPT. UNIT		(G) TOTAL UNITS	(H) SHIFT
1	1	43	60	2580	DAY

(I) ASSIGNED TO	(J) TO BE STARTED	(J) TO BE COMPLETED
RH	5/21	5/61

PROGRESS REPORT

DATE	FROM EQPT. UNIT		TO EQPT. UNIT		TIME SPENT (MINUTES) TEST	TIME SPENT (MINUTES) REPAIR	BY
5/2	1	1	9	60	50	55	RH
5/3	10	1	18	60	55	60	RH
5/4	19	1	27	60	40		RH
5/4	"	"	"	"		65	EF
5/5	28	1	36	60	45	70	RH
5/6	37	1	43	60	50		RH
5/6	"	"	"	"		75	EF
				(N)			

WORK RECORD

(K) EQPT. UNIT		(L) TROUBLE APPEARANCE	(M) ACTION TAKEN	REPAIR TIME	BY
1	2	SLIPPING SWITCHES	RUSTING IN SWITCH	5	RH
2	1			5	
2	2			5	
3	2			5	
4	3			5	
6	1, 2			10	
7	1, 3, 2			15	
8					

Note	Explanation
A	Central Office Identification
B	Locally Assigned Number And Or Letter to Identify Assignment or Job By Type of Work, Shift, Equipment, Etc.
C	Reference Information
D	Identification of Equipment
E	Description of Work to be Performed. If Limited Trouble Might be Expected on This Test, Use of This Form on This Test Would be Optional
F	For Designating the First and Last Circuit or Equipment Assigned by Work Order
G	Total Units This Assignment
H	"Shift" Work to be Performed (Day, Evening, Night)
I	Show Trick Designation or Initials of Employee Work Assigned to
J	Show Date And Or Time Work is Scheduled to be Started and Completed
K	Equipment Unit on Which Trouble is Indicated
L	Details of Trouble Appearance
M	Details of Action Taken to Clear Trouble, Time Consumed, Workman's Initials
N	Show Workmans' Initials and Summary of Time Spent Testing and Repairing by Date and Equipment Involved.
O	For Totaling Trouble Appearances This Page

(O) TOTAL TROUBLE APPEARANCES 65

NO. SHEETS 1 SHEET NO. 1

Fig. 35

E-5452 (6-67)

ON WORK ORDER AND RECORD

ASSIGNMENT OR JOB NO. 13

PROGRESS REPORT

DATE	FROM EQPT. UNIT		TO EQPT. UNIT		TIME SPENT (MINUTES) TEST	TIME SPENT (MINUTES) REPAIR	BY
10/3	1	1	6	33	25	40	EC
10/4	6	33	14	60	30		EC
10/5	"			"		25	JB
10/5	15	1	18	1	20		JB
10/6	18	1	28	3	20	20	EC
10/7	"	"	"	"		40	JB
10/7	28	5	38	33	30		EC
10/10	33	33	43	60	20		EC
					145	125	

ORK RECORD

	ACTION TAKEN	REPAIR TIME	BY
0-3-66			
	ADJ. & CURRENT FLOW "CS"	20	EC
		20	
0-4-66			
	ADJ. & CURRENT FLOW "CS"	25	JB
0-6-66			
	ADJ & CURRENT FLOW "CS"	20	EC
		20	JB
		20	

neduled for Busy Back and Charge Test for Week Ending
As Work is Performed. No Failures were Encountered on
ntered on 10/3, One on 10/4, and Three on 10/6/66.
Test Frame, Time Spent is Shown Under Test in the

on 10/3, 10/5, 10/6 and 10/7. Time Spent is Shown
eport Sections.
n of Page. Total Time Spent is Shown at Bottom of
tered on Test and Inspection Summary, FORMS E-5453 or E-5454

NO. SHEETS 1 SHEET NO. 1

Fig. 36

ENANCE DIAGRAM

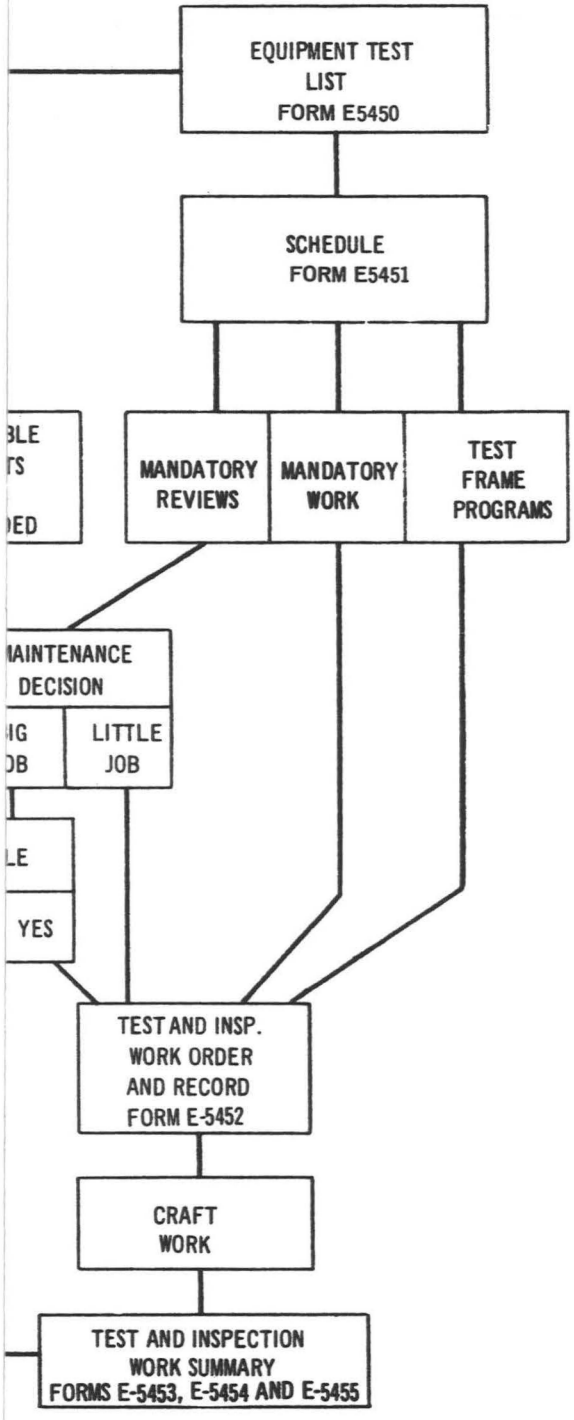

Fig. 37

ndent upon several factors, such as, size of
of defects , accuracy (assurance level
mple sizes illustrated are selected for their
the typical central office maintenance appli-
ize is different from any of the sizes shown
r the nearest universe size in the table.

es

Sample Size
All
15
15
15
15
15
20
20
25
30
40
50
60
70
80
90
100

Fig. 38

TABLE A

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
89429	26726	15563	94972	78739	04419	60523	31022	23728	37647	16476	11170	68376	56874
43427	25412	25587	21276	44426	17369	29010	45337	90245	92053	41447	14897	18753	68291
58575	81958	51846	02676	67781	95137	88430	78260	66962	31812	12759	06427	40337	50115
61888	71246	24246	23487	78639	92006	63846	92263	33212	26516	93662	72399	88244	33922
73891	47025	40937	71907	26827	98865	38882	25757	26662	91441	89357	87803	61521	80600
40938	73894	40854	15997	55293	95033	31736	75068	91314	75293	04895	39355	54837	57203
98053	43567	17292	86908	71364	06089	92394	73691	57883	09983	35643	79309	53449	95334
59774	29138	46993	39836	99596	59050	25419	04130	54632	17223	94604	22973	97731	99476
09765	07548	63043	59782	81449	13652	94420	74460	46707	94303	85523	95244	70995	10742
38991	64502	24770	29209	82909	66610	84418	66214	26001	78685	69117	72446	79783	22305
25622	27100	56128	62145	82388	45197	97609	83942	01120	71717	32858	58679	97165	02810
31864	74120	66231	82306	91784	33177	17681	18963	07216	49288	43185	62797	00735	27085
81171	75639	60863	49562	28846	81581	10249	23190	53440	32357	16472	99013	24328	93670
69874	52803	28544	51569	56090	44558	42095	92311	57915	13368	13719	15833	38744	56065
27848	51107	05761	02159	53911	01952	59273	32250	39647	29908	49075	23061	07795	95047
69407	69736	75375	31488	67528	84234	76462	13628	21286	13736	67478	45218	27867	93049
29418	03091	06364	13151	40663	43633	87954	69800	24773	62596	52476	60631	50503	94116
38222	31231	79415	44558	62490	26936	49682	16307	98535	44822	99574	58487	85020	68881
94720	83796	93251	03568	62484	29140	14152	37044	90398	92042	35099	31640	99753	44409
45275	16852	02284	41361	73733	61486	33189	08907	41159	08147	15478	33250	17361	79961
97260	09552	82626	42915	45847	87401	13339	53850	34931	00602	75307	99708	77863	04924
01990	65259	60684	78175	43825	45211	86287	78190	02431	66251	74970	50246	23975	80697
24633	42314	81192	50253	67516	59076	92006	65676	87343	89231	15760	73706	69426	01979
98071	52677	74920	74461	52266	26967	68284	31612	40335	28865	98949	64492	96905	29184
34101	79442	88403	48541	13010	16596	72001	38546	76305	22119	82668	84017	44111	40302
77186	93967	25918	66403	73837	73445	86663	15929	08237	05647	15785	70444	58670	95967
23114	05481	42335	51396	60823	22680	50459	05429	35227	92559	24136	13126	22099	52388
59988	49944	41038	99977	16348	41119	51548	19511	90142	65604	16147	63445	60525	10480
11852	42254	82304	05588	75165	20179	94198	25700	33473	59554	30974	69973	57629	38550
59992	87922	56299	01700	07003	97507	69260	53349	86947	27517	80159	01899	46890	53850
42116	86593	22828	41422	18176	03250	06079	85467	32052	56922	96804	51060	33157	83948
39663	61401	21471	42702	70588	53144	27087	05591	57759	51394	98873	45625	61069	78783
53542	72009	96296	68908	58657	87117	21483	28879	20480	57309	95552	09826	79928	17141
25996	76108	98476	36397	89457	19577	65877	04802	61938	25032	09190	74932	36925	82686
91106	26450	14451	50328	29084	32332	08635	25192	31337	20249	95073	93800	70022	99968
37133	88924	27845	13024	90687	23726	11212	30414	42185	49224	46560	80447	24334	74866
13982	25736	10087	16762	02564	27250	79316	83848	38684	20552	44402	85153	94526	41256
26663	36187	81688	25005	46677	75851	73938	73044	05132	61204	90384	90296	03182	36672
62572	08275	16313	24936	81680	53829	40412	01479	24241	58488	65341	93414	07135	43446
65925	95455	08383	24643	72962	08172	37824	87587	40698	34964	50166	74756	77033	41501
97978	74676	08942	48919	51592	71196	48534	16955	25759	95645	03148	10646	15660	86520
01914	42524	67820	47985	91773	10383	89514	07557	02084	16736	39198	69697	62485	61938
68565	44811	39238	70394	78555	33539	56310	40809	63204	14479	19635	97299	66947	58010
54370	31672	03893	32423	54092	69375	63308	08016	28407	98287	22874	57545	72695	01604
79954	89601	23881	46951	69084	33477	87968	15639	82409	34125	36864	52112	27102	87334
55479	01059	44229	56975	06785	80930	26443	44892	77561	51123	34495	31376	06238	15973
38114	70330	42157	86699	46212	74692	92603	91306	58558	57280	50639	20563	71370	81487
29766	83452	66202	02488	72704	97821	70614	53616	39050	30355	18340	97298	41795	35185
31771	70640	34779	41831	33456	53194	19602	74194	61154	51774	76822	73794	54182	45264
77522	87188	83577	99067	83235	48662	31503	54829	54723	13177	15387	26073	68915	88415

TABLE B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
64670	10396	82981	58320	71478	08143	48294	42631	45464	58092	14187	12271	98179	87812
25771	02205	73984	28436	88192	11470	11775	67385	66360	59884	93873	29948	66302	82227
27551	13537	54984	89406	88326	33993	92324	13249	35271	60400	70762	08343	76456	90068
91224	22417	44820	26189	57541	87558	45835	28461	54835	92411	44369	47512	49508	02841
75179	64320	71523	67868	38883	09674	27645	76240	47587	01677	38342	85598	12482	30749
64654	91085	65818	03313	39273	46384	66677	14148	87552	38383	67435	21072	63866	74644
98059	81123	67832	04102	66188	78200	67466	46043	65406	22834	08620	17509	51424	25187
38765	63585	18810	95805	11414	58096	00295	82626	42683	44518	12209	83245	53771	95469
01921	03564	71754	10213	80383	13473	94128	62199	59411	46782	62871	51149	87146	40129
16211	93671	27704	66778	96307	06732	63750	04191	40003	51653	54228	14916	05361	08884
70232	86076	61527	56123	48514	53935	86784	42351	67586	07432	61499	01773	97463	58815
22332	94265	67627	85815	00394	75271	98385	53697	56378	50592	77441	88505	89791	16331
81333	45965	64171	84367	15052	37965	03122	81914	69381	70034	92563	61804	58326	97895
39333	47453	66174	04546	10594	64271	61026	39471	55981	18628	67943	35599	37209	34061
29195	20825	50878	80273	26285	90070	79586	12449	77293	36577	59192	03658	90056	83145
74420	64037	06960	25109	08821	60143	34485	19257	29417	72713	72326	41572	41553	46946
22763	16508	24866	13177	07464	51730	65802	95718	28560	11332	74272	59189	53167	13133
72919	54618	40616	33287	51274	78491	53604	66742	97777	64468	98224	45485	17257	31561
92385	42402	15922	90033	21555	31647	22288	75692	20592	84620	58679	24587	83517	55327
85431	19857	97246	46118	71222	82744	67892	77155	10785	00344	19641	98279	18716	13895
40778	12451	14921	51464	45331	75822	46859	66829	35803	27645	76095	41535	25508	53066
88903	46592	60637	65231	08778	86813	47819	19218	46837	89671	77661	08518	85216	62664
29830	34899	85457	19548	83355	52479	77801	01596	48890	56104	68733	40830	58611	59181
22832	47422	08073	10107	46772	92299	42975	86376	27869	52954	07900	75918	51398	87598
75159	14809	11930	83531	51239	86298	72661	63015	98804	98491	99565	42801	71816	84000
99390	08217	56276	09263	82685	30451	25742	41105	74711	42007	02082	93025	86641	28952
68622	80897	08902	10867	91379	30068	84289	45020	92459	03831	08531	63496	98230	42884
92393	95901	41179	72129	72502	91097	09488	84896	37720	68104	73817	67626	16221	63527
53122	66033	38229	51879	29925	45574	53938	72801	64067	76328	28941	43645	37181	95329
43251	11941	86631	93264	53433	70281	55000	24550	74751	32855	25399	95743	85393	20261
16613	24901	34866	75002	55163	68308	20070	36953	39378	71191	84510	47599	93608	24379
12010	60852	92603	70393	17989	95755	14672	58786	41996	02893	94163	36156	54203	94138
85528	97879	27814	08219	02908	71582	31439	00360	72264	87245	65903	42298	28061	81889
32590	55079	33556	83169	92087	77939	53792	78795	58159	26394	41749	91623	26973	81474
92934	30650	16449	15805	61551	38689	59179	85485	18537	70496	98694	19796	76804	03673
80614	10150	09389	61892	79477	14522	40270	45744	29582	29717	39590	10223	43049	78775
62398	12034	90764	52872	22285	50592	42505	80560	38213	18917	10015	03887	62589	15851
02222	46811	05145	67916	15184	02636	59078	57773	21259	86090	56705	65556	04487	95954
08690	31785	61664	61322	24149	21471	23328	03093	31266	14840	30703	01640	07874	16630
61187	73897	66168	12885	73191	89432	65414	41886	75911	35708	43208	59193	04727	31037
12324	61149	85643	64999	63738	46671	25408	69313	54455	04917	35047	09951	72776	84697
47635	42279	98620	70677	52386	50904	97403	03931	42090	28179	98028	47728	45696	74176
70965	00390	08878	15373	70276	71889	86953	37931	23286	20508	40100	22486	37323	35429
58764	15262	96814	54548	00042	19721	78869	85937	36639	29135	12633	67225	69588	74178
07429	05609	31207	50254	68389	07714	92268	64698	32823	60122	46213	05646	54742	98304
15665	28659	54952	53217	76898	88931	25786	55912	85269	29212	84976	08888	94332	58528
64208	53232	99459	43605	04553	48451	68154	49436	49891	65524	65133	55163	76765	26006
17952	73276	52567	48489	64264	24220	55498	97548	98437	26033	39026	17377	43519	27425
60531	43217	39999	38615	97195	76928	87688	99010	90189	12522	00675	01995	82781	95130
76692	39999	43254	68110	88053	88727	14187	98623	84225	78440	67082	37425	40559	16838

Fig. 39
RANDOM NUMBERS
TABLES A & B

TABLE C

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
06433	80674	24520	18222	10610	05794	37515	48619	62866	33963	14045	79451	04934	45576
39298	47829	72648	37414	75755	04717	29899	78817	03509	78673	73181	29973	18664	04555
89884	59651	67533	68123	17730	95862	08034	19473	63971	37271	31445	49019	49405	46925
61512	32155	51906	61662	64130	16688	37275	51262	11569	08697	91120	64156	40365	74297
99653	47635	12506	88535	36553	23757	34209	55803	96275	26130	47949	14877	69594	83041
95913	11085	13772	76638	48423	25018	99041	77529	81360	18180	97421	55541	90275	18213
55864	44004	13122	44115	01601	50541	00147	77685	58788	33016	61173	93049	04694	43534
35334	82410	91601	40617	72876	33967	73830	15405	96554	88265	34537	38526	67924	40474
57729	88646	76487	11622	96297	24160	09903	14047	22917	60718	66487	46346	30949	03173
86648	89317	63677	70119	94739	25875	38829	68377	43918	77653	04127	69930	43283	35766
30574	06039	07967	32422	76791	39725	53711	93385	13421	67957	20384	58731	53396	59723
81307	13114	83580	79974	45929	85113	72268	09858	52104	32014	53115	03727	98624	84616
02410	96385	79007	54939	21410	86980	91772	93307	34116	49516	42148	57740	31198	70336
18969	87444	52233	62319	08598	09066	95288	04794	01534	92058	03157	91758	80611	45357
87863	80514	66860	62297	80198	19347	73234	86265	49096	97021	92582	61422	75890	86442
68397	10538	15438	62311	72844	60203	46412	65943	79232	45702	67055	39024	57383	44424
28529	45247	58729	10854	99058	18260	38765	90038	94209	04055	27393	61517	23002	96560
44285	09452	15867	70418	57012	72122	36634	97283	95943	78363	36498	40662	94188	18202
86299	22510	33571	23309	57040	29285	67870	21913	72958	75637	99936	58715	07943	23748
84842	05748	90894	61658	15001	94055	36308	41161	37341	81838	19389	80336	46346	91895
56970	10799	52098	04184	54967	72938	56834	23777	98392	31417	98547	92058	02277	50315
83125	85077	60490	44369	66130	72936	69848	59973	08144	61070	73094	27059	69181	55623
55503	21383	02464	26141	68779	66388	75242	82690	74099	77885	23813	10054	11900	44653
47019	06683	33203	29608	54553	25971	69573	83854	24715	48866	65745	31131	47636	45137
84828	61152	79526	29554	84580	37859	28504	61980	34997	41825	11623	07320	15003	56774
68921	31331	79827	05748	51276	57143	31986	99915	45821	97702	87125	44488	77613	56823
36458	28285	30424	98420	72925	40729	22337	48293	86847	43186	42951	37804	85129	28993
95752	96065	36847	87729	81679	59126	59437	33225	31280	41232	34750	91097	60752	69783
26768	02513	58454	56958	20575	76746	49878	06846	32828	24425	30249	78801	26977	92074
42613	72456	43636	58085	06766	60227	96414	32671	45587	79620	84831	38156	74211	82752
95457	12176	65482	25596	02678	54592	63607	82096	21913	75544	55228	89796	05694	91552
95276	67524	63564	95958	39750	64379	46059	51666	10433	10945	55306	78562	89630	41230
66954	53574	64776	92345	95110	59448	77249	54044	67942	24145	42294	27427	84875	37022
17457	44151	14113	62462	02798	54977	48349	66738	60184	75679	38120	17640	36242	99357
03704	23322	83214	59337	01695	60666	97410	55064	17427	89180	74018	44865	53197	74810
21538	16997	33210	60337	27976	70661	08250	69599	60264	84549	78007	88450	06488	72274
57178	16739	98310	70348	11317	71623	55510	64756	87759	92354	78694	63638	80939	98644
31048	40058	94953	55866	96283	46620	52087	80817	74533	68407	55862	32476	19326	95558
69799	83300	16498	80733	96422	58078	99643	39847	96884	84657	33697	39578	90197	80532
90595	65017	59231	17772	67831	33317	00520	90401	41700	95510	61166	33757	23279	85523
33570	34761	98939	78784	09977	29398	93896	78227	90110	81378	96659	37008	04050	04228
15340	82760	57477	13898	48431	72936	78160	87240	52716	87697	79433	16336	52862	69149
64079	07733	36512	56186	99098	48850	72527	08486	10951	26832	39763	02485	71688	90936
63491	84886	67118	62063	74958	20946	28147	39338	32169	03713	93510	61244	73774	01245
92003	76568	41034	28260	79708	00770	88643	21188	01850	69689	49426	49128	14660	14143
52360	46658	66511	04172	73085	11795	52594	13287	82531	04388	64693	11934	35051	68576
74622	12142	68355	65635	21828	39539	18988	53609	04001	19648	14083	49623	10840	31915
04157	50079	61343	64315	70836	82857	35335	87900	36194	31567	53506	34304	39910	79630
86003	60070	66241	32836	27573	11479	94114	81641	00496	36058	75899	46620	70024	88753
41268	80187	20351	09636	84668	42486	71303	19512	50277	71508	20116	79520	06269	74173

TABLE D

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
05073	90103	85167	53900	19720	41488	57476	39458	16621	69774	47953	35039	39283	21573
93320	80269	56684	39192	53220	74539	26393	00787	94490	23386	38454	33466	32159	77439
18806	70257	96424	13606	14356	76599	25390	63236	04513	16358	30540	10551	32498	18685
22253	45923	29815	18578	23316	30896	64771	11220	86218	75956	22399	36234	61644	80682
93640	45982	40011	74142	29106	45729	43406	21457	04301	39651	76025	73819	11462	97385
47630	45980	76619	57138	57492	00030	77897	76236	64990	35985	57748	11606	72081	18359
01781	55061	07455	47083	71870	90597	10151	59606	96919	31174	99872	15843	99173	79512
69694	45054	33587	03664	95007	31567	25334	26433	75002	67607	33135	07076	82984	82675
51236	05052	26503	94651	29874	73492	88941	08488	09418	08173	63380	82067	58143	64983
89445	51039	73837	26720	38650	47322	68474	95047	20404	41577	46865	39849	78735	99192
40867	96834	02162	41517	88937	26099	56047	49164	35127	64916	75481	79160	14014	00445
92946	56944	93407	05010	54896	33173	30548	23667	43171	47849	40449	91072	91092	17613
75898	02275	90768	31902	52114	36634	46803	97970	92216	55398	75320	70475	82931	20172
22729	21695	90824	80500	09332	54667	46696	38166	02005	24615	85613	25948	75389	25765
28733	62663	23644	16416	47135	39137	62190	31032	58702	03805	67252	23712	92697	19071
51323	37770	42114	79742	59905	38480	25293	32993	36946	62701	51198	72941	52215	85257
69325	65551	49927	68073	56979	49454	79451	60753	70872	07422	06399	75240	80847	78231
11333	60801	36992	76128	27959	41306	93543	15926	99159	27102	98684	80175	98732	45405
86347	03703	36778	72501	95229	65735	14269	50220	77270	68604	05677	23347	43686	31584
73452	36179	82893	92262	43850	31888	71151	40682	49775	63628	45415	96270	31735	01509
75483	74009	73699	05870	36804	89338	73891	40740	98753	74566	74733	34777	05786	38294
73302	84917	75128	34085	86208	98399	79433	61960	01720	87458	24023	89971	09532	68155
42785	24350	05933	65282	12832	75382	29826	33197	81781	53542	63985	57022	22712	61343
40429	33209	58622	09308	38098	55947	12001	73526	23170	13721	37856	86502	74299	01346
98876	58271	99325	12301	72957	22690	62705	73892	01974	77759	92733	11331	08323	86196
32951	39844	99126	94838	48715	36586	42076	15283	19280	29166	24522	73131	83401	38920
09772	28139	48130	73301	35915	90923	19255	75242	84655	30163	75510	83315	98529	93805
78459	91322	50072	77941	65046	78363	21951	42319	46472	67617	34134	05905	61251	51040
14419	96517	99075	43664	81119	63487	95589	51785	07398	23245	10086	49097	46173	00507
97769	50967	24427	21011	92226	44380	23422	10654	43617	80504	90663	60751	79728	41132
09175	37545	39088	06879	21277	05153	81855	84043	35307	59465	75395	74758	09427	84460
52062	95519	54087	14072	50953	63477	64635	34552	75243	70222	75023	81454	70606	31861
70558	85169	01086	97202	10390	01819	88167	21851	87837	85287	69883	08289	74968	46947
22553	61317	08968	67521	16627	48855	97263	94242	93354	72446	28840	88195	82751	94352
95216	75263	60351	02643	00063	20824	67468	89441	84055	47035	29741	47972	61914	66864
49087	61399	47781	32173	96672	04528	15881	46764	20115	03226	79308	31970	49804	85150
24808	79068	70787	43106	97133	37236	77888	48451	20788	44648	70350	54965	57715	94826
89879	79942	43781	05069	80143	59176	47392	70372	26899	16228	71205	14564	97087	95690
61178	79295	58926	21977	28435	32631	23062	31822	70462	05965	22312	33013	74612	23733
37444	56047	23208	34710	12147	28558	58817	98807	56775	08129	08794	23646	92846	61706
99633	00363	16853	20789	87674	03938	36077	41012	08813	51168	78822	37353	61281	31172
87363	59239	42023	78056	51254	95644	90527	41398	74996	94977	22149	96616	54435	52469
23923	87269	85277	34727	78036	74471	12157	11655	25194	47557	26181	67825	80224	41490
45610	26370	13094	34500	36750	54517	85011	26567	01021	32485	58903	43529	24191	91832
44166	80095	08286	38126	48834	73423	13617	08853	16286	16023	77901	39118	14288	39385
81875	27486	53925	22330	37168	97954	11967	03309	97096	64221	11318	98720	01100	13651
79400	83852	52174	42577	18553	14023	69629	61913	41050	69689	57284	38160	57756	16762
42799	46647	36718	49704	17150	07935	62372	39933	20838	27652	54801	41067	08240	35163
09302	36408	64569	93033	95645	56791	14830	81699	45057	85796	63756	93944	60649	84847
88078	81456	17242	84590	93660	34619	51965	85618	36558	54410	68456	98504	83011	19393

Fig. 39
RANDOM NUMBERS
TABLES C & D

TABLE E

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
85018	23508	91507	76455	54941	72711	39406	94620	27963	96478	21559	19246	88097	44926
11904	73678	08272	62941	02349	71389	45605	60947	60775	73181	43264	56895	04232	59604
75344	98489	86268	73652	98210	44546	27174	27499	53523	63110	57106	20865	91683	80688
65566	65614	01443	07607	11826	91326	29664	01603	23156	89223	43429	95353	44662	59433
51872	72294	95432	53555	96810	17100	35066	00815	01552	06392	31437	70385	45863	75971
03805	37913	98633	81009	81060	33449	68055	83844	90942	74857	52419	68723	47830	63010
21055	78685	71250	10329	56135	80647	51404	06626	10042	93629	37609	57215	08409	81906
48977	36794	56054	59843	57361	65304	93258	56760	63348	24949	11889	29793	37457	59377
93077	72941	92779	23581	24548	56415	61927	64416	29934	00755	09418	14230	62887	92683
84533	26564	91583	83411	66504	02036	02922	63569	17906	38076	32135	19096	96970	75917
11338	12903	14514	27585	45068	05520	56321	22693	35089	07694	04252	23791	60249	83010
23853	68500	98274	87026	99717	01542	72990	43413	59744	44595	71326	91382	45114	20245
94096	74920	25822	98026	05394	61840	83089	09224	78530	33996	49965	04851	18280	14039
83160	82362	09350	98536	38155	42661	02363	67625	34683	95372	74733	63558	09665	22610
97425	47335	69709	01386	74319	04318	99387	86874	12549	38369	54952	91579	26023	81076
83951	11954	24317	20345	18134	90062	10761	54548	49505	52685	63903	13193	33905	66936
93085	35203	05740	03206	92012	42710	34650	73236	66167	21788	03581	40699	10396	81827
33762	83193	58045	89880	78101	44392	53767	15220	66319	72953	14071	59148	95154	72852
49665	85397	85137	30496	23469	42846	94810	16151	08029	50554	03891	38313	34016	18671
37541	82627	80051	72521	35342	56119	97190	43635	84249	61254	80993	55431	90793	62603
22145	85304	35348	82854	55846	18076	12415	30193	42776	85611	57635	51362	79907	77364
27153	08662	61078	52433	22184	33998	87436	37430	45246	11400	20986	43996	73122	88474
00301	49425	66682	25442	83668	66236	79655	88312	93047	12088	86937	70794	01041	74867
43815	43272	73778	63469	50083	70696	13558	98995	58159	04700	90443	13168	31553	67891
14689	86482	74157	46012	97765	27552	49617	51734	20849	70198	67906	00880	82899	66065
16680	55936	82453	19532	49988	13176	94219	88698	41755	56216	66852	17748	04963	54859
86938	60429	01137	86168	78257	86249	46134	51865	09836	73966	65711	41699	11732	17173
33944	29219	73161	46061	30946	22210	79302	40300	08852	27528	84648	79589	95295	72895
16045	67736	18608	18198	19468	76358	69203	02760	28625	70476	76410	32988	10194	94917
37044	52523	25627	63107	30806	80857	84383	78450	26245	91763	73117	33047	03577	62599
61471	45322	35340	35132	42163	69332	98851	50252	56911	62693	73817	98693	18728	94741
47422	21296	16785	66393	39249	51463	95963	07929	66728	47761	81472	44806	15592	71357
24133	39719	14484	58613	88717	29289	77360	09030	39605	87507	85446	51257	89555	75520
67253	67064	10748	16006	16767	57345	42285	56670	88445	85799	76200	21795	38894	58070
62382	76941	01635	35829	77516	98468	51686	48140	13583	94911	13318	64741	64336	95103
98011	16503	09201	03523	87192	66483	55649	36764	86132	12463	28385	94242	32063	45233
37366	24386	20654	85117	74078	64120	04643	14351	71381	28133	68269	65145	28152	39087
73587	83993	54176	05221	94119	20108	78101	81276	00835	63835	87174	42446	08882	27067
33583	68291	50547	96085	62180	27453	18567	55524	86088	00069	59254	24654	77371	26409
02870	33223	39199	49536	56199	05993	71201	78852	65689	32719	13758	23937	90740	16866
91498	41673	17195	35175	04994	09879	70337	11861	69032	51915	23510	32050	52052	24004
91127	19815	30219	55591	21725	43827	78862	67699	01009	07050	73324	06732	27510	33761
12997	55013	18662	81724	24305	37661	18956	50064	39500	17450	18030	63124	48061	59412
96098	13651	15393	69995	14762	69734	89150	93126	17700	94400	76075	08317	27324	72723
97627	17837	10472	18983	28387	99781	52977	01657	92602	41043	05686	15650	89970	95877
40064	47981	31484	76603	54088	91095	00010	13800	76690	75133	60456	28491	03845	11507
16239	68743	71374	55863	22672	91609	51514	98135	42870	48578	29036	69876	86563	61729
58354	24913	20435	30965	17453	65623	93058	08313	99293	00990	13595	77457	79969	11339
52567	65085	60220	84641	18273	49604	47418	90974	83965	62732	85161	54330	22406	86253
06236	29052	91392	07551	83532	68130	56970	33273	61993	88407	69399	17301	70975	99129

TABLE F

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
88188	99345	94118	40373	50387	24802	81352	61640	56614	71506	75541	37818	88047	94144
05200	50533	59428	02797	16833	10038	18901	40743	99449	49825	44637	72784	42649	67052
82828	41316	92617	31346	89263	06589	07121	07151	23905	98435	50453	12983	04738	76421
71006	99318	19269	35233	79183	78538	06326	62715	28701	52809	56581	05925	85210	17745
05937	00875	32264	82808	00229	03868	71072	11519	44876	34508	07859	62424	54319	32842
06021	04370	93070	90737	05354	68427	25554	11165	00123	80338	03876	85648	24978	01687
54789	10960	44023	57857	56556	83993	70787	28193	65872	33723	00125	99818	85571	69509
90400	05707	29128	14859	84117	72206	53740	00464	51853	78852	83593	82926	48985	64355
51424	01651	99970	73521	82356	03297	36288	93531	69269	84798	78962	06336	95618	89718
79743	88757	43370	86536	07166	06401	14413	23643	21527	91902	91384	31444	54783	38760
77418	00322	98854	51507	00565	33066	65791	47857	32483	38493	52606	91078	13631	67863
17580	49302	16408	05678	75532	46218	74359	77556	82242	00134	70184	09027	79459	18730
15489	45559	88548	64330	42126	43145	81287	73884	69312	03395	06879	49562	40000	61598
56342	66773	18536	32600	73958	75993	84250	19254	06677	54192	53422	58200	74464	73949
20202	19216	23762	47856	04623	70728	86657	70801	53719	25214	65635	07565	49977	45525
84877	51708	69357	67914	55372	97225	52837	46723	00256	96221	26641	00309	36009	48392
01647	00311	44989	21900	96079	15793	13148	01433	78721	02647	25454	53913	97554	41578
45652	89311	45302	14539	32045	86727	40595	55953	93448	07805	53622	27330	18749	57867
79975	06153	08932	59185	71386	19070	87098	19392	13899	56096	83645	45871	35950	52278
49744	54713	37053	77467	15348	03363	96086	93295	12413	55774	97318	66402	11209	52495
40922	94903	29638	46870	14108	84391	87313	65969	43349	85142	25650	01896	48680	51236
53319	48020	77444	51447	07916	99506	83504	22290	63835	45589	04884	92760	70462	00538
76682	10559	85446	56236	85919	76388	59850	03262	60347	31077	07165	26588	31296	56112
48869	97229	69581	84581	71728	45150	16901	88717	62688	24828	89469	35483	76532	30256
95961	19279	38078	17473	43945	21562	90937	52140	73771	56084	08775	94820	78139	25987
16521	25945	94076	91281	92272	41233	58614	18912	58454	34011	85969	83621	92099	19131
78282	26332	44072	55104	16895	98311	56005	23331	21939	03463	53828	78930	30987	40988
43473	39179	53174	43498	72674	13087	54261	01844	45738	93150	13240	16694	59155	67589
06513	31352	09177	21367	64725	23784	18125	74873	83971	92678	96950	69821	41119	43312
48734	39737	03448	99009	98136	34562	30339	93143	07350	94289	76144	47238	08110	00037
54832	70111	48339	75270	11652	41597	43277	58089	70520	96997	71007	87803	52458	06637
55844	69515	22658	75438	83086	41325	04694	40359	28351	53492	73134	02370	72313	53039
42829	54398	93338	90705	00626	97752	93482	27726	51835	23966	50279	26329	25754	43530
81128	63461	10925	44382	73365	98875	77605	27351	49177	36914	50258	62361	38229	89608
62885	26354	10368	78026	00186	46783	02059	98892	98061	15330	31705	71923	29266	72716
19525	10375	27010	42791	49471	90607	98103	31752	04842	13693	84292	48485	76178	41716
26570	99202	73924	59888	01827	93314	63949	35394	12989	05867	11568	45056	16609	80470
(4772	17749	01537	96036	02102	02622	06007	52239	61201	57415	35609	38761	19589	24238
49129	12491	62552	64323	44856	29045	76871	80449	81351	73642	48643	23848	48390	56829
19937	75104	57780	95871	94547	53541	77723	54114	90290	62627	68181	15687	81062	06729
52571	67962	72775	28480	87411	12075	45177	08796	99297	48807	88310	75454	45456	85394
54943	80723	81195	84069	28144	48106	04169	16575	62665	97861	71650	56981	61794	94285
16375	88048	29625	08111	92924	53335	09525	88290	17679	08945	25816	11848	95106	22031
38745	91458	30363	95005	55854	38628	13599	73065	40870	82576	37089	86738	16284	44725
09937	17776	86425	88916	80594	28347	08092	64255	55604	78635	13197	72213	95102	36723
30097	47192	27960	15937	42080	61048	14358	44508	72683	51088	58368	85587	27046	11198
02410	60124	62825	42947	74590	89730	16073	28184	30078	92578	83789	08044	76238	47599
44804	80165	19442	72194	76910	40274	93861	06568	92482	70037	66779	63312	00619	94053
37352	79142	51032	58844	03167	57351	51850	92810	35331	78995	44221	41532	51606	26430
60640	14199	48263	71533	94235	42431	44114	90993	41149	06159	39242	11163	14764	19246

Fig. 39
RANDOM NUMBERS
TABLES E & F

TABLE H

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
60359	07603	81594	66235	48154	61257	27978	64695	63165	44593	08210	16863	09655	00855
34992	97880	79115	47587	76167	47086	57064	16730	74172	60317	83215	38133	06303	05466
04887	64208	71842	97885	32616	23280	11783	19852	64266	24446	14189	77419	30991	92130
09332	86232	88199	66094	72594	30100	23673	68705	66989	42666	81857	34651	36167	24221
42326	62962	06485	04978	96639	96214	91478	12408	21457	19862	99102	91426	10181	51762
49187	42836	17042	35179	31880	48444	89877	50915	37426	21556	25999	84256	82314	18813
09228	57404	42180	07949	98750	31506	78442	45809	12725	49774	11276	46371	81681	00623
69720	73477	91252	48009	81393	76401	48168	25967	33372	84414	21506	46131	46046	12354
82222	13787	98611	95257	34753	36674	44326	66070	61131	70620	42865	89251	54844	04013
30703	00513	54586	05623	43999	55387	67189	95058	91174	13121	27557	16512	77963	40635
86369	62151	70713	41166	79321	52215	94358	28962	35868	22796	87221	40014	68875	71420
83331	99035	68506	96734	91074	24356	03035	66926	32197	54944	76781	86722	11769	27368
43053	60600	98921	43720	77342	26186	64554	46226	64244	10703	49564	69737	32948	43060
57104	49148	18487	01775	71782	04679	64369	06208	71669	63046	10470	54194	96709	86502
33177	11409	13925	18130	54242	13460	39174	63528	22670	31810	04313	50669	20653	31779
05424	76714	05732	29415	01183	45054	13493	44006	61641	80304	96504	52181	05359	72203
92950	58665	41191	69259	50244	55322	75137	90193	31989	17381	43795	26981	15326	02303
54925	20502	71767	82737	64847	04496	35921	42670	08584	54090	52907	75331	09155	54187
41980	43710	55304	57526	29616	92314	85883	21584	55045	81997	62277	58884	01590	13532
83825	70977	67987	61545	92066	71215	93967	63071	69928	98917	05699	35957	04679	58769
84047	83627	37763	07081	33048	57895	42182	73279	08032	19165	01701	35656	03328	81785
12776	69127	67921	57611	85876	30744	40886	68396	79787	76434	71221	86769	15104	19062
81419	55440	69506	09115	45032	48343	78352	39075	31689	76469	64918	15149	88457	97144
59844	03603	96297	58028	93069	35674	38479	54639	54455	10300	73946	94827	53164	07458
18350	74940	07044	11210	53622	00779	36027	51496	01694	57895	84570	18271	54461	42210
79960	18784	13376	03415	84450	78874	22050	19730	92598	54291	60658	73188	03446	49864
45420	24157	16374	22384	56892	84941	97157	99656	33978	81436	10955	98991	10456	35727
13945	09559	68152	56960	39453	51654	10617	55628	47933	85161	52998	75414	59552	03546
91206	33871	60730	96821	95808	29763	39678	73104	43398	38181	44314	58343	28884	94613
24847	08724	81499	72905	95102	63004	22223	19808	90777	54986	97234	18458	22889	83960
94303	08209	27804	49372	66392	50578	02966	90907	33164	83044	97985	78526	00983	29271
22732	95331	60954	93333	71142	38827	48222	21779	35598	95957	58844	82319	19780	08330
82809	24004	65983	01091	70431	91145	88207	52216	94846	75303	85105	89486	08182	56504
62700	79965	09610	97213	48579	43574	37652	12447	80233	42473	94585	84840	99926	74778
89870	73755	48525	32765	50818	71468	37876	28334	07762	16180	45346	78324	20422	85784
81493	24124	67928	12735	41249	24180	54740	44290	58903	38681	04066	69393	84595	42173
43630	32189	08532	43055	08080	84208	06295	07813	24068	67549	43081	78581	02095	03471
60234	18992	13283	96334	39746	07272	25295	07871	34201	49620	52178	07290	89767	63890
00107	21861	60367	48999	71634	34053	28265	02064	06290	10620	17941	81086	51759	57028
09657	36088	05976	88267	62683	57675	85265	10856	06585	37911	82332	55758	25054	30436
93948	38350	63464	08008	96607	73505	75513	91238	11042	40972	62837	30260	84002	99947
42746	29761	72298	48186	88584	90141	72879	54531	99127	60063	22374	76895	63812	94877
12939	04181	27698	48297	20574	30169	45545	04462	91067	43847	62739	31141	30385	30098
71032	55283	94804	00202	12254	22920	73225	51484	73943	08431	45681	32663	67097	15644
09188	78876	95736	70659	32725	23024	04656	48102	15904	19019	09882	87431	16879	61253
79236	54729	47052	49717	22312	06735	58347	04402	03838	97049	38378	38579	24489	86899
41337	52635	48056	43317	11599	26382	41305	04589	92877	52732	53130	45275	30183	15962
73732	99966	30485	45994	30195	40239	52751	64124	67778	60982	12167	63134	10730	11350
92113	55625	03726	76886	64237	33300	48004	37440	76329	80441	74766	70630	97855	88039
53797	22667	74860	99731	06975	63055	72287	81976	43983	97018	25559	96618	93350	67143

Fig. 39
RANDOM NUMBERS
TABLES G & H

)	(11)	(12)	(13)	(1
24	06765	29501	62849	50
66	77741	12985	14112	65
69	09363	44394	29087	96
62	94296	94528	82984	71
48	25439	18861	26742	54
59	64179	98567	69313	84
66	36927	53520	58309	58
89	99315	26662	15833	37
01	01767	78894	92922	66
56	13957	52743	42306	87
74	43855	24512	81956	75
79	44093	58405	38515	85
92	30157	63198	75932	02
84	29564	51522	35571	69
48	54049	85937	64718	21
59	70241	47977	78645	48
85	91711	63572	57007	11
99	02026	24596	88692	55
33	92321	23304	77153	86
16	64393	52020	44994	88
35	30064	72710	26327	65
77	34953	08975	83142	48
98	24711	72537	18360	95
53	04322	27171	41828	79
61	65554	53461	61776	03
31	71792	38047	85559	56
63	03152	39235	74289	42
34	83385	91492	45796	04
22	11108	59992	23168	04
80	56791	34690	61634	85
02	07408	50545	21312	11
56	50368	88653	23329	86
40	61529	88660	66941	15
24	81555	82769	23559	55
46	27182	34936	97267	63
16	65948	24841	38607	39
07	25917	56240	73499	45
91	19201	90963	34192	63
15	10201	53931	44245	42
21	23143	14829	55792	84
86	57811	54512	30108	01
06	73432	95276	21237	36
97	67702	49763	25950	49
53	59757	70491	69632	46
62	41253	97688	76883	29
36	21987	15450	56574	45
07	43410	53746	54716	17
89	34082	26035	11928	41
35	28258	27709	90674	09
38	85922	58369	89734	08

FULLY EQUIPPED 60 SELECTOR FRAMES

PANEL CONVERSION TABLE – RANDOM NUMBERS TO FRAME AND SELECTOR

SEL	FRAME 1	FRAME 2	FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7	FRAME 8	FRAME 9	FRAME 10
1	1	61	121	181	241	301	361	421	481	541
2										
3										
4										
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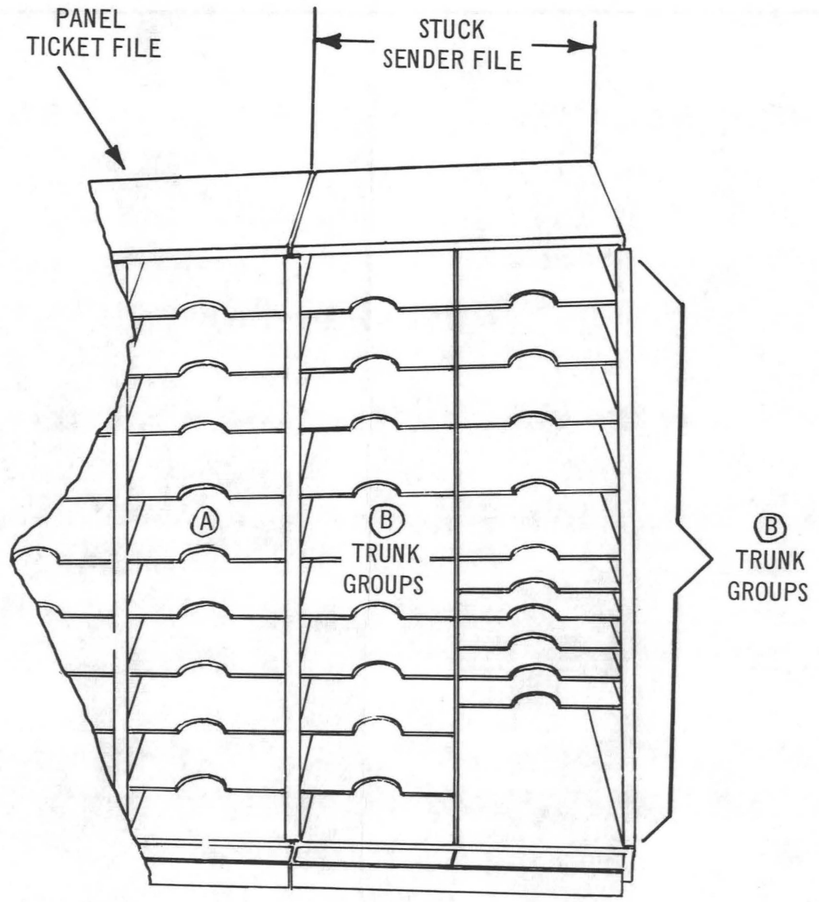
59										
60	60	120	180	240	300	360	420	480	540	600

Fig. 40



NOTE

A-Major Equipment Groups (See Fig. 26)
B-Trunk Groups (Show Office Code or Name of Trunk Group)

STUCK SENDER TICKET FILE

Fig. 41

FORM E-5477
(6-67)

STUCK SENDER TALLY SHEET

OFFICE _____ PERIOD _____

SENDER		TALLY	SENDER		TALLY
FR	SDR		FR	SDR	

Fig. 42