

CONTROLLED MAINTENANCE PLAN FOR TOLL-TYPE EQUIPMENT

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1. GENERAL

1.01 This section describes a plan for the equipment maintenance job in central offices and repeater stations, where the responsibility for maintenance of toll-type equipment is present.

1.02 It should be recognized that failure of toll-type equipment can have adverse effects reaching far beyond the obvious loss of service to customers using the equipment at the time of the failure. For example, such failures can cause billing errors, reduce the call handling capability in switching machines, and create abnormal service loads for testboards, report desks, and traffic switchboards. In addition, such failures may seriously affect special services provided for government and for private customers. Even momentary interruptions of circuits can seriously disrupt a customer's service. The costly nature of these failures indicates that it is most economical to maintain all toll-type equipment at an acceptable level of performance and reliability.

1.03 Controlled maintenance, as described in this section, provides techniques for managing upkeep maintenance on toll-type equipment. *Toll-type equipment, as used here, is equipment installed in a local or toll central office to provide trunks or special services. There may be instances where this equipment is used in other applications. However, regardless of application, the term "toll-type" will apply to this equipment.* "Control," as used here, means to direct, regulate, and coordinate central office

activities. The objective of controlled maintenance is to maintain the designed capability of the equipment in a manner that will provide customers with excellent service while keeping expenses to a minimum.

1.04 Controlled Maintenance Plans for other central office equipment, not classified as toll-type, and Power Systems Equipment Test Lists are covered in other Bell System Practices.

1.05 The basic responsibility for maintenance of equipment and service will be found in Bell System Practices 660-201-010 and 660-202-010, "Toll Telephone and Telegraph Facility Maintenance — Office Responsibilities."

2. CONTROLLED MAINTENANCE — CORRECTIVE AND PREVENTIVE

2.01 "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 type of equipment. The terms "corrective maintenance" and "preventive maintenance" are defined as follows:

Corrective Maintenance consists of : (1) recording details of troubles reported by test frames, customers, operators, alarms, other offices or testboards, etc; (2) locating and repairing reported trouble; and (3) logging details of troubles for further study. The activities included in corrective maintenance are shown in Fig. 1.

Preventive Maintenance is the term applied to the activities of finding, repairing, and recording troubles, service-affecting or not, which are not associated with a trouble report, and for which there are inadequate indicators. For convenience of description, preventive maintenance may be separated into two divisions: (1) the examination of corrective maintenance records for evidence of increasing troubles and the testing of associated equipment for further evidence; and (2) the scheduling and performing of periodic tests for locating troubles for which indications are obscure, or for affirming the correct operation of critical equipment items for which in-service failures cannot be tolerated.

2.02 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 records which present information in an effective way for later analysis. It should be recognized that corrective maintenance procedures provide an adequate method for handling troubles only when trouble reports are received promptly and contain enough detail to allow identification of the failed equipment.

2.03 For toll-type equipment where unreported troubles exist, other means for detecting these 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.

2.04 The Equipment Test List described in Part 16 of this section is provided to assist the supervisor in organizing the preventive maintenance job. This list contains all tests applicable to toll-type equipment found in Bell System Practices.

2.05 Fig. 2 provides an overall view of the controlled maintenance concept. The objective is to maintain the designed capabilities of equipment. Quality control applied to manufacture and installation is intended to ensure equipment installations which meet the standards established by the design. In the Controlled Maintenance Plan 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 records where these records indicate the existence of troubles not yet reported.

2.06 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 conditions where trouble indicators are missing, misleading, or obscure

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and where scheduled tests are required to correct the existing troubles.

3. CONTROLLED MAINTENANCE CONCEPT

3.01 Part 3, in conjunction with the flowchart Fig. 3, provides an overall view of the total Plan in simplified form. It describes in general terms the operations, activities, decision processes, and records used in the Plan.

3.02 Controlled maintenance, as explained in Part 2, consists of a balance between corrective and preventive maintenance activities. In corrective maintenance, current equipment troubles are compared to a predetermined trouble expectancy by types of equipment.

3.03 Reported troubles are recorded daily and summarized monthly for evaluation and comparison purposes.

3.04 The number of troubles expected is determined through the study of past equipment trouble records. These troubles are averaged to a monthly base. The equipment involved is inventoried by types. A comparison is made between troubles expected and actual troubles. Also, troubles expected per 100 items of equipment are compared to actual troubles per 100 items of equipment. The evaluation of troubles per 100 equipment items allows comparison to be made between equipment maintenance groups.

3.05 The occurrence of more trouble than expected is the sign that action is needed. The individual troubles are examined through the analysis process, or a sampling of equipment units may be made to determine if the equipment needs corrective action. When it is decided that work is to be done to prevent further trouble, a Test and Inspection Work Order is originated and assigned. The work done as a result of this process is *preventive maintenance*. A record of troubles found and time spent is kept for further summary and reference.

3.06 Analysis of corrective maintenance records can lead to the requirement for preventive maintenance work described in 3.05. Other preventive maintenance work must be performed or reviewed as specified in the Equipment Test List.

3.07 All toll-type equipment for which periodic work or review is required is listed in an Equipment Test List. Large groups of equipment are broken down into small work items for easier scheduling. These work items are scheduled at the proper intervals. A group of work items is assigned to a "Trick." A *Trick*, as used in this section, is a period of time designated by a distinctive code for work assignment purposes. The identification of work items with a Trick allows the assignment of work on a predetermined basis. A card file system is established, with a card for each work item. This card file system brings up the work items at the proper time and gives all the information necessary to perform the work. If the work item is classified as *Mandatory Work* (MW), a Test and Inspection Work Order is originated and the work is performed. A record of time spent and troubles found are entered on the work order for later summary and evaluation.

3.08 If the work item is classified as *Mandatory Review* (MR), a review must be made of the current equipment performance and whether the work was done at or since the last scheduled period. If the work was done and troubles on the equipment are low, the work may be passed until the next scheduled period. Where scheduled MR work is passed, continuing attention must be given to the troubles versus trouble expectancy for this equipment. An increase in troubles may tell us that the preventive maintenance work must be done before the next scheduled period. Scientific sampling is an optional method for determining the need to perform work classified as MR. This applies where the job is large and where sampling can be used to determine the relative amount of trouble existing in the equipment. Depending on the results of the sampling, work may be performed or deferred.

3.09 Test and Inspection Work Orders issued for preventive maintenance work are retained and summarized. These forms contain a record of troubles found and time needed to perform the work. It is essential that this information be complete and accurate. Records of *trouble found* are used for evaluating scheduled maintenance intervals. Records of time spent doing the work permit evaluation of training needs and force requirements.

4. TROUBLES — THEIR CAUSES AND INFLUENCING FACTORS

4.01 Part 4 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 of the administration of corrective measures is vital to the understanding and application of Controlled Maintenance.

4.02 A *trouble* is any condition requiring corrective action as a result of a report, alarm, trouble card, or other observed indication. Depending on circuit design, customer service may or may not be affected.

4.03 Not all equipment troubles are immediately evident. Equipment design does not always provide for an alarm or other trouble indication. Under these conditions, equipment maintenance forces may be unaware of the existence of trouble and must rely on reports from other sources for adequate information. It is essential that maximum use be made of automatic trunk test frames, manual measurements, circuit tests, DDD Bureau pattern referrals, and customer reports in order to identify these troubles.

4.04 *Intermittent and Transient Troubles:*

"Intermittent troubles" are those which continue to appear and disappear until they are cleared. For example, wire clippings, loose connections, and defective contacts are examples of conditions that cause intermittent troubles. "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.

4.05 *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 deterioration has used up the reserve and that corrective action must be taken before it becomes service-affecting.

Causes of Troubles

4.06 Plant forces responsible for maintaining toll-type equipment must be familiar with the following causes of troubles, most of which result in electrical or mechanical failures:

Dirt: Dirt may come from within or from outside the central office. Lint from clothing or other textiles and 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 by 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 (circuit orders, circuit layout cards, etc) as a result of work errors by employees in other departments.

Defects: Failure 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

4.07 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. They are described in 4.08 through 4.14.

4.08 *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 Western Electric Handbook section attached thereto. These instructions explain in detail the procedures for protecting service and equipment during installation work.

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

4.10 Housekeeping: Various Bell System Practices contain instructions for cleaning equipment without causing service reaction. To remove dirt from equipment, surface dusting and pressure cleaning procedures should be followed. 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.

4.11 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 be required. Central office people should be on the alert for service or safety hazards. They should inform the contractor's representative or the Engineering Department, 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.

4.12 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.

4.13 Environmental Control: Some central offices are provided with equipment for filtering air and for regulating humidity. Its ef-

fective use, coupled with controlled use of windows, outside doors, and openings between building areas, will reduce the introduction and circulation of dirt.

4.14 Application of Bell System Practices:

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

The Trouble Problem

4.15 Control of equipment trouble is made up of three main categories:

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 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, and elimination of work errors are essential. The maintenance people should thoroughly understand the operation of the equipment, the use of the test equipment, and the true significance of trouble reports.

5. FORM E-5840, EQUIPMENT TROUBLE TICKET

General

5.01 Part 5 describes Form E-5840, Equipment Trouble Ticket, and its use. Included are instructions for making entries on the ticket.

5.02 Trouble tickets are records of corrective maintenance work for toll-type equipment and are primary documents of trouble reports and the resultant found and not found troubles. *It is mandatory that tickets be written for all trouble reports and that all entries be complete, accurate, and legible.*

Description

5.03 The Equipment Trouble Ticket, Form E-5840, measures 3-1/2 by 6 inches. All tickets have preprinted serial numbers. The use of serially numbered tickets aids in cross-reference between maintenance groups and offices and helps assure that all troubles are recorded. Fig. 4 is an illustration of Form E-5840.

Use

5.04 Form E-5840 is initiated for equipment trouble reports from toll testboards, other departments, other offices, alarms, or other sources. Tickets may be initiated at a central location for troubles experienced in small offices or stations within the territory of the maintenance group.

5.05 A trouble ticket should be initiated for corrective equipment adjustments made as a result of tests applied to trunks or circuits by test frames or manual methods. These records, when properly analyzed, will reveal unstable equipment functions that need correcting.

5.06 Proper audit controls make it necessary to account for all serially numbered tickets. If errors are made on a ticket, it should be marked *void* and filed with the other completed tickets.

5.07 Trouble tickets are not issued for recording troubles found as a result of scheduled equipment preventive maintenance activities, inspections, or samples. Procedures for recording these troubles are covered in Part 14.

5.08 The effectiveness of the Controlled Maintenance Plan depends on the analysis of all available data. Therefore it is important that all trouble reports be accounted for, recorded, and properly coded. Fig. 4 provides information for making entries on the ticket.

5.09 An Equipment Trouble Code List (see Fig. 5) is provided as a reference for coding trouble tickets. This list may be reproduced locally and posted in the area where trouble tickets are normally prepared.

6. FORM E-5457, CENTRAL OFFICE LOG**General**

6.01 Part 6 describes Form E-5457, Central Office Log. This form is provided primarily for use in small or unattended offices. Illustrations of the form and typical examples are included.

6.02 The log is used for recording details of equipment troubles, trouble reports, and office activities which could cause trouble reports.

Description

6.03 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

6.04 Fig. 6 illustrates the use of Form E-5457, Central Office Log.

6.05 The log may be closed out daily or periodically, depending on the volume of trouble reports and other entries.

6.06 The log may also be used for noting central office activities such as installation, contractor, or preventive maintenance activities. These kinds of entries are useful for investigating troubles which may be related to such activities.

6.07 Where a maintenance area includes several small offices or stations, it is desirable to have a record of troubles at a centralized location for review and summary purposes. In this case it is suggested that an equipment trouble ticket be prepared at the centralized location. Trouble entries in the central office log, maintained at the small office or station, should be cross-referenced to the equipment trouble ticket serial numbers.

6.08 Local reports or office alarms may initiate equipment trouble investigations in the smaller offices. These reports should be entered in the Central Office Log by the attendant. If a trouble condition is observed, the attendant will clear the trouble and advise the centralized location of the essential details so that a trouble

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ticket may be prepared. The attendant should complete his log entry with the serial number of the trouble ticket.

7. FORMS E-5841A, B, C, D — EQUIPMENT CONTROL RECORD

General

7.01 Part 7 describes Form E-5841, Equipment Control Record, and its use.

7.02 Four forms are provided. Three are *pre-printed* to show major equipment groups with subdivisions for specific equipment types. The fourth form does not have preprinted equipment groups, and may be used with locally developed codes for new equipment items until standard codes are provided. This form may also be used for special studies. Columns are provided for recording troubles by equipment types. Entries are to be made on a *daily basis* for a one-month period. The bottom three lines are arranged for entering partial and total trouble expectancies for each equipment type. Fig. 7 through 10 are illustrations of the forms, with a typical example.

Description

7.03 Form E-5841, 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.

Use

7.04 Form E-5841, Equipment Control Record, provides a *current picture* of troubles accumulated for one month, usually on a daily basis. In smaller offices, it may be more convenient to enter troubles at longer intervals.

7.05 Form E-5840 Trouble Tickets are the source data for the Equipment Control Record. Troubles are posted to the Equipment Control Record by day of the month on a cumulative basis. Comparison of actual troubles to a predetermined trouble expectancy is made on a partial month and on a total month basis. Significant variations in actual troubles to expected troubles require investigation or further analysis. Trouble expectancies are described in detail in 8.06, 8.07, and 8.08.

7.06 Compute the partial month objectives for troubles expected for 10-day intervals on a cumulative basis, and post on the Equipment Control Record.

Example: monthly expectancy 45 troubles, 10-day (15), 20-day (30).

7.07 Three columns are provided on the back of the form to record equipment trouble code, date, and remarks. Details of action taken to correct high trouble conditions should be entered here. In addition, the form may be used to record central office activities that may result in increased trouble.

8. FORM E-5842, EQUIPMENT PERFORMANCE SUMMARY

General

8.01 Part 8 describes Form E-5842, Equipment Performance Summary, its use, and instructions for compiling the necessary data. The data consists of an *inventory of equipment items, a locally developed trouble expectancy per 100 equipment items, and a monthly summary of actual troubles per 100 equipment items*. Fig. 11 is an illustration of the form.

8.02 By establishing a base of expected troubles per 100 equipment items per month, a factor is developed which may be used to adjust trouble expectancies when equipment items are added or deleted from the office inventory.

8.03 Trouble expectancies per 100 equipment items also provides a means of comparing equipment performance between groups maintaining the same types of equipment. It should be recognized that some variation may exist between offices, due to the ratio of spare to working equipment items. However, other deviations may point to causes such as: maintenance effort; age of equipment; levels of craft skill; etc.

Description

8.04 Form E-5842, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for standard ring binders.

Use

8.05 The initial step is to inventory each category of equipment, using the Equipment Grouping List, Fig. 12. *This list refers to work unit forms and line numbers for each category of equipment.* Where these work unit records are not available, a physical count will be necessary. The total number of equipment items for each category should be posted on the E-5842 Equipment Performance Summary. The equipment item count should be reviewed each quarter for accuracy.

8.06 The figures to be posted in the column, "Trouble Expectancy per 100 Units," are developed from office records. The best source of information is the coded equipment trouble tickets for the previous year. If these tickets were coded under another plan, it will be necessary to convert the trouble codes used to the codes shown in Fig. 5 or Fig. 12.

8.07 In some cases, a full year's trouble records may not be available; however, use as large a base as possible to establish a valid average of troubles per month. Under these circumstances, any available records should be used to establish temporary trouble expectancies. As monthly troubles are accumulated, they should be used to refine the temporary trouble expectancies. If the number of equipment items varied during the study period, these variations should be considered and the trouble expectancy adjusted accordingly.

8.08 The average troubles per month becomes the trouble expectancy for each category of equipment and will be used as a comparative for current troubles. This figure will be posted on the "Expectancy - Month" line on the E-5841 Equipment Control Record, in the "Avg. Prev. Year" column on the E-5463 Trouble Summary, and in the "Tbl. Expectancy - Average" column on the E-5842 Equipment Performance Summary.

8.09 The average troubles per month in 8.08 must be converted to troubles per 100 equipment units for posting on the E-5842 Equipment Performance Summary. The formula for making this conversion is shown below.

$$\frac{\text{Avg. Tbls./Mo.}}{\text{No. Equip. Units}} \times 100 = \text{Tbls. Exp./100 Units}$$

This figure is then entered in the "Tbl. Expectancy - Per 100 Units" column on the E-5842 Equipment Performance Summary.

8.10 Each month, the actual total troubles taken from the Equipment Control Record are posted in the "Actual Tbl. - No. of Tbls." column on the Equipment Performance Summary. The actual troubles per month are then converted to troubles per 100 units and posted on the Equipment Performance Summary.

9. FORM E-5463, TROUBLE SUMMARY**General**

9.01 Part 9 describes Form E-5463, Trouble Summary. Included are examples of its use and instructions for recording information and for interpreting data. Fig. 13 is an illustration of the form.

9.02 Form E-5463 is provided for recording, each month, the number of troubles associated with equipment items. The form is arranged for comparison of troubles experienced, by month, with the past year's monthly trouble average and with the current trouble expectancy.

Description

9.03 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.

9.04 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

9.05 The Trouble Summary provides space for recording trouble data by months, so that trouble trends are readily apparent. The data

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recorded on this summary is obtained from the "Total" line on Form E-5841, Equipment Control Record.

9.06 Equipment items are listed in the "Equipment" column by trouble code. Two columns, "Avg. Prev. Year" and "Cur. Obj.," are provided for comparing current trouble trends with past trouble results and also for comparing with an objective figure. As the number of troubles are entered each month for each equipment item, comparisons are made. If the number of troubles for a particular equipment item should rise unexpectedly or if a gradual rising trend is noticed, investigation is required to determine the cause.

9.07 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 on the Trouble Summary. When the objective for the next year is being calculated, consideration must be given to current trouble trends and conditions expected to exist during the next year. For example, the addition of equipment or new services or features or the result of a reconditioning program would all have an effect on future trouble rates. The objective should be adjusted if actual results are FAR OUT OF LINE with the previously set objective and the *cause is known*.

9.08 Form E-5463, Trouble Summary, is used for presenting trouble data in large enough pieces (monthly for each equipment item) so developing trends can be recognized. When adverse trends are seen, investigation should be made to determine the cause.

10. FORM E-5843, PERFORMANCE TREND RECORD

General

10.01 Part 10 describes Form E-5843, Performance Trend Record. Included are illustrations of the form, with typical entries (Fig. 14). This is an optional form provided to give the maintenance supervisor a method of graphically recording the performance of selected equipment items or groups.

Description

10.02 Form E-5843, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

Use

10.03 Form E-5843, Performance Trend Record, provides space for recording the performance of five equipment items or groups. Spaces are provided at the left side of the form for identifying the equipment by trouble code and type, and for recording the trouble expectancy from the "Month" line on the Equipment Control Record. The space to the immediate left of each graph section is provided for assigning values to the vertical scale of the graph. These values should be assigned so that the trouble expectancy per month falls near the center of the vertical scale. Other values on the vertical scale should be chosen so that the expected range of troubles will not extend the plotted line off of the graph.

11. FORM E-5844, TROUBLE TALLY SHEET

General

11.01 Part 11 describes Form E-5844, Trouble Tally Sheet. Included are illustrations of the form, with typical entries. This form is provided to give the supervisor a convenient method of making detailed analysis of trouble reports where the Equipment Control Record or the Trouble Summary indicates the need for further analysis.

Description

11.02 Form E-5844, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

Use

11.03 Form E-5844, Trouble Tally Sheet, provides spaces in the left-hand column for listing the equipment to be analyzed and several spaces to the right for stroking trouble reports. These may be Equipment Trouble Codes or *trouble causes such as individual component fail-*

ures, work errors, dirt conditions or excessive wear, corrective adjustment or wiring defects, etc. Headings for the 12 subcolumns are to be chosen according to the trouble categories expected for the equipment being analyzed. Fig. 15 is an illustration of the form, with typical entries.

11.04 Under certain conditions, the Trouble Tally Sheet may be used as an alternate form to replace the Equipment Control Record forms. Part 13 covers the application of con-

trolled maintenance in the small office. Under these conditions, where small numbers and a few varieties of toll-type equipment are being maintained at one or more locations, the Trouble Tally Sheet may be used to accumulate a record of troubles reported by equipment types and by individual locations on a monthly or a quarterly basis. For comparison purposes, it provides space for trouble expectancies. It may also be used to summarize troubles by equipment types for

all offices maintained. All entries for equipment codes or types, objective figures, and office names are on a write-in basis. Fig. 16 gives examples of its use. The back of the form may be used to record action taken as a result of excessive trouble indications.

12. CONTROL AND ANALYSIS OF EQUIPMENT PERFORMANCE

12.01 Under the controlled maintenance concept, mandatory equipment maintenance intervals are prescribed for items where failure could cause severe service reaction. All other preventive maintenance work will be determined either by analysis of trouble reports or by scientific sampling. *Therefore, if this Plan is to be effective, it is necessary that a continuing and comprehensive analysis plan be developed.*

12.02 There are numerous possible techniques for analyzing equipment performance. For example, such systems as machine card sort, key sort, and even computer analysis may be used. For most offices, however, manual methods will prove most practical.

12.03 The basic job of analysis consists of examining trouble reports to determine if a particular category of equipment is causing an excessive amount of trouble.

12.04 Equipment trouble tickets are the major source of data for analysis; however, full use should also be made of data from automatic or manual trunk measurements.

12.05 In small offices, where few trouble reports are received each month, analysis may be done by direct examination of trouble tickets.

12.06 Where many reports are received each month, it is necessary that a continuing record be kept so that the performance of equipment can be closely monitored. The daily posting of trouble ticket information on the Equipment Control Record and comparison of actual trouble to trouble expectancy will reveal equipment groups which may require attention.

12.07 When an equipment item has been identified as having excessive trouble, further analysis may be necessary to determine the exact

cause of the failures. This is done by direct examination of the trouble tickets. A blank Equipment Control Record form or a Trouble Tally Sheet may be used to further analyze these tickets.

12.08 When analysis techniques indicate the need for preventive maintenance, reference should be made to the Equipment Test List to determine the proper tests for the particular equipment type. Form E-5452, Test and Inspection Work Order and Record, should be initiated, scheduled, and assigned. Progress of the work may be observed from entries on the form. The record of troubles found and adjustments made should be retained. The use of Form E-5452 is covered in Part 14.

12.09 In the larger office where many equipment trouble reports are accumulated, it may be desirable to use a ticket file to separate tickets by trouble code. Part 15 describes a ticket file. Fig. 17 is an illustration of the ticket file, and gives ordering information.

13. CONTROL OF EQUIPMENT PERFORMANCE IN SMALL OFFICES OR SMALL INSTALLATIONS

13.01 Part 13 provides procedures for controlling equipment performance in small offices or in groups of small offices. Where a maintenance territory includes both large and small offices, the complete plan will be required for the large offices. The procedures described in Part 13, however, may be applied to that portion of the maintenance territory containing only small offices.

13.02 The procedures described in Parts 14 through 20 for scheduling and assigning preventive maintenance work apply to all maintenance territories, regardless of the sizes of offices involved. The simplified procedures described in this part apply only to the corrective maintenance portion of the job.

13.03 While some of the records and methods for corrective maintenance will vary according to the arrangement of offices in the maintenance territory, there are certain requirements which apply to all offices where toll-type equipment is installed. These requirements are described in 13.04 through 13.07.

13.04 Recording Trouble Reports: As stated in Part 5, an E-5840 Equipment Trouble Ticket must be made for each reported case of equipment trouble. It is expected that trouble tickets for troubles occurring in unattended offices will be made at a central location. This will usually be the testboard or maintenance center controlling the facilities in the unattended office.

13.05 Trouble Expectancies: In controlled maintenance, equipment performance is evaluated by comparison of actual trouble to expected troubles. Therefore, trouble expectancies must be established for all equipment categories. Where a maintenance territory includes several small offices, it may be desirable to establish combined trouble expectancies. This is done by adding the total equipment inventory of all offices for each equipment category. These figures are then used as a base for setting trouble expectancies for each category.

13.06 Analyzing Troubles: All trouble reports must be collected, summarized, and compared to trouble expectancies on a monthly basis. Fig. 16 and 16A are illustrations of Form E-5844, Trouble Tally Sheet, showing how these records may be kept. In Fig. 16, individual expectancies have been established for each office, while Fig. 16A illustrates the use of combined trouble expectancies. Significant deviations from trouble expectancies require further investigation or action. Details of these investigations should be recorded on the back of the E-5844. It should be recognized that the use of combined trouble expectancies can mask poor equipment performance in an individual office. Therefore, trouble tickets for individual offices should be reviewed periodically for evidence of chronic trouble.

13.07 Equipment Performance Results: Equipment performance results must be recorded at least quarterly on Form E-5842, Equipment Performance Summary. Use of this form is described in Part 8. If combined trouble expectancies have been established, the results from all offices may be expressed on a single form.

13.08 Fig. 16B shows the corrective maintenance records required for small offices, and gives a brief description of the use of the forms.

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

General

14.01 Part 14 describes Form E-5452, Test and Inspection Work Order and Record. An illustration of the form is shown in Fig. 18.

14.02 Form E-5452 is used as a preventive maintenance work order and as a record of work performed. Fig. 19, Preventive Maintenance Diagram, shows the application of this form in preventive maintenance work.

Description

14.03 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.

14.04 The front of Form E-5452 provides spaces at the top for recording assignment data, BSP number, equipment, work description, 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

14.05 Form E-5452 is issued for job assignments listed on the Plant Work Schedule and is used by the craftsman for recording progress of the work assignment, trouble experienced, and time spent.

14.06 Form E-5452 is also used for assigning nonrecurring work such as special equipment tests, inspections, or samples.

14.07 Completed E-5452 forms, as used in 14.05, are filed by item number and retained for summarization at a later time. In this Plan, Trick and Item Numbers are the same as the Assignment or Job Number entry on Form E-5452. The information recorded on these forms provides the supervisor with the necessary data for refining estimated times for job assignments and for reducing or increasing the frequency of the tests. Completed forms, as used in 14.06, need not be retained.

15. TICKET FILE**General**

15.01 Part 15 describes a ticket file which may be used where a large number of tickets are handled each month. The file provides systematic storage so that trouble tickets are readily available for reference or study. The file should be located where maintenance records are kept.

Description

15.02 Fig. 17 shows the 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 3/4-inch increments. This feature provides for various filing arrangements. In addition, file units may be connected together to provide the required size for an office.

Use

15.03 Ticket bins may be arranged for filing tickets by equipment items or groups, as required locally. Equipment codes are shown in Fig. 5.

15.04 Trouble tickets should be retained in a 3-month moving file. At the end of each report period, tickets for the oldest month should be removed (see Part 21, Retention of Records).

15.05 Tickets should be filed in the bins by date. During the course of the month, as tickets are filed, repeat troubles may easily be seen. As new trouble tickets are filed, the tickets for the current month are examined quickly to see if the latest ticket is a repeat trouble.

15.06 Separate bins should be designated for filing "Memo," "Hold for Repair," and "Pending" trouble tickets issued during the current month. Spare bins may be used for special studies.

16. E-5450, EQUIPMENT TEST LIST**General**

16.01 Form E-5450 is used as the format for a series of Bell System Practices called *Equipment Test Lists*. For toll-type equipment,

the Equipment Test Lists are found in each BSP division. They contain tests, BSP references, and test intervals for all toll-type equipment found in that division.

16.02 Form E-5450 is also available as a blank form for listing items not covered by the preprinted lists. Fig. 20 is an illustration of the form.

Description

16.03 Form E-5450, printed on white paper, measures 8-3/8 by 10-7/8 inches and is punched for filing in standard ring binders.

Use

16.04 Equipment Test Lists are used to assist in scheduling preventive maintenance work and as a reference for quickly locating trouble tests for corrective maintenance. The Equipment Test Lists should be removed from the BSPs and filed in a separate binder where they will be available to maintenance personnel.

16.05 All test requirements given in the Equipment Test List are given one of the following four classifications: MW, MR, TF, or TT. These classifications are defined in the Equipment Test List instructions. MW (Mandatory Work) tests must be performed at least as often as specified by the Equipment Test List. MR (Mandatory Review) tests must be reviewed, for the need to do them, at least as often as specified by the Equipment Test List. A record of the review must be made on the plant work schedule even if no action is taken. Fig. 21, Table A, shows the Mandatory Review Procedure.

16.06 TF (Test Frame) tests have no specified frequency in the Equipment Test List. Schedules for test frame tests should be developed locally.

16.07 Tests classified as TT (Trouble Tests) are not scheduled. These tests are listed on separate pages of the Equipment Test Lists so that they may be filed separately. TT tests are included in the Equipment Test Lists so that every test will have a classification. They provide a ready reference for selecting tests for trouble clearing and equipment testing purposes.

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16.08 Frequencies for tests are indicated by the following symbols:

SYMBOL	FREQUENCY
D	Daily
W	Weekly
M	Monthly

Less frequent intervals are indicated by a number prefix, ie, 6W for once every 6 Weeks.

16.09 Equipment Test List Instructions for toll-type equipment are found in BSP Section 010-300-011.

17. SCHEDULING — ASSIGNING AND CONTROLLING — PERIODIC PREVENTIVE MAINTENANCE

17.01 Part 17 describes the forms and procedures for scheduling, assigning, and controlling preventive maintenance on toll-type equipment as specified by the Equipment Test List.

17.02 In offices where toll-type equipment is a small part of the total job and where a Switching System Controlled Maintenance Plan is being used, the toll-type equipment may be scheduled on the switching plan forms. Fig. 22 through 26 show examples of toll-type equipment scheduled on these forms. *For offices where maintenance of toll-type equipment is a major part of the job, the methods and forms described in the Plan for toll-type equipment are to be used.*

17.03 The organization of the preventive maintenance job consists of the distribution of the known work to the available work force. This Plan provides the means for accomplishing this task as well as providing feedback information relating to troubles found during the performance of the work. This information is recorded and retained for later use in evaluating the effectiveness of the maintenance program.

17.04 The scheduling and assigning of a variety of recurring work items is accomplished by collecting groups of work items on a schedule form in amounts reasonable for one man to accomplish in a given time. This group of work

items is then assigned to an identity known as a **Trick**.

17.05 As used here, the word "Trick" is the identity of a period of time designated by a distinctive code for work assignment purposes. Either scheduled or nonscheduled work items may be assigned to the Trick.

17.06 The number of Tricks established depends on the time required to accomplish all the known work assigned to that particular work force.

17.07 Individuals in the work force may be assigned to work the Trick on a daily or on a continuing basis. These assignments can be predetermined and posted.

17.08 Tricks should be conveniently designated. One suggested method is a combination of letters and numerals. The letters indicate the period of the day, and whether they are Monday through Friday or Saturday, Sunday, or Holiday Tricks. The numerals indicate the number of Tricks. The following chart illustrates this method of assigning the letter prefixes.

	MON.-FRI.	SAT.	SUN.	HOLIDAY
Day	D	AD	UD	HD
Evening	E	AE	UE	HE
Night	N	AN	UN	HN

The Tricks in each period may then be numbered serially, ie, D1, D2, E1, E2, etc.

18. FORM E-5845, PLANT WORK SCHEDULE — RECURRING WORK ITEMS

General

18.01 Part 18 describes Form E-5845, Plant Work Schedule. This form is provided for listing and scheduling recurring maintenance work specified by the Equipment Test List. Fig. 27 is an example of the Plant Work Schedule, with instructions and typical entries.

Description

18.02 Form E-5845, printed on white paper, measures 10-7/8 by 16-7/8 inches and is punched for filing in a long form binder. The form is a calendar-type schedule covering a

period of one year. The months on the form are divided into four periods of approximately seven days each. Columns are provided for listing work items, test classifications, intervals, item numbers, and estimated times for each item.

Use

18.03 Symbols are used in the calendar portion of the form, opposite each listed maintenance item. The symbols indicate when the work is scheduled to be done and when it actually was done. An additional symbol is provided to indicate that a particular work item was omitted or passed. Space is provided on the back of the form for explaining deviations from the schedule.

18.04 The Equipment Test List provides for two kinds of tests which will be scheduled on the E-5845 Plant Work Schedule. These are MW (Mandatory Work) and MR (Mandatory Review). These terms are described in Part 16. Mandatory Work, as the name implies, must be done each time it is scheduled. Mandatory Review, however, requires a maintenance decision to determine whether the work will be done or passed. Table A, Fig. 21, shows the procedure for making such a decision. As can be seen in Table A, this decision is based on the size of the job, the current trouble trend, and whether the work was performed at or since the last time it was scheduled. If the decision is made to pass the work, it should be indicated on the E-5845 Plant Work Schedule by use of the appropriate symbol. Also, a brief explanation of this action should be entered on the back of the schedule.

18.05 Where large numbers of the same type of equipment are to be scheduled, it will be necessary to break them into multiple work assignments. In no instance should there be more than "one man week" of work assigned under a single item number. This allows the supervisor to review and control the progress of the work and to take any necessary action before the scheduled completion date.

18.06 Each work assignment scheduled on the E-5845 should be given a locally assigned item number. This is a control number used to simplify locating and stroking completed work assignments.

18.07 The entries in the "Interval" column are those given on the Equipment Test List for that particular test. It should be noted that the test frequency shown on the Equipment Test List is the *maximum interval for that test*. If trouble experience indicates the need for making the test more often, it should be so scheduled. Test intervals should not be extended unless a basic study indicates that the test is being performed too frequently. Results of the basic study and recommendations for change of interval should be forwarded to the proper level of supervision for approval.

18.08 Entries made on the form in the "Min. Per Item" column should be made in pencil, since this figure is subject to review and change. Initially this figure will be the estimated time per work assignment, based on the supervisors experience or on time studies of the work operation. On a continuing basis, this figure will become the average of the actual time required to perform the tests. *Realistic job loading and work force control depends on the review of these time increments*. The "Min. Per Item" figure should be reviewed for accuracy periodically until such time as the supervisor determines he has a valid time figure established.

18.09 The work items listed on Form E-5845 will be scheduled on the calendar portion of the form according to the frequency shown on the Equipment Test List.

18.10 When scheduling work items across the calendar, consider the office pattern for vacation periods and for other known periods when work forces will be reduced.

18.11 To assign work items, add the total minutes for all the work items scheduled in the period, convert this total to hours, and post on the "Total Hours" line, as shown in Fig. 27. This allows the supervisor to determine if the trick fully loaded during the period or if additional work can be assigned. Also, by totaling a period on all E-5845 forms, the supervisor can determine his preventive maintenance work load for that period.

18.12 *For each item listed on the E-5845, an E-5846 Scheduled Work Assignment card is made out.* The trick designation and the work

item number provide the necessary cross-referencing between the card and the schedule.

18.13 Work items completed as scheduled should be marked on the schedule with the appropriate symbol. When work items are not completed as scheduled, the deviation should be marked as shown in the example (Fig. 27). In addition, a notation should be made on the back of Form E-5845, to explain the reason for the deviation.

19. FORM E-5846, SCHEDULED WORK ASSIGNMENT

General

19.01 Form E-5846, Scheduled Work Assignment, provides a notice of the assignment and gives a detailed description of work scheduled to be performed. Fig. 28 is an illustration of the form. When the forms are filed as shown in Fig. 29, the work item is automatically brought forward to the attention of the supervisor and craftsman when due. Because this is a basic control card and remains in the file, it should be used in association with Form E-5452, Test and Inspection Work Order and Record. When properly established and used, this file system reduces the supervisory time involved in making individual work assignments. The entries on Form E-5846 are obtained from the E-5845 Plant Work Schedule and from the Equipment Test List.

Description

19.02 Form E-5846, a salmon colored card printed on one side, measures 5 by 8 inches and is for use in a standard card file system. The card provides space for entering information, such as work to be done, office or location, equipment items involved, and BSP references for the tests to be performed.

Use

19.03 Form E-5846 is a control card and is permanently retained in a file arranged as shown in Fig. 29. Under this system of filing, work assignment cards are brought forward at the beginning of each period. Each month is divided into four periods known as first, second, third, and fourth periods to correspond to the E-5845 Plant Work Schedule covered in Part 18.

Work assignment cards for the current period are then placed behind the proper trick guide card. When the craftsman assigned to the particular trick picks up the work assignment cards at the beginning of the period, he will transfer the work assignment information from the card to a blank Form E-5452. He then returns the card to the file under the In-Progress Guide Card until the work assignment is completed.

19.04 During the progress of the work assignment, the Form E-5452 is used to record all equipment troubles and adjustments that were made to return the equipment to Bell System Practice limits. If the work assignment extends over a period of several days, daily entries should be made on the "Progress Report" portion of the form. All time spent in performing the work assignment should be accurately recorded as indicated. Fig. 18 gives an example of entries on Form E-5452.

19.05 When the work assignment is completed, the work assignment card is removed from the In-Progress file and placed behind the Completed guide card in the file. The completed Form E-5452 is turned in to the supervisor.

19.06 Use of common trick and item numbers on the Plant Work Schedule, Scheduled Work Assignment cards, and Test and Inspection Work Orders facilitates cross-referencing individual work items between these forms.

19.07 At the end of the period, the supervisor reviews his Plant Work Schedule for uncompleted work items. These uncompleted items require further attention and recheduling. All completed work assignment cards are placed in the file behind the guide for the month they are next due.

20. SAMPLING MAINTENANCE CONDITIONS

General

20.01 Part 20 describes the use of sampling for evaluating performance or condition of equipment. It includes definitions of terms, tables of random numbers, and an example of sampling applied to toll-type equipment.

20.02 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:

- (a) To minimize the possibility of bias or distortion affecting sample results.
- (b) To allow certain definite conclusions to be drawn about the particular universe when the sample results are known.

20.03 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.

20.04 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

20.05 Defined below are sampling terms which are commonly used.

Universe: The total number of items under investigation is called the universe. If large numbers of an equipment item are present, the group may be divided into more than one universe.

Sample: A sample is that portion 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. When a sample is drawn from a group of items, each of the items must have an equal chance of being selected.

Random Number Tables: These are 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

20.06 There are three reasons for the 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 units of a large of equipment need attention sooner than others.

20.07 Sampling can be applied to a large number of equipment components when information is sought about the extent of a specific condition. Usually, frequency or level 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 electron tubes with low emission.

20.08 There are instances when the use of sampling is not recommended because little or no savings would be realized. For in-

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stance, 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.

20.09 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 20.08. Second, procedures for taking samples must be followed exactly. Third, results must be understood for what they represent and must be used accordingly.

Application

20.10 Sampling is used to reduce testing time where MR tests require that equipment conditions be ascertained. For example, MR tests (such as tests B or C in Section 362-035-501) are due. Assume that the office contains 400 N1 carrier terminals. Testing time for each of the tests for all terminals would require considerable time. Instead of 100% testing, let us sample the terminals, as prescribed in the MR review procedures. We may disclose out-of-limits conditions which have not been identified by trouble reports. A sample, properly taken, could produce a practical estimate of the condition of the 3700 Hz oscillators in all the terminals. It will provide an indication of urgency to perform this test on all the 3700 Hz oscillators.

20.11 If the terminals are to be sampled, certain steps must be followed. First, the sample size must be determined. We know that the universe is 400 terminals. Reference to Fig. 30 shows that a sample of 40 terminals is adequate.

20.12 Next, the sample must be determined in terms of the particular items (terminals) in the universe which are to be tested. It is important that this step be done as described. If proper procedures are not followed, the results obtained will not be reliable. It must be understood that the random sample selection method described will properly weight the effect

of variables such as age of equipment, location, and relative use.

20.13 Tables of random numbers are provided in Fig. 31. Numbers are selected from the tables and are used for 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 the 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.

20.14 The following illustrates the use of random number tables:

- (a) Universe size — 400.
- (b) Sample size from Fig. 30 — 40 units.
- (c) Random numbers to be selected — 40.
- (d) Items in universe are numbered 001 through 400.
- (e) Refer to Fig. 31, Table C. Start at the top left-hand side of column designated (1). Inspect first three columns of digits. (Digits seen are 064, 392, 898, etc.)
- (f) Scan down the first three digits of the first column and select any 3-digit number between 001 and 400. Selections made are 064, 392, 353, 305, 024, 189, etc.
- (g) Repeat, starting at the top of column (2), selecting the first three digits. Selections made are: 321, 110, 060, etc.
- (h) Repeat until 40 numbers have been selected.
- (i) Arrange the 40 random numbers in convenient order. If repetitions are encountered, discard all but one of set and select more random numbers.

20.15 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. This may be done mentally by counting from the upper left-hand side across each succeeding row to the bottom right. Terminals whose position number cor-

responds with one of the random numbers selected become one of the sample.

20.16 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 the use of sampling greatly helps to simplify and speed up the process.

20.17 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 Practice standards should be used, where applicable. 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. Examination of the completed form will provide information as to the condition of the universe.

21. RETENTION OF RECORDS, AND ORDERING INFORMATION

Retention of Records

21.01 The forms described in this section have been designed for recording useful information in an orderly fashion. The need for retaining the different forms varies according to their usefulness for analysis and audit purposes. Following is a list of the forms and their minimum required retention period:

FORM NUMBER	MINIMUM RETENTION
E-5452	1 YR.
E-5463	1 YR.
E-5842	1 YR.
E-5845	1 YR.
E-5840	3 MO.
E-5457	3 MO.
E-5841A, B, C, D	3 MO.
E-5843	AS REQ.
E-5844	AS REQ.
E-5846	AS REQ.

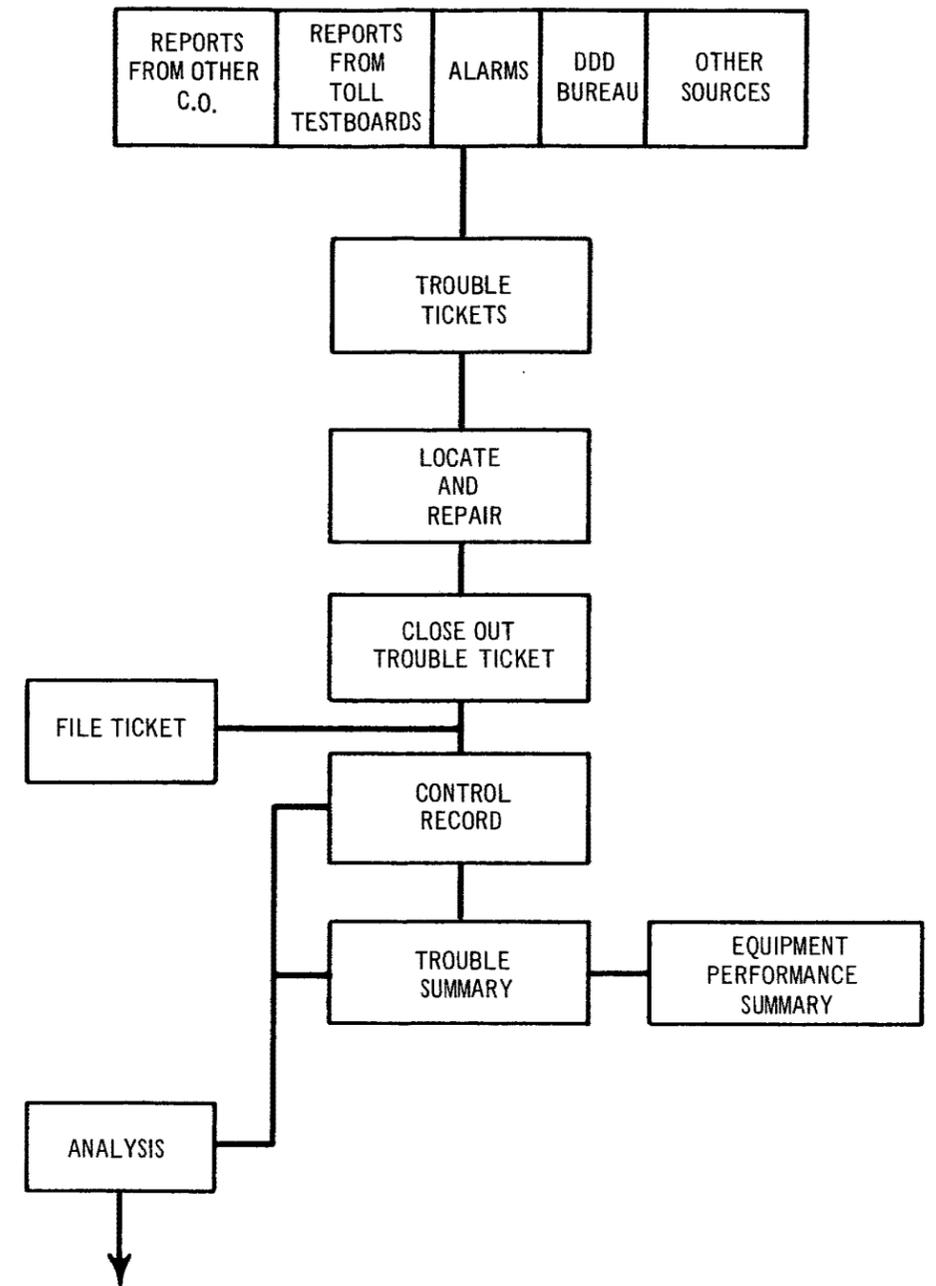
Ordering Information

21.02 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 NUMBER	FORMS PER PACKAGE
E-5452	50
E-5463	25
E-5842	25
E-5845	25
E-5840	500
E-5457	50
E-5841A	25
E-5841B	25
E-5841C	25
E-5841D	25
E-5843	25
E-5844	25
E-5846	50

CORRECTIVE MAINTENANCE DIAGRAM



SEE FIG. 19

PREVENTIVE MAINTENANCE
DIAGRAM

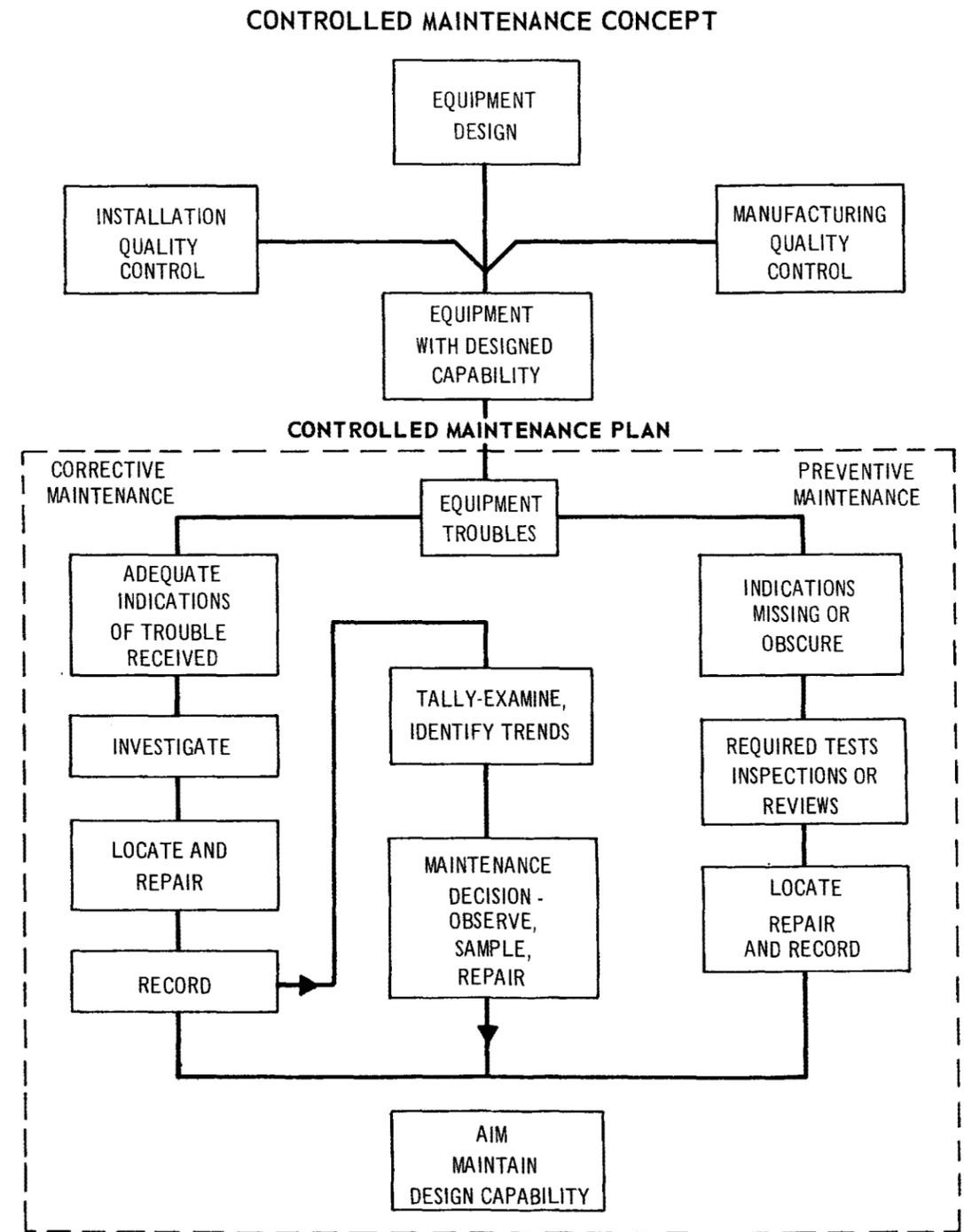


Fig. 2

CONTROLLED MAINTENANCE PROCEDURES AND FORMS

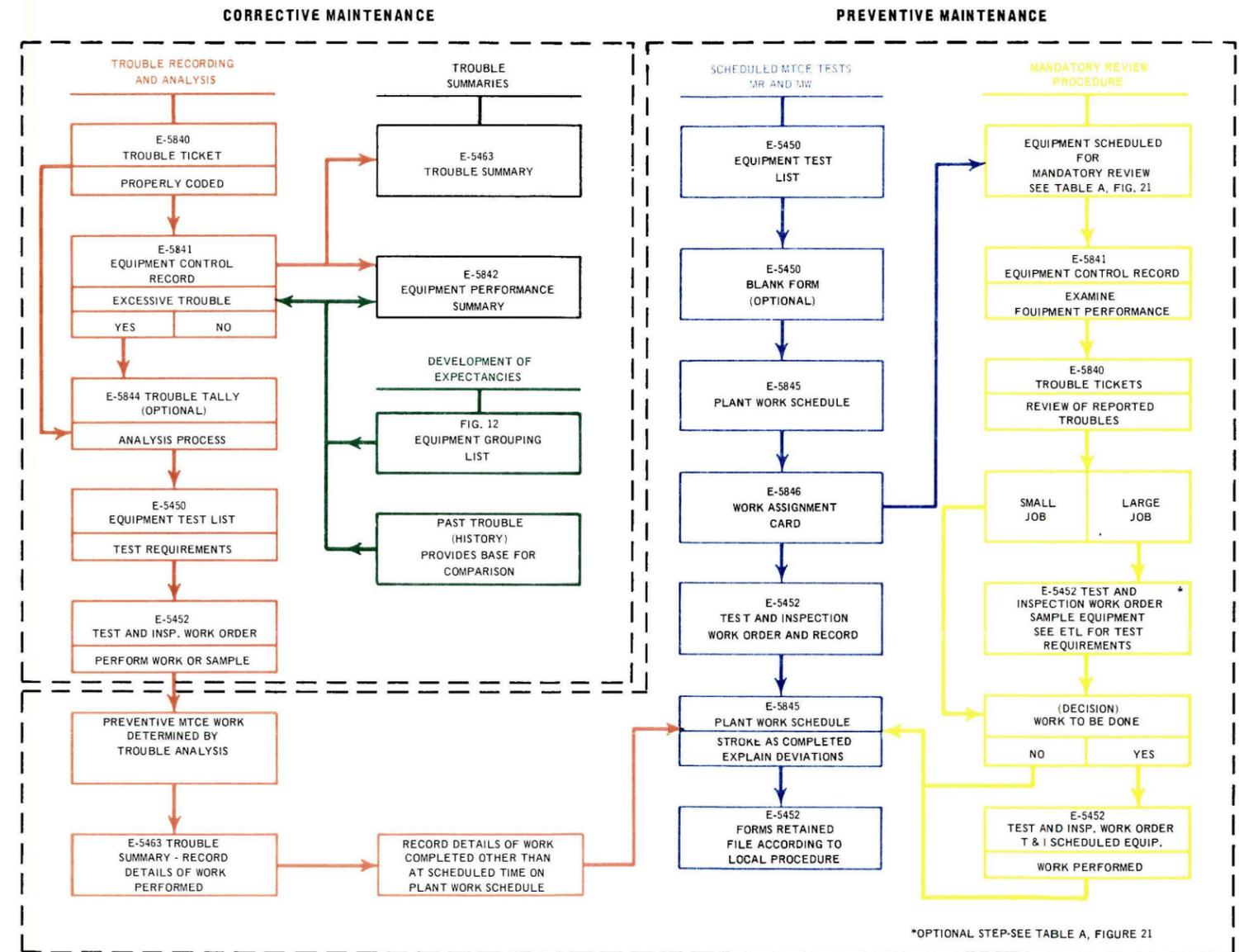


Figure 3

E-5840 EQUIPMENT TROUBLE TICKET

E-5840

EQUIPMENT TROUBLE TICKET

SERIAL NUMBER		REF SERIAL		OUT OF SVC		MEMO	
REPORTED FROM		BY		DATE	TIME	REC BY	
CIRCUIT, CHANNEL, GROUP OR SYSTEM						OFFICE OR STATION	
EQUIPMENT OR UNIT TYPE AND NUMBER							BAY
TROUBLE REPORTED							
TURNED DOWN OR RELEASED							
TO		BY		TIME		DATE	
TURNED UP							
TO		BY		TIME		DATE	
MADE GOOD							
BY		TIME		ON		DATE	
RESTORE REGULAR							
NTFD		AT		TIME		DATE	
TROUBLE FOUND							
EQUIPMENT PERFORMANCE ANALYSIS						POSTED ON E-5841	
TROUBLE CODE						BY	
EQUIP REPAIR TIME		TBL CLEARED					
HRS		MIN		BY			

PRE PRINTED SERIAL # → SERIAL NUMBER

ENTER SERIAL NO. OF TICKET IN REPORTING GROUP → REF SERIAL

CHECK IF EQUIP IN TROUBLE IS CAUSING SERVICE OUTAGE → **OUT OF SVC**

CHECK IF EQUIP IS TURNED DOWN FOR ROUTINE TESTS OR WHERE TICKET IS FOR RECORD PURPOSES ONLY → MEMO

ENTER DATE, TIME AND INITIALS OF PERSON TAKING REPORT → REC BY

IF EQUIP IN TROUBLE IS LOCATED IN ANOTHER OFFICE OR STATION ENTER OFFICE OR STATION NAME → OFFICE OR STATION

IDENTIFY GROUP AND PERSON MAKING REPORT → REPORTED FROM

IDENTIFY EQUIP IN TROUBLE BY UNIT, TYPE, NUMBER AND BAY → EQUIPMENT OR UNIT TYPE AND NUMBER, BAY

IF EQUIP IS TURNED DOWN FOR ROUTINE OR TESTS, ENTER NOTIFICATION DATA → TURNED DOWN OR RELEASED

IF SERVICE IS MADE GOOD, ENTER DETAILS HERE → MADE GOOD

DO NOT START LOG HERE. AFTER TROUBLE IS FOUND ENTER CAUSE OF IN THIS SPACE → TROUBLE FOUND

ENTER INITIALS OF PERSON POSTING THIS TICKET DATA ON FORM E-5841 EQUIP CONTROL RECORD → POSTED ON E-5841

ENTER APPLICABLE TROUBLE CODE FROM FIG. 5 TROUBLE CODE LIST → TROUBLE CODE

ENTER TIME ACTUALLY REQUIRED TO REPAIR EQUIP. → EQUIP REPAIR TIME

ENTER INITIALS OF PERSON CLEARING EQUIPMENT TROUBLE → TBL CLEARED

Fig. 4

EQUIPMENT TROUBLE CODE LIST

V. F. EQUIPMENT

V, E, 22, & 44 Type Repeaters1VR
 All Other Voice Frequency Equipment
 Troubles Including Blown Fuses1M
 Echo Suppressors and Compandors1ES

S. F. SIG.

Tube Type Single Frequency Units2SF
 Transistor Type Single Frequency Units2SFT

OTHER SIG.

Composite, SX, DX Signalling Units and PLR3CX
 All Other Signalling Units3OS

L CARRIER

H.F. Line Amplifier L1 Carrier4LA
 H.F. Line Regulator L1 Carrier4LR
 H.F. Flat Gain and Plug-In4FG
 Line Amplifiers L3 & L4 Carrier
 H.F. Line Regulator L3 & L4 CXR4L3R
 L CXR GP, SG Suomaster & Master GP Equipment4L3G
 Channel Bank J, K, & L CXR4CH

N, O AND ON CARRIER

O, N, & ON Tube Type Repeaters5ONR
 N Transistor Type Repeaters5N3R
 N1 Group Equipment5N1G
 N1 Channel Equipment5N1C
 N2 Group Equipment5N2G
 N2 Channel Equipment5N2C
 N3 Group Equipment5N3G
 N3 Channel Equipment5N3C
 O & ON Group Equipment (group and junction) ...5ONG
 O & ON Channel Equipment5ONC

RADIO

Microwave Transmitter, (Long Haul)6DT2
 Microwave Transmitter, (Short Haul)6MT
 Microwave Receiver, (Long Haul)6DR2
 Microwave Receiver, (Short Haul)6MR
 Microwave Repeater6RP2

T CXR

T Carrier Repeater7TR
 T Carrier Terminal (per channel)7TT

OTHER CARRIER

Commercial Type Repeater8CR
 Commercial Type Terminal (per channel)8CT
 Other Bell Sys. Repeater8BR
 Other Bell Sys. Terminal (per channel)8BT
 Misc. Carrier Troubles Incl.
 Blown Fuses & Frame Troubles8M

K CARRIER

Line and Twist Amplifiers8KA
 Group Equipment8KG

FM EQUIPMENT

FM Receiver9FMR
 FM Transmitter9FMT

TELEGRAPH EQUIPMENT

Regenerative Teleg. Repeaters10RG
 Other Telegraph Repeaters10R
 Telegraph Carrier Channel10C
 Misc. Teleg. Equipment Troubles10M

OTHER RADIO

All Other Land Based Receivers11R
 Other Transmitters11T
 All Other Radio Equipment Troubles11M

VIDEO AND PROGRAM

Program Amplifiers12PA
 Program Switching Equipment12PS
 Video Amplifiers12VA
 Video Switching Equipment12VS

DISTRIBUTING FRAME

Frame, Cross Connect13M

MISC.

No Trouble FoundNTF

E-5841A
(10-68)

EQUIPMENT CONTROL RECORD

OFFICE _____		PERIOD _____															
DATE	VOICE FREQ. EQUIPMENT			S.F. SIG. EQUIP		OTHER SIG. EQUIP		TELEGRAPH EQUIPMENT				PROGRAM AND VIDEO EQUIPMENT				FRAME X-CON	
	1VR	1M	1ES	2SF	2SFT	3CX	30S	10RG	10R	10C	10M	12PA	12PS	12VA	12VS	13M	
5																	
10																	
15																	
20																	
25																	
30																	
31																	
TOTAL																	

EXPECTANCY	10 DAY																
	20 DAY																
	MON																

Fig. 7

EQUIPMENT CONTROL RECORD

E-5841B
8-69

OFFICE _____		PERIOD _____																
DATE	K CARRIER		L CARRIER EQUIPMENT						RADIO					FM EQUIP.		OTHER RADIO		
	8KA	8KG	4LA	4LR	4FG	4L3R	4L3G	4CH	6DT2	6MT	6DR2	6MR	6RP2	9FMR	9FMT	11R	11T	11M
5																		
10																		
15																		
20																		
25																		
30																		
31																		
TOTAL																		

EXPECTANCY	10 DAY																	
	20 DAY																	
	MONTH																	

Fig. 8

E-5841C
(10-68)

EQUIPMENT CONTROL RECORD

OFFICE _____		PERIOD _____															
DATE	N, O AND ON CARRIER									T CARRIER		OTHER TYPE CARRIER					
	50NR	503R	5N1G	5N1C	5N2G	5N2C	5N3G	50NG	50NC	7TR	7TT	8CR	8CT	8BR	8BT	8M	
5																	
10																	
15																	
20																	
25																	
30																	
31																	
EXPECTANCY	10 DAY																
	20 DAY																
	MONTH																

Fig. 9

EQUIPMENT PERFORMANCE SUMMARY

OFFICE _____

PERIOD _____

	TBL CODE	EQUIP. COUNT	TBL EXPECTANCY		ACTUAL TBLs	
			Average	PER 100 UNITS	No. of Tbls	PER 100 UNITS
VF Equip.	1VR					
	1M					
	1ES					
SF Sig	2SF					
	2SFT					
Other Sig	3CX					
	3OS					
Telegraph	10RG					
	10R					
	10C					
	10M					
Prog-Video	12PA					
	12PS					
	12VA					
	12VS					
Radio	6DT2					
	6MT					
	6DR2					
	6MR					
	6RP2					
FM Equip.	9FMR					
	9FMT					
Other Radio	11R					
	11T					
	11M					
K Cxr.	8KA					
	8KG					
L Carrier	4LA					
	4LR					
	4FG					
	4L3R					
	4L3G					
	4CH					
N-O-On Carrier	5ONR					
	5N3R					
	5NIG					
	5NIC					
	5N2G					
	5N2C					
	5N3G					
	5N3C					
5ONG						
5ONC						
T Carrier	7TR					
	7TT					
Other Carrier	8CR					
	8CT					
	8BR					
	8BT					
	8M					
DF	13M					

EQUIPMENT GROUPING LIST

V.F. Equipment	1VR	V, E, 22 & 44 Type Repeaters	4407A	10, 11
	1M	All Other Voice Frequency Equipment Troubles Including Blown Fuses	4417	1 thru 22
	1ES	Echo Suppressors and Companders	4407A	12
S.F. SIG	2SF	Tube Type Single Frequency Units	4407A	2
	2SFT	Transistor Type Single Frequency Units	4407A	3
Other SIG	3CX	Composite, SX, DX Signalling Units and PLR	4407A	4
	3OS	All Other Signalling Units	4407A	5
L Carrier	4LA	H.F. Line Amplifier L-1 Carrier	4407B	9
	4LR	H.F. Line Regulator L-1 Carrier	4407B	10
	4FG	H.F., Flat Gain and Plug-In Line Amplifiers L3 & L4 Carrier	4407B	11
	4L3R	H.F. Line Regulator L3 & L4 CXR	4407B	12
	4L3G	L CXR GP, SG Submaster, & Master GP Equipment	4407B	15
	4CH	Channel Bank J, K, & L CXR (*Multiply Line 16 By 12)	4407B	16*
N, O And ON Carrier	5ONR	O, N, & ON Tube Type Repeaters	4407B	18, 19
	5N3R	N Transistor Type Repeaters	4407B	20
	5N1G	N1 Group Equipment	4407B	21
	5NIC	N1 Channel Equipment	4407B	22
	5N2G	N2 Group Equipment	4407B	27
	5N2C	N2 Channel Equipment	4407B	28
	5N3G	N3 Group Equipment	4407B	29
	5N3C	N3 Channel Equipment	4407B	30
	5ONG	O and ON Group Equipment (group and junction)	4407B	23 and 25
5ONC	O and ON Channel Equipment	4407B	24 and 26	
Radio	6DT2	Microwave Transmitter, Long Haul	4408A	7-8
	6MT	Microwave Transmitter, Short Haul	4408A	9
	6DR2	Microwave Receiver, Long Haul	4408A	1-2
	6MR	Microwave Receiver, Short Haul	4408A	3
	6RP2	Microwave Repeaters	4408A	13
T CXR	7TR	T Carrier Repeater	4407B	33
	7TT	T Carrier Terminal (per channel)	4407B	34
Other Carrier	8CR	Commercial Type Repeater	4407B	40
	8CT	Commercial Type Terminal (per channel)	4407B	41
	8BR	Other Bell Sys. Repeater	4407B	42
	8BT	Other Bell Sys. Terminal (per channel)	4407B	43
	8M	Misc. Carrier Troubles Incl. Blown Fuses & Frame Troubles	4407B	1 thru 43
K CXR	8KA	K Carrier Line and Twist Amplifiers	4407B	7
	8KG	K Carrier Group Equipment	4407B	8
FM Equip.	9FMR	FM Receiver	4408A	4
	9FMT	FM Transmitter	4408A	10
Telegraph Equipment	10RG	Regenerative Teleg. Repeaters	4407A	15
	10R	Other Telegraph Repeaters	4407A	16
	10C	Telegraph Carrier Channel	4407A	21
	10M	Misc. Teleg. Equipment Troubles	4407A	15, 16, 21
Other Radio	11R	All Other Land Based Point To Point Receivers	4408A	6
	11T	Other Transmitters	4408A	11-12
	11M	All Other Radio Equipment Troubles	4408A	1 thru 31
Video And Program	12PA	Program Amplifiers	4407A	22
	12PS	Program Switching Equipment	4407A	23
	12VA	Video Amplifiers	4407A	24
	12VS	Video Switching Equipment	4407A	25
DF X CON	13M	Frame, Cross Connect	4417	1 thru 22

E-5843

OFFICE ALPHA PERFORMANCE TREND RECORD PERIOD 1968

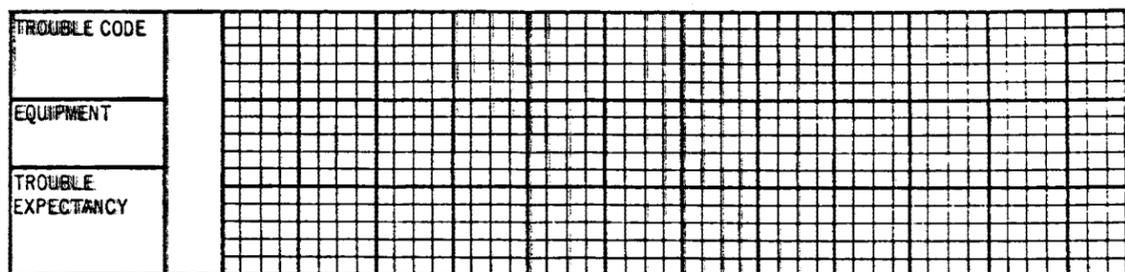
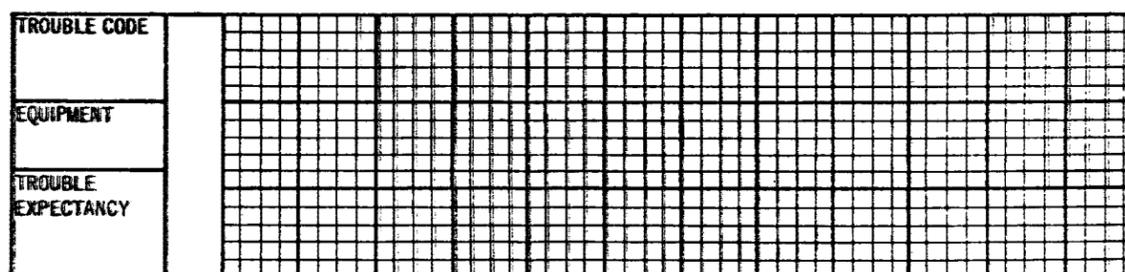
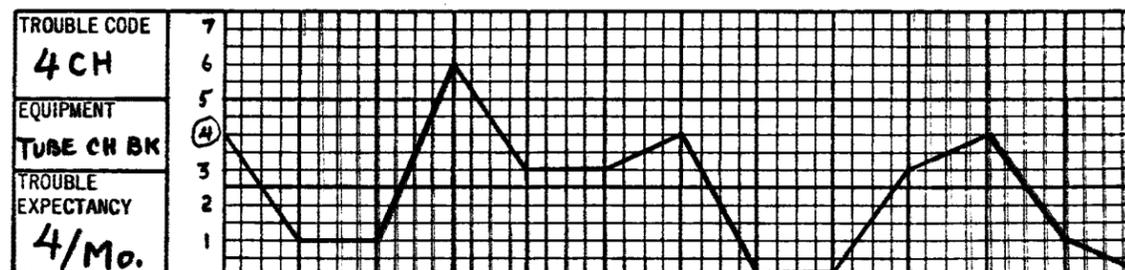
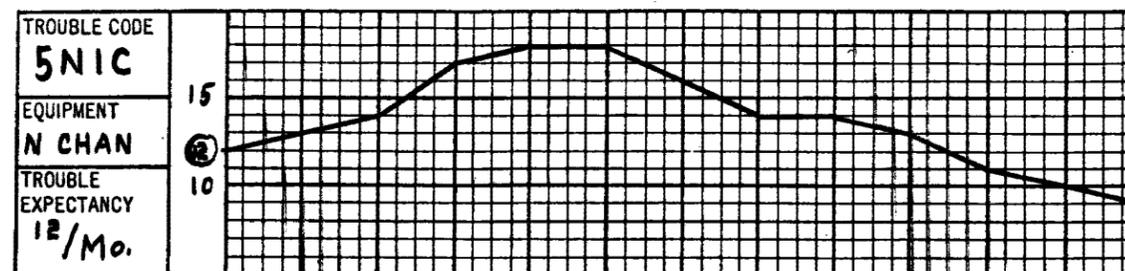
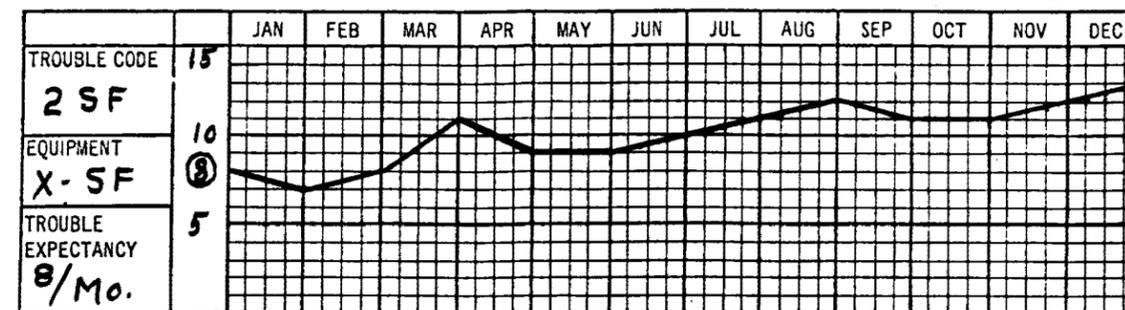


Fig. 14

E-5844

TRUBLE TALLY SHEET

OFFICE ALPHA

PERIOD 1ST QTR 68

		GP1	GP2	GP3	GP4	GP5	GP6						
L.A. 601	CORRECTIVE ADJ												
L.A. 602													
L.A. 603													

		CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	CH12
SANA IN3 GP1	CORRECTIVE ADJ												
SANA IN3 GP2													

		RELAY ADJ	REPL. ARM	TUBES	MISC								
1 ES	ECHO SUP TROUBLES												

E-5844

TRUBLE TALLY SHEET

OFFICE *Alpha Main*

PERIOD *July 1968*

	1YR	2SF	3CX	5NCL	7TT	13M	MTF	Corr. Obj.				
<i>Bristol</i>	III	III III		III II		II	III	III III III				
<i>Objective</i>	2	4	1	6				10				
<i>Troubles</i>	3	note #3 (8)	0	note #1 (7)		note #4 (2)	3	note #1 (13)				
<i>Maxwell</i>			III	III			II	III				
<i>Objective</i>		1	1	3				6				
<i>Troubles</i>		0	note #2 (5)	3			2	4				
<i>9th street</i>	III	1		III I				III II				
<i>Objective</i>	3	3	2	5				9				
<i>Troubles</i>	3	1	0	6				9				
<i>Jay st. Arlington</i>			III		1			III				
<i>Objective</i>	1		4	3	2			4				
<i>Troubles</i>	0		4	0	1			3				
<i>Combined Objective</i>	6	7	8	17	/	/	/	29				
<i>Total Troubles</i>	6	9	9	16	1	2	5	29				

Front

DATE NOTE REMARKS

7/12	#1	<i>5N Alpha - Bad 408A tube on Exp. Control amp. Causing chan. level to vary.</i>
7/16	#2	<i>DXI-5095487, Units 21-40 installed 1 year. First use 5-3-68. Analysis shows "R" relay out of adj. in 4 units - Planned TAD work order to adj. all "R" relays in units 21-40 per circuit requirement table - Complete 6/24/68</i>
7/23	#3	<i>SF unit mount #42 - Multiple reports low SF tone on line. Short caused by wire clipping on wiring side of connector block on mount.</i>
7/30	#4	<i>2 work errors on Bristol I.D.F. caused during work on circuit rearrangement. Covered 2 man from crew on proper frame procedures.</i>

Back

E-5844

TROUBLE TALLY SHEET

OFFICE ALPHA - OUTSIDE MTCE (Radio-CXR)

PERIOD July 1968

	6DT2	6DR2	6RP2	50NR	5N3R	8KA							
CASTLE BUTTE RADIO RELAY													
ALPHA NIW				III									
ALPHA NIS				III									
BELVUE K STATION					I								
COMBINED OBJECTIVE	0	0	0	6	1	1							
TOTAL TROUBLES	0	0	①	⑨	1	0							

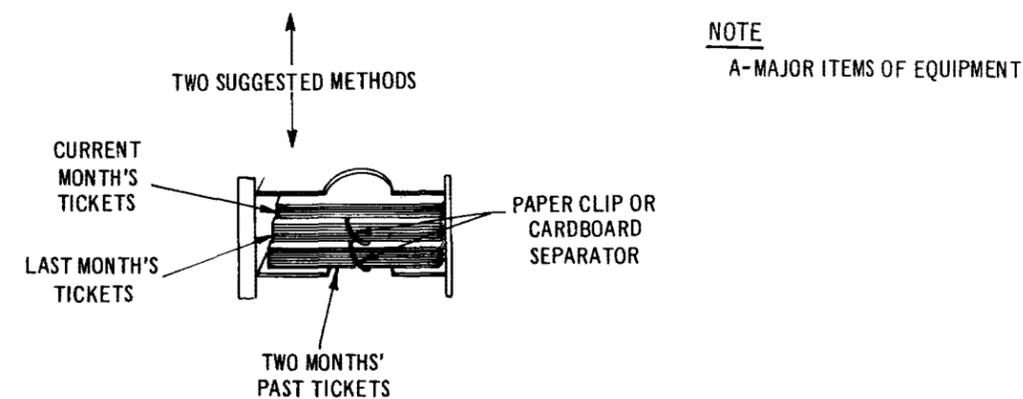
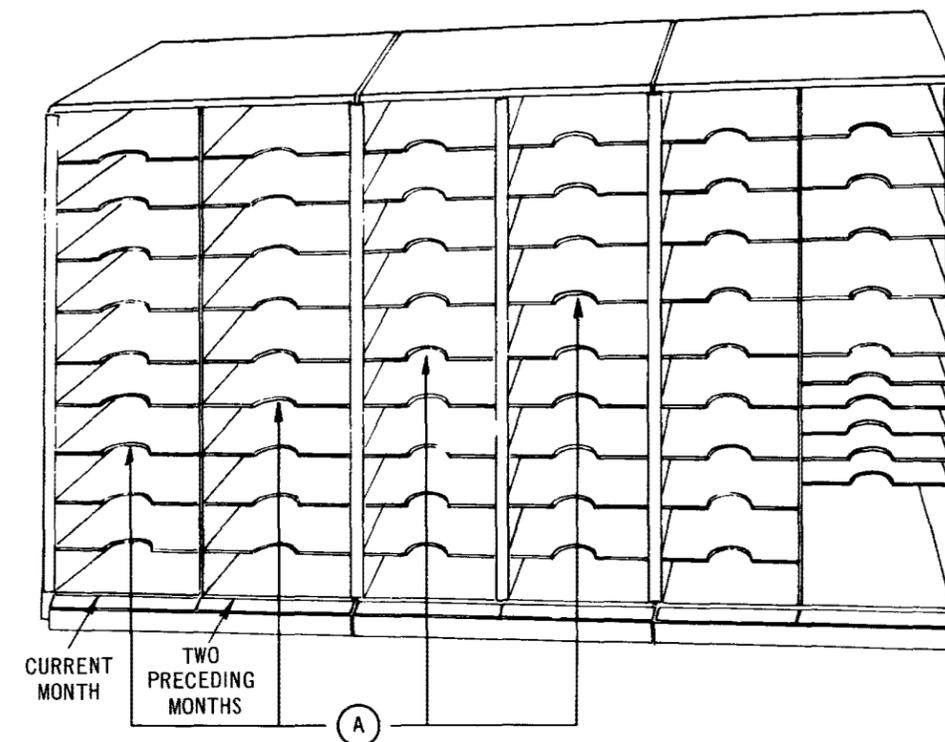
DATE	NOTE	REMARKS
7/23	#1	Chan 604 switch on noise - Lo power alm from Castle Butte. Replaced Trans Amp - Returned unit for bench tests
7/29	#2	Alpha NIW - Hits on 9th st 4N1. Found bad repeater mount. Replaced & OK

Back

SIMPLIFIED RECORDS FOR SMALL OFFICES

ACTION	FORM	USE
Recording Trouble Reports	E-5840 Equipment Trouble Ticket and E-5457 Central Office Log	Troubles are recorded on the C.O. Log at the station. E-5840 Trouble Ticket is made at the maintenance center or testboard. Log and Ticket are cross referenced by TKT serial.
Summarizing Trouble Reports	E-5844 Trouble Tally Sheet	Tickets are collected and stroked on Form E-5844 as shown in Fig. 16 and 16A. Troubles should be summarized on this form at least monthly.
Summarizing Equip. Troubles Quarterly	E-5842 Equipment Performance Summary	Trouble expectancies are established as described in Part 8. Data from E-5844 is summarized and posted on the Equipment Performance Summary.
Analyzing Trouble	E-5844 Trouble Tally Sheet	Examination of E-5844 forms will reveal areas of excessive trouble. Further analysis may be made directly from E-5840 trouble tickets.

TICKET FILE



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. 17

TEST AND INSPECTION WORK ORDER AND RECORD

OFFICE Alpha-Main (A) Trick N3 Stam 136
 ASSIGNMENT OR JOB NO.

ASSIGNMENT DATA				PROGRESS REPORT					
B.S.P. NO. TEST LETTER OR PAR. <u>320-225-500</u>				DATE	FROM EQPT. UNIT	TO EQPT. UNIT	TIME SPENT (MINUTES)		BY
EQUIPMENT							TEST	REPAIR	
<u>12C Program Amplifiers</u> <u>Tests and adjustments</u>				8/5	1	3	90	10	DCB
				8/6	4	6	75	-	DCB
				8/7	7	9	85	-	DCB
				8/8	10	12	100	-	DCB
FROM EQPT. UNIT	TO EQPT. UNIT	TOTAL UNITS	SHIFT						
<u>unit 1</u>	<u>unit 12</u>	<u>12</u>	<u>Night</u>						
ASSIGNED TO	TO BE STARTED	(C) TO BE COMPLETED							
<u>DCB</u>	<u>8/5/68</u>	<u>8/9/68</u>							
				(B)					
							350	35	

WORK RECORD				
EQPT. UNIT	TROUBLE APPEARANCE	ACTION TAKEN	REPAIR TIME	BY
<u>12C # 1</u>	<u>102F tube-Fil. Oct. 16</u>	<u>Replace tube</u>	<u>5</u>	<u>DCB</u>
<u>12C # 3</u>	<u>101F tube microphonic</u>	<u>Replace tube</u>	<u>5</u>	<u>DCB</u>
	<u>4DDB above N.R.L. peaks</u>			
<u>12C # 11</u>	<u>Potentiometer movement causes erratic output of amplifier</u>	<u>Clean potentiometer per B.S.P.</u>	<u>25</u>	<u>DCB</u>
	(D)		(E)	
A. Enter assignment data from Scheduled Work Assignment Form E-5846. B. Entries made as work progresses. Summarize test and repair time. C. Period in which work is scheduled. D. Note trouble observed and record test set reading when outside of maintenance limits. E. Record repair time spent on individual troubles. F. Total number of trouble appearances where equipment is found outside of maintenance limits.				

TOTAL TROUBLE APPEARANCES 3 (F) NO. SHEETS SHEET NO.

PREVENTIVE MAINTENANCE DIAGRAM

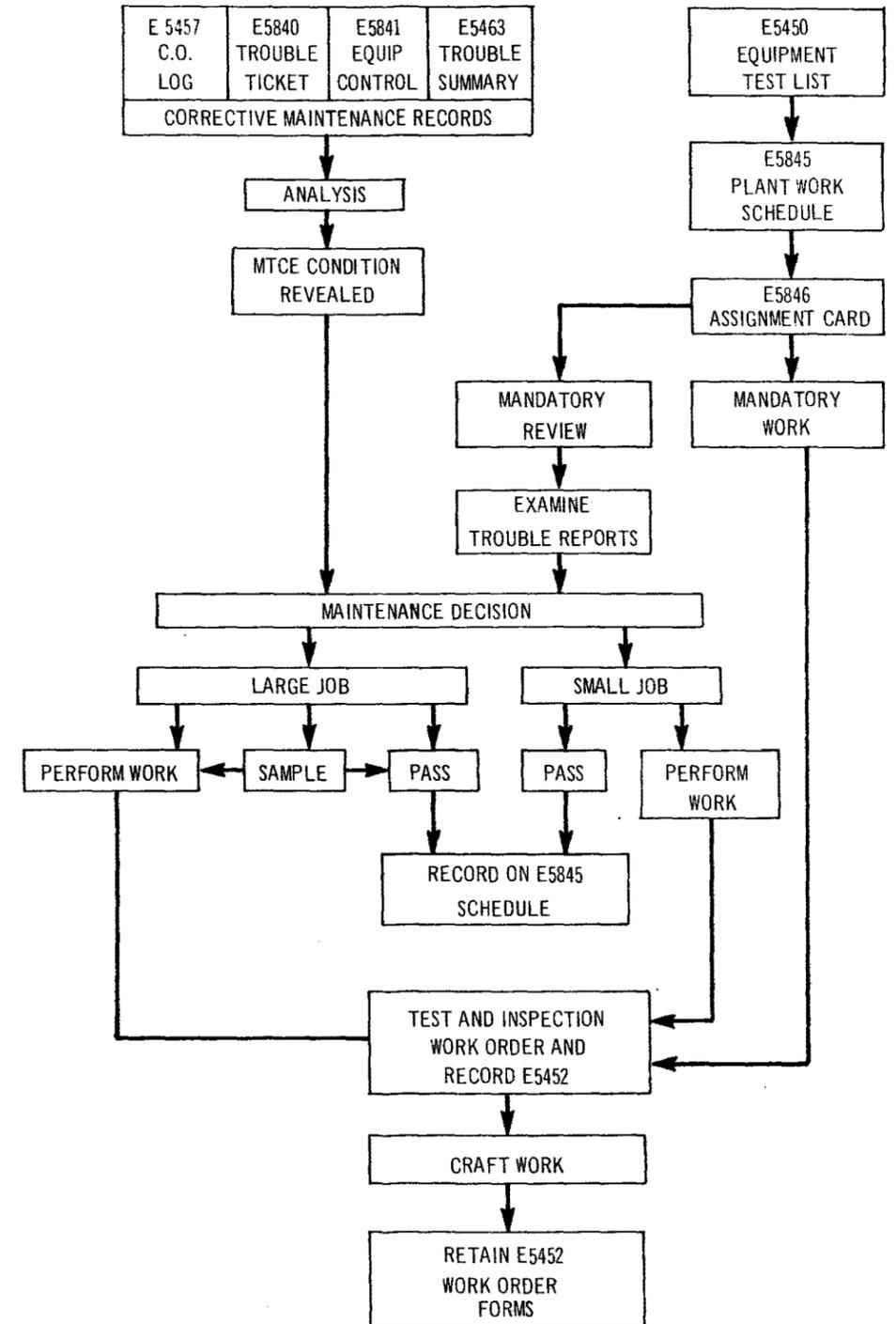


Fig. 19

**TABLE A
MANDATORY REVIEW PROCEDURE**

MANDATORY REVIEW SCHEDULED ON E-5845	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 20.

ϕ A RECORD OF EACH REVIEW MUST BE MADE ON THE PLANT WORK SCHEDULE EVEN IF NO ACTION IS TAKEN.

EQUIPMENT TEST LIST						
B.S.P.	ISS	TEST OR REQ	EQUIPMENT AND WORK DESCRIPTION	CLASS	FREQ.	JOB NO.
362	51		TYPE N, O, AND ON CARRIER TELEPHONE SYSTEMS AND ASSOCIATED EQUIPMENT COMPONENTS			
⁰¹⁰ 362-C45			TYPE N1 CARRIER TELEPHONE SYSTEM - TERMINAL EQUIPMENT			
362-010			GENERAL INFORMATION - OVER-ALL SYSTEMS			
362-010-501	1		Order-Wire and Alarm Facilities - Line Up and Maintenance			
		2(J)	Alarm operation test	MW	6M	2
		3(R)	Order-Wire signaling operation test	MW	6M	2
362-020			TESTS AND ADJUSTMENTS - GENERAL			
362-020-501	2		Heater Supply Voltage Adjustment	MW	6M	10
(161-452-701)			Blower Operation	MW	6M	12
362-020-502	2		Electron Tube Cathode Activity Measurements	MW	6M	10
362-020-503	3		Check of Alarm Operation	MW	12M	15
362-025			CHANNEL UNIT LINE-UP - TRANSMITTING			
362-025-501	3		Channel Carrier Output & Carrier Leak Test Channel Carrier Output (also see 362-330-501-, 362-330-502, 362-330-503, 362-330-504, 362-330-505, and 362-330-507)	MR	6M	13
			Bridged meas. of transmitting carrier	MW	24M	16
362-025-502			Compressor Test & Adj. (Modified units only)(also see 362-330-501 & 362-330-502)	MR	6M	NR

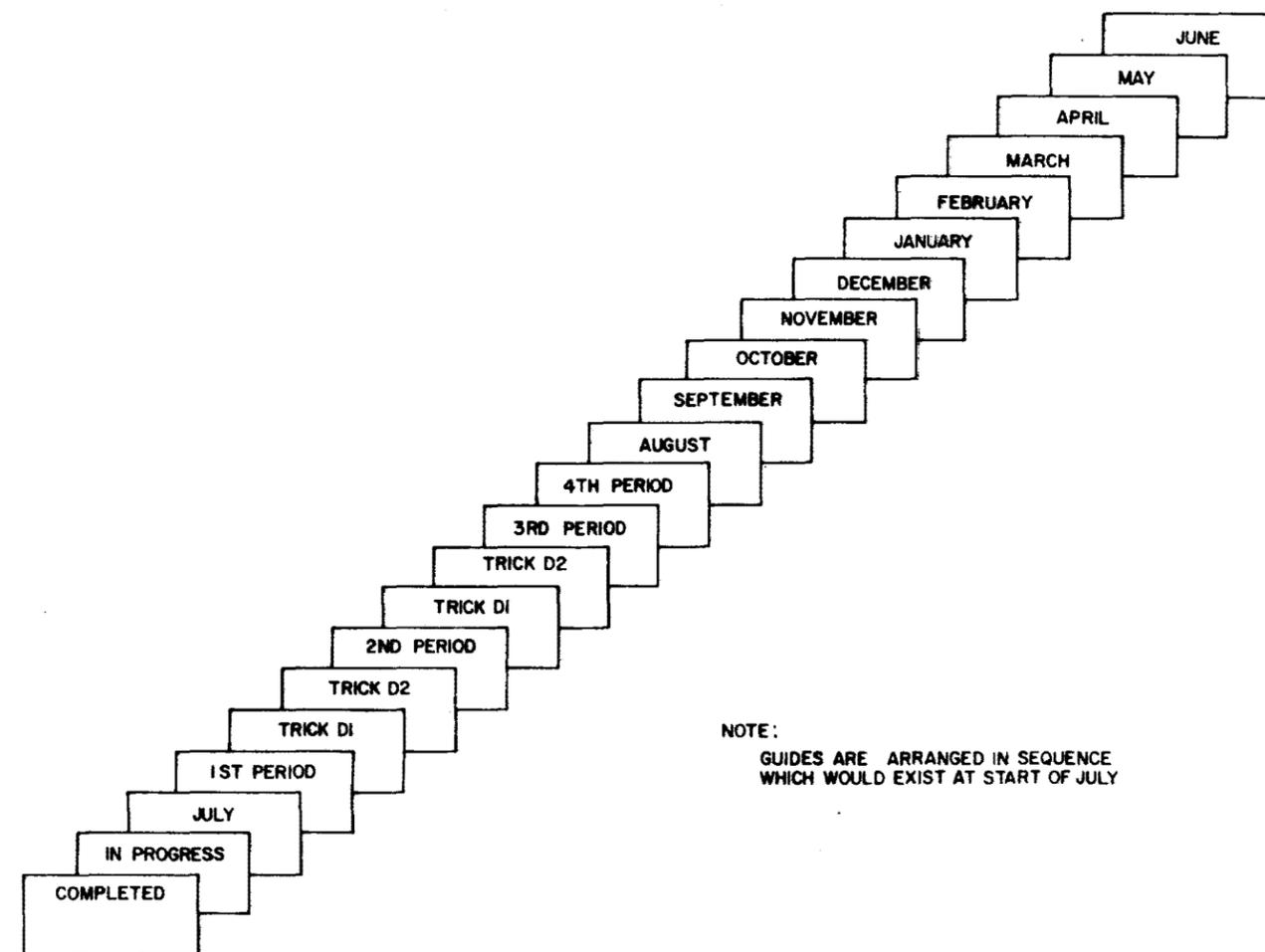
TEST AND INSPECTION SUMMARY
MULTIPLE JOB ASSIGNMENTS

OFFICE Alpha-Main ASSIGNMENT OR JOB NO. 10

BSP NO. AND TEST LETTER OR PAR.	EQUIPMENT	CLASS	TEST	EST. TIME	PER UNIT ASGN.	DATE		BY	NO. OF TBL.	TIME SPENT		DATE		BY	NO. OF TBL.	TIME SPENT		DATE		BY	NO. OF TBL.	TIME SPENT		DATE		BY	NO. OF TBL.	TIME SPENT		DATE							
						E-5452 ISS.	WORK COMPL.			TEST	RE-PAIR	E-5452 ISS.	WORK COMPL.			TEST	RE-PAIR	E-5452 ISS.	WORK COMPL.			TEST	RE-PAIR	E-5452 ISS.	WORK COMPL.			TEST	RE-PAIR								
						JOB NO.	MO. DUE	FROM EQPT./UNIT	TO EQPT./UNIT	NO. UNITS																											
362-020-501 362-020-502	6M Carrier Team Buys 130M-5 WORK DESCRIPTION Check Heater voltage Cathode Activity tests	MU	6M	150"	3.5"	1	2/68	Team 1	Team 6	6	2/1	2/16	RC	5	120	40																					
						2	8/68	Team 1	Team 6	6																											
						3	2/69																														
						4	8/69																														

SCHEDULED WORK ASSIGNMENT

TRICK. <i>N3</i>	ITEM <i>136</i>	BRING UP <i>Feb., Aug. - 1st Period</i>
CIRCUIT OR EQUIPMENT	<i>12C Program Amplifiers</i>	CLASS INTERVAL <i>MW 6M</i>
	<i># 1 through 12</i>	
LOCATION	<i>1600 line</i>	ACCOUNT <i>157R</i>
REFERENCE	<i>B.S.P. 320-225-500</i>	
SUPPLEMENTARY INFORMATION	<i>Test working equipment after program network goodnight.</i>	
INSTRUCTIONS	<i>Perform all tests and adjustments as specified. Complete E-5452</i>	
	<i>*note: when tests are complete, restore all equipment to normal. Make overall class "A" program lineup and adjust Amplifier gain on working equipment.</i>	



NOTE:
GUIDES ARE ARRANGED IN SEQUENCE
WHICH WOULD EXIST AT START OF JULY

BRING-UP SYSTEM GUIDE CARDS

Sample size is dependent upon several factors, such as, size of universe, expected number of defects, accuracy (assurance level and range) desired. The sample sizes illustrated are selected for their practical value and "fit" to the typical central office maintenance application. When the universe size is different from any of the sizes shown below, use a sample size for the nearest universe size in the table.

Sample Sizes

<u>Size of Universe</u>	<u>Sample Size</u>
Below 60	All
60	15
80	15
100	15
120	15
125	15
150	20
160	20
200	25
300	30
400	40
500	50
600	60
700	70
800	80
900	90
1000 and up	100

TABLE A

	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
3	94972	78739	04419	60523	31022	23728	37647	16476	11170	68376	56874
7	21276	44426	17369	29010	45337	90245	92053	41447	14897	18753	68291
6	02676	67781	95137	88430	78260	66962	31812	12789	06427	40337	50115
6	23487	78639	92006	63846	92263	33212	26516	93662	72399	88244	33922
7	71907	26827	98865	38882	25757	26662	91441	89357	87803	61521	80600
4	15997	55293	95033	31736	75068	91314	75293	04895	39355	54837	57203
2	86908	71364	06089	92394	73691	57883	09983	35643	79309	53449	95334
3	39836	99596	59050	25419	04130	54632	17223	94604	22973	97731	99476
3	59782	81449	13652	94420	74460	46707	94303	85523	95244	70995	10742
0	29209	82909	66610	84418	66214	26001	78685	69117	72446	79783	22305
8	62145	82388	45197	97609	83942	01120	71717	32858	58679	97165	02810
1	82306	91784	33177	17681	18963	07216	49288	43185	62797	00735	27085
3	49562	28846	81581	10249	23190	53440	32357	16472	99013	24328	93670
4	51569	56090	44558	42095	92311	57915	13368	13719	15833	38744	56065
1	02159	53911	01952	59273	32250	39647	29908	49075	23061	07795	95047
5	31488	67528	84234	76462	13628	21286	13736	67478	45218	27867	93049
4	13151	40663	43633	87954	69800	24773	62596	52476	60631	50503	94116
5	44558	62490	26936	49682	16307	98535	44822	99574	58487	85020	68881
1	03568	62484	29140	14152	37044	90398	92042	38099	31640	99753	44409
4	41361	73733	61486	33189	08907	41189	08147	18478	33250	17361	79961
6	42915	45847	87401	13339	53850	34931	00602	75307	99708	77863	04924
4	78175	43825	45211	86287	78190	02431	66251	74970	50246	23975	80697
2	50253	67516	59076	92006	65676	87343	89231	15760	73706	69426	01979
0	74461	52266	26967	68284	31612	40335	28865	98949	64492	96905	29184
3	48541	13010	16596	72001	38546	76305	22119	82668	84017	44111	40302
8	66403	73837	73445	86663	15929	08237	05647	15785	70444	58670	95967
5	51396	60823	22680	50459	05429	35227	92559	24136	13126	22099	52388
8	99977	16348	41119	51548	19511	90142	65604	16147	63445	60525	10480
4	05588	75165	90179	94198	25700	33473	59554	30974	69973	57629	38550
9	01700	07003	27507	69260	53349	86947	27517	80159	01899	46890	53850
8	41422	18176	03250	06079	85467	32052	56922	96804	51060	33157	83948
1	42702	70588	53144	27087	05591	57759	51394	98873	45625	61069	78783
6	68908	58657	87117	21483	28879	20480	57309	95552	09826	79928	17141
6	36397	89457	19577	65877	04802	61938	25032	09190	74932	36925	82686
1	50328	29084	32332	08635	25192	31337	20249	95073	93800	70022	99968
5	13024	90687	23726	11212	30414	42185	49224	46560	80447	24334	74866
7	16762	02564	27250	79316	83848	38684	20552	44402	85153	94526	41256
8	25005	46677	75851	73938	73044	05132	61204	90384	90296	03182	36672
3	24936	81680	53829	40412	01479	24241	58488	65341	93414	07135	43446
3	24643	72962	08172	37824	87587	40698	34964	50166	74756	77033	41501
2	48919	51592	71196	48534	16955	25759	95645	03148	10646	15660	86520
0	47985	91773	10383	89514	07557	02084	16736	39198	69697	62485	61938
8	70394	78555	33539	56310	40809	63204	14479	19635	97899	66947	58010
3	32423	54092	69375	63308	08016	28407	98287	22874	57545	72695	01604
1	46951	69084	33477	87968	15639	82409	34125	36864	52112	27102	87334
9	56975	06785	80930	26443	44892	77561	51123	34495	31376	06238	15973
7	86699	46212	74692	92603	91306	58558	57280	50639	20563	71370	81487
2	08488	72704	97821	70614	53616	39050	30355	18340	97298	41795	35185
9	41831	33456	53194	19602	74194	61154	51774	76822	73794	54182	45264
7	99067	83235	48662	31503	54829	54723	13177	15387	86073	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	07461	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	92807	77939	53792	78795	58159	86394	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	29588	29717	39590	10223	43049	78775	
62398	12034	90764	52872	22285	50592	42505	80560	38213	18917	10015	03887	62589	15851	
02222	46811	05148	67916	15184	02636	59078	57773	21289	86090	56705	65566	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	54485						

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	38099	31640	99753	44409
45275	16852	02284	41361	73733	61486	33189	08907	41189	08147	18472	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	94128	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	97899	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	44898	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)
64670	10396	82981	58320	71478	08143	48294	42631	45464	58092	1418
25771	02205	73984	28436	88192	11470	11775	67385	66360	59884	9387
27551	13537	54984	89406	88326	33993	92324	13249	35271	60400	7076
91224	22417	44820	26189	57541	87558	45835	28461	54835	92411	4436
75179	64320	71523	67868	38883	09674	27645	76240	47587	01677	3834
64654	91085	65818	03313	39273	46384	66677	14148	87552	38383	6743
98059	81123	67832	04102	66188	78200	67466	46043	65406	22834	0862
38765	63585	18810	95805	11414	58096	00295	82626	42683	44518	1220
01921	03564	71754	10213	80383	13473	94128	62199	59411	46782	6287
16211	93671	27704	66778	96307	06732	63750	04191	40003	51653	5422
70232	86076	61527	56123	48514	53935	86784	42351	67586	07432	6149
22332	94265	67627	85815	00394	75271	98385	53697	56378	50592	7744
81333	45965	64171	84367	15052	37965	03122	81914	69381	70034	9256
39333	47453	66174	04546	10594	64271	61026	39471	55981	18628	6794
29195	20825	50878	80273	26285	90070	79586	12449	77293	36577	5919
74420	64037	06960	25109	08821	60143	34485	19257	29417	72713	7232
22763	16508	24866	13177	07464	51730	65802	95718	28560	11332	7427
72919	54618	40616	33287	51274	78491	53604	66742	97777	64468	9822
92385	42402	15922	90033	21555	31647	22288	75692	20592	84620	5867
85431	19857	97246	46118	71222	82744	67892	77155	10785	00344	1964
40778	12451	14921	51464	45331	75822	46859	66829	35803	27645	7609
88903	46592	60637	65231	08778	86813	47819	19218	46837	89671	7766
29830	34899	85457	19548	83355	52479	77801	01596	48890	56104	6873
22832	47422	08073	10107	46772	92299	42975	86376	27869	52954	0790
75159	14809	11930	83531	51239	86298	72661	63015	98804	98491	9956
99390	08217	56276	09263	82685	30451	25742	41105	74711	42007	0208
68622	80897	08902	10867	91379	30068	84289	45020	92459	03831	0853
92393	95901	41179	72129	72502	91097	09488	84896	37720	68104	7381
53122	66033	38229	51879	29925	45574	53938	72801	64067	76328	2894
43251	11941	86631	93264	53433	70281	55000	24550	74751	32855	2539
16613	24901	34866	75002	55163	68308	20070	36953	39378	71191	8451
12010	60852	92603	70393	17989	95755	14672	58786	41996	02893	9416
85528	97879	27814	08219	02908	71582	31439	00360	72264	87245	6590
32590	55079	33556	83169	92087	77939	53792	78795	58159	26394	4174
92934	30650	16449	15805	61551	38689	59179	85485	18537	70496	9869
80614	10150	09389	61892	79477	14522	40270	45744	29582	29717	3959
62398	12034	90764	52872	22285	50592	42505	80560	38213	18917	1001
02222	46811	05148	67916	15184	02636	59078	57773	21259	86090	5670
08690	31785	61664	61322	24149	21471	23328	03093	31266	14840	3070
61187	73897	66168	12885	73191	89432	65414	41886	75911	35708	4320
12324	61149	85643	64999	63738	46671	25408	69313	54455	04917	3504
47638	42279	98620	70677	52386	50904	97403	03931	42090	28179	980

TABLE C

(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
18222	10610	05794	37515	48619	62866	33963	14045	79451	04934	45576
37414	75755	04717	29899	78817	03509	78673	73181	29973	18664	04555
68123	17730	95862	08034	19473	63971	37271	31445	49019	49405	46925
61662	64130	16688	37275	51262	11569	08697	91120	64156	40365	74297
88535	36553	23757	34209	55803	96275	26130	47949	14877	69594	83041
76638	48423	25018	99041	77529	81360	18180	97421	55541	90275	18213
44115	01601	50541	00147	77685	58788	33016	61173	93049	04694	43534
40617	72876	33967	73830	15405	96554	88265	34537	38526	67924	40474
11622	96297	24160	09903	14047	22917	60718	66487	46346	30949	03173
70119	94739	25875	38829	68377	43918	77653	04127	69930	43283	35766
32422	76791	39725	53711	93385	13421	67957	20384	58731	53396	59723
79974	45929	85113	72268	09858	52104	32014	53115	03727	98624	84616
54939	21410	86980	91772	93307	34116	49516	42148	57740	31198	70336
62319	08598	09066	95288	04794	01534	92058	03157	91758	80611	45357
62297	80198	19347	73234	86265	49096	97021	92582	61422	75890	86442
62311	72844	60203	46412	65943	79232	45702	67055	39024	57383	44424
10854	99058	18260	38765	90038	94209	04055	27393	61517	23002	96560
70418	57012	72122	36634	97283	95943	78363	36498	40662	94188	18202
23309	57040	29285	67870	21913	72958	75637	99936	58715	07943	23748
61658	15001	94055	36308	41161	37341	81838	19389	80336	46346	91895
04184	54967	72938	56834	23777	98392	31417	98547	92058	02277	50315
44369	66130	72936	69848	59973	08144	61070	73094	27059	69181	55623
26141	68779	66388	75242	82690	74099	77885	23813	10054	11900	44653
29608	54553	25971	69573	83854	24715	48866	65745	31131	47636	45137
29554	84580	37859	28504	61980	34997	41825	11623	07320	15003	56774
05748	51276	57143	31986	99915	45821	97702	87125	44488	77613	56823
98420	72925	40729	22337	48293	86847	43186	42951	37804	85129	28993
87729	81679	59126	59437	33225	31280	41232	34750	91097	60752	69783
56958	20575	76746	49878	06846	32828	24425	30249	78801	26977	92074
58085	06766	60227	96414	32671	45587	79620	84831	38156	74211	82752
25596	02678	54592	63607	82096	21913	75544	55228	89796	05694	91552
95958	39750	64379	46059	51666	10433	10945	55306	78562	89630	41230
92345	95110	59448	77249	54044	67942	24145	42294	27427	84875	37022
62462	02798	54977	48349	66738	60184	75679	38120	17640	36242	99357
59337	01695	60666	97410	55064	17427	89180	74018	44865	53197	74810
60337	27976	70661	08250	69599	60264	84549	78007	88450	06488	72274
70348	11317	71623	55510	64756	87759	92354	78694	63638	80939	98644
55866	96283	46620	52087	80817	74533	68407	55862	32476	19326	95558
80733	96422	58078	99643	39847	96884	84657	33697	39578	90197	80532
17772	67831	33317	00520	90401	41700	95510	61166	33757	23279	85523
78784	09977	29398	93896	78227	90110	81378	96689	37008	04050	04228
13898	48431	72936	78160	87240	52716	87697	79433	16336	52862	69149
56186	99098	48850	72527	08486	10951	26832	39763	02485	71688	90936
62063	74958	20946	28147	39338	32169	03713	93510	61244	73774	01245
28260	79708	00770	88643	21188	01850	69689	49486	49128	14660	14143
04172	73085	11795	52594	13287	82531	04388	64693	11934	35051	68576
65638	21828	39539	18988	53609	04001	19648	14083	49623	10840	31915
64318	70836	82857	35335	87900	36194	31567	53506	34304	39910	79630
32836	27573	11479	94114	81641	00496	36058	75899	46620	70024	88753
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
82253	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	67282	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	37886	86502	74299	01346
90876	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	20116	03226	79308	31970	49804	85150
84808	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	88312	33013	74612	23733
37444	56047	23208	34710	12147	28558	58817	98807	56776	08129	08794	23646	98846	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	6		

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	61428	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	68017	59231	17772	67831	33317	00520	90401	41700	95510	61166	33757	23279	85523
33570	34761	98939	78784	09977	29398	93896	78227	90110	81378	96689	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	49486	49128	14660	14143
52360	46658	66511	04172	73085	11795	52594	13287	82531	04388	64693	11934	35051	68576
74622	12142	68358	65638	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	20361	09636	84668	42486	71303	19512	50277	71508	20116	79520	06269	74173

TABLE D

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
05073	90103	85167	53900	19720	41488	57476	39458	16621	69774	47991
93320	80269	56684	39192	53220	74539	26393	00787	94490	23386	38441
18806	70257	96424	13606	14356	76599	25390	63236	04513	16358	30541
22253	45923	29815	18578	23316	30896	64771	11220	86218	75956	22391
93640	45982	40011	74142	29106	45729	43406	21457	04301	39651	76021
47630	45980	76619	57138	57492	00030	77897	76236	64990	35985	57741
01781	55061	07455	47083	71870	90597	10151	59606	96919	31174	99811
69694	45054	33587	03664	95007	31567	25334	26433	75002	67607	33131
51236	05052	26503	94661	29874	73492	88941	08488	09418	08173	63331
89445	51039	73837	26720	38650	47322	68474	95047	20404	41577	46811
40867	96834	02162	41517	88937	26099	56047	49164	35127	64916	78411
92946	56944	93407	05010	54896	33173	30548	23667	43171	47849	40411
75898	02275	90768	31902	52114	36634	46803	97970	92216	55398	78311
22729	21695	90824	80500	09332	54667	46696	38166	02005	24615	85611
28733	62663	23644	16416	47135	39137	62190	31032	58702	03805	67211
51323	37770	42114	79742	59905	38480	25293	32993	36946	62701	51111
69325	65551	49927	68073	56979	49454	79451	60753	70872	07422	06311
11333	60801	36992	76128	27959	41306	93543	15926	99189	27102	98611
86347	03703	36778	72501	95229	65735	14269	50220	77270	68604	05611
73452	36179	82893	92262	43850	31888	71151	40682	49775	63628	45411
75483	74009	73699	05870	36804	89338	73891	40740	98753	74566	74711
73302	84917	75128	34085	86208	98399	79433	61960	01720	87458	24011
42785	24350	05933	65282	12832	75382	29826	33197	81781	53542	63911
40429	33209	68622	09308	38098	55947	12001	73526	23170	13721	37811
98876	58271	99325	12301	72957	22690	62705	73892	01974	77759	92711
32951	39844	99126	94838	48715	36586	42076	15283	19280	29166	24511
09772	28139	48130	73301	35915	90923	19255	75242	84655	30163	75511
78459	91322	50072	77941	65046	78363	21951	42319	46472	67617	34111
14419	96517	99075	43664	81119	63487	95589	51785	07398	23245	10011
97769	50967	24427	21011	92226	44380	23422	10654	43617	80504	90611
09175	37545	39088	06879	21277	05153	81855	84043	35307	59465	75311
52062	95519	54087	14072	50953	63477	64635	34552	75243	70222	75011
70558	85169	01086	97202	10390	01819	88167	21851	87837	85287	69811
22553	61317	08968	67521	16627	48855	97263	94242	93354	72446	28811
95216	75263	60351	02643	00063	20824	67468	89441	84055	47035	29711
49087	61399	47781	32173	96672	04528	15881	46764	20115	03226	79311
84808	79068	70787	43106	97133	37236	77888	48451	20788	44648	70311
89879	79942	43781	05069	80143	59176	47392	70372	26899	16228	71211
61178	79295	58926	21977	28435	32631	23062	31822	70462	05968	82311
37444	56047	23208	34710	12147	28658	58817	98807	56775	08129	08711
99633	00363	16853	20789	87674	03938	36077	41012	08813	51168	78811
87363	59239	42023	78056	51254	95644	9052				

TABLE E

(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
07	76455	54941	72711	39406	94620	27963	96478	21559	19246	88097	44926
72	62941	08349	71389	45605	60947	60775	73181	43264	56895	04832	59604
68	73652	98210	44546	27174	27499	53523	63110	57106	20865	91683	80688
43	07607	11826	41326	29664	01603	23156	89223	43429	95353	44662	59433
32	53555	96810	17100	35066	00815	01552	06392	31437	70385	45863	75971
33	81009	81060	33449	68055	83844	90942	74857	52419	68723	47830	63010
50	10329	56136	80647	51404	06626	10042	93629	37609	57215	08409	81906
54	69843	57361	68304	93258	56760	63348	24949	11859	29793	37457	59777
79	23581	24548	56415	61927	64416	29934	00755	09418	14230	62887	92683
83	83411	66504	02036	02922	63569	17906	38076	32138	19096	96970	75917
14	27585	45068	05520	56321	22693	35089	07694	04252	23791	60249	83010
74	87026	99717	01542	72990	43413	59744	44595	71326	91382	45114	20245
22	98026	05394	61840	83089	09224	78530	33996	49965	04851	18280	14039
50	98536	38155	42661	02363	67625	34683	95372	74733	63558	09665	22610
09	01386	74319	04318	99387	86874	12549	38369	54952	91579	26083	81076
17	20345	18134	90062	10761	54548	49505	52685	63903	13193	33905	66936
40	03206	92012	42710	34650	73236	66167	21788	03581	40699	10396	81827
45	89800	78101	44392	53767	15220	66319	72953	14071	59148	95154	72852
37	30496	23469	42846	94810	16151	08029	50554	03891	38313	34016	18671
51	72521	35342	56119	97190	43635	84249	61254	80993	55431	90793	62603
48	82854	55846	18076	12415	30193	42776	85611	57635	51362	79907	77364
78	52433	22184	33998	87436	37430	45246	11400	20986	43996	73122	88474
82	25442	83668	66236	79655	88312	93047	12088	86937	70794	01041	74867
78	63469	50083	70696	13558	98995	58159	04700	90443	13168	31553	67891
57	46012	97765	27552	49617	51734	20849	70198	67906	00880	82899	66065
53	19532	49988	13176	94219	88698	41755	56216	66882	17748	04963	54859
37	86168	78257	86249	46134	51865	09836	73966	65711	41699	11732	17173
61	46061	30946	22210	79302	40300	08852	27528	84648	79589	95295	72895
08	18198	19468	76358	69203	02760	28625	70476	76410	32988	10194	94917
27	63107	30806	80857	84383	78450	26245	91763	73117	33047	03577	62599
40	35132	42163	69332	98851	50252	56911	62693	73817	98693	18728	94741
85	66393	39249	51463	95963	07929	66728	47761	81472	44806	15592	71357
84	58613	88717	29289	77360	09030	39605	87507	85446	51257	89555	75520
48	16006	16767	57345	42285	56670	88445	85799	76200	21795	38894	58070
38	35829	77516	98468	51686	48140	13583	94911	13318	64741	64336	95103
01	03523	87192	66483	55649	36764	86132	12463	28385	94242	32063	45233
54	85117	74078	64120	04643	14351	71381	28133	68269	65145	28152	39087
76	05221	94119	20108	78101	81276	00835	63835	87174	42446	08882	27067
47	96085	62180	27453	18567	55524	86088	00069	59254	24654	77371	26409
99	49536	56199	05993	71201	78882	65889	32719	13788	23937	90740	16866
98	33175	04994	09879	70337	11861	69032	51915	23510	32050	52052	24004
19	55591	21725	43827	78862	67699	01009	07050	73324	06732	27510	33761
62	81724	24305	37661	18956	50064	39500	17450	18030	63144	48061	59412
93	69995	14762	69734	89150	93126	17700	94400	76075	08317	27324	72723
72	18983	28387	99781	52977	01657	92602	41043	08686	15650	89970	95877
84	76603	54088	91095	00010	13800	76690	75133	60486	28491	03845	11507
74	55863	22672	91609	51614	98135	42870	48578	29036	69876	86863	61729
35	30965	17453	65623	93058	08313	99293	00990	13595	77457	79969	11339
20	84641	18273	49604	47418	90974	83965	62732	85161	54330	22406	86253
98	07551	83532	68130	56970	33273	61993	88407	69399	17381	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
82888	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	00895	32264	82808	00229	03868	71072	11519	44876	34508	07889	62424	54319	32842
06021	04370	93070	90737	05354	68427	25554	11165	00123	20338	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	69869	84798	78968	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	49662	40000	61598
56342	66773	18536	38600	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	51788	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	03383	96086	93296	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	91981	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	41697	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
04772	17749	01537	96036	02102	02622	06007	52239	61201	57415	35609	38761	19589	24238
49129	18491	62658	64323	44856	29045	76871	80449	81381	73642	48643	83848	48390	56829
19937	75104	57780	95871	94547	53541	77723	54114	90290	62627	68181	15687	81062	06729
52571	67962	72775	28480	87411									

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	41326	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	56136	80647	51404	06626	10042	93629	37609	57215	08409	81906
48977	36794	56054	59843	57361	66304	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	92274	87026	99717	01542	72990	43413	59744	44595	71326	91382	45114	20245
94096	74920	25822	94026	05394	61840	83089	09224	78530	33996	49965	04851	18280	14039
83160	88362	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	41785	56216	66882	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
02878	33223	39199	49536	56199	05993	71201	78882	65889	32719	13788	23937	90740	16866
91498	41673	17198	33175	04994	09879	70337	11861	69032	51918	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	29970	95877
40064	47981	31484	76603	54088	91095	00010	13800	76690	75133	60486	28491	03845	11507
16239	68743	71374	55863	22672	91609	51614	98135	42870	48578	29036	69876	86863	61729
58354	24913	20435	30965	17453	65623	93058	08313	99293	00990	13595	77457	79969	11339
52567	65885	60220	84641	18273	49604	47418	90974	83965	62732	85161	54330	22406	86253
06236	29052	91392	07851	83532	68130	56970	33273	61993	88407	69399	17381	70975	99129

TABLE F

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
88188	99345	94118	40373	50387	24802	81352	61640	56614	71506	7554
05200	50533	59428	02797	16833	10038	18901	40743	99449	49825	4463
82888	41316	92617	31346	89263	06589	07121	07151	23905	98435	5045
71006	99318	19269	35233	79183	78538	06326	62715	28701	52809	5658
05937	00875	32264	82808	00229	03868	71072	11519	44876	34508	788
06021	04370	93070	90737	05354	68427	25554	11165	00123	20338	0387
54789	10960	44023	57857	56556	83993	70787	28193	65872	33723	0012
90400	05707	29128	14859	84117	72206	53740	00464	51853	78852	8359
51424	01651	99970	73521	82356	03297	36288	93531	69869	84798	7896
79743	88757	43370	86536	07166	06401	14413	23643	21527	91902	9138
77418	00322	98854	51507	00565	33066	65791	47857	32483	38493	5260
17580	49302	16408	05678	75532	46218	74359	77556	82242	00134	7018
15489	45559	88548	64330	42126	43145	81287	73884	69312	03395	0687
56342	66773	18536	36600	73958	75993	84250	19254	06677	54192	5342
80202	19216	23762	47856	04623	70728	86657	70801	53719	25214	6863
84877	51788	69357	67914	55372	97225	52837	46723	00256	96221	2664
01647	00311	44989	21900	96079	15793	13148	01433	78721	02647	2545
45652	89311	45302	14539	32045	86727	40595	55953	93448	07805	5362
79978	06153	08932	59185	71386	19070	87098	19392	13899	56096	8364
49744	54713	37053	77467	15348	03383	96086	93295	12413	55774	9731
40922	94903	29638	46870	14108	84391	87313	65969	43349	85142	2565
53319	48020	77444	51447	07916	99506	83504	22290	63835	45589	0488
76682	10559	85446	56236	85919	76388	59850	03262	60347	31077	0716
48869	97229	69581	84581	71728	45150	16901	88717	62688	24828	8946
95961	19279	38078	17473	43945	21562	90937	52140	73771	56084	0877
16521	25945	94076	91981	92272	41233	58614	18912	58454	34011	8596
78222	26332	44072	55104	16895	98311	56005	23331	21939	03463	5382
43473	39179	53174	43498	72674	13087	54261	01844	45738	93150	1324
06513	31352	09177	21367	64725	23784	18125	74873	83971	92678	9698
48734	39737	03448	99009	98136	34562	30339	93143	07350	94289	7614
54832	70111	48339	75270	11652	41697	43277	58089	70520	96997	7100
55844	69515	22658	75438	83086	41325	04694	40359	28351	53492	7313
42829	54398	93338	90705	00626	97752	93482	27726	51835	23966	5027
81128	63461	10925	44382	73366	98875	77605	27351	49177	36914	5025
62885	26354	10368	78026	00186	46783	02059	98892	98061	15330	3170
19525	10375	27010	42791	49471	90607	98103	31752	04842	13693	8429
26570	99202	73924	59888	01827	93314	63949	35394	12989	05867	1156
04772	17749	01537	96036	02102	02622	06007	52239	61201	57415	3560
49129	18491	68558	64323	44856	29045	76871	80449	81351	73642	4864
19937	75104	57780	95871	94547	53541	77723	54114	90290	62627	6815
52571	67962	72775	28480	87411	12075	45177	08796	99297	48807	8831
54943	80723	81195	84069	28144	48106	04169	16575	62665	97861	7165</

TABLE G

	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	94545	80152	62327	83165	31035	82295	11824	06765	29501	62849	50419
3	40028	58036	14075	05980	57094	45527	18766	77741	12985	14112	65058
0	70644	76012	37000	98321	97197	30645	56169	09363	44394	29087	96569
5	48115	17223	63161	29677	69820	77159	20762	94296	94528	82984	71418
1	12373	35999	30832	02508	93055	57173	79848	25439	18861	26742	54970
1	40972	22887	89759	09095	00587	03998	13659	64179	98567	69313	84637
2	44358	69844	73042	88091	07288	74971	47066	36927	53520	58309	58605
1	37459	31945	03627	47690	97813	45272	42789	99315	26662	15833	37246
7	01200	84800	27930	98937	76108	11043	29101	01767	78894	92922	66537
1	32037	96699	56314	75755	68667	47430	15256	13987	52743	42306	87515
3	11867	47523	24094	23334	78839	81588	67374	43855	24512	81956	75721
7	22358	15907	13247	44784	82957	53009	73379	44093	58405	38515	85531
4	17556	52153	63549	03661	78290	96447	04192	30157	63198	75932	02367
1	80091	34749	56784	98486	06018	27447	00884	29564	51522	35571	69208
7	12225	28483	35358	99941	63054	54358	80748	54049	85937	64718	21466
3	96622	30239	20482	50028	16632	57708	78559	70241	47977	78645	48550
2	37777	20085	38703	31753	18608	52524	08585	91711	63572	57007	11379
7	71424	27596	74645	88790	66478	78885	53799	02026	24596	88692	55936
L	60763	56611	73508	88479	86151	78563	31633	92321	23304	77153	86639
3	42377	56350	67861	47478	11961	78516	95316	64393	52020	44994	88205
5	62864	03421	34292	36084	39604	89838	03635	30064	72710	26327	65521
7	03348	91237	28372	65330	00966	73904	17477	34953	08975	83142	48425
7	48478	14007	11384	19576	68138	30774	51898	24711	72537	18360	95682
5	01236	27444	47010	80938	15828	86484	92753	04322	27171	41828	79025
1	40190	41294	72776	38528	22272	34709	34561	65554	53461	61776	03585
3	34437	98365	17630	42196	49736	39619	16731	71792	38047	85559	56700
5	73821	80904	05950	63441	86109	79900	14063	03152	39235	74289	42342
5	40601	57718	93925	67763	67671	21739	87534	83385	91492	45796	04621
1	49608	36893	43453	38580	27639	52832	01522	11108	59992	23168	04414
1	07770	51679	64857	36998	95796	46745	36780	56791	34690	61634	85411
9	94793	55055	44762	22800	02663	91182	13102	07408	50545	21312	11365
1	16311	01767	77301	63016	01227	29273	79256	50368	88653	23329	86500
1	56090	41453	82886	33077	99791	86553	64640	61529	88660	66941	15936
1	42262	74097	44317	40304	05346	90342	73324	81555	82769	23559	55238
1	08075	69395	08189	66668	11663	84852	93146	27182	34936	97267	63996
5	54767	67683	57818	98756	49119	91258	71916	65948	24841	38607	39412
1	06011	80623	36021	81846	71868	98242	72307	25917	56240	73499	45106
1	51092	89263	82352	95072	68828	28001	48991	19201	90963	34192	63336
1	86311	57615	69666	60651	49084	39681	66415	10201	53931	44245	42850
1	47133	89534	37085	28495	39162	89121	52021	23143	14829	55792	84641
3	35258	70734	59465	49227	01431	90694	96186	57811	54512	30108	01261
1	73077	74726	86176	31623	14569	89225	09606	73432	95276	21237	36507
1	84780	92759	09781	06912	96802	92502	97497	67702	49763	25950	49924
1	57546	45467	06653	99212	60612	26046	53553	59757	70491	69632	46009
1	57014	52797	83779	56495	33104	26858	07662	41253	97688	76883	29444
6	69351	98168	81043	26682	00063	96223	30436	21987	15450	56574	45011
1	64992	25021	45680	46501	92943	99165	20707	43410	53746	54716	17090
1	23801	34422	13728	35016	80605	86628	21689	34082	26035	11928	41817
1	15663	45983	29425	12085	96233	29036	91135	28288	27709	90674	09705
1	28462	95680	42433	70311	09702	71615	72688	85922	58369	89734	08750

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	
C4887	64208	71842	97885	32616	23280	11783	19852	64266	24446	14189	77419	30991	92130	
09332	88232	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	46009	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	18271	84570	18271	54461	
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	84486	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	62883	57675	85265	10886	06585	37911	82332	85752	28054	30436	
93948	38350	63464	08008	96607	73505	75513	91238	11042	40					

TABLE G

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
31630	67734	78201	94545	80152	62327	83165	31035	82295	11824	06765	29501	62849	50419
25101	98983	36993	40028	58036	14075	05980	57094	45527	18766	77741	12985	14112	65058
86207	09805	46240	70644	76012	37000	98321	97197	30645	56169	09363	44394	29087	96569
31611	47643	28795	48115	17223	63161	29677	69820	77159	20762	94296	94528	82984	71418
10649	89132	59781	12373	35999	30832	02508	93055	57173	79848	25439	18861	26742	54970
68210	16228	34801	40972	22887	89759	09095	00587	03998	13659	64179	98567	69313	84637
32367	69587	66102	44358	69844	73042	88091	07288	74971	47066	36927	53520	58309	58605
14684	42446	01751	37459	31945	03627	47690	97813	45272	42789	99315	26662	15833	37246
64260	04661	39957	01200	84800	27930	98937	76108	11043	29101	01767	78894	92922	66537
66035	77943	70861	32037	96699	56314	75755	68667	04730	15256	13987	52743	42306	87515
20966	71492	32323	11867	47523	24094	23334	78839	81588	67374	43855	24512	81956	75721
20498	68176	02027	22358	15907	13247	44784	82957	53009	73379	44093	58405	38515	85531
56320	79875	60634	17556	52153	63549	03661	78290	96447	04192	30187	63198	75932	02367
50559	90270	33571	88091	34749	56784	98486	06018	27447	00884	29564	51522	35571	69208
49366	90095	73459	12225	28483	35358	99941	63054	54358	80748	54049	85937	64718	21466
29022	19268	03003	96622	30239	20482	50028	16632	57708	78559	70241	47977	78645	48550
77212	76531	68842	37777	20085	38703	31753	18608	52524	08585	91711	63572	57007	11379
41121	90499	83459	71424	27596	74645	68790	66478	78885	53799	02026	24596	88692	55936
06613	95412	94751	60763	56611	73508	88479	86151	78563	31633	92321	23304	77153	86639
66430	95324	60108	42377	56350	67861	47478	11961	78516	95316	64393	52020	44994	88205
39380	09648	47285	62864	03421	34292	36084	39604	89838	03635	30064	72710	26327	65521
27595	63289	75149	03348	91237	28372	65330	00966	73904	17477	34953	08975	83142	48425
43525	45549	58819	48478	14007	11384	19576	68138	30774	51898	24711	72537	18360	95682
60024	79858	72015	01236	27444	47010	80938	15828	86484	92753	04322	27171	41828	79025
35914	73076	05158	40190	41294	72776	38528	22272	34709	34561	65554	53461	61776	03585
58253	32995	54370	34437	98365	17630	42196	49736	39619	16731	71798	38047	85559	56700
85887	54618	23532	73821	80904	05950	63441	86109	79900	14063	03182	39235	74289	42342
88988	60426	34636	40601	57718	93925	67763	67671	21739	87534	83385	91492	45796	04621
65381	17333	32358	49608	36893	43453	38580	27639	52832	01522	11108	59992	23168	04414
20214	88406	06098	07770	51679	64857	36998	95796	46745	36780	56791	34690	61634	85411
04970	56425	74303	94793	55055	44762	22800	02663	91182	13102	07408	50545	21312	11365
87556	31521	19669	16311	01767	77301	63016	01227	29273	79256	50368	88653	23329	86500
34615	85796	30299	56090	41453	82886	33077	99791	86553	64640	61529	88660	66941	15936
95769	07371	49569	42262	74097	44317	40304	05346	90342	73324	81555	82769	23559	55238
57338	58325	53918	08075	69395	08189	66668	11663	84852	93146	27182	34936	97267	63996
08882	30762	14602	54767	67683	57818	98756	49119	91258	71916	65948	24841	38607	39412
62644	32814	31337	06011	80623	36021	81846	71868	98242	72307	25917	56240	73499	45106
55358	48010	24440	51092	89263	82352	95072	68828	28001	48991	19201	90963	34192	63336
02254	43319	79888	86311	57615	69666	60651	49084	39681	66415	10201	53931	44245	42850
61023	48494	57279	47133	89534	37085	28495	39162	89121	52021	23143	14829	55792	84641
41900	90881	96080	35258	70734	59465	49227	01431	90694	96186	57811	54512	30108	01261
94500	19764	94752	73077	74726	86176	31623	14569	89225	09606	73432	95276	21237	36507
66375	34653	37125	84780	92759	09781	06912	96802	92502	97497	67702	49763	25950	49924
27141	20959	02318	57546	45467	06653	99212	60612	26046	53553	59787	70491	69632	46009
25670	88933	19316	57014	52797	83779	56495	33104	26858	07662	41253	97688	76883	29444
06590	67256	21117	69351	98168	81043	26682	00063	96223	30436	81987	15450	56574	45011
36429	99750	38004	64992	25021	45680	46501	92943	99165	20707	43410	53746	54716	17090
52011	93461	06334	23801	34422	13728	35016	80605	86628	21689	34082	26035	11928	41817
09443	77694	26882	15663	45983	29425	12085	96233	29036	91135	28288	27709	90674	09705
25862	81855	5254	28462	95680	42433	70311	09702	71615	72688	85922	58369	89734	08750

TABLE H

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
60359	07603	81594	66235	48154	61257	27978	64695	63165	44593	0821
34992	97880	79115	47587	76167	47086	57064	16730	74172	60317	8321
C4887	64208	71842	97885	32616	23280	11783	19852	64266	24446	1418
09332	86232	88199	66094	72594	30100	23673	68705	66989	42666	8185
42326	62962	06485	04978	96639	96214	91478	12408	21457	19862	9910
49187	42836	17042	35179	31880	48444	89877	50915	37426	21556	2599
09228	57404	42180	07949	98750	31506	78442	45809	12725	49774	1127
69720	73477	91252	46009	81393	76401	48168	25967	33372	84414	2150
82222	13787	98611	95257	34753	36674	44326	66070	61131	70620	4286
30703	00513	54586	05623	43999	55387	67189	95058	91174	13121	2755
86369	62151	70713	41166	79321	52215	94358	28962	35868	22796	8722
83331	99035	68506	96734	91074	24356	03035	66926	32197	54944	7678
43053	60600	98921	43720	77342	26186	64554	46226	64244	10703	4956
57104	49148	18487	01775	71782	04679	64369	06208	71669	63046	1047
33177	11409	13925	18130	54242	13460	39174	63528	22670	31810	0431
05424	76714	05732	29415	01183	45054	13493	44006	61641	80304	9650
92950	58665	41191	69259	50244	55322	75137	90193	31989	17381	4379
54925	20502	71767	82737	64847	04496	35921	42670	08584	54090	5290
41980	43710	55304	57526	29616	92314	85883	21584	55048	81997	6227
83825	70977	67987	61545	92066	71215	93967	63071	69928	98917	0566
84047	83627	37763	07081	33048	57895	42182	73279	08032	19165	0170
12776	69127	67921	57611	85876	30744	40886	68396	79787	76434	7122
81419	55440	69506	09115	45032	48343	78352	39075	31689	76469	6499
59844	03603	96297	58028	93069	35674	38479	54639	54455	10300	7394
18350	74940	07044	11210	53622	00779	36027	51496	01694	57895	8457
79960	18784	13376	03415	84450	78874	22050	19730	92598	54291	6066
45420	24157	16374	22384	56892	84941	97157	99656	33978	81436	1099
13945	09559	68152	56960	39453	51654	10617	55628	47933	85161	5299
91206	33871	60730	96821	95808	29763	36978	73104	43398	38181	4431
24847	08724	81499	72905	95102	63004	22223	19808	90777	54986	9721
94303	08209	27804	49372	66392	50578	02966	90907	33164	83044	9798
22732	95331	60954	93333	71142	38827	48222	21779	35598	95957	5884
82809	24004	65983	01091	70431	91145	88207	52216	94846	75303	8516
62700	79965	09610	97213	48579	43574	37652	12447	80233	42473	9456
89870	73755	48525	32765	50818	71468	37876	28334	07762	16180	4534
81493	24124	67928	12735	41249	24180	54740	44290	58903	38681	0406
43630	32189	08532	43055	08080	84208	06295	07813	24068	67549	4306
60234	18992	13283	96334	39746	07272	25295	07871	34201	49620	5217
00107	21861	60367	48999	71634	34053	28265	02064	06290	10620	1794
09657	36088	05976	88267	62683	67675	85265	10886	06525	37911	8231
93948	38350	63464	08008	96607	73505	75513	91238	11042	40972	6281
42746	29761	72298	48186	88584	90141	72879	54531	99127	60063	2231