

## CONTROLLED MAINTENANCE PLAN STEP-BY-STEP SWITCHING SYSTEM

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### NOTICE

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1. GENERAL

1.01 This section describes the specific plan for the maintenance of the Step-by-Step (SXS) Switching System and applies to all SXS offices. The *very small* or *unattended* community dial offices cannot effectively use this plan and should refer to Section 225-001-010 for the proper maintenance of these offices. ***This section is a supplement to Section 201-020-510, Controlled Maintenance***

**Plan for Switching Systems.** The reader should be familiar with that document before continuing with this section.

**1.02** This section is being reissued to cover major changes occurring in the SXS Controlled Maintenance Plan. Since this is a major revision, change arrows have been omitted.

**1.03** Recommendations for changes, additions, or deletions to this section or to any equipment test list (ETL) should be forwarded on Form E-3973 and as specified in Section 000-010-015.

**1.04** The 9 parts of this section, as shown in the Table of Contents, contain the principles, definitions, descriptions, explanations, and examples necessary to apply Controlled Maintenance in a SXS office. Part 2 describes the integrated plan for managing upkeep maintenance in the SXS Switching System. Parts 3 through 9 contain details of the required maintenance activities, records, files, and techniques which are part of Controlled Maintenance.

## 2. CONTROLLED MAINTENANCE

**2.01** *Controlled Maintenance* is the name given to the specific plan described in this section and the general plan described in Section 201-020-510 for managing upkeep maintenance in the SXS Switching System. The objective of Controlled Maintenance is to maintain the designed switching capability of the equipment with a realistic balance between preventive and corrective maintenance to meet the needs of the SXS Switching System. A detailed explanation of Controlled Maintenance can be found in Section 201-020-510.

**2.02** The SXS Controlled Maintenance Plan relies heavily on preventive maintenance. There are some SXS equipment areas where it is impossible to quickly obtain adequate trouble location details. These details can only be located through routine testing. There is also more equipment that requires periodic cleaning, lubrication, or adjustment.

**2.03** Corrective maintenance cannot be eliminated. The SXS Switching Systems are unable to detect most failures of equipment and remove it from service. Customer service is dependent on prompt handling of trouble reports and the clearing or removal from service of the equipment found in trouble.

## 3. TROUBLES—THEIR CAUSES AND INFLUENCING FACTORS

**3.01** A detailed description of troubles, their causes, and influencing factors can be found in Section 201-020-510, Part 3.

## 4. PREVENTIVE MAINTENANCE

**4.01** A detailed description of preventive maintenance and the associated forms can be found in Section 201-020-510, Part 4. The following paragraphs give brief descriptions of the requirements and the forms used in SXS offices.

### A. Identification of Routines

**4.02** Equipment Test List (ETL)—Form E-5450 is a Bell System Practice (BSP) format that specifies classifications and frequencies for tests and other requirements relating to standard office equipment. The test lists for SXS equipment common to all offices are Sections 226-001-012 through 226-001-019. There are two additional test lists for specific and miscellaneous equipment. These lists are Sections 225-001-012 through 225-001-019, and 227-001-012 through 227-001-017, respectively. Figure 1 is an example of the ETL for SXS systems.

**4.03** The action classification (Test and Inspection Class) that is identified as Mandatory Review (MR) is of special importance in the SXS Switching System, since it requires sampling. *When MR is indicated, it will be mandatory to sample before passing or performing the test on all units at that time.* Figure 2 illustrates the MR review procedure. If the total number of units is too small for sampling, then all units must be tested. The nature of SXS equipment lends itself to the techniques of sampling as covered in Part 6 of this section.

### B. Scheduling of Routines—Forms E-5450 and E-5451

**4.04** Form E-5450, Equipment Test List (Fig. 1) contains columns for the section number, test or paragraph requirements, equipment and work description, test classification, frequency, and job number assigned in the office. Form E-5451, Preventive Maintenance Schedule (Fig. 3) provides columns for listing the job numbers for tests, work description, class, frequency of tests, units involved, schedule of when tests are due,

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and when tests have been completed. See Table A for a physical description of Forms E-5450 and E-5451.

**4.05** Figure 3 illustrates the use of Form E-5451, Preventive Maintenance Schedule, as used in SXS offices. It should be noted that the time given in the minutes per assignment (Min Per Asgn) column is the total time required to perform the test to all units as listed in the number units column. These columns may be used to show only sampling time and units to be sampled. They may also be divided to show both total testing and sampling times, and total units to be tested and sampled. Care should be exercised in the method used, since it affects the total hours of work effort at the period scheduled. Sampling requires less work time; however, the results of sampling could increase this work time, and must be considered in scheduling of routines. Refer to Part 6, Sampling, of this section for further descriptions.

**4.06** As shown in Fig. 3, Multiple Job Assignments are scheduled as listed on Form E-5455, Test and Inspection Summary. This will ensure accurate scheduling of work effort when a large number of equipment units are involved. On Form E-5451, it is suggested that sufficient line space be left between equipment items for inserting items of equipment added in an office. See Fig. 3.

**4.07** Deferred work is the postponement of any scheduled job. All applicable ETL routines must be scheduled. Deferred work may be the result of poor scheduling, available work force, etc, and may result in an increase of service affecting troubles. Monthly and more frequently scheduled routines are not to be deferred. Deferring of routines scheduled less frequently than monthly is permitted, provided the routine is completed within the interval set on the ETL. For example, a routine with a 12-month (12M) interval, scheduled and completed in December, must be completed by the end of December the following year. The ETL interval is not to be extended by deferring. A routine not completed by the end of its ETL interval is considered "missed". "Missed" routines are to be reported as back log hours and must be rescheduled and completed as soon as possible.

### **C. Assignment of Routines and Recording of Results—Form E-5452**

**4.08** Form E-5452, Test and Inspection Work Order and Record, is used in assigning

preventive maintenance routines to craft people and provides a method of recording the results. The front of Form E-5452 (Fig. 4) provides spaces at the top for recording assignment data, section number, equipment, work description, equipment units involved, and progress made. The lower portion of the form is for recording details of trouble(s) found and action taken. The back of the form provides more space for recording trouble details.

**4.09** Form E-5452 is issued for job assignments listed on the ETL. Assignment and reference data are obtained from the test and inspection summaries for each preventive maintenance job shown on the ETL. Form E-5452 (Fig. 4) specifies the work to be performed. Details of test failures and troubles found are to be entered in the spaces provided. Completion or partial completion of a job are to be entered in the progress report section of the form.

**4.10** Form E-5452 is also used for other work not specified by the ETL. Examples of this are special equipment tests, inspections, and samples.

*Note:* See Table A for a physical description of Form E-5452.

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

**4.12** Completed forms are to be filed by job number and retained since the information recorded on the forms provides the supervisor with the data for refining estimated times for job assignments and for reducing or increasing the frequency of the tests. Completed forms, as used in 4.10, need not be retained.

### **D. Summarization of Routine Results—Forms E-5453, E-5454, and E-5455**

**4.13** Forms E-5453, E-5454, and E-5455 are Test and Inspection Summaries prepared from the applicable ETL(s) (Form E-5450) and also from office equipment records. Space is provided on these forms for summarizing found troubles and craft work time for routines. These three forms are also the source of information for preparing

Form E-5452, Test and Inspection Work Order and Record.

- Form E-5453 (Fig. 5) provides spaces on the front for recording assignment data, section number, equipment, work description, number of equipment units involved, estimate of work time, and results of work accomplished. The back of the form provides more space for results.
- Form E-5454 (Fig. 6) is a smaller version (5 inches by 8 inches) of Form E-5453. This form is suitable for users who desire a card file arrangement for maintaining test and inspection routines.
- Form E-5455 (Fig. 7) provides space for summarizing multiple assignment work details for certain jobs in larger offices. These are jobs which must be broken into smaller assignments because the amount of overall work is too great for scheduling at one time.

**Note:** See Table A for physical descriptions of Forms E-5453, E-5454, and E-5455.

**4.14** It is recommended that all MR routines be examined for qualification of multiple job assignment, using Form E-5455. As seen in Sampling, Part 6 of this section, each universe is designed for sampling, by bays or frames, of equipment. Spreading out the work items on Form E-5455 (of a MR type routine) in convenient universe size will aid in the preparation of the Preventive Maintenance Schedule, Form E-5451. An example of this is shown in Fig. 7.

**4.15** As equipment is added, removed, relocated, etc, the forms must be updated to reflect the changes, and estimated time entries must be adjusted accordingly. These updates and adjustments must also be entered on Forms E-5451, Preventive Maintenance Schedule, for the office. As posted to Form E-5452, Test and Inspection Work Order and Record, refinement of the estimated time entries are to be made and also reflected on the Preventive Maintenance Schedules, Forms E-5451 for the office.

## 5. CORRECTIVE MAINTENANCE

**5.01** A general description of corrective maintenance can be found in Section 201-020-510, Part

5. It also explains, in general terms, the use of the forms used in Corrective Maintenance.

### A. Administering Trouble Reports

#### SXS Trouble Ticket—Form E-5461

**5.02** The entries to be made on the “Front” and “Back” of Form E-5461, SXS Trouble Ticket are explained in Fig. 8 and 9. It should be noted that in the “Report Detail” section of the trouble ticket, the results of testing by any testing group **must** be included. This is important in directing the maintenance force promptly to the reported trouble and affecting repair. See Table B, Report Classifications, to identify the major sources of trouble reports in a SXS office. That entry is made in the REPT CLS block of Form E-5461.

**5.03** As “T” tickets are closed out, details of found or no trouble found must be recorded for future analysis. Table C lists coding entries to be made in the “Equipment” and “Apparatus” spaces. Tables D and E list coding entries to be made in the “Cause” and NTF spaces. A trouble coding decision chart for different trouble coding situations is shown in Fig. 10. “MEMO” tickets are not to be coded. Examples of trouble ticket use are shown in Fig. 11 through 22.

**Note:** See Table A for a physical description of Form E-5461.

#### Central Office Log—Form E-5457

**5.04** Form E-5457, Central Office Log, is used for recording trouble reports, traces, and central office activities which result in trouble reports. See Fig. 23. The log may also be used for noting central office activity such as installation, contractor, or preventive maintenance activities. The log becomes a record which may alert central office forces to unfavorable changes or reactions in switching performance. Refer to Section 201-020-510, Part 5 for a detailed description of Form E-5457, Central Office Log.

**Note:** Refer to Table A for a physical description of Form E-5457.

### B. Monitoring and Evaluating Office Performance

**5.05** Monitoring and evaluating office performance in SXS switching systems requires analysis of all trouble reports and indicators on a continuous

basis. The ticket file and the Control Record, Form E-5462, provide the SXS maintenance supervisor with a usable system to aid in this analysis, while monitoring and evaluating office performance.

**Ticket File**

**5.06** A ticket file is illustrated in Fig. 24. In the SXS ticket file, it is recommended the bins be arranged to correspond to the equipment groups listed on Forms E-5462, SXS Control Record. Trouble tickets filed in each equipment group bin (Line Finder, 1st Selector, Connector, etc) should also be filed sequentially by bay, frame, or equipment number. For example, Line Finder—Groups 27, 36, 89, 146; 1st Selector—Bays 102, 104, 110 might represent trouble tickets filed in the equipment bins for troubles that had occurred in this equipment.

**5.07** It is important that during the course of a month, as each ticket is filed by equipment group, the tickets for the current month in that bin be analyzed to see if the latest ticket is a repeat offender. A repeat offender may be a trouble in the same bay, group of bays, same aisle, or same switch as on a previously filed ticket. If a repeat offender is uncovered, corrective action should be taken. The intent of this analysis is to prevent any build up of a trouble condition that may affect customer service.

**SXS Control Record—Form E-5462**

**5.08** The SXS Control Record, Form E-5462, provides a current picture of the performance on a daily basis which can be compared to other days performance and the office objectives. Cumulative entries are usually made daily for all indicators listed on the form and facilitates partial or total month comparison with established objectives. Adverse changes or trends, deviating from the objectives, can be promptly recognized. Once recognized, analysis must be performed to determine the causes of trouble and to initiate corrective action to reduce the potential of future troubles as appropriate. See Fig. 25 and 26 for illustrations of Form E-5462, SXS Control Record and example entries.

**5.09** Most of the data recorded on the SXS Control Record is taken from completed SXS Trouble Tickets, Form E-5461. Only "T" tickets are to be summarized and recorded. Additional data may be supplied by register readings and information

from Plant Service Centers and Service Observing Forces. If registers are used, they should be read at the same time each day, so that comparisons made apply to equal time periods. Form E-4744, Register Readings (Fig. 27), may be used for recording the daily readings and differences from the preceding readings. The readings should start at the bottom of the form.

**Setting Objectives**

**5.10** The total objectives to be entered on the last line of Form E-5462 are associated with "Equipment Groups" and the three "NTF" classifications. The entries are obtained from the "Current Objectives" (CUR OBJ) columns of Form E-5463, Trouble Summary. (Refer to 5.15—5.18 for a detailed description of Form E-5463, Trouble Summary.)

**5.11** Objectives for the indicators listed under "Service" can be easily determined. These indicators are important components of the SXS Network Switching Performance Measurement Plan. The following example illustrates a method for setting an Equipment Code 5 and 8 objective, using the rates shown in the Index Table of the SXS Network Switching Performance Measurement Plan, Section 226-020-005, Issue 1. The component index of 97.0 used in this example is not intended to be an indicator of good performance in a SXS office, but is strictly for example use only.

- (1) 97.0 is selected as the component index objective. The index table shows that a performance rate of .60 is the maximum level allowable to attain the 97.0 component index.
- (2) Last month, the working main stations plus equivalent main stations were 22,900. It is assumed that next month the figure will be similar, and can be used as the base figure.
- (3) The performance level of .60, multiplied by the base in units of 100 (.60 X 229), equals 137 reports, which is the maximum number of Equipment Code 5 and 8 reports that will produce a 97.0 component index for the month.
- (4) To compute the partial month objective (10 days, 20 days), the figure (137) is divided by 3. One-third (45) is the 10 day objective, two-thirds (90) is the 20 day objective, and the

total (137) is the objective for the month. (See Fig. 25.)

**5.12** As the cumulative troubles are posted, the figure for the tenth and twentieth days are compared to the 10 and 20 day objectives. It is not necessary to wait for the tenth or twentieth day before making comparisons. The fifth day, or any other day may be chosen and a simple mental division made to ascertain the objective. For example, in 5.11 (4), the ten day figure of 45 equates to about 22 for five days. This procedure permits prompt recognition of any indicator over the objective and signals the requirement to analyze the equipment group to determine the cause. This allows corrective action to be performed prior to further service reaction. As shown in Fig. 25 and 26, appropriate entries and remarks of the deviation noted are required on action taken or not taken as a result of the analysis. (Refer to 5.19 to 5.27 for further descriptions.)

**Note:** See Table A for physical description of Form E-5462.

### C. Trend and Detailed Analysis

**5.13** The *basic* job of analysis consists of examining trouble reports to determine if a particular bay or bays, frame, shelf, unit, or category of equipment, etc, is causing an excessive amount of trouble. There are numerous possible techniques for analyzing equipment performance, such as machine card sort, key sort, and even computer analysis. For most offices, however, manual methods will prove most practical.

**5.14** Trouble tickets are the major source of data for analysis; however, the supervisor should use every available means to analyze, locate, and clear troubles or potential troubles. CTRAP, NOTIS 2 and ESS TN08 printouts are some examples of this additional analysis material that may be used. The continual analysis of individual trouble tickets and the Control Record provide current office information; however, they do not present the entire picture of an office.

#### Trouble Summary—Form E-5463

**5.15** Form E-5463, Trouble Summary, presents trouble data so that developing trends can be recognized. When adverse trends are seen, an analysis should be made to determine the cause

and corrective action initiated. Figures 28 and 29 illustrate the use of Form E-5463, Trouble Summary in SXS offices.

**5.16** The data to be recorded on this summary is transcribed from the "Total" column of Found and Not Found troubles to the monthly Control Records, Form E-5462. Since "MEMO" tickets are not recorded on the Control Record, only summaries of "T" tickets by equipment groups appear on the Trouble Summary.

**5.17** The Trouble Summary form is arranged for comparison of troubles by months (trends), comparison of trouble with the past year's average, and comparison with an objective level of trouble. As the number of troubles are entered each month for each equipment group, comparisons are to be made. If the number of troubles for a particular equipment group should rise unexpectedly or if a gradual rising trend is noticed, investigation (analysis) to determine the cause is required. In order to analyze the increase in troubles, refer to 5.19 of this section, SXS Trouble Tally Sheet. Appropriate entries and remarks of the deviation noted and action taken or not taken as a result of the analysis are also required. (See Fig. 28 and 29.)

**5.18** Objectives should be established as described in Section 201-020-510, Part 5, Trouble Summary. When objective figures are finally set, they should also be recorded on the Control Record, Form E-5462, in the OBJECTIVE (OBJ) TOTAL column. If there are changes in the objectives, the changes are to be reflected on both forms (E-5462 and E-5463) with appropriate notes and entries on each.

#### SXS Trouble Tally Sheet—Form E-5464

**5.19** Form E-5464, SXS Trouble Tally Sheet should be used whenever the trouble data recorded on Form E-5462, Control Record, or on Form E-5463, Trouble Summary, exceeds objectives or is observed to be a rising trend.

**5.20** Entries on Form E-5464, correspond to the Apparatus, Cause, and NTF coding spaces of the SXS Trouble Ticket, Form E-5461. The tally sheet is arranged so that coded trouble data on the Trouble Tickets may be easily transferred to a tally sheet when required. Space is provided for recording totals of troubles for equipment units, apparatus, and various causes.

5.21 Figure 30 illustrates the use of Form E-5464, SXS Trouble Tally Sheet. The entries shown are a typical analysis of a rising trend in connector troubles recorded on Fig. 28, Trouble Summary, Form E-5463. (Refer to Table A for the physical description of Form E-5464.)

5.22 The following procedures are used for the SXS Trouble Tally Sheet, Form E-5464.

(1) Select the trouble tickets filed under the affected equipment group plus appropriate NTF classification for the period during which the trouble increased and stroke them on a Trouble Tally Sheet. See Fig. 30. It may be necessary to select the trouble tickets filed under the affected equipment group, plus appropriate NTF classification, covering the preceding period of the same length as the first group tallied. Stroke these on the same tally sheet but in a different color or part of the space. (Not illustrated in Fig. 30.)

(2) Total troubles at bottom of form by equipment heading. Total Troubles at right side of form by apparatus, cause, and NTF classification. See Fig. 30.

(3) Examine totals by apparatus and cause. Circle or mark any total which is substantially higher than others in the column. (From the example on Fig. 30, we find: Relay—Dirt—14, Other-Spring Assembly—Dirt—7 and Bank Wiper—Dirt—15. The most common trouble here is dirt. Therefore, dirt is suspected as the cause of increased troubles, but its hidden location needs to be further identified.)

(4) Examine totals by equipment heading. Circle or mark any total which is substantially higher than others in the column. (From the example on Fig. 30, we find: Connector Groups 3-43 through 3-47 have more troubles than other groups. Because these groups are suspected as the possible location of increased troubles, we need to confirm if the suspected cause of troubles [dirt] is located here.)

(5) Examine the strokes under all equipment headings in the suspect cause columns, and circle or check those that appear in the suspect groups. Include the appropriate NTF classification. (From the example on Fig. 30 we find: 11 of the 14 Relay—Dirt troubles in our suspect groups,

6 of the 7 Other Spring Assembly—Dirt troubles in our suspect groups, all 15 of our Bank Wiper—Dirt troubles in our suspect groups, and 2 of out 43 NTF troubles in our suspect groups. The troubles increase cause and its location have now been pinpointed.)

(6) Examine the equipment under suspicion.

Determine if the suspected cause exists, its extent, what must be done to correct the problem and also, if necessary, what steps can be taken to prevent a further recurrence of this type. (From the example on Fig. 30, we find: A dirt problem in Connector frames on aisle adjacent to horizontal distributing frame. Bank Wiper cleaning and operational tests started June 6th. Pressure cleaning may not be necessary.)

**Note:** All tallies made should be documented on Form E-5462, Control Record or Form E-5463, Trouble Summary, with regards to action taken or not taken as a result of any tally sheet use.

5.23 The example in Fig. 30, using the preceding procedure, shows the *basic* idea in the use of a Tally Sheet. There will be instances where the further breakdown of an equipment category will be necessary in order to identify the trouble and location. More than one tally sheet may be used per equipment group. It is intended for the Tally Sheet to be versatile in its use. After the trouble tickets have been tallied and the cause determined and located, they should be returned to the ticket file and arranged as before.

5.24 When the use of tally sheets do not clearly identify the cause and location of an increase in trouble, it might be necessary to make use of sampling, inspections, or tests to determine the exact nature and extent of the trouble condition. It is possible that an increase in total troubles noted on the Control Record or on the Trouble Summary could occur because of small increases in one or more trouble causes in different apparatus. It is unlikely that this will occur frequently.

5.25 After maintenance activities are begun in order to reduce the trouble rate, indicators should be considered when evaluating trouble levels on the Control Record and on the Trouble Summary. If the expected drop in trouble does not occur, it is necessary to examine additional trouble data to determine the nature of the new situation.

**5.26** Trouble indicators and reports will require a varying degree of analysis for each office. Whenever the objective level of failures for an equipment group is exceeded or observed to be a rising trend, analysis of that group is to be performed. In addition, each group is to be analyzed periodically in an attempt to improve the level of performance and to identify any hidden faults.

**5.27** The process of Corrective Maintenance calls for awareness, ingenuity, and constant refinement on the part of the central office maintenance supervisor. The supervisor should become involved and aware of all the associated operations. Setting objectives, analyzing, and taking appropriate action is a completely integrated management system. There may be adjustments required at any point in the total process.

## 6. SAMPLING

**6.01** Sampling is a method of evaluating the performance or condition of SXS switching equipment. It is to be used in MR routine procedures and may be used in other applications. The MR review procedure is illustrated in Fig. 2.

**6.02** There are three reasons for using sampling. 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 percent inspection. Third, sampling can be used to determine which parts of a large group of equipment need attention.

**6.03** Sampling, as explained in this section, 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.

**6.04** The information which follows shows how scientific sampling can be applied to evaluate central office equipment conditions. Although scientific sampling is sometimes viewed as being

complicated, the method described consists of simple steps which, if followed carefully, will produce useful results.

**6.05** Defined below are sampling terms which are commonly used.

**UNIVERSE:** The total number of items under investigation. For instance, all the wipers in a 1st Selector Bay, or all of the "A" relays in a Connector frame would be examples of universes.

**SAMPLE:** A sample is that part of a universe which is selected for examination.

**SAMPLE SIZE:** The number of items selected for the sample. It is dependent on two things: (1) the size of the universe, and (2) the degree of accuracy required.

**REJECTION THRESHOLD:** The number of defective items or failures found while testing or inspecting the sample, which, if **exceeded**, requires the entire universe to be tested or inspected. It indicates that the failure rate in the universe can be expected to be above objective service levels and that testing or inspection of all units within that universe is now mandatory.

**ORDERING:** All items in the universe must be sequentially numbered for identifying each one separately. In SXS, for example, the existing equipment numbering (frame, bay, switch, or circuit number, etc) lends itself readily to association with random numbers.

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

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

**CRITERIA:** It is necessary that the defective items be precisely identifiable, so that the

determination of good or bad may be consistent. Tests and inspections must be made according to BSP standards.

**6.06** Sampling can be applied to a large number of equipment components when information is sought about the extent of a specific condition. Sampling, if properly applied on MR routines, will reduce the need for "project work" and "immediate action type jobs".

**6.07** There are instances when the use of sampling is not recommended because little or no savings can be gained. For instance, if the time required for taking the sample is large, when compared with the time required for 100 percent test or inspection, little may be gained by taking a sample. It is also the case when setup time required to test the sample items is large, when compared with the time to test the sample.

**6.08** Sampling may be used effectively when MR sampling action is required. For example, the extent of contact wear may be determined when corrective action information indicates that wear may be a widespread trouble.

**6.09** The preliminary steps for taking any sample are described as follows.

(1) **Can it be sampled?**—In order to sample, the condition being sought must be identifiable; for example, "A" relay contact wear or MR routines such as selector pulsing, connector operation, etc. Once identified, specific BSP tests or inspections must be designated.

(2) **Determine Universe Size**—The Sample Selection Table, Table F, fits *typical* arrangements in SXS offices:

- (a) Line Finders—Normally 48 to 60 per frame
- (b) Toll Selectors—Normally 70 per bay
- (c) Connectors—Normally 70 per bay
- (d) Other Selectors—Normally 160 per bay.

When sampling several bays or frames, it is practical to treat each bay or frame as a *separate universe*. There is an overall savings in maintenance work when the results of the separate bays or frames are known **AND** it is scientifically concluded that

no further work is required in some of the bays or frames.

(3) **Determine Sample Size**—This is governed by the universe size or sizes selected from the Sample Selection Table, Table F.

(4) **Determine Rejection Threshold**—This is also governed by the universe size or sizes selected from the Sample Selection Table, Table F.

(5) **Universe Ordering**—The items must be universe size or sizes selected. A selector bay, with switches numbered from 1 to 160, would not require ordering if a universe size of 160 were selected for the sampling procedure. However, if two selector bays, each 160 in size, are to be combined for sampling as a 320 size universe, ordering is required. Spare equipment locations should not receive a number assignment. For example, the first Selector bay has 158 switches. Therefore, the first switch on the second bay would be number 159, the second switch would become 160, etc. Line Finder Frames, with three groups of sixteen switches each, could be assigned numbers 1 through 48 for sampling by frames. When assigning sequential numbers, any horizontal (left to right, right to left) and vertical (top to bottom, bottom to top) method may be used, since the random sample selection method will properly weigh the effect of variables such as first choice, age, and location, regardless of how ordering is accomplished.

(6) **Select Random Numbers**—Tables of random numbers are provided in Tables G, H, I, and J. The numbers shown contain three digits and are designed to be used for any size universe selected from Table F, Sample Selection Table. The groups of ten numbers each may be scanned in vertical columns or horizontal rows. It is not necessary to start at Column 1, row A when selecting random numbers. Any column or any row may be used as a starting point. The following illustrates the use of random number tables.

(a) Universe Size—Actual 82 (From Table F, 60-89 is selected as the range of the universe).

(b) Sample Size (From Table F)—14.

- (c) Random Numbers to be Selected—14.
- (d) Rejection Threshold (From Table F)—1.
- (e) Items in universe are numbered 001 to 082.
- (f) Referring to Table G, Column (5) is selected. Starting at the top of column designated (5) and scanning down first group of ten numbers (Row A) in the column, the first four numbers seen are 006, 083, 329, 228.
- (g) Scan down the first group of ten numbers (Row A) in the column and select any numbers between 001 and 082. Selections: 006, 082, 062.
- (h) After making selections from first group, go to second group and continue to make selections down the same column. (You may, instead, repeat across by rows, starting at top of Column [6].) Select again, any numbers between 001 and 082. Column selections: 007, 042, 020, 069, 024, etc. (Row selections: 034, 009, 065, 040, 053, etc.)
- (i) Repeat until 18 numbers have been selected.
- (j) Arrange the 18 numbers in convenient order. If repetitions are encountered, they should be discarded and other random numbers selected until 18 numbers have been accumulated.
- (k) The items in the universe, whose position number corresponds with one of the random numbers selected, become one of the samples.

**6.10** The preceding description sounds more complicated than the actual procedure. However, if reliable sampling results are to be obtained, these steps must be carefully followed. Experience gained from the use of sampling helps to simplify and speed up this process.

**6.11** After the specific items to be sampled have been selected and the rejection threshold identified, it is necessary to clearly establish the criteria for deciding good or bad items in the sample. There are many tests that have this criteria clearly established (such as marginal tests, "B" relay release, for example) that either pass or fail the established timing requirement. Those

tests or inspections that lack criteria must have a pass or fail value placed on them. BSP standards should be used, where applicable. Examples of worn contacts (labeled "good" or "bad" as appropriate) are useful for comparing with items in the sample. It is important for the craft performing the test or inspection to clearly understand pass- or fail-type values.

**6.12** The next step is to prepare Form E-5452, Test and Inspection Work Order and Record, showing the specific test or inspection to be made, pass or fail criteria (if needed), the rejection threshold for the sample, and the identity of each sample item. A separate E-5452 form should be issued for *each* universe sample. If further testing or inspection becomes mandatory, the sample work order should continue to be used. In some cases, a new work order sheet, attached to the original, may be needed for completion of the routine. See Fig. 31 and 32.

**6.13** The use of a rejection threshold in multiple type tests or inspections such as Section XXX-XXX-XXX Test A and Test B, must be applied to *each test individually*. For example, rejection threshold is 3. Bay 101 has three failures on Test A and one failure on Test B. Test A failures exceed the rejection threshold of 3, and it must now be performed on all units in Bay 101. Test B failures did not exceed the rejection threshold of 3, and no further Test B effort is needed in Bay 101, except to repair or adjust the one failure found.

**6.14** The use of a rejection threshold when sampling several bays or frames as separate universes must also be applied to *each universe individually*. For example: Rejection threshold is 3. Bay 101 has three failures, Bay 102 has three failures, Bay 103 has one failure. Bays 101 and 102 had failures which exceeded the rejection threshold of 3, and all units in both bays must now be tested or inspected. Bay 103 failures did not exceed the rejection threshold of 3 and no further effort is needed in Bay 103, except to repair or adjust the one failure found.

**6.15** When sampling several bays or frames as separate universes, *do not* use the same random numbers selected for the first universe for the rest of the bays or frames involved. The random numbers for the remaining bays or frames are to be obtained, according to sample size, by

continuing in the same random number table where the previously selected numbers were obtained. For example: consider 3 bays of selectors, each equipped with 160 switches. The sample size for 160 is 33 (from Table F). As outlined in 6.09, item 6, the first selector bay would be sampled by using the first 33 numbers (from 001 to 160) obtained from the selected random number table. The second bay would be sampled by using the second set of 33 numbers (from 001 to 160) obtained by starting in the table immediately after the last number obtained for the first 33 numbers. The third bay would be sampled by using the third set of 33 numbers (from 001 to 160) obtained by starting in the table immediately after the last number obtained for the second 33 numbers. This continuation of obtaining numbers for each universe, in the same random number table, provides for accurate sampling results.

**6.16 PASS** on MR routines is made only if *any* rejection threshold is not exceeded. From the example in 6.13, Test B may be "passed", while Test A must be applied to all units. In the example of 6.14, Bay 103 may be "passed", while bays 101 and 102 require further effort. All defects or failures found in the universe "passed" must be repaired or adjusted at that time.

## 7. SXS MAINTENANCE SUBJECTS

**7.01** This part presents various SXS maintenance subjects in general terms. Each was selected because of its importance in the overall maintenance of SXS switching systems. Appropriate attention should be placed on those items that are a part of the Network Switching Performance Measurement Plan.

### A. Trunk Outage

**7.02** It is the responsibility of the maintenance force to keep all trunks available for service. Controls have been established which will account for any trunk out of service. Section 660-400-010 describes these controls, other trunk maintenance requirements, and the use of Form E-4255, Trunk Outage Log. All offices are required to maintain this log.

**7.03** Any condition which causes a trunk to be out of service should be corrected as quickly as possible. When a trouble condition has been referred to another work group or office, diligent

follow-up is required to minimize the trunk outage. Thorough analysis of trouble and routine test records, and close contact with other trunk terminal locations will prevent unsatisfactory conditions from developing.

### B. Switch and Common Equipment Outage

**7.04** It is the responsibility of the maintenance force to keep all switches and common equipment available for service. Controls have been established which will account for any switches or common equipment out of service. Section 201-114-001 describes these controls and the use of Form E-4256, Record of Equipment Outage. All offices are required to maintain this log.

**7.05** Since it is probable that the removal of switches or common equipment from service will affect customer service, prompt restoral of switches or common equipment to service is required.

### C. SXS Data Collection

**7.06** Data collection in SXS systems falls into three general categories:

- (1) **Equipment Usage**—Normally measured as the length of time, and the number of times, a piece of equipment was in use. This includes, in most instances, maintenance busy conditions.
- (2) **Equipment Availability**—Normally measured in terms of all finders busy, dial tone speed, overflows, etc.
- (3) **Equipment Failure**—Normally indicates equipment malfunction and/or unaccessability of equipment.

**7.07** *Usage* and *Availability* data is used to administer present equipment, to project future demands, and provide equipment, if and when required. It is also used for performance indicators in the quality of service provided to the customer. Reliable, accurate recording of equipment usage and availability data is a joint responsibility of the Network Administration (Dial Administration) and the Central Office (maintenance). The Network Administration forces arrange to collect the required data while the Central office forces have the responsibility for keeping all equipment (including the data collection devices) in working order. The

two groups must communicate and work together as a team.

**7.08 Failure** data is used to detect and aid in the correction of equipment malfunctions or access problems. It is also used for performance indicators in the quality of service provided to the customer.

**7.09** Equipment usage and availability data is collected and recorded by such collection devices as the Traffic Usage Recorder (TUR), Dial Tone Speed units, totalizers, or individual central office or traffic peg count registers. Equipment failure data is collected normally by central office maintenance registers and read and recorded manually by these forces.

#### **D. Permanent Signal and Alarm Handling**

**7.10** Permanent signal handling is an important part of every day central office procedure. Improper handling can cause customer service reaction. The procedures described in Section 226-135-300 should be followed.

**7.11** All other alarms should be handled promptly. A priority for handling the types of alarms should be set for each location.

#### **E. Equipment Blockages and Failures**

**7.12** Equipment blockages and failures are measured in terms of equipment blockages and equipment irregularities. They are used to determine how effectively the SXS subscriber is served in the completion of calls. They are obtained as a result of routine service observations and are used for performance indicators in the quality of service provided to the customer.

**7.13** Equipment blockages include occurrences classified as "reorder" (RO) and "no circuit" (NC). Equipment irregularities include occurrences classified as "wrong number reached", "misdirected", "no ring", and "other" equipment irregularities.

**7.14** Call failure details from the service observing force are available after a predetermined time and should be used to identify points of equipment congestion and/or trouble. Early correction of call failures through analysis and prompt action will not only improve service but

will reduce materially the need for subsequent analysis.

#### **F. Customer Trouble Reports—Code 7**

**7.15** Code 7 reports (test OKs) reflect trouble conditions in the entire network from end-to-end and are used as a performance indicator in the quality of service provided to the customer. They may reflect conditions other than those directly relatable to the measured office.

**7.16** A special in-depth analysis is sometimes required to identify the cause of these reports. The need may vary and may not be required on a continuing basis. Service results and other pertinent indicators may dictate this need.

#### **G. Billing**

**7.17** Billing involves the accuracy of the bill rendered to the customers. Certain conditions in office switching (including equipment trouble) may interfere with proper billing. Many facets of billing are involved as performance indicators in the quality of service provided to customers.

**7.18** In SXS switching systems, various equipment such as automatic message accounting (AMA), step-by-step automatic message accounting (SAMA), automatic number identification (ANI), etc, is provided to record proper billing of subscriber calls. Proper maintenance of this equipment is required since failures result in lost revenue. Applicable sections must be followed carefully in the maintenance of this equipment.

#### **H. Emergency and Routine Procedures**

**7.19** Each office location should establish procedures to be followed in handling emergency and certain routine operations. It may be necessary to post these, along with contact names and phone numbers. Examples of emergency items include power failures, fire, emergency call tracing, etc. Examples of routine operations include building security, emergency engine operation, remote alarm handling, etc.

## 8. STUCK SENDER AND ORIGINATING REGISTER ADMINISTRATION

**8.01** Various SXS offices have been equipped with senders or originating registers in order to provide AMA, centralized automatic message accounting (CAMA), or Common Control features. Because of the variety of equipment in use, each with its own designations, they will all be referred to in Part 8 as *senders*.

**8.02** The majority of troubles causing stuck senders are in trunking facilities. Regardless of the trouble location, the customer's call is not completed. This normally results in another attempt, which increases the load on the common equipment. Therefore, it is necessary to establish an effective stuck sender tracing program in order to locate the troubles and to minimize the stuck sender rate.

**8.03** Senders are equipped with manual devices for cancelling the timed release feature (H key, HN key, HD jack, etc). These will be referred to as "HOLD" keys.

**8.04** A high stuck sender rate reduces the sender group capacity by significantly increasing individual sender holding time. This is especially true for a sender with its HOLD key *operated*, since it remains out of service until released by the maintenance force. If however, the sender HOLD key is *normal*, and a trunk in trouble causes a stuck sender, the trunk in trouble will have a shorter than normal holding time. The result is that the trunk in trouble will be selected more frequently, which increases the trouble rate, sticks more senders, and produces customer reaction. The need for prompt and adequate attention to stuck senders is of utmost importance. Trunks and equipment causing stuck senders must be located, removed from service, repaired, and returned to service as quickly as possible.

### Sender Tracing Program

**8.05** When preparing or reviewing a stuck sender tracing program, the following considerations are important.

(a) **Stuck Sender Rate**—The number of stuck senders, during the hours of coverage, should be used in setting an objective of the number of senders to be traced. Ideally, all stuck senders should be traced. In addition to

the tracing of stuck senders, certain minimal testing requirements should be set for the equipment and trunking involved in a given trace. The finding of a trunk in trouble during this testing may prevent more stuck senders, as well as customer call failures. The detection of major facility (cable or carrier) failures on trunking requires fast action in removing the affected trunks from service until repaired. This will substantially reduce the effect on other senders in the group and the associated customer trouble reporting rate.

(b) **Group Busy Indicators**—SXS offices are provided with varying group busy indicators. Audible and visual alarms provide immediate group busy notice, while group busy and peg count type registers, require mechanized and/or manual methods to determine a group busy condition. The receipt of a sender group busy alarm, or recognition of the condition by using registers, should be investigated. Senders held by operated HOLD keys can cause sender group and trunk group overflows to customers if not promptly traced. Maintenance busies should at all times be minimal, and during peak usage periods, it is expected all senders will be available for customer use.

(c) **Work Force Availability**—There must be a continuing program for tracing stuck senders, and for locating and clearing the associated troubles. The available work force must certainly be considered. Tracing stuck senders is important; however, it is recognized that other office work may be considered equally or perhaps, more important, limiting the amount of work force available for tracing stuck senders for a short period of time. ***HOLD keys should not be operated if senders are not being traced promptly.***

**8.06** There are two methods of handling stuck sender work in common use: logs and trouble tickets. The method chosen for use in an office should be the one that provides the most effective stuck sender program, including trouble records aimed at finding other troubles not yet identified. Logs require more clerical effort and may not provide sufficient space for recording all necessary information. Subsequent study is therefore restricted by the limited information available.

**8.07** The recommended method makes use of trouble tickets (Form E-5461) and a ticket file and is described as follows. For each stuck sender traced, complete information is recorded on a trouble ticket which is filed in the ticket file for later use. This file should be a separate unit reserved for stuck sender studies. A suggested layout of this file is shown in Fig. 33. Other arrangements may serve a particular location to better advantage. For example, a common control office may find it more beneficial to file by code selectors and combined trunk groups.

**8.08** When stuck sender trouble tickets are closed out, they may be filed under the particular trunk group involved in the connection. Tickets are filed sequentially by trunk numbers for ease in spotting "repeaters". This method requires little clerical work. Repeated failures show up quickly as tickets are filed in the trouble bins. Common troubles are indicated by increases in the number of tickets in one or more bins. Trouble in a sender should be found by the personnel assigned to tracing senders during the testing procedures.

**8.09** For detecting obscure sender or sender link troubles, it is recommended that tickets (or log information) be tallied periodically. The tally requirement will vary according to the amount of tickets (or log entries) or, of course, the amount of troubles in an office. Figure 34 shows Form E-5477, Stuck Sender Tally Sheet, which is used for these tallies.

## **9. RETENTION OF RECORDS AND FORM ORDERING INFORMATION**

### **RETENTION OF RECORDS**

**9.01** The forms described in this section have been designed for containing useful information

in an orderly fashion. The minimum length of time each record is to be kept should be found in your company's record retention schedule. If it appears that it is desirable to retain records for a longer period than indicated in this retention schedule, you should seek to have your company's present retention requirements changed. However, the normal practice should be to retain a record no longer than legally required.

**9.02** A simple method for retaining these records is to establish large folders or mailing envelopes, each marked with the month and the year. As each report month ends, records may be removed from binders and filed in the appropriately marked envelope. At the same time, records in an envelope whose date exceeds company retention requirements should be discarded. If stated retention periods exceed two years and reference to these records is infrequent, consideration should be given to storage of these records in record service centers.

### **FORM ORDERING INFORMATION**

**9.03** Forms should be ordered in multiples of the quantities contained within each package. Requisitions should be worded as follows:

**(Quantity) Form (Number).**

*Note:* See Table A for the quantity of forms contained in each package.

EQUIPMENT TEST LIST						
B.S.P.	I S S	TEST OR REQT.	EQUIPMENT AND WORK DESCRIPTION	CLASS	FREQ.	JOB NO.
226-565-500	6		(Cont)			
			SET ES-30417-01, SD-31426-01 OR SD-31524-01			
		A	Delayed Charge Type Trunks	MR	24M	
		B	Immediate Charge Type Trunks	MR	24M	
		C	Immediate Charge Type Trunks — (99 Term.)	MR	24M	
		D	Delayed Charge Type Trunk-Overtime Reg	MR	24M	
226-565-501	4		INDIV L MR TRKS LF TYPE — OPR TSTS USING 2-MR TST SET SD-31151-01, SD-31258-01 OR SD-31456-01			
		A	Delayed Charge Type Trunks	MR	24M	
		B	Immediate Charge Type Trunks	MR	24M	
		C	Immediate Charge Type Trks (99 Term.)	MR	24M	
		D	Delayed Charge Type Trunks Overtime Reg	MR	24M	
226-566-500	2		2-PTY MR TRKS — PULS TSTS PERCENT BK METHOD USING PULS & PULS RPTG TST SETS (Para. 1.01-4.07)	MR	24M	
226-566-501	4		2-PTY MR TRKS — OPR TSTS USING TST SET SD-31151-01, SD-31258-01 OR SD-31456-01			
		A	Imed Chg Type Trks — Tip Party Lp	MR	24M	
		B	Imed Chg Type Trks — Ring Party Lk	MR	25M	
		C	Delayed Chg Type Trks — Tip Party Lp	MR	24M	
		D	Delayed Chg Type Trks — Ring Party Lk	MR	24M	
		E	Free Call (C Lead) Test	MR	24M	
		F	Imed Chg Type Trks — Foreign Ground	MR	24M	
		G	Delayed Chg Type Trks — Foreign Ground	MR	24M	
226-588-500	3		TRK TRMSN TST—WITHOUT MAN. OGT TST FRAME			
		A	One-Way 1000-Hz Loss to 102 Type Test Line	MW	*	
		B	Message Ckt Noise Meas to 100 Type Test Line	MW	*	
		C	Impulse Noise Meas to 100 Type Test Line	MW	*	
		D	Two-Way 1000-Hz & Noise Tst to 104 Test Line	MW	*	
		E	Two-Way 1000-Hz Loss Meas to Lp-Around Tst Line	MW	*	
		AA	Two-Way 1000-Hz Loss to 101 Test Line — Orig End	MW	*	
		AB	Two-Way Freq Response to 101 Test Line — Orig End	MW	*	
		AC	Message Ckt Noise Meas to 101 Test Line — Orig End	MW	*	
		AD	Impulse Noise Meas to 101 Test Line — Orig End	MW	*	
		AE	Two-Way PAR Meas to 101 Test Line — Orig End	MW	*	
226-590-500	2		TRK TRMSN TSTS — SXS OFF. WITH M.O.T.T. FRAME			
		A	One-Way 1000 Hz Loss Measurement	MW	*	

Fig. 1—Equipment Test List—Form E-5450

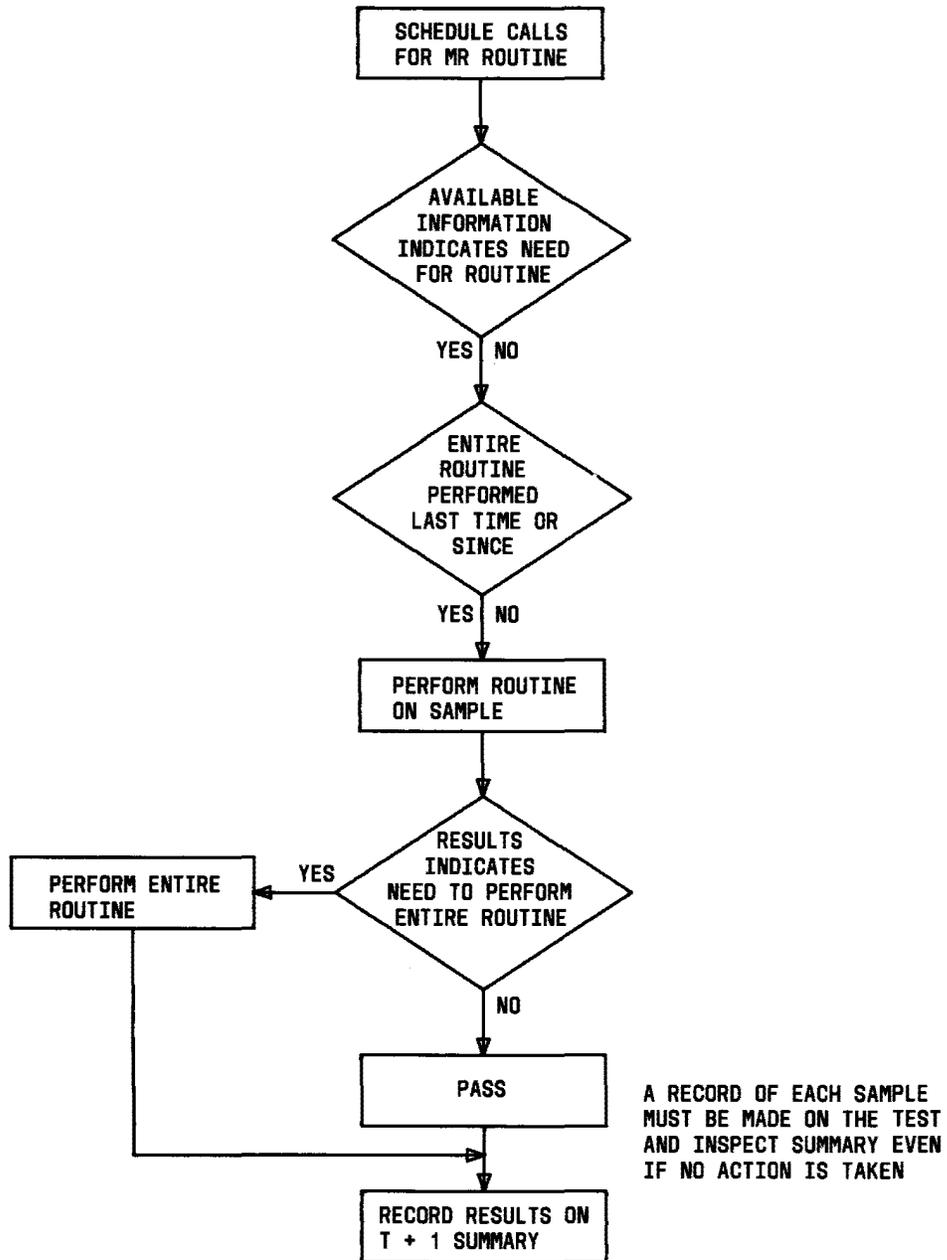


Fig. 2—Mandatory Review (MR) Procedure



**TEST AND INSPECTION WORK ORDER AND RECORD**

OFFICE 563.5 ASSIGNMENT OR JOB NO. 76-8

ASSIGNMENT DATA					PROGRESS REPORT							
B.S.P. NO. <u>030-705-706</u>					DATE	FROM EQPT. UNIT		TO EQPT. UNIT		TIME SPENT (MINUTES)		BY
TEST LETTER OR PAR. <u>3.01</u>						TEST	REPAIR					
EQUIPMENT <u>SELECTORS</u>					10-3-76			402	1	402	80	460
WORK DESCRIPTION <u>LUBRICATION</u>					10-4-76	402	81	402	160	480		
					10-5-76	403	1	403	80	470	10	
					10-6-76	403	81	403	160	480		
					10-11-76	404	1	404	80	465	15	
10-12-76	404	81	404	160	465							
FROM EQPT. UNIT		TO EQPT. UNIT		TOTAL UNIT	SHIFT							
402	1	404	160	480	EVE							
ASSIGNED TO		TO BE STARTED		TO BE COMPLETED								
EB		10-3-76		10-12-76								

WORK RECORD					
EQPT. UNIT	TROUBLE APPEARANCE	ACTION TAKEN	REPAIR TIME	BY	
					402
402	74	FRAYED WIPER CORD	REPLACED	10	}
403	72	FRAYED WIPER CORD	REPLACED	10	
404	2	LOOSE SHAFT SPRG. ASSY.	REPAIRED	15	↓

NOTE	EXPLANATION
A	Central office designation
B	Locally assigned number and/or letter to identify assignment or job by type of work, shift, equipment, etc
C	Reference information
D	Identification of equipment
E	Description of work to be performed
F	For designating the first and last circuit or equipment assigned by work order
G	Total units this assignment
H	"Shift" work to be performed (Day, Evening, Night)
I	Show trick designation or initials of employee work assigned to
J	Show date and/or time work is scheduled to be started and completed
K	Equipment unit on which trouble is indicated
L	Details of trouble appearance
M	Details of action taken to clear trouble, time consumed, workman's initials
N	Show workman's initials and summary of time spent testing and repairing by date and equipment involved
O	For totaling trouble appearances this page. Limited trouble might be expected on this test. Use of this form on this test would be optional.

**O** TOTAL TROUBLE APPEARANCES \_\_\_\_\_ NO. SHEETS \_\_\_\_\_ SHEET NO. \_\_\_\_\_

Fig. 4—Test and Inspection Work Order and Record—Form E-5452







SXS TROUBLE TICKET							O/S	TKT. NO.	EQUIPMENT
T MEMO ← (A) →							(B)	(C)	(Q)
OFFICE (D)	DATE (E)	TIME	REPT. BY (F)	LOCATION (G)	RCVD. BY (H)	REPT. CLS. (I)			
TEL. NO.	LINE EQPT.		ASSOC. EQPT./CA. PR.						
REPORT DETAIL	(J)						APPARATUS	(R)	
ACTION TAKEN							CAUSE	(S)	
(K)							DIRT		
							WEAR		
							DEFECT		
							WORK ERROR		
							OTHER		
							ORIGINATING		
							NTF	(T)	
							TERMINATING		
							OTHER		
BY	←	CLEARED TO (L)	TIME	DATE (M)	WORKTIME (N)	FMN CK (O)	CODE (P)		

- | NOTE | EXPLANATION  |
|------|--|
| A    | Check "T" or "Memo"  |
| B    | Check O/S (out of service) if equipment is removed from service.   |
| C    | Serial number of ticket  |
| D    | Central office name or designation.  |
| E    | Date and time report received in central office.*  |
| F    | Initials of person reporting or equipment designation if from alarm, trouble recorder, trouble indicator, or trouble ticketer. |
| G    | Origin of report.  |
| H    | Initials of person receiving report.   |
| I    | Report class.  |
| J    | Details of trouble report. Include test results of any testing group.  |
| K    | Details of action taken including referrals.   |
| L    | Initials of person clearing trouble, person report cleared to and time.*   |
| M    | Date report closed out.  |
| N    | Time spent on this trouble.  |
| O    | Foreman's initials upon review of ticket.  |
| P    | Central office trouble code.   |
| Q    | Equipment group abbreviation and location.   |
| R    | Check apparatus where trouble is located.  |
| S    | When apparatus is identified, check cause of trouble.  |
| T    | If NTF check according to report.  |
- \*Recommend use of 24-hour clock.

Fig. 8—Trouble Ticket (Front)—Form E-5461

TRACING INFORMATION

EQUIP.	BAY/GRP.	SWITCH	LEVEL	TRK. TERM.
LF-PLS				
SLS				
1st SEL				
2nd SEL				
3rd SEL				
4th SEL				
5th SEL				
CONN.				
ROTS.				
RPTR.				
TRK.				
INC. SEL				
REGISTER TRUNK & LINK				
FR.	SWI.	HOR.	VER.	
	PRI.			
	SEC.			
TP	REG. NO.		RD	
			TT	
REF. TO	INITIALS	DATE	TIME	

REMARKS:

E-5461 (6-67)

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- | NOTE | EXPLANATION  |
|------|--|
| A    | Record of equipment.   |
| B    | Additional record of Common Control equipment.   |
| C    | Referral record.   |
| D    | Supplementary information (called number registered in originating register, states of selected relays in sender additional tracing details, etc). |

Fig. 9—Trouble Ticket (Back)—Form E-5461

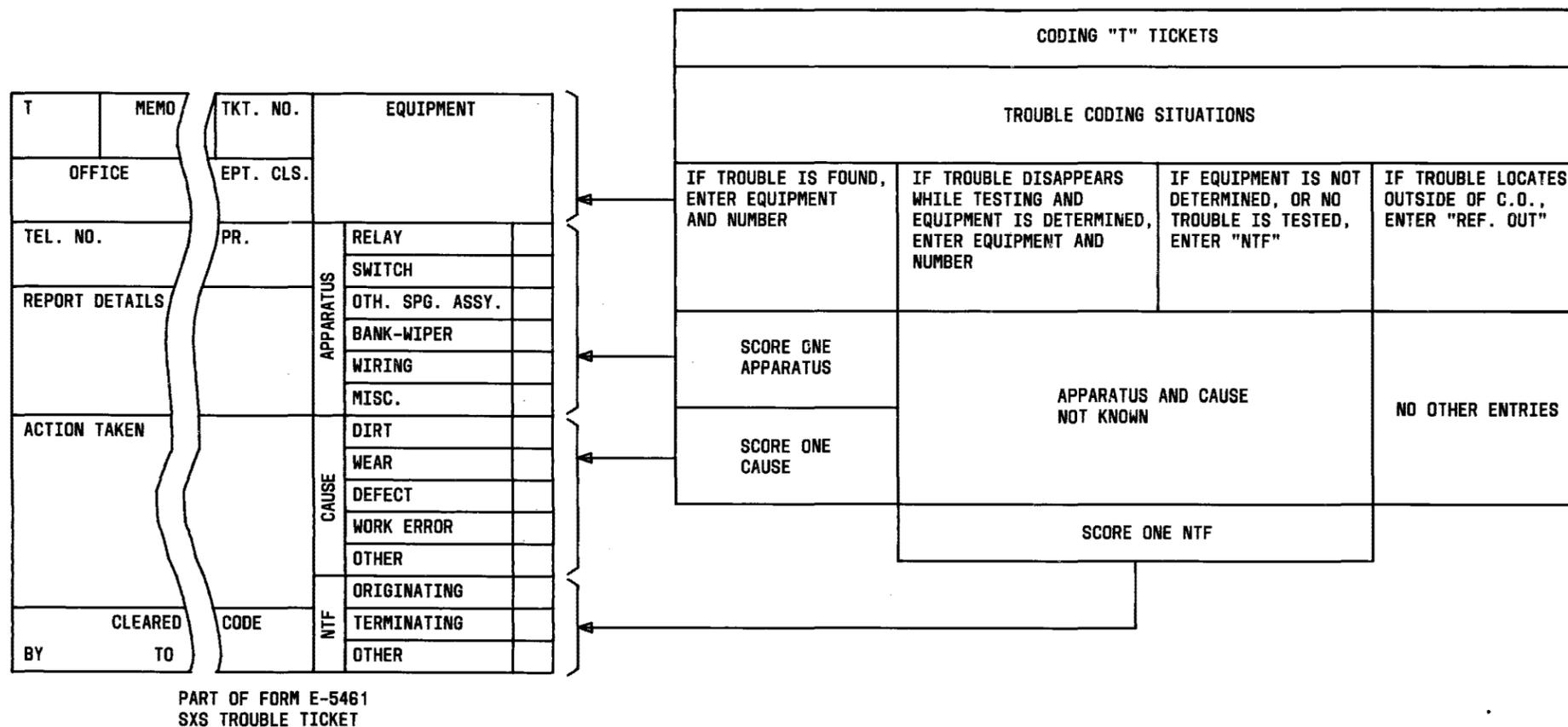


Fig. 10—Trouble Coding on "T" Ticket

T		MEMO	SXS TROUBLE TICKET				O/S	TKT. NO.	EQUIPMENT	
✓								2/5	NTF	
OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.				
563,5	10-31-76	1630	SA.#4	DSA	TM	B				
TEL. NO.	LINE EQPT.		ASSOC. EQPT./CA. PR.					APPARATUS		
REPORT DETAIL							RELAY			
NOISY CONNECTIONS ON CALLS TO 279 NUMBERS							SWITCH			
							OTH. SPG. ASSY.			
							BANK - WIPER			
							WIRING			
							MISC.			
ACTION TAKEN							CAUSE			
ALL TRUNKS TO 279 OFFICE CHECKED FOR NOISE							DIRT			
							WEAR			
							DEFECT			
							WORK ERROR			
							OTHER			
CLEARED		TIME	DATE	WORKTIME	FMN CK	CODE	NTF			
BY TM TO SA #4		1130	11-1-76	120M	TAK	-	ORIGINATING			
							TERMINATING			
							OTHER	✓		

Traffic reports noise on calls to several numbers in 279 office. All trunks to 279 office checked for noise. No trouble found. Since equipment causing trouble is not known — enter NTF. NTF-OTHER scored because report concerns trouble after connection established.

Fig. 11—"T" Ticket—NTF Other

SECTION 226-020-510

T	MEMO	SXS TROUBLE TICKET					O/S	TKT. NO.	EQUIPMENT	
✓							✓	1	1ST SEL	
OFFICE		DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.	102-14		
563,5		11-1-76	0830	BC	PSC	SL	A			
TEL. NO.		LINE EQPT.		ASSOC. EQPT./CA. PR.						
3-2421		14-72		9-206						
REPORT DETAIL							APPARATUS			
GETS WRONG NUMBERS WHEN CALLING OUT										
TEST OK										
ACTION TAKEN							CAUSE			
SELECTOR 102-14 FAILS PULSING TEST (A) RELAY CONTACTS PITTED AND WORN. REPLACED AND PULSED										
CLEARED		TIME	DATE	WORKTIME	FMN CK	CODE	NTF			
BY	TO									
SL	BC	0910	11-1-76	40m	TAK	5				
							RELAY ✓			
							SWITCH			
							OTH. SPG. ASSY.			
							BANK - WIPER			
							WIRING			
							MISC.			
							DIRT			
							WEAR ✓			
							DEFECT			
							WORK ERROR			
							OTHER			
							ORIGINATING			
							TERMINATING			
							OTHER			

Equipment and apparatus are identified. Lack of contact "follow" in (A) relay apparently caused by normal deterioration - cause is "wear." Trouble in CO causing customer report is a code 5.

Fig. 12—"T" Ticket—Relay Wear

T	MEMO	SXS TROUBLE TICKET					O/S	TKT. NO.	EQUIPMENT	
✓								2	MDF	
OFFICE		DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.			
563,5		11-1-76	0910	KG	PSC	PR	A			
TEL. NO.			LINE EQPT.		ASSOC. EQPT./CA. PR.					
5-3449			17-82		14-394					
REPORT DETAIL								APPARATUS		
<p>NDT</p> <p>TEST RING SIDE OPEN IN</p>								RELAY		
								SWITCH		
								OTH. SPG. ASSY.		
								BANK - WIPER		
								WIRING	✓	
ACTION TAKEN								CAUSE		
<p>RING JUMPER NOT SOLDERED AT HMDF</p> <p>SOLDERED - RETEST OK</p>								DIRT		
								WEAR		
								DEFECT		
								WORK ERROR	✓	
								OTHER		
								NTF		
								ORIGINATING		
								TERMINATING		
								OTHER		
CLEARED		TIME	DATE	WORKTIME	FMN CK	CODE				
BY PR TO KG		0920	11-1-76	10M	TAK	5				

A customer reports "no dial tone." The test center tests one side open in the central office and refers the trouble to the switchroom for correction. Investigation of the frame connections discloses that the ring side had not been soldered on the HMDF. The connection is repaired and the ticket closed out to the test center. In this case, the equipment "MDF" is written in, and the apparatus and cause scored.

Fig. 13—"T" Ticket—Wiring Work Errors

T		MEMO	SXS TROUBLE TICKET				O/S	TKT. NO.	EQUIPMENT	
✓								3	NTF	
OFFICE		DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.	CONN 5-99#9		
563,5		11-1-76	0940	RC	922-3456	JS	J			
TEL. NO.		LINE EQPT.		ASSOC. EQPT./CA. PR.						
REPORT DETAIL								APPARATUS	RELAY	
CALLED 565-9994 NO RING - HOLDING									SWITCH	
									OTH. SPG. ASSY.	
									BANK - WIPER	
								WIRING		
ACTION TAKEN								CAUSE	MISC.	
#9 CONN 5-99 NO RING - TBL CAME CLEAR WHILE TESTING - CHECKED ALL CONTACTS IN RINGING PATH - FOLLOW OK NTF									DIRT	
									WEAR	
									DEFECT	
									WORK ERROR	
								OTHER		
CLEARED		TIME	DATE	WORKTIME	FMN CK	CODE	NTF	ORIGINATING		
BY JS	TO RS	0955	11-1-76	15M	TAK	-		TERMINATING	✓	
								OTHER		

"No Ring" report received from employee at 922 office. Connector #9 failed to ring out on line. Equipment is known, but trouble came clear before apparatus and cause were determined.

Fig. 14—"T" Ticket—NTF Terminating

T	MEMO	SXS TROUBLE TICKET					O/S	TKT. NO.	EQUIPMENT	
✓							✓	4	MISC	
OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.				
563,5	11-1-76	1030	SA#2	POS. 23	RR	B				
TEL. NO.	LINE EQPT.		ASSOC. EQPT./CA. PR.							
REPORT DETAIL						APPARATUS				
POOR TRANSMISSION ON						RELAY				
563 TOLL SW. TRK #4						SWITCH				
						OTH. SPG. ASSY.				
						BANK - WIPER				
						WIRING				
						MISC.	✓			
ACTION TAKEN						CAUSE				
REPLACED DEF E6 REPT.						DIRT				
201.7 #46						WEAR				
RETEST OK						DEFECT	✓			
						WORK ERROR				
						OTHER				
						NTF				
CLEARED	TIME	DATE	WORKTIME	FMN CK	CODE					
BY RR TO SA#2	1100	11-1-76	15M	TAK	-	ORIGINATING				
						TERMINATING				
						OTHER				

Investigation of Traffic Report discloses a faulty voice repeater. Ticket is coded to show equipment, apparatus, and cause.

Fig. 15—"T" Ticket—Miscellaneous Defect

T		MEMO	SXS TROUBLE TICKET				O/S	TKT. NO.	EQUIPMENT	
✓								5	NTF	
OFFICE		DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.			
563, 5		11-1-76	1120	BC	PSC	BR	A			
TEL. NO.		LINE EQPT.		ASSOC. EQPT./CA. PR.						
3-1451		37-112		23-197						
REPORT DETAIL							APPARATUS			
NDT AT TIMES - REPEAT REPORT-							TEST OK CAN'T DUPLICATE			
							RELAY			
ACTION TAKEN				CAUSE						
CHECKED ALL FRAME CONNECTIONS, LINE CKT., AND LINE FINDERS NTF				DIRT						
				WEAR						
				DEFECT						
				WORK ERROR						
				OTHER						
NTF		ORIGINATING								
		TERMINATING								
		OTHER								
BY		CLEARED	TIME	DATE	WORKTIME	FMN CK	CODE			
BR		TO BC	1145	11-1-76	20M	TAK	8			

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

Fig. 16—"T" Ticket—NTF Originating

T	MEMO	SXS TROUBLE TICKET					O/S	TKT. NO.	EQUIPMENT			
✓		OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.	REF OUT			
		563,5	11-1-76	1315	K6	PSC	EB	A				
TEL. NO.		LINE EQPT.			ASSOC. EQPT./CA. PR.			APPARATUS RELAY SWITCH OTH. SPG. ASSY. BANK - WIPER WIRING MISC. CAUSE DIRT WEAR DEFECT WORK ERROR OTHER NTF ORIGINATING TERMINATING OTHER				
5-0563		17-42			14-112							
REPORT DETAIL												
CAN'T CALL 522					TEST							
NUMBERS					OK							
ACTION TAKEN												
52 TRK #8 FAILS ON CALL THRU TEST - REF'D TO G.S. AT 52 OFFICE - MADE BUSY AT R2-23, LOG'D IN TRUNK LOG. (BROKEN VERT. PAWL INC. SEL 302-119 AT 52 OFF)												
CLEARED		TIME	DATE	WORKTIME	FMN CK	CODE						
BY EB	TO K6	1335	11-1-76	20M	TAK	0						

A customer reports trouble calling the 522 office. The Plant Service Center tests no trouble and dispatches report to the central office. Investigation discloses trouble on trunk #8. The trunk is made busy, entered on trunk outage log, and referred to terminating office. Ticket is closed out to Plant Service Center. "Ref. Out" is recorded in the equipment space and ticket is filed in "Referred Out" bin of ticket file.

Fig. 17—"T" Ticket—Referred Out

T	MEMO ✓	SXS TROUBLE TICKET				O/S	TKT. NO. 7	EQUIPMENT
OFFICE 563,5	DATE 11-1-76	TIME 1410	REPT. BY SA #3	LOCATION Pos 14	RCVD. BY TF	REPT. CLS. -	MEMO	
TEL. NO. 3-2722	LINE EQPT. 10-16		ASSOC. EQPT./CA. PR.					
REPORT DETAIL TRACE "0" NC TRK #12							APPARATUS	
ACTION TAKEN TRACED AND REF'D TO S.A. #3							CAUSE	
BY TF TO SA #3							NTF	
CLEARED	TIME	DATE	WORKTIME	FMN CK	CODE			
TO SA #3	1420	11-1-76	10M	RNA	-			

MEMO TICKET (FRONT)

TRACING INFORMATION

EQUIP.	BAY/GRP.	SWITCH	LEVEL	TRK. TERM.
LF-PLS	10	1	1	6
SLS				
1st SEL	102	12	0	3
2nd SEL				
3rd SEL				
4th SEL				
5th SEL				
CONN.				
ROTS.				
RPTR.				
TRK.				
INC. SEL				
REGISTER TRUNK & LINK				
FR.	SWI.	HOR.	VER.	
	PRI.			
	SEC.			
TP	REG. NO.	RD		
		TT		
REF. TO	INITIALS	DATE	TIME	

REMARKS:

Traffic requests trace for identification of calling line.

MEMO TICKET (BACK)

Back of ticket used for recording equipment details.

Fig. 18—"Memo" Ticket—Traffic Trace

T ✓		MEMO		SXS TROUBLE TICKET				O/S	TKT. NO.	EQUIPMENT	
OFFICE		DATE		TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.	CONN.		
563,5		11-1-76		1430	KG	PSC	AM	A	3-82#1		
TEL. NO.			LINE EQPT.		ASSOC. EQPT./CA. PR.						
3-8267			27-63		17-322						
REPORT DETAIL								APPARATUS			
CBC - BDR								RELAY		✓	
TEST								SWITCH			
OK								OTH. SPG. ASSY.			
								BANK - WIPER			
								WIRING			
								MISC.			
ACTION TAKEN								CAUSE			
CONNECTOR TEST - #1 CONN. FAILED								DIRT		✓	
DIRTY CONTACT 3/4 TOP "K" RELAY								WEAR			
FOLLOW OK								DEFECT			
								WORK ERROR			
								OTHER			
CLEARED			TIME	DATE	WORKTIME	FMN CK	CODE	NTF			
BY AM TO KG			1445	11-1-76	15M	HLD	5	ORIGINATING			
								TERMINATING			
								OTHER			

A customer report of "can't be called" and "bell doesn't ring" results in finding a faulty contact in a connector relay. Contact follow is OK; therefore, "dirt" is scored as the cause. Apparatus and equipment are also recorded as above.

Fig. 19—"T" Ticket—Relay Dirt

T		MEMO		SXS TROUBLE TICKET				O/S	TKT. NO.	EQUIPMENT	
OFFICE		DATE		TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.			
563,5		11-1-76		1120			BR				
TEL. NO.			LINE EQPT.			ASSOC. EQPT./CA. PR.					
			37-114								
REPORT DETAIL									APPARATUS		
BROKEN TIP WIRE - HMDF											
ACTION TAKEN											
CLEANED LUG AND RECONNECTED WIRE											
Cleared			TIME	DATE	WORKTIME	FMN CK	CODE	NTF			
BY	TO										
BR		1125	11-1-76	5M	WGL	-					
									RELAY		
									SWITCH		
									OTH. SPG. ASSY.		
									BANK - WIPER		
									WIRING		
									MISC.		
									DIRT		
									WEAR		
									DEFECT		
									WORK ERROR		
									OTHER		
									ORIGINATING		
									TERMINATING		
									OTHER		

While working on a trouble (see Fig. 19) craftsperson noticed a broken wire on an adjacent line circuit. Craftsperson cleared this trouble as well as one reported on Figure 19. This memo ticket is made out by craftsperson to indicate work done and account for time spent. Memo tickets are not coded.

Fig. 20—"T" Ticket—Observed Trouble

T		MEMO		SXS TROUBLE TICKET				O/S	TKT. NO.	EQUIPMENT	
✓								✓	9	L.F.	
OFFICE		DATE		TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.	EQUIPMENT		
563,5		11-1-76		1830	ALM	LG-37	DS	D	LG 37-7		
TEL. NO.			LINE EQPT.			ASSOC. EQPT./CA. PR.					
REPORT DETAIL								APPARATUS	RELAY		
CALL BLOCK ALARM LF #7 - NO ROTARY									SWITCH		
									OTH. SPG. ASSY.		
									BANK - WIPER		
									WIRING		
								MISC.			
ACTION TAKEN								CAUSE	DIRT		
BROKEN ROTARY PAWL LF MADE BUSY - LOGGED IN EQUIP. OUT OF SERVICE LOG									WEAR		
									DEFECT		
									WORK ERROR		
									OTHER		
CLEARED			TIME	DATE	WORKTIME	FMN CK	CODE	NTF	ORIGINATING		
BY DS	TO		1835	11-1-76	5M	RWA	-		TERMINATING		
									OTHER		

Investigation of a call block alarm discloses a broken rotary pawl. Pending replacement, the line finder is made busy and ticket held for repair in pending file. When repair is made later, work details are entered on memo ticket ( See Fig. 22). "T" ticket may be coded to show trouble found if sufficient information is available when trouble report is investigated.

Fig. 21—"T" Ticket—Held for Repair

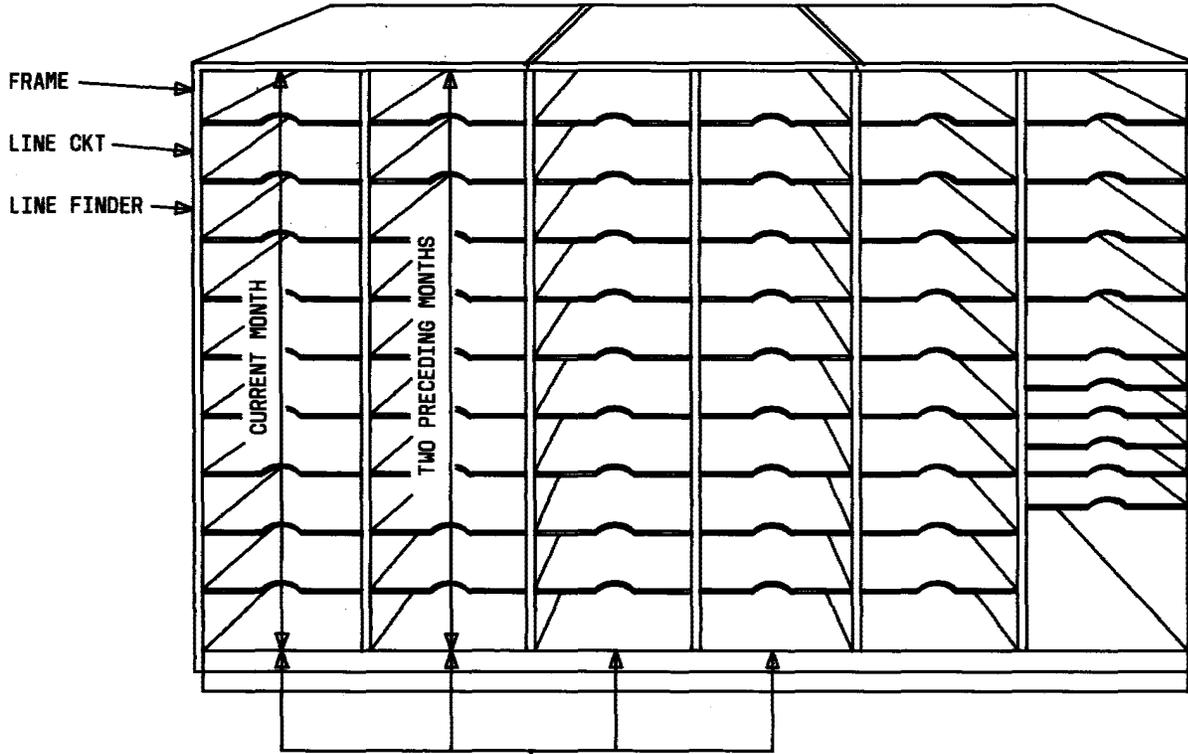
T	MEMO	SXS TROUBLE TICKET					O/S	TKT. NO.	EQUIPMENT		
	✓								MEMO		
OFFICE	DATE	TIME	REPT. BY	LOCATION	RCVD. BY	REPT. CLS.					
TEL. NO.	LINE EQPT.		ASSOC. EQPT./CA. PR.						RELAY		
REPORT DETAIL								APPARATUS	SWITCH		
L.G. 37 #7 BROKEN ROTARY PAWL (SEE TKT. No. 9)									OTH. SPG. ASSY.		
									BANK - WIPER		
									WIRING		
									MISC.		
ACTION TAKEN								CAUSE	DIRT		
REPLACED PAWL, TESTED, RELEASED FOR SERVICE. CLOSED OUT EQUIP. OUT OF SERVICE LOG.									WEAR		
									DEFECT		
									WORK ERROR		
									OTHER		
CLEARED		TIME	DATE	WORKTIME	FMN CK	CODE	NTE	ORIGINATING			
BY	OJ	TO	HG	0900	11-2-76	30M		HG	—	TERMINATING	
								OTHER			

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

Fig. 22—"Memo" Ticket—Repair

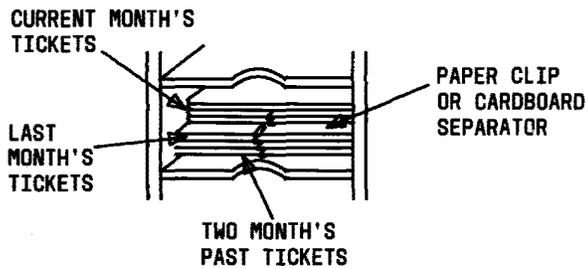


TICKET FILE



(SEE NOTE)

TWO SUGGESTED METHODS



NOTE:  
MAJOR ITEMS OF EQUIPMENT ARE:

- FRAME
- LINE CIRCUIT
- LINE FINDER
- LINE SWITCH
- 1ST SELECTOR
- 2ND SELECTOR
- 3RD SELECTOR
- 4TH SELECTOR
- 5TH SELECTOR
- TOLL SELECTOR
- CONNECTOR
- TRUNK
- REPEATER
- MISCELLANEOUS
- AMA/ANI

- NTF { ORIGINATING
- TERMINATING
- OTHER

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. 24—Ticket File

**SXS CONTROL RECORD**

OFFICE **(A) 563,5** PERIOD COVERED **(B) NOVEMBER** E-5462 (12-76)

(C) DATE	SERVICE (D)			TROUBLE REPORT TREND BY EQUIPMENT (E)															
	EQUIP. CODE 5 & 8	FRAME CODE 5	CODE 7	EQUIP. IRREG.	FRAME	LINE CKT.	LINE FDR	1ST SEL.	2ND SEL.	3RD SEL.	4TH SEL.	5TH SEL.	TOLL SEL.	CONN.	TRK.	RPTR.*	MISC.	AMA ANI	COIN ALARMS
OCT 23	1				0		0	0	1										
24	7				0		2	1	2										
25	14				1		2	2	2										
26	22				1		7 <sup>(G)</sup>	4	4										
27	29				4 <sup>(G)</sup>		11	6	4										
28	34				4			8	5										
29	37				5			9	5										
30	38				7			10	5										
31	46				9			11	7										
NOV 1	53				12 <sup>(G)</sup>			13	8										
2	59				13			15	9										
3	65				14			17	10										
4	70				14			19	12 <sup>(G)</sup>										
5	74				15			20											
6	76				16			22											
7	81				16			23											
8	85				17			23											
9	88				17			25											
10	92				18			26											
11	97				19			27											
12	99				19			28											
13	100				20			29											
14	105				20			30											
15	109				21			31											
16	112				22			33											
17	116				23			35											
18	122				24			36											
19	126				24			37											
20	128				26			39											
21	134				27			40											
22	138				28			41											
TOTAL	138				28			41											
10 DAYS	45	6			8			13	14	5									
20 DAYS	90	12			17			26	28	10									
TOTAL	135	18			26			39	43	15									

**A** - Office designation  
**B** - Report period  
**C** - Calendar dates included in report period  
**D** - Service indicators recorded cumulatively  
**E** - Daily "T" Ticket totals recorded cumulatively (\* Pulse Rptr. Only, Voice Rptrs. such as "E" and "V" types are recorded as Misc.)  
**F** - Partial and total month objectives  
**G** - Examples of significant variations, pertinent facts are recorded under "Remarks"

Fig. 25—SXS Control Record (Front)—Form E-5462

SXS CONTROL RECORD

E-5462 (12-76)

A DATE	B NTF			SPECIAL STUDIES AND/OR COMMON CONTROL DATA						D REMARKS:	
	ORIG.	TERM.	OTHER	LINE SW	C						
1											① 3 TBL'S. - 4PTY. REGRUUPS-ASSGNM'T ERRORS
5											② WIPER TBL. - INEXPERIENCED CRAFT ACTIVITY - TRAINING RESUMED
10											③ SOLDER SPLASHES, CLIPPINGS, ETC. - FRAME VACUUM CLEANED - TRAINING & QUALITY INSPECTIONS INCREASED.
15											④ V.O.N. SPG. ASSY. WEAR - SAMPLED - RECONDITIONING STARTED 11-8
20											⑤ OBJ. CHANGED DOWNWARD DUE TO "E" RELAY RECONDITIONING COMPG 8-25
25											
30											
31											
	TOTAL										
	OBJ.	10 DAYS									
		20 DAYS									
		TOTAL									

- A - Calendar dates included in report period
- B - Daily "T" Ticket totals recorded cumulatively by "Orig.," "Term" or "Other"
- C - Spaces provided to record data for locally selected indicators or common control performance data
- D - Information pertaining to trends and major deviations
- E - Partial and total month objectives

E-5462 (12-76) (BACK)

Fig. 26—SXS Control Record (Back)—Form E-5462



TROUBLE SUMMARY

Office 563,5

Period Covered 1976

EQUIPMENT	AVG PREV. YEAR	CUR OBJ	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
FRAME	38	26	27	32	43 <sup>①</sup>	32	27	22	20	21	23	26	28		
LINE CKT															
LINE FINDER	42	39	41	44	46	49 <sup>②</sup>	40	39	35	34	39	42	40		
1 <sup>ST</sup> SELECTOR	49	43 <sup>⑤</sup>	48	49	48	50	51	59	51	46	42	40	41		
2 <sup>ND</sup> SELECTOR															
3 <sup>RD</sup> SELECTOR															
4 <sup>TH</sup> SELECTOR															
5 <sup>TH</sup> SELECTOR															
TOLL SELECTOR															
CONNECTOR															
TRUNK															
REPEATER															
MISCELLANEDUS															
AMA/ANI															
COIN ALARMS															
LINE SWITCH															
NTF-ORIG															
NTF-TERM	27	22	21	23	28	36	43 <sup>③</sup>	34	23	20	24	25	23		
NTF-OTHER															



(A) OFFICE <u>563,5</u>		SXS TROUBLE TALLY SHEET												(B) PERIOD COVERED <u>MAY 1976</u>			
(C) EQUIPMENT		(D)												(G) TOTAL			
CONNECTORS		3-02	3-14	3-43	3-44	3-45	3-46	3-47	3-83	5-19	5-48	5-64	5-82	5-94			
RELAY	DIRT	1		11	1	111	11	1	1					1			(14)*
	WEAR		1								1						2
	DEFECT	1															1
	WORK ERROR												1				1
	OTHER																
SWITCH	DIRT					1		1									2
	WEAR																
	DEFECT						1		1		1						3
	WORK ERROR																
	OTHER																
OTHER SPG. ASSY.	DIRT		1	1	1	11	1	1									(5)*
	WEAR									1							1
	DEFECT																
	WORK ERROR																
	OTHER																
BANK WIPER	DIRT			11	111	111	111	11									(15)*
	WEAR				1	11											3
	DEFECT									1		1					2
	WORK ERROR																
	OTHER																
WIR-ING	WORK ERROR								1								1
	OTHER																
MISC.	DIRT																
	WEAR																
	DEFECT																
	WORK ERROR																
	OTHER																
NTF	ORIGINATING																
	TERMINATING					1	1										2
	OTHER																
TOTAL (F)		2	2	5	6	14	10	5	2	2	2	2	1	1			54

- A Office designation
  - B Period covered by tickets tallied
  - C Equipment group under scrutiny
  - D Frame, Bay, Equipment Number
  - E Determine "Apparatus" and "Cause" or "NTF" from trouble ticket and tally in appropriate space under equipment heading. Comparison with a previous period of equal time may be made by using a different color or column on the same sheet (Not illustrated).
  - F Total troubles by equipment heading
  - G Total troubles by apparatus and cause or NTF classification
- \* See Item 3 of Fig. 33 Remarks.

Printed in U. S. A.

Fig. 30—SXS Trouble Tally Sheet—Form E-5464

TEST AND INSPECTION WORK ORDER AND RECORD

E-5452 (6-68)

OFFICE 563,5

ASSIGNMENT OR JOB NO. 1:

ASSIGNMENT DATA				PROGRESS REPORT							
U.S.P. NO. <u>286-305-503</u> TEST LETTER OR PAR. <u>TEST A</u>				DATE	FROM EQPT. UNIT		TO EQPT. UNIT		TIME SPENT (MINUTES)	BY	
EQUIPMENT <u>LOCAL SELECTORS</u>								TEST	REPAIR		
WORK DESCRIPTION <u>SAMPLE</u> <u>SELECTOR OPERATION TEST</u>				<u>1-3-76</u>	<u>101</u>	<u>1</u>	<u>102</u>	<u>160</u>	<u>55</u>		<u>TM</u>
				<u>1-4-76</u>	<u>101</u>	<u>1</u>	<u>102</u>	<u>160</u>	<u>275</u>	<u>175</u>	<u>TM</u>
				<u>1-5-76</u>	<u>102</u>	<u>47</u>	<u>102</u>	<u>116</u>	<u>10</u>	<u>20</u>	<u>TM</u>
FROM EQPT. UNIT		TO EQPT. UNIT		TOTAL UNITS	SHIFT				<u>340</u>	<u>195</u>	
<u>101</u>	<u>1</u>	<u>102</u>	<u>160</u>	<u>SAMPLE</u> <u>48</u>	<u>DAY</u>						
ASSIGNED TO		TO BE STARTED		TO BE COMPLETED							
<u>TM</u>		<u>1-3-76</u>		<u>1-7-76</u>							
<u>UNIVERSE-320 USED TABLE B Col. 1 WORK RECORD REJ. THRESHOLD - (3)</u>											
EQPT. UNIT		TROUBLE APPEARANCE				ACTION TAKEN				REPAIR TIME	BY
<u>101</u>	<u>2</u>	<u>NTF</u>									
	<u>13</u>	<u>NTF</u>									
	<u>35</u>	<u>FAILS Dig. ABSORB - LEV. 5</u>				<u>ADJ. N.P. CAM. SPRG. ASSEMBLY</u>				<u>15M</u>	<u>TM</u>
	<u>43</u>	<u>NTF</u>									
	<u>45</u>	<u>NTF</u>									
	<u>49</u>	<u>NTF</u>									
	<u>63</u>	<u>NTF</u>									
	<u>64</u>	<u>NTF</u>									
	<u>78</u>	<u>NTF</u>									
	<u>81</u>	<u>NTF</u>									
	<u>93</u>	<u>NO RLSE - LEV. 6</u>				<u>CLEANED &amp; ADJ. V.D.N.</u>				<u>10M</u>	<u>TM</u>
	<u>100</u>	<u>NTF</u>									
	<u>106</u>	<u>NTF</u>									
	<u>118</u>	<u>NTF</u>									
	<u>119</u>	<u>NTF</u>									
	<u>132</u>	<u>NTF</u>									
	<u>136</u>	<u>NTF</u>									
<u>101</u>	<u>140</u>	<u>NTF</u>									

TOTAL TROUBLE APPEARANCES 2

NO. SHEETS 2 SHEET NO. 2

Fig. 31—Test and Inspection Work Order and Record for Sampling

TEST AND INSPECTION WORK ORDER AND RECORD

E-5452 (6-68)

OFFICE 563,5

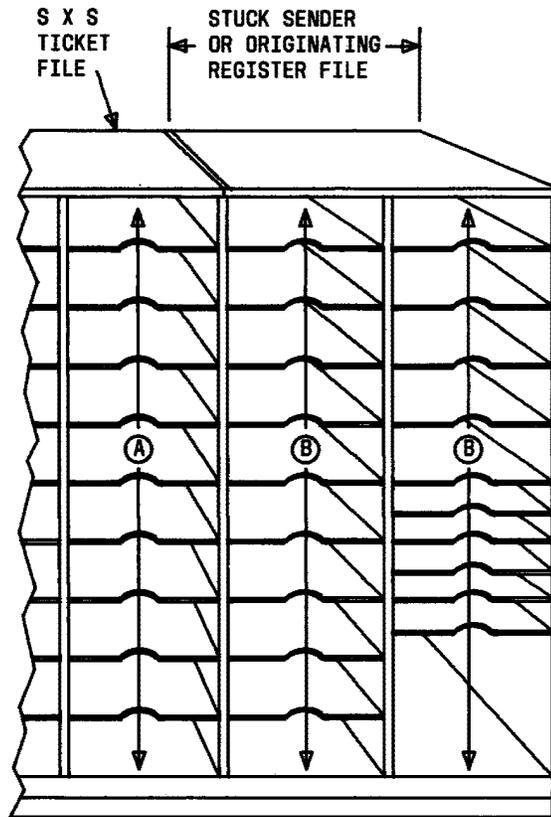
ASSIGNMENT OR JOB NO. 1

ASSIGNMENT DATA					PROGRESS REPORT					
B.S.P. NO. TEST LETTER OR PAR.					DATE	FROM EQPT. UNIT	TO EQPT. UNIT	TIME SPENT (MINUTES)		BY
EQUIPMENT								TEST	REPAIR	
LOCAL SELECTORS										
WORK DESCRIPTION					ALL TIME POSTED ON 1ST SHEET					
ACTION REQUIRED DUE TO SAMPLING										
FROM EQPT. UNIT		TO EQPT. UNIT		TOTAL UNITS		SHIFT				
101	1	102	160							
ASSIGNED TO		TO BE STARTED		TO BE COMPLETED						
TM		1-4-76		1-7-76						
WORK RECORD										
EQPT. UNIT		TROUBLE APPEARANCE			ACTION TAKEN			REPAIR TIME	BY	
101	37	FAILS LP & LK			ADJ & C.F.D "A" RELAY			10M	TM	
	48	POOR ROTARY STEPPING			ADJ & C.F.D "E" RELAY			15M		
	62	FAILS LP & LK			ADJ. & C.F.D "A" RELAY			10M		
	135	" " "			" " " "			10M		
	141	FAILS DIG ABSORB-LEV.5			REPLACED N.P. CAM			20M		
101	152	POOR RLSE-DEF. T&R WIPERS			REPLACED & ADJ			25M		
102	7	POOR VERT. STEPPING			REPLACED "A" RELAY			40M		
	22	FAILS LP & LK			ADJ. & C.F.D "A" RELAY			10M		
	47	" " "			" " " "			10M		
102	116	" " "			" " " "			10M		
4 TROUBLES FOUND ON SAMPLE. ACTION REQUIRED ON BOTH BAYS THIS SHEET ISSUED WITH MINIMUM INFORMATION FOR ADDITIONAL TROUBLES FOUND ON MANDATORY 100% TESTING										

TOTAL TROUBLE APPEARANCES 10

NO. SHEETS 2 SHEET NO. 2

Fig. 32—Test and Inspection Work Order and Record for Sampling



NOTE:  
A-MAJOR EQUIPMENT GROUPS  
B-TRUNK GROUPS (SHOW OFFICE CODE  
OR NAME OF TRUNK GROUP)

Fig. 33—Stuck Sender or Originating Register Ticket File

STUCK SENDER TALLY SHEET

FORM E-5477  
(6-67)

OFFICE \_\_\_\_\_

PERIOD \_\_\_\_\_

SENDER		TALLY	SENDER		TALLY
FR	SDR		FR	SDR	

Fig. 34—Stuck Sender Tally Sheet—Form E-5477

**TABLE A**  
**FORM DESCRIPTIONS**

FORM	TITLE	SIZE (INCHES)	PAPER STOCK	MARGIN/PUNCH
E-4255	Trunk Outage Log	8-3/8 x 10-7/8	Bond	None
E-4744	Register Reading	11 x 17	Bond	None
E-5450	Equipment Test List	8-3/8 x 10-7/8	Bond	Right/7-hole
E-5451	Preventive Maintenance Schedule	11 x 17	Bond	Standard/7-hole
E-5452	Test and Inspection Work Order and Record	8-3/8 x 10-7/8	Bond	Standard/7-hole
E-5453	Test and Inspection Summary	8-3/8 x 10-7/8	Bond	Standard/7-hole
E-5454	Test and Inspection Summary	5 x 8	Card	None
E-5455	Test and Inspection Summary	11 x 17	Bond	Standard/7-hole
E-5457	Central Office Log	8-3/8 x 10-7/8	Bond	None
E-5461	Trouble Ticket	3-1/2 x 6-1/2	White Paper	None
E-5462	Control Record	8-3/8 x 10-7/8	Bond	None
E-5463	Trouble Summary	8-3/8 x 10-7/8	Bond	None
E-5464	SXS Trouble Tally Sheet	8-3/8 x 10-7/8	Bond	Standard/7-hole
E-5477	Stuck Sender Tally Ticket	8-3/8 x 10-7/8	Bond	None

TABLE B

## REPORT CLASSIFICATIONS—TROUBLE TICKETS

The major sources of trouble reports are assigned the following alphabetical designations for ease in identifying report sources on trouble tickets.		
TYPE OF TICKET	REPORT CLASS	REPORT SOURCE
T	A	Plant Service Center or Testboards
T	B	Traffic Department
T	C	Sender or Originating Register
T	D	Alarm
T	E	Trouble Recorder, Trouble Indicator, Tbl. Ticketer
T	J	Other Office or Other Sources of Report
Memo	No Class	All "Memo" Tickets

TABLE C

CODING "T" TICKETS – EQUIPMENT AND APPARATUS

TROUBLE CODING SPACES	SITUATIONS
<u>Equipment</u>	Enter equipment, frame, and number for cases of found trouble and for cases where trouble disappears. If equipment is not determined or no trouble is tested enter NTF. Enter Ref. Out (Referred Out) when trouble report is referred to another office, PSC, or testboard.
<u>Apparatus</u>	Score one cause for each case of found trouble.
	Relay      Score "relay" for all troubles caused by relay failures.
	Switch      Score "switch" for troubles caused by failures in switch mechanisms.
	Oth. Spg. Assy      Score "other spg. assy." for troubles caused by failures in spring assemblies such as 11th rotary step, vertical off-normal, etc.
	Bank Wiper      Score "bank wiper" for troubles located in banks, other than wiring, and troubles caused by wiper failures.
	Wiring      Score "wiring" for loose connections, opens, crosses, transpositions, or low insulation resistance, either in wiring, cabling, or between wiring terminals. Includes cases where solder or wire clippings cause short circuits, grounds or crosses. Also includes troubles caused by missing, open, crossed, grounded, transposed, or left-in cross-connection.
	Misc.      Score "misc." (miscellaneous) for troubles that cannot be assigned to one of the above apparatus categories, ie, lamps, transformers, Electron Tubes, capacitors, resistors, etc.

**TABLE D**  
**CODING "T" TICKETS – CAUSE**

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

**TABLE E**  
**CODING "T" TICKETS – NTF**

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

**TABLE F**  
**SAMPLE SELECTION TABLE**

UNIVERSE SIZE	SAMPLE SIZE	REJECTION THRESHOLD
Below 48	ALL	
48 to 54	13	1
55 to 64	14	1
65 to 89	14	1
90 to 138	24	2
139 to 232	33	3
233 to 320	44	4
321 to 360	50	5
<p>The universe sizes illustrated "fit" to the typical SXS central office maintenance application. When the universe size is different from any of the sizes shown above, use a sample size for the nearest universe size in the table. NOTE: 320 is the maximum universe size that may be used.</p>		

TABLE G  
RANDOM NUMBER TABLE-1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(A)	008	054	242	188	006	123	040	273	317	023	135	190
	074	357	035	292	083	034	304	300	156	159	113	096
	063	309	101	117	329	206	053	153	091	015	046	033
	151	034	104	288	228	009	197	081	204	020	250	303
	244	301	107	168	346	165	269	359	356	151	182	184
	072	302	311	326	082	141	259	112	215	275	104	043
	056	017	109	040	179	223	098	121	255	244	198	215
	131	227	107	318	173	191	103	161	106	084	190	214
	127	333	358	321	226	319	085	080	316	016	339	331
	355	077	240	342	062	065	110	159	038	167	198	124
	259	289	062	234	197	198	217	124	283	078	070	020
	108	044	044	045	279	117	236	030	134	359	360	220
	106	222	029	062	252	282	046	232	301	315	243	046
	134	019	307	356	007	297	241	072	340	311	229	230
(B)	067	333	326	318	347	011	296	330	080	205	122	327
	115	301	069	049	351	079	056	017	181	294	078	091
	112	055	223	010	327	127	080	002	064	170	184	139
	057	070	133	163	278	096	085	132	059	276	304	037
	076	137	005	114	205	036	187	241	095	338	087	082
	240	241	321	189	218	360	297	041	226	349	048	093
	092	307	331	054	127	183	139	248	227	001	096	129
	091	214	113	035	042	044	113	159	012	294	170	097
	087	141	290	267	158	355	263	183	231	213	233	235
	341	301	212	261	119	295	129	188	266	245	245	233
(C)	089	271	346	349	248	148	154	260	277	067	093	254
	017	139	301	295	020	300	349	247	043	031	111	074
	271	259	192	102	231	219	340	282	118	187	207	136
	291	152	041	008	085	316	036	174	345	167	140	015
	131	096	076	304	207	216	306	039	110	047	274	307
	347	217	292	280	260	268	290	310	005	072	060	166
	186	119	009	158	222	276	026	012	053	116	014	145
	331	058	097	059	296	025	090	233	036	317	360	195
	228	330	284	316	069	266	350	120	140	308	036	279
	240	132	353	204	342	283	113	176	059	081	328	097
(D)	066	137	294	172	359	228	319	159	347	284	302	200
	275	034	140	274	024	250	344	123	012	320	118	223
	175	122	033	012	344	077	163	080	060	352	238	156
	284	287	348	017	323	020	335	030	051	235	346	323
	060	196	302	146	313	244	023	193	211	063	268	152
	098	162	046	192	105	329	173	315	073	307	360	197
	346	209	316	251	322	106	323	146	209	204	290	066
	275	359	202	049	357	088	022	271	256	065	094	258
	177	328	016	187	005	302	259	191	058	066	204	242
	067	220	111	264	192	047	249	136	338	187	354	112
(E)	312	309	081	257	292	166	195	162	270	006	147	129
	059	063	314	090	075	003	273	018	265	354	166	023
	263	238	156	118	086	111	078	038	001	068	266	254
	256	048	071	087	132	317	115	356	258	131	345	337
	001	033	252	026	078	310	248	340	055	239	153	136
	058	089	061	239	287	001	215	324	066	062	138	124
	219	073	283	048	129	176	300	353	071	115	111	281
	004	236	192	014	193	222	032	189	233	018	277	273
	317	353	087	165	281	065	189	071	063	255	144	131
	169	181	303	050	020	060	041	095	135	086	143	160
(F)	248	100	065	038	032	064	330	157	190	033	215	130
	237	345	026	290	120	283	168	002	053	071	005	042
	320	153	141	079	168	116	006	013	018	021	281	031
	027	313	352	148	056	326	219	145	174	213	284	081
	111	210	322	291	164	185	237	089	296	091	034	226
	109	103	270	015	296	303	279	194	008	043	109	057

TABLE H  
RANDOM NUMBER TABLE-2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(A)	260	339	103	340	010	315	049	117	101	035	187	155
	320	281	088	275	273	299	038	224	192	208	297	142
	190	237	048	131	131	008	177	329	330	217	246	239
	143	067	083	156	284	173	215	314	118	094	321	042
	035	140	038	209	133	283	137	235	180	056	290	135
	063	249	007	076	339	217	114	119	047	275	124	281
	310	327	070	174	009	279	231	015	100	299	179	350
	346	125	080	203	098	088	286	262	135	008	010	177
	274	016	008	066	226	092	152	161	301	027	079	090
	320	118	016	138	083	332	271	296	350	029	023	107
(B)	346	124	135	046	185	189	269	171	334	020	055	015
	043	180	339	275	131	222	292	201	274	059	098	023
	118	245	053	181	234	353	221	309	194	308	167	049
	217	243	147	283	226	174	182	076	103	235	280	013
	203	032	304	254	195	181	351	160	358	035	052	331
	189	309	075	082	014	145	258	093	243	057	353	011
	186	256	353	167	144	107	016	092	206	171	302	186
	153	104	314	204	235	265	129	120	086	292	212	165
	243	332	198	136	178	249	290	119	038	210	113	238
	337	221	271	003	146	166	339	160	241	335	028	129
(C)	162	062	215	186	183	004	176	201	257	190	315	015
	013	005	318	237	311	136	167	351	193	321	324	114
	140	317	057	095	227	083	091	241	142	011	083	350
	334	105	116	158	070	259	237	233	347	113	059	082
	319	145	330	236	305	223	331	063	056	240	245	341
	100	288	297	223	087	221	261	113	233	163	359	311
	078	246	038	074	271	137	291	301	232	032	162	059
	081	324	160	276	166	045	043	094	204	351	020	017
	231	019	192	073	352	201	207	268	088	251	010	162
	208	007	112	214	084	236	310	329	329	159	331	152
(D)	106	345	218	318	116	265	088	033	263	253	101	305
	252	142	298	120	192	219	234	158	230	360	121	136
	119	148	308	036	315	260	331	318	226	051	018	208
	045	326	285	039	122	079	346	197	143	233	291	298
	093	279	128	359	212	103	166	173	284	121	185	171
	136	185	036	267	050	319	164	058	340	093	123	210
	140	026	321	050	219	347	297	347	345	223	068	298
	335	265	021	236	059	244	010	089	232	168	130	065
	172	050	022	216	037	264	333	281	003	263	274	050
	188	222	017	227	287	111	343	097	144	091	225	248
(E)	239	093	045	182	031	357	182	211	289	012	141	319
	049	186	046	309	311	230	079	022	102	150	269	056
	064	193	232	040	146	350	108	062	299	148	037	270
	311	073	274	176	324	337	163	024	119	343	126	314
	345	041	203	031	273	193	238	116	347	302	336	149
	201	355	086	261	181	330	320	040	314	244	109	241
	268	037	043	196	327	360	035	115	229	134	015	081
	247	349	312	238	219	104	174	109	321	018	040	004
	194	154	140	098	047	219	216	336	068	326	084	211
	132	195	298	080	342	001	099	285	319	223	082	005
(F)	281	189	353	054	047	166	237	250	339	241	258	090
	193	182	292	259	333	293	209	007	117	114	106	177
	002	214	085	150	205	067	026	027	002	279	113	099
	218	275	199	114	324	108	220	041	261	296	295	034
	255	177	138	282	041	328	096	245	125	137	131	079
	154	158	335	024	332	304	141	332	164	203	321	110
	060	127	105	094	225	057	107	213	066	313	282	025
	121	233	169	167	358	077	121	064	354	305	024	189
	285	267	340	037	315	310	335	153	041	028	307	251
	088	163	174	127	215	138	289	202	243	036	158	110

TABLE I  
RANDOM NUMBER TABLE-3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(A)	307	350	126	006	016	228	074	186	113	003	276	038
	328	028	297	189	148	357	049	281	205	291	292	260
	125	352	294	285	205	107	358	278	185	295	212	312
	232	328	132	284	141	041	124	192	192	015	245	003
	030	039	117	276	002	031	344	222	257	094	200	146
	233	254	257	141	081	114	339	096	134	067	316	304
	300	145	026	214	197	077	242	114	003	150	105	262
	088	074	215	087	299	179	029	222	151	241	151	045
	284	261	033	041	102	045	251	131	332	195	101	092
	108	082	158	128	153	188	277	069	248	159	149	080
	119	089	348	278	335	164	093	051	088	312	103	022
	135	224	035	208	165	198	124	348	148	082	119	249
	306	101	120	317	077	152	056	286	257	275	019	162
(B)	223	291	227	298	228	166	120	325	022	086	123	074
	156	179	339	107	223	028	270	049	019	291	104	171
	016	159	351	187	007	243	077	278	173	239	220	331
	243	031	071	156	271	062	111	148	064	229	158	230
	316	332	131	018	098	106	313	205	260	164	127	048
	356	328	164	137	350	154	157	157	241	161	309	091
	031	196	228	344	153	153	318	265	099	172	323	133
	299	137	081	006	288	221	056	275	250	202	205	349
	167	144	341	303	131	237	332	266	260	011	072	212
	247	349	024	082	352	334	320	204	313	051	242	257
(C)	020	284	310	258	041	189	231	322	136	163	089	316
	159	054	195	270	055	288	048	251	304	014	169	075
	080	156	290	317	254	176	102	141	331	133	060	270
	214	086	112	264	196	315	044	173	060	136	331	019
	269	291	269	165	226	201	032	195	323	237	272	081
	103	335	334	268	288	130	163	070	181	290	025	067
	334	212	026	234	160	292	021	314	131	035	055	017
	130	167	250	249	246	324	024	155	255	242	172	247
	285	057	063	022	259	228	214	144	278	100	163	083
	089	038	238	347	267	254	289	075	271	030	312	168
	096	054	264	258	082	321	010	097	256	318	279	294
(D)	019	246	341	231	118	259	139	266	033	317	053	171
	222	282	261	071	101	186	114	116	106	133	114	252
	025	138	100	120	107	091	231	259	314	254	009	108
	187	275	059	330	188	246	292	043	128	217	251	280
	192	335	038	304	299	296	087	313	238	229	157	202
	276	209	145	306	174	151	175	253	325	024	005	067
	293	090	266	010	348	165	003	176	084	092	084	212
	235	137	006	033	089	050	197	177	234	140	211	076
	119	179	250	144	117	332	256	172	196	194	010	249
(E)	095	273	152	189	339	287	006	284	001	198	262	079
	087	213	316	310	308	012	337	253	263	068	130	214
	190	311	255	307	044	190	349	192	044	016	306	194
	245	240	314	001	120	216	286	159	343	345	305	237
	227	142	052	337	185	132	241	084	204	050	154	053
	293	223	303	288	357	042	147	251	231	119	309	032
	249	224	204	287	125	123	280	355	357	117	185	075
	099	307	136	147	180	190	073	354	341	166	148	198
	340	170	355	309	244	013	061	218	250	246	017	126
	060	153	296	299	112	298	073	337	244	165	328	020
	111	094	157	069	022	342	182	135	033	102	238	182
(F)	143	350	018	287	055	039	329	004	300	237	113	350
	134	167	124	239	195	183	282	130	305	317	056	337
	253	033	102	024	188	097	225	252	202	283	032	098
	121	067	169	297	181	063	127	141	186	298	002	260
	042	238	008	359	054	338	265	267	088	028	086	290
	064	265	053	107	290	178	201	295	272	334	283	234

TABLE J  
RANDOM NUMBER TABLE-4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(A)	224	179	059	211	232	332	333	195	159	122	251	310
	222	182	324	208	205	320	085	123	076	265	037	217
	033	079	150	034	149	279	262	232	276	217	171	174
	246	073	276	158	229	145	168	207	254	320	189	313
	102	213	123	273	109	177	287	033	118	231	107	263
	129	264	002	219	169	322	254	217	110	192	326	273
	188	307	052	280	274	222	331	355	239	163	087	285
	184	149	191	295	042	264	195	053	143	200	096	271
	070	143	299	298	068	097	281	308	220	294	324	295
	128	121	026	288	289	081	070	179	270	078	328	268
	154	187	249	240	148	043	199	191	351	257	155	218
	015	105	020	352	093	313	010	360	271	003	293	067
	264	159	213	259	266	090	286	269	189	225	092	034
	332	344	104	007	104	328	191	245	090	179	135	122
(B)	212	033	187	342	209	228	192	326	272	224	095	082
	163	015	208	047	028	100	213	133	026	082	278	343
	072	245	149	189	279	025	156	298	223	193	225	163
	179	327	146	326	196	056	167	257	216	230	221	181
	183	061	049	323	352	227	068	187	129	331	061	145
	133	327	066	181	329	261	138	037	110	178	304	006
	140	298	334	307	282	299	125	019	276	178	048	340
	079	003	360	157	003	268	155	084	004	318	039	114
	247	077	152	331	285	065	176	151	312	058	300	017
	142	079	070	187	122	007	233	098	203	227	113	214
(C)	210	310	231	118	034	358	343	241	351	222	123	115
	119	319	297	311	309	184	141	074	345	337	337	186
	063	260	172	315	124	297	198	032	012	040	001	130
	276	110	317	283	098	071	018	160	113	066	347	203
	260	122	285	031	143	126	227	080	317	034	275	209
	041	268	288	234	308	242	337	059	249	250	087	160
	147	335	114	303	262	047	307	265	038	283	161	293
	225	097	044	064	227	240	338	188	287	275	360	104
	116	096	232	209	341	144	099	280	184	264	110	169
	001	194	277	271	130	180	016	265	014	058	021	055
(D)	070	186	232	145	180	354	058	045	181	120	173	127
	115	148	157	055	094	125	249	228	294	111	018	007
	166	053	116	019	156	049	346	024	336	058	059	054
	320	096	115	008	336	244	128	304	073	320	253	236
	323	325	233	347	302	175	062	216	087	178	166	302
	078	103	269	257	061	054	052	039	275	179	009	350
	209	271	139	322	169	317	263	068	295	047	239	269
	195	167	011	162	114	128	325	126	130	072	075	088
	087	086	351	208	023	277	094	286	174	242	192	142
	138	083	010	073	128	262	085	282	308	302	301	011
(E)	072	202	173	106	069	056	126	330	033	270	356	316
	106	007	114	332	135	229	208	098	046	119	226	277
	063	133	143	147	254	036	168	150	030	322	099	173
	137	306	338	153	236	176	023	151	334	047	190	293
	018	344	055	077	338	096	160	085	145	153	301	045
	044	133	253	011	127	048	064	354	236	294	335	203
	193	304	272	219	322	296	064	291	223	013	071	052
	272	250	054	274	350	317	045	137	051	348	078	157
	137	161	340	201	176	199	195	219	220	009	329	243
	026	026	345	206	012	168	061	198	107	132	006	117
(F)	221	085	175	349	210	060	136	068	155	319	134	012
	101	342	184	083	257	163	249	192	078	091	180	199
	305	088	273	326	100	304	036	318	062	119	076	236
	176	252	210	358	332	289	345	120	108	095	130	174
	066	055	258	321	089	190	219	134	302	203	360	285
	101	201	337	150	010	058	224	238	220	151	193	312