FUNDAMENTALS OF MAINTENANCE ADMINISTRATION
COMMUNITY DIAL OFFICES

OBJECTIVE — EFFICIENT MAINTENANCE

WHY? — Well, the time and money spent on CDO maintenance obviously must be used for ***OUR*** best interests and those of ***OUR*** customers.

An unnecessary or unproductive maintenance procedure is a useless expenditure of operating money. If you hope to spend your maintenance dollar according to demonstrated need, productively and wisely — read on.

HOW? — This section and the two following ones describe an analysis plan which with your interested cooperation, can help you spend maintenance money in the best way you can. At the same time, customers will appreciate the service benefits.

There are many words, pictures and ideas in the following pages. They have been tested and tried in field trials by people with field experience. The results have been encouraging enough to recommend the plan for your use. Wouldn't you like to find out what it's all about and give it intelligent and enthusiastic adoption?

CONTENTS

1. GENERAL

1.01 This section describes the general concepts and procedures to be considered in the administration of maintenance of all types of community dial offices. It reviews maintenance objectives, service, the factors which cause and influence trouble, maintenance effort, types of records, qualitative maintenance and planned administration.

1.02 The table of contents is provided for reference purposes. The particular subjects involved, and their interrelationship are shown by block diagram on Fig. 1.

2. SERVICE

2.01 Service is the ability of community dial offices to function in a manner which will provide rapid and trouble free communications. The purpose of switching systems is to enable a customer to originate, and satisfactorily converse over a connection with another customer.

2.02 The provision of good service by the equipment is affected by: equipment failure to perform designed function, human failure, or equipment being unavailable.

(a) The introduction or development of trouble conditions such as worn or dirty contacts, insulation breakdowns, broken wires, etc, result in equipment failures.

(b) Human failure may be due to customers, or Company personnel. Failures on the part of customers are usually in the form of incorrect or partial dialing, leaving the receiver off the hook, etc. Company personnel errors usually result in troubles due to improper adjustment, dirt, open, short, crossed,

CDO ADMINISTRATION

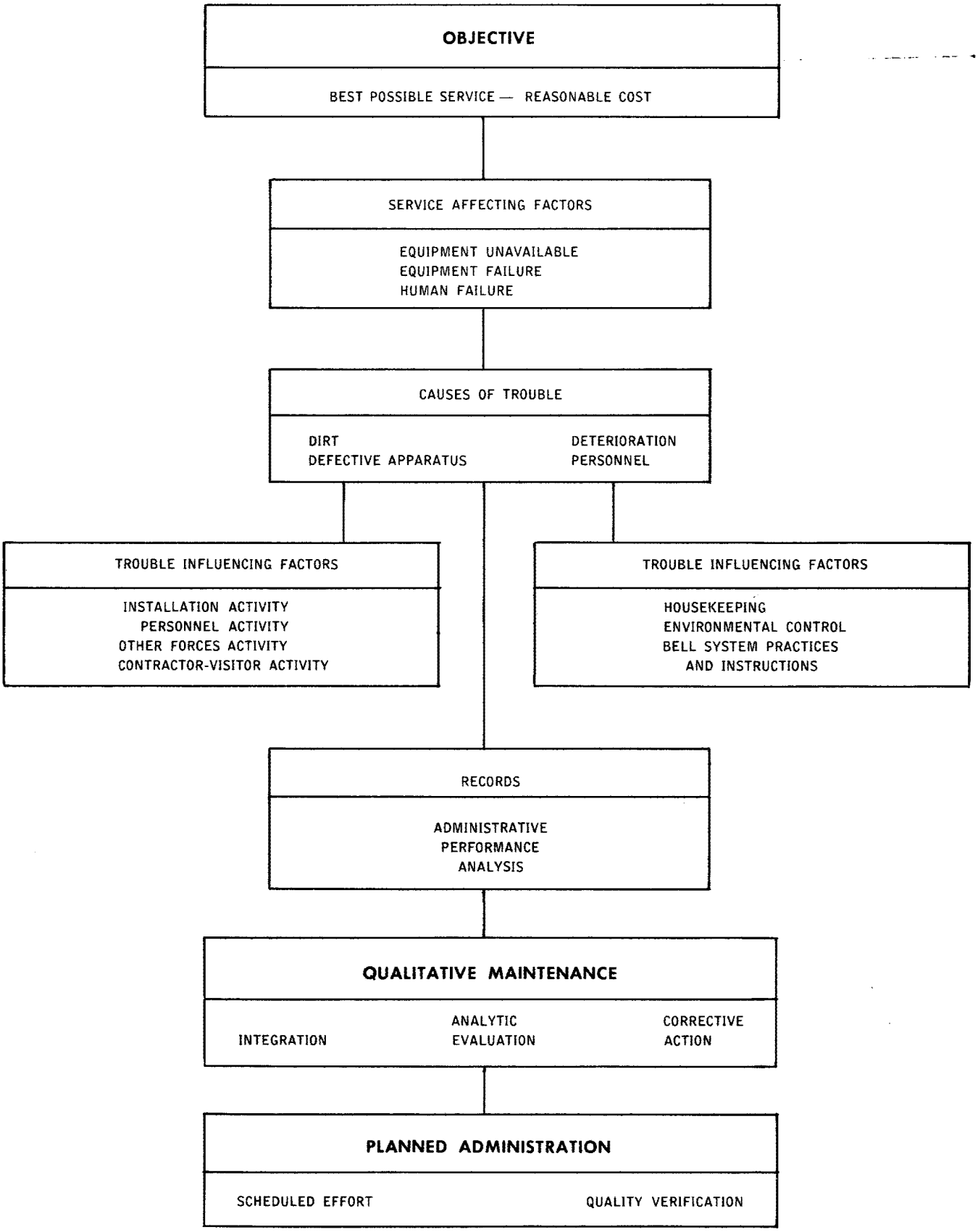

Fig. 1

or incorrect wiring, etc. These failures result in circuits and equipment being unnecessarily out of service.

(c) Equipment may not be available for the completion of a customer's call for a number of reasons. For example, during periods of unusual load, the required equipment may be busy for periods of time; therefore, it is unavailable to handle all offered traffic. In other cases, due to growth, equipment may not be available in sufficient quantities to carry normal loads. In addition, equipment may be in trouble, or removed from service for other reasons and, therefore, not available to handle the offered load.

3. CAUSES OF TROUBLE

3.01 The failure of equipment to perform properly is usually caused by trouble originating from one or a combination of the following sources.

3.02 ***Dirt*** — There are two general sources of dirt. The first develops from outside sources, usually sand, grit, vegetable matter (pollen or seeds) or combustion residues, such as soot, cinders, and gases. The second usually develops within the building or office. This dirt can come from the following:

(1) Textile fibers and dust from clothing and shoes.

(2) Handling of papers.

(3) Textile fibers and dust produced as a result of wear and aging of equipment.

(4) Handling, storing, packing and unpacking of material, particularly during installation periods.

(5) Installation or other maintenance activity which produces dirt from textile fibers, cabling, and general activity.

3.03 ***Deterioration*** — Normal wear, due to the operation of relays, switches, brushes, etc, results in progressive deterioration. It can be accelerated by dirt and poor workmanship. Therefore, the relation of these items to deterioration should be fully appreciated, and administrative procedures should be such as to minimize their effects.

3.04 ***Personnel*** — Trouble caused by Company personnel may be due to insufficient job knowledge, lack of a full appreciation of maintenance objectives, or careless workmanship. Trouble caused by other personnel is usually due to a lack of appreciation of the causes of trouble, and its effects upon service. Failures may appear as one or a combination of the following: dirt, solder splashes, loose connections, broken wires, connections to incorrect terminals, removal of heat coils, removal of cross connections in error, failure to make adjustments or tests in accordance with Bell System Practices, poor records, failure to restore equipment to service after testing, etc.

3.05 ***Defective Apparatus*** — The troubles caused by premature failure of apparatus components have been minimized by careful design and high manufacturing quality requirements.

4. TROUBLE INFLUENCING FACTORS

General

4.01 Administration which reduces dirt and poor workmanship to a minimum, also serves to substantially diminish trouble due to deterioration or wear. This fact is basic and should be thoroughly understood so that day-to-day operations may be properly planned to preclude the introduction or development of those conditions which cause service failures.

4.02 Certain phases of community dial office operation, such as those listed below, have a fundamental bearing on service and cost. Proper administration will help minimize troubles and facilitate trouble analysis.

(a) Installation Activity.

(b) Personnel Activity.

(c) Housekeeping.

(d) Contractor Activity.

(e) Other Forces Activity.

(f) Environmental Control.

(g) Application of Bell System Practices and Instructions.

Installation Activity

4.03 Pending installation activity may be determined from engineering specifications and project schedules. To insure protection of

service during installation activity, it is essential that all forces concerned be thoroughly familiar with the proposed operation before work is started and with all instructions covering the provision of adequate equipment protection, prevention of service interruptions, fire prevention, and safety.

4.04 Prior to the start of installation, existing equipment involved in the activity, and equipment being installed, should be clean. All necessary steps should be taken to preclude the introduction of outside dirt, and dirt due to activity. Paragraphs 4.07 thru 4.10, Housekeeping, cover several items which should be considered in connection with dirt control to keep trouble due to this source at a minimum.

4.05 Any increase in trouble during the period of installation activity should be disclosed by the continuing analysis of trouble results. Verification checks, observation of installation methods, and test results, will indicate the quality of the job and the expected volume of postcutover service affecting trouble. Keeping the installation force advised of trouble results, analyses, and observations, will assist them in minimizing service reactions.

Personnel Activity

4.06 Activity of maintenance personnel in performing necessary maintenance work may result in trouble due to the disturbance or carrying of dirt by the removal of equipment covers, equipment cleaning, routine work, distributing frame work, etc. Troubles may also be caused by failure to respect prescribed techniques in equipment adjustment and maintenance. Adequate knowledge, experience, and a full appreciation of the importance of the facilities which they connect and maintain, will aid in minimizing troubles caused by personnel activity.

Housekeeping

4.07 Precautionary measures including those relating to personnel activity and environmental control should be a prime consideration in preventing the introduction of dirt in equipment areas. As the exclusion of all dirt may be impractical and uneconomical, standard methods are provided for its removal from equipment quarters and equipment.

4.08 The proper maintenance procedure for equipment quarters, furniture and fixtures, as covered in Bell System Practices, provides a means for cleaning with minimum equipment reaction.

4.09 Surface dusting, vacuum and pressure cleaning methods, as covered in the Bell System Practices, should be used to remove dirt from equipment.

4.10 In general, material should not be stored, unpacked, or crated in equipment areas. Tools, test equipment, instructions, prints and necessary maintenance material should be stored and maintained in a manner to prevent accumulation of dirt.

Contractor Activity

4.11 Work requiring the services of outside contractors is necessary from time to time. This work, which may be contracted by the local forces, or others, must be properly planned and performed in accordance with specifications which provide optimum equipment protection. To insure protection of service during such activity, it is essential that the contracting forces be familiar with the equipment protection required and the effect of dirt and activity on the equipment.

Other Forces Activity

4.12 Other forces, visiting or working on or near CDO equipment should appreciate that troubles may result from dirt, activity and unnecessary handling. Familiarity with service objectives by these forces will help prevent service interruptions.

4.13 When it is necessary for other forces to work in CDO's, the nature and duration of their visit, and the details of the work to be performed, should be reported in accordance with local instructions. In unattended locations their activity may be logged to facilitate trouble analysis.

Environmental Control

4.14 Control of the use of windows, outside doors, and doors between areas, will reduce dirt circulation and thereby help avoid potential trouble conditions.

Application of Bell System Practices and Instructions

4.15 Bell System Practices are designed to prescribe proper techniques for the testing, removal from service, adjustment and repair of equipment and apparatus. Work performed in accordance with instructions by personnel who have a full appreciation of their purpose, should result in effective repairs with no service reaction. Nonstandard adjustments and repairs may result in a condition which will require reconditioning effort.

4.16 Any work done on apparatus increases the possibility of trouble on items other than those involved in the work being done. The introduction of contact troubles through removal of covers, accidental damage, etc, are all hazards to service. In general, apparatus should not be worked on more than necessary.

5. RECORDS AND THEIR USE

5.01 Good community dial office administration requires that records designed to reflect the various aspects of operation and performance be maintained and considered when determining maintenance procedures. By their very nature, records are hindsight, or "after the fact" accumulations of data. But, if we are to predict with reasonable accuracy what we may expect tomorrow, we must know where we are today. And, knowing our present situation requires knowing where we have been. Therefore, good records of where we have been are vital for an effective maintenance administration. Awareness of current status permits measurement of the effectiveness of maintenance effort. In short, records provide a basis for why a thing is done or not done.

5.02 In general, all records may be thought of as administrative tools to be used by a supervisor in the discharge of his management responsibilities. The start of record work often appears to be unproductive, and its value will frequently show up only after history of past performance has been accumulated. However, much can be gained in sound job planning by factually knowing what has transpired each day. To help in understanding the important part that records play in the day-to-day job, they may be broken down into three areas, administrative, performance and analysis.

5.03 Administrative records differ somewhat from the general description of records in that they do provide advance planning information of work operations and force scheduling. They are designed to reflect work load, force availability, volume and handling of trouble reports, equipment out of service, scheduled routines, etc. By using these records, it should be possible to make good management decisions for doing first things first.

5.04 Performance records are the accumulation of trouble results data on a continuing basis and they serve to indicate current trends. They also provide data for the development of trouble expectancy figures for each item of equipment. In addition, performance records provide a yardstick for measuring the effectiveness of administrative planning.

5.05 Analysis records combine the various sources of data by equipment groups, types of trouble, date, time and location. The analysis of these records in accordance with the procedures outlined in this practice will assist in determining unsatisfactory trends and will help indicate when effort is required to correct specific conditions.

6. QUALITATIVE MAINTENANCE

General

6.01 For many years it has been the practice to speak of corrective and preventive maintenance of telephone plant.

Corrective maintenance is the action of clearing those faults which actually occur and are usually recognized as the result of subscriber reports, employee reports, alarms, etc.

Preventive maintenance is the action directed toward the discovery and correction of conditions which may be developing and may later cause service interruptions.

6.02 Neither of these methods, used alone, is sufficient to attain the objective of the best possible service consistent with reasonable cost. Only by obtaining the proper relationship between these two types of maintenance effort, through their analytic correlation, can this objective be attained.

6.03 To appreciate the importance of this correlation, it is necessary to understand the beneficial aspects and limitations of each type of maintenance effort and the inherent characteristics of equipment.

6.04 ***Corrective Maintenance*** — The sole use of corrective maintenance effort will ultimately result in excessive deterioration of both equipment and service. However, immediate benefits will be obtained through the correction of the maximum number of known faults with the least expenditure of manpower. These faults will also provide indications of other possible service affecting conditions.

6.05 ***Preventive Maintenance*** — The elimination of all faults by preventive maintenance effort, before they cause service interruptions, is not practicable. Routine tests alone will not permit the attainment of desired service levels, since prohibitive frequencies would be required to minimize the chance of service reaction. In addition, an attempt to detect and correct all faults and deterioration in the early stages will result in prohibitive costs, due to excessive use of manpower. Experience indicates that any intensification in preventive effort also increases the possibility of trouble due to personnel activity. If practicable, preventive maintenance effort directed toward the correction of potential service affecting conditions just before customer reaction is experienced would result in the most benefits and economies.

6.06 ***Inherent Characteristics***—Telephone equipment is designed and manufactured to meet high standards of quality. However, progressive deterioration will always be present. Because of the margins designed in the equipment, this deterioration may not be service affecting. The apparatus requirements in the Bell System Practices, and on the circuit requirement tables, are intended to insure that if apparatus meets all of these requirements, it should function satisfactorily under service conditions. However, apparatus which fails to meet the requirements in one or more respects will not necessarily fail in service or be improved by a general reconditioning, or by minor changes in adjustment. Therefore, it is not considered economical to attempt to maintain CDO's in a condition whereby every piece of apparatus meets every requirement specified. It must also be realized that fortuitous trouble will occur. These are troubles that happen by chance or a combination of circumstances which may never repeat, such as, a piece of lint which is on a contact long enough to cause only one operational failure. Therefore, it must be recognized that some service interruptions will always exist due to these troubles.

6.07 Proper administration requires the consideration of these inherent characteristics to attain the maximum benefits of corrective and preventive maintenance. These benefits can be attained through the use of a method termed "qualitative maintenance."

6.08 ***QUALITATIVE MAINTENANCE: The corrective action applied where, when, and to what extent needed as determined by the integration and analytic evaluation of records, routine test results, sampling inspections, and experience.***

6.09 Descriptions of the various components of qualitative maintenance appear as follows:

Integration — Paragraphs 6.11 thru 6.13

Analytic Evaluation — Paragraphs 6.14 thru 6.48

Corrective Action — Paragraphs 6.49 thru 6.59

6.10 The block diagram, Fig. 2, shows the sequence of integration, analytic evaluation and corrective action.

Integration

6.11 Experience has shown that no single source of information can give a satisfactory indication of the distribution, type and quantity of trouble, and its effect on service. To obtain a comprehensive picture of the trouble conditions in an office, it is necessary to integrate information from all possible sources.

6.12 Generally the principal sources of information are:

(1) Reports from subscribers.

(2) Reports from employees.
(Plant, Traffic, Accounting, Commercial reports, permanent signals, reports from other offices or locations, etc.)

(3) Reports from other sources on CDO equipment.
(Routine test failures, equipment inspections, observed defects, alarms, service observing failures, etc.)

6.13 Information in the form of trouble reports from the sources covered in Paragraph 6.12 is recorded for examination to facilitate determining when, where and to what extent a particular condition or type of trouble, exists in a CDO.

Analytic Evaluation

6.14 The analytic process is the examination and evaluation of all known facts, coupled with experience, to determine the required corrective action.

6.15 It is important that complete data from all sources be considered, as analysis can be no more accurate than the data analyzed.

6.16 It is also important that every report be recorded, whether or not the actual cause of the report is determined. Analysis of troubles found on routine tests or inspections, subscriber reports, employee reports, traffic reports, observed defects, alarms, etc, as well as investigation of reports on which the trouble was not located, are necessary for the proper evaluation of the data.

6.17 To properly evaluate the data received from the various sources outlined above, all reports should be routed to the person, or persons, responsible for analysis. They should be responsible for verifying the classification of the trouble and that the action taken is consistent with the nature of the report. The objective of the trouble analysis is to uncover a pattern composed of a group of found and/or not found troubles that have a common relationship by type and/or location. Patterns indicate the need for further examination of administrative, analysis, and performance records and subsequent evaluation of sampling inspections and routine tests to determine the required corrective action. Since judgment largely determines the accuracy of the analysis, it is essential that this operation be closely supervised to be most economical.

6.18 The phases of the analytic evaluation process, as shown in Fig. 2, are covered in subsequent paragraphs.

6.19 ***Handling of Reports Referred by the Local Exchange Test Center.*** Found and not found troubles are an integral part of the analytic process. Information concerning test and found O.K.'s may be obtained from the Local Exchange Test Center as covered in Bell System Practices or from the broad gauge "No trouble found analysis" on the trouble ticket Form E-4319.

6.20 This evaluation provides for the recording and examination of reports by type, and channeling them into patterns which direct trouble clearing effort into certain groups or common items of equipment. The resulting found and not found trouble data are correlated with information from other sources in the analytic evaluation process to determine corrective action.

6.21 ***Trouble Ticket CDO:*** Subscriber reports, employee reports, test and found O.K. trouble pattern reports, alarms, service observing reports, routine test failures, equipment inspection irregularities, observed defects, etc, are the types of troubles recorded on the "Trouble Ticket." Observation of found and not found trouble categories on these forms, is important in the process of detecting existing or potential trouble conditions. In making this examination, reference and comparison to past trouble results are invaluable for correct evaluation of the pattern. This can not be a precise comparison because of the random distribution of trouble and the wide fluctuations encountered over a short period of time.

6.22 Trouble patterns can be associated with one or more of the following:

(a) Major equipment groups such as line finders, links, selectors, power equipment, etc. Trouble trends not otherwise evident in small installations may be revealed by combining major equipment groups in several locations.

(b) Specific types of apparatus such as relays, banks, wipers, keys, jacks, etc.

(c) Type of trouble such as contacts, adjustments, wiring, etc.

6.23 Consideration should be given to the relationship between reported trouble (T), trouble found as a result of routines (R) and trouble found as a result of inspections (I). Experience with analytic procedures should develop skill in evaluating these sources of trouble indications so that administration and direction of maintenance effort may achieve their proper balance.

6.24 Having developed a pattern, tickets associated with the pattern are analyzed for further detail and decision regarding specific sampling inspections or routine tests required to

QUALITATIVE MAINTENANCE

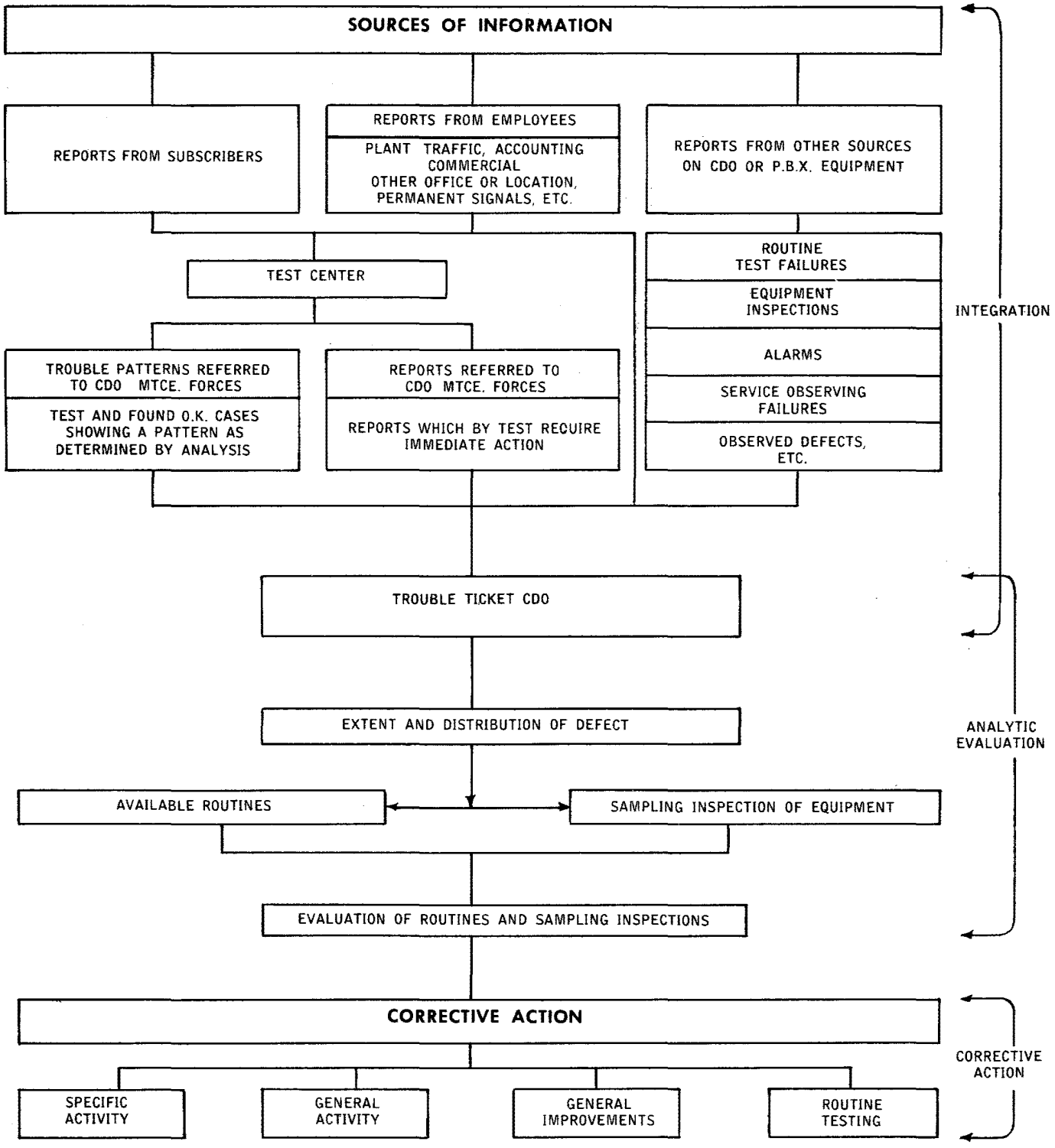

Fig. 2

evaluate the pattern. Subsequent analysis of the tickets may disclose some common factor that can be identified with the faulty condition, such as, geographical location of the equipment, time of day reports were received, identity of workmen, performed routine tests or inspections, etc. Disclosure of a common factor will permit application of effective corrective action.

6.25 It should be anticipated that several attempts to analyze a condition may be required before a satisfactory conclusion can be reached. In many instances it will be necessary to obtain additional information by instituting special temporary measures or records to provide the needed data.

6.26 It is extremely important to keep the analysis unbiased and to avoid shaping it to support a preconceived conclusion.

6.27 If troubles are materially reduced in any period, the data should also be reviewed to insure that troubles are being properly recorded and classified, and to determine any prevailing conditions that may have contributed to the improvement.

6.28 To determine the extent and distribution of a faulty condition revealed by the analysis, sampling inspections and routine tests should be utilized. These inspections and tests should be scheduled and assigned by use of the Routine Schedule and Progress Card in accordance with Bell System Practice 226-014-000 entitled Method of Classifying, Scheduling, Assigning and Recording Routine Effort Community Dial Offices.

6.29 Section 226-013-000 of Bell System Practices entitled, Trouble Ticket and Summary Community Dial Offices covers the preparation of the Trouble Ticket CDO or PBX Form E-4319.

6.30 ***Routine Effort:*** Community Dial Office routine effort can generally be grouped into three major categories: routine tests, routine inspections and effort incident to the general equipment maintenance.

6.31 Routine tests are prescribed procedures for setting up conditions to disclose the state of equipment in relation to a predetermined quality. These tests are performed through the use of portable test equipment and other test apparatus.

6.32 Routine inspections are prescribed procedures for visually determining the condition of equipment in relation to a predetermined quality.

6.33 Effort incident to the general equipment maintenance includes those activities such as equipment cleaning, lubrication, battery readings, etc.

6.34 A specific routine test, inspection or general maintenance effort is classified as "insurance," "productive," or "as required" in accordance with its service protection and trouble detection quality.

6.35 Insurance routines are those which, from a standpoint of service protection alone, are performed at periodic intervals to reduce to an acceptable level the possibility of serious interference with service. (Bell System Practices and/or local instructions often specify service protection requirements.)

6.36 "Productive routines" are those scheduled periodically where local experience indicates a definite anticipated volume of trouble. The frequency or classification of such routines must be adjusted or changed from time to time in terms of type and quantity of troubles found as a direct result of the routine, as compared with the total time used to perform the routine.

6.37 "As required" routines are those routines where trouble history can not justify a definite frequency of performance. In general, routines should be placed in this classification when other means such as alarms, displays, operator or subscriber reports, will indicate failures more effectively than a routine testing program. Experience has indicated that the majority of routines will be in this classification. Such routines may be performed when analytic evaluation indicates the need for corrective action.

6.38 Routine frequencies and classifications should be assigned locally to meet the conditions prevailing in the office and should be revised when local conditions change. These changing conditions may require the reclassification of "as required" or "productive" routines. The experience and ability of the force, and the skill with which trouble patterns are analyzed, are among

the factors that are to be considered in establishing the routine frequency.

6.39 ***Application of Sampling Inspections for Evaluation of Analysis*** — Should an analysis of the trouble data reveal a common fault in a number of equipment units, the extent and distribution of the fault in the remainder of the equipment should be determined. If the defect is simple, easily accessible, and the indications conclusive, a complete inspection can be made. However, if the defect is not simple, not readily accessible or if the indications are not conclusive, it is advisable to make a sample inspection on a representative portion of the equipment.

6.40 An inspection of relatively small quantities of like equipment units, if properly selected, is representative of the condition of the whole. For ordinary purposes, these sampling inspections may be utilized to check the accuracy of the trouble analysis, or as a preparatory step in the determination of the amount, or location, of work required.

6.41 The sample should be taken at selected points within the equipment group. For example, if selectors in a step-by-step CDO are to be sampled, the switch location of the selectors inspected should progress in numerical sequence from shelf to shelf to provide an equal number of switch locations in the sample.

6.42 The results of the sample should be examined to spot conditions common to a particular group of equipment such as, age, general location or peculiar conditions. For the purpose of this procedure, the size of the sample should be determined from the number of units in the whole. The following may be used to ascertain the size of the sample.

Number of Units in Group	Units to Inspect
1-200	All
200-300	200
300-500	225
500-1000	250
Over 1000	260

6.43 In those cases where the available data are inconclusive, a sample inspection in accordance with the above may be used to augment the data and to determine the need for a more thorough inspection. Consideration should be given to the possibility that troubles may be concentrated in a particular portion of the equipment, due to previous activity or some other factor.

6.44 Upon completion of the inspection, the supervisor will then be in a position to determine how the faulty conditions can be corrected economically with the minimum service reaction.

6.45 ***Application of Available Routine Tests for Evaluation of Analysis*** — While routine tests are effective in detecting specific troubles in the equipment, any improvement at reasonable cost must depend upon corrective action based upon trouble data analysis, inspections, routine tests and experience.

6.46 Within certain limits routine tests will indicate the nature of defects, the extent to which these defects are present and their location and distribution in the equipment. To evaluate a trouble pattern which has been developed by analysis, utilize the routine test which has previously disclosed the type of defect to be detected. For the purpose of analytic evaluation of trouble data, routine tests are divided into general classes as follows:

Operation tests which are performed primarily to check the operation of various units of equipment to determine whether they will satisfy ordinary service conditions.

Marginal tests which will detect certain types of potential failures in the equipment before they become service affecting and which test the equipment under certain combinations of service conditions.

6.47 Trouble data from critical marginal tests, which may result in a large number of test failures, will be more easily evaluated by dividing the equipment into approximately equal size groups, and then scheduling these separate groups at approximately equal intervals during the test cycle. It must be recognized that many of the troubles detected by routine testing are marginal in nature and that this type of trouble may not be service affecting.

6.48 When defects disclosed by routine tests, initiated to evaluate analysis, are numerous and of one predominant type, sampling inspections may be a more efficient and economical method of disclosing the extent, location and distribution of the condition than by increasing the frequency of routine testing. Promptly clear defects

that are scattered by location and type which do not substantiate the pattern and use other available methods to collect additional data.

Corrective Action

6.49 Corrective action is the effort applied to an existing, or developing, trouble condition as a result of analytic evaluation of trouble data.

6.50 The several recognized methods of caring for these conditions are listed below:

(a) Specific activities designed to correct particular trouble conditions.

(b) General activities which correct a number of defects.

(c) Incorporation of improved parts or revised requirements which effect a general improvement and as a result cause a reduction in trouble.

(d) Routine testing.

6.51 In maintaining a CDO, the objective should not be to put every part of the equipment in perfect condition, but rather to reduce the volume of troubles in the equipment to a satisfactory level at minimum expense. Definite action, therefore, should be undertaken on the apparatus responsible for the items which are appreciably over expectancy.

6.52 Specific activities to correct a particular condition are the most common and most direct methods of reducing a level of trouble in a CDO. Examples of particular defects that might be corrected by this method are worn parts, eroded contacts and readjustment of relays. Where defects of a specific type are prevalent, the most efficient and economical method of correcting them is by concentrated effort being directly applied without encumbering the job with minor improvements of other apparatus parts.

6.53 General activities to correct a number of particular conditions concurrently, if judiciously organized, are excellent in improving the condition of a CDO, and preventing progressive deterioration of equipment. However, if such activities are performed without careful consideration and supervision, they may be extravagant and wasteful of material and manpower.

6.54 Some of the questions to be considered in organizing general activities of this type are:

(a) Are the items selected for improvement adversely affecting service or equipment operation?

(b) Has the useful life of the part been obtained, or will it be exhausted in the immediate future?

(c) Is general activity more economical than specific activity at this time?

(d) Will the work affect other adjustments or requirements?

These considerations are intended to promote careful deliberation and should not be construed as discouraging general activities that correct a number of existing or developing conditions.

6.55 Incorporating improved parts or revised requirements into existing equipment often becomes a job of considerable magnitude. Some improvements are designed for new apparatus only and are not intended for universal application. For these reasons, it is advisable to estimate the cost of obtaining the improvement and the effect it will have on maintenance expense or subscriber service before undertaking such a program. If the benefits to be obtained are not conclusive, or if the job is beyond the resources or authority of the local administration, proper approval should be secured before proceeding.

6.56 In general, the majority of routines should be on an "as required" basis. Where routine frequencies are assigned, they should be designed to meet the prevailing conditions and should be revised when local conditions change.

6.57 Uniformly scheduled routine testing is not generally recommended as a method of securing improvement in equipment conditions. Scheduled routine tests, used to find specific troubles and to provide information for analytical purposes, should be expanded or curtailed to meet these needs. Special cycles of tests performed during periods of equipment installation, work requiring removal of covers, trunk rearrangements, building alterations, etc, are effective in reducing subscriber reactions. In the cases mentioned above there is usually no question of ap-

paratus improvement and it is expected that the trouble rate will drop when the extraordinary activity terminates.

6.58 The probability that service affecting failures can be located by routine tests before they actually affect service calls is in proportion to the ratio of routine test calls to service calls. Considering the frequency with which a particular circuit is used in regular service, it would be necessary to make routine tests at a prohibitive frequency in order to minimize the chance of service reactions.

6.59 Where the troubles are of a type which make it probable that they will be located by other means, such as analysis of employee reports, subscriber reports, etc, it would seem that intensive routine tests could not be justified. However, where there is little probability of the trouble being reported, some increase in testing might be justified to reduce the interval that the troubles are allowed to remain in the equipment.

7. PLANNED ADMINISTRATION

General

7.01 Planned administration is the technique used to effectively direct and complete all CDO work.

7.02 To successfully plan the administration of a CDO, the variations in type, design, location, load, age, ventilation, humidity and previous effort, should be recognized. Proper evaluation and integration of information obtained from analyses of available records, tests and inspections, knowledge of current conditions, and of work loads is essential for effective, efficient and economical administration. To attain these objectives, administrative effort should be directed toward:

(a) Planning day-to-day operations to control trouble and deterioration by controlling the trouble influencing factors, as covered in Part 4 of this practice.

(b) Planning the preparation and analysis of reports, records, tests and inspections, to determine the necessity and magnitude of maintenance effort required.

(c) Planning the scheduling and completion of maintenance effort in an economical and trouble-free manner.

(d) Planning the correlation of maintenance and service work loads to produce good service and cost performance.

Scheduled Effort

7.03 In order to effectively direct and complete the many types of maintenance and service work (clearing trouble, routine testing, routine inspection, service orders, transfers and rearrangement of line facilities, trunk orders, cable transfers, repeater and carrier line-up, etc), detailed scheduling is essential.

7.04 In general, it is desirable to schedule CDO work operations at least a week in advance. Tentative schedules may be prepared several weeks in advance. In order to facilitate scheduling, the Form E-4254, Central Office Daily Work Schedule, as covered in Bell System Practice entitled, Central Office Work Scheduling, may be used.

7.05 Information concerning all orders or other work authorizations should be channeled to the person preparing the detailed work schedule to facilitate the completion of this work when due. Reasonable advance notice and realistic due dates are essential on work authorized by other forces.

7.06 Service work volume estimates may be based on inward and outward station movement trends and other loads such as trunk orders, and cable transfers, etc. Analyses of past trouble rates should be an asset in estimating corrective maintenance work volume. Routine test and inspection work which has been scheduled should be correlated with current corrective maintenance and service work.

7.07 With experience, a high degree of proficiency can be developed in the planning and scheduling of CDO work.

Quality Verification

7.08 Inasmuch as poor workmanship will cause trouble, quality verification inspections should be made of all types of work performed in CDO's.

7.09 Quality verifications may include inspection of the following items:

(a) Service order and other distributing frame work.

(b) Reported trouble handling.

(c) Routine maintenance operations.

(d) Apparatus adjustment work.

(e) Clerical work.

(f) Housekeeping activities.

(g) Equipment installation work.

(h) Contracted work.

7.10 The size of the inspection sample should be adequate to correctly indicate the quality of work being performed.