

SWITCHING SYSTEMS MANAGEMENT
STEP-BY-STEP SYSTEM—ADMINISTRATION
PROBLEM ANALYSIS AND CORRECTIVE ACTION

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1. GENERAL

1.01 Purpose

1.01.1 This section contains procedures to be followed by Traffic Department personnel responsible for the administration of Step-by-Step local dial offices when there are indications of service problems that do not appear to be definable or correctable by ordinary administrative routines. Emphasis is placed on Dial Line Component Indexes in, or approaching, the Weakspot range. These procedures, however, may be applied to less serious service problems in order to increase the effectiveness of dial administration and central office operation.

1.02 Group Involvement

1.02.1 Generally, these situations require the involvement of groups or departments other than the Traffic Department. Such areas of mutual responsibility have been identified to the extent necessary for Traffic dial administration personnel to clearly recognize the action they must take in the detection, investigation, and correction of dial service problems.

1.03 Intensified Efforts and Departmental Involvement

1.03.1 It is *not* the intention of this Traffic dial administration material to *assign responsibility to other groups or departments*; to direct their activities; or to dictate changes in their existing practices or procedures. *Rather*, it is intended that this information can be used to *expedite and simplify* the detection and correction of *Weakspot areas* by intensifying efforts and also through the establishment of *mutual interests and approaches*.

1.04 Recognition of Organizational Structures

1.04.1 Due to differences in organizational structures, specific titles of individuals, groups, and departments have been avoided. Instead, general descriptive or functional names have been used. This type of format permits identification by the individual company of a particular organization level (or sequence of organization levels) responsible for the procedures described herein.

2. ELEMENTS OF ANALYSIS

2.01 Definition of Weakspots

2.01.1 A dial office require treatment for Weakspot performance when one or more of its Dial Line Components are below a 90 Index level. The Dial Line Index Plan is described in Traffic Service Observing Practice, Division B, Section 1 and Division F, Section 2.

2.01.2 A Weakspot condition is like a wasting disease; at the start it is relatively easy to eliminate but difficult to detect. After awhile, unless it has been previously recognized and corrected, it becomes easy to detect but difficult to eliminate. It is for this reason that early recognition of unsatisfactory service trends is more important than trying to attach some significance to a dial component that has slipped for one month below an arbitrarily set objective level. A dial office may also be considered a possible Weakspot candidate when any of the other service problem indicators, detailed in this section, are present.

2.02 Traffic Considerations

2.02.1 *Data*: The accumulation and analysis of service data makes up the most important part of the Weakspot elimination effort. The importance of reliable data cannot be overemphasized. It is the base on which the entire dial administration job is built.

2.02.2 *Unique and intensified administration efforts*: The analysis and correction of Weakspots may require the use of unique and intensified administration efforts by both the Traffic and central office maintenance forces. Consideration might be given to the use of such expedients as:

- (a) Coverage of Traffic dial administration offices outside of the customary daylight hours.
- (b) Temporary redistribution of central office maintenance forces in order to provide a heavier concentration of manpower at the problem office.

(c) Dial machine daily load forecasting similar to the system used for anticipating daily loads at toll switchboards. Such a forecast would be based on:

A system of weather watching which utilizes radio, newspaper, television, or telephone-accessed recorded forecasts.

Obtaining advance knowledge of all scheduled and nonscheduled school closing days within the dial district.

The local traffic load experienced on a corresponding day during preceding years.

A knowledge of the factors influencing the toll board load that were considered for a particular day, which may also affect local calling volumes.

2.02.3 Traffic dial administration responsibilities in Weakspot situations will include the following (some may be joint responsibilities involving other groups or departments):

(a) A continuing review of all available service indicators for the purpose of locating and interpreting undesirable performance trends.

(b) Initiating, developing, and augmenting, *jointly with other groups when appropriate*, plans for corrective action when service-affecting conditions are identified.

(c) Obtaining acceptance of a proposed plan by all personnel necessary for its successful execution. This will include such groups as: Plant (central office and installation maintenance forces), Engineering, and the Western Electric Company, when involved. Those responsible for Traffic dial administration work can satisfy this requirement by pointing out service-affecting indicators in letters, reports, and memorandums and also at interdepartmental meetings. *(It is of the utmost importance that all Traffic administration functions be satisfied and that valid traffic data be obtained before requesting help and remedial action from related work groups.)*

(d) Providing the necessary controls to evaluate the effect of the plan on the condition it is intended to correct.

(e) Following through on the plan until the proposed action is concluded.

2.03 Knowledge of Equipment

2.03.1 A fundamental requirement for problem analysis work is an understanding of equipment functions in relation to switching logic and call carrying capability. In order to attain this level of facilities orientation, it is necessary to become familiar with all dial equipment components which affect the flow of traffic within your district. This basic knowledge requirement includes such items as line finders, selectors, rotary out trunk switches, line load control cabinets, office alarm frames, switchboards, service desks, and traffic concentrating devices.

2.03.1.1 Telephone equipment knowledge can be obtained and expanded during visits to the central offices. The analysis value of central office visits can be substantially increased if you are aware of:

(a) *The status of any switch:* Is it carrying a call intentionally made busy, held permanent, missing, or under security surveillance?

(b) *The meaning of visual alarms:* What do the red, white, green, and yellow aisle pilot lamps signify?

(c) *The visual indicators available:* Ragged switch operation, selectors frequently hunting latter choice trunks, switches going off the banks (11th rotary step) on certain levels, and 200-type selectors constantly spinning in an attempt to find an idle trunk.

2.03.2 An evaluation of the general status of a switchroom can be made by observing such things as:

(a) The amount of equipment found busied-out or missing.

(b) The record of equipment currently made busy.

2.03.3 In addition, it is important for those engaged in Traffic dial administration work to develop the ability to assess the knowledge and appreciation that other groups, such

as engineering and central office maintenance, have for traffic considerations. This assessment can be made by noticing the following relationships between:

- (a) Peak traffic periods and the Western Electric Company installation activity.
- (b) The traffic busy season and the central office maintenance force vacation schedules.

2.04 Traffic Administration Environment

2.04.1 The Traffic administration group must recognize and accept the basic premise that *nothing can be managed that cannot be controlled, nor can anything be controlled properly that cannot be measured*. It is for this reason that all dial administration personnel must completely understand the uses and functions of traffic measuring devices and registers detailed in Central Office Management, Division E, Section 3 (January 1959), and Section 3-A (October 1966). It will be necessary not only to thoroughly understand the routine application of this traffic measuring apparatus but also to be aware of any unique associations that can be made between any individual measuring device and the equipment to be studied. An example of such a unique arrangement is described in the analysis of excessive dial tone delays where an Esterline Angus Recorder is used to locate line finder groups in which dial tone delays occur. When interpreting usage data, it is well to remember that traffic measuring apparatus records the status of equipment load (including permanents, busied-out components, and equipment failures), not actual customer demand.

2.05 Employee Assistance

2.05.1 Telephone Company personnel in other departments can contribute useful information regarding Traffic Department considerations and responsibilities. The central office maintenance force is usually aware of peak calling periods as indicated by switch and alarm activity, in addition to equipment problems which affect the flow of traffic. The Commercial group has available oral and written comments regarding subscribers' opinions of telephone service offered. The Commercial Manager through his

business community associations, may be aware of undetected traffic problems.

2.06 Customer Contacts

2.06.1 Analysis information may be obtained from either formal or informal customer contact channels. The *Service Attitude Measurement Plan* (SAM) is an example of a formal source. Information in this report reflects how subscribers feel about their telephone service. The SAM Plan is based on four questionnaires (the General Service, Business Office, Installation, and Repair Service), which are mailed to a sample of residence and non-PBX business customers each month. Each district operation will obtain approximately 650 completed questionnaires from customers per month; 200 for the General Service questionnaire and 150 for each of the other three questionnaires. The SAM questionnaires are standard throughout the Bell System to ensure consistency of results System-wide.

2.06.2 Personal contact with telephone users is another, informal source of material for problem identification. The following people are usually good providers of current data:

- (a) Students
- (b) Housewives
- (c) Those critical of the telephone service industry.

2.06.2.1 As employees, traditional exposure to good telephone usage counseling may have a tendency to emphasize the act of talking rather than listening. Efforts to improve the latter skill will be appropriate for the analysis of service problems.

2.07 Report Data

2.07.1 The following summary of Traffic Reports, Fig. 1, represents an inventory of dial administration data available for use in problem analysis. Blank spaces are provided for identifying each report of the individual telephone company by name and number or the American Telephone and Telegraph standard designation when such a classification exists.

TRAFFIC REPORTS

FORM NO.

REPORT	CO	A.T.&T. Co.	REFERENCE
Line Equipment and Telephone Numbers	_____	_____	_____
Local Dial Office Terminals in Use	_____	_____	_____
Summary of Rotary and Level Connector Terminals	_____	_____	_____
Monthly Dial Tone Speed Report	_____	_____	_____
Monthly Line Report	_____	_____	_____
Summary of Dial Analysis Work	_____	_____	_____
Overall Balance Index	_____	_____	_____
Traffic Data Results Summary	_____	_____	_____
Terminals in Use	_____	_____	_____
Summary of Working Lines and Terminals	_____	_____	_____
Summary of Rotary Reservations and Single Lines in Rotary	_____	_____	_____
Check of Line Finder Terminal Record Against Frame	_____	_____	_____
Check of Connector Terminal Record Against Frame	_____	_____	_____
Summary of Status of Connector Equipment	_____	_____	_____
Summary of Status of Line Finder Terminals	_____	_____	_____

Fig. 1

2.07.2 The following schedule of report checking has also been included for use as an aid in anticipating and preventing short- and long-range dial service problems.

Daily Checks

- Dial tone speed
- Dial analysis results
- Weather forecast
- Current events
- This day last year
(holiday, local conditions)

Weekly Checks

- Load Balance results
- Overflows
- Dial analysis results
- Customer complaints
(dial assistance requests due to "Busy before through dialing" and all other repeated comments regarding unsatisfactory service)
- Service Observing results

Monthly Checks

- Monthly service results reports
- Customer dialing irregularity activities
- Monthly forecast compared to actual growth
- Connector Group balance
- Schedule of equipment additions, changes, rearrangements, and introduction of new services
- Long-Range Planning—proposals for rearrangements, changes, and additions and introduction of new services
- Directory schedule
- Location of busy hour
- Party-Line Fill

Yearly Checks

- Location of busy season
- Changes in customer-calling habits
- CCS/MS trend
- Comparison of station forecast and actual growth
- Line Load control assignments and review of Essential User List

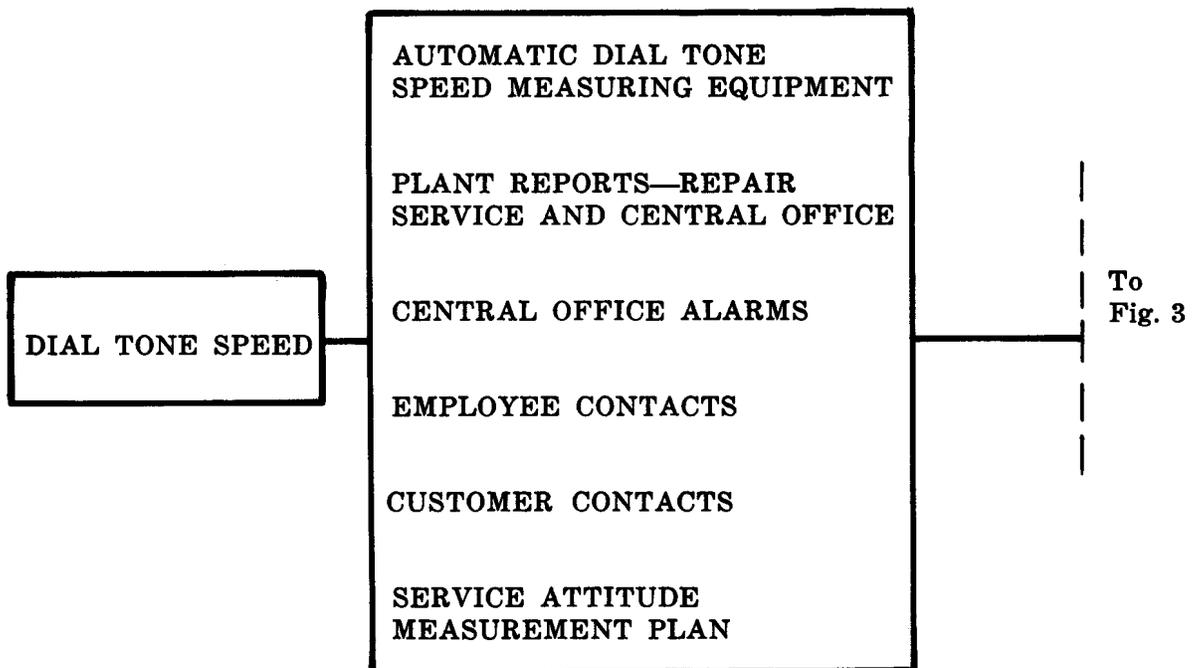


Fig. 2—Flowchart—Dial Tone Speed Indicators

3. DIAL TONE SPEED

3.01 Indicators (Fig. 2)

3.01.1 It is necessary to consider all the dial tone speed service indicators prior to making a judgment on, or proposing remedial action for, an apparent speed of dial tone problem. Theoretically, data from each information source should substantiate rather than conflict with its related service indicators. However, mechanical failure, human error, and subjective reporting will, at times, provide distorted or misleading information.

3.01.1.1 Complete reliance on data obtained from a single measurement source, without considering the factual material available at the other check points, can be responsible for the concealment of an existing Weakspot, or the creation of a nonexistent service problem.

Validity checking and evaluation of Weakspot indicators are detailed in the analysis section of the dial tone speed service problem.

3.01.2 Automatic Dial Tone Speed Measuring

Equipment: An important standard of the service given by dial equipment is the machine measured speed of dial tone. A knowledge of the daily percent dial tone speed by class of service in the busy hour, in time segments of the busy hour, and in periods outside the traditional busy hour, will provide a performance profile for the measured entity. The accumulated percentages indicate the average dial tone conditions on all business days providing a valuable overall service performance measurement, and considerable aid in accomplishing efficient use of the equipment.

3.01.2.1 Accumulated percent dial tone speed results may also be used in the plotting of load-service relationships in order to obtain busy season trends. This basic data can then be utilized in the determining of equipment capacities.

3.01.2.2 Inspection of the daily dial tone speed results reveals the extent of deviations on *high days* from the *average for the month*. The number of high days, oddball days, and

normal days, and the average level of dial tone speed on these days will influence loading and engineering policy.

3.01.2.3 Numerous conditions may affect the measured dial tone speed results. These influencing factors are summarized in 3.03.1, Invalid Data.

3.01.2.4 The *three System-standard versions* of automatic dial tone speed measuring equipments are described below. For further information, reference is made to CD-96403-01, and BSP, Section 951-901-100.

Note: For step-by-step installations arranged for common control or TOUCH-TONE®, only the version equipped with SD-96403-01, Fig. 12 *and* Fig. 13 will give accurate dial tone speed measurements.

3.01.2.5 *Vacuum Tube Machine SD-96403-01, Fig. 1:* This unit of dial tone speed measuring equipment (shown in Appendix 1) consists of:

- (a) A vacuum tube timing device which can be calibrated to *approximately* 3 seconds.
- (b) One or two 206-type selector switches, each having five test arcs of twenty terminals which are cabled to a terminal block for cross-connection to selected spare subscriber line equipment. This permits a maximum of 100 or 200 test lines. The initial access switch is designated the "A" switch, and its arcs are numbered A2 through A6, inclusive. Similarly, the second switch is designated the "B" switch, and arcs are numbered B2 through B6, inclusive.
- (c) A 206-type selector designated "C". This selector controls the operation of selectors "A" and "B".
- (d) A maximum of 5 pairs of registers per access switch: one register (T) of each pair to record test calls; and the other (D) to record the number of dial tone delays.
- (e) Five or ten hand-operated switches; each switch being associated with a particular access switch arc, and having the same designation, ie, "A2", "A3", etc.

Each of these hand switches have 6 positions numbered 1 through 6. Each of the first five settings (1 through 5), has one test (T) and one delay (D) register associated with it. With the hand-operated switches, test calls from one or more arcs may be recorded on one pair of registers. Thus, when a loading division extends over more than one arc of a single access switch, the results may be recorded on one pair of registers by setting the rotary selector switches for these arcs to the position corresponding to the designated pair at (T) and (D) registers. When the hand-operated switch is set in the sixth setting, the test lines in the associated arc are skipped, thus permitting one or more classes of service to be omitted, if desired.

(f) Four keys, each with an OFF and ON position, are as follows:

1. ST—Start
2. CAL—Calibration
3. FAST—Shortens interval between tests (used by Plant Department in calibration tests).
4. SD—When in “ON” position, causes unit to stop whenever a delay exceeds 3 seconds. Testing is restarted by turning the SD key to the “OFF” position and restoring it to the “ON” position (not installed or effective in all instances).

Where the traffic registers are located away from the terminal room, a remote control start key is provided at the register rack. This key, when operated, makes the SD key ineffective so that, when the record is being taken, the dial tone speed equipment will not stop if the SD key is inadvertently thrown by local Plant.

Note: Care should be taken to ensure that the controls 2, 3, and 4 above are in the “OFF” position during all periods in which dial tone speed measurements are being taken.

3.01.2.6 Vacuum Tube Machine SD-96403-01, Fig. 1 modified for Fig. 12 circuit: The Fig. 1, which is arranged to make tests *approximately* every 3 seconds, should be modified to make tests accurately at 4-second intervals. This

modification consists of replacing the timing device with the new synchronous timer. The operation and assignment of the machine so modified then are similar to the version's installed with SD-96403-01, Issue 26D and later.

However, the hand-operated switches are not replaced by the newer-type toggle switch, installed with Issue 26D and later.

3.01.2.7 Dial Tone Speed Register Circuit SD-96403-01, Fig. 12, Synchronous Timer

Version: This type of dial tone speed measuring equipment is shown in Appendix 2 and consists of:

(a) A synchronous timer which maintains a precise 4-second interval between all test calls, and also provides *accurate* timing of the 3-second dial tone delay.

(b) One or two 206-type selector access switches, each having five test arcs of twenty terminals which are cabled to a terminal block for cross-connection to selected spare subscriber line equipment. This permits a maximum of 100 or 200 test lines. The initial access switch is designated the “A” switch, and its arcs are numbered A2 through A6, inclusive. Similarly the second switch is designated the “B” switch, and its arcs are numbered B2 through B6, inclusive.

(c) A maximum of five pairs of registers per access switch; one register (T) of each pair to record test calls, and the other (D) to record the number of dial tone delays.

(d) Five or ten toggle switches; each switch being associated with a particular arc, and having the same designation; ie, “A2”, “A3”, etc. Associated with each switch is one Test (T) and one Delay (D) register. These toggle switches have two positions. When operated in the UP position, the arc will be tested and the “test” and “delay” registers will score, as appropriate. The DOWN position causes the arc to be skipped. When relatively few lines are assigned due to the small size of the office, the test lines should be assigned to as few arcs as possible. For those arcs with no test lines assigned, set the toggle switch in the DOWN position to prevent these arcs from being tested.

3.01.3 Plant Reports: Two sources of dial tone service results data are available in the Plant Department:

- (a) Repair Service reports of "No Dial Tone—No Trouble Found." These accounts represent subscriber complaints of not being able to receive dial tone in situations where a subsequent maintenance investigation failed to reveal an equipment problem.
- (b) The central office record of call block alarms. During the hours of Plant coverage, the central office force records call block situations. These ticket reports include such information as the time of day the blockage occurred, and the line group involved. A call block situation develops when a subscriber attempts to originate a call from a line group where no idle line finder is available to handle the call. Local arrangements may be required to obtain these data from the central office maintenance force in order to compare this information with measured usage of the individual line.

3.01.4 Line Load Control Cabinet Displays:

Line group busy (G) lamps, located on the Line Load Control Panel in the central office, provide a real-time visual indication of all finder busy conditions in flat rate and message rate line groups. It may, at times, be desirable to establish supplementary stroke type records based on the alarm displays. These tabulations can be useful for implementing other data sources when attempting to identify busy groups and busy hours.

3.01.5 Informal Employee Contacts: The central office maintenance force can provide selective information concerning:

- (a) Line finder groups which appear to be overloaded
- (b) Permanent signal traffic, volumes, and characteristics
- (c) Selection of busy hour, or busy hours
- (d) Design, or engineering arrangements which affect the call carrying capacity of the line equipment.

3.01.6 Customer Contacts: Subscribers encountering dial tone delays usually contact Repair Service rather than request operator assistance. This choice of trouble reporting locations is due to the lack of an audible signal during call block situations. The customers attempting to originate calls have no way of recognizing the presence of a busy condition; to them, their line is "out of order." These reports are usually classified as "no dial tone—no trouble found" and are covered in 3.01.3, Plant Reports. Requests for operator assistance will, however, reflect some dissatisfaction with poor dial tone speed service. This type of assistance traffic increases rapidly when excessive dial tone delays occur. It is difficult to determine the number of "wrong numbers reached" assistance tickets generated due to a customer dialing before receiving a delayed tone.

3.01.6.1 Slow dial tone is an indication to the subscriber of poor service. It may be the indicator to which the customer has the greatest sensitivity and least tolerance.

3.01.7 Service Attitude Measurement Plan:

Comparing the results published in this report under the heading, "Local Dial Service—Trouble Getting Dial Tone" with the service profile in the Component Index—"Dial Tone Over 3 Seconds—Busy Hour" may reveal items requiring remedial action, such as:

- (a) Inaccurate dial tone speed measuring equipment
- (b) Inaccurate or incomplete TUR data
- (c) Wrong busy hour being measured
- (d) Delay patterns occurring outside busy hours
- (e) A changing traffic profile for a specific office or for a geographical area
- (f) Outside Plant facilities problems, such as loop design limitations being exceeded
- (g) Line finder and related equipment problems

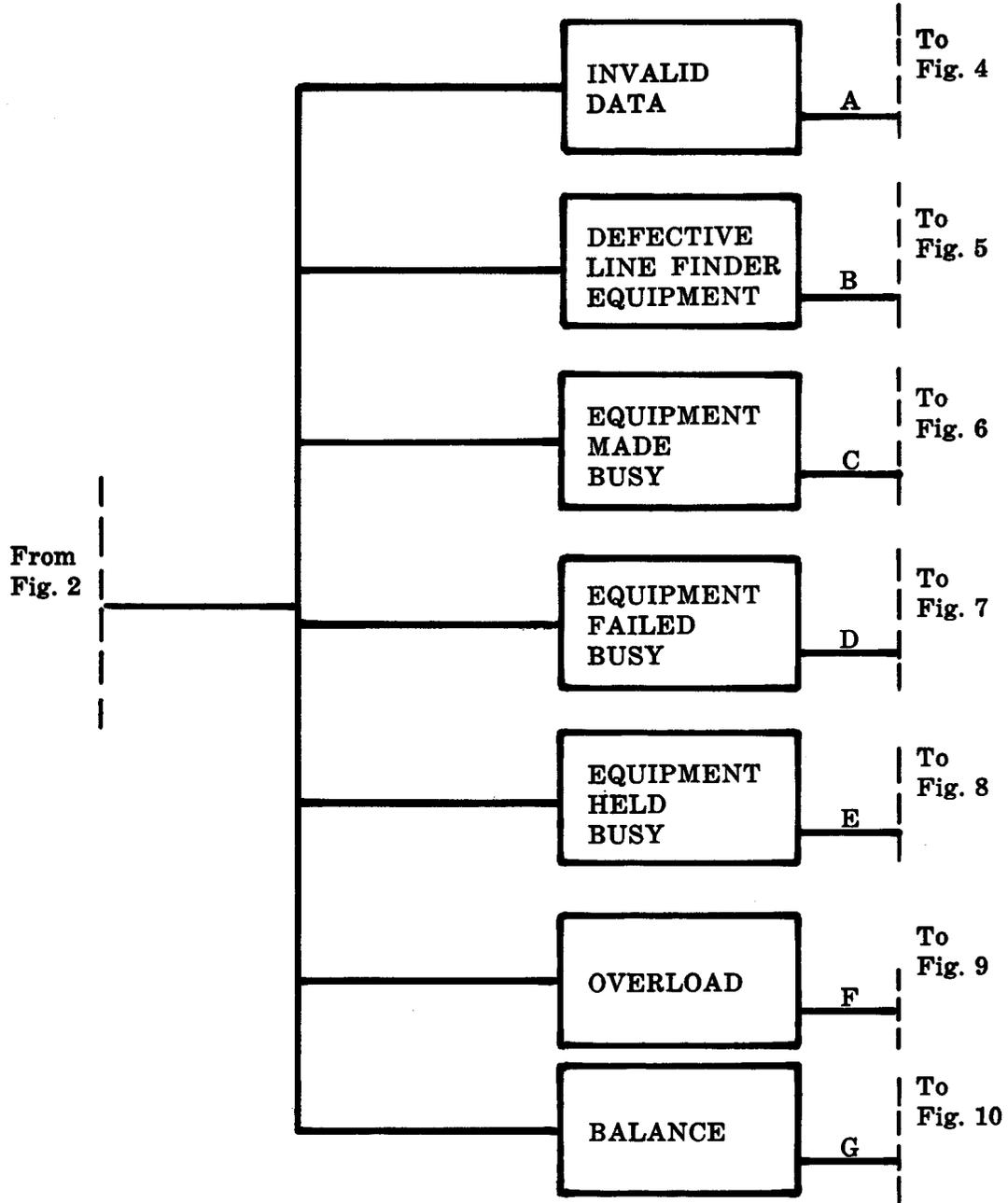


Fig. 3—Flowchart—Dial Tone Speed—Causes of Delay

3.02 Causes of Delay (Fig. 3)

3.02.1 Any or all of the following items may contribute to the accumulation of excessive dial tone delay results.

3.02.2 Invalid Data: The recording of invalid data can be due to:

(a) Improper distribution of dial tone speed test terminals.

(b) Malfunctioning of dial tone speed test machine or of associated registers.

(c) Incorrect calibration of dial tone speed test machine.

(d) Clerical error.

(e) Misunderstanding method of calculating results.

3.02.3 Defective line finder equipment can directly or indirectly affect dial tone speed service when it fails to perform any of its principal functions. These functions are summarized below according to their relationship to dial tone delays.

3.02.3.1 Functions directly influencing dial tone speed:

- (a) To find *subscriber's* line in the group of lines appearing on the line finder bank and to extend the tip ring and sleeve leads of the line to a first selector directly or through a message rate or coin box trunk circuit.
- (b) To advance the start lead to the next choice line finder.
- (c) To extend ground to the sleeve of the associated line when the line is found, to make it test busy to incoming calls.
- (d) To return to normal when the call is abandoned, except when a call is held by an operator's trunk circuit.
- (e) To hold the line finder operated under control of a succeeding switch.
- (f) To return to normal when the finder fails to find a line.

3.02.3.2 Functions indirectly influencing dial tone speed:

- (a) To operate a peg count or usage register when the line finder restores to normal.
- (b) To provide an alarm on certain troubles.

3.02.4 Equipment Made Busy

3.02.4.1 Equipment intentionally made busy for:

- (a) Maintenance and repair (central office maintenance force)
- (b) Cleaning (apparatus cleaners)
- (c) Transitory arrangements (equipment installation personnel)

3.02.4.2 Central office utilization and service are affected when trunks and equipment are taken out of service. When outages result in a reduction in the number of line finders available for customer use, service reaction may appear as dial tone delays. In addition, these equipment outages create:

- (a) Distortion of the traffic distribution within the office, which could result in false indications of an overload condition.
- (b) Distortion of usage data unless the Traffic Department is advised of all outages and is able to adjust the data accordingly.

3.02.5 Equipment Failed Busy: Originating equipment failures or malfunctions which result in a self-busy condition such as:

- (a) Line finder failing to return to normal, due to snagged wipers, insufficient shaft spring tension, or inadequate lubrication.
- (b) The "D" relay of line finder holding associated first selector permanent due to the line finder vertical off-normal springs being out of adjustment.

3.02.6 Equipment Held Busy:

- (a) Subscriber leaving the receiver off hook.
- (b) Storm or other damage to outside cable facilities.
- (c) Subscriber's loop or telephone instrument problems.

3.02.7 Overload: Traffic overloads may be caused by inadequate amounts of equipment provided or changes in customer calling habits.

3.02.7.1 Inadequate amounts of equipment may be furnished due to:

- (a) Inaccurate or incomplete data furnished to Engineering.
- (b) New or unusual growth which exceeds forecast for engineering period.
- (c) Inappropriate equipment addition scheduling.

3.02.7.2 Changes in customer calling habits due to:

- (a) Urban renewal and redevelopment projects which can create calling patterns of a type and size different from those anticipated in the growth estimates
- (b) Area transfers and rate changes
- (c) Weather conditions
- (d) Current events

3.02.8 Balance: Some of the things that cause imbalance are:

- (a) Poor data (wrong busy hour)
- (b) Actual changes in offered loads
- (c) Ineffective balance and assignment procedures
- (d) Failure to utilize new line equipment
- (e) Busied-out equipment
- (f) Improper wiring of equipment and trunks to Traffic Usage Recorder
- (g) Improper terminal assignment and sub-grouping of local first selectors
- (h) Trunk shortages
- (i) Indiscriminate use of call-through testing during busy hour

3.02.9 The degree of balance within an office affects three important phases of the administrative job:

SERVICE

- (a) Balancing improves service. The improvement of service in overloaded groups brought about by balance action, is proportionately greater than the impairment to service in underloaded groups.

UTILIZATION

- (b) Efficient utilization depends upon balance. Whenever a balance condition exists between groups of a loading division, a maximum load can be carried by the loading division while producing the best service for the load offered.

ENGINEERING

- (c) Good balance permits the derivation of sound office characteristics for use in determining proper equipment quantities on equipment additions.

3.03 Analysis: The analysis method described herein is based on the natural progression of trouble investigation fundamental to all service problems, whether they relate to a house, auto, or laborsaving appliance. The sequence starts with the elimination of the most common and easiest to check trouble spots. Failure to identify the problem in the initial or earlier

stage requires continuing the investigation into the infrequent and only remotely possible causes of service degradation. Although this analysis procedure is described as a series of progressive steps, it is recognized that several of these probable trouble areas may be examined simultaneously. The instruction for analyzing each of the possible causes of the particular problem begins with a list of administration tools and traffic measuring devices required for the investigation.

3.03.1 Invalid Data (Fig. 4)

3.03.1.1 Items Required for Analysis

- (a) A complete and current copy of the Traffic Service Observing Practice, Division F, Section 2, Dial Line Index Plan.
- (b) Dial Facilities Management Practices, Division and Sections to be published.
- (c) Automatic Dial Tone Speed Measuring Equipment—The following types are available and described in the "Indicators" portion of this Weakspot category.
 - Vacuum tube nonmodified type—SD-96403-01, Fig. 1
 - Vacuum tube modified type—SD-96403-01, Fig. 12
 - Synchronous timer type—SD-96403-01, Fig. 12
- (d) Dial tone speed test line assignment for unit under investigation.
- (e) Load service curves for unit under investigation.

3.03.1.2 The validity of dial tone speed results become questionable when:

- (a) Loading divisions having the same number of line finders and carrying the same class of service traffic produce widely varying results for no apparent reason.
- (b) The various speed of dial tone indicators produce a contradictory results picture. An example of this would be found in an office with good measured dial tone results, where Plant repair service reports and central office alarms indicate severe and prolonged periods of call blockage (Is the right busy hour being measured?).

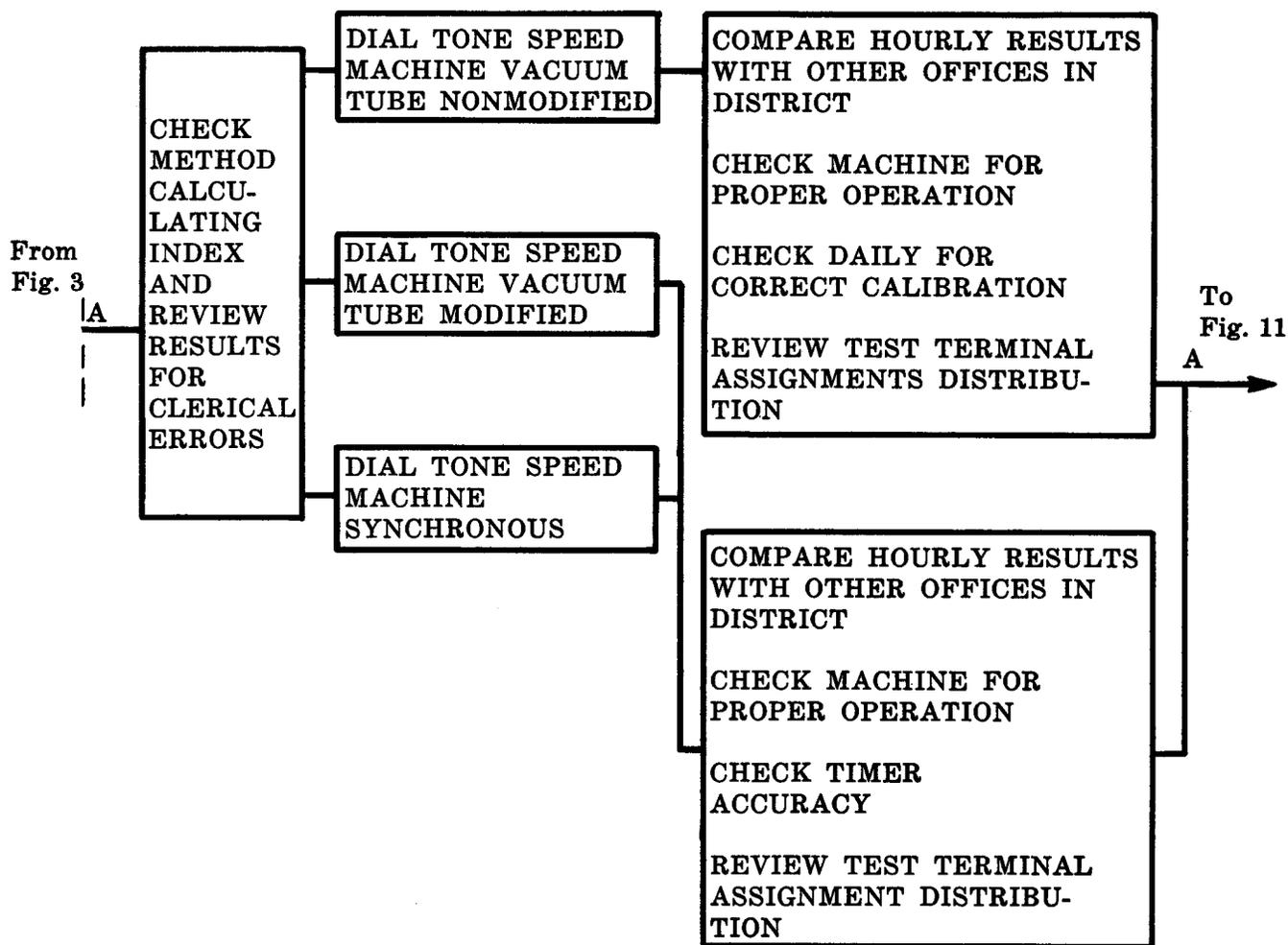


Fig. 4—Flowchart—Analysis of Dial Tone Delays—Invalid Data

(c) Some dial administration people, responsible for converting register readings into performance ratings, are not thoroughly familiar with the Dial Line Index Plan as described in Traffic Service Observing Practice, Division F, Section 2, and instead use inherited, note-type material that has been handed down from previous employees or supervisors.

3.03.1.3 The first step in this analysis procedure is a detailed review of the clerical calculations, regardless of whether any of the preceding conditions exist. There can only be two reasonable consequences of this review. The calculations will be found either free from significant error, or they will not. The analysis logic branch developed from anticipating these results

will then point toward one of two administration areas, ie: personnel or equipment.

3.03.1.4 Results Data Containing Compilation Errors: When this condition exists, all data compilation errors must be immediately assessed in terms of magnitude and impact on service results. After this has been done, reference can be made to Dial Facilities Management Practices, Division B, Personnel Relations, Sections 2 and 4 when published.

3.03.1.5 Results Data Free of Compilation Errors: Although the unsatisfactory results data prove to be free from compilation errors, their validity remains questionable. It

must be determined if these data represent a true sample of the service offered. They may actually contain distortions caused by improper testing methods, or dial tone speed machine malfunctioning. Reference to the flowchart, Fig. 4 indicates that the next step in this analysis sequence is to establish the integrity of the testing device. The direction to advance is indicated by the following instructions for each of the three types of dial tone speed measuring equipment.

3.03.1.6 Defective Dial Tone Speed Measuring Equipment: Comparison of results by district, building, and loading division is a preliminary recommendation that applies to all classes of dial tone speed machines. This check will spotlight any service measurements occurring outside the average of the busy hour results. Extreme results deviations, not previously encountered between similar dial units serving the same geographical area, strongly indicate either call carrying, or dial tone speed measuring equipment trouble.

3.03.1.7 Check for Proper Machine Operation: This Traffic administration requirement applies to all versions of the dial tone speed machines. To check that delays are not being encountered due to machine or equipment troubles, Traffic shall:

- (a) Verify Traffic trouble log with the central office maintenance to determine the need for additional tests.
- (b) Operate machine during light traffic period, daily if necessary, to further review the need for Plant checks above minimal schedule.

3.03.1.8 Daily Calibration Check: This Traffic administration requirement is only for the nonmodified vacuum tube type machine SD-96403-01, Fig. 1. To verify the calibration of the dial tone speed machine, Traffic shall:

- (a) Make daily comparison of the actual number of hourly test registrations with the expected number of registrations, as described in Central Office Management, Division E, Section 3, Appendix 2. Comparison should be made of both the total test registrations and the test calls for each loading division.

- (b) Investigate any deviation exceeding 3% between the actual number and the expected number of registrations. First, recompute the expected registrations for the hour being investigated using the actual delays encountered (rather than the average). If after recomputing, the actual differs from the expected, refer to the central office maintenance forces for investigation, *with a description of the problem.*

3.03.1.9 Daily Check of Timer Accuracy: This Traffic administration requirement applies to the following type machines:

Synchronous timer type
SD-96403-01, Fig. 12

Vacuum tube modified type
SD-96403-01, Fig. 12

The synchronous timer associated with this machine does not require calibration. The number of test calls recorded during a selected interval will remain reasonably constant, as delays encountered do not affect the 4-second timing interval between test calls. However, the following steps must be followed to ensure continual accuracy:

- (a) Compare the actual number of total hourly test registrations with the expected number of registrations.
- (b) Any deviations between actual and expected registrations should be referred to the central office maintenance force.

Where the wiring option designated by the letters TU is provided, an additional daily check shall be made by rereading the registers after the machine has ceased to operate. The results should exactly equal the theoretical computation for these conditions.

3.03.1.10 On a routine basis and when other checks, such as the use of the number of tests indicate a possible timing error, the circuit will be tested as follows. (It must be recognized that this timer circuit cannot be calibrated by the central office maintenance force.)

Procedure: 4-second cam:

- (a) Select any arc which does *not* contain skip terminals. (See Note 3 below.)

- (b) At the Dial Tone Speed Register Circuit, operate the TST key.
- (c) Start stopwatch timing when the selector stops on terminal one. (See Note 4 below.)
- (d) Stop timing when the selector stops on terminal one of the next arc.
- (e) The elapsed time should be 80 ± 0.5 seconds.

Procedure: 3-second cam:

- (a) Select any assigned terminal.
- (b) Start stopwatch timing when the ST2 relay operates.
- (c) Stop timing when the P1 relay operates.
- (d) The elapsed time should be three seconds.

Do not confuse human error caused by inaccurate stopwatch operation with defective circuit timing.

Notes:

1. For both of the above procedures, a minimum of six tests shall be made to ensure accuracy of timing.
2. If calibration requirements are not met, defective KS-16663 timers must be replaced.
3. If all arcs contain skip terminals, calibration time must be adjusted by adding to the measured time, 4 seconds for each terminal skipped.
4. If the selector is normally resting on terminal one of the arc to be tested, it will be necessary to wait until the selector has completed a test cycle and it returns to terminal one of the same arc.

3.03.1.11 Miscellaneous: In Step-by-Step offices equipped for Common Control and/or TOUCH-TONE, a detector circuit is used which recognizes the two frequencies that comprise TOUCH-TONE dial tone. As dial tone speed measurements in these Step-by-Step offices cannot be made accurately without the detector arrangement, the dial administrator will want to verify that it has been provided in accordance with SD-96403-01, Issue 30A and includes Fig. 13.

- (a) Identifying installed units *and record*

Except for the units manufactured since 1966, there is no stenciling on the installed units to identify which version or issue, figure, etc, has been provided. As a result, it would appear desirable to fully identify each unit, with the assistance of the local Plant or Engineering forces and through the use of office record drawings. On units installed since 1966, stenciling shows which issue of the SD-96403-01 has been installed.

3.03.1.12 Distribution Review of Dial Tone Speed Test Terminals:

Examine dial tone speed assignments for uniform distribution over all line locations, to ensure that the sample represents average hunting time and that the results are representative under all degrees of loading.

3.03.1.13 The following examples of unsatisfactory daily dial tone speed results and their probable causes illustrate the most frequently encountered situations. Generally speaking, the sudden appearance of a degraded service condition indicates a primary cause other than a Traffic administration deficiency.

3.03.1.14 Unsatisfactory results appear throughout district

- (a) Invalid data due to a defective measuring device or clerical errors.
- (b) Overload due to:
 - (1) inclement weather.
 - (2) school closings.
 - (3) a combination of items (1) and (2).
 - (4) unforeseen traffic stimulation caused by current events, radio contests, or other promotional calling.
- (c) Balance.
- (d) Equipment made busy by central office maintenance or installation forces.
- (e) Equipment held busy by subscribers.
- (f) Equipment failed busy (not available for service, self-busy conditions).
- (g) Equipment failure (available, but will not provide satisfactory service).

3.03.1.15 *Unsatisfactory results confined to a single central office building.*

- (a) Invalid data due to a defective measuring device or clerical errors.
- (b) Equipment failure.
 - (1) line finder group(s) (available, but will not provide satisfactory service).
 - (2) ringing machine failure.
 - (3) commercial power failure.
- (c) Balance.
- (d) Equipment made busy by central office maintenance or installation forces.
- (e) Equipment failed busy (not available for service, self-busying condition).
- (f) Equipment held busy by subscribers.
- (g) Overload.

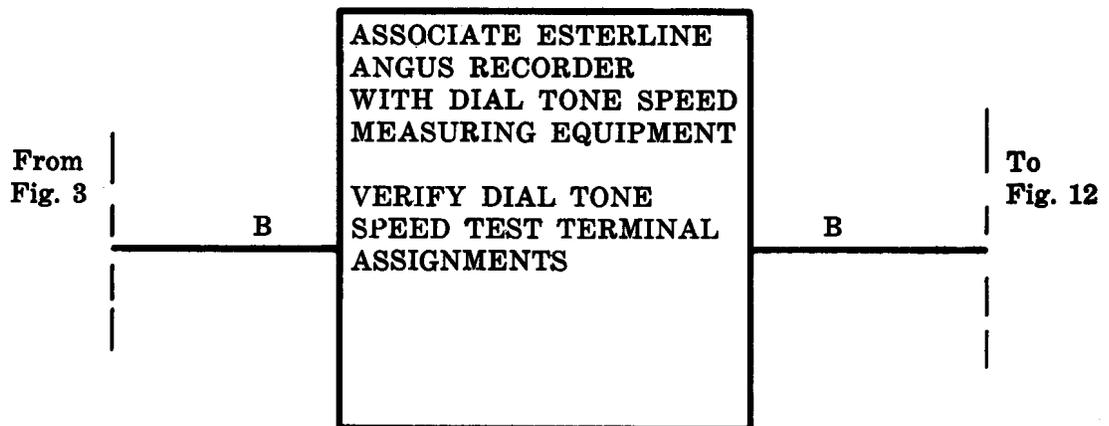
3.03.1.16 *Unsatisfactory results confined to a single loading division*

- (a) Invalid data due to a defective measuring device, or clerical errors.
- (b) Equipment failure.
 - (1) line finder group(s) (available, but will not provide satisfactory service).

- (c) Balance.
- (d) Overload.
- (e) Equipment made busy by central office maintenance or installation forces.
- (f) Equipment failed busy (not available for service, self-busying condition).
- (g) Equipment held busy by subscribers.

3.03.2 *Defective Line Finder Equipment* (Fig. 5):

Defective call-carrying equipment troubles cannot be overlooked as a possible source of service reaction. The Step-by-Step dial system is an electromechanical type machine which depends on good maintenance to operate at peak efficiency. A basic requirement for the analysis of dial tone speed results is the ability to locate the individual line groups which are contributing to the delays. This is essential when call carrying equipment problems or balance considerations are involved. Degraded dial tone speed results, due to other equipment problems such as ringing machine or commercial power failures, are more readily determined through Plant contacts or reports.



**Fig. 5—Flowchart—Analysis at Dial Tone Delays—
Defective Line Finder Equipment**

3.03.2.1 Items required for Analysis

(a) Automatic Dial Tone Speed Measuring Equipment—The following types are available:

Vacuum tube type
SD-96403-01, Fig. 1

Vacuum tube modified type
SD-96403-01, Fig. 12

Synchronous timer type
SD-96403-01, Fig. 12

(b) The Esterline Angus Recorder (the twenty pen type).

(Appendixes 3 and 4 of this section describe the studies related to this analysis).

(c) Dial tone speed test terminal assignment charts for the unit under investigation.

3.03.2.2 The line finder associated troubles listed below would tend to give a customer slow or no dial tone during busy hours:

- (a) C relay out of adjustment.
- (b) C relay contacts pitted or missing.
- (c) Vertical off-normal springs out of adjustment.
- (d) Commutator wiper out of adjustment.

3.03.2.3 Individual line groups in which dial speed delays are indicated should be examined under the following symptomatic classifications:

<i>Indication</i>	<i>Probable Cause</i>
Delays registered in same group on every cycle of test period.	Test terminal trouble not picked up during stop on delay test. (a) blocking tool in cut-off relay. (b) broken jumper to test terminal.
Delays registered in group with accumulated quality control scores which indicate an average or underloaded condition exists.	Assignment or cross-connection errors in TUR, or in dial tone speed test equipment. Line finder equipment trouble.
Delays registered in group with accumulated quality control scores which indicate an average or overloaded condition exists.	Excessive amount of traffic being offered groups. Traffic with unusual peaking characteristics being offered group. Line finder equipment trouble.

A stroke record should be maintained, during the analysis period, of all groups in which delays are encountered. Patterns of recurring trouble may become apparent from the use of this clerical aid. When such problem line groups are found to exist, it is suggested that visual observations be made of the group's performance during the hours when delays are anticipated.

3.03.3 *Equipment Made Busy* (Fig. 6)

- (d) No. 3B TUR
- (e) No. 4A TUR

3.03.3.1 Items required for analysis

Any of the following Traffic measuring facilities

- (a) No. 1 TUR (Portable)
- (b) No. 2A TUR (C TUR)
- (c) No. 3A TUR (S TUR)

3.03.3.2 This equipment made busy status category includes all switching and trunking facilities that are intentionally made busy for maintenance, cleaning, or for transition work. The analysis includes the following checklist for the inspection of equipment.

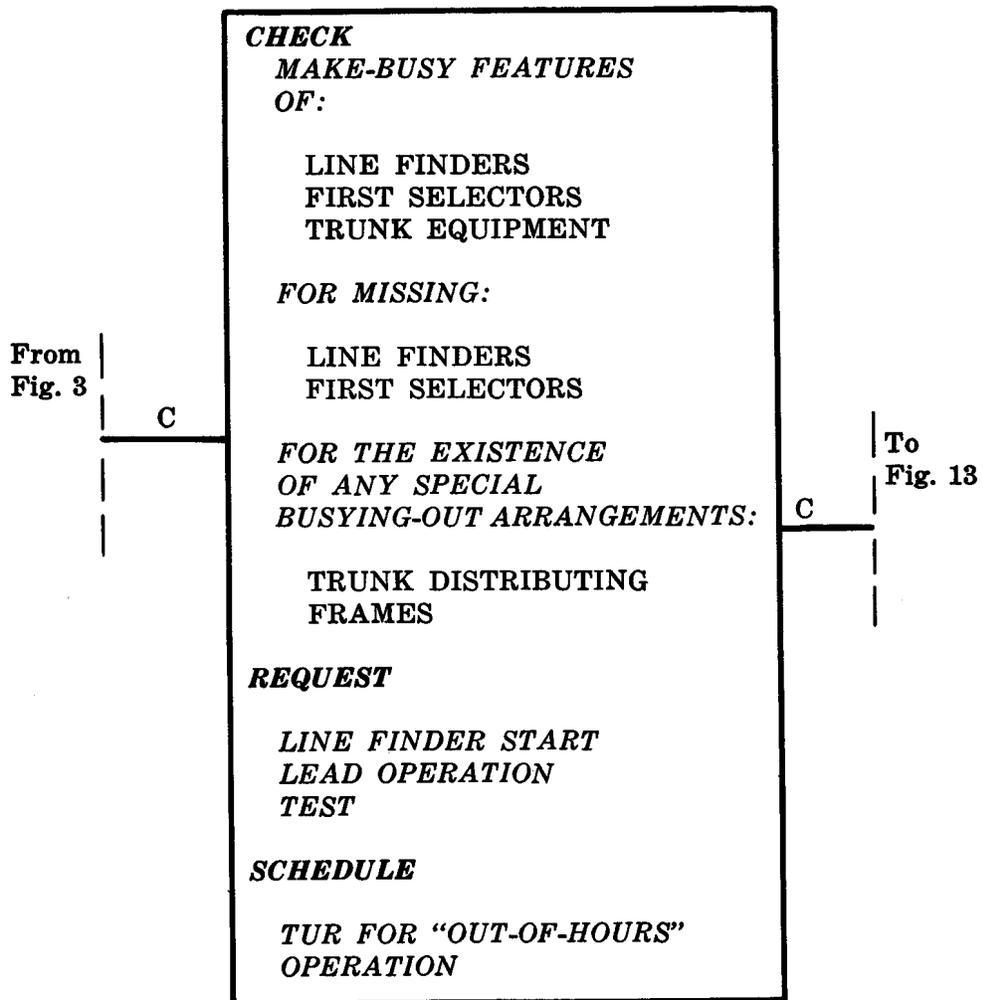


Fig. 6—Flowchart—Analysis of Dial Tone Delays—
Equipment Made Busy

3.03.3.3 Inspect line finder make-busy features.

Older equipment has busy-out jack panel mounted on the left-hand side of each line group. Newer groups incorporate a telltale, red lever make-busy switch under the baseplate on the left-hand side of each line finder. (See Appendix 5.)

3.03.3.4 Visually check all line finder and first selector trunk equipment make-busy features. This will include the following facilities where a "not available for service" condition can reduce call carrying capacity or can create regenerative traffic:

- (a) Coin box trunks

- (b) Message rate trunks
- (c) Zero level trunks
- (d) Trunks to service code selectors
- (e) Information trunks
- (f) Repair Service trunks
- (g) Trunks from local first selectors to local and extended local area offices, or to special services.

3.03.3.5 Inspect first selector test jacks for make-busy tools. (See Appendixes 6 and

7.)

3.03.3.6 Review central office Form E-4256, Record of Equipment Outages, described in Bell System Practices, Section 201-114-001 and illustrated in Appendix 9. The status of this form, its accuracy or even its absence, will indicate the attitude and degree of appreciation the central office maintenance people (in that work location) have for traffic considerations.

3.03.3.7 Include "out-of-hours" operation in TUR basic schedule. It is recommended that provision be made in the regular study schedule for running the TUR during periods of minimum traffic (eg, either 2 A.M. to 3 A.M. or 3 A.M. to 4 A.M., when few or no scorings would be expected) to test for busied-out equipment.

Usage registered during either of these periods would reveal the amount of equipment busied out according to the following simple formula,

$$E = \frac{A}{36\overline{CCS}} \quad \text{where:}$$

E = number of equipment components busied out

A = A.M. usage recorder in CCS

36CCS = 100% usage of any trunk

An "out-of-hours" reading of 108CCS, when substituted in the above formula, would indicate the following equipment quantities made busy:

$$E = \frac{108\overline{CCS}}{36\overline{CCS}}$$

E = 3 components made busy

This test will only indicate conditions of "ground busy." Line finders and associated first selectors, which have been removed from service by the use of make-busy plugs or the activation of baseplate switches cannot be detected by this test.

3.03.4 Equipment Failed Busy (Fig. 7)

3.03.4.1 Items required for analysis

Any of the following Traffic measuring facilities

- (a) No. 1 TUR (Portable)
- (b) No. 2A TUR (C TUR)
- (c) No. 3A TUR (S TUR)
- (d) No. 3B TUR
- (e) No. 4A TUR

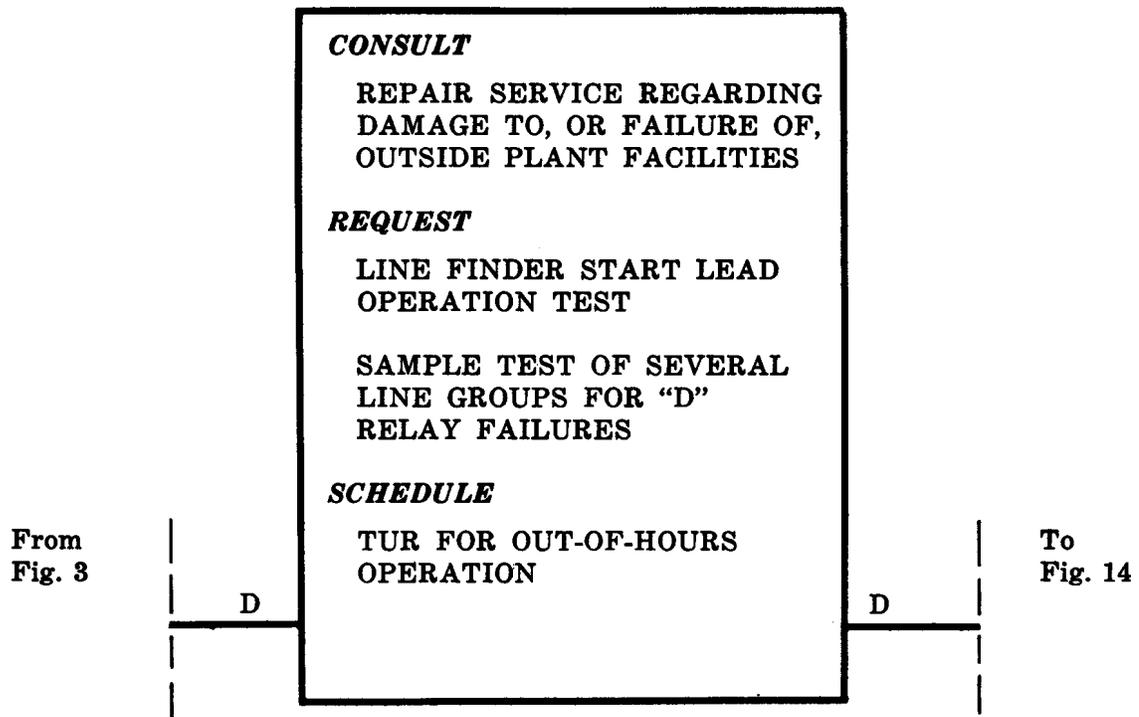
3.03.4.2 This equipment failed busy status category covers Step-by-Step component failures which result in self-busy conditions.

3.03.4.3 When degraded or unusual dial tone speed results develop suddenly in one or more central office areas, check Repair Service personnel for damage to, or failure of, Outside Plant facilities. As these service patterns are also symptomatic of inclement weather or invalid data situations, it is important that more than simply the existence of a cable failure be determined. Details of the outage must be reviewed in order to evaluate its impact on dial tone speed results for the period in question. These details should include:

- (a) Cable or cables involved.
- (b) Quantity of cable pairs involved.
- (c) Duration of outage.
- (d) Time when heat coils were removed.

3.03.4.4 Occasionally, line finder equipment may appear on TUR printouts as being made busy, yet an investigation fails to verify this indication. These intermittent and obscure failures can be due to the following line finder problems.

- (a) "D" relay adjustment.
- (b) Vertical off-normal spring adjustment.
- (c) Insufficient shaft spring tension.
- (d) Inadequate switch lubrication.



**Fig. 7—Flowchart—Analysis of Dial Tone Delays—
Equipment Failed Busy**

The conditions listed above can be detected by:

(a) Regularly scheduling the TUR for "Out-of-Hours" operation as previously covered in 3.03.3.7, Equipment Made Busy: This application of "Out-of-Hours" TUR operation is

more effective than when it is employed to detect line finders which have intentionally been made busy. This increased effectiveness is due to the fact that in almost all equipment failed busy situations a sleeve ground condition is present.

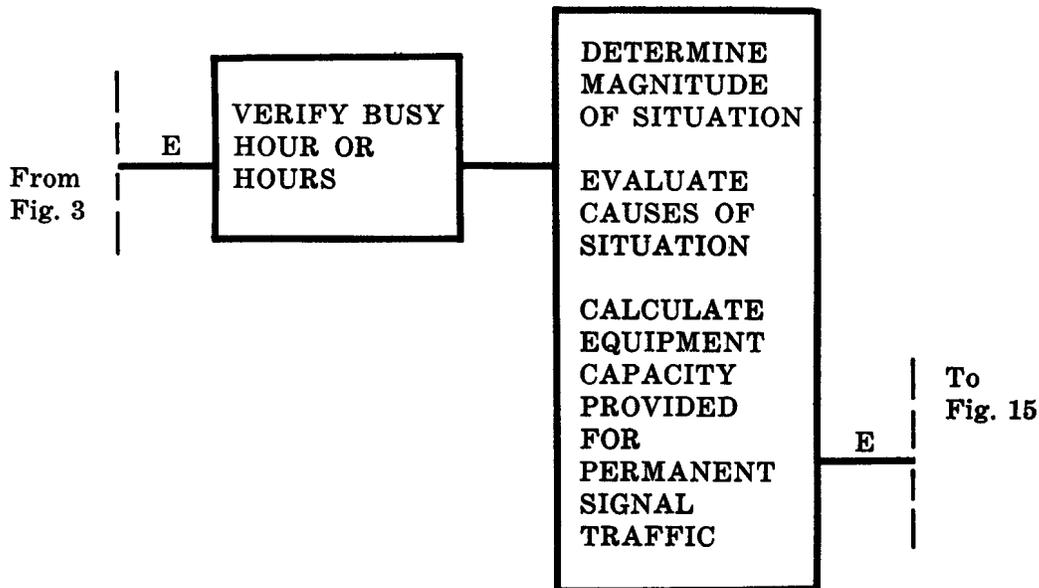
3.03.5 Equipment Held Busy by Subscribers Leaving Their Receivers Off the Hook (Fig. 8).

3.03.5.1 The analysis of this problem involves the following general requirements to:

- (a) Verify busy hour or hours as recommended in Traffic Facilities Practices, Division D, Section 1d.
- (b) Determine magnitude of problem (approximate number of busy-hour permanents in each line finder group).
- (c) Study and evaluate the reasons for subscribers leaving their receivers off-hook in

the problem offices where permanent signal volumes appear high or abnormal. Customers may be experiencing such a poor grade of service that they habitually leave their receivers off the hook to ensure the availability of dial tone.

- (d) Calculate the anticipated volume of permanent signal traffic provided for on the last time equipment addition. (This is done by subtracting the total first selector, office busy hour traffic from the total originating office busy hour traffic that appears on the current Traffic Order.)



**Fig. 8—Flowchart—Analysis of Dial Tone Delays—
Equipment Held Busy**

3.03.6 Overload (Fig. 9)**3.03.6.1** Items required for analysis in offices equipped with Traffic Usage Recorders:

- (a) The current Traffic Order
- (b) Load service curves
- (c) Record of lines and main stations by class of service
- (d) Record of total originating traffic by individual line groups
- (e) Record of total originating traffic by detector group usage

3.03.6.2 Items required for analysis in offices not equipped with Traffic Usage Recorders:

- (a) The current Traffic Order
- (b) Load service curves
- (c) Record of lines and main stations by class of service
- (d) Record of peg count registrations by individual line groups
- (e) Record of line finder all trunks busy registrations
- (f) Repair Service reports of no dial tone—no trouble found (A.T.&T. Form E-4086, Inspection and Routine of Central Office Equipment).

3.03.6.3 When it is suspected that unsatisfactory dial tone speed results are due to equipment overloads, it will be necessary for the dial administrator to verify the Dial Tone Speed busy hour. This is required in order to obtain statistically valid data for measuring subscriber service. The busy hour as defined in Traffic Service Observing Practice, Division F, Section 2, being that hour having the greatest average business day percent of dial tone delays over 3 seconds generally throughout the busy season, *but subject to change*. This will generally coincide with the hour having the maximum CCS usage for that class of service (or loading division); when it does not *the cause needs to be determined*.

3.03.6.4 For the purpose of this analysis, the overload problem will be divided into its two basic components:

- (a) offered traffic
- (b) existing equipment

3.03.6.5 Offered Traffic: After determining the busy hour(s), the following checks should be made for the purpose of validating total originating call volumes:

TUR Data

(a) Total DGU register traffic should equal the sum of the traffic recorded on the individual line group registers for the same period of time.

(b) Line finders should be compared by group for consistency in usage. Any group $\pm 50\%$ of average and having a similar number of working lines as other line groups requires further investigation.

(c) In Step-by-Step offices, line finder usage minus the usage of all outgoing trunks to switchboards, desks, and other offices plus the usage of all incoming toll trunks, and trunks from other offices normally exceed connector usage by five to seven percent. The excess of originating, less outgoing, plus incoming usage, over terminating usage is the effect of permanent signals, false starts, partial dial calls, and part of the dialing time of good calls. If it is substantially below this range, investigation for omitted TUR cabling or cross-connections or busied equipment is indicated. If it is substantially above this range, investigation with respect to permanent signals as well as the above items is indicated.

(d) Any sudden change in the previously established position of a line group, relative to the average of all like groups, calls for investigation unless it is known that significant changes in loading have been made.

(e) Overall usage for a line group can be checked by computing the holding time from usage and peg count records and checking this frame for reasonableness. Where unusually high holding times are indicated, busied-out equipment may be involved.

NON-TUR Data

(a) Peg count readings of similar line finder group classes should approximate each other.

(b) Calling rate per line of like classes of groups should approximate each other.

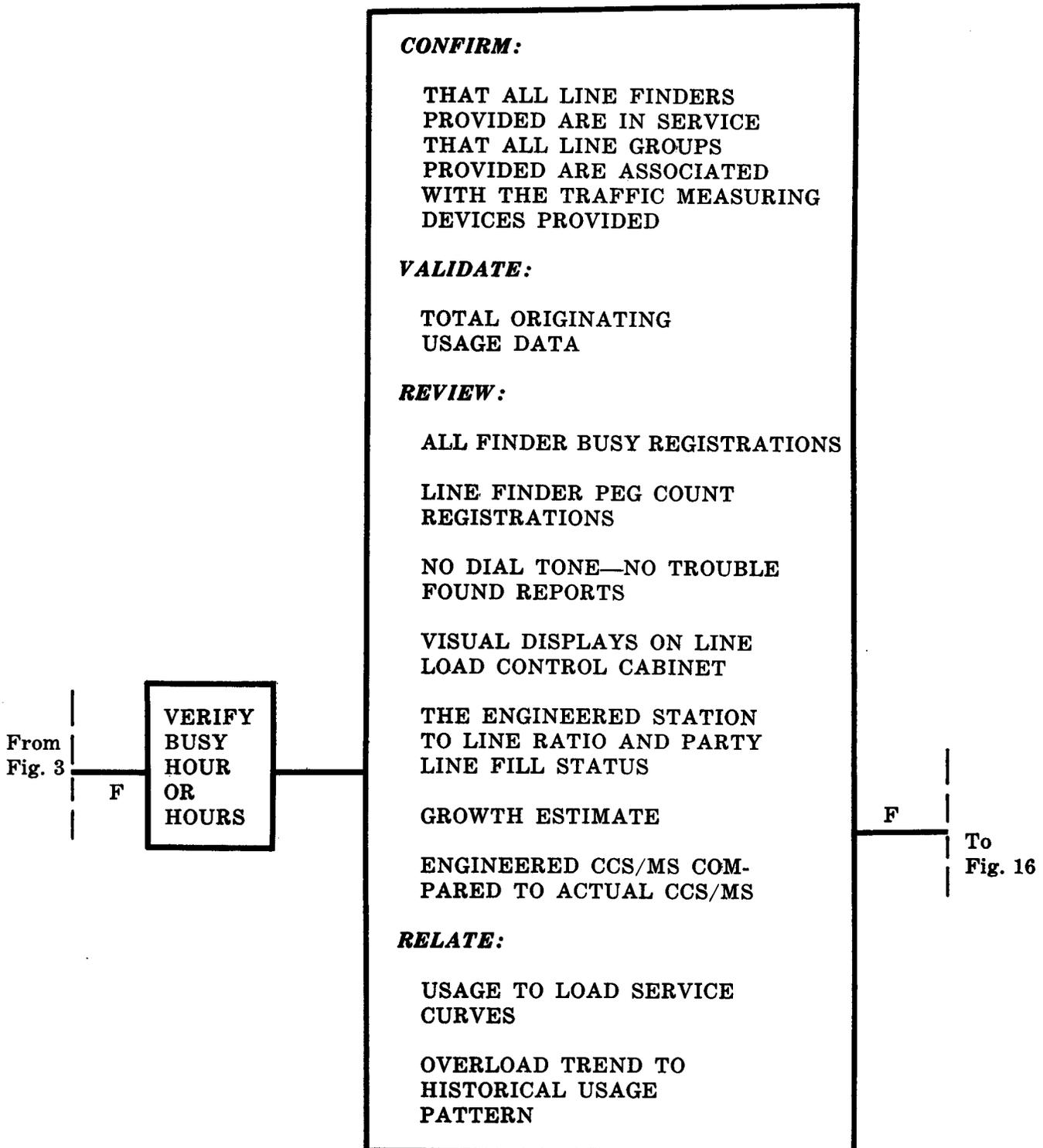


Fig. 9—Flowchart—Analysis of Dial Tone Delays—Overload

Subsequent to the validation and review of the total originating Traffic data, the analysis should be extended to include a check of such high load indicators as:

- (a) All finder busy registrations
- (b) Line Load control cabinet visual displays
- (c) Repair Service reports of "no dial tone—no trouble found"
- (d) Central Office record of call block alarms.

When an overload exists, positive signs of it will be present in all the above-mentioned indicators.

3.03.6.6 In determining the overload pattern, its magnitude and growth rate, comparisons will be made of the following items:

- (a) The current traffic volume outline and the historical load service curve. (The duration and severity of an overload may be predicted, if it is tracking a traditional, although even higher, trend.)
- (b) The actual to engineered CCS per main station figures.
- (c) The number of working lines and main stations by class of service against those furnished in the forecast of growth.

3.03.6.7 Indicated below is a chart of the relationship between ABD Busy Hour percent dial tone speed with its associated component index, and engineered load expressed in terms of percent capacity.

% DTS	Component Index	Approximate % Eng. CCS Cap.
0.0 to 1.1	100	96
1.5 to 1.6	98	100
1.8	96	102
2.0	94	104
2.2	92	105
2.3	90	107

The above percent engineered CCS capacity is based on the theoretical load service relationship. This chart is intended for use as a first reference guide only in evaluating the impact of an overload. It is not a substitute for load service curves, which can:

- (a) Indicate the capacity of an office.

- (b) Help to determine if service objectives will be met.
- (c) Reveal equipment and measuring device problems and also some distinguishing characteristics of otherwise similar offices.

The subject of load-service curves is covered in the Traffic Facilities Practices, Division D, Section 1-b.

3.03.6.8 Existing Equipment: Determine that all line finder groups provided are in service and associated with the traffic measuring devices. An inventory may be quickly made by comparing line assignment records against the line finder and associated first selector summaries provided in the current Traffic Order. An investigation should be made of any established line group where the following are *absent*:

- (a) Subscriber assignments.
- (b) Indications of call volumes or traffic usage.

In addition, administration records should be checked for evidence of such written restrictions as:

- (a) Line groups where fills are noticeably below office average.
- (b) Line groups which carry such notations as: "Do Not Assign," "Do Not Assign Above _____," "DNA."

An on-site inspection should be made of current and past line additions which were installed on an advance completion request. The dial administrator should be aware of the existence of any equipment penalties which had been assessed as part of the cost of advancing the job. Examples of such penalties are:

Line Finder Groups

- (a) Limiting the number of terminals provided per group.
- (b) Limiting the number of line finders provided per group.

First Selectors

- (a) Nonstandard shelf distribution of selectors.
- (b) Proposed grading of first selectors not done.
- (c) Limiting the number of first selectors provided.

3.03.7 Balance (Fig. 10)

3.03.7.1 Investigation of unsatisfactory dial tone speed results caused by imbalance includes two basic analysis requirements previously described elsewhere in this section. They are:

- (a) The determination of the actual office busy hour(s). This time period may not coincide with the present Engineering, or Service Observing busy hour.
- (b) The capability of identifying individual line groups which are contributing to delay totals.

These preliminary steps are necessary in order to obtain statistically valid data and to eliminate

the possible presence of other causes of poor dial tone service that can provide a false picture of imbalance.

3.03.7.2 The indications of imbalance are varied and complex with not all symptoms being present at all times. The following are the most common indications of imbalance.

- (a) An unequal distribution of lines by class of service within a loading entity (considerations must be given to special classes, such as WATS or Dial TWX).
- (b) When the results information obtained from traffic registers (All Finder Busy and Peg Count) for a specific group or groups deviate significantly from the average of like groups.

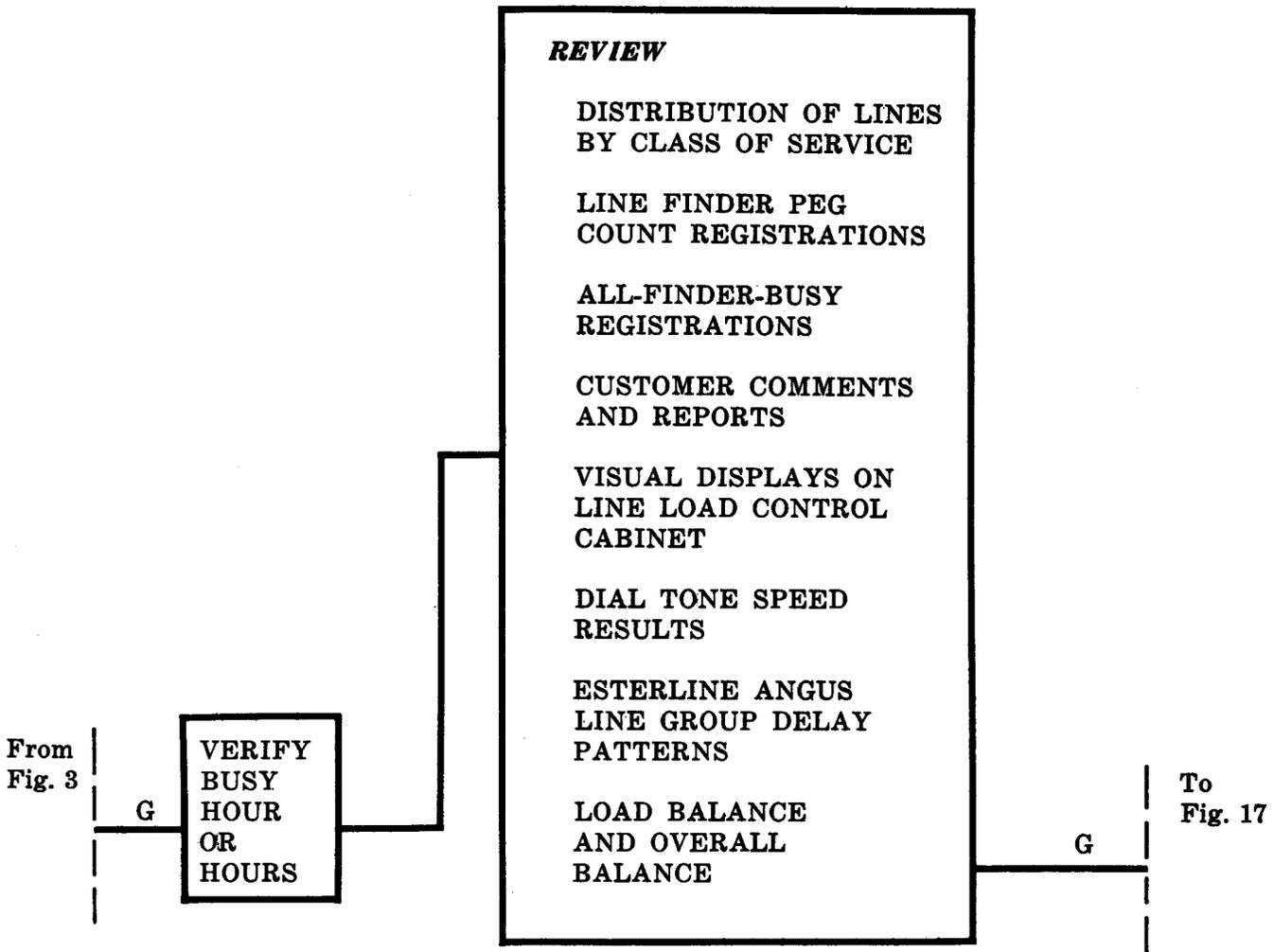


Fig. 10—Flowchart—Analysis of Dial Tone Delays—Balance

- (c) When unfavorable comments are frequently received from customers in a specific group, eg, "via no dial tone—no trouble found" reports, SAM surveys, or informal contacts.
- (d) When TUR data indicate imbalance.
- (e) When certain line groups appear repeatedly on line load control cabinet displays during the busy hour(s).
- (f) When speed of dial tone results are excessive for particular loading divisions.
- (g) When Esterline Angus Recorders, associated with dial tone speed test equipment, indicate repeated delay pattern in specific line groups.
- (h) When load balance and overall balance results indicate problems.

Note: Refer also to letter by Messrs. Hunt and Collins, dated August 29, 1967, File 3B3.2A/2E2.4A, *Permanent Signal Procedures for overloaded offices.*

3.03.7.3 When overloaded line groups have been identified, the appropriate remedial measures will be applied. These are outlined in 3.04.7, Corrective Action—Balance.

3.04 Corrective Action

3.04.1 Invalid Data (Fig. 11)

3.04.1.1 Replace any informal or handed-down reference material with Traffic Service Observing Practice, Division F, Section 2. The unsuitable reference material may be in the form of oral instructions, letters, or provisional prac-

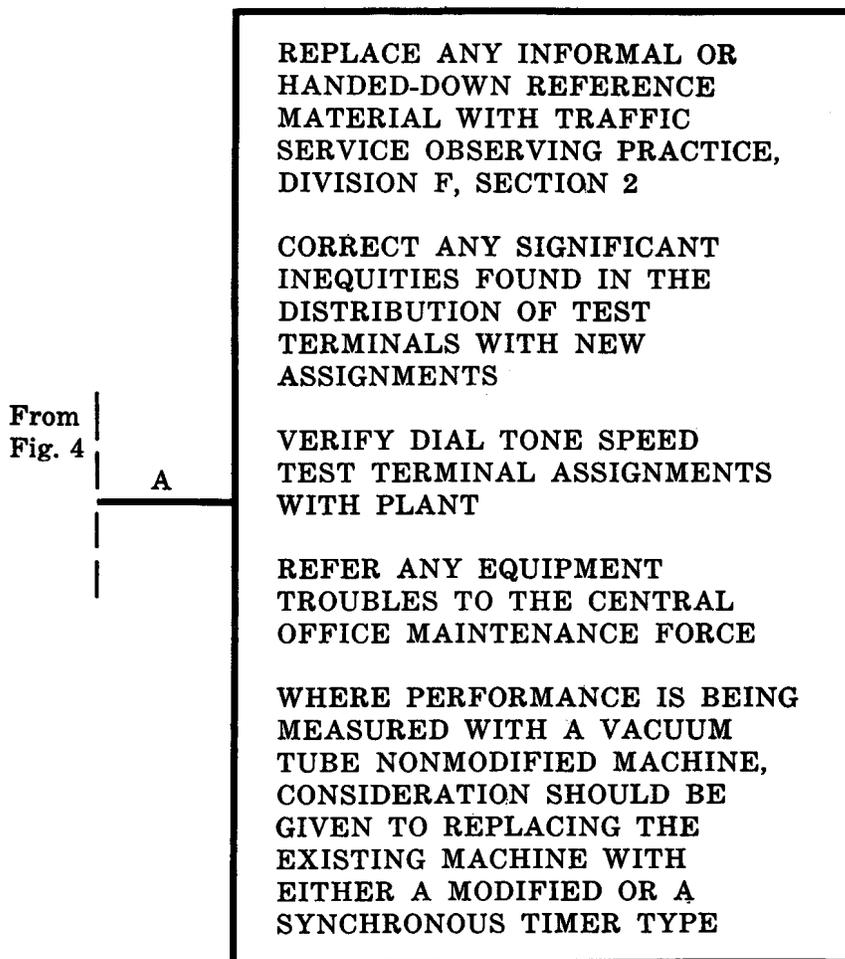


Fig. 11—Flowchart—Dial Tone Delay—Corrective Action—Invalid Data

tices which have become outdated. It is recommended that each employee involved in the compilation of dial tone speed data and all other dial line components be provided with a current copy of the Dial Line Index Plan. Familiarization with this instructional material and responsibility for its maintenance will aid in the development of more accurate and uniform results.

3.04.1.2 Correct any significant inequities found in the distribution of test terminals with new assignments. The assignment practices to be followed for all types of dial equipment and the various service offerings are covered in Traffic Facilities Practices, Division B, Section 4.

3.04.1.3 Verify with the Plant Department that their list of dial tone test assignments posted at the dial tone speed machine, agrees with current Traffic records. This information is normally reviewed with the central office maintenance force prior to the busy season, and after each line addition. Care should be taken not to overlook this requirement on advance completions of line additions.

3.04.1.4 Refer any equipment troubles to the central office maintenance force on standard Traffic Data Trouble Ticket, Form E-4988. (See Appendix 10.) When it is necessary to refer troubles verbally, the above-mentioned form should be sent subsequently as a confirmation. The following guidelines should be adhered to:

- (a) Enter as much information as possible to assist Plant-*phone urgent cases*.

- (b) If at all possible, troubles should be cleared prior to the next day's busy hour.
- (c) Maintain a record of all troubles reported to Plant including time of referral, time of return, and trouble found.
- (d) Obtain an explanation of all troubles not cleared within a 24-hour interval.

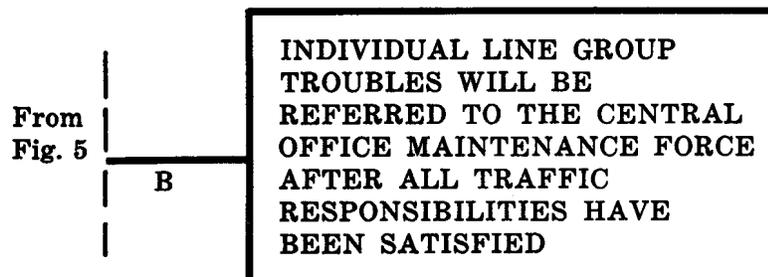
3.04.1.5 Where speed of dial tone performance is being measured with the older vacuum tube timer version of the Dial Tone Speed Register Circuit (SD-96403-01, Fig. 1), it is suggested that consideration be given to replacing this equipment with either a modified machine (SD-96403-01, Fig. 12) or the synchronous timer type (SD-96403-01, Fig. 12). (See Appendixes 1 and 2.)

3.04.2 Defective Line Equipment (Fig. 12)

3.04.2.1 Refer any suspected equipment troubles to the central office maintenance force on standard "Referred Trouble Ticket" (See Appendix 11.)

The following administration guidelines should be adhered to when initiating this form:

- (a) Enter as much information as possible to assist Plant. This would include administrative data concerning usage, loading, and traffic analysis.
- (b) Arrange, if at all possible, for troubles to be cleared prior to the next busy hour.



**Fig. 12—Flowchart—Dial Tone Delay—Corrective Action—
Defective Line Equipment**

(c) Maintain a record of all troubles reported to Plant including time of referral, time of return, and trouble found.

When it is desirable to refer troubles verbally, the above-mentioned form should be sent subsequently as a confirmation.

3.04.3 Equipment Made Busy (Fig. 13)

3.04.3.1 Busy Hour equipment outages be kept to an absolute minimum, and accurate records be maintained on all out-of-service items on the following forms; illustrated in Appendixes 12 and 9, respectively:

Form E-4255 Record of Trunk Outages

Form E-4256 Record of Equipment Outages

Because hourly loads vary for different periods of time and for items of equipment, it is important that the following be known.

(a) When equipment may not be taken out of service (except for troubles).

(b) The *Quantity* which may be removed for testing and wiring operations during a given time interval.

(c) The order of *Priority* for restoral to service (paramount consideration should be given to the limiting item or items of equipment).

3.04.3.2 Traffic will determine the minimum number of equipment needed to maintain good service at various load conditions. These requirements will be recorded on a form similar to "In-Service Requirements," Appendix 13, and a copy given to the central office maintenance force for information and discussion. An additional copy also will be forwarded to the Engineering Department. If the central office maintenance representative does not concur with these minimum requirements, and demonstrates that maintenance requirements exceed the Traffic Department's limitations, the Engineering De-

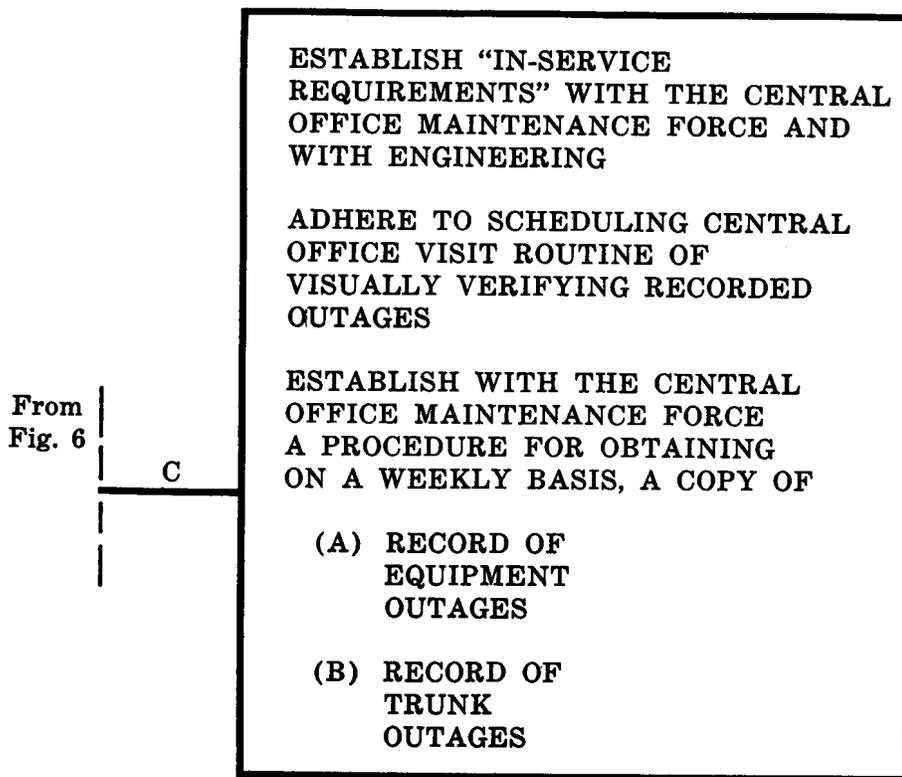


Fig. 13—Flowchart—Dial Tone Delay—Corrective Action—Equipment Made Busy

partment must be informed. Consideration may then be given to providing additional equipment to meet both service and maintenance requirements.

3.04.3.3 It must be clearly understood that maintenance equipment is not normally provided for the 10 High (usage) days of the year. Since the 10 High days are impossible to predict in advance, the central office maintenance forces must be prepared to have all equipment in service during the peak load periods, as they occur generally without warning.

3.04.3.4 The dial administrator will schedule a weekly visit to the central office to visually verify the recorded outages and will refer any discrepancies to the central office maintenance force. If accuracy of this record is substantiated by several weekly visits, and if service is satisfactory, the schedule may be reduced gradually to a minimum of one visit per month. In TOUCH-TONE or common control SXS offices equipped with TURs, an additional verification is made by comparing reported outages (for those hours that the TUR is in operation) with maintenance usage data *for components so measured*. The "Record of Equipment Outages," Form E-4256, should be compared regularly with the Traffic record, "In-Service Requirement" to determine when there have been excess equipment outages.

3.04.3.5 Each week, the Traffic dial administrator will receive from the Plant Department two copies of the "Record of Trunk Outages," Form E-4255. (See Appendix 12.) One copy will be retained and used for evaluating and analyzing trunk overflow readings and the other copy will be forwarded to the Trunk Facilities forces for use with the weekly trunk overflow readings.

3.04.3.6 The dial administrator will also receive, on a weekly basis, one copy of "Record of Equipment Outages" Form E-4256 (see Appendix 9) showing equipment outages, including those occurring during periods when TUR maintenance usage referred to in 3.04.3.4 is not available.

3.04.3.7 The dial administrator will furnish the central office maintenance forces with up-to-date issues of "In-Service Requirements,"

(form similar to Appendix 13) showing the minimum number of equipments needed to render good service at various traffic load conditions.

The form should be prepared so that traffic load conditions may be grouped into various categories. The categories should be representative of percentages of busy hour traffic loads.

For example:

Category	Bands
A	85-100% of busy hour load
B	65-84% of busy hour load, etc.

It should be emphasized that the number of categories required and the usage levels defining the limits will be determined by Traffic and discussed with the central office maintenance and engineering forces. Power charts can be used to assist in determining in which category each hour of the day belongs. Since local conditions differ, there is no one answer appropriate to all offices.

3.04.3.8 These "In-Service Requirements" forms will be prepared prior to the busy season and after equipment additions. It should be noted that this "In-Service Requirement" form is a *guide* for central office maintenance and, as discussed, it will not be adhered to when traffic is extremely heavy. Under heavy traffic conditions, all equipments removed from service for routine testing will be restored to service as soon as possible.

Note: Whenever maintenance or installation activities require more than the maximum allowable number of items to be removed from service, a joint Plant, Traffic, and Engineering determination shall be made to cover the situation. It is intended that this effort will serve two purposes:

- (a) To hold maintenance and installation work until mutually agreed to arrangements can be developed for preventing service degradation on the job under consideration.
- (b) To develop work scheduling and engineering recommendations for anticipating and eliminating the need to remove more than the maximum allowable items from service on future jobs.

3.04.4 Equipment Failed Busy (Fig. 14)

3.04.4.1 Review with the central office maintenance forces the current experience of equipment troubles affecting dial tone speed and the need for and timing of remedial measures.

3.04.4.2 This is an appropriate time to correct a popular fallacy sometimes used in estimating the impact of busied-out equipment. The percent of lost switching capability is based on the reduction in the *call-carrying capacity* of the equipment, *not the number of units of equipment*, removed from service. For example:

Size of Group	Switches Made Busy		Reduced Call—Carrying Capacity
	No.	%	
10	1	10%	15.6%
4	1	25%	50%

3.04.5 Equipment Held Busy (Fig. 15)

3.04.5.1 For Weakspot offices, discuss with central office maintenance forces the need for a permanent signal patrol based on Bell

System Practices, Section 226-135-300, Method of Handling Permanent Signals—Step-by-Step and Community Dial Offices.

Note: Refer also to letter by Messrs. Hunt and Collins, dated August 29, 1967, File 3B3.2A/2E2.4A, *Permanent Signal Procedures for overloaded offices.*

3.04.5.2 The arrangement mentioned above assumes that maximum maintenance efforts will be made to clear all permanents during the busy hour(s). This would include the use of all available permanent signal release equipment, such as line lock-out shoes. In addition, release priority will be given to those groups indicating "All Finders Busy" on the line load control cabinet.

3.04.5.3 The central office maintenance force is responsible for recording and forwarding to the Traffic dial administration force lists of busy hour permanents by group and terminal. Traffic will want to take part in developing programs both for improving customer performance in this respect and reducing any concentration of these customers in particular line groups.

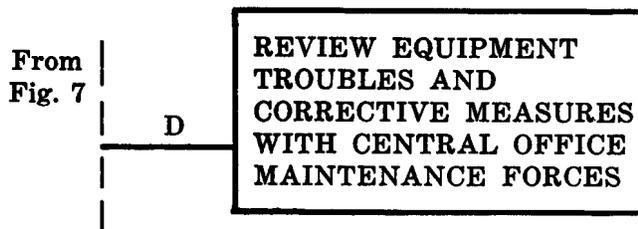


Fig. 14—Flowchart—Dial Tone Delay—Corrective Action—Equipment Failed Busy

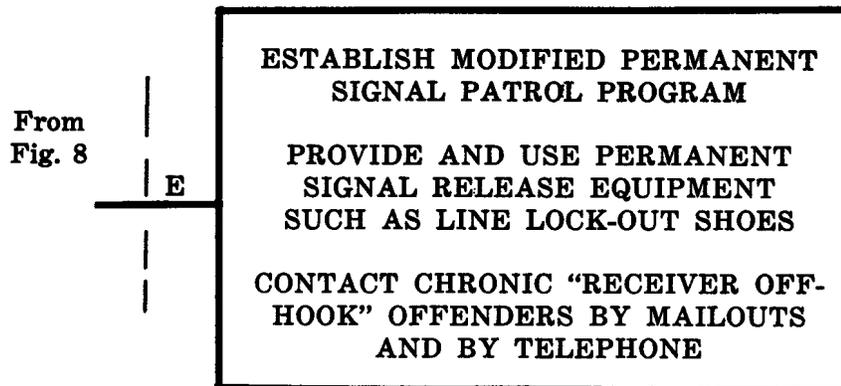


Fig. 15—Flowchart—Dial Tone Delay—Corrective Action—
Equipment Held Busy

3.04.6 Overload (Fig. 16)

3.04.6.1 The following 4-step program is *Inter-departmental* and is intended to minimize an existing equipment overload and to control the service impact of any overloading deemed to be unavoidable.

Step 1 Make certain that all dial administration responsibilities that are involved are being fulfilled.

(a) Balance

Keep TUR in service to obtain balance data.

Keep dial tone speed machine in service.

Review arrangements regarding line transfers.

Determine that efforts are being made to reach party-line fill objectives.

(b) Maintenance

Develop a maintenance plan to control equipment and trunk outages during busy periods.

Develop a priority list of equipment components to be restored to service first.

(c) Permanents (equipment held busy)

Institute special measures for permanent signal control during busier hours (See 3.04.5, Equipment Held Busy).

(d) Bottlenecks

Locate and minimize the effects of all bottlenecks which can create regenerative traffic. Middle of the dial train shortages and balance problems can affect dial tone speed results. There is no alternate routing in a Step-by-Step dial system.

(e) Dial Assignment

In a multiunit building, take new growth in other offices where possible. Give consideration to both originating and terminating loading and balancing when doing this.

(f) Avoid stimulating telephone usage

Discuss with Marketing and Commercial the effects on service of any promotions that will encourage telephone calling.

Step 2 Establish Relief Plans

(a) Request relief on an expedited basis, if none is planned.

From
Fig. 9

F

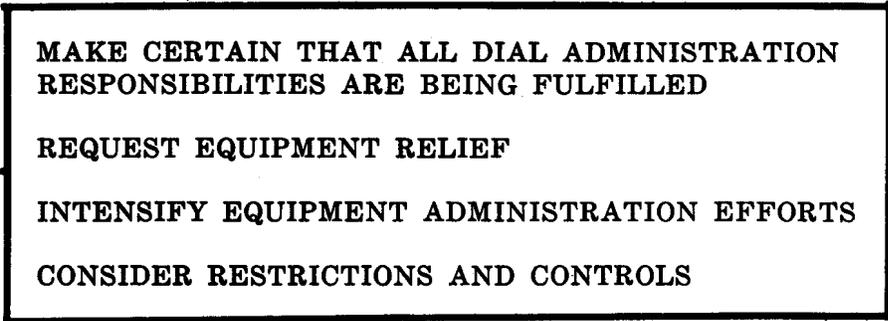


Fig. 16—Flowchart—Dial Tone Delay—Corrective Action—Overload

- (b) Request advance completion of next scheduled job.
- (c) Request advance completion of portions (critical components) of next scheduled job.
- (d) Request that equipment be diverted from job shipping to another office where need is not as critical.
- (e) Request area transfer of lines to another office which can accept the additional load without service reaction.

Note: Prior to applying Step 2, remedial action consideration must be given to the following conditions:

- (1) The existence of other limiting factors such as outside cable facilities. It would be wasteful to pay the penalty for having a central office equipment addition advanced and then discover that no outside facilities exist to meet the additional central office equipment.
- (2) The presence of a historical load-service pattern that indicates a drop in offered load will occur before the preceding corrective action can be made effective.

Step 3 Intensify Traffic and Plant Administrative Efforts

Where equipment relief is not available, as a feasible solution for an existing Traffic overload,

the local Plant-Traffic team will be organized for intensive effort. This intensive effort would include:

- (a) The stationing of dial administration personnel at the overloaded entity during the office busy hour(s) for the purpose of:
 - (1) Line load control cabinet monitoring to aid the central office maintenance forces in clearing switches held permanent
 - (2) Traffic register reading
 - (3) Record verification such as frame and equipment checking when not involved in the first two items
- (b) The temporary relocation of central office repairmen, if necessary, to the overloaded unit, or wire center
- (c) The temporary relocation of equipment such as line finders and first selectors from nonoverloaded offices to replace any switches waiting parts in the problem area
- (d) The borrowing of portable line lock shoe equipment from non-Weakspot unit when locally provided.

Step 4 Restrict New-Connects

- (a) When the previous three steps do not adequately relieve the overload, consideration should be given to:
 - Establishment of line restrictions.

(b) Where line finder terminal shortages are affecting good balancing efforts, the following actions should be initiated by the Dial Administrator:

- Verify Plant records with Traffic records of working lines.
- Check 2- and 4- party line fills (to determine if Company objectives are being met).
- Compare records on working lines with actual working lines (frame check).
- Check the status of any out-of-service line equipment with the central office maintenance forces.
- Recheck records on reserved terminals and held orders.

3.04.7 Balance (Fig. 17)

3.04.7.1 Balance requires constant analysis of the changes in group loads and the effects on service. A line group that appears to be out of control one week may be well under control the next week without having any corrective action applied. To do an acceptable balancing job and judiciously apply corrective action, it is necessary to be thoroughly familiar with the following other Sections of Division H of these Practices:

- (a) Section 2b—Step-by-Step, Switching Facilities (when published)

- (b) Section 2d(1)—Step-by-Step, Administration—Basic Procedures (when published)
- (c) Section 2e—Step-by-Step, Traffic Measurements (when published)

3.04.7.2 In addition, the following principles of balance are to be considered when applying corrective action:

- (a) Perfect balance is impossible. Customer offered loads vary from day to day. When the variations do not exceed the quality control limits, a good practical balance exists.
- (b) A practical balance is the absence of significant load deviations of specific groups, from the overall average of similar groups.

3.04.7.3 Balance in an underloaded office is not to be ignored because:

- (a) It is difficult, time-consuming, and expensive to rebalance an office once it has been permitted to get out of balance.
- (b) In an imbalanced office, average service is poorer than if it were balanced.
- (c) In an imbalanced office giving objective average service, some groups of customers receive poor service.

3.04.7.4 Line assignments must always be made with the thought of maintaining or improving the balance within an office. A numerical balance of lines by class of service in any loading

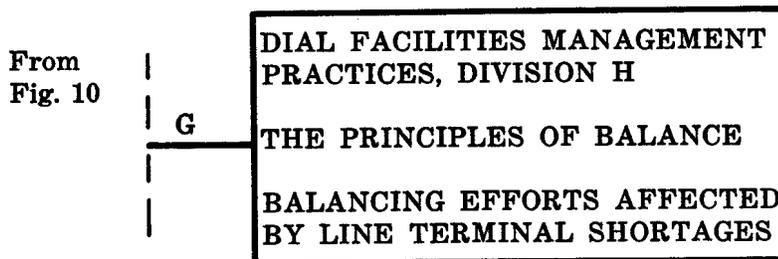


Fig. 17—Flowchart—Dial Tone Delay—Corrective Action—Balance

division is the first big step toward a load balance. It is about the only expedient that can be resorted to, when it *appears* that an office has two classes of service busy hours. For example:

An office has a morning busy period where the offered traffic is mostly composed of business calling. It also has an evening busy interval of about the same magnitude due to residential traffic. In this situation, a numerical class of service balance may be maintained with corrective action confined to business telephones.

3.04.7.5 Additions to offices must be substantially loaded immediately upon completion of the job. Considerations must be given to the difference in offered load by old customers and by new customers.

4. OVERFLOWS

4.01 *Indicators* (Fig. 18)

4.01.1 The *direct measurement* of overflows occurring within step-by-step selector trains

is generally not possible as overflow registers are not available except in portions of installations equipped with common-control or AMA. As a result, indirect means of appraising this service situation are necessary as described below. Recognize that there may be a relationship between Overflow and Dial Tone Speed problems as blocked calls cause additional attempts.

4.01.2 The indicators summarized below are those available for detecting Overflow conditions.

4.01.3 *Service Observations:* (Reference TSOP, Division B, Section 1C) Overflow signals, in general, are 60 or 120 IPM tone. In some Step-by-Step offices, the busy signal and the 60 IPM overflow signal are the same. If it is the overflow, the signal will usually be encountered before the end of dialing. In the case of calls to PBXs served by level hunting connectors, and in isolated instances where connection to a customer's line is made directly from a selector level, it is possible under certain conditions for either an overflow or a line busy condition to be encountered before the completion of dialing.

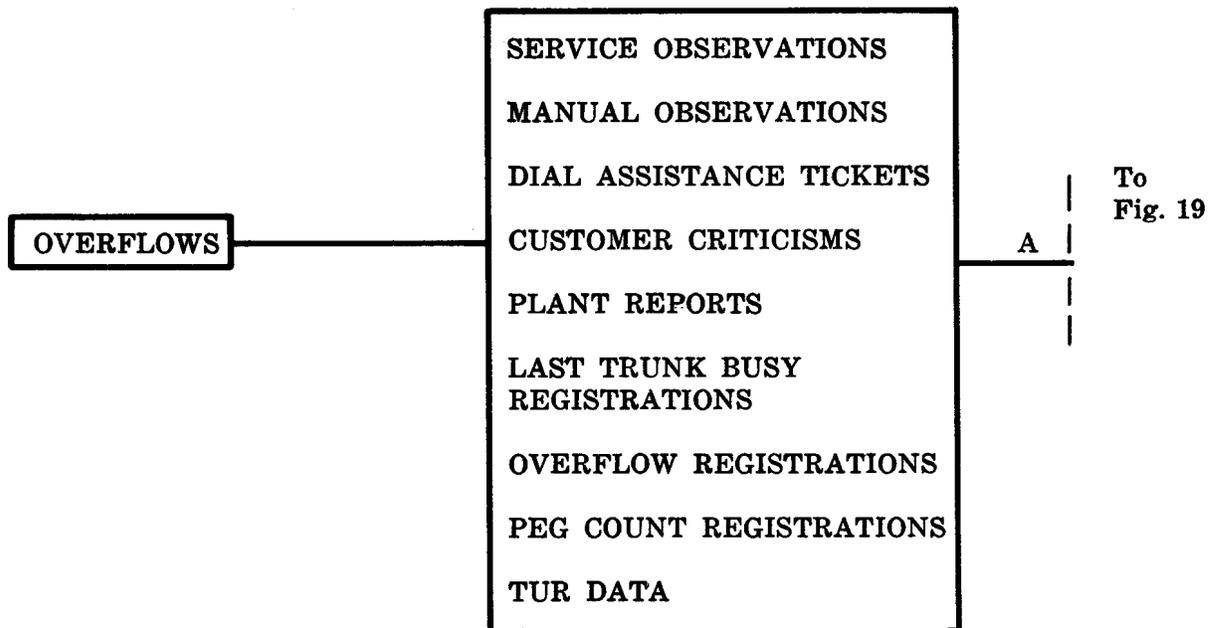


Fig. 18—Flowchart—Overflow—Indicators

4.01.4 Manual Observation: Information regarding this indicator is obtained during periodic visits by the Traffic Dial Administrator to the various central offices. Selectors frequently hunting latter choice trunks or going off the banks (11th rotary step) and rotary out trunk switches which are constantly hunting for idle trunks are conditions to be observed.

4.01.5 Dial Assistance Tickets: Indications of an overflow situation can be found in the ticketed requests for operator assistance where a subscriber has encountered a "busy before through dialing" condition.

4.01.6 Customer Criticisms: This indicator being in the form of an oral or written complaint distinguishes it from a request for operator assistance. The condition described by the customer is usually of a severe and repeated nature. A typical example of this type of criticism would contain the statement, "Everytime I dial that number, I get a busy after the fourth digit."

4.01.7 Central Office Maintenance Reports: These reports are similar to those described in 4.01.4, "Manual Observations," the difference being in their origin. These reports are originated by the central office maintenance forces.

4.01.8 Last Trunk Busy Registrations: Last Trunk Busy Registrations (LTB) indicate the number of times the last *choice* trunk of a group or subgroup is seized. Last Trunk Busy readings are used cautiously, however, because it is possible to have an LTB registration and still have idle trunks in the group.

4.01.8.1 LTB allowable registrations should be established for each selector group and entered on a form for the accumulation of weekly readings.

4.01.9 Overflow Registrations: When overflow registers are associated with the customer's line in rotary or level hunting service, they indicate the number of times a call to a customer's line series encounters an all lines busy condition.

4.01.10 TUR Usage: These data, when available, are used to indicate the volumes of traffic handled by the various selector groups or subgroups.

4.01.11 Peg Count Registrations: These registrations are used to indicate the number of calls handled by various selector groups or subgroups.

4.02 Causes (Fig. 19)

4.02.1 Balance: Selector group or subgroup imbalance situations which create or contribute to excessive overflows within the dial tone train can be caused by any of the following items.

4.02.1.1 Equipment Intentionally Made Busy:

Normally, equipment can be busied out during nonbusy hours without any adverse effect on service. Equipment may intentionally be made busy for maintenance and repair, cleaning, or transition purposes. However, when equipment outages result in a reduction of the number of selectors available for customer use during peak traffic periods, service reaction can appear as subscriber overflows. In addition, these equipment outages cause:

- (a) Distortion of the traffic distribution within the office which can result in false indications of overloading.
- (b) Distortion of usage data unless the Traffic administration force is advised of all outages and is able to adjust the data accordingly.

4.02.1.2 Improper Equipment Arrangements or Trunk Layouts: The basic reason for such undesirable situations is almost always a lack of, or invalid, dial administration data.

4.02.1.3 A Disregard for Connector Balance Considerations: This can be caused by a line assignment policy so heavily committed to the provision and reuse of telephone numbers that it completely ignores balance considerations, and imbalance indicators, at the connector switch stage.

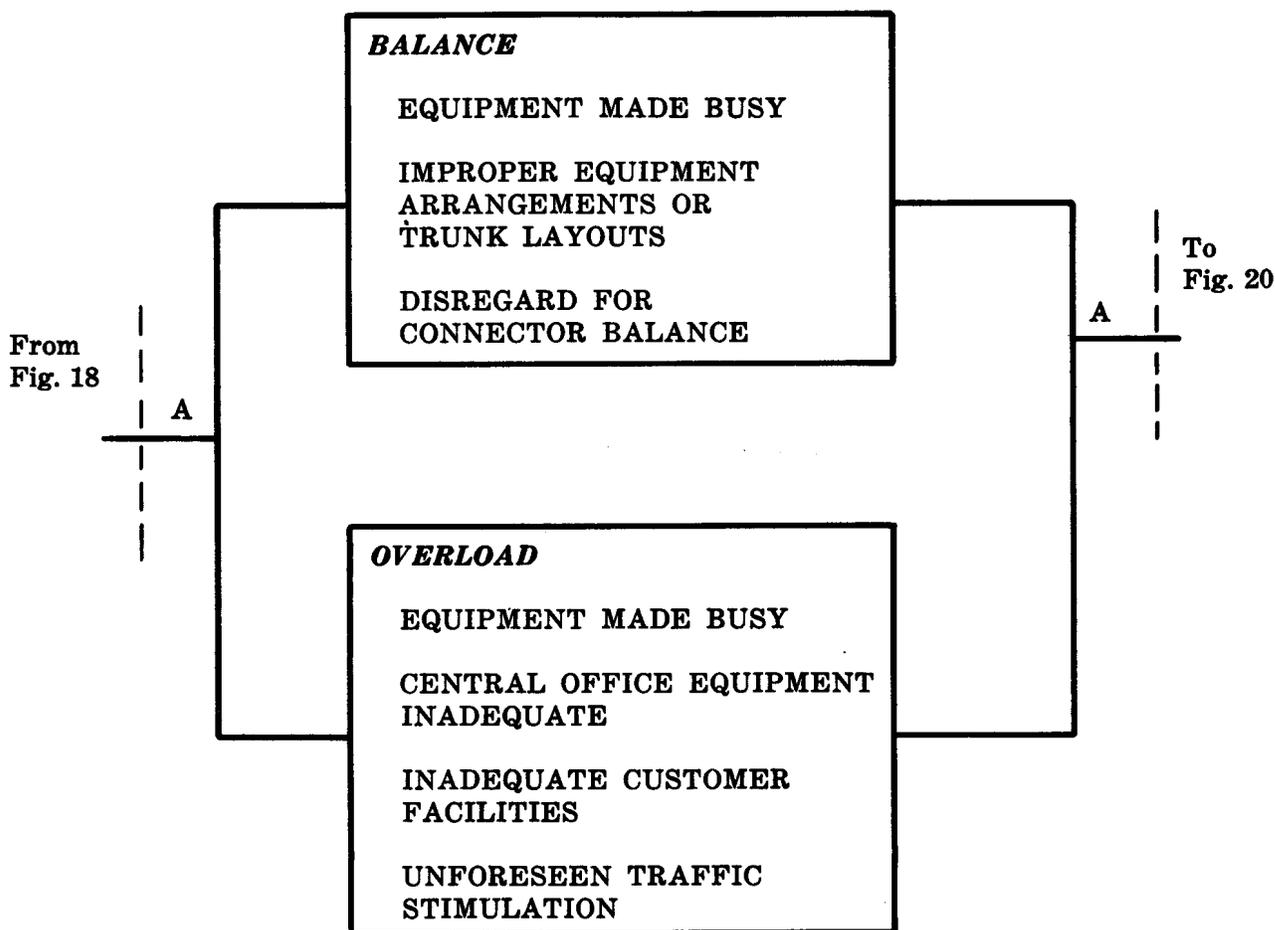


Fig. 19—Flowchart—Overflow—Causes

4.02.2 Overload: A traffic overload can develop under any one or more of the following circumstances.

4.02.2.1 Equipment Intentionally Made Busy: See description under "Balance"

4.02.2.2 Central office equipment inadequate to handle offered traffic: Contributing factors to this type of situation are:

- (a) Inadequacies in the current Traffic order due to lack of, or invalid dial administration data. This deficiency can result in the provision of insufficient equipment quantities or too severe cutbacks in existing switch and trunk group sizes.
- (b) The equipment amounts and grading arrangements requested in the current Traf-

fic order are not provided, due to Engineering and installation errors.

4.02.2.3 Inadequate Customer Facilities: A trunk overflow situation can be created by traffic backing up from the connectors due to insufficient lines between the serving central office and a subscriber's location. This potential service-affecting condition is usually confined to the selector level groupings which serve rotary and level hunting connector hundreds. The factors contributing to this condition are:

- (a) Lack of, or invalid, traffic busy line study data regarding customer communications requirements.

(b) Absence of marketing effort for increasing the customer's facilities to meet study requirements.

(c) Customer's reluctance to meet their study indicated requirements.

4.02.2.4 Unforeseen Traffic Stimulation: Unanticipated volumes of offered traffic can be caused by:

(a) Area transfers and rate changes.

(b) Changes in customer calling characteristics (Urban Renewal, and redevelopment projects can create calling patterns of a type and size different from those anticipated in the growth estimate).

4.02.2.5 Office at Service Capacity: The office may have reached its service capacity and, in all probability, the speed of dial tone is also reaching an equivalent point of unsatisfactory service.

4.03 Analysis (Fig. 20)

4.03.1 Items Required for Analysis: Historically, selectors and other middle-of-the-train equipment items have not been measured

and studied to the same extent as line finders or connectors. A Weakspot analysis can be made, however, by examining and comparing data obtained from the following service indicators.

- (a) Dial Assistance Tickets
- (b) Service Observed Overflows
- (c) Manual Observed Overflows
- (d) Customer Criticisms
- (e) Plant Reports
- (f) Last Trunk Busy Registers
- (g) Overflow Registers
- (h) TUR (or other usage measuring devices)
- (i) Peg Count Register
- (j) Esterline Angus Recorders
- (k) Switch Counts

4.03.2 Analysis of Dial Assistance Tickets Requests: Dial assistance tickets indicative of overflow conditions are classified as Group 1, Busy Before Through Dialing, in the method of analysis described in 5.03, Equipment Irregularities—Analysis. The Overflow Weakspot Analysis procedure is similar and is based on:

- (a) The analyst's ability to understand the Traffic schematic drawings associated with the local switching network.

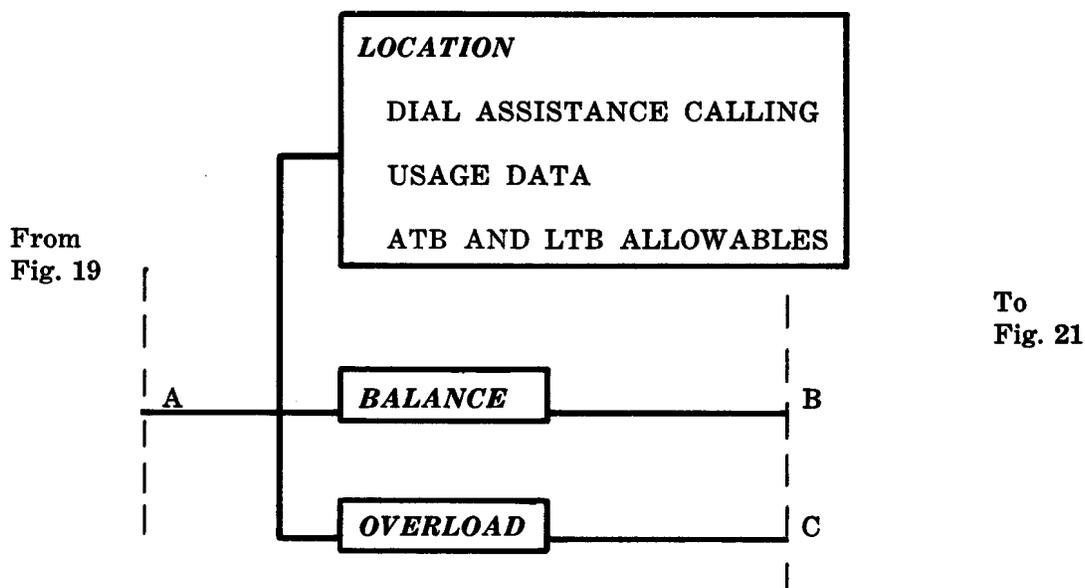


Fig. 20—Flowchart—Overflow—Analysis

(b) The recording of many assistance request incidents in such a fashion that trouble patterns are made to appear in graphic form.

4.03.3 Appendix 14 is an example of one format that can be used to maintain a stroke record of "Busy Before Through Dialing" reports. It consists of a simple grid arrangement; or, the *calling* central office occupying the horizontal axis and the *called* central office the vertical axis. The displayed record illustrated covers a time span of five business days.

4.03.4 The distribution of "Busy Before Through Dialing" reports for the five days stroked on Appendix 14 indicates two patterns of possible overflow trouble:

Pattern 1: This concentration of overflow reveals a trunk or switching problem within the 255 Central Office unit. The pattern also suggests that the restriction is being encountered at some location in the dial tone train before the incoming and intraoffice traffic is combined.

Pattern 2: The problem outlined by this distribution appears to be confined to a common group of rotary out trunk switches, selectors, or trunks carrying traffic to the 335 office.

4.03.5 At this point in the analysis, it is appropriate to recall that trouble patterns formed by dial assistance requests only indicate the possible existence of a service problem or a Weakspot condition. Additional investigation of the Overflow Indicators (service observations, manual observations, customer criticisms, central office maintenance reports, Last Trunk Busy registrations, Overflow registrations, Peg Count registrations, and TUR data) is required in order to locate the selector subgroup, group, or groups contributing to the situation and to validate register data.

4.03.6 In addition, it must be recognized that ticketed requests for operator assistance represent the minimum number of unsuccessful attempts by the subscribers to use the dial system. These requests for assistance do not include those calls successfully completed or abandoned after the second, third, or fourth attempt.

4.03.7 Further analysis of the indicated trouble area is based on the assumption that

either a sufficient number of usage studies are taken each year on all the various selector groups in the office for administration and engineering purposes, or LTB and ATB allowable registrations have been established and are recorded on a form that provides for the accumulation of weekly readings.

4.03.8 The administrator should make a comparison of the bottlenecks indicated by dial assistance Traffic and those selector groups consistently running over capacity, or over allowable registrations. This data validity check is made in order to avoid concealing an existing Weakspot, or creating a nonexistent service problem. All apparent inconsistencies between measured results and subscriber requests for assistance will be resolved before attempting to classify the trouble cause as balance or overload.

4.03.9 In offices approaching full load, those groups running well below capacity should be examined for indications of surplus equipment and accuracy of register readings. After locating the limiting item of equipment creating the overflow situation, the analysis is directed toward determining the cause of the problem. The natural order of progression in this investigation is to first consider the state of balance existing in the located area of traffic restriction.

4.03.10 *Balance:* Middle-of-the-train selector, or rotary out trunk switch group imbalance may occur at any time. Balancing problems are frequently encountered during or immediately after a dial addition. These last mentioned situations are usually caused by central office equipment rearrangements based on invalid data.

4.03.10.1 Middle-of-the-train balance problems are usually detectable by visual observation. The switches on certain shelves or in some equipment bays will be hunting to the 11th rotary step, while other selectors carrying the same traffic may not even be seeking latter choice trunks. If the state of imbalance is not so pronounced it may require the use of a portable Traffic Usage Recorder, Esterline Angus, Peg Count, All-Trunk-Busy registers, or manual switch counts to determine its size and location.

4.03.10.2 When an imbalance situation does occur, it is suggested that the following items be reviewed immediately.

- (a) Traffic load offered entire group.
- (b) Engineered capacity of each subgroup.
- (c) Grading and equipment arrangements requested in Traffic order.
- (d) Grading and equipment arrangements provided by the Western Electric Company.
- (e) Equipment made busy.
- (f) Line Finder and connector balance.

This review is necessary in order to determine the direction in which to apply corrective action.

4.03.11 *Overload:* The analysis procedure for detecting the existence and cause of a selector overload is substantially the same as that for imbalance with some additional considerations. Not only should the traffic load offered the group be reviewed, but also an attempt should be made to determine the composition of this traffic.

4.03.11.1 The content of the traffic carried by the group may indicate the cause of the overload. This congestion might be due to traffic backing up from a single connector group or telephone number.

In addition, the following items should be reviewed.

- (a) Engineered capacity of group.
- (b) Grading and equipment arrangements requested in traffic order.
- (c) Grading and equipment arrangements provided by the Western Electric Company.
- (d) Equipment made busy.

4.04 *Corrective Action* (Fig. 21)

4.04.1 Normally, any imbalance or overloading problems in the interlocal dial train can only be corrected by a Western Electric job, ie, a Traffic order and equipment specification must be issued to provide more equipment or perhaps to change a subgrouping or cabling arrangement which is causing the imbalance. Spare equipment can occasionally be utilized to remedy poor service conditions when they arise, but this expedient

is limited. However, when such conditions do develop, the dial administrator should consult with representatives of the local central office maintenance group, along with Equipment and Field Service Engineering for the purpose of:

- (a) Agreeing on a method to secure accurate and timely data on the traffic offered the congested portion of the dial train.
- (b) Completely exploring corrective actions which may be taken immediately, instead of waiting for relief with a regular scheduled job.

4.04.2 Data Validation

4.04.2.1 Agreement must be reached immediately between the dial administrator and those responsible for the provision of equipment, on the method to be used for the purpose of validating or augmenting existing data relating to the problem causing segment of switching equipment.

4.04.2.2 A Busy Equipment Switch Count is probably the quickest and yet accurate method of obtaining corroborating data for engineering purposes. This system of basic data gathering is covered in Dial Facilities Management Practices, Division E, Data Administration (when published).

4.04.3 Balance—Selector Switch Stage

4.04.3.1 The only corrective action applicable to improperly balanced selector groups is through a change of subgrouping or cabling arrangements. Regardless of the individual situations, the equipment must be cabled (or cross-connected) in such a manner which will ensure equal distribution in the flow of traffic, and maximum utilization of the call-carrying capacity.

4.04.4 Balance—Connectors

4.04.4.1 Imbalance in connector groups is particularly critical since number changes must be made in some instances to relieve connector group overloads, in addition to selector imbalance. This is often impossible, and always objectionable from a subscriber's viewpoint especially with PBX and other consecutive service customers in rotary and level hunting groups.

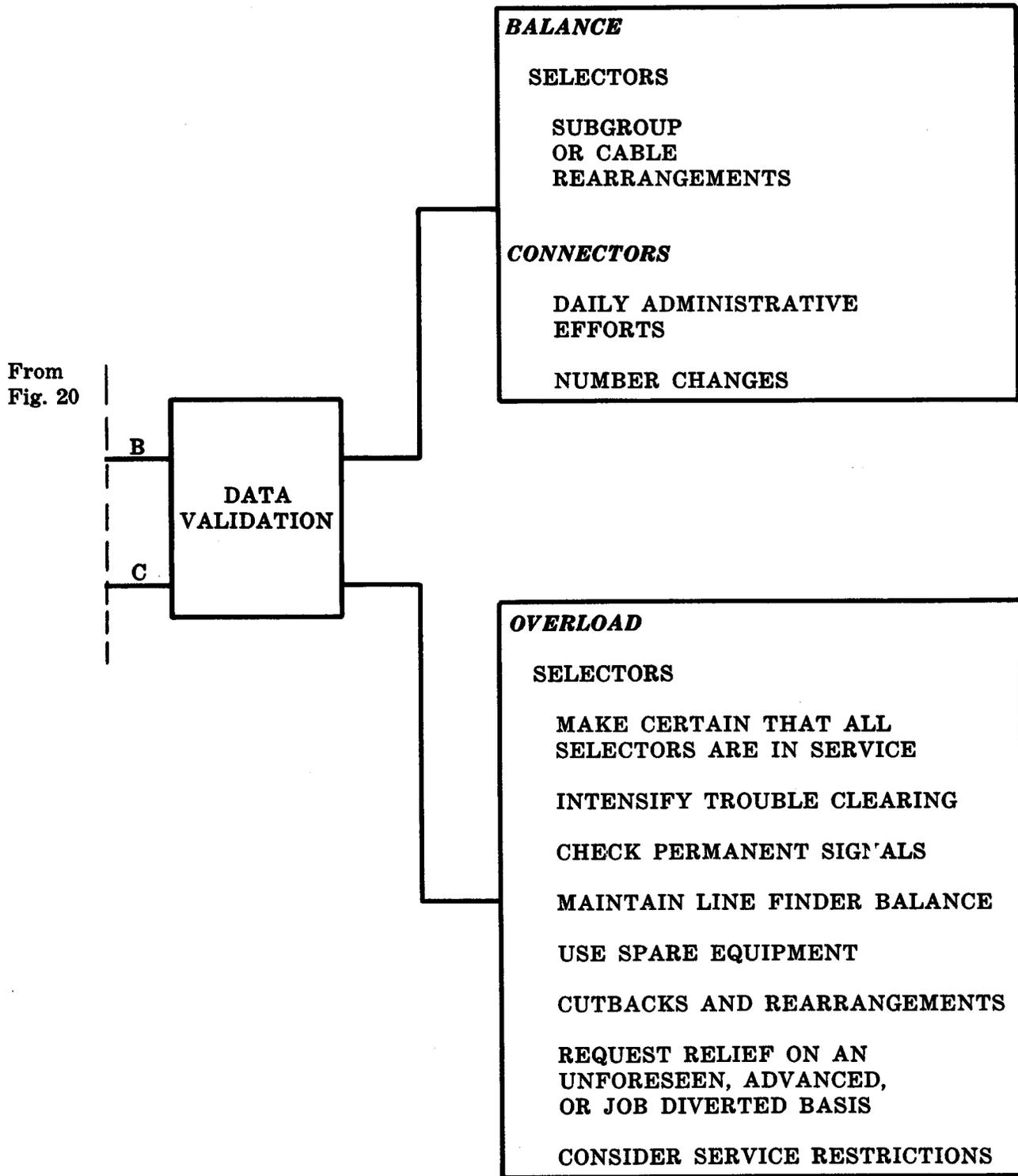


Fig. 21—Flowchart—Overflow—Corrective Action

4.04.4.2 Connectors do not, in most cases, get the attention from the dial administration group which they warrant. It is for this reason that connector imbalance corrective action will highlight some preventive maintenance efforts that should be, but are not always, made in day-to-day administration.

4.04.4.3 *Regular Connectors:* The regular (or nonhunting) groups in a given office are usually all of the same size. In these groups, the best method for ensuring proper balance is through good number assignment procedures. Where possible, the various types of services within a class of connector groups should be evenly spread over all of the groups. The assignment policy for regular connectors should include maintaining an equal terminal fill in all groups of the same class of service. When new groups are added, rebalance in the terminal fill should be attained as soon as possible, by assigning solely in the new groups as often as possible. Even though an office might be working at a relatively low terminal and load fill, every effort should be made to keep the connector groups in balance.

4.04.4.4 *Rotary Connectors:* Rotary and level hunting connector groups are especially difficult to administer properly. The fact that they have two separate call-carrying capacities, local and toll, is in itself a problem. Add to this the fact that PBX and consecutive service groups of the same size will frequently have unusually high terminating toll traffic with only average local terminating traffic or vice versa, and the need for good administration is immediately obvious. In addition, the various businesses represented by the PBX and other consecutive service groups within a rotary or level hunting connector group have busy seasons of their own which may not occur at the time busy season studies are made. The dial administrator should be alert to this condition and should act accordingly.

4.04.4.5 The average Step-by-Step office was placed in service with one or two rotary connector groups per thousand connector terminals and perhaps one level hunting group.

Originally, most of those rotary groups were of the same size for a given office. Also, the facilities administrator estimated a consecutive service terminal capacity in the vicinity of 45 to 55 for each. As offices and the demand for consecutive service have grown, two rotary groups of exactly the same size are seldom found. Either the number of local switches or the number of toll switches will differ, and often both. This has happened because it became necessary to relieve overloaded groups by adding additional equipment. Therefore, the consecutive service capacity, as stated in the Traffic Order, is at best just an estimate. The actual capacity must be "tailor-made" through the joint efforts of the dial administrator and the facilities administrator.

4.04.4.6 The dial administrator must, in a manner of speaking, "engineer" rotary or level hunting connector groups himself, in that it is his responsibility to furnish the facilities administrator with all information and data, except a forecast of growth, pertinent to the call-carrying capacity needed to do the job. The dial administrator has gathered all the Traffic data. He knows who is working in the connector groups, the numbers reserved for growth, and what PBXs will be placed in service in the immediate future. He has a forecast of consecutive service demand which is furnished by the commercial engineer. Also, it can be determined if and when additional rotary or level hunting groups will be added to the office. By combining this information with what is known about the existing consecutive service capacity, both call-carrying and terminal, he is adequately equipped to apply administrative measures and to communicate with the facilities administrator concerning additional equipment.

4.04.4.7 *Number Changes:* The most appropriate time for administrative measures is prior to the closing date of the subscribers' directory. All hunting groups should be reviewed. The load capacity of each group should be compared with the terminal fill, especially the consecutive terminal fill. When a group is found working at a 90 percent overall fill, for example, and has a surplus of load or call-carrying capacity, both local and toll, then residence 2- and 4-party numbers may be changed to make

terminals available for consecutive service growth. On the other hand, if a group is working in excess of its call-carrying capacity, this is a good time to discuss with Commercial or Sales the possibility of moving a subscriber or subscribers who are contributing most to the overload condition. If the dial administrator finds that number changes cannot be made to give sufficient relief, then he should consult with the facilities administrator concerning the provision of additional equipment. Often only an additional switch or two, local or toll, will bring the service to the desired objective. In other instances, moving local or toll switches from one group to another will solve the service problem and will provide better utilization of equipment.

4.04.5 Overload Selectors: Selector and associated trunk shortages can have a severe impact on Step-by-Step switching systems since there is no alternate routing. It is therefore imperative that such shortages be relieved on a priority basis. Some possible means of providing relief are:

- Step 1:** (a) Make sure available selectors are used effectively.
- (b) Arrange with central office maintenance force for intensified trouble clearing efforts where required.
 - (c) Determine effects of permanent signals on problem area.
 - (d) Maintain line finder balance.

- Step 2:** (a) The use of spare equipment, if available, from other switch stages and trunk groups.
- (b) Selector and trunk rearrangements based on cutbacks and reuse of equipment in underloaded groups and subgroups.
 - (c) Request relief on an expedited basis, if none is planned.
 - (d) Request advance completion of portions (critical components) of next scheduled job.
 - (e) Request that equipment be diverted from job shipping to another office where need is not critical.
 - (f) Consider restrictions if office has reached its service capacity.

5. EQUIPMENT IRREGULARITIES

5.01 Indicators (Fig. 22)

5.01.1 This analysis and corrective action material for equipment irregularity problems is confined to traffic data sources and Traffic administrative responsibilities. The information contained in this publication is not intended to replace any existing Plant or Traffic Department routines. It supplements them by indicating central office and station trouble through the

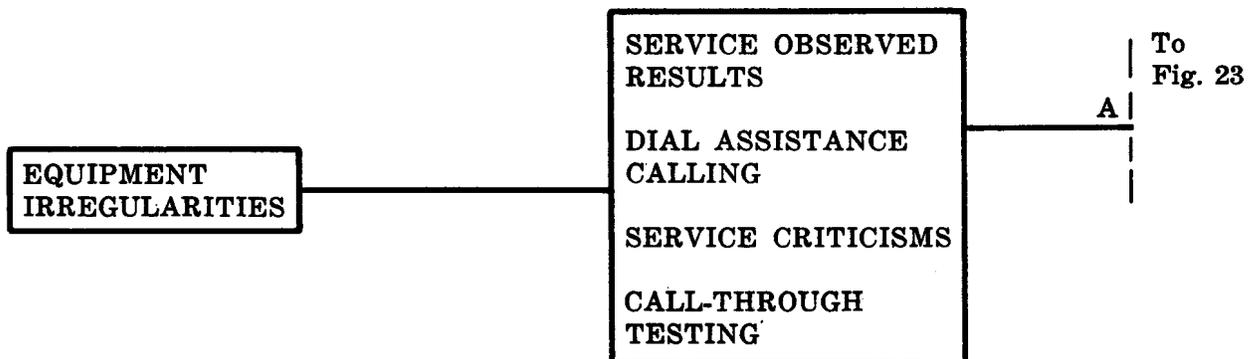


Fig. 22—Flowchart—Equipment Irregularities—Indicators

analyzation of traffic data. The three basic traffic data sources relating to equipment irregularities are:

5.01.2 Service Observed Results

5.01.2.1 As defined in Traffic Service Observing Practices, Dial Line, Division B, Section 1C, Equipment Irregularities, are classified as:

- (a) Wrong Numbers
- (b) Misdirected
- (c) Double Connections
- (d) No Ringing Conditions
- (e) Miscellaneous

5.01.3 Dial Assistance Calling

5.01.3.1 The efforts of a toll operator to aid a customer in the completion of a local call or in the reporting of a local trouble condition is termed as local dial assistance. A means of gauging the public's reaction and determining their difficulties with dial service is the analysis of dial assistance calls. The volume of dial assistance calls compared to the total originating traffic is an indication of the degree of satisfaction that customers are experiencing with dial service.

5.01.3.2 Generally, assistance calls are caused by one of the following reasons: central office equipment trouble, main station equipment trouble, customer irregularities, or busy conditions. Through actual experience, it has definitely been proven that by the proper analysis of assistance calls, equipment failures and individual customer's difficulties can be located and remedied. The prompt clearance of trouble benefits the Traffic Department by ensuring a maximum amount of dial equipment available to complete local traffic calls, and tends to keep assistance calls at a minimum. The actual value of a dial assistance ticket is sometimes overlooked. It must be realized that each assistance request may represent two or more unsuccessful attempts to complete a call.

5.01.3.3 *The analysis of dial assistance traffic fails to function when the operators do not write assistance tickets. Therefore, it is essential that each operator understand the importance of writing assistance tickets and that the Chief Operator or her representative check at various intervals during the day to see that these tickets are being written.*

5.01.3.4 *It is equally important that the Traffic Administrator recognize the value of these tickets and the waste of money involved when they are not competently analyzed. This analyzation should never be permitted to regress into an exercise in ticket counting and classification. The analysis procedures described in this section are based on a manual sort and classification of ticketed assistance calling. Future issues of these Practices will include references to, and details regarding, the mechanization of dial analysis work.*

5.01.3.5 In addition to providing valuable analysis information regarding equipment failures, dial assistance tickets may reflect unsatisfactory service caused by:

- (a) *Traffic Overloads:* Analysis and corrective action relating to this problem is detailed in this Section under the following:
 - Part 3, Dial Tone Speed
 - Part 4, Overflows
- (b) *Traffic Imbalance:* Analysis and corrective action relating to this problem is detailed in this Section under the following:
 - Part 3, Dial Tone Speed
 - Part 4, Overflows
- (c) *Customer Confusion:* Analysis and corrective action relating to this problem is detailed in this Section under Part 6, Customer Irregularities.

5.01.4 Service Criticisms

5.01.4.1 Service criticisms include all oral and written customer complaints not directed to, or cleared by, Plant repair service. Very often, these criticisms concern the same difficulties which ticketed assistance requests are indicating.

5.01.5 Call-Through Testing

5.01.5.1 Call-through testing can be regarded as a supplementary equipment irregularity indicator which involves joint Plant-Traffic decisions on both need and method. Although this procedure is more closely related to central office maintenance and repair efforts, the test calls generated through its application will affect traffic load and balance considerations. This overall office test locates the trouble, and then holds the defective component until the central office maintenance force can remove it from service. Call-through testing may be performed with the aid of the following apparatus.

(Plant)

(a) Automatic Call-Through Test Set

(b) Croswell Interoffice Trunk Test

(Traffic)

(c) Magicall™ (Card Dialer)

5.01.5.2 Card dialers are the type of automatic dialing devices most suitable for use by dial administration personnel. If it has been decided that call-through testing is to be *undertaken by Traffic*, the following procedures are recommended.

5.01.5.3 Obtain as many Automatic Dialing Devices (such as Card Dialers) as practical. At least two or three lines should be used to keep one person busy; and to generate an adequate number of calls to give some statistical validity to the tests.

5.01.5.4 Try to duplicate the reported trouble condition as closely as possible. The best hope of locating the source of the problem is to have the test calls traveling the same route as the calls that are experiencing difficulty. Examine the trouble reporting sources, whether it be Dial Line index or other sources, to determine the time of day, the calling line group, the calling class of service, the number called, or the routing used. The more things the test calls have in common with failing calls, the better the chance of duplicating the failure.

5.01.5.5 Coordinate testing activities with the central office maintenance forces to enlist their assistance and to enable them to have personnel available for tracing any failures encountered.

5.02 Causes (Fig. 23)

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

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

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

5.02.4 *Defects*: Failures of apparatus or of components such as open relay windings, broken rotary pawls, internal crosses, or grounds in spring assemblies are called defects.

5.02.5 Trouble-Influencing Factor

5.02.5.1 *Installation Activity*: One of the controllable factors which influence central office equipment trouble rates is installation activity. Central office maintenance people and the installation forces will always need to be thoroughly familiar with proposed work before the job is started. This is a basic essential of any equipment addition. All dial personnel must be familiar with instructions relating to central office equipment installation. The instructions found in Bell System Practices, Section 201-112-001 and those contained in the Western Electric Handbook explain in detail the procedures for protecting service and equipment during installation work.

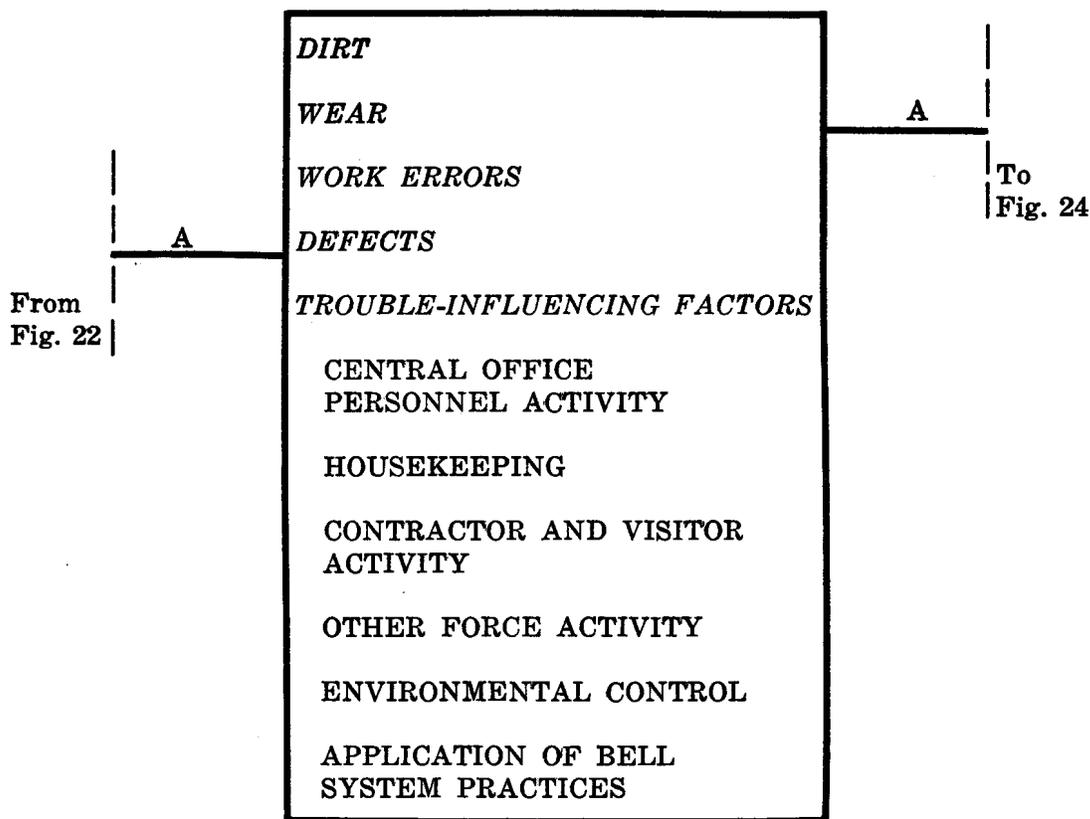


Fig. 23—Flowchart—Equipment Irregularities—Causes

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

5.02.5.3 Contractor and Visitor Activity: During building alterations, large amounts of dust and dirt can be brought into the equipment areas. Special protection, such as temporary dustproof partitions and special control of windows, doors; and ventilating equipment may all be required. Dial management must be on the alert for service reactions and arrange for appropriate corrective action. Coordination with other departments and control of visitors during "Open House" and other activities also help to reduce dirt.

5.02.5.4 Other Force Activities: When it is necessary for other forces, such as Traffic personnel, to work in the central office, the nature and duration of their visit and the details of work to be performed are to be reported in accordance with local instructions. Central office maintenance forces are responsible for seeing that customer service is not jeopardized. Traffic representatives should conduct office visits, so as not to violate this maintenance themselves in such a manner during central force responsibility.

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

5.02.5.6 Housekeeping: Plant practices contain instructions for cleaning equipment

without causing service reaction. Surface dusting and pressure-cleaning procedures should be followed to remove dirt from equipment. Material should not be stored, unpacked, or crated in equipment areas. Tools, test equipment, drawings, and supplies must not be allowed to become dirt collectors. Except during times when work is actually in progress, all equipment covers are to be in place.

5.02.6 Application of Bell System Practices:

Bell System Practices prescribe proper procedures for testing, removing from service,

adjusting, and repairing equipment. Work performed in accordance with these instructions should result in effective repair without service reaction. Nonstandard adjustment or repairs must be avoided.

5.03 Analysis (Fig. 24)

5.03.1 Dial Administration Responsibilities:

Dial analysis work is an integral part of the local equipment administration program. It is to the advantage of the dial administrator forces not to neglect this area of their responsi-

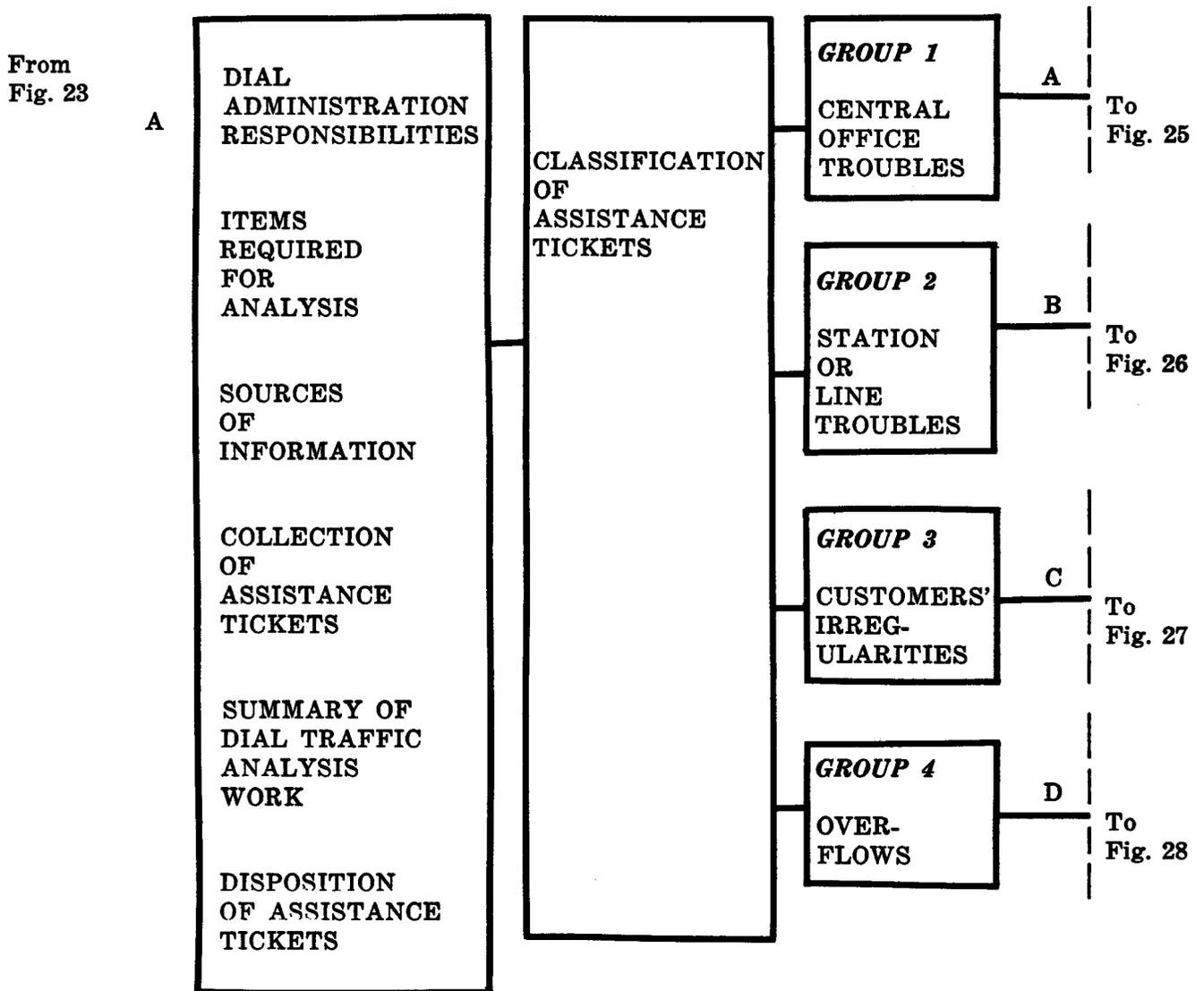


Fig. 24—Flowchart—Equipment Irregularities—Analysis

bility. A major contribution of dial analysis work can be the minimizing of requests for operator assistance. The primary goal of the analysis effort, however, is to effectively assist the central office maintenance force in locating equipment problems. *It is the traffic analyst's responsibility to narrow the trouble-search area to the smallest size possible from the available Traffic data sources. A maintenance investigation should never be requested until this requirement has been satisfied.*

5.03.2 Items Required for Analysis of Assistance Tickets

5.03.2.1 Dial Assistance Call-Board

5.03.2.2 The dial assistance call-board is a device for locating possible central office equipment troubles. The call-board also provides a graphic illustration of the machine performance for supervisory Plant and Traffic personnel (see Appendix 15). The broad face appears as a number of grids representing the central offices of a toll center area and those offices within the toll center's extended local service limits. A grid is composed of a hundred squares with each square indicating a connector hundred. The squares are divided by a diagonal line running from the lower left to the upper right corner. Of the resulting two triangles, the upper left is for a pin record of "No Ringing Signal" ticket reports and the lower right for "Wrong Number Reached" reports.

5.03.2.3 In addition, there is space provided for pinning

- (a) Reached Operator
- (b) Dial Tone or Coin Return While Dialing
- (c) Busy Before Through Dialing
- (d) Can't Reach Information

5.03.2.4 In pinning an assistance call, the called office is identified by the three digits of the central office unit designation placed to the left of the grid. The vertical row of numbers indicates a connector terminal thousand and the horizontal row of numbers indicates a connector terminal hundred. Rotary and level hunting connector hundred squares should be color-shaded for identification. The calling office is identified

by the color of the pin. In addition, assistance calls from Inward should have a distinctive color. The calling office need not be identified. It should be noted that the actual connector terminal number in the group is not represented. The analysis board is designed to locate possible switch troubles and not subscriber line trouble.

5.03.2.5 **Ticket Filing Cabinet:** A ticket filing cabinet is an essential aid in dial analysis work. A typical arrangement is shown in Appendix 16. Spaces can also be provided, as indicated, for additional types of assistance calling such as:

- (a) Verification of don't answer.
- (b) Verification of busy lines.
- (c) Reverting call requests.
- (d) Dialed operator for Directory Assistance or Repair Service.
- (e) Customers' Irregularities.
- (f) Miscellaneous.

5.03.2.6 **Table:** A table should be located next to the analyzation desk for supporting the ticket filing cabinet and also to provide sufficient area for ticket sorting for those engaged in analysis work.

5.03.2.7 **Binders:** The station and trunk analysis record should be kept in loose-leaf binders on the basis of one binder for each working central office unit.

5.03.3 In addition to the previously mentioned clerical aids and office equipment, it is essential that those involved in dial analysis work possess a complete understanding of the following:

- (a) Step-by-Step switching apparatus and related equipment involved in the progress of a call as covered in Division H, Section 2b of these Practices (when published).
- (b) Service order routing as related to Directory Assistance and Intercepting practices and records.
- (c) Local and extended local dialing instructions for all exchanges within the dial administration area as printed in the current telephone directory.
- (d) The local service criticism routine.

5.03.4 A general understanding is required of:

- (a) Test center functions such as, how customer complaints are received, routed, tested, and cleared, in addition to the part this group has in the processing of service orders.
- (b) Central office tests and routines used in response to Traffic's requests for locating and clearing trouble.

5.03.5 Sources of Information: The more information available concerning customers' difficulties with dial equipment, the more effective will be the analysis job. The Traffic dial administration group should receive:

5.03.6 Dial Assistance Tickets

5.03.6.1 The tickets written by operators on all local dial assistance calls, including those written at Intercepting and Inward positions. These tickets (classified in Paragraph 5.03.10) will show the called and calling numbers, the time, the operator's number, the customer's difficulty, and the operator's report of her attempt to complete the call. In addition to the written tickets, the dial administration group should be immediately notified verbally of any unusual or unique service reaction which may develop suddenly, and which indicates the possibility of widespread equipment malfunctioning.

5.03.7 Service Observations.

5.03.7.1 Those service observations on which the following irregularities and traffic conditions are noted should be analyzed for indications of patterns or trends.

- (a) equipment irregularities.
- (b) customers' irregularities.
- (c) overflows.

These three components of the Dial Line Index are described in Traffic Service Observing Practices, Division B, Section 1.

5.03.8 Service Criticism: All other local and toll service criticisms shall be routed to the dial administration group.

5.03.9 Collection of Assistance Tickets: Collection arrangements will be necessary for picking up Assistance tickets from the operating room at frequent intervals. This requirement recognizes the need for speed in minimizing and clearing equipment troubles. During the hours when the dial administration force is not covered, local arrangements are followed for reporting troubles. These tickets which have accumulated during the off hours (usually 5:00 P.M. to 8:00 A.M.) will be tabulated by the dial administration force at the start of the next work day.

5.03.10 Classification of Assistance Tickets: All assistance tickets shall first be sorted into three major categories, subdivided as follows:

5.03.10.1 Group 1—Possible Central Office Troubles.

- (a) Wrong number reached*.
- (b) No ringing signal.
- (c) Busy before through dialing.
- (d) Reached operator while dialing.
- (e) Dial tone or coin return while dialing.
- (f) Can't reach Information.

*Exclude party-line interference and Wrong Number in Mind reports and file as customers' irregularity.

5.03.10.2 Group 2—Possible Stat on or Line Troubles.

- (a) Referred to Repair Service by operator (operator also unable to reach number).
- (b) Station or line trouble, no reference to Repair Service. The customer may report a station or line trouble in one of the following ways:

No dial tone.	Can't reach.
Trouble dialing.	Can't hear.
Trouble on line.	Steady ring.
Line out of order.	Ringing trips.
Noise on line.	Lost coin.
Can't dial.	Steady dial tone.

5.03.10.3 Group 3—Possible Customer Irregularities.

- (a) Verification of don't answer.
- (b) Verification of busy lines.
- (c) Reverting call or ring on line requests.
- (d) Dialed operator for Information or Repair Service.
- (e) Miscellaneous customer irregularities.
- (f) All other tickets.

5.03.11 Method of Analysis: Group 1—Possible Central Office Troubles.

5.03.11.1 In most cases it is difficult to determine the reason for an individual Assistance request. A "No Ringing Signal" or "Wrong Number Reached" report may have been caused by a station trouble, a central office problem, or a customers' irregularity. A method of overcoming this handicap is to use many ticketed reports to establish trouble patterns. By pin recording such assistance requests as "Wrong Number Reached" and "No Ringing Signal" on a dial analysis board, it is possible to develop a trouble-frequency display relating to a particular area within the dial machine. This relationship may be established through the identification of two basic trouble-locating patterns. They are:

- (a) Switch rank.
- (b) Floor plan.

5.03.11.2 In switch rank location, the trouble area is defined by analysis in reference to a switching rank location and the office numbering plan arrangement.

ie, An examination of assistance tickets indicates a significant number of "No Ringing Signal" reports occurring after the same fourth (thousands) digit has been dialed. In this case the trouble would most likely be found in the corresponding thousands, fifth selector switch rank or in the trunking from the immediately preceding switch stage.

5.03.11.3 Floor plan-located troubles require a higher degree of analysis ability, effort, and equipment layout knowledge. The source of these service problems is not as obvious

as those defined by switch rank. An example of this second type is:

An office has a traditionally high incidence of "No Ringing Signal" troubles scattered throughout the entire unit. No apparent switch rank pattern is evident. The absence of such an indicator may at first create the impression that overall neglect and its inherent machine performance penalties are the basic causes of this problem. A thorough examination of dial assistance tickets may, however, indicate:

- (a) A repetitive trouble sequence that repeats itself every seventh and eighth connector hundred.
- (b) That certain connector hundreds have not caused a single request to be originated for operator assistance during the study period.
- (c) Scattered clusters of connector hundreds contribute a disproportionate quantity of "No Ringing Signal" reports.

5.03.11.4 Further analysis of this nebulous, but now evident, trouble pattern may also reveal that the greater majority of "No Ringing Signal" reports are associated with connector shelves located nearest the floor, closest to air conditioning outlets, doors, and other dirt accumulation areas. Should a subsequent maintenance investigation support this analysis, the amount of corrective action will be substantially reduced from that appropriate for a neglected dial unit. The program approach of pressure-cleaning and routining an entire office can now be replaced by selective cleaning and maintenance in only the areas where the requirement is indicated. It is possible that this effort may be accomplished at no additional cost in time or money, if further and supplementary analysis reveals that some portions of the dial equipment are being overcleaned or overmaintained.

5.03.11.5 Dial analysis must be done in a logical conscientious manner. *The analyst who simply sorts Operator Assistance tickets until the first common trouble characteristic appears and then passes the information on because she does not know what to do with it, is not performing dial analysis work.*

5.03.11.6 In fulfilling the primary responsibility of pinpointing trouble location areas, the analyst must:

- (a) Maintain, and examine in depth, Traffic records of connector shelves with histories of above average trouble records for possible middle of the train problems, equipment troubles of a unique nature, or obscure wiring errors.
- (b) Recognize and isolate possible equipment troubles from trunk blockages, operator force problems, and customers' irregularities.
- (c) Be aware of all dial administration data and records which may aid the central office maintenance force in their daily efforts (not necessarily associated with dial assistance work) to minimize equipment irregularities.

5.03.11.7 The following guide is included as an administration aid for use in determining when an analysis should be initiated prior to requesting a Plant investigation by the central office maintenance force. The guide is based on the daily (8:00 A.M. to 5:00 P.M.) accumulation of assistance tickets.

5.03.11.8 *Group 1—Possible Central Office Trouble:* (No ringing signal or wrong number reached).

- (a) Two reports to a regular connector group.
- (b) Three reports to a rotary or level-hunting connector group.
- (c) Five reports to a connector thousand.
- (d) Five reports between any two central offices.

5.03.11.9 *Reached Operator, Dial Tone or Coin Return While Dialing.*

- (a) Two reports (any combinations), provided the called or calling offices are the same.

5.03.11.10 *Miscellaneous.*

- (a) Any buildup of assistance traffic to or from any particular central office unit or wire center.
- (b) Observed equipment irregularities or customer criticisms with characteristics common to each other or to a single dial assistance request.

- (c) When the dial administration group receives an indication of any unusual customer reaction which may develop suddenly and which indicates the possibility of service impairment.

5.03.11.11 *Group 2—Possible Station and Line Troubles:* These requests for operator assistance are generally caused by station or line troubles although customers' irregularities may contribute to this category. Considering the nature of these reports (as described in Paragraph 5.03.10.2), it is suggested that the analysis technique initially assumes they are caused by station and line troubles rather than by customers' irregularities. Ticketed reports of "Trouble Dialing" or "Can't Reach" will be entered in the Station Analysis Record (Appendix 17).

5.03.11.12 *Group 3—Possible Customers' Irregularities:* The following assistance tickets due to possible customer irregularities shall be entered daily in the Station Analysis Record, Appendix 17.

WNR — Wrong Number Reached.

VBV — Verification of Busy.

VDA — Verification of Don't Answer.

DO — Dialed Operator for Directory Assistance, Repair Service, or Local Call.

5.03.11.13 The "Don't Answer" and "Wrong Number Reached" tickets recorded in the Station Analysis Record shall be reported to Repair Service for the elimination of possible station or line troubles prior to classifying these incidents as customers' irregularities. Repair Service will notify the dial administration force by telephone concerning the results of each requested investigation.

5.03.11.14 *Group 4—Overflows (Busy Before Through Dialing):* Analysis of this problem is covered in Dial Facilities Management Practices.

(a) This section, Part 4, Overflow.

(b) Division H, Section 2d(8), Dial Equipment Management, Step-by-Step, Handling Overload and Emergency Situations. (When issued.)

5.03.12 Summary of Dial Traffic Analysis Work

5.03.12.1 All assistance tickets will be summarized monthly by central office building on a form similar to the Summary of Dial Traffic Analysis Work, Appendix 18. The larger units may be subdivided according to loading divisions.

5.03.12.2 The following classes of Assistance tickets will be recorded against the called or terminating office.

- (a) Wrong Number Reached.
- (b) No Ringing Signal.
- (c) Busy Before Through Dialing.

In the case of a central office having extended local service from another central office that is located in a different toll center area, it will be necessary for the analyst in each of the toll centers to obtain by telephone the monthly tally of assistance calls placed in the adjacent toll center areas. An example of this situation would be:

Analyst A in toll center A summarizes the tickets for central office A.

Central Office B in toll center B has extended local service to office A.

Analyst B has filed "Wrong Number Reached," "No Ringing Signal," and "Busy

Before Through Dialing" tickets from central office "B" to "A" by called office.

It will be the responsibility of Analyst A to telephone Analyst B for a tally of the tickets in order to provide a complete count of terminating tickets.

All other tickets are counted and summarized by the calling office.

5.03.13 Disposition of Assistance Tickets: The assistance tickets for each month shall be wrapped separately and filed with the uncompleted toll tickets and retained for a reasonable period.

5.04 Corrective Action

5.04.1 Group 1—Possible Central Office Troubles (Fig. 25): When the analysis of assistance tickets indicates a possible central office equipment trouble, the complete details will be immediately telephoned to the central office maintenance forces. A Dial Assistance Traffic Request (see Appendix 19), will be prepared by the analyst for each requested investigation. A gold-colored pin (or other uniquely marked pin) will be inserted among the associated pin cluster on the analysis board to indicate that an investigation has been requested.

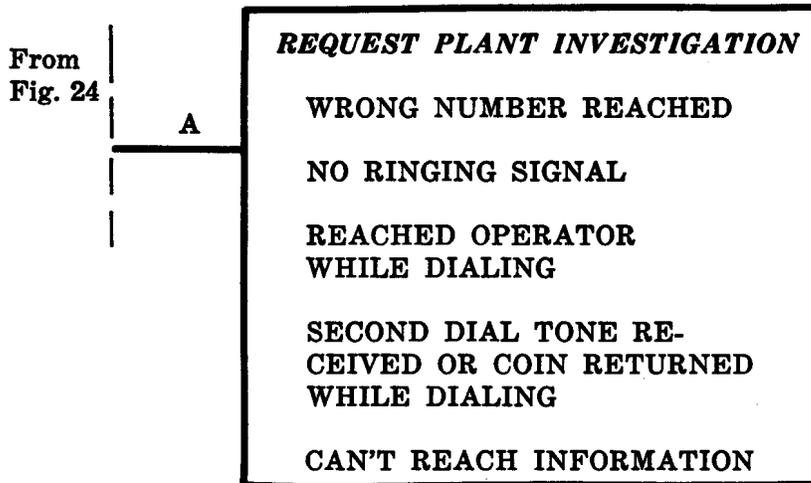


Fig. 25—Flowchart—Equipment Irregularities—Corrective Action—Central Office Troubles

5.04.1.1 The central office maintenance group will telephone the results back to the responsible dial administration force, of each investigation. This information will be posted by the analyst on the corresponding Dial Assistance Traffic Request using a form similar to Appendix 19.

5.04.1.2 The following summary covers the most frequently encountered categories of Step-by-Step equipment irregularities and their general causes:

Wrong Number Reached

- (a) Over an understepping of selectors or connectors.
- (b) Repeater pulsing failures.
- (c) Station or loop troubles.
- (d) Customer irregularities.
- (e) Use of reversing diodes for call tracing (partial train with unguarded sleeve on interoffice calls).

No Ringing Signal

Note: This category may be inflated by inaccurate descriptions of customer complaints.

- (a) Connector troubles.
- (b) Open trunk.

- (c) Selector troubles.
- (d) Inaudible or no busy signal.
- (e) Customer irregularities (a misdialed 5-digit effective call routed into a 6-digit effective train).

Reached Operator While Dialing

- (a) Selector failed to release from previous zero level call.
- (b) Customer's irregularity (subscriber dialing zero for letter O).

Second Dial Tone Received or Coin Returned While Dialing

- (a) Open trunk.

Can't Reach Information

- (a) Central office equipment or Directory Assistance desk trouble.
- (b) Inadequate force coverage of Information desk.

5.04.2 *Group 2—Possible Station or Line Trouble* (Fig 26): All of Group 2 calls should have been reported directly to Repair Service by the subscriber. When the assistance ticket indicates an operator failed to refer a subscriber to Repair Service, the analyst will make this referral by telephone.

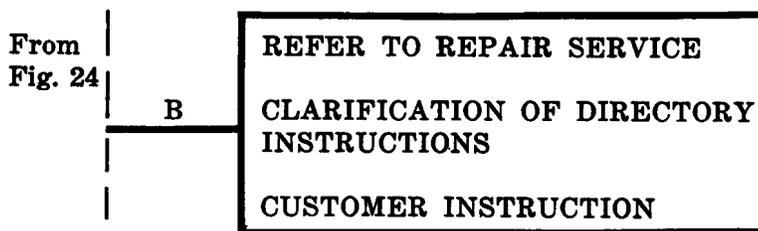


Fig. 26—Flowchart—Equipment Irregularities—
Corrective Action—Station or Line Troubles

The volume of Group 2 requests for assistance may be reduced by:

- (a) Clarification of assistance calling definition in the instruction pages of the telephone directory.
- (b) Customer instruction regarding the proper method of reporting service troubles.

5.04.2.1 When applying the remedial action, as suggested in 5.04.2(b), above, reference should be made to Dial Facilities Management Practices, Division C, Customer Relations Sections 1 and 2 (when published).

5.04.3 Group 3—Possible Customer Dialing Troubles (Fig. 27): When it is evident, from an examination of the Station Analysis Record (see Appendix 17), that a subscriber has made two assistance calls during a 5-day period, an attempt will be made by a representative of

the dial administration group, to instruct the customer by telephone.

5.04.3.1 The individual instructions the customer should be familiar with are described elsewhere in these Practices:

- (a) Division C, Section 2, Customer Contacts, Dial Customer Instruction (when published).
- (b) This section in Part 6, Customers' Irregularities.

5.04.4 Group 4—Overflows (Busy Before Through Dialing) (Fig. 28): Corrective action relating to this situation is detailed elsewhere in these Practices as follows:

- (a) Division H, Section 2d(8), Switching Systems Management, Step-by-Step Administration, Handling Overload and Emergency Situations (when published).
- (b) This section, Part 4.

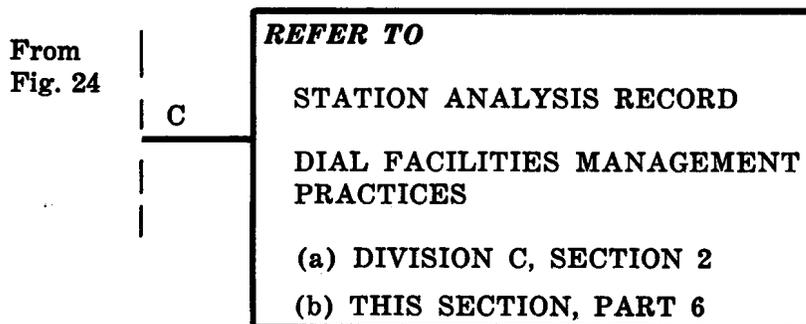


Fig. 27—Flowchart—Equipment Irregularities—Corrective Action—Customer Dialing Troubles

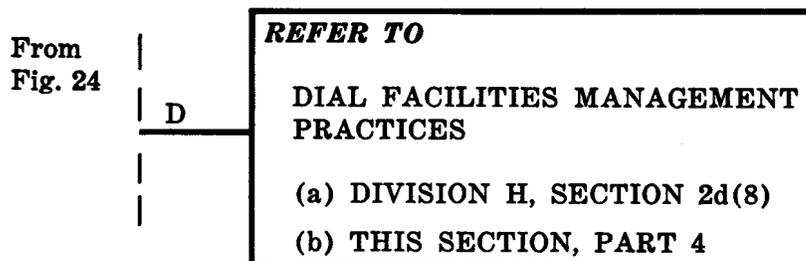


Fig. 28—Flowchart—Equipment Irregularities—Corrective Action—Overflows

6. CUSTOMERS' IRREGULARITIES

6.01 Indicators (Fig. 29)

6.01.1 A description of Customers' Irregularity Indicators is contained in Central Office Management Circular, Division C, Section 1 in Part 5, Sources of Instruction Data:

- (a) Assistance Calls.
- (b) Service Observing Data.
- (c) New Customers.
- (d) Customer Contacts With Supervisors.
- (e) Trouble Supervisory Positions.
- (f) Intercepting Positions.
- (g) Vacant Code Calls.
- (h) Chief Operator Calls.
- (i) Repairman or Installer.
- (j) Business Office.
- (k) Permission to Dial Operator.
- (l) Repair Service.
- (m) Special Records at Operator Positions.
- (n) Temporary Observing at Nonobserved Offices.

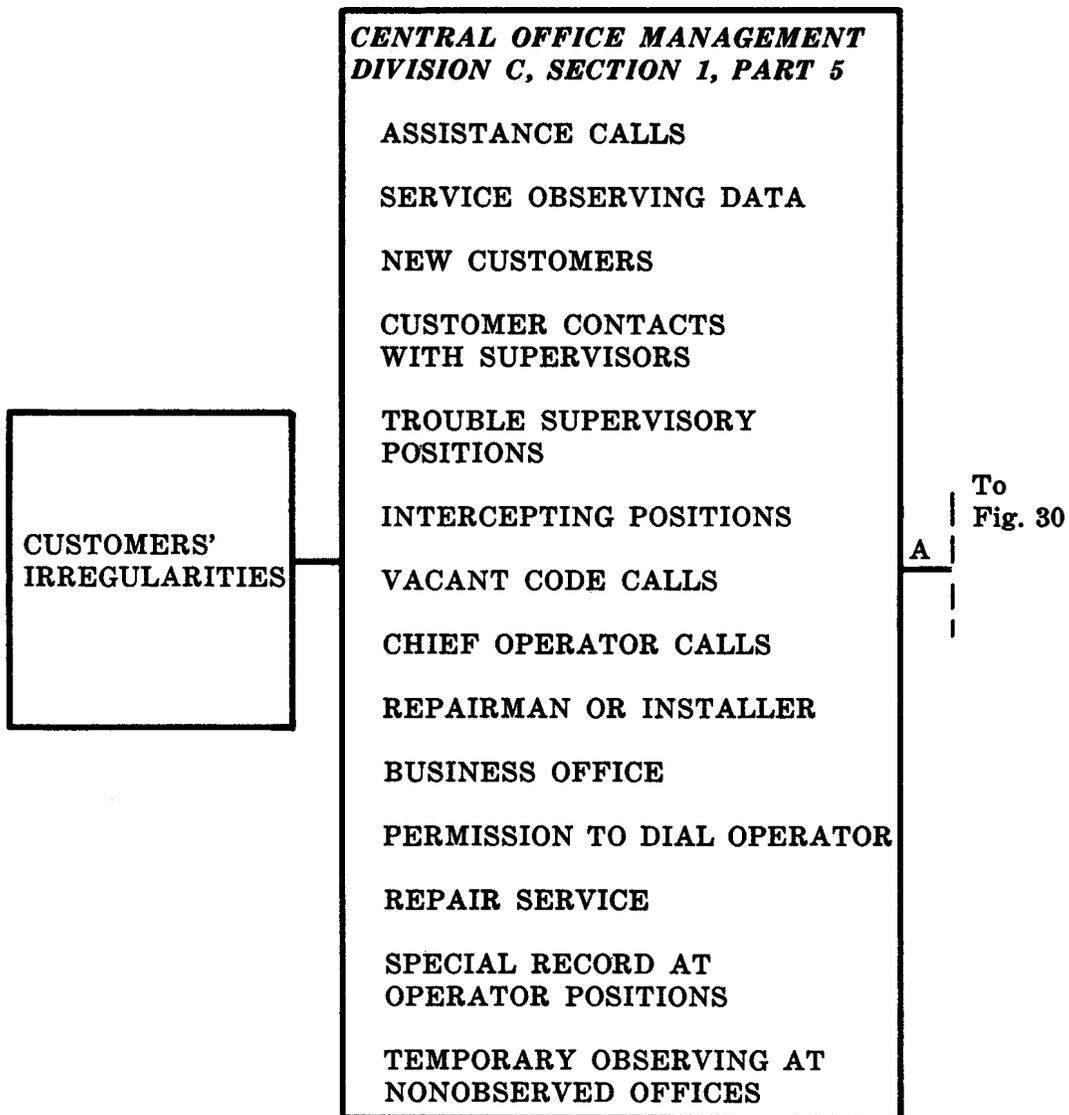


Fig. 29—Flowchart—Customers' Irregularities—Indicators

6.01.2 A brief review of the various customer dialing failures (both local and DDD) which may occur is necessary if analyzation and corrective action are to be applied effectively.

(a) Omit Code.

This is an instance of failure to dial, or partially dialing the directing code, the prefix code (1, 11, or 112), or the NPA code, when required.

(b) Insufficient Digits.

This is an instance of dialing fewer than the number of digits required to give a complete setup. This failure relates only to insufficient digits for the NNX code or line number. Failing to dial or partially dialing the directing code, prefix code, or NPA code is classified as Omit Code.

Note: In the designation NNX, the letter N stands for any of the eight digits from 2 through 9. The letter X represents the ten digits from 1 to and including 0.

(c) Extra Digit.

An extra digit dialing failure is an instance of dialing more than the required number of digits. As an exception, if the excess dialing occurs after the number or code of the desired station or operator has been dialed, no failure is charged.

(d) Wrong Digit.

This irregularity includes dialing a wrong digit or digits in the directing code or NPA code, dialing a wrong digit or digits, letter or letters, or central office numeral in the office code, dialing a wrong digit in the line number, or transposing digits. Also included in this category will be cases of customers attempting to dial a nondialable point instead of dialing the code for the operator who handles such calls, or attempting to dial a TWX station number which answers by returning a high-pitched tone.

(e) Wrong Number in Mind.

This irregularity includes all cases where evidence indicates that the customer dialed the number he had in mind, but should have dialed a different number. Also included in this classification are cases where it is doubtful whether the correct number was dialed on any of the attempts observed.

(f) Dialed Before Tone.

Dialed before tone is an instance of starting to dial after removing the receiver and without dial tone, regardless of the length of the interval from removal of receiver to start of dialing.

(g) Forced Dial.

This is an instance where speeding the return of the dial above normal after it has been pulled to the finger stop position results in one of the following conditions:

1. The no-such-number signal is connected.
2. The attempt is misdirected.
3. A wrong number is reached with no evidence of faulty equipment operation.

(h) Retarded Dial.

This is an instance of interfering with, or slowing up, the return of the dial after it has been pulled to the finger stop position.

(i) Dialed Too Soon.

Dialed too soon is an instance of dialing completely or partially before removing the receiver from the hook.

(j) Extension Station and Party-Line Interference.

Extension station and party-line interference is an instance of another station on the calling line effectively interfering with the dial pulses of the calling party. As an exception, no failure will be charged where the interference in pulsing is due entirely to the other station merely removing the receiver and being on the line.

(k) Dialed Again Without Restoring.

Dialed again without restoring comprises instances where the calling party, without restoring the receiver on the previous attempt, again dials a complete or partial order either as a subsequent attempt, or as a new initial attempt.

(l) Flash or Switchhook Interruption.

This is an instance of intentional or unintentional movement of the switchhook, other than a preliminary impulse, and shall be charged

as a dialing failure unless it is evident that the occurrence did not affect the operation of the equipment.

(m) Preliminary Impulse.

A preliminary impulse is any movement, except flashing, of the telephone switchhook before dialing. No failure will be charged if the preliminary impulse is absorbed so that it does not affect the normal progress of the call.

In addition, two other types of customers' dialing irregularities may occur when customers have TOUCH-TONE dialing stations.

(n) Simultaneous Push.

Simultaneous push is an instance of pushing two buttons at the same time.

(o) Overlapping Push.

Overlapping push is an instance of de-

pressing another button before releasing a previously pushed button.

6.01.3 Complete details regarding these Customers' Irregularities may be found in Traffic Service Observing Practice, Division B, Section 1D, Dial Line Observing Practice—Customers' Irregularities.

6.02 Causes (Fig. 30)

6.02.1 Most customer dialing irregularities are a result of the following circumstances.

6.02.2 *The Customer does not know how to dial correctly.*

6.02.2.1 The subscriber does not know how to dial correctly due to a lack of dialing information furnished him by the telephone company, inadequate or hard to understand directory information which makes no impression on him, or a basically complex and confusing dialing plan which may exist in some locations.

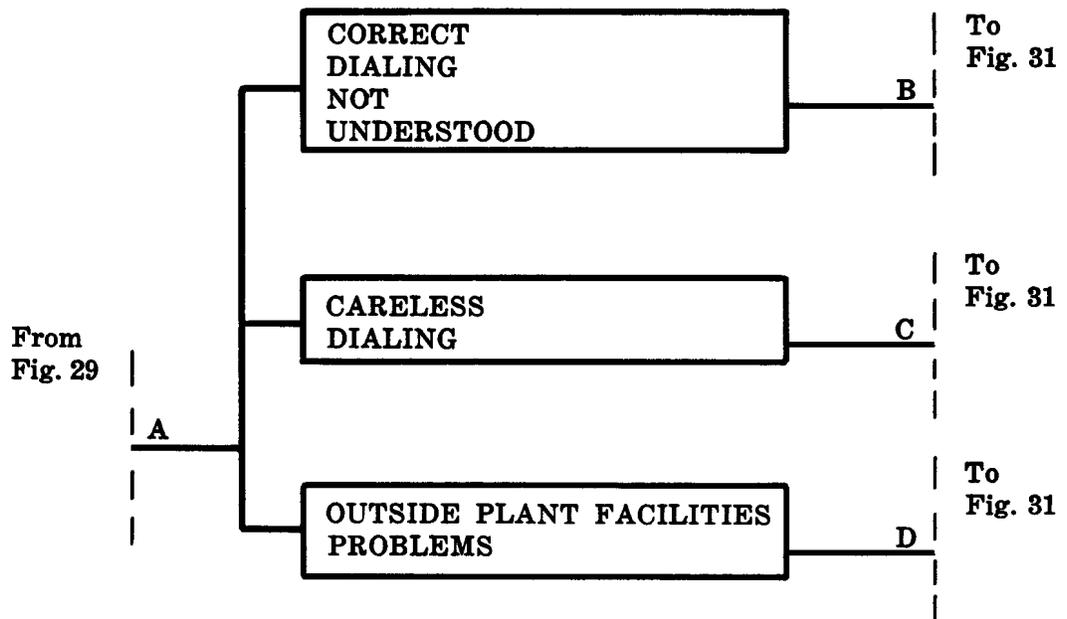


Fig. 30—Flowchart—Customers' Irregularities—Causes

6.02.2.2 This confusion is further compounded by:

- (a) Local newspapers which fail to recognize toll requirements in local advertisements.
- (b) Promotional type directories, printed outside the telephone company, that contain outdated or erroneous information.
- (c) The need for the customer to be aware of geographical, political, and telephone exchange area boundaries (sometimes in varying combinations of these three definitions).

6.02.3 *The customer understands how to dial correctly.*

6.02.3.1 The customer understands how to dial correctly but does not do so because of poor dialing habits or lack of appreciation of the importance and value to him personally, of correct dialing.

6.02.3.2 Poor dialing habits are created by an attitude of carelessness. The customers' mind is either preoccupied during the act of dialing, or he lacks the incentive to verify the number he is calling. He chooses to gamble on a "fail first" basis only being forced to obtain the correct information when he loses, ie, after he has committed a customers' irregularity.

6.02.3.3 Dialing from memory is stimulated on local calling in predominately flat rate service areas. In these locations, the customer is not obliged to contact the telephone company for credit each time he is responsible for a dialing error.

6.02.3.4 It is conjectural, but does not seem unreasonable, to assume that some relationship exists between the customer's dialing irregularities and the customer's opinion of the telephone company's attitude toward him. Customer resentment and frustration may be reflected in his dialing habits when:

- (a) He frequently has to wait for dial tone.
- (b) He often encounters sustained trunk busy conditions when attempting to originate a call.

(c) The calls he does complete frequently terminate in no ringing signals, wrong numbers, or noisy connections.

(d) His business office contacts are diverted into merchandising opportunities.

(e) Telephone personnel generally appear indifferent toward his problems, or those individuals who do offer to help are incapable of aiding him.

6.02.4 Equipment irregularities may be misclassified as customers' irregularities. This is due to the fact that service observations are based on the assumption that the recorded impulses are identical to the digits dialed by the customer. Concealed by this assumption are distorted or missing dial pulses which result from:

(a) Defective or improperly adjusted dials and other malfunctioning telephone set components.

(b) Defective loop and cable facilities.

(c) Cable and loop design limits being exceeded.

6.03 *Analysis (Fig. 31)*

6.03.1 Analysis Material to Identify the Specific Problem.

6.03.1.1 There are several good sources of information which will indicate the type and trend of customer dialing failures in a locality.

6.03.1.2 Service Observations.

6.03.1.3 Copies of detailed service observations should be transmitted to the Traffic dial administration group responsible for customer dialing performance, so that a continuing record of customer dialing irregularities, by type of failure, can be maintained for each office.

6.03.1.4 Many areas have found it advantageous to maintain a record of customer dialing irregularities by originating telephone number. It must be recognized, however, that since service observations are taken on only a small sample of customers at any given time, information obtained from this source will be limited.

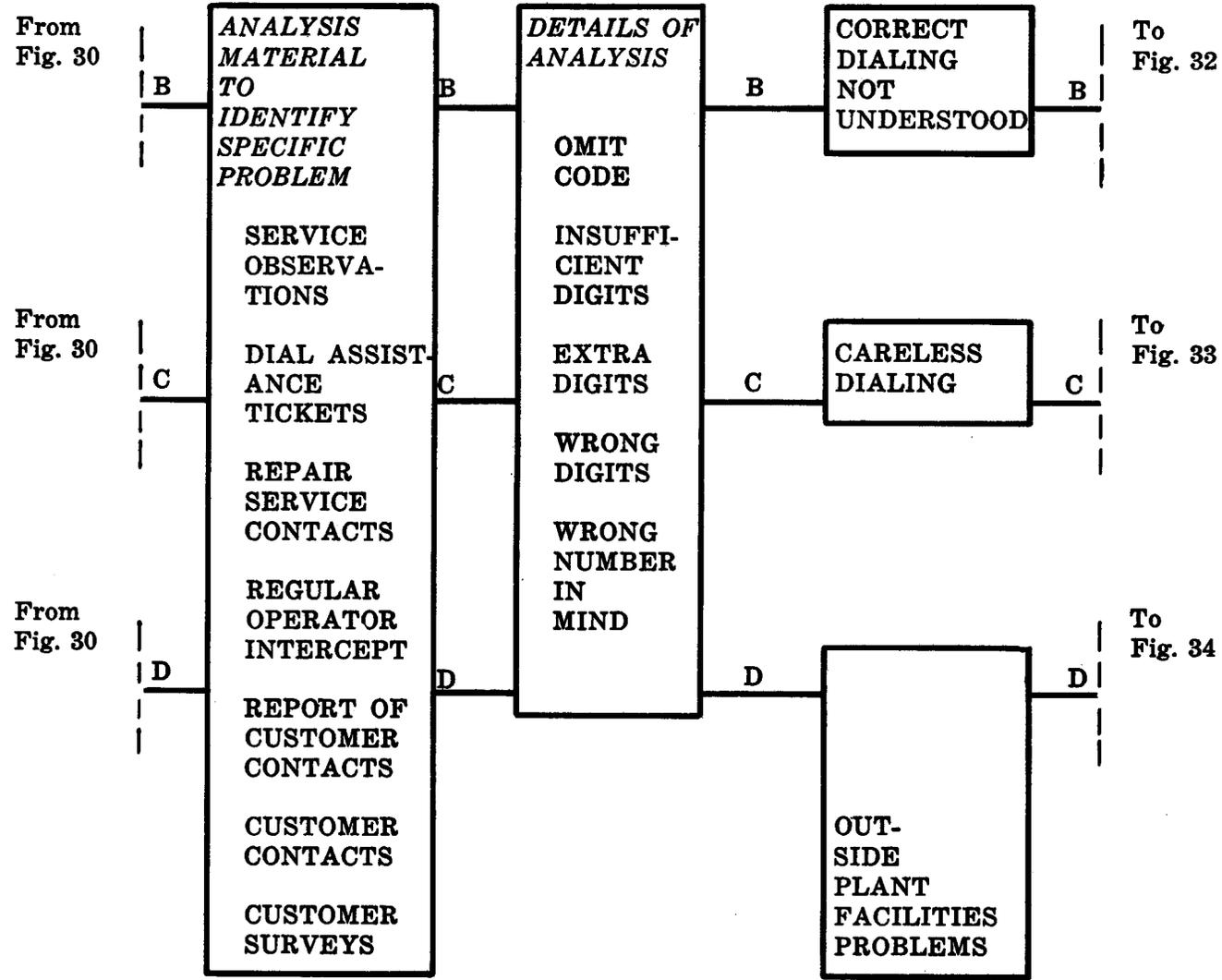


Fig. 31—Flowchart—Customers' Irregularities—Analysis

Further, it must be clearly understood that this data can be used *only* for supporting evidence of a need for customer information and must *never* be used directly nor by implication in contacts with customers. Under no circumstances should such customers be contacted for informational purposes until their lines have been removed from observing, since such action may bias the observing results.

Note: Contact with customers based on observations is prohibited under all circumstances.

6.03.1.5 Dial Assistance Tickets.

6.03.1.6 Group 3—Possible Customers' Irregularities.

The following assistance tickets, due to possible customer irregularities, shall be entered daily in the Station Analysis Record (sample form, Appendix 17)

WNR—Wrong Number Reached.

VBY—Verification of Busy.

VDA —Verification of Don't Answer.

DO —Dialed Operator for Information, Repair Service, or Local Call.

6.03.1.7 The "Don't Answer" and "Wrong Number Reached" tickets recorded in the Station Analysis Record shall be reported to Repair Service, for the elimination of possible station or line troubles prior to classifying these incidents as customers' irregularities. Repair Service will notify the dial administration force by telephone, concerning the results of each requested investigation. Additional information regarding this data source is detailed in Part 5 "Equipment Irregularities," Para. 5.01, "Indicators."

6.03.1.8 Repair Service Contacts.

6.03.1.9 Arrangements should be made with local Plant to make a memo ticket of Repair Service calls which involve customer dialing failures. These memo tickets should be referred to Traffic for analysis and possible follow-up. In order for Repair Service employees to recognize a customer failure as the reason for the Repair Service call, they must be familiar with the dialing arrangements for the localities which they serve and the common dialing irregularities which occur in that exchange.

6.03.1.10 Regular Operator Intercept.

6.03.1.11 Analysis should be made of local calls reaching Intercept for O.K. numbers. Although many of these calls represent isolated cases of customers' dialing failures, a routine should be established for recording calling and called numbers in those instances where a customer indicates he has reached Intercept previously with the same O.K. number report.

6.03.1.12 Before it can be determined that a customer dialing failure has taken place, all copies of the Traffic Intercept records must be verified to make certain that a change or disconnect entry has not been omitted. A physical check should then be made by the central office maintenance force to determine if the called number has been improperly routed to intercept. If both Central Office and Traffic records agree the number in question is a work-

ing number, not routed to Intercept, it is likely that the customer has dialed incorrectly.

6.03.1.13 It is possible that a customer dialing incorrectly will reach a recorded announcement of a vacant or disconnected number. In this case, he may request help from an Information Operator. Memo tickets showing calling and called number and disposition of call, should be prepared on these calls and forwarded promptly to the customer instruction group.

6.03.1.14 Although dialing failures revealed by an analysis of intercepted calls will represent local failures primarily, many of the same failures are evident on DDD calls. And corrective action to improve local dialing will be reflected in improved DDD performance.

6.03.1.15 Report of Customer Contacts—Critical customer comments received by a service assistant are to be recorded and referred to the appropriate department for corrective action, if required. It is essential that any of the comments which pertain to a customer dialing problem be referred promptly to the customer instruction group. This referral should be made even though the service assistant has given dialing information to the customer.

6.03.1.16 *Customer Contacts.*

6.03.1.17 Customer contacts provide a good source of information regarding customer dialing problems. These *contacts may be* face-to-face by Plant installers or repairmen. Commercial business office people, Traffic PBX or customer instructors, Marketing salesmen, or any employee who has occasion to meet the public at Open Houses, Central Office Visits, Lecture Demonstrations, Film Showings, share owner interviews, etc. Telephone contacts may be experienced by Commercial business office service representatives, Traffic central office personnel, Public Relations people, etc.

6.03.1.18 While line people in all departments share the responsibility for giving dialing information to customers, it is the primary responsibility of Traffic to provide the necessary information to enable these contact employees to do an effective job.

6.03.1.19 In addition to these on-the-job contacts, all employees have opportunities for off-the-job contacts with customers. Employee information programs should be developed to provide all employees with background information on the customer dialing problem.

6.03.1.20 Locally established routines should provide for recording information pertaining to customer dialing problems from the above sources. This information should be transmitted to Traffic for analysis and corrective action as required.

6.03.1.21 *Customer Surveys.*

6.03.1.22 Special customer surveys, opinion surveys, etc, may provide useful information regarding customer dialing problems.

6.03.2 Detailed Analysis of Dialing Failures.

6.03.2.1 After the specific or general pattern of customer dialing failures has been determined for a given office or locality, further analysis must be made before the proper corrective action can be initiated.

6.03.2.2 Specific Types of Dialing Failure.

6.03.2.3 *Omit Code:* An omit code failure pattern may be indicative of a lack of understanding on the part of the customer regarding how to dial, or it may be due to careless dialing habits.

(a) *Prefix Code Omission*—Confusion concerning the limits of the local calling area will be indicated if a majority of "Omit Prefix" failures are to points just beyond the local calling radius of the calling telephone, as shown by an analysis of these failures by originating and terminating points. If instances of omit prefix code are high on both FNPA and distant HNPA points, this would indicate that customers generally are not confusing a DDD call with a local call. If subsequent attempts, as revealed by dial line observations or reports to assistance operators, show the same repetitive failure, lack of understanding rather than careless dialing is the probable cause of this failure.

(b) *Area Code Omission*—A detailed analysis of these individual failures by originating and terminating points will indicate the probable cause of the dialing error. Failures on calls to points which are just beyond NPA boundary lines generally show a lack of knowledge of the geographical limits of the HNPA. If the omit area code failures are primarily on calls to distant FNPA points and subsequent attempts or reports to assistance operators show the same repeated failure a basic lack of understanding of the use of area codes is evident.

(c) *Directing Code Omission*—Directing codes (other than prefix codes "1", "11", or "112") generally are not required on DDD calls. Where they may be required, however, the probable reason for the omission will be indicated by the subsequent attempts observed. PBX extension users may be required to dial a directing code, "9" for example, before making a DDD or local call, but since service observations are taken on the PBX trunk and not on the extension, a failure to dial the "9" normally would not be observed.

6.03.2.4 *Insufficient Digits*—An analysis of these failures by specific digit or digits omitted will show if careless dialing is the cause or if customers are confused because of permissive 4-, 5-, or 6-digit dialing for their own local or EAS calls. Omission of all or part of the NNX code may be due also to the customer's knowledge that a local call in the distant city can be completed with less than 7 digits.

6.03.2.5 *Extra Digit*—A breakdown of these failures will show if the dialing of an extra digit or digits is due to misunderstanding of area code use, or if careless dialing is the cause. Use of HNPA code on HNPA calls is a common failure. This indicates the customer does not understand the basic principle that the area code is not dialed when it is the same as the area code of the calling telephone. Inadequate directory information and telephone number plates which do not show the area code are contributing causes of this irregularity. An extra digit dialed, where two or more repeated digits occur in the called number, is usually a result of careless dialing.

6.03.2.6 Wrong Digit—The failures included in this classification are generally due to careless dialing. An analysis of individual failures will indicate if the problem is due to confusing the letter “O” with numeral “0” or the letter “I” with the numeral “1”. Another contributing cause of these irregularities is dialing from memory rather than from reference to a “frequently called number” list.

6.03.2.7 Wrong Number in Mind—Dialing from memory is the major reason for failures of this type. The use of frequently called number lists will minimize these failures.

6.03.2.8 All Other Dialing Failures— The remaining categories of customer dialing failures should occur very infrequently, except in locations recently converted to dial. The following customer irregularities are all due to careless dialing.

- (a) Dialed Before Tone.
- (b) Forced Dial.
- (c) Retarded Dial.
- (d) Dialed Too Soon.
- (e) Extension Station and Party-Line Interference.
- (f) Dialed Again Without Restoring.
- (g) Flash or Switchhook Interruption.
- (h) Preliminary Impulse.
- (i) Simultaneous Push.
- (j) Overlapping Push.

6.03.2.9 The majority of customer dialing failures fall in the first five of the preceding classifications (Para. 6.03.2.3 through 6.03.2.7). “Omit Code” failures generally reflect a lack of understanding by the customer as to when a directing code, prefix code, or area code is required, although they may also result from careless dialing. The other type of actual customer dialing failures are due generally to careless dialing habits rather than a lack of knowledge regarding dialing arrangements.

6.03.3 No Specific Failure Pattern Is Evident— Where no single type of failure is predominant, it is likely that the apparent poor performance is due to poor dialing habits rather

than a lack of understanding on how to dial. The start of analysis for careless dialing would be to determine why this problem exists in certain areas and not in others.

6.03.4 Equipment problems should also be considered as a possible contributing cause to customer irregularity results, when no specific failure pattern is evident. Observed customers’ irregularities (and observed equipment irregularities which intensive central office maintenance investigation cannot account for) should be sent to the Test Bureau to have the associated outside facilities tested and measured. This testing should include a measurement of the ringing, tripping, pulsing, and supervisory requirements for each line in question. These results should then be compared to the office design limits.

6.04 Corrective Action.

6.04.1 The following basic requirements must be met prior to the establishment of a program for the correction of *customers’ irregularities due to a lack of dialing knowledge* (Fig. 32).

6.04.1.1 An Accurate Analysis of the Problem:

An accurate analysis of the problem is needed based on a statistically valid accumulation of observed customer irregularities and supported, if possible, by other customer irregularity indicators. When this requirement is not met, situations may develop where:

- (a) Spontaneous corrections occur which are obviously not related to the applied remedial efforts.
- (b) No reaction is evident to even an intensified and extensive customer irregularity correction program. In some instances, the measured results may even trend lower. The cost (and other penalties) involved in applying the wrong cure may be greater than the problem itself.

6.04.1.2 Coordinated Responsibilities: The Traffic Department has the responsibility for coordinating all phases of a customer dialing improvement program. The direction and broad control of the program rests with the Traffic staff organizations. The ultimate task of carrying

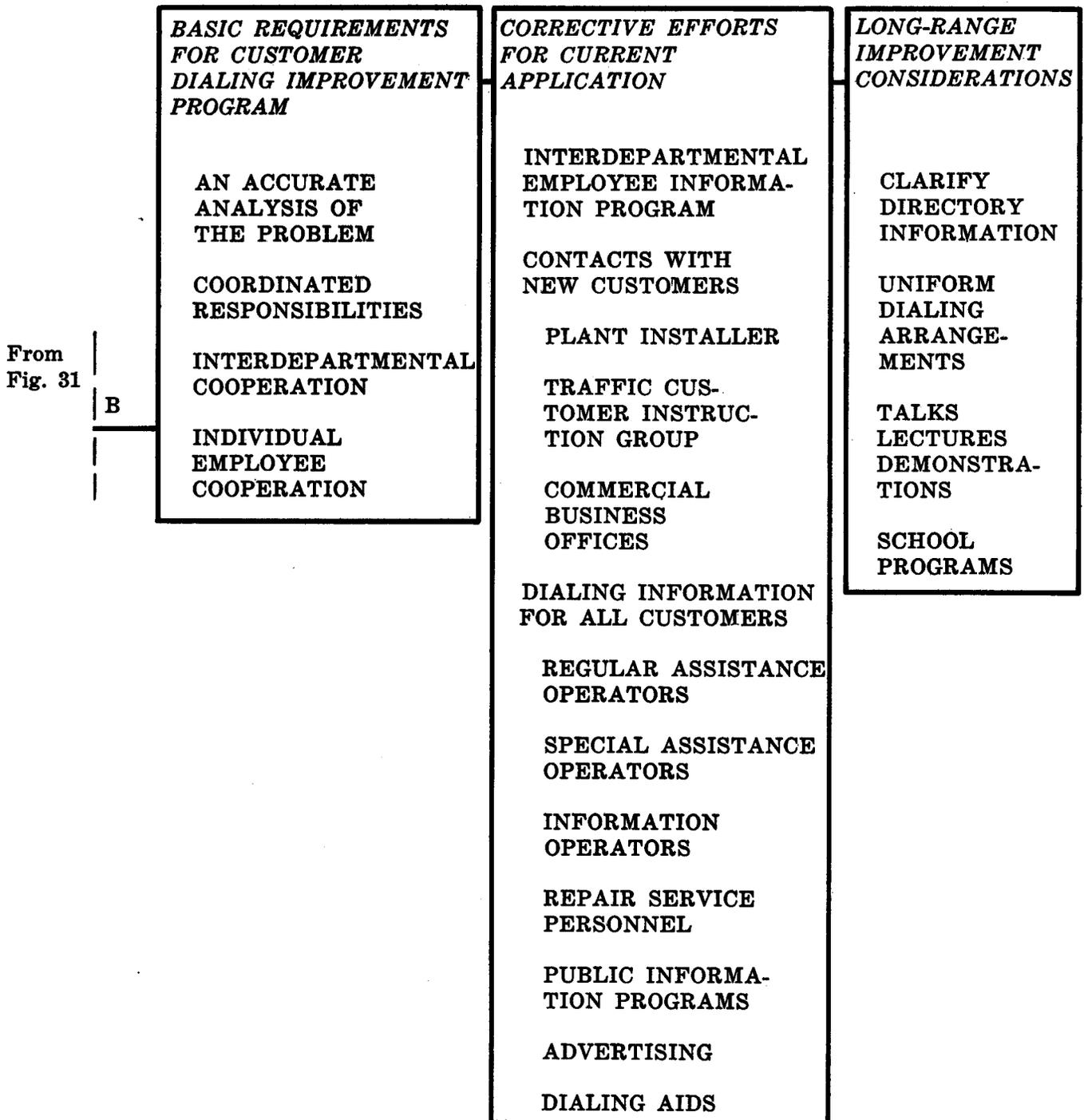


Fig. 32—Flowchart—Customers' Irregularities—Corrective Action—
Correct Dialing Not Understood

out and implementing the program, as required, is the responsibility of the Traffic field organization, who should coordinate the instruction activities of Chief Operator forces and Dial Administration groups reporting to them. If the customer instruction group is separate from the PBX or Business Services group, there will need to be close coordination between these groups to ensure that the customer instruction activities of each have a common objective.

6.04.1.3 Interdepartmental Cooperation and Coordination: Although Traffic is responsible for customer information activities, assistance and cooperation is required from all departments. This interdepartmental coordination may be directly between Traffic and other departments involved, or it may be through interdepartmental committees at all levels of the organization. When remedial programs are proposed, it must be done on an interdepartmental basis with assigned departmental responsibilities. To obtain maximum cooperation, it is necessary for Traffic to keep other departments informed of the problems which exist and to request assistance where it can be provided by the other departments.

6.04.1.4 Cooperation of Individual Employees: A basic requirement for the improvement of customer dialing habits is to convince all employees in all departments that correct telephone usage is the responsibility of every employee. The degree to which telephone personnel display a lack of dialing knowledge, unfamiliarity with directory instructions, or lack of concern directly affects the value of any customer instruction program.

6.04.1.5 Although there are many things that can be done to improve customer dialing performance, no single activity can be completely effective. Some elements of the program will involve immediate action while others will, of necessity, be long-range projects. The degree of involvement in any of the following remedial measures will depend on the magnitude and nature of the problem.

6.04.1.6 Corrective Efforts for Current Application.

6.04.1.7 Dial Facilities Management Practices—

Division C, when published, will contain the details regarding Customer Instruction and Customer Relations. A review of this material will be most helpful in connection with the development of an effective customer dialing improvement program.

6.04.1.8 Interdepartmental Employee Information Program:

Since our employees have many off-the-job, in addition to on-the-job, contacts with the public, they should be familiar with all aspects of customer dialing so they can answer questions and provide information which will be helpful to our customers. Traffic and Public Relations Departments should develop and carry out an employee information program which will accomplish the above objectives. Because of the nature of the problem, most employee information programs will have to be tailor-made to meet the local situation. This program should include the following basic information:

- Local dialing arrangements.
- Location of dialing information in the telephone directory.
- DDD dialing arrangements from telephones in their locality.
- Reasons for prefix codes ("1", "11", and "112").
- All-Number Calling program.
- NPA Arrangements.
- Advantages of giving area codes on operator-handled calls.
- Tones and signals which may be heard on ineffective attempts.
- Requesting credit on Wrong Numbers Reached on DDD calls.
- Current level and objective level of customer dialing performance.
- Why it is advantageous to our customers to dial correctly.
- How good customer dialing performance benefits the Company.
- How to get DDD information (555-1212).
- Need for referring names of customers requiring dialing assistance to the Traffic customer instruction group.

6.04.1.9 Contacts with New Customers: One of the basic requirements for good customer dialing performance is that all new customers should be provided with complete and concise dialing information at the time their telephones are installed. Generally, this information should be given to all new customers as well as those customers who have moved from one location to another, in a metropolitan area where different dialing arrangements are in effect. This information may be given in the following way:

(a) **Plant Installer**—The Plant installer is in an ideal position to give customer information, providing he is well-trained and understands the overall objectives of the customer information program. It is recommended that arrangements be made to give customer instruction training to all Plant installers who will be involved in customer instruction work. This training program should be developed and presented by selected Traffic people who are thoroughly familiar with customer dialing problems and the overall objectives of the dialing improvement program. This training session need not be lengthy. Usually, it will consist of a brief review with installers on a periodic basis at company garages, prior to dispatch in the morning. The training given to the Plant installer should provide the necessary background information to enable him to cover the following items in his face-to-face contact with the customer.

- Our objective is to provide the best possible telephone service for every customer. This includes proper use of the service to obtain maximum satisfaction.
- Explain and demonstrate how to find dialing information in the Information pages of the telephone directory.
- Emphasize the basic fundamentals of proper dialing, look up the number, write it down, and listen for dial tone.
- Review local and DDD (HNPA and FNPA) calling areas as related to the particular station involved.
- Explain and demonstrate how to make a call to a point in each of these areas. For DDD calls, stress the necessity for prefix code (if

required) and area code if different from area code of calling telephone.

- Explain proper procedure for reporting wrong numbers reached on local and DDD calls.
- Stress use of area codes on operator-handled calls outside the HNPA.
- Describe the tones and announcements which may be encountered.
- Billing information may be given as locally directed.

Certain handout items, as described in Paragraph 6.04.1.14, may be left with the customer for future reference. Requests for additional assistance or material should be invited and referred to the Traffic customer instruction group for follow-up. (Such items as personal directories, frequently called number lists, assistance for absent members of the family to be given at a later date, etc.)

(b) **Traffic Customer Instruction Group**—A “Welcome Call” to all new customers, as well as to those customers who have moved within a metropolitan area where different dialing arrangements are in effect, provides an opportunity to review dialing procedures at a time when the customer may be most in need of assistance. This call may be made in conjunction with a regular verification check of name, address, telephone number, and equipment installed. If the Plant installer has given dialing information to the customer, the purpose of this call would be to answer subsequent questions which may have arisen in the customer’s mind and to reemphasize our interest in providing him with the best possible service. If no information has been given by the installer, the Traffic caller should review correct dialing techniques with the customer as outlined for the Plant installer. Verification to determine if the customer’s telephone has the correct number plate should be done also at this time.

(c) **Commercial Business Offices**—In handling customer contacts, particularly claims and inquiries regarding toll calls, Business Office Service Representatives may detect a need for dialing information. To ensure that they are familiar with dialing arrangements and current DDD dialing performance, Traffic should

review this information with them on a periodic basis. If, in the judgment of the service representative, the customer requires more information than can be given by her, the customer should be told that a Company representative will visit or call him to give additional information. These "leads" should be referred to Traffic so that arrangements can be made for a personal visit or a telephone call at the earliest opportunity.

6.04.1.10 *Dialing Information for All Customers*

(a) Regular Assistance Operators—Assistance operators have many opportunities to give information to customers at the time they are in need of assistance, because of difficulty in completing a call. Since these operators should make every effort to determine the specific dialing failure being made by the customer in order to inform him properly, it is extremely important that they are well-trained in the dialing arrangements of the offices which they serve and are familiar with the objective of the customer dialing program. Patience, tact, and a genuine spirit of service are necessary qualifications for a successful contact by these operators. It is not contemplated that a customer would be questioned on a simple request for credit beyond asking the number or city reached in error. However, if a customer indicates he had trouble with his call and reached a wrong number as a result, the assistance operator should be alert to the opportunity for providing dialing assistance. To the extent possible, adequate information should be given to the customer on the initial contact. If, however, it is apparent that further assistance is required, the customer should be informed that a telephone company representative will contact him with the necessary assistance or information. These customer information "leads" should be given promptly to the Traffic customer instruction group for follow-up at the earliest possible time.

(b) Special Assistance Operators (Local and DDD)—If the volume of assistance traffic is high because of a recent change in dialing arrangements, it may be desirable to establish temporary assistance positions on the switchboard. Customers requiring assistance may then be trunked to these positions where a

small, well-trained team of operators can provide dialing information. It is important that a fast speed of answer be provided so that customers will not be delayed unduly.

(c) Information Operators—Information operators may be called by local customers who are in need of dialing assistance. While it is not practical to expect an Information Operator to be familiar with the detailed dialing arrangements for all of the offices which she serves, she should have a good understanding of the local and DDD dialing arrangements for the city in which she is located. She should also have a basic knowledge of ANC, centralized information bureaus, NPA arrangements, etc. Since the Information operator will not know where a toll information call originates, she will not know the prefix and area code requirements necessary to dial a number in the city for which she is giving information. Toll customers requesting dialing assistance should be asked to dial their assistance operator for complete information.

(d) Intercept Operators—Although most situations involving customer instruction by Intercept operators will represent local calls, operators should be alert to the possibility of a DDD customer encountering difficulty and requesting assistance. Intercept operators must have a basic understanding of local dialing arrangements and a familiarity with the common causes of customer dialing irregularities, in order to provide maximum assistance to customers.

(e) Repair Service Personnel—Plant Repair Service employees should be trained by Traffic customer instruction people so that they will be able to recognize customer trouble reports which are a result of improper dialing rather than equipment failure. This training should include a review of the dialing arrangements for all localities served by the local Repair Service. It should also include a review of the common types of dialing failures which are made by customers in these localities, how these failures may be detected, and the appropriate information to be given. Customer requests for additional information or material should be referred to the Traffic customer instruction group for follow-up.

6.04.1.11 Public Information Program.

6.04.1.12 Development of a public information program geared to meet local needs should be a joint undertaking of Traffic and Public Relations Departments with members of the local team. In addition to employee information, the program will probably consist of two major elements: advertising and publicity. Among the ways available to encourage improved dialing performance are:

- Newspaper Articles.
- Radio and TV Interviews.
- Bill Inserts.
- Open Houses and Central Office Visits.
- Lecture Demonstrations, Talks, Film Showings.
- Letters to Customers.
- Public Office Displays.
- Envelope and Bill Messages.
- Telephone Stickers.
- Other Company Publications.
- PBX Magazines.
- PBX Directories.

6.04.1.13 Incorporating a combination of these into a program should be weighed against the seriousness of the problem. In most areas, the local manager is responsible for contacts with the press. Information given to these media should be channeled through him.

(a) Newspapers—Formal preparation of news releases and feature articles should be done by the Public Relations group with the assistance of the local team.

(b) Radio and TV—Radio and TV interview and discussion programs offer an opportunity to go into problems in more detail than articles do. Appearances on such programs often are successful since they make it relatively easy to reach a wide audience in depth. For TV shows, it is important to provide some clear visuals to help tell the story.

(c) Bill Inserts—Bill inserts are an inexpensive way to reach a great number of customers. But it should be remembered that not all customers see bill inserts. This is particularly true of business customers.

(d) Open House and Central Office Visits—

Open House and Central Office Visits offer an excellent opportunity to thoroughly explain local dialing procedures to those present. Maps and charts showing local calling areas and NPA boundaries are especially helpful.

(e) Letters to Customers—Letters to customers are an excellent means of blanketing an area with information. They also make it possible to reach a selected audience directly. In addition to the letter, it is helpful many times to enclose a folder or card containing clear concise dialing information.

(f) Lecture Demonstrations, Talks, Film Showings—Lecture Demonstrations, Talks, Film Showings, all offer an opportunity to discuss local dialing problems. If the situation warrants it, special talks should be devised and booked. Traffic Personnel can speak with special authority and believability on the subject.

(g) Public Office Displays—Public office displays can help direct attention to proper dialing procedures.

(h) Envelope and Bill Messages—Company envelopes and bills provide the opportunity for brief messages. These are useful when used as reminders or tied in with an overall program.

(i) Telephone Stickers—Telephone stickers may be used to remind or to inform customers about correct dialing procedures.

(j) Other Company Publications—It is often possible to arrange for items in a customer's Company magazine or news bulletin which will feature tips on improving extension user dialing performance. Where the customer has been shown direct evidence of the cost in time and money because of employee misdialing, the chances are good that this idea will be accepted.

(k) PBX Magazines—Articles in Company sponsored PBX magazines provide an opportunity to reach PBX operators with appropriate suggestions for improving dialing performance. Reminders to keep frequently called number lists up to date, proper use of prefix codes and area codes, correct handling of equipment on incoming calls, etc, are items that can be covered effectively.

(l) PBX Directories—PBX directories should be reviewed to make sure they contain up-to-date dialing information presented in an easy-to-understand manner.

(m) Advertising—Any advertising program which is developed should complement and support other customer information activities. It should be worked out with the aid of the Public Relations groups, taking into account all available local media. Advertising should not be regarded as a “cure-all” or planned in lieu of other activities. It is difficult to direct advertising in any mass media to a specific audience. It should be remembered that a large percentage of the audience probably has experienced no difficulty or may be unfamiliar with the problem. Perhaps advertising is most effective when it is used to “announce” or “remind” customers of an event or procedure. Since the attention span of the reader (or listener) is not likely to be long, any program should concentrate on a single theme with an easy-to-grasp message. Considering the impact of the various media in a locality and devising a “mix” which will reach the customers believed to be having the problem, while not offending the others, is of the utmost importance.

Among the media which should be considered are :

- Newspapers.
- Radio and TV.
- Truck Cards, Billboards, and Car Cards.
- Direct Mail.
- Home Shows, Fairs, and Industrial Exhibits.

Note: The effectiveness of any advertising program is difficult to assess by itself. It is best judged in view of the success of the total program.

6.04.1.14 Dialing Aids and Handouts: There are many different dialing aids or “handouts” which can be utilized for customer information purposes. These may be distributed on a general or on a selected basis depending upon the coverage desired. The message to be used in this medium must be brief and understandable. Following are some examples of handouts which may be used :

- (a) *Frequently called number lists*—These may be desk, pocket, or wallet-size. They

*Trademark of Foley Industries

should have space for writing name, prefix code (if applicable), area code, and telephone number. In addition, they should contain a specific or a general reminder message. If specific, the message should be related to the particular dialing problem in the locality where the number lists are to be distributed. Calldex® frequently called number list holders for use on 500-type sets may be considered for distribution to high users. This device has the advantage of providing a convenient location for the listing of frequently called numbers.

(b) *Personal directories*, with DDD instruction pages specifically designed for a particular Company or location, are a good means of encouraging customers to maintain a list of frequently called numbers. These directories may be given blanket distribution as with the customer’s regular directory, or they may be distributed on a selected basis.

(c) *Call Guides*—In localities where there is confusion concerning the limits of the local calling area, call guides may be used to help clear up this misunderstanding. They should show, with a map and/or tabular listing, the localities or central offices which are within the local calling area. Brief instructions for making a DDD call should also be included. These call guides may be a convenient size for carrying in a wallet or pocket or slightly larger to be used as a placemark or as a guide to associate name and telephone number when looking up listings in the directory. They may be printed on adhesive back paper for placement on the customer’s telephone directory or Blue Book. Personal directories can be ordered with a specific informational page which shows the local calling limits for a metropolitan area in the same manner as suggested for call guides.

(d) *Tent cards*, with an appropriate message, can be provided for distribution to PBX extension users and to Telephone Company cafeterias and lounges. They may be part of a telephone good usage program or they may be used as independent reminders of good dialing habits.

(e) *Calendars*—Small wallet-size calendars, with a reminder message, are useful and thus encourage retention. Larger calendars with

dialing tips as reminders may be given to extension users to be placed on their desks.

(f) *Dialing Tools*, either on the end of a pencil or as a separate tool, can serve to keep a very brief reminder message before the customer at the time he makes a call. These are most useful for PBX attendants and other heavy users.

(g) *Magic Slates*—These small memo pad-size slates will permit a PBX attendant to jot down notes and telephone numbers as reminders while she is operating. These also can be used by extension users and residence customers. By lifting the cellophane cover, the message is erased and the pad becomes reusable for the next note. Dialing tips on the top of the pad will be constant reminders to the attendant. The practical value of the pad will encourage its retention by the attendant.

(h) *Pencils* with brief messages on good dialing techniques are good items for handing out at Open Houses, Central Office Visits, etc. Since pencils have a practical value, it is likely that they will be retained and used for a period of time.

(i) *Small memo pads* with three or four alternating messages at the top or at the bottom are an inexpensive way to attract the customer's attention with a dialing tip. These memo pads may be used as handouts in connection with personal visits to customers or as giveaways at Open Houses, Central Office Visits, lectures, film showings, etc.

6.04.1.15 Long-Range Improvement Considerations: In carrying out a program designed to improve customer dialing performance, there are many things which may be done on a current basis, while certain other items will, of necessity, require a longer period of time for accomplishment.

(a) *Clarify Directory Information*—Continued attention must be given to the clarification of dialing information in the customer's directory. The objective is to provide clear and concise information in a convenient location which will encourage ready reference by the customer. Traffic, Public Relations, and Directory must coordinate their efforts in this area in following System recommendations on directory information pages.

(b) *Uniform Dialing Arrangements*—One of the basic reasons for poor customer dialing is the complex and often variable dialing arrangements which are in effect in many metropolitan locations. Long-range planning should be used on the objective for uniform dialing arrangements. System recommendations have been made which outline ultimate objectives in this area.

(c) *Talks and Lecture Demonstrations*—In developing talks, lectures, and lecture demonstrations, the correct dialing of calls should be considered as a "tie-in" wherever possible. Traffic, Public Relations, and Commercial should coordinate their activities in this area.

(d) *School Programs*—The System school programs in use today are an invaluable means of providing educators and students with up-to-date telephone information. Since the elementary and secondary school students of today are present users and future customers, it is to our advantage that they develop good telephone habits. It is important that those responsible for providing educational programs be thoroughly familiar with references to dialing practices that appear in the materials they distribute to schools as well as the specific dialing procedures that relate to the various communities they serve. Equipped with this information, they are in a position to answer effectively questions that result from class or teacher discussions on the subject.

(e) *Personal Directories*—Specific dialing instructions for a metropolitan area or a company, where common dialing arrangements are in effect.

6.04.2 The following basic considerations should be explored before establishing a customer dialing improvement program when it has been determined that the underlying cause of the irregularity problem is *careless dialing rather than lack of knowledge*. (Fig. 33)

(a) Determine the problem boundaries. If the irregularities appear to be confined to a wire center or exchange, attempt to find the reason for this pattern.

(b) Review the most current customer attitude surveys of the problem area for general indicators of subscriber frustration, hostility,

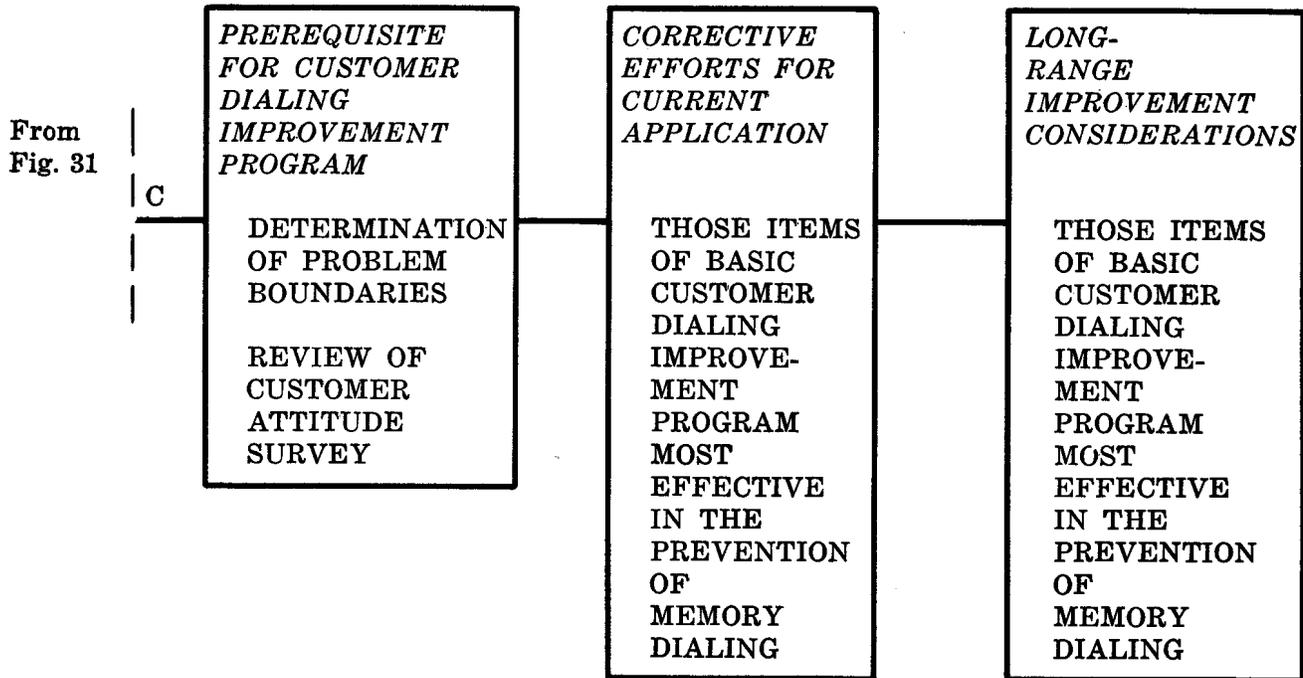


Fig. 33—Flowchart—Customers' Irregularities—
Corrective Action—Careless Dialing

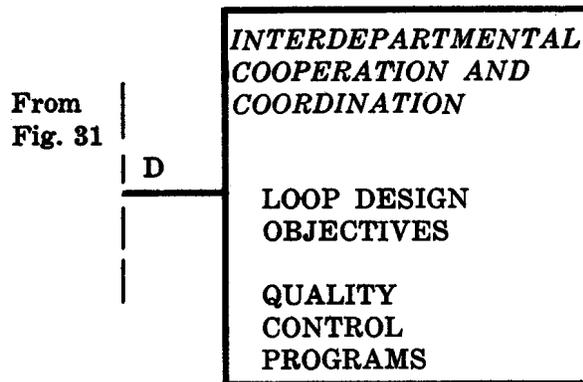
or resentment regarding their telephone service. A customer dialing improvement program will be of little value while these attitudes exist.

6.04.3 The term careless, or poor dialing habits obscures the fact that such irregularity terms as "Omit Code," "Number in Mind," "Wrong Digit," "Extra Digit," and "Insufficient Digits," when not due to lack of dialing knowledge are caused by the customer attempting to dial the called party's number from memory. It is for this reason that when a customer irregularity problem exists which is not due to a lack of dialing knowledge, an improvement plan should be established. The proposed remedial action would use those portions of the basic cus-

tomer instruction program which can, in the judgment of the interdepartmental committee, be most effective in the prevention of memory dialing.

6.04.4 Outside Plant Facilities Problems: (Fig 34) The major requirement for the correction of what appear to be customers' irregularities but which are actually caused by outside plant facilities problems, is interdepartmental cooperation and coordination. It is therefore suggested that the District committee review the following:

- (a) Loop design objectives.
- (b) Existence and status of transmission and signaling quality control programs.



**Fig. 34—Flowchart—Customers' Irregularities—
Corrective Action—Outside Plant Facilities Problems**

7. REFERENCES

Bell System Practices:

201-112-001
201-114-001
226-135-300
951-901-100

Central Office Management:

Division E, Sections 3, 3-A

Traffic Facilities Practices:

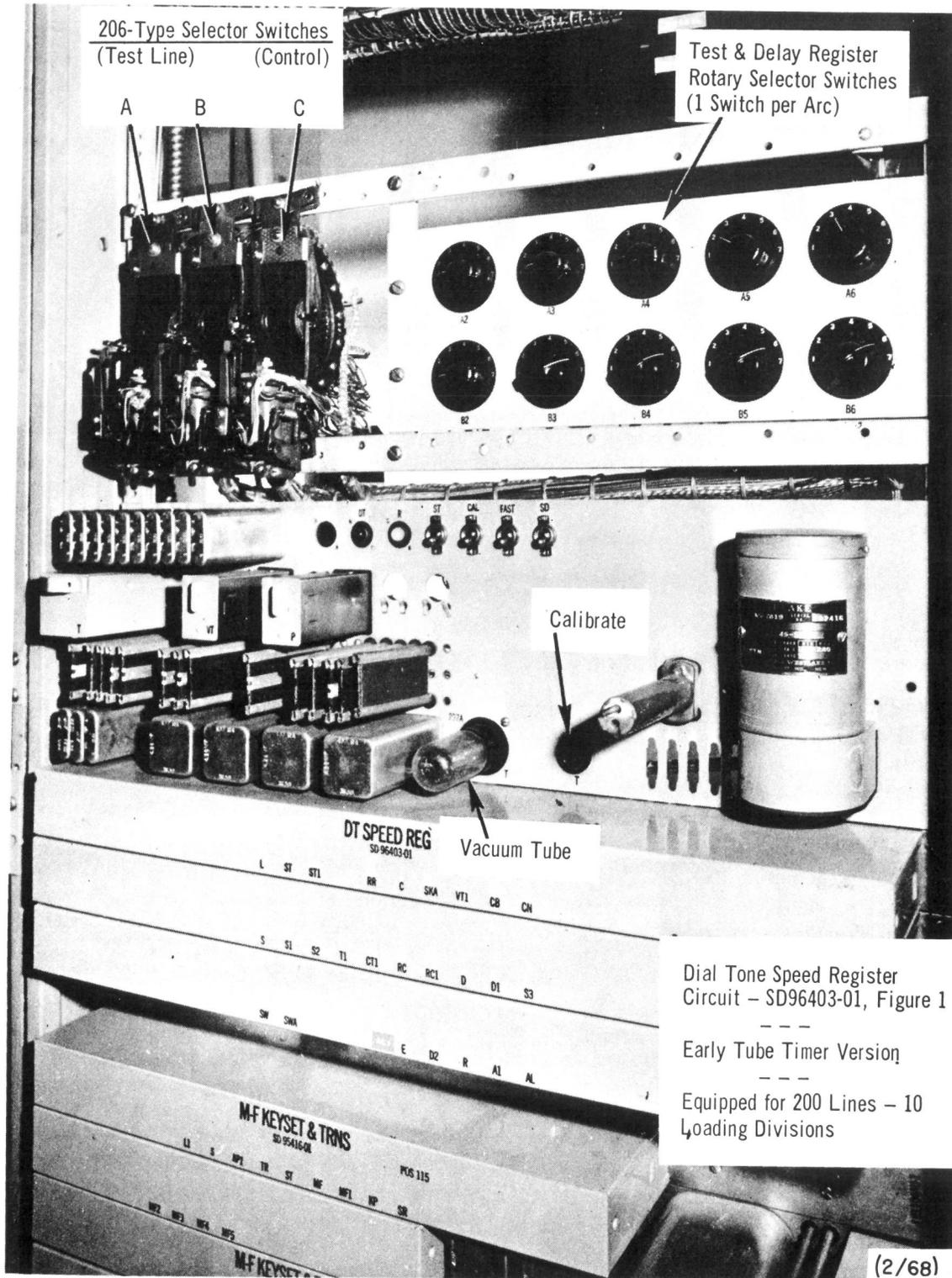
Division B, Section 4
Division D, Sections 1-b, 1-d

Traffic Service Observing Practices:

Division F, Section 2
Division B, Section 1
CD—96403-01
SD—96403-01

Letter:

PERMANENT SIGNAL PROCEDURES
FOR OVERLOADED OFFICES, J. H.
Hunt, C. K. Collins, 8/29/67



206-Type Selector Switches
(Test Line) (Control)
A B C

Test & Delay Register
Rotary Selector Switches
(1 Switch per Arc)

Calibrate

Vacuum Tube

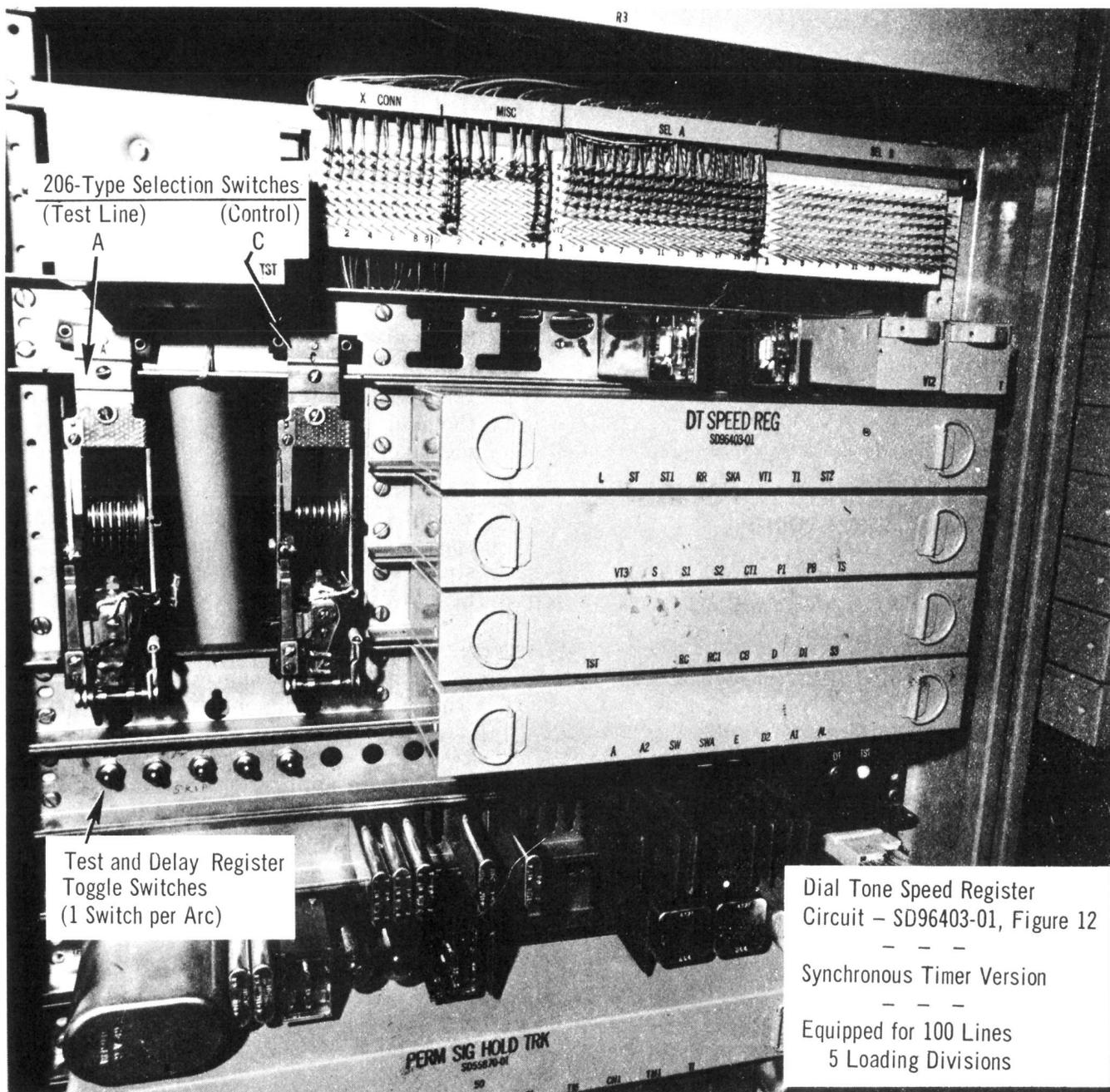
Dial Tone Speed Register
Circuit - SD96403-01, Figure 1

Early Tube Timer Version

Equipped for 200 Lines - 10
Loading Divisions

(2/68)

DIAL TONE SPEED REGISTER CIRCUIT—SD-96403-01, FIGURE 1
Early Tube Timer Version



206-Type Selection Switches
(Test Line) (Control)

A C
TST

Test and Delay Register
Toggle Switches
(1 Switch per Arc)

Dial Tone Speed Register
Circuit – SD96403-01, Figure 12
— — —
Synchronous Timer Version
— — —
Equipped for 100 Lines
5 Loading Divisions

DIAL TONE SPEED REGISTER CIRCUIT—SD-96403-01, FIGURE 12
Synchronous Timer Version

ESTERLINE ANGUS TWENTY PEN RECORDER

STUDY PURPOSE: To determine line groups where dial tone delays occur.

4 4 Battery
 4' Arc A3 Delay register lead

(Similar connections for other Arcs with assignments.)

CIRCUIT: Dial Tone Speed Register Circuit SD-96403-01.

SAMPLE CHART: See Appendix 4

CHART SPEED: 12 inches per minute (2 spaces per second).

Notes:

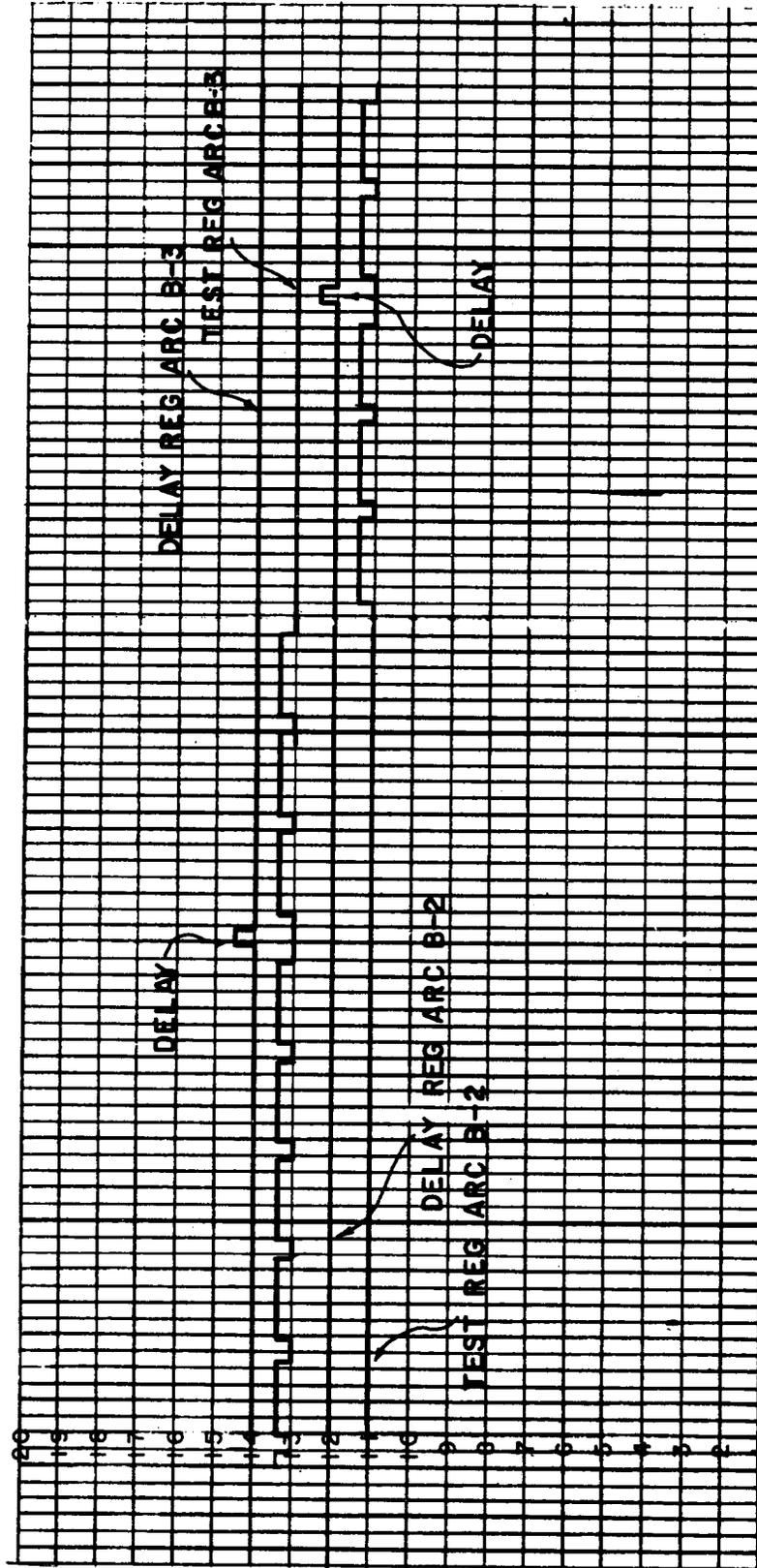
Place: Larger green gear on lower spindle and smaller gear on upper spindle.

1. The indicated dial tone delays on the Esterline Chart will be identified by comparing the associated test position on the tape with the dial tone speed test terminal assignment chart.
2. The dial tone speed assignment chart should be checked against the dial tone speed assignment wiring prior to this study, and verified with the Traffic Department's list.

CONNECTION POINTS

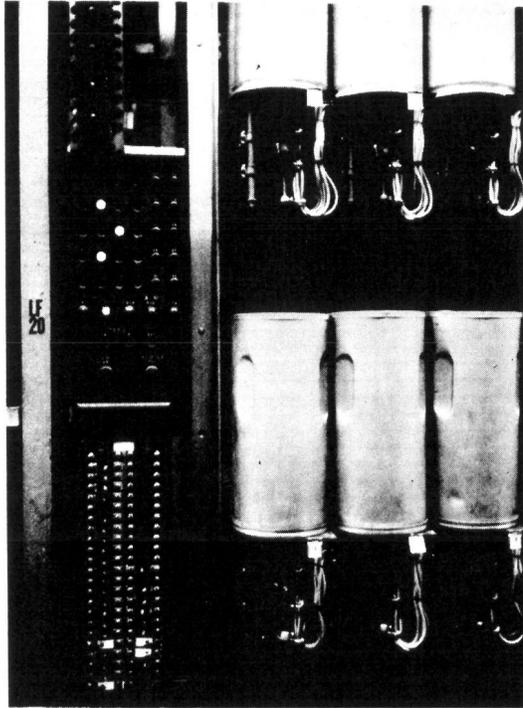
Pen No.	Terminal No	Connect to:
1	1	Battery
	1'	Arc A2 Test register lead
2	2	Battery
	2'	Arc A2 Delay register lead
3	3	Battery
	3'	Arc A3 Test register lead

Note: A similar application may be used by central office maintenance forces for monitoring line load control lamp activity principally in connection with minimizing the effects of *permanent signals* (See 3.03.7.2, (h), Note:). Both applications are generally not needed simultaneously, but where this is done, their results should be correlated.



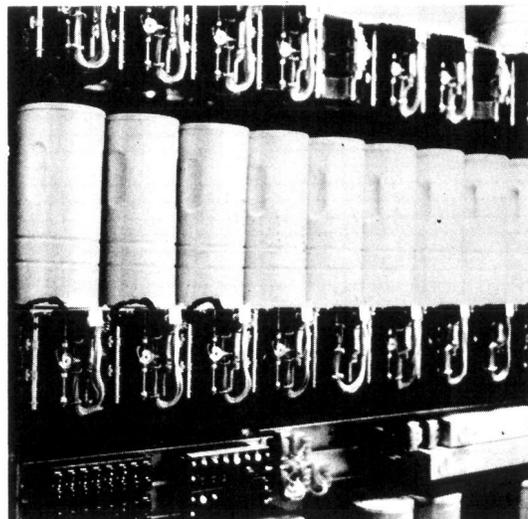
ESTERLINE ANGUS TWENTY PEN RECORDER
Sample Chart

LINE FINDER MAKE-BUSY FEATURES Older Type Line Groups



Line Finders
#7, #9, and #13
Made Busy

Newer Type Line Groups



Line Finders
#1, #2, and #3
Made Busy
(Note absence
of make-busy
jack field)

SELECTOR MAKE-BUSY FEATURES



Showing Selectors #96, #97, and #98 Made Busy

MAKE-BUSY FEATURES FOR THE FOLLOWING,
ARE SIMILAR TO THE ABOVE:

Connectors

Repeaters

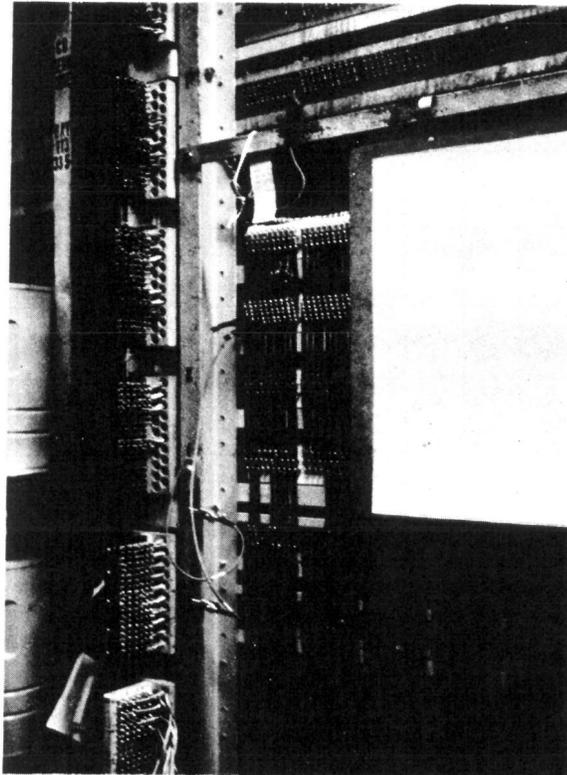
Trunk Equipments

MAKE-BUSY TOOLS

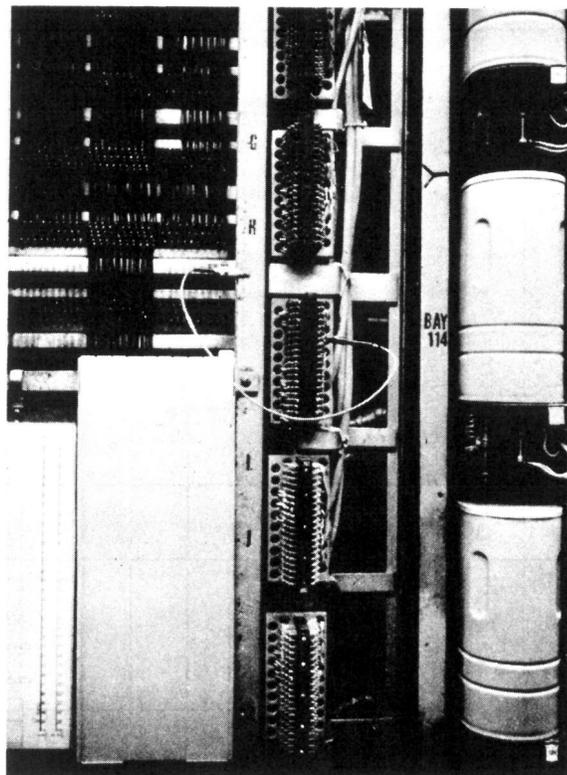
Standard Tools

Tool	Used With
Make-Busy Plug	Line Finders (Older Type)
477A Tool	Selectors, Connectors, Repeaters, Trunk Equipments
Ground Strap	Trunks

TRUNK MAKE-BUSY FEATURES



**Made Busy At
Distributing Terminal
Assembly**



**Made Busy At
Distributing Terminal
Block**

FORM E-4256
 (4-67)

RECORD OF EQUIPMENT OUTAGE

MONTH March - 66
 SHEET OF SHEETS

OFFICE OR MARKER GROUP 735

EQUIP AND NO.	TICKET NO.	OUT OF SERVICE				RESTORED TO SERVICE			N.B.D. OUTAGE		REMARKS	
		BY	REASON	REFERRED TO	DATE	TIME	DATE	TIME	BY	PLANT		OTHER
Conn 226 F4	5	R.A.	Open Winding "A" Relay	-	3/3	8 ³⁰ _A	3/3	9 ³⁰ _A	R.A.	10		
Conn 526 D1	6	R.A.	Worn Wiper Brush Assembly	-	3/5	11 ¹⁵ _A	3/5	11 ⁴⁵ _A	R.A.	50		
LG 141 #10	7	A.B.	Wire Off Rotary Magnet	-	3/7	3 ²⁵ _P	3/7	3 ³⁵ _P	A.B.	05		
A	TOTAL NUMBER OF OUTAGES		B.S.P. 201-114-001	B+C A = OUTAGE RATIO		TOTAL NUMBER OF N.B.D. HOURS			B	C		

RECORD OF EQUIPMENT OUTAGES, FORM E-4256

Dial Facilities Management Practices

PRINTED IN U.S.A.

FORM E-4988
 (9-66)

TRAFFIC DATA TROUBLE TICKET

Report Period _____
QUARTER WEEK NO.

Issuing Group _____ Tkt. No. _____

C.O. Entity		Verbal Report Given Date	Hour	To Whom
No. of Unusable Computations		TUR		Other
Register, Frame, Field Nos.				
Trouble Date			Trouble Time	
Unusable	No Data		Trouble Report	
	Unreliable Data			
Data Below To Be Supplied By Plant				
Camera & Film		Trouble Found, Cause, Work Done		
TUR				
Central Office				
Out-of-Service				
Administration				
Automatic Process. System Failure				
Other				
No Trouble Found				
Work Done By		Date		

Plant return to:

Distribution:

INSTRUCTIONS—TRAFFIC DATA TROUBLE TICKET, FORM E-4988

TROUBLE CATEGORIES

CAMERA & FILM - Any equipment trouble relating to the camera, i. e., shutter failure, inoperative lights, etc., and any film problems such as development, emulsion separation, etc. (Improper camera loading, lost film, missing designations strips, etc., are not to be included in this category.)

TUR - Any equipment trouble relating to improper operation or failure of the TUR frame. (This category does not include cross-connection errors, converter, magnetic tape unit, paper tape applique unit or TURDF problems, assignment errors, etc.)

CENTRAL OFFICE (& CROSS-CONNECTIONS) - Any cross-connection or wiring errors, broken wires, wiring shorts, etc., found in the TUR, TURDF, or converter. Also included are central office equipment troubles, i. e., traffic registers, markers, etc., malfunction.

OUT OF SERVICE - Any time the TUR or central office equipment associated with it is out of service due to Western Electric work or Plant maintenance, preventing the collection of scheduled data, the desired computations not obtained are counted in this category, even though both Traffic and Plant have agreed to the outage.

ADMINISTRATION - Failure to set program timer, set camera clock, insert designation strip, load film properly, load magnetic tape or paper tape applique units, etc. In addition, lost film or tape, errors in scheduling, failure to properly address and route film or tape, cross-connection assignment errors (when due to telephone company record preparation), data channel assignment errors, etc., are included in this category.

AUTOMATIC PROCESSING SYSTEM FAILURE - This category includes improper converter output (not due to cross-connection errors), magnetic tape or paper tape applique unit failures, data channel failure, improper summarizer operation (or failure), uncorrected keypunch errors, and all other losses directly or indirectly related to the mechanized collection and/or processing of Traffic data.

OTHER - This includes only those troubles that cannot be traced to any of the above categories.

NO TROUBLE FOUND - Either nothing abnormal found or abnormal condition existed but cause not found.

REFERRED TROUBLE TICKET, FORM E-2384

FORM E-2384 (2-61)										REFERRED TROUBLE TICKET						TKT. NO.		
OFFICE			DATE				TIME			ISSUED BY								
REFERRED FROM									TROUBLE FOUND AND CAUSE									
TICKET NO.			ROUTINE JOB NO.			OTHER												
T	R	I																
EQUIPMENT																		
TROUBLE																		
			REMOVED FROM SERVICE				TIME SPENT			CLEARED								
BY		DATE		TIME		BY				DATE		TIME						
			REFERRED				TIME SPENT			RESTORED TO SERVICE								
TO		DATE		TIME		BY				DATE		TIME						

PRINTED IN U.S.A.

FORM E-4255
 (4-67)

RECORD OF TRUNK OUTAGE

MONTH March 66

OFFICE OR MARKER GROUP 735

SHEET 1 OF SHEETS

TRUNK NO. & OFFICE	TICKET NO.	OUT OF SERVICE					RESTORED TO SERVICE				N.B.D. OUTAGE		REMARKS
		BY	REASON	REFERRED TO	DATE	TIME	DATE	TIME	OK'D BY	RSTRD BY	PLANT	OTHER	
28 CAMA	1	A.C.	open Ring	W.A	3/2	9 ⁴⁵ _A	3/2	12 ⁴⁵ _P		A.C.	3	0	
13 W.Ave.	2	A.C.	No Ring	DRJ	3/2	10 ¹⁵ _A	3/2	11 ¹⁵ _A		A.C.	1	0	
30 T.Ave.	3	A.C.	Calls Don't Terminate	RD	3/3	1 ³⁰ _P	3/3	3 ³⁰ _P		A.C.	2	0	
A	TOTAL NUMBER OF OUTAGES		B.S.P. 201-114-001				OUTAGE RATIO $\frac{B+C}{A} =$		TOTAL NUMBER OF N.B.D. HOURS		B	C	

RECORD OF TRUNK OUTAGES, FORM E-4255

OVERFLOWS - Grouped By Central Office

ORIGINATING CENTRAL OFFICE UNIT	DATE	TERMINATING CENTRAL OFFICE UNIT						
		333	334	335	336	367	368	255
333	1-15-68		/	7 ///		/		
	16							
	17			///				
	18	/		/				
	19			7 ///				
334	1-15-68			//				
	16			///				
	17		/			/	/	
	18			///				
	19			/				
335	1-15-68			/				
	16							
	17							
	18	/					//	/
	19							
336	1-15-68	/		7 ///				
	16			/	/			
	17		/	/				
	18			///			/	
	19	/		/				
367	1-15-68			/				/
	16		//	///				
	17			///				
	18			//		//		
	19			/				
368	1-15-68	/		7 ///				
	16			//	/			
	17			///				
	18							
	19			7 ///				
255	1-15-68			///		/		///
	16			//				7 ///
	17		/	//				7 ///
	18							///
	19			/				7 ///

Week Ending 1-19-68

DIAL ASSISTANCE CALL BOARD

Wrong Number
No Ringing Signal
Don't Answer

Hour	8	9	10	11	12	1	2	3	4
Inf.	NRS DA	/	/	/	/	/	/	/	/

EXTENDED LOCAL SERVICE

CO9	/	BE5	/	BE7	/	MA8	/	LU2	/
LU3	/	HU2	/	HU9	/	JO7	/	TU8	/
	/	/	/	/	/	/	/	/	/
	/	/	/	/	/	/	/	/	/
	/	/	/	/	/	/	/	/	/
	/	/	/	/	/	/	/	/	/

Reached Operator Dial Tone or Coin Return While Dialing

Busy Before Through Dialing

	0	1	2	3	4	5	6	7	8	9
0	NRS WNR	/	/	/	/	/	/	/	/	/
1	/	/	/	/	/	/	/	/	/	/
2	/	/	/	/	/	/	/	/	/	/
3	/	/	/	/	/	/	/	/	/	/
4	/	/	/	/	/	/	/	/	/	/
5	/	/	/	/	/	/	/	/	/	/
6	/	/	/	/	/	/	/	/	/	/
7	/	/	/	/	/	/	/	/	/	/
8	/	/	/	/	/	/	/	/	/	/
9	/	/	/	/	/	/	/	/	/	/

CONNECTOR HUNDREDS

CONNECTOR THOUSANDS

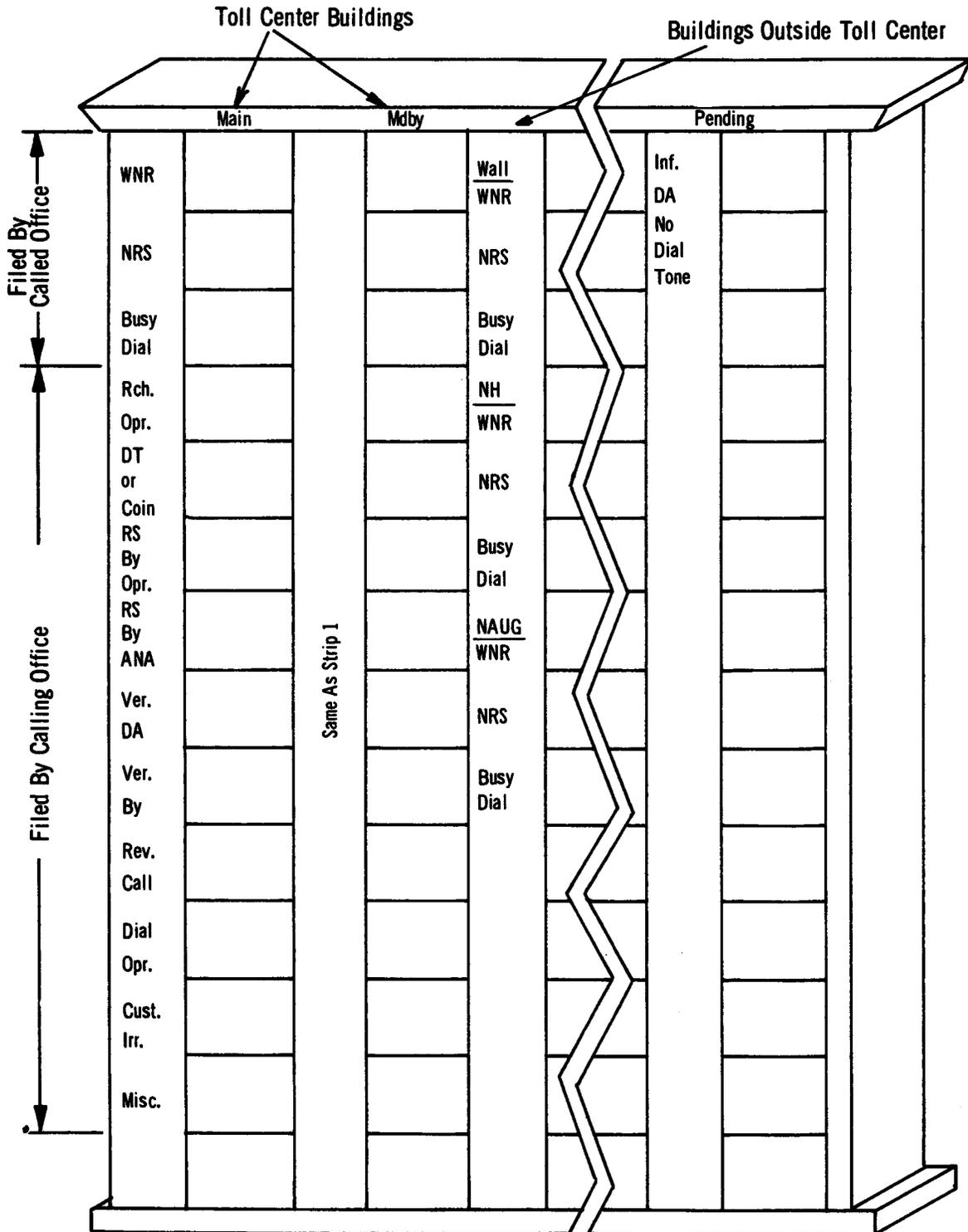
	0	1	2	3
0	NRS WNR	/	/	/
1	/	/	/	/
2	/	/	/	/
3	/	/	/	/
4	/	/	/	/
5	/	/	/	/
6	/	/	/	/
7	/	/	/	/
8	/	/	/	/
9	/	/	/	/

PL3

PL7

PL8

DIAL ANALYSIS TICKET FILING CABINET ARRANGEMENTS



STATION ANALYSIS RECORD

Connector Group _____

00		25	
01		26	
02		27	
03		28	
04		29	
05		30	
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SUMMARY OF DIAL TRAFFIC ANALYSIS WORK

Div. H, Sec. 2d(3)
 Appendix 18
 December 1968

Dial Facilities Management Practices

Item	Ave. 19__	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Group 1													
1	Wrong Number Reached												
2	No Ringing Signal												
3	Busy Before Through Dialing												
4	Reached Operator While Dialing												
5	Dial Tone or Coin Return Dialing												
6	Total Group 1												
7	Tickets Per 1000 Main Stations												
8	Plant Investigations Requested												
9	Troubles Found												
10	% Troubles Found of Investigations												
11	% Troubles Found of Tickets												
Group 2													
12	Referred to Repair Service By Operator												
13	Referred to Repair Service By Analyst												
14	Total Group 2												
15	Tickets Per 1000 Main Stations												
Group 3													
16	Verification of Don't Answer												
17	Verification of Busy												
18	Reverting Call or Ring on Line Requests												
19	Dialed Opr. Fdr. Inf. or Repair Service												
20	Miscellaneous Customers' Irregularities												
21	All Other Tickets												
22	Total Group 3												
23	Tickets Per 1000 Main Stations												
24	Customer Instruction Calls by Analyst												
25	Total Tickets Written												
26	Working Main Stations ÷ 1000												
27	Total Tickets Per 1000 Main Stations												
28	No. of Assistance Observations												
29	No. of Assistance Tickets Found												
30	Percent of Tickets Found												

Building _____ Central Office _____

DIAL ASSISTANCE TRAFFIC INVESTIGATION—SAMPLE FORM

DIAL ASSISTANCE TRAFFIC INVESTIGATION				
DATE _____		EXCHANGE _____		No. _____
TRAFFIC SECTION				
CALLING NO.	L.F. S. & T.	CALLED NO.	TIME	CUSTOMERS DIFFICULTY
SOURCE OF TRAFFIC INFORMATION				
ASST. CALL. _____		TEL. CALL _____		SERV. CRIT. _____
RESULTS OF TRAFFIC INVESTIGATION				
TIME				
PLANT INVESTIGATION DATA				
TEST SHOWS	TROUBLE FOUND	DATE - TIME		
NOTED _____		SIGNED _____		
C.O. FOREMAN		SWITCHMAN		